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DEPARTMENT OF TRANSPORTATION

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I-80 Reconstruction
SR 0080 Section 17M
Phase I Alternatives Analysis

Agreement E02656

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AECOM

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1. PROJECT BACKGROUND AND PURPOSE AND NEEDS

1.1 PROJECT AREA DESCRIPTION

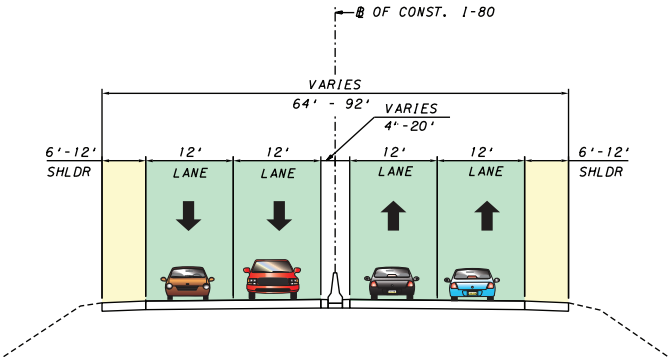
The Interstate 80 (I-80) Section 17M project includes 3.5 miles of full roadway reconstruction, widening, and interchange reconfiguration within eastern Monroe County, Pennsylvania. The roadway in this region serves as a major carrier of local and regional commuter traffic; local, regional, and national freight; and local and regional tourism. The project corridor serves as a gateway to the Pocono resort areas as well as the Delaware Water Gap National Recreational Area. Originally constructed in the 1960s, the roadway has suffered significant deterioration in recent years, and no longer meets multiple design criteria. The heavy traffic volumes contribute to frequent congestion and crashes. This segment of I-80 is currently designated as a highway safety corridor, and as a result is targeted for the application of signs, increased levels of enforcement, and increased penalties for the purpose of reducing unsafe driver behaviors.

This Phase I Alternatives Analysis has been prepared for the Federal Highway Administration (FHWA) and Pennsylvania Department of Transportation (PennDOT) District 5-0 and provides multiple alignment options for upgrading the roadway and improving connections for all users.

Roadway Network

The project corridor passes through three municipalities within Monroe County: Stroud Township to the west, the Borough of Stroudsburg and the Borough of East Stroudsburg to the east. The project limits run from just west of the 303 interchange to west of the Lincoln Avenue bridge in East Stroudsburg. The project area includes the 303, 304, 305, 306 and 307 interchanges. (See Figure 1.1)

I-80 is classified as an urban interstate and serves as a major east/west limited-access highway running through northern Pennsylvania, including Monroe County, as part of its 2,900 mile route from Teaneck, New Jersey to San Francisco, California. (See Figures 1.2 and 1.3) Through the project area, I-80 includes two lanes in each direction with a median barrier, with variable inside and outside shoulder widths.



In addition to I-80, the area is serviced by several routes which are important arterials and collectors in the area. They are, from west to east:

- **US Route 209** (US 209, urban other principal arterial) running north to south and connecting with I-80 at Exit 304 in Stroud Township. From this merge, US 209 and I-80 share roadway and signage east to Exit 309, where US 209 separates from I-80 and continues northward as an urban minor arterial.
- **Business 209/SR 2012 (West Main Street)** runs approximately east/west through the project area south of I-80, from its start with US 209 in Hamilton Township south of the project area to its terminus in Marshalls Creek in Smithfield Township in the northeast. Business 209/SR 2012 is classified as an urban principal arterial in the project area, and serves as a major local connection and "main street".
- **SR 611 (North 9th Street)** is an urban minor arterial, running east from the western limits of the project area to its connection with Business 209 (West Main Street) in the Borough of Stroudsburg. From here SR 611 shares Business 209 to South 7th Street. At this point, SR 611 runs south as Park Avenue making an eastbound-only on/off connection with I-80 at Exit 307 and continues until it intersects with SR 191.
- **SR 191** (urban minor arterial) is a major north/south route which starts with its connection at SR 447 in Stroud Township in the north and runs through downtown Stroudsburg to its intersection with Business 209 (Main Street). This segment is signed as North 5th Street. From here, SR 191 is re-signed as Broad Street, crosses the Pocono Creek and proceeds southwards through southern Stroud Township. Exit 307 off of I-80 makes a westbound-only on/off connection with SR 191 (Broad Street) just south of McMichael Creek and just north of the I-80.
- **Other smaller, but locally important routes** include Bridge Street (SR 2009) a rural major collector running north/south from SR 611 to Business 209/SR 2012, and Dreher Avenue (SR 2004) an urban minor arterial running north to south from Business 209/SR 2012 to the intersection of Glenbrook Road just over the municipal line in Stroud Township. I-80 makes a connection with Dreher Avenue at Exit 306 approximately between these two termini.

Land Use/Land Cover

Existing land use/land cover can be classified as mostly urban in the eastern portion of the project area, especially in the two boroughs of Stroudsburg and East Stroudsburg. The project area becomes more rural heading westward along I-80. (See Figure 1.4)

Starting from the eastern terminus of the project area the land use immediately adjacent to the roadway corridor includes a water/wastewater treatment facility and flood protection areas around Brodhead Creek. Crossing the creek and heading westward there is a mixed use of commercial/industrial and residential land uses as the interstate winds its way through the urban areas of Stroudsburg Borough. This includes open space at Exit 307 taking the form of Ann Street Park and Rotary Creek Park. Continuing westbound between SR 611 and Exit 306, the interstate is bordered to the north by McMichael Creek and its floodplain and by residential neighborhoods to the south made up of mostly single family homes. At this point I-80 is bordered by the Stroudsburg Cemetery to the north and a private scrap yard and the Labar Village Senior Community Association to the south.

Approaching Exit 305 there is single family residential housing to the south and residential multi-family housing consisting of the Garden Street Housing Development to the north. The interchange here is commercial to the north and mostly residential to the south. After this point, the northern side of I-80 includes Pocono Creek and its

floodplain which eventually runs underneath I-80 and continues on the south side of I-80 after Bridge Street (SR 2009).

At Exit 304 there is another large private scrap yard in the southeast quadrant and a residential multi-family complex in the southwest quadrant of the I-80/US 209 interchange. Continuing towards the project area's western end there are residential single family homes south of the I-80 overpass at Bridge Street/SR 2009 and commercial development on the northern side of Pocono Creek.

After this, the area includes a township maintenance yard at Exit 303 as well as the gateway to the large shopping areas along SR 611 and the northern portion of the Kirkwood Camp and Conference Center to the south of I-80.

McMichael Creek with Rotary Park

1.2 PROJECT HISTORY

Conditions along the I-80 corridor in the project area have slowly been deteriorating as local and regional growth added to congestion and safety concerns. As a result of these changes, the Safe 80 Task Force was created in 2001 as a coalition of local government and business representatives to identify issues and potential solutions. Initiatives from the task force have included lowering the speed limit to 50 miles per hour and the introduction of signage to help avert congestion-related incidents. Most recently, the task force has been focusing on enforcement of the existing speed limits, as numerous crashes with speed as a contributing factor have resulted in major traffic tie-ups.

Correspondingly, PennDOT District 5-0 has worked closely with the Task Force recognizing that systemic issues may be contributing to the problems identified in the 2009 study of 18 miles of I-80 in Monroe County running from Exit 298 (I-380) east to Exit 310, where I-80 crosses into New Jersey. The I-80 Section 17M project constitutes much of the eastern end of the original study where interchanges are most densely concentrated. The 2009 study recommended several interchange upgrades, which served as the starting point for the alternatives presented in this report.

1.3 PROJECT PURPOSE AND NEEDS

The purpose of this project is to provide a safe and efficient transportation system on this National Highway System component for both local and regional connections in the area by reducing future congestion on I-80 in the 2045 design year to Level of Service (LOS) E or better, improving safety, and bringing the I-80 roadway and structures up to current design standards with no or minimal design exceptions.

The following Project Needs have been identified:

- **Safety.** Recent crash data showing rates above the statewide average (see Figure 1.5 for Crash Summary) indicates a high percentage of rear-end, side swipe, and hit fixed object crashes which can be attributed to the congestion (see below) and geometric deficiencies within this Safety Corridor. Geometric deficiencies include:
  - The acceleration and deceleration lane lengths for 9 of the 14 existing movements within the project limits are below PennDOT/AASHTO design criteria. See Table 1.1 for existing versus criteria lengths. Lack of sufficient length contributes to safety issues throughout the corridor, as indicated by the collosion types and numbers shown in the Crash Analysis Map in the Crash Summary.
  - The Westbound I-80 to SR 209 ramp at Exit 304 and the Main Street to Westbound I-80 ramp at Exit 305 also have an entrance / exit weave which requires a total of 2000 feet based on PennDOT/AASHTO criteria. The available length is 1000 feet. This

contributes to the high number of rear-end and hit fixed object collisions in this roadway section.

- I-80 has varying inside and outside shoulder widths below minimum design criteria. Existing inside shoulders range from 1 foot to 4 feet, with 10 feet to 12 feet minimum required. Outside shoulders are 10 feet, where 12 feet is required. This results in reduced access for emergency vehicles during incidents, as well as the potential for disabled vehicles to impact the travel lanes.
- Deteriorated roadway and bridge components cause hazardous conditions under normal use as well requiring frequent lane closures for ongoing maintenance issues. The I-80 corridor in the project area was constructed in the 1950s and early 1960s. The roadway pavement has reached the end of its useful life and is in poor condition. In addition, the I-80 bridge over SR 2009 (Bridge Street) is structurally deficient, with a sufficiency rating of 30.7 and a substructure condition rating of 3.

- **Congestion.** Existing and projected future high traffic volumes, as well as the geometric deficiencies detailed above, contribute to congestion in the project area.
  - Current volumes on I-80 average approximately 47,300-70,500 vehicles per day (2013) with 12% heavy vehicles (trucks). Both overall and truck volumes increase from approximately Exit 305 eastward; overall, truck volumes tend to be heavier eastbound. Design year projections (2045) show volumes of approximately 89,200-132,800 vehicles per day. The additional future traffic will increase congestion, with the entire mainline from Exit 304 to Exit 307 and most ramps operating at LOS F in the No-Build scenario. This will also then increase the potential for conflicts at the interchange acceleration and deceleration ramps, as congested conditions make movements more difficult. See Tables 1.2 through 1.5.
  - Lack of sufficient length for acceleration and deceleration lanes also contributes to the congestion throughout the corridor. This is reflected in the LOS shown in Tables 1.2-1.5.
- **Mobility**
  - System continuity is lacking. PennDOT and AASHTO design requirements for interstate systems call for all traffic movements to be available at each interchange. In addition, drivers generally expect full movement availability. Exits 303, 304, and 306 provide only some of the connections available (see Table 1.6), which contributes to congestion and safety issues in the region, such as the illegal left hand turns made on SR 611 at Exit 303 by exiting eastbound traffic.
  - The project corridor services both local and through traffic, creating conflicts between the types of traffic and deviating from the intent of the Interstate system to facilitate long range travel. A significant portion of the project area traffic is local use that both enters and exits I-80 within the project area. For example, 48% of the traffic entering at the 307 interchange westbound exits at either the 306, 305, or 304 interchanges.
  - Four lanes of traffic, two in each direction, must be maintained on I-80 at all times during construction, except for short term closures necessary for the safe execution of specific construction activities.
  - The Strategic Highway Network (STRAHNET) system is the system of roads deemed necessary to support the Department of Defense's operations. As a component of this system, I-80 should include minimum vertical clearances of 16'0", particularly to facilitate freight mobility. PennDOT requires an additional 6 inches of vertical clearance to accommodate future pavement overlay. The existing Exit 303 ramp bridge over I-80 provides 16'0" vertical clearance, the existing Exit 304 ramp bridge over I-80 provides 16'4", and the existing SR 0191 structure over I-80 provides only 15'0" vertical clearance.

TABLE 1.1 CRITERIA LENGTHS

Exit	Movement	Existing Length (feet)	Speed (mph)	Required Length (feet)*
303	EB to 611	715	35	342
303	611 to WB	930	35	490
304	209 to EB	700	40	130
304	WB to 209	500	35	285
305	WB to Main St.	150	25	355
305	Main St. to WB	500	25	550
305	EB to Main St.	180	25	355
305	Main St. to EB	195	25	550
306	Dreher Ave. to EB	280	35	350
306	WB to Dreher Ave.	170	35	285
307	EB to Park Ave.	180	35	285
307	Park Ave. to EB	260	15	660
307	WB to Main St.	500	35	285
307	Main St. to WB	225	35	350

**Based on 50MPH for Existing Posted Speed*

Movements which provide less than required length are shaded

TABLE 1.2 FREEWAY SEGMENTS PEAK HOUR LEVELS OF SERVICE (LOS)

Location	Existing 2013 A.M. Peak Hour LOS	Existing 2013 P.M. Peak Hour LOS	No Build 2045 A.M. Peak Hour LOS	No Build 2045 P.M. Peak Hour LOS
I-80 EB between Int. 303 and 304	B	B	C	E
I-80 EB between Int. 304 and 305	C	C	F	F
I-80 EB between Int. 305 and 306	C	C	F	F
I-80 EB between Int. 306 and 307	C	C	F	F
I-80 WB between Int. 303 and 304	A	C	C	F
I-80 WB between Int. 304 and 305	B	E	D	F
I-80 WB between Int. 305 and 306	B	E	D	F
I-80 WB between Int. 306 and 307	B	E	E	F

TABLE 1.3 RAMP MERGES PEAK HOUR LEVELS OF SERVICE (LOS)

Location	Existing 2013 A.M. Peak Hour LOS	Existing 2013 P.M. Peak Hour LOS	No Build 2045 A.M. Peak Hour LOS	No Build 2045 P.M. Peak Hour LOS
I-80 EB Int. 304 from Rt. 209	C	C	F	F
I-80 EB Int. 305 from W. Main St.	C	D	F	F
I-80 EB Int. 306 from Dreher Ave.	D	D	F	F
I-80 EB Int. 307 from Park Ave.	C	C	F	F
I-80 WB Int. 303 from Rt. 611	B	C	C	F
I-80 WB Int. 307 from Broad St.	C	E	E	F

TABLE 1.4 RAMP DIVERGES PEAK HOUR LEVELS OF SERVICE (LOS)

Location	Existing 2013 A.M. Peak Hour LOS	Existing 2013 P.M. Peak Hour LOS	No Build 2045 A.M. Peak Hour LOS	No Build 2045 P.M. Peak Hour LOS
I-80 EB Int. 303 to Rt. 611	B	B	D	F
I-80 EB Int. 305 to W. Main St.	D	D	F	F
I-80 EB Int. 307 to Park Ave.	D	D	F	F
I-80 WB Int. 305 to W. Main St.	C	E	E	F
I-80 WB Int. 306 to Dreher Ave.	C	E	E	F
I-80 WB Int. 307 to Broad St.	C	E	E	F

TABLE 1.5 WEAVING SEGMENT PEAK HOUR LEVELS OF SERVICE (LOS)

Location	Existing 2013 A.M. Peak Hour LOS	Existing 2013 P.M. Peak Hour LOS	No Build 2045 A.M. Peak Hour LOS	No Build 2045 P.M. Peak Hour LOS
I-80 WB Int. 305 to 304	B	D	D	F

TABLE 1.6 MOVEMENTS

Available Movement				
Exit	EB On	EB Off	WB On	WB Off
303		X	X	
304	X			X
305	X	X	X	X
306	X			X
*307	X	X	X	X

*Exit 307 movements are split: eastbound connect to SR 611, westbound to SR 191.

1.4 PROJECT COORDINATION

Stakeholder interviews were conducted in March 2005 as part of the data gathering for the I-80 Corridor Study Report issued in 2009 to both inform the public of planning efforts as well as receive their comments and feedback. There were over 30 stakeholders representing 19 different organizations in attendance. Stakeholders included: Monroe County Planning Commission, Monroe County Redevelopment Authority, Northeastern Pennsylvania Alliance (NEPA), the Boroughs of Delaware Water Gap, East Stroudsburg and Stroudsburg, and the Townships of Jackson, Middle Smithfield, Pocono, Smithfield and Tobyhanna.

In addition there were interviews with representatives from the Pennsylvania State Police, the Stroud Regional Police Department, East Stroudsburg University, the Pocono Mountain School District and the Monroe County Transportation Authority (MCTA). Other regional stakeholders included the Stroud Region Open Space & Recreation Commission, The Nature Conservancy, and Tobyhanna State Park/Big Pocono State Park. Finally, Excel Storage Products was interviewed. Perspective and priorities included development patterns, safety, and congestion/capacity.

A Public Officials Briefing was held on Monday, June 20, 2005 with 26 legislators, officials and aids where a presentation and open question period was presented. Comments received included improving roadways to accommodate increased commuter traffic, the inclusion of other important roadways in the project scope, interchange improvements and traffic calming.

Afterwards, a general Public Meeting was held over two days on Monday, June 20, 2005 and Tuesday, June 21, 2005 at the Stroudsburg High School and the Pocono Ambulance Building. The attendance was approximately 60 residents, business people, officials and media over the two days. Major issues and comments were safety, congestion/capacity, signage, noise mitigation, environmental and historic resource protection, truck traffic and other improvements.

During the public involvement effort informational material was mailed to over 1,700 area residents and businesses as well as the continuing development of media materials, a logo and advertisements. Public bulletins relating to the project were also broadcast over public-access channels and printed in area newspapers. Continuing coordination with public officials was ongoing throughout the project study period and included legislative and municipal officials as well as representatives from the Delaware River Joint Toll Bridge Commission (DRJTBC), which operates the bridge carrying I-80 across the Delaware River into New Jersey.

As this project advances through the project delivery process, additional public outreach and coordination is anticipated.

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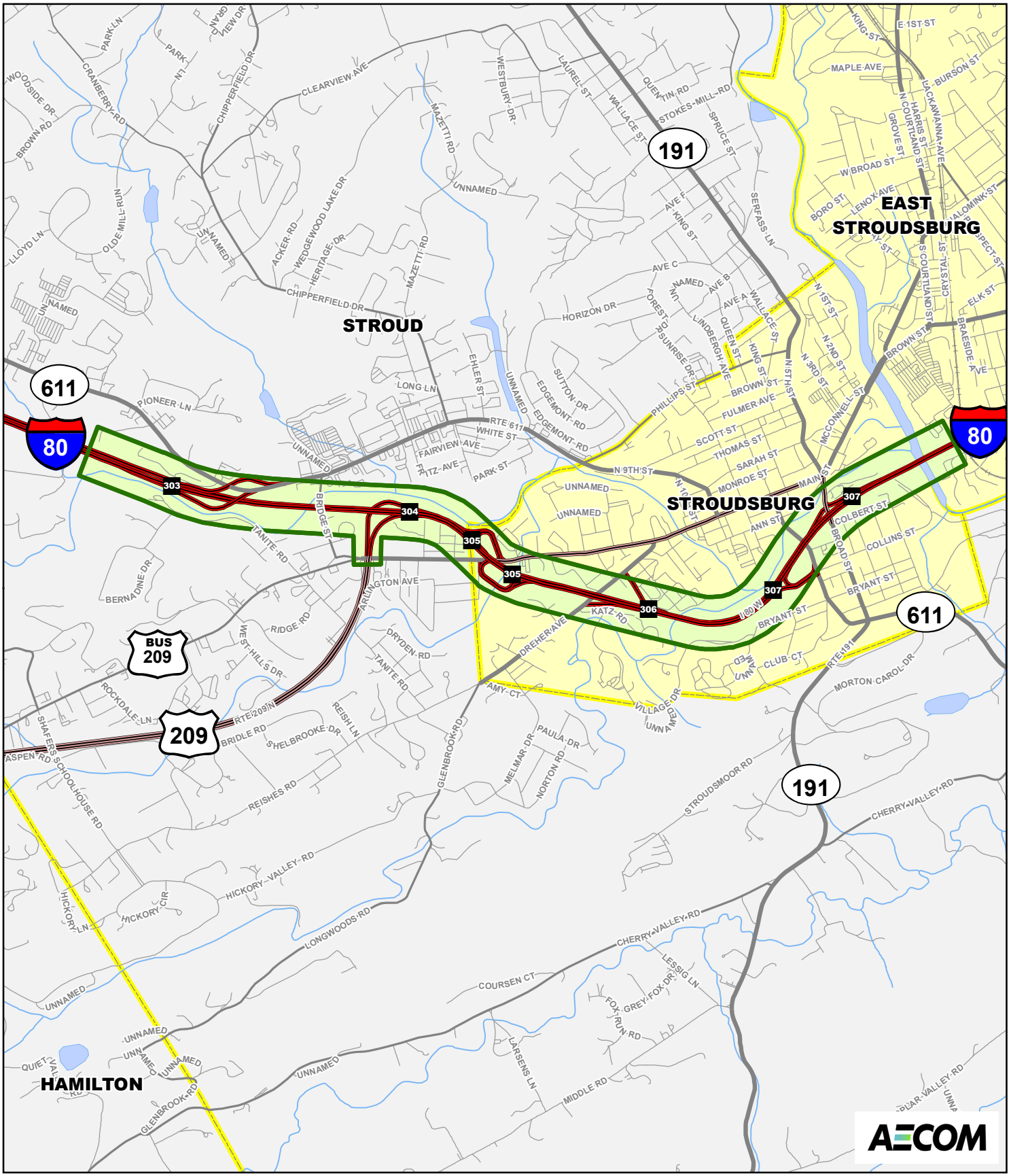


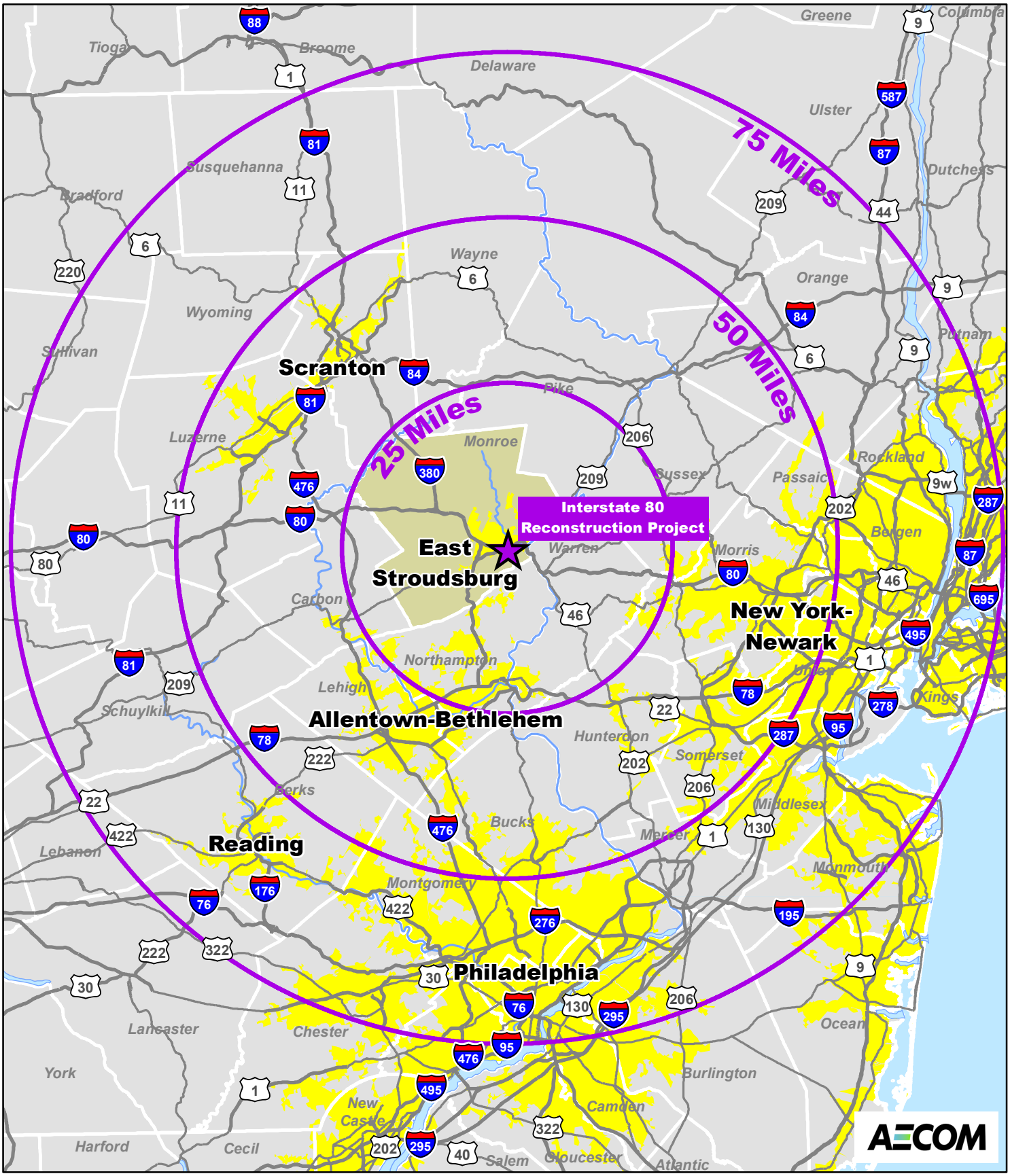
I-80 RECONSTRUCTION
FIGURE 1.1:
PROJECT STUDY AREA

Project Location

N

0 0.25 0.5

Miles



I-80 RECONSTRUCTION

FIGURE 1.2: REGIONAL CONTEXT

Project Location

Distance from Project

Urban Area

Monroe County

N

0 10 20

Miles

N

0 300 600

Feet

I-80 RECONSTRUCTION

FIGURE 1.3:

AERIAL FEATURES

Sheet 1 of 2

Source: PAMAP, 2008.

N

0 300 600

Feet

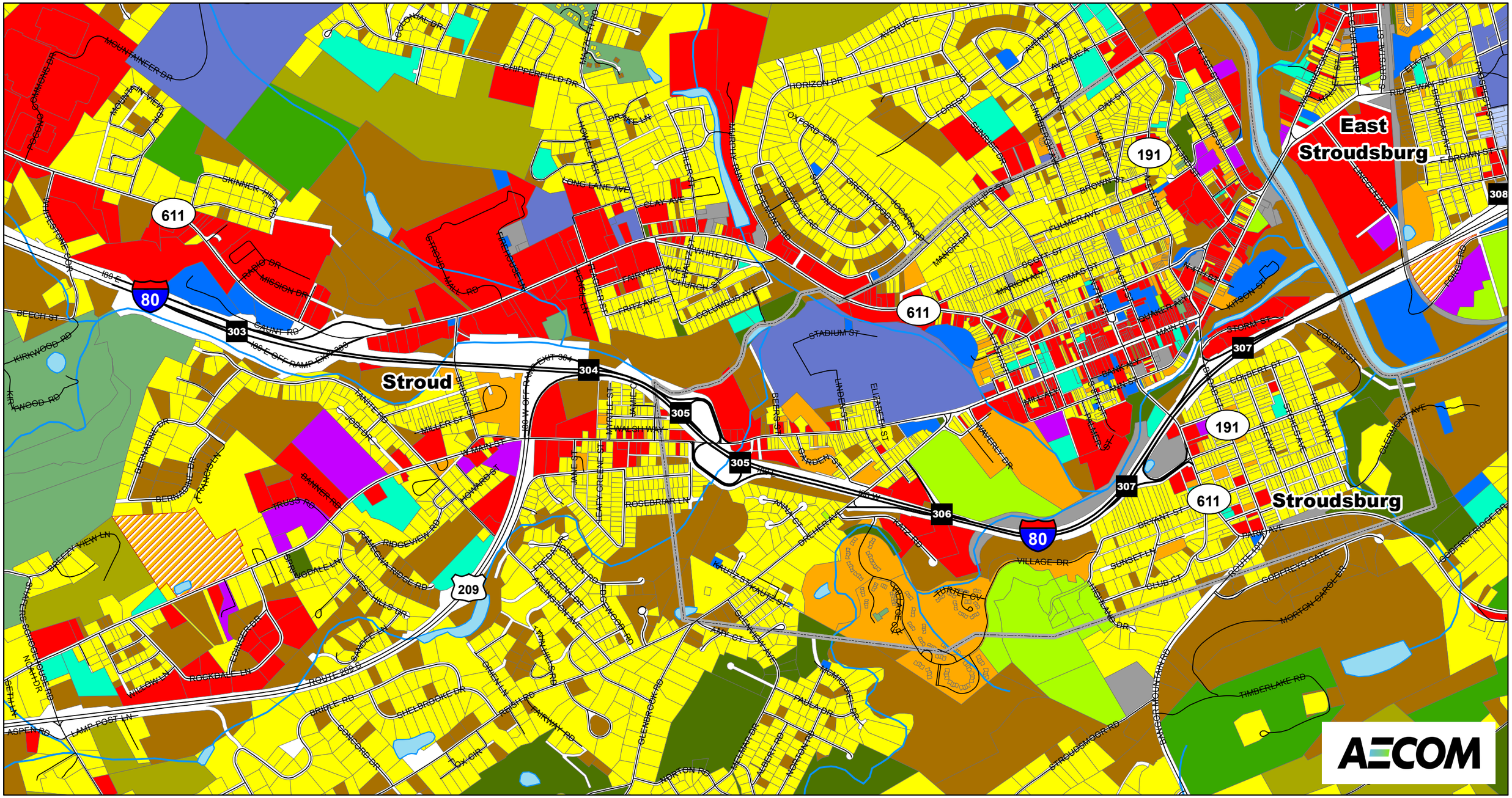
I-80 RECONSTRUCTION

FIGURE 1.3:

AERIAL FEATURES

Sheet 2 of 2

Source: PAMAP, 2008.



N

0 600 1,200

Feet

- Agricultural
- Cemetery
- Educational
- Forest Reserve
- Government Services
- Industrial
- KOZ/KOEZ
- Medical
- Recreational-Private
- Recreational-Public
- Religious or Service Organization
- Residential Multi-Family
- Residential Single Family
- Retail & Services
- Transportation & Utilities
- Undeveloped Land

I-80 RECONSTRUCTION
FIGURE 1.4: EXISTING LAND USE

Source: Monroe County, January 18, 2013.

CRASH DATA SUMMARY

Five-year crash data records (2008-2012) were obtained from the Pennsylvania Department of Transportation for the I-80 main line sections within the project area. Crash reports in the identified sections have been evaluated and presented in graphic form following this summary. The following is a summarization of information taken from the crash data records.

A total of 239 crashes were reported over the 3.45 mile reconstruction segment during the five year period (2008-2012), including 43% Hit Fixed Object and 31% Rear-End collisions. These types of crashes on an interstate are typical where congestion and geometry deficiencies exist.

Crash rates for seven (7) separate segments were calculated for each direction (see tables attached) to compare average crash rates with the current Statewide Accident Average for similar road type, which was obtained from PennDOT Accident Records Systems Homogeneous Report.

The majority of segments display average crash rates that exceed the current statewide average for urban interstates (0.56). The highest average crash rate for crashes grouped by segment within the project area (obtained from PennDOT crash data) occurred in segment 3050/3051 (US 209 ramps at Exit 304), with the crash rates reaching 0.84 (westbound) and 1.09 (eastbound).

I-80 between Interchange 303 to Interchange 304

Immediately west of Interchange 303 (PA Route 611) approaching the eastbound exit and westbound entrance ramps, no crash clusters are observed at the acceleration and deceleration areas to the interchange. Some rear-end collisions were reported on the mainline section, suggesting at least some drivers in this area are reacting to speed variation in traffic flow created by accelerating or decelerating traffic. One fatality accident occurred in the eastbound direction just past the ramp exit gore area.

Within the I-80 segment from Interchange 303 (PA Route 611) to Interchange 304 (US209), the number of crashes increases with the majority reported as fixed object collisions (motorists hitting median barrier or guiderail). A number of small accident crash clusters (3 accidents or less) are shown in this area. Some rear-end collisions are evident in this section, suggesting possible driver reaction to the reduced speed limit signage heading eastbound.

I-80 between Interchange 304 to Interchange 305

The area immediately east of Interchange 304 shows the highest number of crashes within the project area on I-80. The majority of eastbound crashes within this segment are fixed object collisions with motorists hitting median barrier or guiderail in the curve section. Some rear end collisions are shown within the eastbound deceleration ramp area to exit at Interchange 305, suggesting the possibility of insufficient deceleration lengths affecting mainline free flow in this area. Crash cluster data from PennDOT also indicates a “Hit Barrier” cluster in this area.

A significant number of westbound crashes are rear-end collisions, suggesting driver reaction to the weave section involving traffic merging from the Interchange 305 entrance ramp and traffic exiting for the Interchange 304 westbound exit to US209.

I-80 between Interchange 305 to Interchange 306

The area between Interchange 305 (W. Main Street) and Interchange 306 (Dreher Ave) contains no noticeable crash clusters. No operational issues are evident from crash data in this section.

I-80 between Interchange 306 to Interchange 307

Within the I-80 segment between Interchange 306 (Dreher Ave) and Interchange 307 (Park Ave), the majority of crashes reported are fixed object collisions involving motorists hitting median barrier or guiderail.

Some westbound crashes are same direction sideswipe collisions approaching the Interchange 306 westbound exit ramp, suggesting a possible driver reaction to combination of the roadway curve section and exiting vehicles at Interchange 306.

A small cluster of rear-end collision crashes is noted within the Interchange 307 (Park Avenue) eastbound section, suggesting driver reaction to oncoming traffic from the eastbound entrance ramp at this interchange. A sideswipe accident was also reported within this section. A small cluster of rear-end and side-swipe collision crashes is also evident at Interchange 307 (Broad Street) in the westbound section, suggesting driver reaction to decelerating (diverging) or accelerating (merging) vehicles in the westbound direction.

Within this section, one fatality accident occurred in the eastbound direction within the curve approaching Exit 307 (Park Avenue), and one fatality accident occurred in the eastbound direction at the Park Avenue overpass location.

I-80 Reconstruction
Figure 1.5: Crash Data Summary

N

0 300 600

Feet

- Fatality (3)
- Angle (14)
- Head-On (2)
- Hit Fixed Object (103)
- Non-Collision (16)
- Rear-End (74)
- Same Direction Sideswipe (16)
- Pedestrian (1)
- Unknown (13)

Note: 239 crashes in the study area with 3 being fatal.

I-80 RECONSTRUCTION

FIGURE 1.5:

Crash Analysis Map

1/1/08 - 12/31/12

Sheet 2 of 3

Source: CDART, 2013

N

0 300 600

Feet

Fatality (3)	Hit Fixed Object (103)	Same Direction Sideswipe (16)
Angle (14)	Non-Collision (16)	Pedestrian (1)
Head-On (2)	Rear-End (74)	Unknown (13)

Note: 239 crashes in the study area with 3 being fatal.

I-80 RECONSTRUCTION

FIGURE 1.5:

Crash Analysis Map

1/1/08 - 12/31/12

Sheet 3 of 3

Source: CDART, 2013

2. ENVIRONMENTAL OVERVIEW

Environmental resources were identified using secondary source material, primarily Geographic Information Systems (GIS) databases provided by the county and state. Resource locations and extents will be field verified prior to the Phase II Alternatives Analysis.

2.1 NATURAL RESOURCES

There are eight waterways running through the project area. The major ones include Brodhead Creek which runs north/south, McMichael Creek which runs east/west, and Pocono Creek which also runs east/west. Others include Flagler Run, Big Meadow Run and Little Pocono Creek. There are also two identified unnamed tributaries; one is a tributary of Brodhead Creek and the other of Pocono Creek. (See Figure 2.1)

- **Brodhead Creek** is located in the eastern section of the project area running north/south and marks the border between Stroudsburg and East Stroudsburg boroughs. The creek's designated use is Trout Stocking and Migratory Fishes (TSF/MF) as well as supporting natural reproduction of trout. The existing use is Cold Water and Migratory Fishes (CWF/MF) and is in attainment for its water quality criteria of supporting aquatic life. Brodhead Creek is the primary source of drinking water for much of the project area, although the withdrawal point is well upstream of the project area.
- **McMichael Creek** is a tributary of Brodhead Creek and runs west to east through the project area, paralleling I-80 to the north from Exit 306 to beyond 307 where it flows into Brodhead. The water quality designation changes at the Pocono Creek confluence; upstream McMichael is High Quality Cold Water and Migratory Fishes (HQ-CWF/MF) while downstream it is TSF/MF. Throughout the project area, it is attaining its water quality criteria and supporting natural trout reproduction.
- **Pocono Creek** is a tributary of McMichael Creek running generally west to east through the project area. It is also HQ-CWF/MF, supporting natural trout reproduction, and attaining its water quality, as well as being a Class A wild brown trout stream in the eastern half of the project area.
- **Flagler Run** is a tributary of Pocono Creek. It runs mostly north to south in the area north of the Exit 304 interchange. A significant portion of this waterway runs through a culvert underneath the Stroud Mall parking lot. Despite this, it does have a designated use of HQ-CWF/MF, although water quality is impaired for aquatic life.

- **Big Meadow Run** is a tributary of Pocono Creek that runs north to south along Murphy Run Road and North 9th street. It is HQ-CWF/MF, supporting natural trout production, and attaining for water quality.
- **Little Pocono Creek** is another tributary of Pocono Creek running south to north around the area of US 209 through Stroud Township and Stroudsburg Borough through Exit 305. From here it proceeds northward crossing Business 209 (SR 2012) and enters Pocono Creek behind the Stroudsburg High School stadium. It is designated HQ-CWF/MF and is in attainment and supporting natural trout.

In addition to the named waterways, there is a small, unnamed tributary to Brodhead Creek just north of the I-80 bridge/Brodhead Creek crossing. It runs eastward into Brodhead Creek along the northern side of the water treatment plant from a point behind Main Street businesses. This tributary's designated use is listed as Trout Stocking (TSF) and it is also aquatic life supporting.

Finally, there is a small, unnamed tributary of Pocono Creek running behind the Stroud Township maintenance yard north of Exit 303 off of SR 611 (North 9th Street). It is also HQ-CWF/MF.

Wetlands

Preliminary wetland investigations completed in 2013 involved a desktop GIS search as well as a basic field walkthrough. (See Figure 2.1) The following is a brief listing of some of the major systems.

There are potential wetland areas along the south side of Pocono Creek just north of I-80. The National Wetlands Inventory (NWI) database shows potential Riverine (R5USC) wetlands in the vicinity of Exit 304. NWI also shows Freshwater Forested/Shrub Wetland (PFO1A) behind the homes on Columbus Avenue and the north side of Pocono Creek.

A large wetland system was found south of Exit 305 behind the homes on Anna Court. This wetland system consists of Freshwater Pond (PUBHx) and Freshwater Forested/Shrub Wetlands (PFO1E). It is located primarily on Stroudsburg Municipal Authority property.

Extensive Wetland Area South of Exit 305

Other potential wet areas include areas north and south along the McMichael Creek/I-80 overpass; Riverine (R2USA) and the mouth of Pocono Creek where it meets McMichael Creek (Riverine, R2USA).

There are numerous NWI wetlands all along Brodhead Creek on both sides as well as at the mouth of McMichael Creek where it enters Brodhead Creek (Riverine, R2USA). In addition, NWI shows a large wetland system along Big Meadow Run (Freshwater Pond, PUBHh) running the length of the waterway from just north of SR 611 (North 9th Street) up to a large, open wetland system outside the project area.

All wetland areas are pending field verification. Due to the universal stream designations of supporting natural trout reproduction, all project area wetlands are Exceptional Value (EV).

Floodways and Floodplains

Brodhead, McMichael, and Pocono creeks all have defined FEMA floodways and FEMA 100 year floodplains while Little Pocono Creek has only a defined FEMA 100 year floodplain. All these areas make up a large percentage of the project area and will be of concern during project development. The largest floodway/floodplain areas are located around the Stroudsburg High School extending towards Exit 304, the confluence of Pocono and McMichael Creeks and the confluence of McMichael and Brodhead Creeks. McMichael Creek and Brodhead Creek have been subject to past flood control projects by the US Army Corps of Engineers. (See Figure 2.1)

Soils

Within the project area prime, unique and farmland soils of statewide importance are identified; however, all project area soils are within transportation use or an urban setting with little potential for active agricultural production. (See Figure 2.2)

Vegetation

The vegetation existing in the I-80 right-of-way varies throughout the project area, but consists of mature trees, grasses and shrubs. The trees consist of Maples, Oaks and Walnuts as well as various evergreens. Shrub cover consists of wild rose, flowering dogwoods, and raspberry. Numerous vines such as wild grape and poison ivy are also found in the project area. Invasive species are prevalent, with Japanese knotweed of particular concern along streambanks and floodplains. Figure 2.2 shows Forest Reserve areas.

Geologic Resources

The review of available data indicates that most of the project area is potentially underlain by the Marcellus Formation or its stratigraphic equivalent. It is also located in potentially significant acid-producing sulfide minerals. These structures include the top of Palmerton Sandstone through the base of the Marcellus Formation. Also included is the Buttermilk Falls Limestone through Esopus Formation, undivided.

Groundwater

Search of available databases showed no wells within the project area, but numerous seeps were identified during field views conducted in 2013.

Seep located along Pocono Creek

These will be surveyed as necessary as part of the project area wetland delineation scheduled to be performed in the Fall of 2013.

Wildlife and Habitat

The numerous cover types in the project area allow for a large variety of habitats for wildlife. The large number of important trout streams and large wetlands provide prime habitat for many aquatic and terrestrial species.

Coordination with the Pennsylvania Game Commission, Pennsylvania Fish and Boat Commission, PA Department of Conservation and Natural Resources and United States Fish and Wildlife Service resulted in the following:

- **Pennsylvania Game Commission.** No known occurrences of a state listed threatened or endangered bird or mammal species is associated with this project. A conservation measure is suggested for a seasonal timber restriction to avoid impacting the Northern Long-eared Bat (Myotis septentrionalis). All trees or dead snags greater than 5 inches in diameter at breast height that need to be harvested shall be cut between November 1 and March 31.
- **Pennsylvania Fish and Boat Commission.** No adverse impacts expected from the proposed project although there is an element of occurrence of a rare, candidate, threatened, or endangered species under their jurisdiction in the vicinity of the project area.
- **PA Department of Conservation and Natural Resources.** No Impact Anticipated but a voluntary conservation measure to be mindful of the potential presence of Lethe eurydice (eyed brown).
- **United States Fish and Wildlife Service.** The proposed project is within the known range of the bog turtle (Clemmys muhlenbergii). As a result, a Phase I Bog Turtle survey will need to be conducted.

It was confirmed that no public (Game Commission) or private (Nature Conservancy) lands are within or immediately adjacent to the project area. See Appendix J for Endangered Species Correspondence.

2.2 SOCIOECONOMIC RESOURCES

General Metrics

The general population for the project area is approximately 9,927 (2010 U.S. Census) persons with a population density of 1,330 persons per square mile. Of this total 28% are listed as being a minority. There are approximately 4,030 households. The per capita income for the area is $23,167 (Census, 2010, ACS 2006-2010).

Stroudsburg Borough

The total population of Stroudsburg Borough in 2010 according to the U.S. Census is 5,567 persons of which the median age is 34.3 years. The racial makeup of the Borough is 4,302 White persons, 621 black or African American persons, 22 American Indian and Alaska Native persons, and 104 Asian persons. In addition, 795 persons identify themselves as Hispanic or Latino (of any race).

There are 2,385 households in 2,661 housing units of which the average household size is 2.30 persons. Of the total housing units, 2,385 are occupied and 276 are vacant. Of the total occupied units, 880 are owner-occupied and 1,505 are renter-occupied.

Employment metrics according to the U.S. Census shows 4,652 persons 16 years and over of which 2,826 are in the labor force. Of those, 2,462 are employed and 364 are unemployed. The percent unemployed is 12.9%.

The major employment sectors are Educational services, and health care and social assistance (26.7%), Retail Trade (20.4%), Arts, entertainment, and recreation, and accommodation and food service (13.5%) and Manufacturing (13.0%).

The median household income is $33,061 and the mean household income is $52,184. Within Stroudsburg Borough, 14.6% of families and people have an income below the poverty level for the last 12 months.

East Stroudsburg Borough

The total population of East Stroudsburg Borough in 2010 according to the U.S. Census is 9,840 persons of which the median age is 25.6 years. The racial makeup of the Borough is 7,793 White persons, 1,092 black or African American persons, 24 American Indian and Alaska Native persons, and 246 Asian persons. In addition, 1,166 persons identify themselves as Hispanic or Latino (of any race).

There are 3,175 households in 3,456 housing units of which the average household size is 2.38 persons. Of the total housing units, 3,175 are occupied and 281 are vacant. Of the total occupied units, 1,476 are owner-occupied and 1,699 are renter-occupied.

Employment metrics according to the U.S. Census shows 8,706 persons 16 years and over of which 4,996 are in the labor force. Of those, 4,325 are employed and 662 are unemployed. The percent unemployed is 13.3%.

The major employment sectors are Educational services, and health care and social assistance (28.3%), Retail Trade (19.0%), Arts, entertainment, and recreation, and accommodation and food service (13.8%) and Professional, scientific, and management, and administrative and waste management services (9.7%).

The median household income is $46,289 and the mean household income is $59,862. Within East Stroudsburg Borough, 12.5% of families and people have an income below the poverty level for the last 12 months.

Stroud Township

The total population of Stroud Township in 2010 according to the U.S. Census is 19,213 persons of which the median age is 40.2 years. The racial makeup of the Borough is 13,595 White persons, 3,150 black or African American persons, 57 American Indian and Alaska Native persons, and 686 Asian persons. In addition, 2,920 persons identify themselves as Hispanic or Latino (of any race).

There are 6,829 households in 7,661 housing units of which the average household size is 2.81 persons. Of the total housing units, 6,829 are occupied and 832 are vacant. Of the total occupied units, 5,531 are owner-occupied and 1,298 are renter-occupied.

Employment metrics according to the U.S. Census shows 15,392 persons 16 years and over of which 10,172 are in the labor force. Of those, 9,106 are employed and 1,053 are unemployed. The percent unemployed is 10.4%.

The major employment sectors are Educational services, and health care and social assistance (26.7%), Professional, scientific, and management, and administrative and waste management services (11.0%), Retail Trade (10.7%), Manufacturing (9.6%).

The median household income is $65,524 and the mean household income is $80,191. Within Stroud Township, 4.4% of families and people have an income below the poverty level for the last 12 months.

Population Change

Below is a table showing population change between 1980 and 2010 for Stroud Township and Stroudsburg and East Stroudsburg Boroughs.

TABLE 2.1 TOTAL POPULATION

US Census 1980-2010	East Stroudsburg Borough	Stroud Township	Stroudsburg Borough
Total (2010)	9,840	19,213	5,567
Total (2000)	9,888	13,978	5,756
Total (1990)	8,781	10,600	5,312
Total (1980)	8,039	9,150	5,149

NOTE: For information on confidentiality protection, non-sampling error and definitions, see http://www.census.gov/prod/cen2010/doc/sf1.pdf.

Source: U.S. Census Bureau, 1980-2010 Census & The Multi-Municipal Comprehensive Plan (2005).

Educational Facilities

The area is serviced by two school districts: the Stroudsburg Area School District and the East Stroudsburg Area School District. (See Figure 2.3)

The Stroudsburg Area School District encompasses 9 schools including 6 elementary schools, 1 middle school, 1 junior high school and 1 high school. These include: Arlington, B.F. Morey, Clearview, Hamilton, W.H. Ramsey Elementary Schools, and Stroudsburg Intermediate Elementary School, Stroudsburg Middle School, Stroudsburg Junior High School and Stroudsburg High School. The total District population is approximately 6,000 students and 900+ administrative, professional and support staff (Stroudsburg Area School District). The School District services the municipalities of the Borough of Stroudsburg, the Borough of Delaware Water Gap, the Township of Hamilton and the Township of Stroud.

The Borough of East Stroudsburg is serviced by the East Stroudsburg Area School District which encompasses 10 schools including six elementary schools, two intermediate schools and two high schools. These include: Bushkill, East Stroudsburg, J.M. Hill, Middle Smithfield, Resica and Smithfield Elementary Schools, Lehman and J.T. Lambert Intermediate Schools and the North and South High Schools. The total District population is approximately 7,000 students and around 900 administrative, professional and support staff (2009). The School District services East Stroudsburg Borough, Smithfield Township, Middle Smithfield Township, and Price Township in Monroe County and Lehman and Porter Townships in Pike County.

Parochial schools in the area include Shawnee Academy-the Beacon School, Stroudsburg Seventh Day Adventist School and Notre Dame Elementary and High Schools.

College-level educational facilities include the 257 acre East Stroudsburg University in East Stroudsburg Borough and the new 72 acre Monroe County campus of Northampton Community College in Tannersville which will open in 2014 and can accommodate 5,000 students.

Economics

The Pocono Mountains Economic Development Corporation (PMEDC) and the Redevelopment Authority of Monroe County (RAMC) are the two main public agencies tasked with promoting Monroe County to the business community. In addition, the Pocono Mountains Visitors Bureau and the Greater Pocono Chamber of Commerce are private sector organizations who aid in this task as well. The Pennsylvania Welcome Center is located in Delaware Water Gap Borough on the border with

New Jersey and is considered the "Gateway to the Poconos."

The Pocono Mountains Region's proximity to the New Jersey-New York Metropolitan area, the Philadelphia/Delaware Valley Metropolitan area and the Allentown-Bethlehem-Easton Metropolitan area makes it a prime location for visitors and businesses alike. The Region is known for skiing, camping, hiking, shopping and many other outdoor events all year round. The Monroe County Comprehensive Plan (Update 2013) also lists the Pocono Region as being the fourth ranked area in terms of visitor spending behind areas such as Philadelphia, Dutch Country and Pittsburgh. It also states that the Pocono Mountain Region as coming in 2nd for the highest share of spending on tourism and shopping among Pennsylvania's 11 tourism regions.

Major shopping centers in the area include: the Stroud Mall, Pocono Plaza, Eagle Valley Mall, and the Pocono Commons. There is also the Pocono Vacation Park for RVers and the Kirkwood Camp and Conference Center for camping accommodations. (See Figure 2.3)

Stroud Mall on SR 611

Major Employers

The largest employers in the Region according to the Pennsylvania Career Link for Monroe County are the Tobyhanna Army Depot, Sanofi Pasteur, the Pocono Mountain School District, Pocono Medical Center, East Stroudsburg School District, Wal-Mart, Stroudsburg Area School District, and the various Resorts/casinos (Pleasant Valley, Mt. Airy, Camelback and Shawnee).

Emergency Management

Safety and security for the Region are provided by the Monroe County Office of Emergency Management, the Pennsylvania State Police, the Stroud Area Regional Police and the Monroe County Sheriff's Department. There are also approximately eight fire stations in the general project area and one hospital (Pocono Medical Center). EMS is provided by the Bushkill Emergency Corps and Suburban EMS. Also of importance in the wider area are the Marshalls Creek Fire Company, the Shawnee Fire Company and the Delaware Water Gap Fire Company. (See Figure 2.3)

Public Transportation

Public transportation is provided by the Monroe County Transportation Authority (MCTA) running the Pocono Pony bus system. (See Figure 2.4) The Pocono Pony runs along five major bus routes (Red, Blue, Orange, Yellow, and Express) daily, year-round. In addition, MCTA provides Medical Assistance Transportation, a Shared Ride program and a Workers Express program. Other public transportation options include taxi service provided by numerous taxi companies and Martz Trailways for longer distance bus travel.

Environmental Justice

Socioeconomic factors within the project area indicate that extensive populations of minority and low income individuals are present. A compilation of census data shows higher concentrations of disadvantaged populations throughout the project area. (See Figure 2.4)

2.3 CULTURAL RESOURCES

The project area includes many individual cultural resources as well as defined Districts. (See Figure 2.5)

Borough of Stroudsburg

The Borough of Stroudsburg includes three Historic Districts: The Stroudsburg Historic Preservation District – HDA, The Stroudsburg Commercial Historic District, and The Academy Hill Historic District.

The Stroudsburg Historic Preservation District – HDA is a local historic district which was certified by the Pennsylvania Historical and Museum Commission (PHMC) on November 15, 2006. Although it is recognized by PHMC as a local historic district, giving the borough the ability to control development within its boundaries, this is not a National Register eligible boundary and is not subject to regulation under Section 106 of the National Historic Preservation Act.

The Stroudsburg Commercial Historic District is an associated resource which is National Register (NR) Eligible. It is an example of Early Republic, Mid-19th Century, Late Victorian, and Late 19th and 20th Century Revivals. It is made up of public and private dwellings, businesses and manufacturing. It was Agency Eligible on November 1, 1999 and SHPO Eligible on March 17, 2000.

The Academy Hill Historic District is located north of Main Street and the Monroe County Court House north of the other two districts and is National Register Listed as of November 30, 1989. It is an example of Queen Anne, Colonial Revival, and Late 19th and 20th Century American Revivals. The District's historic function is domestic dwellings (single and multiple), educational and religious.

Two individual National Register Listed properties are present. The Kitson Woolen Mill; Holland Thread Company at 411 Main Street which was constructed in the Italianate style between 1893 and 1904. It is made up of four primary buildings arranged in a "U" shape to allow for natural light to enter the area. It is an example of 19th century construction and of the past textile industry of the area. The Mill was listed on January 12, 1984. The Stroud Mansion located at 900 Main Street is National Register Listed. It was built in 1795 in the Federal style by the town's founder, Jacob Stroud.

National Register Eligible properties include the:

- Wallace Hardware Building located at 435 Main Street which was built between 1857 and 1902 in the Italianate style.
- Little Bethel African Methodist Church on 113 North 3rd Street, built in 1868 and an example of the Vernacular style.
- Stroudsburg U.S. Post Office located at 701 Ann Street, which is an example of the Classical Revival style and was constructed between 1934 and 1966.
- George Tillotson House located at 905 Main Street, constructed in 1880 in the Second Empire style and also within the boundaries of the Stroudsburg Historic Preservation District. It is SHPO Eligible.

Borough of East Stroudsburg

The East Stroudsburg Armory located at 271 Washington Street was built in 1928 in the Tudor Revival style. It is also known as the Captain George M. Kemp Memorial Armory. It was placed on the National Register on March 3, 1991. The Armory's main function was the storage of arms and was part of the Pennsylvania National Guard Armories with a period of significance between 1928 and 1939.

The Gilbert, William & Company, Ryle, John C. & Company; Stroudsburg Dyeing & Finishing, Inc. building is an example of Gothic Classical Revival built between 1886 and 1950. It is SHPO Eligible.

A linear resource is the Delaware, Lackawanna & Western Railroad Line (Scranton to Slateford Junction) which runs along the southern border of the Borough until around the Lincoln Avenue/I-80 bridge. Here, it turns northward and proceeds along until shifting towards the northwest around Burson Street. This resource was made SHPO eligible on May 5, 2006.

Another rail line is the New York, Susquehanna & Western Railroad which traverses the two boroughs as well as the Stroud Township. This railroad was created by the consolidation of a number of smaller rail lines in 1881.

In addition to previously identified resources, there are numerous potential resources throughout the project area. These will be identified as studies progress. Archaeological resources, both historic and pre-contact, may also be present. An archaeological model is being developed to evaluate potential throughout the project area, to better focus possible field excavations.

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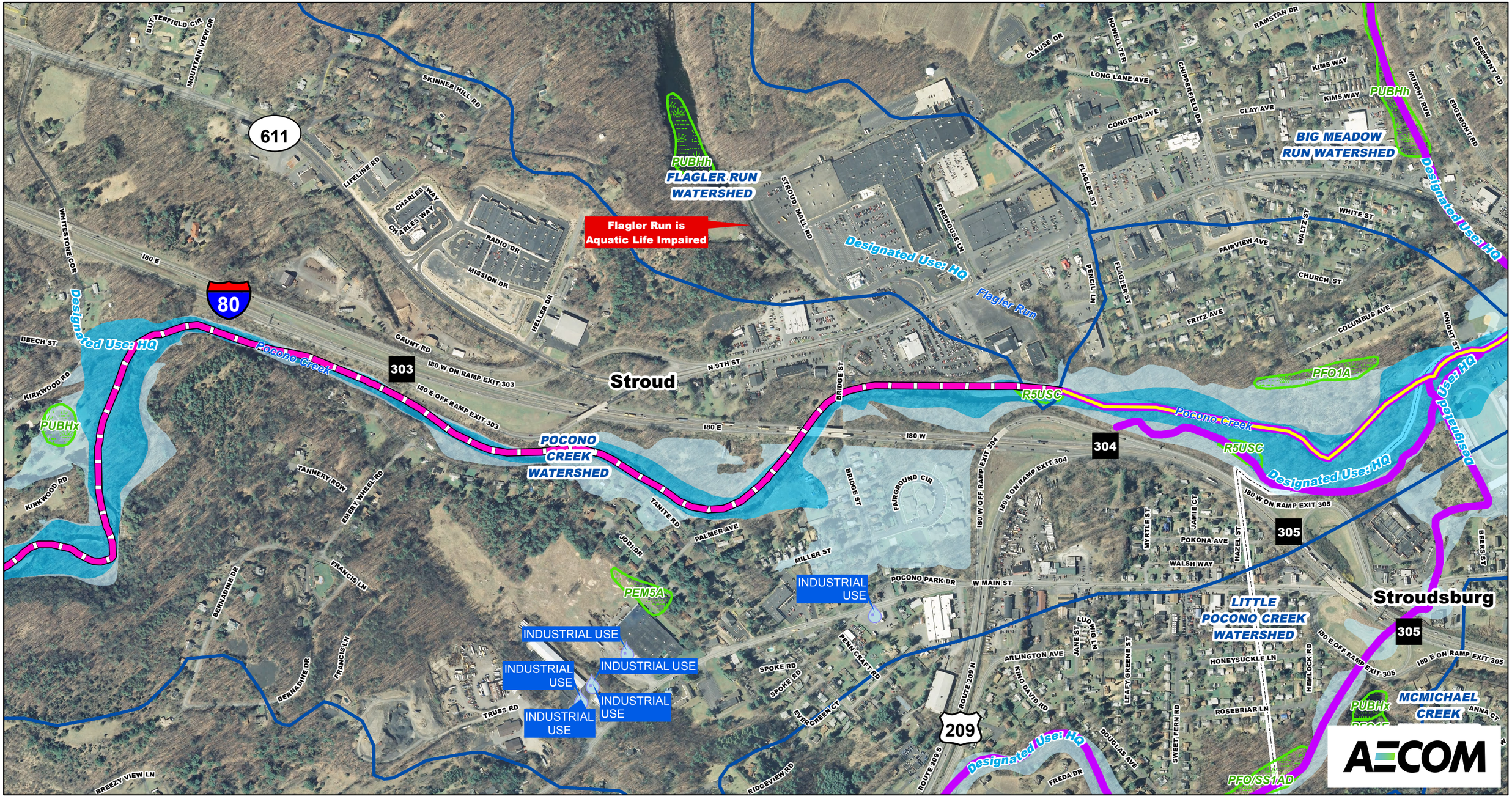


N

0 300 600

Feet

Class A Stream

Trout Stream (Stocked)

Trout Stream (Natural Reproduction)

Watershed

NWI Wetland

Water Resource

FEMA Floodzone

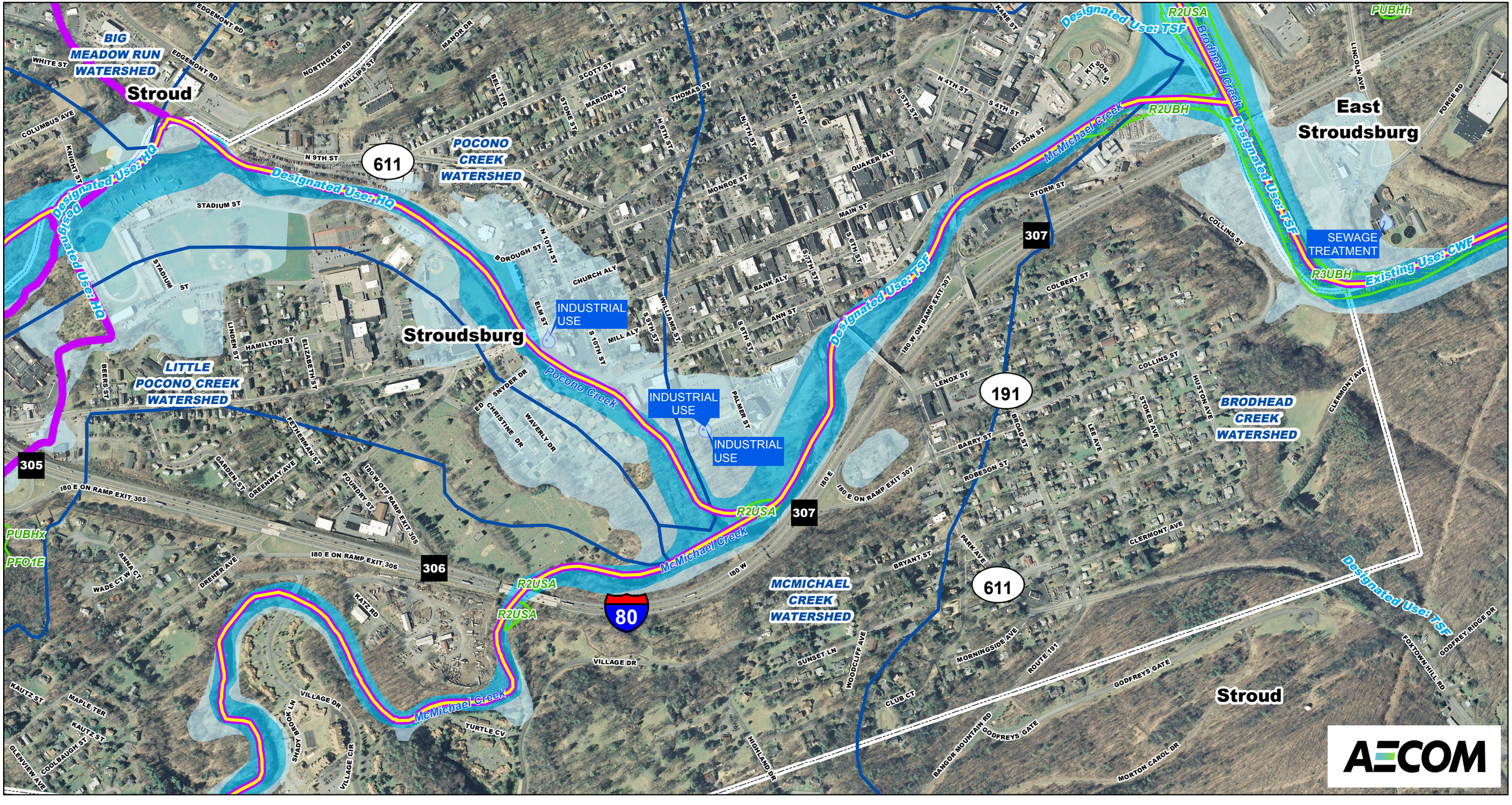
FEMA Floodway

I-80 RECONSTRUCTION

FIGURE 2.1: HYDROLOGICAL FEATURES

Sheet 1 of 2

Source: PASDA, PennDOT, DEP, FEMA, Monroe Co. (Aerial: PAMAP 2008).



N

0 300 600

Feet

Class A Stream

Trout Stream (Stocked)

Trout Stream (Natural Reproduction)

Watershed

NWI Wetland

Water Resource

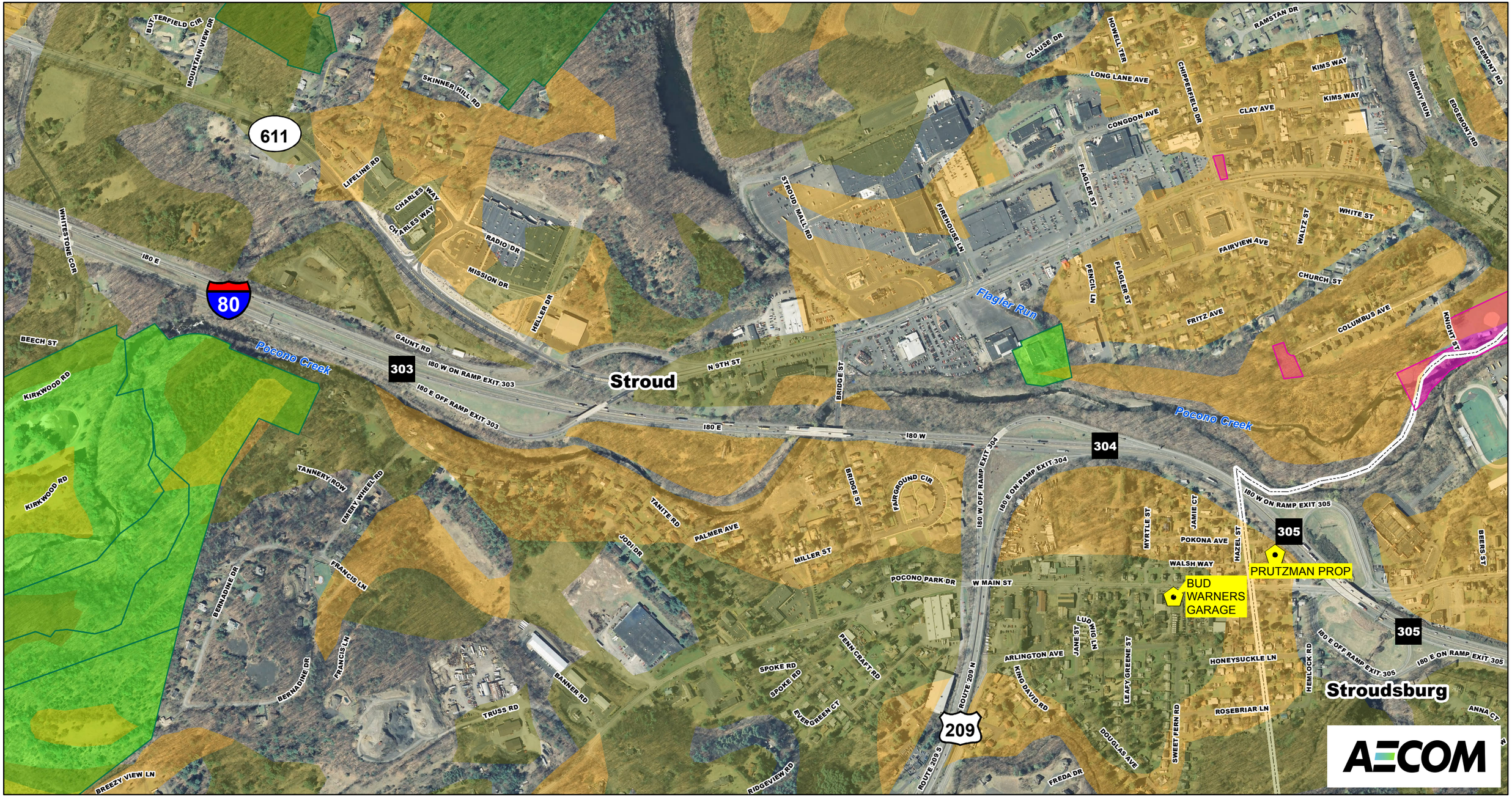
FEMA Floodzone

FEMA Floodway

I-80 RECONSTRUCTION
FIGURE 2.1: HYDROLOGICAL FEATURES

Sheet 2 of 2

Source: PASDA, PennDOT, DEP, FEMA, Monroe Co. (Aerial: PAMAP 2008).



N

0 300 600

Feet

- Municipal Waste Operation
- Land Recycling Cleanup Location
- Soils of Statewide Importance
- Prime Farmland Soils
- Forest Reserve
- Recreational-Private
- Recreational-Public

I-80 RECONSTRUCTION
FIGURE 2.2: ENVIRONMENTAL FEATURES

Sheet 1 of 2

Source: PASDA, PennDOT, DEP, FEMA, Monroe Co. (Aerial: PAMAP 2008).

HAROLD FRAILY FARM

MONROE CNTY RESOURCE REC & RECYCLING FAC

EAST STROUDSBURG DUMP

DUMITRU RES

POCONO GROW FERTILIZER

STROUDSBURG HIGH SCH

Stroud

Stroudsburg

East Stroudsburg

Pocono Creek

McMichael Creek

Brodhead Creek

611

307

191

305

306

80

EDGEMONT RD
WHITE ST
NORTHGATE RD
PHILLIPS ST
MANOR DR
COLUMBUS AVE
KNIGHT ST
N 9TH ST
STADIUM ST
STADIUM ST
LINDEN ST
HAMILTON ST
ELIZABETH ST
BEERS ST
BELL TER
SCOTT ST
STONE ST
MARION ALY
THOMAS ST
N 6TH ST
N 7TH ST
N 8TH ST
N 10TH ST
BOROUGH ST
CHURCH ALY
ELM ST
MILL ALY
S 10TH ST
S 9TH ST
WILLIAMS ST
MONROE ST
QUAKER ALY
MAIN ST
BANK ALY
ANN ST
S 8TH ST
S 7TH ST
S 6TH ST
N 5TH ST
N 4TH ST
S 4TH ST
KANE ST
KITSON ST
STORM ST
COLLINS ST
COLBERT ST
LINCOLN AVE
FORGE RD
180 W ON RAMP EXIT 307
LENOX ST
COLLINS ST
HUSTON AVE
CLERMONT AVE
BARRY ST
BROAD ST
ROBESON ST
LEE AVE
STOKES AVE
PALMER ST
SNYDER DR
ED CHRISTINE DR
WAVERLY DR
180 E
180 E ON RAMP EXIT 307
180 E ON RAMP EXIT 305
GARDEN ST
GREENWAY AVE
FETHERMAN ST
FOUNDRY ST
180 W OFF RAMP EXIT 305
180 E ON RAMP EXIT 306
ANNA CT
WADE CT W
DREHER AVE
KATZ RD
180 W
BRYANT ST
PARK AVE
KAUTZ ST
MAPLE TER
KAUTZ ST
COOLBAUGH ST
GLENVIEW AVE
VILLAGE DR
SHADY BROOK LN
VILLAGE CIR
TURTLE CV
VILLAGE DR
SUNSET LN
WOODCLIFF AVE
CLUB CT
HIGHLAND DR
MORNINGSIDE AVE
ROUTE 191
GODFREYS GATE
GODFREYS GATE
BANGOR MOUNTAIN RD
MORTON CAROL DR
FOXTOWN HILL RD
GODFREY RIDGE DR
CLERMONT AVE

N

0 300 600

Feet

Municipal Waste Operation

Land Recycling Cleanup Location

Soils of Statewide Importance

Prime Farmland Soils

Recreational-Private

Recreational-Public

AECOM

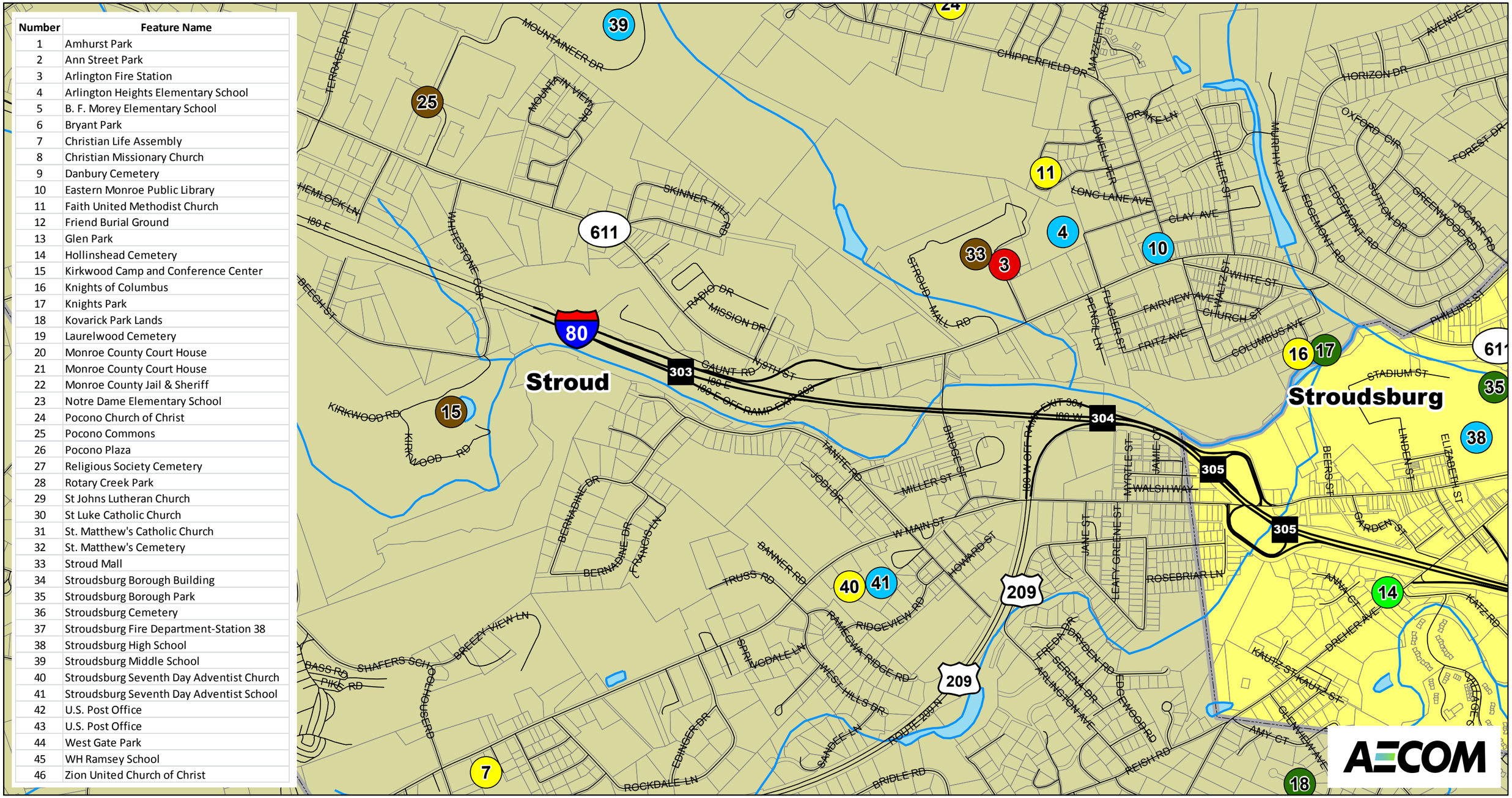
I-80 RECONSTRUCTION

FIGURE 2.2: ENVIRONMENTAL FEATURES

Sheet 2 of 2

Source: PASDA, PennDOT, DEP, FEMA, Monroe Co. (Aerial: PAMAP 2008).

Number	Feature Name
1	Amhurst Park
2	Ann Street Park
3	Arlington Fire Station
4	Arlington Heights Elementary School
5	B. F. Morey Elementary School
6	Bryant Park
7	Christian Life Assembly
8	Christian Missionary Church
9	Danbury Cemetery
10	Eastern Monroe Public Library
11	Faith United Methodist Church
12	Friend Burial Ground
13	Glen Park
14	Hollinshead Cemetery
15	Kirkwood Camp and Conference Center
16	Knights of Columbus
17	Knights Park
18	Kovarick Park Lands
19	Laurelwood Cemetery
20	Monroe County Court House
21	Monroe County Court House
22	Monroe County Jail & Sheriff
23	Notre Dame Elementary School
24	Pocono Church of Christ
25	Pocono Commons
26	Pocono Plaza
27	Religious Society Cemetery
28	Rotary Creek Park
29	St Johns Lutheran Church
30	St Luke Catholic Church
31	St. Matthew's Catholic Church
32	St. Matthew's Cemetery
33	Stroud Mall
34	Stroudsburg Borough Building
35	Stroudsburg Borough Park
36	Stroudsburg Cemetery
37	Stroudsburg Fire Department-Station 38
38	Stroudsburg High School
39	Stroudsburg Middle School
40	Stroudsburg Seventh Day Adventist Church
41	Stroudsburg Seventh Day Adventist School
42	U.S. Post Office
43	U.S. Post Office
44	West Gate Park
45	WH Ramsey School
46	Zion United Church of Christ



N

0 600 1,200

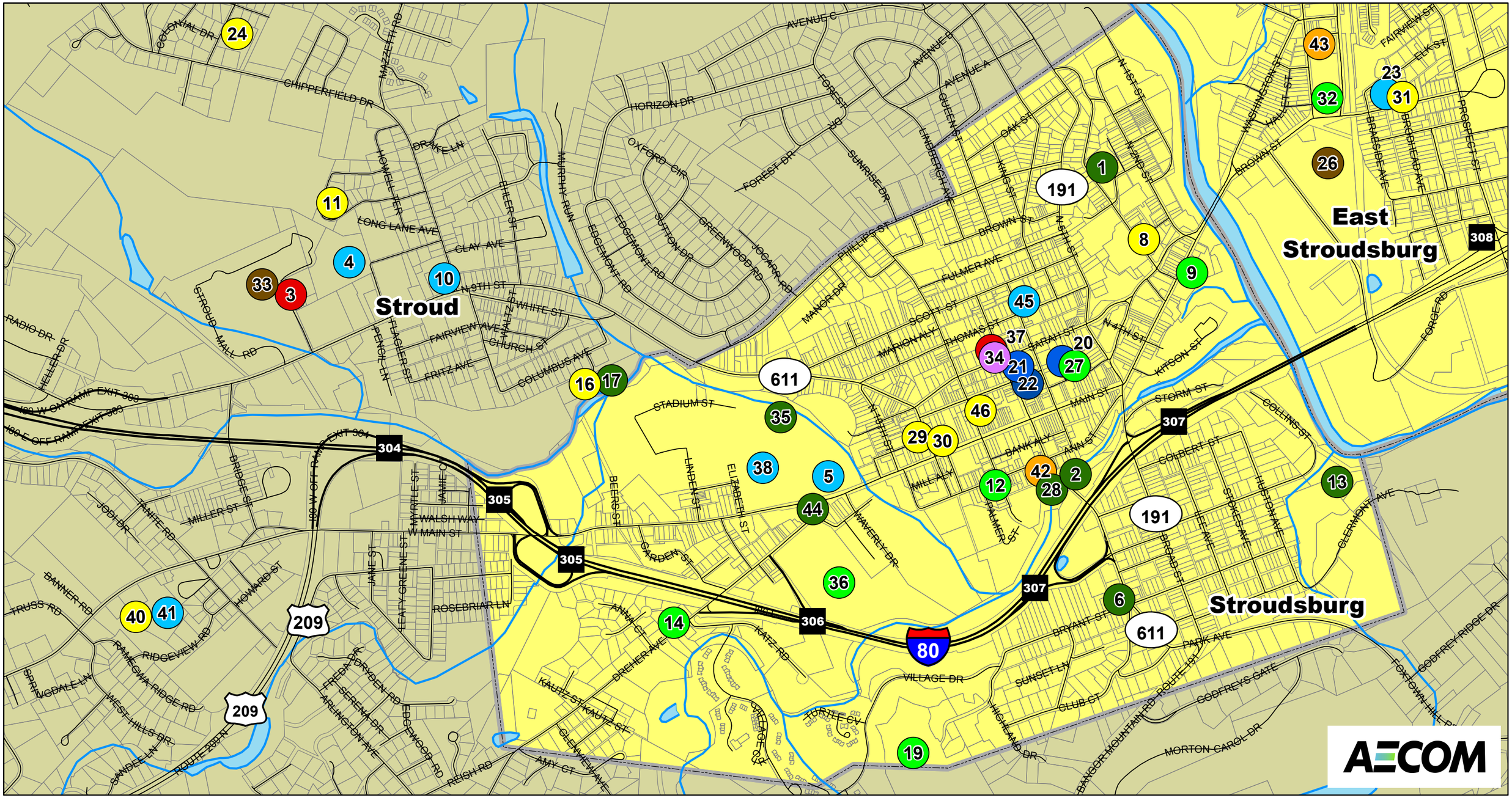
Feet

Cemetery
County
Educational
Fire
Municipal
Park
Police
Post Office
Religious
Retail/Tourist
Borough
Township

I-80 RECONSTRUCTION
FIGURE 2.3: COMMUNITY FEATURES

Sheet 1 of 2

Source: AECOM Research.



N

0 600 1,200

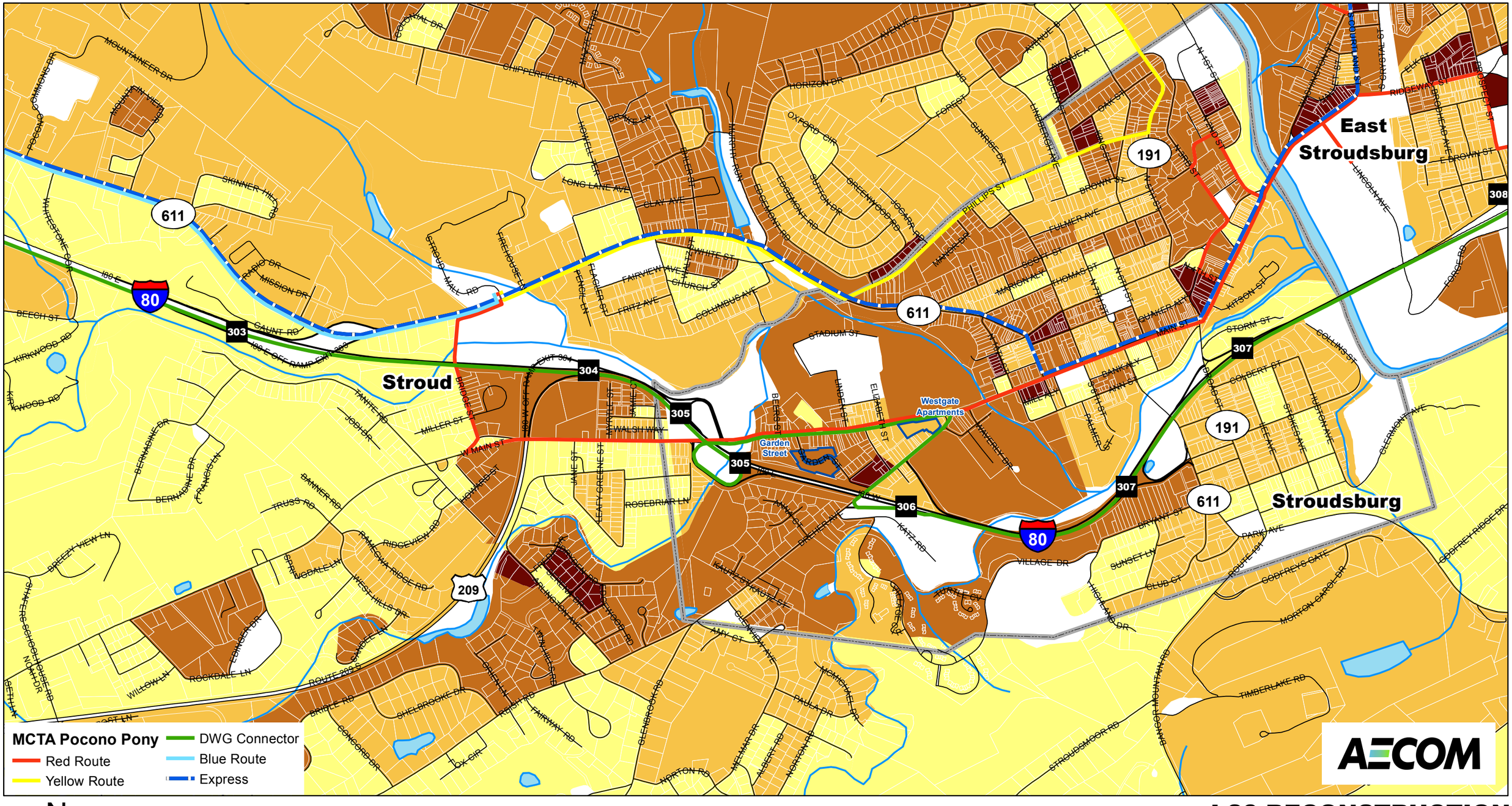
Feet

- Cemetery
- County
- Educational
- Fire
- Municipal
- Park
- Police
- Post Office
- Religious
- Retail/Tourist
- Borough
- Township

I-80 RECONSTRUCTION
FIGURE 2.3: COMMUNITY FEATURES

Sheet 2 of 2

Source: AECOM Research.



N

0 600 1,200

Feet

EJ Score*

- 15 or Less
- 15 to 30
- 30 to 60
- 60 and Above
- Monroe Co. Housing Authority

EJ Score based on adding the percentages of 2 factors: Minority Population and Families Below Poverty Level.

I-80 RECONSTRUCTION

FIGURE 2.4: ENVIRONMENTAL JUSTICE & BUS TRANSIT ROUTES

Source: U.S. Census Bureau, 2010 Census & 2007-2011 American Community Survey.

AECOM

Key	Name
D1	Stroudsburg Historic Preservation District
D2	Stroudsburg Commercial Historic District
D3	Academy Hill Historic District
D4	Delaware, Lackawanna & Western Railroad District
D5	New York, Susquehanna & Western Railroad District
R1	Kitson Woolen Mill; Holland Thread Company
R2	Wallace Hardware Building
R3	Little Bethel African Methodist Church
R4	Stroudsburg U.S. Post Office
R5	George Tillotson House
R6	Stroud Mansion
R7	East Stroudsburg Armory
R8	Gilbert, William & Company

N

0 600 1,200

Feet

\# *Individual Resources

D3 Academy Hill Historic District

D4 Delaware, Lackawanna & Western Railroad District

D5 New York, Susquehanna & Western Railroad District

D2 Stroudsburg Commercial Historic District

D1 **Stroudsburg Historic Preservation District

Borough

* Eligible for or Listed on the National Register.
** Not subject to Section 106 regulation.

I-80 RECONSTRUCTION
FIGURE 2.5:
CULTURAL RESOURCES

Source: Pennsylvania Cultural Resources Geographic Information System (CRGIS).

3. PRELIMINARY ALTERNATIVES OVERVIEW

Engineering alternatives were developed using LIDAR data only. Elevations and tie-ins must be verified during the Phase II alternatives development using project mapping.

3.1 NO-BUILD ALTERNATIVE

The No-Build Alternative is an essential part of the alternative comparison, serving as the baseline for comparison of alternatives and meeting the project Purpose and Needs. This alternative assumes no improvements are made to the existing system. I-80 remains four lanes with substandard shoulders and underclearances. Deteriorated pavement and structures continue to be repaired through maintenance activities only.

3.2 TRANSPORTATION SYSTEMS MANAGEMENT

Transportation Systems Management (TSM) initiatives are traffic operation improvement techniques targeted to increase vehicle occupancy and reduce the number of single-occupant vehicles on the roadway. TSM concepts are designed to improve system-wide efficiency, with some specific strategies targeting congestion, travel times, and driver safety.

The TSM concepts identified in this report include the following:

- Ramp Metering
- Mass transit
- High-Occupancy Vehicle (HOV) facilities
- Park and Ride facilities
- Intelligent Transportation Systems (ITS) and Incident Management

Ramp Metering

The ramp metering concept applied to I-80 within the Stroudsburg metropolitan area would offer the potential to improve peak period flow along the I-80 mainline by controlling the entering flow of traffic from the entrance ramps. The concept restricts platoons of traffic from entering the merge areas along the corridor, where higher density often times causes drivers to force their way into mainline traffic causing reduced speeds. The following seven freeway entrance ramps are included in the project area:

I-80 Interchange 303

I-80 WB from SR 611: In the 2045 No-Build condition, this ramp has approximately 173 and 322 vehicles in the design year AM and PM peak hours, respectively. It is noted that the closest upstream signal (platooning traffic) to the ramp is 1000 feet west of ramp entrance (Bridge Street and SR 611).

I-80 Interchange 304

I-80 EB from US209: In the 2045 No-Build condition, this ramp has approximately 1572 and 1445 vehicles in the design year AM and PM peak hours, respectively.

I-80 Interchange 305

I-80 EB from West Main Street: In the 2045 No-Build condition, this ramp has approximately 324 and 369 vehicles in the design year AM and PM peak hours, respectively. The existing ramp intersection with West Main Street is unsignalized; however under No-Build volumes, it is anticipated a signal would be present creating conditions for platooning traffic.

I-80 WB from West Main Street: In the 2045 No-Build condition, this ramp has approximately 328 and 603 vehicles in the design year AM and PM peak hours, respectively. The existing ramp intersection with West Main Street is unsignalized; however under No-Build volumes, it is anticipated a signal would be present creating conditions for platooning traffic.

I-80 Interchange 306

I-80 EB from Dreher Avenue: In the 2045 No-Build condition, this ramp has approximately 219 and 188 vehicles in the design year AM and PM peak hours, respectively.

I-80 Interchange 307

I-80 EB from Park Avenue: In the 2045 No-Build condition, this ramp has approximately 219 and 264 vehicles in the design year AM and PM peak hours, respectively.

I-80 WB from Broad Street: In the 2045 No-Build condition, this ramp has approximately 473 and 790 vehicles in the design year AM and PM peak hours, respectively.

Mass Transit

Monroe County Transit Authority (MCTA) bus service (red route and yellow route) runs adjacent to the I-80 corridor along SR 611 and Business PA209, offering mass transit access for commuters within the Stroudsburg area. Service is provided five times per day in each direction on weekdays and Saturdays. The region is also served by regional charter bus services. Currently, MCTA is updating their Strategic Plan for the next 5-6 years and this document is currently in final draft form. Some of the items expected to be in the plan are a 250-car Park and Ride and a Bus Transfer Center, which locations are currently in strategic planning stages. A Ride Share/Vanpool program and potentially converting the fleet to natural gas are also mentioned to be part of this plan.

The Monroe County Comprehensive Plan indicates the first section of the passenger rail service proposed from Scranton to Hoboken, NJ is under construction. This section is from Port Morris, NJ to Andover, NJ. The two remaining sections from NJ to Stroudsburg, PA, and from Stroudsburg to Scranton are unfunded at this time. Whether the line will be funded and constructed is unknown at this time.

High Occupancy Vehicle (HOV) Facilities

The project area covers approximately 3.5 miles along I-80 within Monroe County. In addition, PennDOT does not have plans for HOV facilities on adjacent I-80 sections.

Park and Ride Facilities

Strategically located park and ride lots could provide motorists the opportunity to carpool reducing their commuting costs, and reducing the number of vehicles on portions of the roadway network.

Currently, the closest park and ride facility within the I-80 corridor is located at Delaware Water Gap Welcome Center adjacent to I-80 Exit 310. As noted previously, MCTA does have future park-and-ride facilities in the strategic planning stages (locations unknown at the time of this document).

Intelligent Transportation Systems (ITS) and Incident Management

From an interstate perspective, ITS/incident management focuses on managing events that could cause rapid system degradation such as crashes, construction activity, weather events, or planned special events (i.e. racing events at Pocono Raceway).

Currently, there is relatively minimal ITS deployment within the I-80 corridor.

Typically, equipment includes:

- Dynamic Message Signs
- Closed Circuit Television Cameras (CCTV)
- Incident Detection System
- Highway Advisory Radio (HAR)
- Roadway Weather Information Systems (RWIS)
- Changeable Message Signs
- Communications Infrastructure (conduit/fiber optic cable)
- Freeway Service Patrols
- Incident Management Plan (IMP): The I-80 corridor IMP is managed from the PennDOT District 5 Traffic Management Center (TMC), and includes static detour signage used in major incidents.

Existing ITS equipment including CCTV cameras, Dynamic Message Signs, and Highway Advisory Radio locations are within the I-80 corridor area west of the project limits near Tannersville. Additional ITS equipment is currently in the design stages for implementation adjacent/within the project area, including CCTV cameras, Dynamic Message Signs, and Highway Advisory Radio locations.

The District TMC also provides information on travel conditions for I-80 for use in the statewide 511PA website. The website provides information on construction activities and incidents that affect travel conditions along these roadways. The District TMC is also actively involved in incident management and has planned diversion routes for implementation when incidents close a section of I-80.

3.3 HIGHWAY IMPROVEMENT ALTERNATIVES

Through several workshops, a number of highway improvement alternatives were conceptualized and presented for consideration. As an outcome of the initial screening process, Alternatives A, B, C, F, and G were retained and are presented herein. The District's objective is to maintain two travel lanes in each direction during construction. Based upon the existing and proposed lane widths, traffic analyses, and the development of construction staging schemes, a six-lane section was warranted. Therefore, each of the proposed highway improvement alternatives provides six travel lanes with full median and shoulders.

On November 20, 2013, a coordination meeting was conducted with representatives from FHWA and PennDOT to review the traffic comments to the Phase I Report. The outcome of the meeting was to develop additional design alternatives that incorporated the concept of a collector-distributor roadway between Exits 305 and 306, as well as an alternative that retains the current ramp movements at Exit 305. Alternatives H and I have been developed to incorporate these concepts. Included within Section 7 of the report is the information related to Alternatives H and I.

Alternative A

I-80 Mainline will generally follow the existing alignment and the proposed typical section consists of 3-12 foot lanes each way with a 26-foot median (including 12-foot inside shoulders) and flanking 12-foot outside shoulders. (See Figures 3.1, 5.1, and 5.2) The interchanges are improved as follows:

SR 611 Interchange (Exit 303): This alternative incorporates shifting I-80 to the south approximately 30 feet and provides a full diamond interchange located approximately 650 feet west of the existing Exit 303 and tying into the SR 611 shopping center. The driveway to the existing Stroud Township maintenance yard would be realigned along the former I-80 WB on-ramp alignment.

US 209/Business 209/Dreher Avenue Interchanges (Exits 304, 305, and 306): This alternative incorporates an approximate 50-foot shift of the I-80 mainline to the north at Exit 304 and to the south between Exits 305 and 306 to accommodate proposed ramps and a smoother geometry.

At Exit 304, existing movements from US 209 NB to I-80 EB, and I-80 WB to US 209 SB are maintained with a reconfiguration to provide full movements via a proposed ramp connecting US 209 NB with I-80 WB and to SR 611. Ramp B begins coincident with Ramp A to eliminate weaving between the new EB on-ramp at Exit 303 and the new EB exit ramp at Exit 304. A proposed collector-distributor road is included along I-80 WB which eliminates the current weaving between the on-ramp from Exit 305 and the off-ramp for US 209 SB. Ramp C will require a multi-span structure to avoid severe impacts to Pocono Creek. In addition, a full diamond interchange is proposed to connect US 209 with Bus 209 (Main Street) allowing for the elimination of the I-80 EB on-ramps and off-ramps at Exit 305. At Exit 306, the on-ramp from Dreher Avenue to I-80 EB, and the off-ramp from I-80 WB to Dreher Avenue are maintained with some reconfiguration to meet design criteria. A new off-ramp from I-80 EB to Dreher Avenue is proposed. Improvements to Dreher Ave are also anticipated within the vicinity of the interchange. Anticipated wall locations in the area of the cemetery do not encroach beyond the toe of slope of the existing I-80 section. Auxiliary lanes will connect Exits 305 to 307. Bridge Street will be connected to Business 209 to help alleviate congestion on both SR 611 and Business 209. The Business 209 on-ramp merges with Ramp G and provides access to US 209 southbound.

SR 191 Interchange (Exit 307): This alternative incorporates shifting I-80 approximately 36 feet to the north to accommodate the proposed I-80 mainline ultimate section below the recently reconstructed SR 611 overhead structure. A split diamond interchange is proposed maintaining the off-ramp from I-80 EB to SR 611 (Park Avenue). Ramps for the connection of SR 191 (Broad Street) to I-80 EB and I-80 WB will also be provided with

some reconfiguration to meet design criteria. A cul-de-sac would be incorporated to terminate Colbert Street and replace the intersection at SR 191. The overhead structures carrying SR 191 over I-80 and McMichael Creek would be reconstructed and tie into the existing 5-point intersection with Ann Street and Main Street. Medical facility access is maintained with a reconstructed driveway tying to the new SR 191 profile. Mainline geometry will connect to the adjacent project at Exit 308.

TABLE 3.1 RAMP NAMES AND CORRESPONDING MOVEMENTS

RAMP	MOVEMENT
Ramp A	I-80 Eastbound to SR 611/SR 611 to I-80 Westbound
Ramp B	I-80 Eastbound to 209 Bypass/SR209 Southbound
Ramp C	I-80 Westbound/Business 209 to SR 611
Ramp D	SR 611 to I-80 Westbound
Ramp E	209 Bypass to Business 209
Ramp F	SR209 Northbound to I-80 Westbound
Ramp G	I-80 Westbound to SR209 Southbound
Ramp H	SR209 Northbound to I-80 Eastbound
Ramp I	Business 209 to I-80 Eastbound
Ramp J	Business 209 to SR209 Southbound
Ramp K	SR209 Northbound to Business 209
Ramp L	I-80 Westbound to Business 209
Ramp O	I-80 Eastbound Exit/Entrance to/from Dreher Ave
Ramp P	I-80 Westbound to Dreher Ave
Ramp Q	I-80 Eastbound to SR 611 (Park Ave)
Ramp R	SR 191 to I-80 Westbound
Ramp S	I-80 Westbound to SR 191
Ramp T	SR 191 to I-80 Eastbound

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N

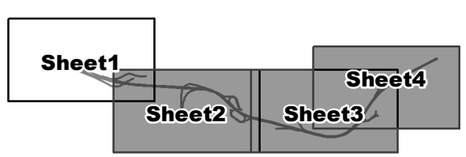
0 200 400

Feet

Structure

Shoulder or Barrier

Travel Lane

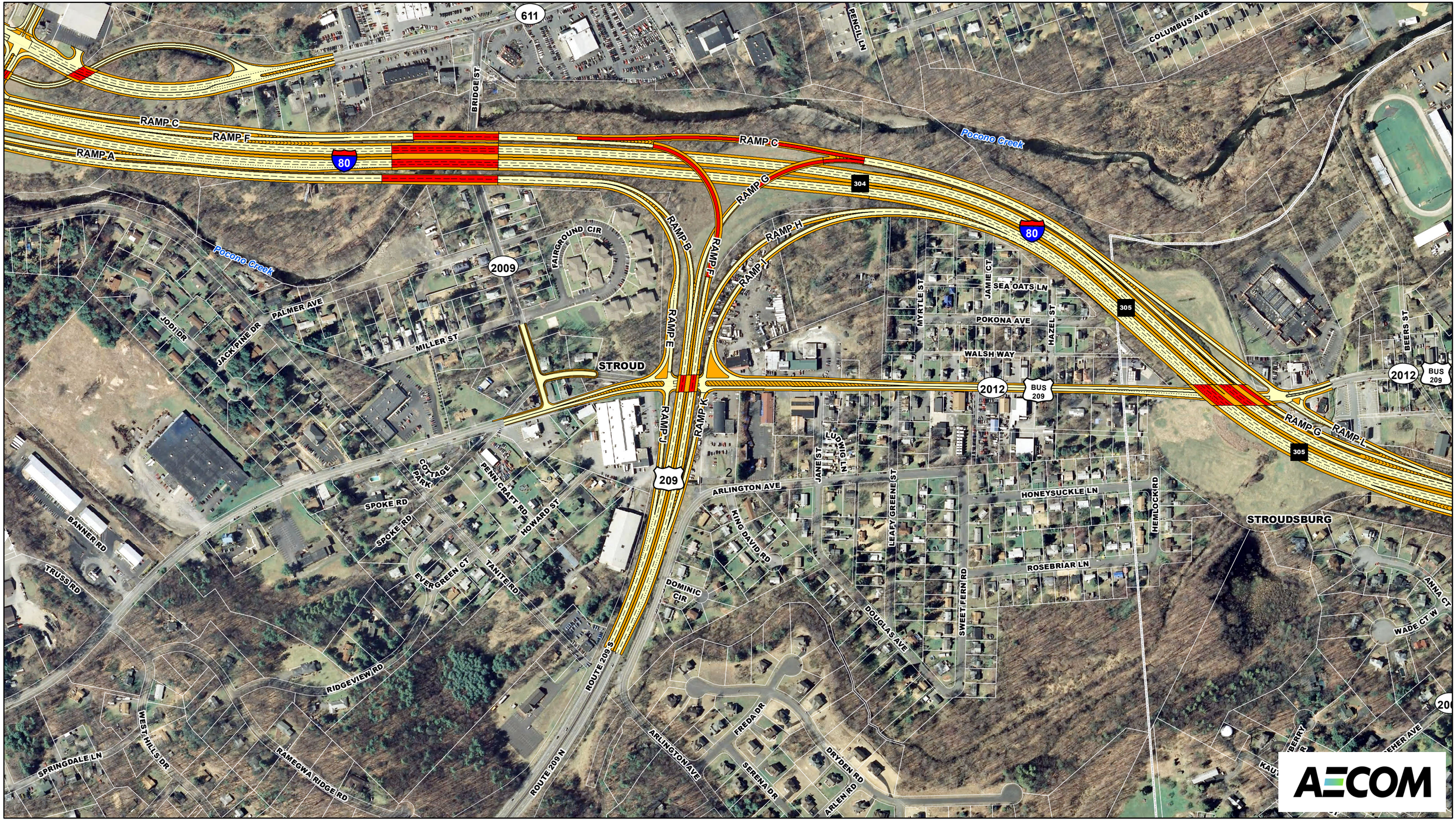


AECOM

I-80 RECONSTRUCTION

FIGURE 3.1: ALTERNATIVE A

Sheet 1 of 4



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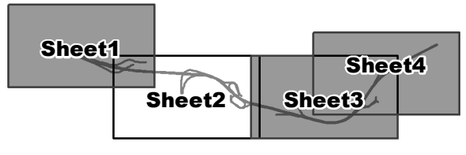
Feet

Structure

Shoulder or Barrier

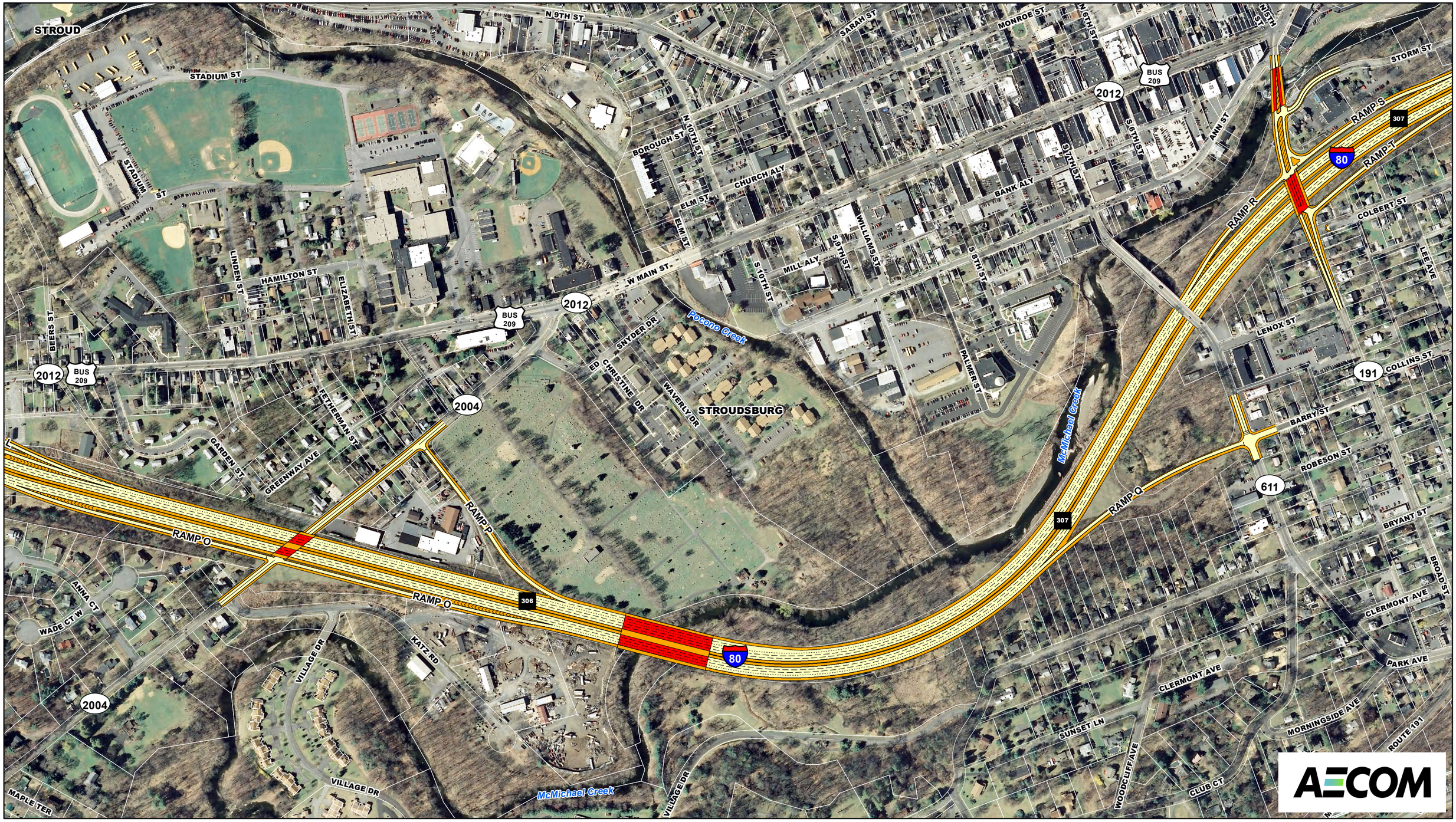
Travel Lane



I-80 RECONSTRUCTION

FIGURE 3.1: ALTERNATIVE A

Sheet 2 of 4



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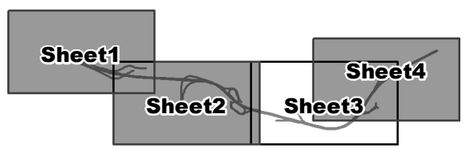
Feet

Structure

Shoulder or Barrier

Travel Lane



AECOM

I-80 RECONSTRUCTION
FIGURE 3.1: ALTERNATIVE A

Sheet 3 of 4

Alignment Will Tie Into Previously Constructed I-80 Section 05S

N

0 200 400

Feet

Structure

Shoulder or Barrier

Travel Lane

Sheet1

Sheet2

Sheet3

Sheet4

I-80 RECONSTRUCTION

FIGURE 3.1: ALTERNATIVE A

Sheet 4 of 4

Alternative B

In comparison to Alternative A, minor realignments of the corridor are introduced to minimize impacts to adjacent properties and environmentally sensitive areas. (See Figure 3.2) The interchange modifications are as follows:

SR 611 Interchange (Exit 303): This alternative is similar to Alternative A, with the exception of the 209 Bypass. Ramp A is now split into Ramp A and Ramp B. The Exit is still a full diamond interchange. Ramp baselines shown provide adequate length for grades to tie into mainline I-80. The new I-80 EB exit to US 209 SB (Exit 304) begins after Exit 303 creating a weave condition.

US 209/Business 209/Dreher Avenue Interchanges (Exits 304, 305, and 306): This alternative is similar to Alternative A with the exception of one major element, the replacement of the I-80 WB bypass with a braided ramp. The braided ramp configuration allows for traffic to enter I-80 westbound quicker, rather than diverting them to a collector-distributor road. This configuration also reduces the amount of impacts to Pocono Creek for both temporary and permanent conditions. The Business 209 on-ramp (Ramp H) with the braided ramp does not provide access to US 209 southbound via Ramp I. Access to US 209 is provided at the new Ramp M.

SR 191 Interchange (Exit 307): This alternative is the same as Alternative A.

TABLE 3.2 RAMP NAMES AND CORRESPONDING MOVEMENTS

RAMP	MOVEMENT
Ramp A	I-80 Eastbound to SR 611
Ramp B	SR 611 to I-80 Eastbound
Ramp C	I-80 Westbound/Business 209 to SR 611
Ramp D	SR 611 to I-80 Westbound
Ramp E	SR209 Northbound to I-80 Westbound
Ramp F	I-80 Eastbound to SR209 Southbound
Ramp G	I-80 Eastbound to Business 209
Ramp H	Business 209 to I-80 Westbound
Ramp I	I-80 Westbound to SR209 Southbound
Ramp J	SR209 Northbound to I-80 Eastbound
Ramp K	Business 209 to I-80 Eastbound
Ramp L	SR209 Northbound to Business 209
Ramp M	Business 209 to SR209 Southbound
Ramp N	I-80 Westbound to Business 209
Ramp O	I-80 Eastbound Exit/Entrance to/from Dreher Ave
Ramp P	I-80 Westbound to Dreher Ave
Ramp Q	I-80 Eastbound to SR 611 (Park Ave)
Ramp R	SR 191 to I-80 Westbound
Ramp S	I-80 Westbound to SR 191
Ramp T	SR 191 to I-80 Eastbound

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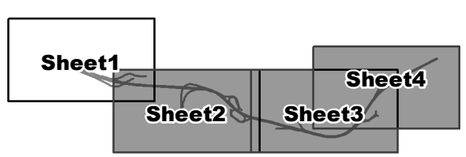
N

0 200 400

Feet

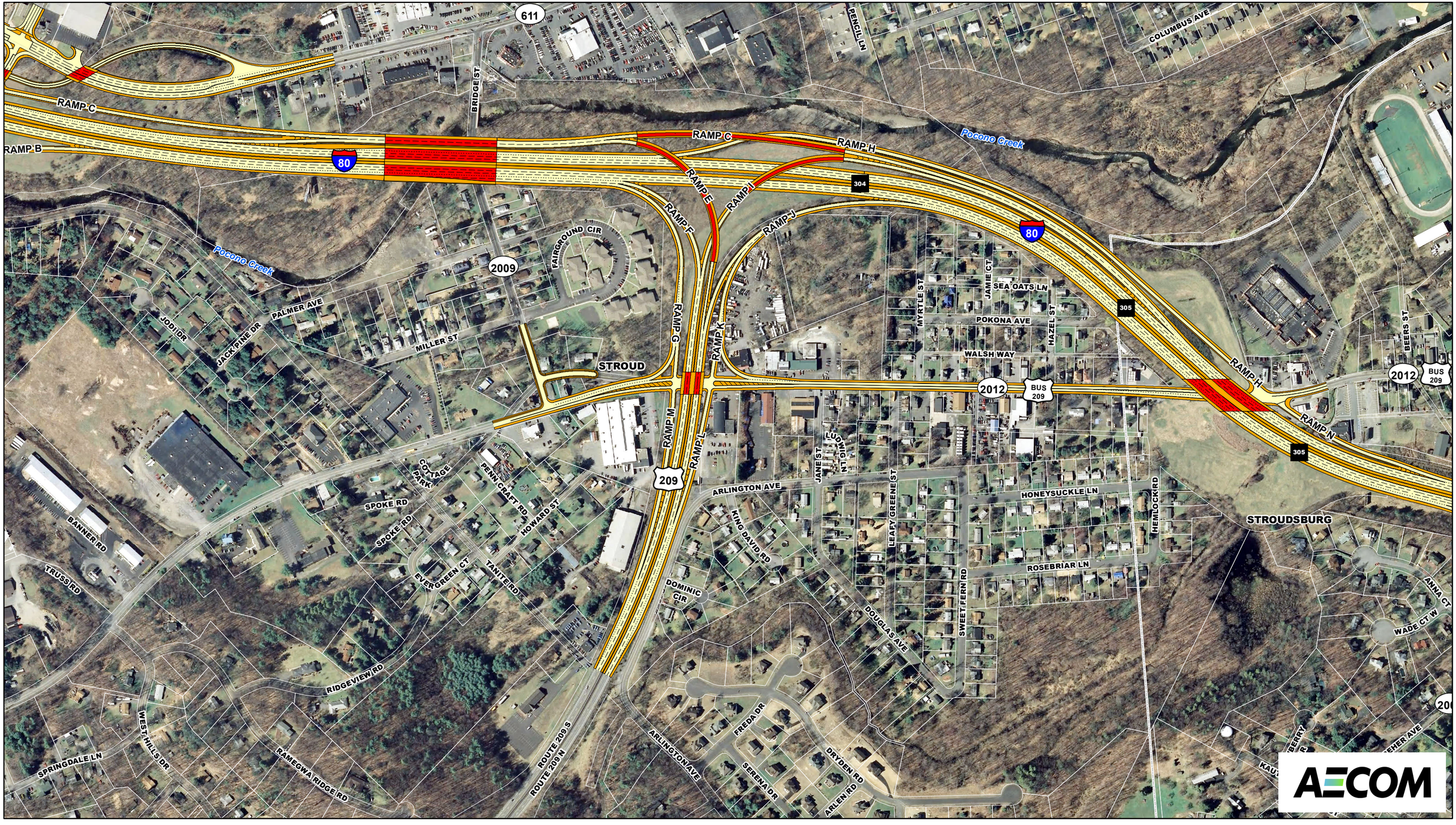
- Structure
- Shoulder or Barrier
- Travel Lane



I-80 RECONSTRUCTION

FIGURE 3.2: ALTERNATIVE B

Sheet 1 of 4



N

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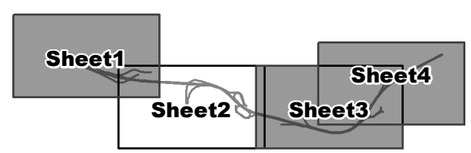
Feet

Structure

Shoulder or Barrier

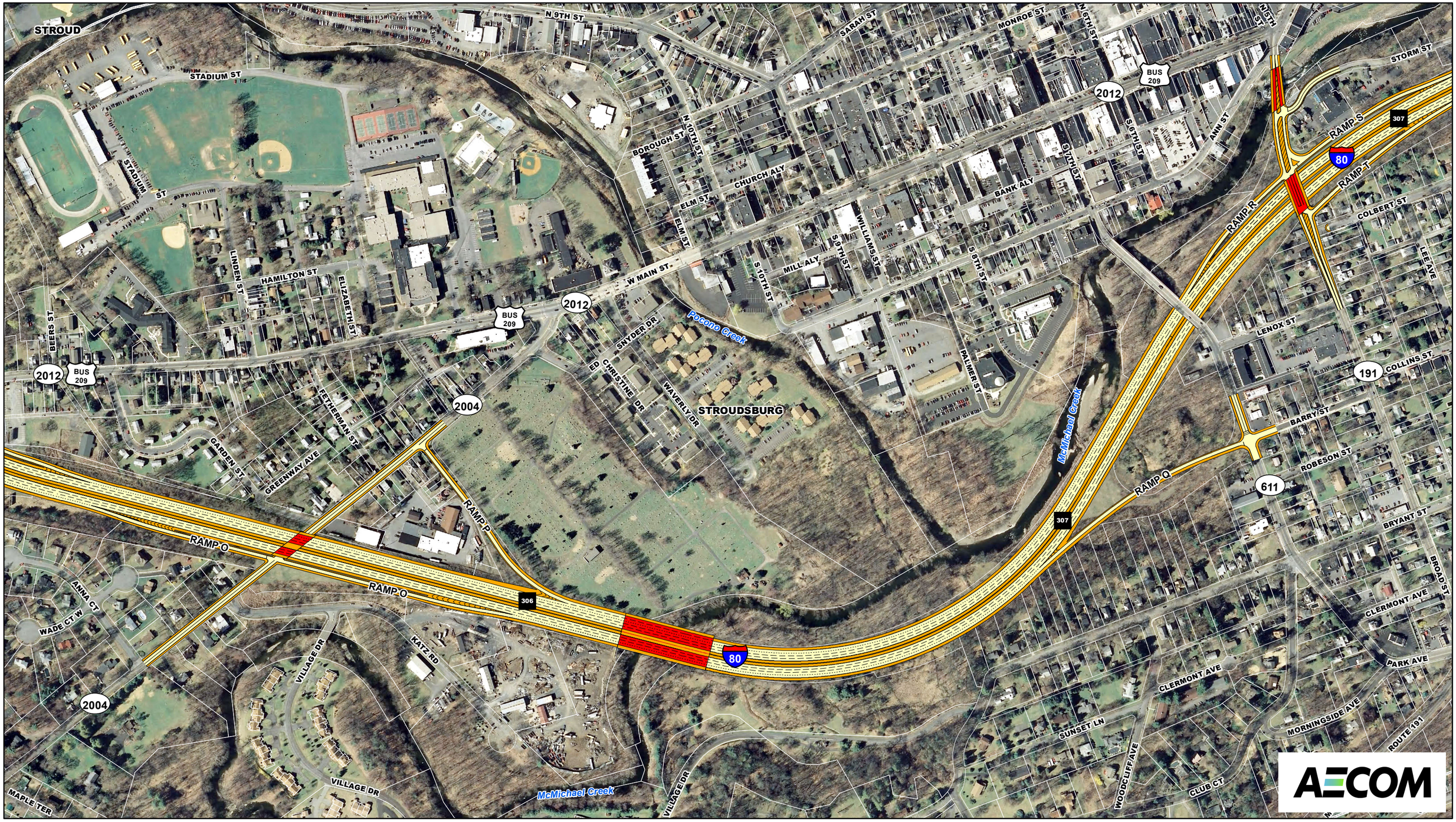
Travel Lane



I-80 RECONSTRUCTION

FIGURE 3.2: ALTERNATIVE B

Sheet 2 of 4



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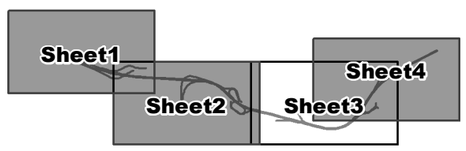
Feet

- Structure
- Shoulder or Barrier
- Travel Lane



I-80 RECONSTRUCTION

FIGURE 3.2: ALTERNATIVE B

Sheet 3 of 4

Alignment Will Tie Into Previously Constructed I-80 Section 05S

N

0 200 400

Feet

Structure

Shoulder or Barrier

Travel Lane

Sheet1

Sheet2

Sheet3

Sheet4

I-80 RECONSTRUCTION

FIGURE 3.2: ALTERNATIVE B

Sheet 4 of 4

Alternative C

In comparison to Alternative A, minor realignments of the corridor are introduced to minimize impacts to adjacent properties and environmentally sensitive areas. (See Figure 3.3) The interchange modifications are as follows:

SR 611 Interchange (Exit 303): This alternative is similar to Alternative A. It requires the realigning the maintenance yard access road as well as I-80.

US 209/Business 209/Dreher Avenue Interchanges (Exits 304, 305, and 306): This alternative is similar to Alternative A. It incorporates the 209 Bypass along with a diamond configuration, as well as reconstructing Bridge Street to tie into Business 209. Ramp P is reconfigured at Dreher Ave to parallel I-80. The Business 209 on-ramp (Ramp L) does not provide access to US 209 southbound via Ramp G. Access to US 209 is provided at the new Ramp J.

SR 191 Interchange (Exit 307): This alternative is similar to Alternative A with minor geometry modifications of the EB I-80 off-ramp geometry, which will tie into SR 611 at the shopping center.

TABLE 3.3 RAMP NAMES AND CORRESPONDING MOVEMENTS

RAMP	MOVEMENT
Ramp A	I-80 Eastbound to SR 611/SR 611 to I-80 Westbound
Ramp B	I-80 Eastbound to 209 Bypass
Ramp C	I-80 Westbound to SR 611
Ramp D	SR 611 to I-80 Westbound
Ramp E	209 Bypass to Business 209
Ramp F	SR209 Northbound to I-80 Westbound
Ramp G	I-80 Westbound to SR209 Southbound
Ramp H	SR209 Northbound to I-80 Eastbound
Ramp I	Business 209 to I-80 Eastbound
Ramp J	Business 209 to SR209 Southbound
Ramp K	SR209 to Business 209
Ramp L	Business 209 to Ramp C
Ramp M	I-80 Westbound to Business 209
Ramp O	I-80 Eastbound Exit/Entrance to/from Dreher Ave
Ramp P	I-80 Westbound to Dreher Ave
Ramp Q	I-80 Eastbound to SR 611 (Park Ave)
Ramp R	SR 191 to I-80 Westbound
Ramp S	I-80 Westbound to SR 191
Ramp T	SR 191 to I-80 Eastbound

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N

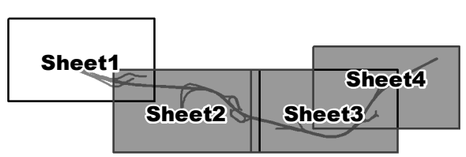
0 200 400

Feet

Structure

Shoulder or Barrier

Travel Lane

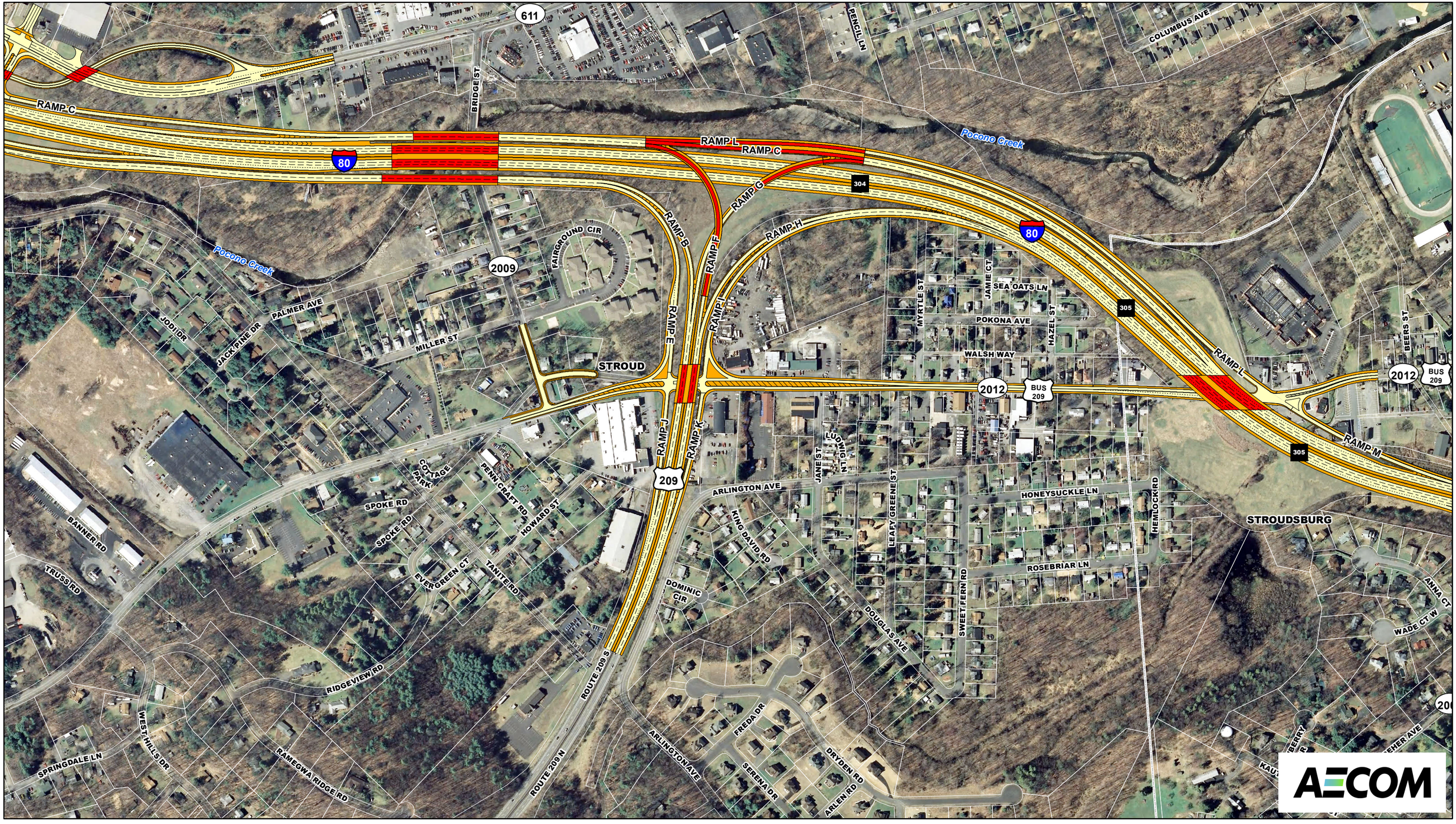


I-80 RECONSTRUCTION

FIGURE 3.3: ALTERNATIVE C

Sheet 1 of 4

AECOM

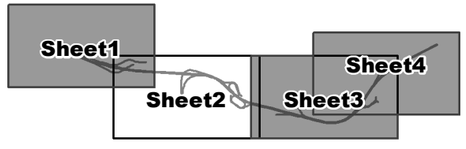


N

0 200 400

Feet

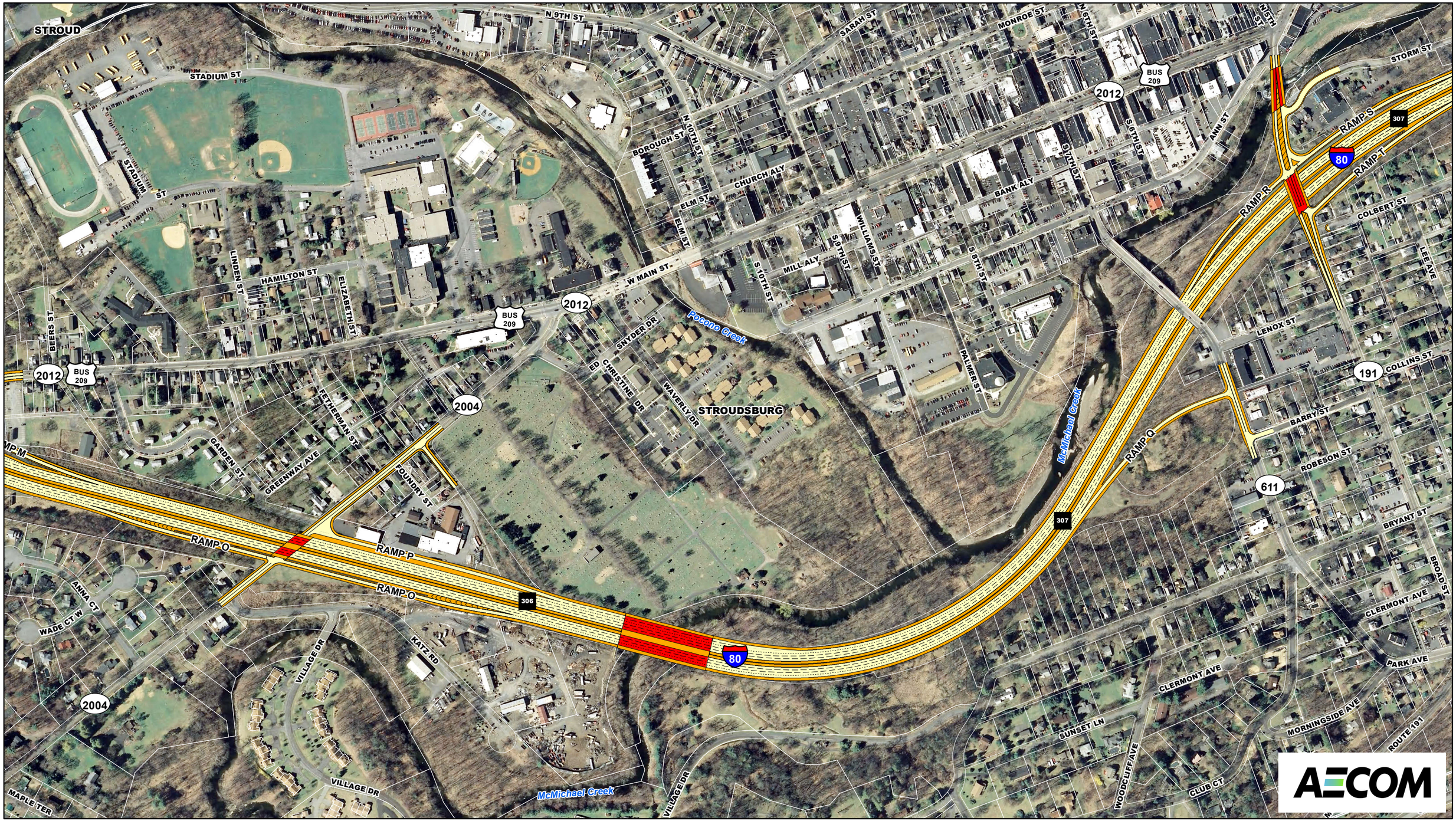
- Structure
- Shoulder or Barrier
- Travel Lane



I-80 RECONSTRUCTION

FIGURE 3.3: ALTERNATIVE C

Sheet 2 of 4

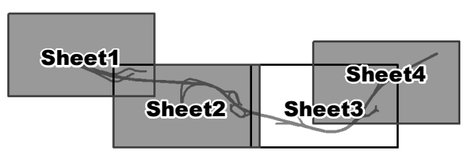


N

0 200 400

Feet

- Structure
- Shoulder or Barrier
- Travel Lane



AECOM

I-80 RECONSTRUCTION

FIGURE 3.3: ALTERNATIVE C

Sheet 3 of 4

Alignment Will Tie Into Previously Constructed I-80 Section 05S

N

0 200 400

Feet

Structure

Shoulder or Barrier

Travel Lane

Sheet1 Sheet2 Sheet3 Sheet4

I-80 RECONSTRUCTION

FIGURE 3.3: ALTERNATIVE C

Sheet 4 of 4

AECOM

Alternative F

In comparison to Alternative A, minor realignments of the corridor are introduced to minimize impacts to adjacent properties and environmentally sensitive areas. (See Figure 3.4) The interchange modifications are as follows:

SR 611 Interchange (Exit 303): This alternative incorporates shifting I-80 to the south approximately 60 feet to tie into Exit 304 ramps and provides a half-diamond interchange. The connector ramp crosses under I-80 and SR 611 as a recessed road and intersects with SR 611. The I-80 mainline profile will be raised to provide minimum required vertical clearance (16'-6") over the connector road and Bridge Street. The I-80 westbound ramps (Ramps C and D) are provided as part of the connector ramp completing a full movement interchange. The Stroud Township maintenance access is not impacted.

US 209/Business 209/Dreher Avenue Interchanges (Exits 304, 305, and 306): This alternative incorporates a shift of the I-80 mainline to the south at Exit 304 and between Exits 305 and 306 to accommodate for ramps and smoother geometry. A full interchange is proposed at Exit 304. The proposed NB US 209 to I-80 WB ramp is a recessed ramp under I-80. The SB US 209 ramp is a viaduct flyover which minimizes impacts to Pocono Creek. A braided ramp connects the Exit 305 on-ramp to I-80 WB while allowing a bypass ramp to connect I-80 WB traffic to SR 611.

Exit 305 interchange has been revised to a half diamond interchange. I-80 EB on-ramp has been relocated 0.5 miles to the west to eliminate weaving at the interchange. In addition, the off-ramp I-80 EB to US 209 Business is relocated to west of Exit 304 to eliminate weaving at the interchange.

Exit 306 is maintained with slight realignments of the ramps and the addition of an off-ramp from I-80 EB.

SR 191 Interchange (Exit 307): This alternative is the same as Alternative A.

TABLE 3.4 RAMP NAMES AND CORRESPONDING MOVEMENTS

RAMP	MOVEMENT
Ramp A	I-80 Eastbound to SR 611/SR 611 to I-80 Westbound
Ramp B	I-80 Eastbound to Business 209
Ramp C	I-80 Westbound to SR 611
Ramp D	SR 611 to I-80 Westbound
Ramp E	209 Bypass/Ramp A to SR209 Southbound
Ramp F	SR209 Northbound to I-80 Westbound
Ramp G	I-80 Westbound to SR209 Southbound
Ramp H	SR209 Northbound to I-80 Eastbound
Ramp I	Business 209 to I-80 Eastbound
Ramp J	Business 209 to SR209 Southbound
Ramp K	SR209 Northbound to Business 209
Ramp L	Business 209 to I-80 Westbound
Ramp M	I-80 Westbound to Business 209
Ramp O	I-80 Eastbound Exit/Entrance to/from Dreher Ave
Ramp P	I-80 Westbound to Dreher Ave
Ramp Q	I-80 Eastbound to SR 611 (Park Ave)
Ramp R	SR 191 to I-80 Westbound
Ramp S	I-80 Westbound to SR 191
Ramp T	SR 191 to I-80 Eastbound

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N

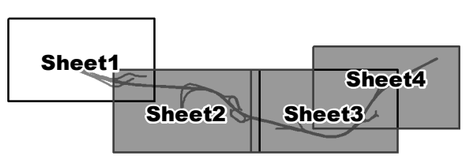
0 200 400

Feet

Structure

Shoulder or Barrier

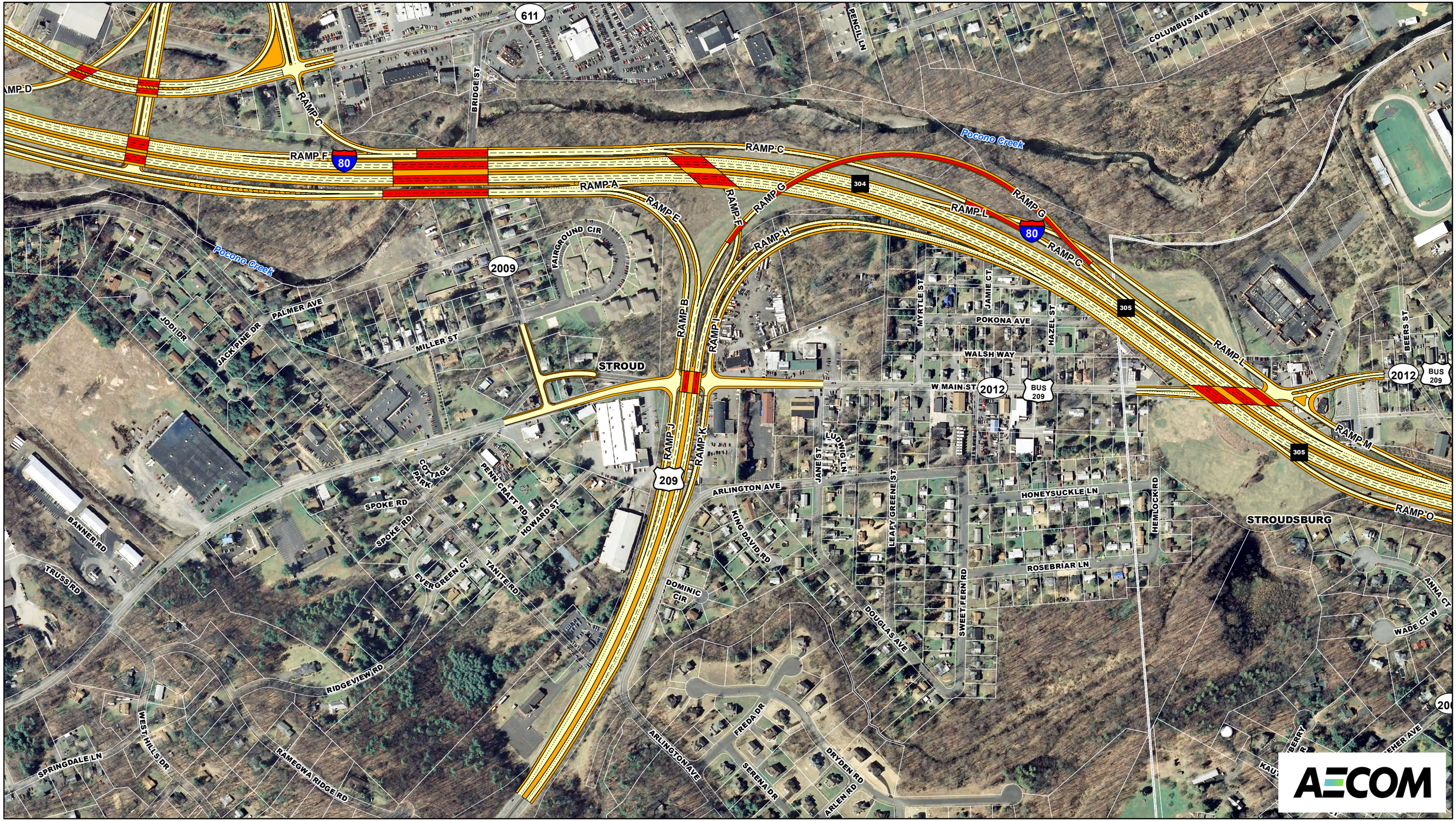
Travel Lane



I-80 RECONSTRUCTION

FIGURE 3.4: ALTERNATIVE F

Sheet 1 of 4



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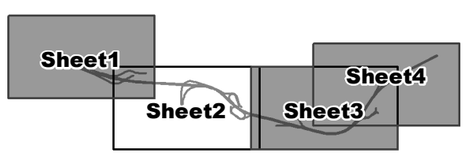
Feet

- Structure
- Shoulder or Barrier
- Travel Lane



AECOM

I-80 RECONSTRUCTION

FIGURE 3.4: ALTERNATIVE F

Sheet 2 of 4

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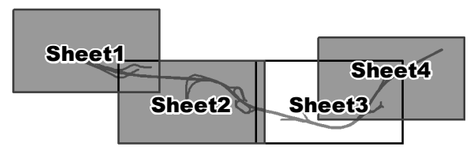
Feet

Structure

Shoulder or Barrier

Travel Lane



I-80 RECONSTRUCTION

FIGURE 3.4: ALTERNATIVE F

Sheet 3 of 4

Alignment Will Tie Into Previously Constructed I-80 Section 05S

N

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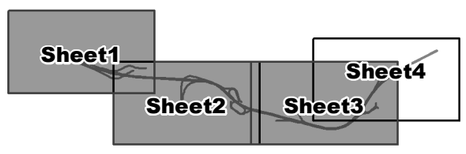
Feet

- Structure
- Shoulder or Barrier
- Travel Lane



I-80 RECONSTRUCTION
FIGURE 3.4: ALTERNATIVE F

Sheet 4 of 4

Alternative G

In comparison to Alternative A, minor realignments of the corridor are introduced to minimize impacts to adjacent properties and environmentally sensitive areas. (See Figure 3.5) The interchange modifications are as follows:

SR 611 Interchange (Exit 303): This alternative is similar to Alternative F, but provides a full diamond interchange along with the connector road.

US 209/Business 209/Dreher Avenue Interchanges (Exits 304, 305, and 306): This alternative is the same as Alternative F.

SR 191 Interchange (Exit 307): This alternative is the same as Alternative A.

TABLE 3.5 RAMP NAMES AND CORRESPONDING MOVEMENTS

RAMP	MOVEMENT
Ramp A	I-80 Eastbound to SR 611/SR 611 to I-80 Westbound
Ramp B	I-80 Eastbound to Business 209
Ramp C	I-80 Westbound to SR 611
Ramp D	SR 611 to I-80 Westbound
Ramp E	209 Bypass/Ramp A to SR209 Southbound
Ramp F	SR209 Northbound to I-80 Westbound
Ramp G	I-80 Westbound to SR209 Southbound
Ramp H	SR209 Northbound to I-80 Eastbound
Ramp I	Business 209 to I-80 Eastbound
Ramp J	Business 209 to SR209 Southbound
Ramp K	SR209 Northbound to Business 209
Ramp L	Business 209 to I-80 Westbound
Ramp M	I-80 Westbound to Business 209
Ramp O	I-80 Eastbound Exit/Entrance to/from Dreher Ave
Ramp P	I-80 Westbound to Dreher Ave
Ramp Q	I-80 Eastbound to SR 611 (Park Ave)
Ramp R	SR 191 to I-80 Westbound
Ramp S	I-80 Westbound to SR 191
Ramp T	SR 191 to I-80 Eastbound

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N

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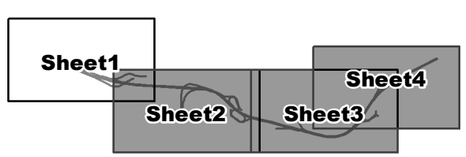
Feet

Structure

Shoulder or Barrier

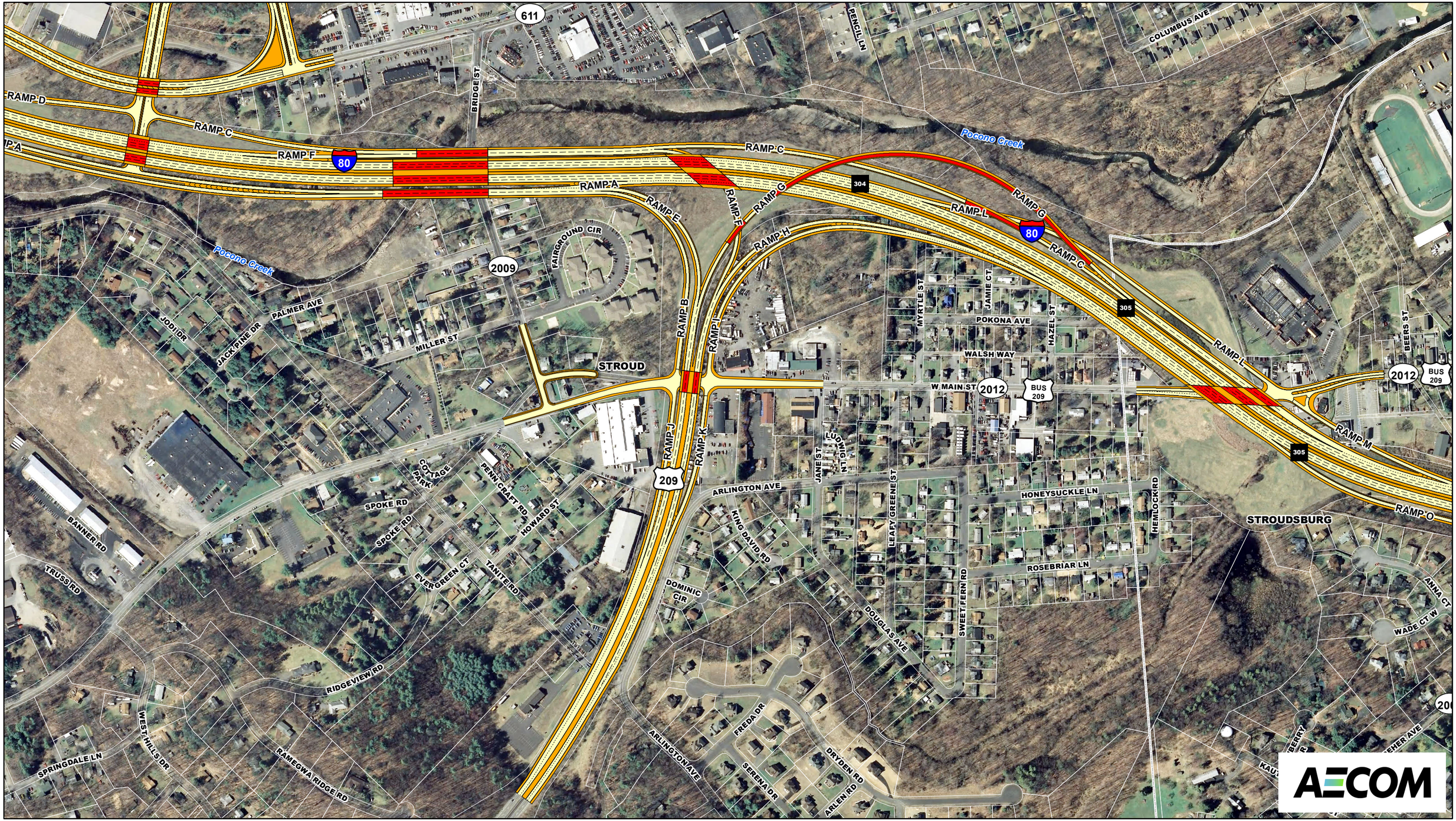
Travel Lane



I-80 RECONSTRUCTION

FIGURE 3.5: ALTERNATIVE G

Sheet 1 of 4



N

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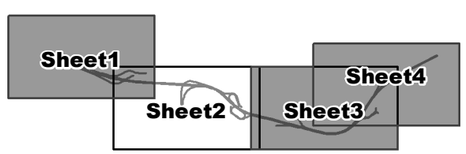
Feet

- Structure
- Shoulder or Barrier
- Travel Lane



AECOM

I-80 RECONSTRUCTION

FIGURE 3.5: ALTERNATIVE G

Sheet 2 of 4

N

0 200 400

Feet

Structure

Shoulder or Barrier

Travel Lane

Sheet1

Sheet2

Sheet3

Sheet4

I-80 RECONSTRUCTION

FIGURE 3.5:

ALTERNATIVE G

Sheet 3 of 4

AECOM

Alignment Will Tie Into Previously Constructed I-80 Section 05S

I80 W
I80 E
LINCOLN AVE
FORGE RD
EAST STROUDSBURG
STROUD
FULMER AVE
SCOTT ST
MARION ALY
STONE ST
WALLACE ST
THOMAS ST
SARAH ST
KANE ST
N 4TH ST
MAIN ST
KITSON ST
N 5TH ST
N 6TH ST
N 7TH ST
N 8TH ST
QUAKER ALY
MONROE ST
N 9TH ST
BUS 209
2012
McMichael Creek
Brodhead Creek
STORM ST
RAMP S
307
80
RAMP T
RAMP R
COLLINS ST
COLBERT ST
ANN ST
S 6TH ST
S 7TH ST
BANK ALY
CHURCH ALY
BOROUGH ST
N 10TH ST
ELM ST
W MAIN ST
MILL ALY
S 9TH ST
S 10TH ST
WILLIAMS ST
STROUDSBURG
SNYDER DR
Pocono Creek
ED CHRISTINE DR
WAVERLY DR
PALMER ST
McMichael Creek
RAMP Q
307
LENOX ST
COLLINS ST
HUSTON AVE
CLERMONT AVE
191
BARRY ST
LEE AVE
STOKES AVE
ROBESON ST
611
BRYANT ST
CLUB CT
BROAD ST

AECOM

N

0 200 400
Feet

Structure
Shoulder or Barrier
Travel Lane

Sheet1
Sheet2
Sheet3
Sheet4

I-80 RECONSTRUCTION
FIGURE 3.5: ALTERNATIVE G

Sheet 4 of 4

4. EVALUATION CRITERIA

4.1 BASELINE CONDITIONS

Traffic data collection for the project area was performed in April 2013 for I-80 mainline at each end of the project area, for all on and off ramps, and for ramp termini intersections. To obtain average daily traffic (ADT) and peak hour data, the raw data was adjusted using a seasonal adjustment factor for the applicable Traffic Pattern Group (TPG) shown in PennDOT Publication 601 (August 2012 edition). From the data collection, AM and PM peak traffic hours for the project area were determined to be 8:00-9:00AM, 4:00-5:00PM, respectively. Existing traffic volume information is provided in Appendix A.

Mainline Volumes

Existing I-80 ADT volumes in the project study area range from 47,300 west of interchange 303 to 70,500 east of interchange 307, with 12% heavy vehicle traffic. Traffic volumes west of Interchange 304 (US209) are the higher volume sections due to volumes accessing I-80 from US209 ramps that only serve areas to/from the east. The mainline section between Interchange 306 and 307 was observed to be the highest volume segment, with PM peak hour volumes reaching 6,099 (bi-directional).

Ramp Volumes

Current ramp ADT volumes within the project area vary from 1,480 to 4,450, with the exception of Interchange 304, the US209 ramps, which currently carry 10,550 vehicles for the eastbound on-ramp and 10,780 vehicles for the westbound off-ramp.

Level of Service

The peak hour traffic volumes were analyzed to determine the existing operating conditions in accordance with the standard techniques contained in the current Highway Capacity Manual (2010). The results are presented using application of peak hour levels of service. Level of service is a grading system for amount of congestion, using the letter A to represent the least amount of congestion and F to refer to the greatest amount. The analyses were performed for the mainline, ramps, ramp terminus intersections, and weave sections along I-80 from Interchange 303 to Interchange 307. For existing 2013, I-80 mainline operates at LOS C or better except westbound between Interchange 307 on-ramp and 304 off ramp which operates at LOS E during the PM peak. The weave segment westbound between Interchange 305 and 304 operates at LOS D or better.

All ramp merges onto I-80 operate at LOS D or better except Interchange 307 westbound on ramp which operate at LOS E during the PM peak. All ramp diverges Exiting I-80 operate at LOS D or better except the westbound off-ramps to Interchanges 307, 306, and 305 which operate at LOS E during the PM peak. All ramp terminus intersections are currently unsignalized and operate at acceptable LOS C or better. The Interchange 303 eastbound off-ramp as it merges onto SR 611 experiences delays due to the congestion and queuing along the SR 611 corridor. Observations also indicate that some traffic makes illegal left-turns from this ramp onto westbound SR 611, and also eastbound SR 611 to the westbound I-80 on-ramp.

Summary tables and the detailed capacity/level-of-service analysis worksheets for the existing conditions are provided in Tables 4.1 through 4.4 and Appendix A and B.

TABLE 4.1 EXISTING PEAK HOUR LEVELS OF SERVICE FREEWAY SEGMENTS

Location	Existing Year 2013 A.M. Peak Hour LOS/Density (pc/mi/ln)	Existing Year 2013 P.M. Peak Hour LOS/Density (pc/mi/ln)
I-80 EB between Int. 303 and 304	B (12.5)	B (16.2)
I-80 EB between Int. 304 and 305	C (21.2)	C (24.0)
I-80 EB between Int. 305 and 306	C (21.9)	C (23.1)
I-80 EB between Int. 306 and 307	C (23.9)	C (23.2)
I-80 WB between Int. 303 and 304	A (10.4)	C (22.6)
I-80 WB between Int. 304 and 305	B (15.7)	E (39.2)
I-80 WB between Int. 305 and 306	B (15.9)	E (39.7)
I-80 WB between Int. 306 and 307	B (16.9)	E (42.5)

TABLE 4.2 EXISTING PEAK HOUR LEVELS OF SERVICE WEAVING SEGMENT

Location	Existing Year 2013 A.M. Peak Hour LOS/Density (pc/mi/ln)	Existing Year 2013 P.M. Peak Hour LOS/Density (pc/mi/ln)
I-80 WB Int. 305 to 304	B (12.1)	D (28.2)

TABLE 4.3 EXISTING PEAK HOUR LEVELS OF SERVICE RAMP MERGES

Location	Existing Year 2013 A.M. Peak Hour LOS/Density (pc/mi/ln)	Existing Year 2013 P.M. Peak Hour LOS/Density (pc/mi/ln)
I-80 EB Int. 304 from Rt. 209	C (21.6)	C (24.7)
I-80 EB Int. 305 from W. Main St.	C (26.9)	D (28.8)
I-80 EB Int. 306 from Dreher Ave.	D (28.3)	D (29.0)
I-80 EB Int. 307 from Park Ave.	C (26.1)	C (27.0)
I-80 WB Int. 303 from Rt. 611	B (11.1)	C (24.4)
I-80 WB Int. 307 from Broad St.	C (22.4)	E (40.2)

TABLE 4.4 EXISTING PEAK HOUR LEVELS OF SERVICE RAMP DIVERGES

Location	Existing Year 2013 A.M. Peak Hour LOS/Density (pc/mi/ln)	Existing Year 2013 P.M. Peak Hour LOS/Density (pc/mi/ln)
I-80 EB Int. 303 to Rt. 611	B (14.9)	B (20.0)
I-80 EB Int. 305 to W. Main St.	D (28.0)	D (30.8)
I-80 EB Int. 307 to Park Ave.	D (30.8)	D (30.1)
I-80 WB Int. 305 to W. Main St.	C (22.3)	E (42.0)
I-80 WB Int. 306 to Dreher Ave.	C (23.3)	E (43.2)
I-80 WB Int. 307 to Broad St.	C (22.5)	E (41.7)

Crash Analysis

Crash data for the I-80 project area was reviewed. A total of 239 crashes were reported during the five year period from 2008 to 2012. Fixed object (43%) and rear-end (31%) crashes were prevalent and are typical of a freeways with congestion and geometric deficiencies. There were also three fatalities – one eastbound near Exit 303, eastbound at the curve approaching Exit 307, and eastbound at the Park Avenue bridge overpass. (See Appendix D)

Deficiency Analysis

A Geometric Deficiency Survey Review of Roadway and Structures report was prepared for PennDOT in 2005 by McCormick Taylor. Since criteria and minimum requirements (AASHTO and PennDOT DM2) have evolved over the past eight years a review of the report was performed to compare existing conditions with new requirements. It was found that all deficiencies along this section of I-80 are present and need to be addressed. Some of those deficiencies include horizontal and vertical clearance, median width, horizontal geometry, and superelevations. Table 4.5 summarizes the horizontal curves along I-80 and their respective superelevations. Three out of the five curves have substandard superelevations. The acceleration and deceleration lane lengths for several of the existing movements within the project limits are below design criteria. See Table 1.1 on page 6 for existing versus criteria lengths.

TABLE 4.5 EXISTING SUPERELEVATIONS ON I-80

ALIGNMENT	SEG NB	OFFSET	SEG SB	OFFSET	RADIUS (ft)	EXIST SE (%)	REQUIRED SE* (%)	RESULT
I-80	3045	738	3044	738	7640	1.6	2.4	SUBSTANDARD
I-80	3051	2207	3050	2207	1450	6.3	6.0	STANDARD
I-80	3055	1402	3054	1402	1910	4.7	5.6	SUBSTANDARD
I-80	3065	355	3064	355	1450	6.3	6.0	STANDARD
I-80	3071	592	3070	592	3820	2.1	3.8	SUBSTANDARD

** Based on 60 MPH design speed*

4.2 COMPARATIVE CRITERIA

Five build alternatives plus the No-Build and TSM alternatives were developed for the project corridor. In order to evaluate and compare the various alternatives, the following criteria have been applied:

- Addressing the project needs
  - Safety
    - Substandard ramp and weave lengths
    - Substandard shoulder widths limiting emergency service response
    - Deteriorated pavement and structures
  - Congestion
    - Widespread LOS F in the design year
  - Mobility
    - System continuity lacking
    - Conflicts between local and through traffic
    - Maintain four lanes during construction
    - STRAHNET required clearances
- Traffic Performance
- Environmental Impact
- Constructability, MPT, and Staging
- Cost

Based on the results of these evaluations, alternatives will be recommended for further investigation in the Phase II Alternatives Analysis.

Traffic analyses were performed for the mainline ramp sections, ramp terminus intersections, and weave sections within the I-80 segment from Interchange 303 to Interchange 307 for each Build Alternative. Each alternative has been evaluated for its ability to adequately accommodate traffic along the mainline and associated interchange and ramp configurations. The results of the analysis for each alternative are discussed within Section 5, Preliminary Alternative Assessment.

5. PRELIMINARY ALTERNATIVE ASSESSMENTS

Each of the alternatives developed has been evaluated for its ability to meet the project's Purpose and Needs, for accommodating future traffic in both the opening and design years, for compliance with design criteria, and for environmental impacts. In addition, all proposed designs must allow for the maintenance of two lanes of traffic in each direction throughout construction, except for short term closures.

As the environmental information is primarily from secondary sources, the impact acreages are not considered accurate but are consistently measured across alternatives to provide a means of comparison. Because detailed engineering has only been developed using LiDAR base mapping, environmental impacts were based on a 20 foot buffer from the proposed edge of shoulder. No avoidance or minimization measures have been incorporated; it is anticipated that impacts overall will be reduced as the designs are progressed.

5.1 ALTERNATIVES DISMISSED

Numerous alternatives, including several options from the 2009 I-80 Corridor Study prepared by McCormick Taylor (provided for reference on attached CD), were developed initially but dismissed without further engineering development due to excessive impacts and/or an inability to meet the Purpose and Needs. In addition to the I-80 Corridor Study options the two other alternatives that were studied and dismissed included Alternative D and Alternative E, both of which provided variations to the ramp configurations at Exit 307. The following is a summary of the dismissed alternatives:

Exit 303

Options 2 and 3 from the 2009 Corridor Study were preliminarily designed and dismissed. Key factors considered were safety, environmental impacts and Right-of-Way acquisition.

Option 2 realigned the off ramp to SR 611 and proposed a signalized intersection at this location. With the current traffic queuing, future congestion is anticipated due to the proximity to Bridge St. This option also does not allow any additional movements on or off of I-80. Therefore, this design would not meet the project needs of relieving congestion or improving system continuity. Horizontal and vertical geometry constrained the

intersection at this location. Design exceptions would have been required in this alternative.

Option 3 maintained the off ramp to SR 611 and introduced a jug-handle movement to accommodate the entrance to I-80 westbound. Similar horizontal and vertical geometry constraints limited this option as well. Design exceptions would have been sought in this alternative as well.

Key components developed from this option, and used in the proposed alternatives, are the necessity to relocate the intersection to accommodate ramp and mainline geometry along with adequate sight distances.

Exits 304, 305 and 306

Options 1 through 5 from the 2009 Corridor Study were preliminarily designed and dismissed. Key factors considered were safety, environmental impacts, right-of-way impacts, socioeconomic impacts and geometry constraints.

Options 1 and 5 did not address key safety concerns of merging traffic onto I-80 eastbound from SR 209, and therefore did not meet the project needs. Options 2, 3 and 4 addressed the substandard geometry of I-80 and the on ramps; however these options incorporated a collector-distributor road along the eastbound side of I-80, which restricted areas for stormwater BMPs. These ramps also required extensive Right-of-Way acquisitions.

Options 1, 3 and 4 incorporated on and off ramps to and from Business 209, which required extensive Right-of-Way acquisitions. Also, in these options, as well as option 2, significant environmental impacts would occur along Pocono Creek. Structure costs for these options would be significant due to the need for high retaining walls.

Key components developed from these options, and used in the proposed alternatives, are the on and off ramps at Business 209. Additional refinement allowed for a tight diamond full interchange configuration at Exit 304. On and off ramps throughout the corridor used the collector distributor road concept for on and off ramp for Exit and entrance throughout the corridor. This allows for local users to easily access and Exit the highway as they currently do today.

Exit 307

All options incorporating a full diamond interchange from the 2009 Corridor Study were preliminarily designed and dismissed. The overhead structure carrying SR 611 is skewed with I-80 on a curve and does not allow for the ultimate six-lane section including auxiliary lanes to fit underneath. All on and off ramps, with the exception of the eastbound off ramp (Ramp Q), are located at SR 191 preventing this from being a full interchange.

Options 1A, 1B, 3 and 4 do not allow Ramp Q to geometrically fit underneath the new overhead structure.

Option 2 requires the Right-of-Way acquisition of a brand new bank, which was not present at the time of the 2009 Study.

Key components taken from these options are the 3-leg interchange and the reconstruction of Ramp Q with minor geometry improvements.

Two additional design alternatives that were studied and dismissed for Exit 307 included Alternative D and Alternative E. Key factors considered were geometric constraints, safety, environmental impacts and right-of-way acquisition.

Alternative D, which is similar to Option 3 from the 2009 Corridor Study, illustrates a realignment of SR 191 that shifts the interchange approximately 200 feet to the east and ties into Lee Avenue rather than Broad Street. This alternative introduces major alignment modifications to both I-80 and the interchange ramps in order to meet current design standards and minimize impacts to adjacent property owners and environmentally sensitive areas. Ultimately, this alternative was not further developed due to the vertical clearance constraints with the newly constructed SR 611 Bridge, the increased property impacts and for traffic concerns associated with increasing the traffic volumes on Lee Avenue, a township road.

Alternative E incorporated a slight realignment of SR 191 that shifts the interchange approximately 50-75 feet to the east. The I-80 mainline and ramp configurations are similar to alternative D, however this alternative ties into Broad Street on either side of I-80 as opposed to Lee Avenue. Similar to Alternative D this alternative was not developed due to the vertical clearance constraints with the newly constructed SR 611 Bridge and the increased property impacts.

Roundabout Concepts

Roundabouts were conceptually laid out at each signalized intersection of each alternative to evaluate their feasibility. All alternatives have shown major environmental and/or right-of-way impacts at each interchange with the inclusion of roundabouts.

At Exit 303, the shopping center entrance at the eastern end would be converted to a roundabout intersection. The overall terrain at this Exit is unsuitable for a roundabout, including increased costs associated with right-of-way acquisition and environmental impacts. Alternatives F and G would require additional structures to accommodate the roundabouts.

At Exits 304, 305 and 306, roundabouts would result in extensive impacts to properties, mostly businesses. Additional structures would be needed to accommodate the roundabout placement at each interchange.

At Exit 307, extensive environmental and property impacts would occur with the incorporation of a roundabout. The necessary horizontal and vertical geometry would require multiple property acquisitions at the 5-point intersection in Stroudsburg, along with major impacts to McMichael Creek. Additional structures and potential design exceptions would be necessary at these locations to accommodate this option.

5.2 NO-BUILD ALTERNATIVE

Meeting Purpose and Needs

The project corridor was constructed in the 1950s and 1960s. As such various components do not meet current standards, as detailed in the Purpose and Need statement in Section 1.3. Shoulder widths less than criteria limit emergency response during incidents. Ramp lengths and weave sections shorter than required contribute to crash rates above the statewide average.

Insufficient ramp lengths also contribute to current congestion throughout the project area, as traffic must slow to merge or diverge. Future congestion only worsens due to insufficient capacity in the four lane section.

The current configuration mixes local and through traffic with numerous partial interchanges, failing to meet driver expectations. In addition, vertical clearance deficiencies prevent STRAHNET compliance.

The No-Build Alternative fails to address the safety, congestion, or mobility issues caused by the current conditions, and therefore does not meet the project purpose and needs.

Traffic Performance

Design year daily traffic volumes (2045) were developed for the No-Build Alternative utilizing a two percent yearly growth rate, increasing the mainline volume to approximately 89,200 to 132,800. Corresponding design year ramp volumes vary from 2,790 to 8,400 vehicles per day. The Interchange 304, US209 ramps, are projected to be 19,882 vehicles for the eastbound on-ramp and 20,310 vehicles for the westbound off-ramp. Detailed information on the traffic volumes for the No Build Alternative is provided in Appendix E.

Summary tables and the detailed capacity/level-of-service analysis worksheets for the No Build scenario are contained in Appendix E.

Using 2045 design year volumes, a significant portion of the eastbound and westbound freeway segments, mainly between Interchanges 304 and 307 operate at Level of Service F during AM and PM peak periods. The corresponding ramp merge and diverge analyses within these sections also operate at Level of Service E.

In addition, ramp movements at Interchange 305 and 307 ramp terminus intersections experience deteriorating Level of Service under design year volumes, particularly during PM peak period. The Interchange 305 westbound off-ramps at West Main Street and the Interchange 307 westbound off-ramps at Broad Street operate at Level of Service F during PM peak period.

Under design year volumes, the No-Build weave section westbound between Interchange 305 and 304 (ramp to US209 southbound) operates at Level of Service F during PM peak period.

The No-Build Alternative does not adequately accommodate future traffic volumes and does not meet the project need to alleviate congestion.

Environmental Impact

The No Build Alternative would not have any direct environmental impacts on the physical features within the project area. That is, there would be no wetland or stream encroachments, no effects to cultural resources, and no property acquisitions.

5.3 TRANSPORTATION SYSTEMS MANAGEMENT

Transportation Systems Management (TSM) initiatives are traffic operation improvement techniques targeted to increase vehicle occupancy and reduce the number of single-occupant vehicles on the roadway. TSM concepts are designed to improve system-wide efficiency, with some specific strategies targeting congestion, travel times, and driver safety.

TSM initiatives were identified and reviewed for the I-80 reconstruction project area (Interchange 303 to Interchange 307) to determine whether the TSM alternative alone could meet project needs. The purpose and need for the reconstruction project is to improve overall roadway safety, access, and operations by providing adequate shoulders and improved ramp access (including acceleration/deceleration lengths, ramp auxiliary lanes) throughout the project area. In addition, vertical clearance for existing structures over I-80 is proposed to be improved to meet the minimum requirements.

The TSM concepts identified in this report include the following:

- Ramp Metering
- Mass transit
- High-Occupancy Vehicle (HOV) facilities
- Park and Ride facilities
- Intelligent Transportation Systems (ITS) and Incident Management

Ramp Metering

The ramp metering concept applied to I-80 within the Stroudsburg metropolitan area would offer the potential to improve peak period flow along the I-80 mainline by controlling the entering flow of traffic from the entrance ramps. The concept restricts platoons of traffic from entering the merge areas along the corridor, where higher density often times causes drivers to force their way into mainline traffic causing reduced speeds. The seven freeway entrance ramps were evaluated for ramp metering. Six of the ramps are not appropriate for ramp metering due to geometric constraints of the existing ramps, along with the design year ramp volumes that are lower than typically applies for ramp meters. For the US209 Eastbound entrance, ramp metering is not appropriate since the ramp serves as a highway to highway connection between limited access sections of US209 northbound and I-80 eastbound.

A Ramp-Meter system alone would not meet the project needs.

Mass Transit

Monroe County Transit Authority (MCTA) bus service (red route and yellow route) runs adjacent to the I-80 corridor along SR 611 and Business 209, offering mass transit access for commuters within the Stroudsburg area. The region is also served by regional charter bus services. Currently, MCTA is updating their Strategic Plan for the next five to six years and includes a 250-car Park and Ride and a Bus Transfer Center, which locations are currently in strategic planning stages. A Ride Share/Vanpool program and potentially converting the fleet to natural gas are also mentioned to be part of this plan.

The Monroe County Comprehensive Plan indicates the first section of the passenger rail service proposed from Scranton to Hoboken, NJ is under construction (Port Morris, NJ to Andover, NJ). The two remaining sections from NJ to Stroudsburg, PA, and from Stroudsburg to Scranton are unfunded at this time. Whether the line will be funded and constructed is unknown at this time.

In order for the current no-build condition to meet the future traffic projections, mass transit would need to divert over 2,500 motorists away from I-80 westbound in the PM peak hour and onto mass transit. A mass transit alternative does not improve any of the roadway deficiencies and does not meet the project need to improve safety. Previous studies of this alternative indicate that approximately 118 vehicles per hour would be removed from I-80 westbound and use mass transit during the PM peak hour. A mass transit alternative alone would not meet the project need to improve congestion.

Therefore, a transit investment alternative is not considered a viable alternative to meet the project needs.

High Occupancy Vehicle (HOV) Facilities

The project area covers approximately 3.5 miles along I-80 within Stroudsburg. HOV lanes alone would not meet the project needs. In addition, PennDOT does not have plans for HOV facilities on adjacent I-80 sections.

Park and Ride Facilities

Currently, the closest park and ride facility within the I-80 corridor is located at Delaware Water Gap Welcome Center adjacent to I-80 Exit 310. As noted, MCTA does have future park-and-ride facilities in the strategic planning stages (locations unknown at the time of this document). While a park and ride lot alone would not meet the project needs, it would be considered for implementation as part of the project. Depending upon the preferred alternative for the project, an opportunity may exist within the interchange areas to provide a park and ride facility.

Intelligent Transportation Systems (ITS) and Incident Management

From an interstate perspective, ITS/incident management focuses on managing events that could cause rapid system degradation such as crashes, construction activity, weather events, or planned special events (i.e. racing events at Pocono Raceway).

ITS equipment including CCTV cameras, Dynamic Message Signs, and Highway Advisory Radio locations are currently in the design stages for implementation adjacent/within the project area. The District TMC also provides information on travel conditions for I-80 for use in the statewide 511PA website. The website provides information on construction activities and incidents that affect travel conditions along these roadways. The District TMC is also actively involved in incident management and has planned diversion routes for implementation when incidents close a section of I-80.

While all of these efforts help to better manage the roadway from a safety and capacity standpoint, they alone do not meet the project needs.

TSM alternatives (when implemented individually or in combination with each other) do not satisfy the project needs and, therefore, would not be considered a viable standalone alternative. Intelligent Transportation Systems (ITS) and Incident Management strategies discussed for the corridor offer significant improvements to roadway operations management and are beneficial from a safety and capacity standpoint, and should be considered for implementation as part of a selected alternative.

5.4 ALTERNATIVE A

Meeting Purpose and Needs

Alternative A meets the Purpose and Needs and Design Criteria for this project. It meets all design criteria in Appendix I, providing 12-foot shoulders and ramps with sufficient acceleration and deceleration lengths. Structures will provide minimum 16-foot 6-inch clearances.

Lengthened ramps and weave sections will reduce the potential for crashes from insufficient time for

merging or diverging. Full shoulders will facilitate emergency access during incidents, as well as traffic clearing during backups. Reconstructed roadway components will minimize potential incidents resulting from deteriorated pavement or structures. Therefore, Alternative A meets the Safety Need.

By providing a six-lane section, Alternative A meets the Congestion need, improving Levels of Service to E or better throughout the corridor. Improved ramp and weave lengths further contribute to improved operations.

Alternative A consolidates movements to minimize access points along the interstate. This provides improved movement for both local and regional traffic. In addition, full connections are provided to the local road network at many interchanges. The improved vertical clearance provides compliance with STRAHNET requirements. Therefore, Alternative A meets the Mobility Need.

Traffic Performance

Design year daily traffic volumes (2045) were developed for Alternative A utilizing a two percent yearly growth rate. Alternative A includes removal of existing ramps as well as proposed new ramps that currently are not provided for. Traffic volume assignments for proposed new ramps in Alternative A were developed considering both the removal of ramps and regional traffic patterns and current congested areas. For example, congestion at Interchange 302 just west of the project area was considered when assigning volumes to the new Interchange 303 configuration which provides a full movement interchange and also provides for all movements at the interchange terminus at SR 611. New ramps at Interchange 303 and 304 consider traffic that utilizes Business 209 to/from the south and Bridge Street to SR 611 and the Stroud Mall area. Detailed information on the traffic assignments for Alternative A is provided in Appendix F.

Summary tables and the detailed capacity/level-of-service analysis worksheets for the Alternative A scenario are contained in Appendix G and H.

Using 2045 design year volumes, all freeway segments operate at Level of Service D or better during AM peak period, and Level of Service E or better during PM peak period. The segment located at the west limit of the project (between Interchange 302 and 303) experiences Level of Service F during PM peak period due to the bottleneck condition created at the project limits. Compared to the No-Build alternative, this alternative provides an improvement in Level of Service during peak periods under design year conditions.

During PM peak periods, the westbound segments between Interchanges 305 to 307 operate at Level of Service E due to high volumes in this section of I-80 carrying westbound vehicles bound for US209 southbound access. Under the alternative, this westbound section of I-80 (Interchange 305 to 307) contains an auxiliary travel lane between the Interchange 307 on-ramp and the Interchange 304 off-ramp.

Ramp merge and diverge analyses indicate all merges and diverges will operate at Level of Service D or better, with the exception of the merge from SR 611 to I-80 westbound (Interchange 303), which operates at Level of Service F in the PM peak. This is at the project limits where the proposed improvements transition to the existing two-lanes on I-80.

Weave analyses for this alternative indicate that all weaves within the reconstruction area will operate at Level of Service D or better, with the exception of the Interchange 307 to 308 westbound weave section which operates at Level of Service E in the PM peak.

Ramp terminus intersections were found to operate at acceptable Level of Service D or better. Under this alternative, the analysis suggests signalization would be implemented for ramp terminus intersections at:

- Interchange 303 (SR 611/Heller Drive/Exit 303 Connector Road),
- Interchange 304 (West Main Street/US209 Ramps),

- Interchange 305 (West Main Street/Westbound Ramps),
- Interchange 307 (Westbound On/Off Ramps)

At the proposed diamond Interchange 303 (SR 611/ Heller Drive/Exit 303 Connector Road), queuing along the northbound approach of the Connector Road to SR 611 is anticipated to utilize the entire approach distance to the downstream intersection with I-80 westbound ramps (approximately 200 feet) in order to accommodate PM peak hour volumes.

Other ramp termini locations are unsignalized and operate at acceptable levels of service.

Alternative A adequately accommodates future traffic volumes and meets the project need to alleviate congestion.

Environmental Impacts

Based on the available resource mapping, Alternative A would impact approximately 0.8 acre of wetland and 1970 linear feet of stream, which includes 350 feet of Class A wild trout stream. Many of these impacts are the result of widening I-80 where streams run parallel and in close proximity to the roadway. These impacts also include new structures over Pocono Creek west of US 209, over McMichael Creek east of Dreher Avenue and at SR 191, and over Brodhead Creek.

Residential property acquisitions would be necessary both at the northern edge of Myrtle Street and Jamie Court, and also at the intersection of Colbert Street and SR 191. Commercial acquisitions would be clustered at the US 209 (SR 209) ramps as well as Interchange 305.

This alternative does not physically impact any known cultural resources, although the effect to the New York, Susquehanna, and Western Railroad District, which parallels much of the I-80 corridor, would need to be assessed.

For a full tabulation of the areal impacts of various resources, please see Table 6.1.

5.5 ALTERNATIVE B

Meeting Purpose and Needs

Alternative B meets the Purpose and Needs and Design Criteria for this project in the same way Alternative A does. Please refer to Section 5.4 for the expanded discussion.

Traffic Performance

Design year daily traffic volumes (2045) were developed for Alternative B utilizing a two percent yearly growth rate. Alternative B includes removal of existing ramps as well as proposed new ramps that currently are not provided for. Traffic volume assignments for proposed new ramps were developed similar to Alternative A traffic assignment methodology. Detailed information on the traffic assignments for Alternative B is provided in Appendix F.

Summary tables and the detailed capacity/level-of-service analysis worksheets for the Alternative B scenario are contained in Appendix G and H.

Using 2045 design year volumes, all freeway segments are expected to operate at Level of Service D or better during AM peak period, and Level of Service E or better during PM peak period. Compared to the No-Build alternative, this alternative provides an overall improvement in corridor Levels of Service during peak periods under design year conditions.

Ramp merges are expected to operate at similar conditions to Alternative A, with all merges operating at Level of Service D or better, with the exception of the merge from SR 611 to I-80 westbound (Interchange 303), which operates at Level of Service F in the PM peak. As noted in Alternative A, this is at the project limits where the proposed improvements transition to the existing two-lanes on I-80.

The proposed improvements include a new eastbound on-ramp from Interchange 303 and a new off-ramp to Interchange 304 (Route 209 South) similar to Alternative A. However, Alternative B includes additional conflict points and a weave between these two new ramps while Alternative A does not since it separates the Exit for Interchange 304 at the same location as the Exit for Interchange

303. The weave analyses for this section indicates it will operate at an acceptable LOS C or better.

Other weave areas in Alternative B operate at Level of Service D or better, with the exception of the Interchange 307 to 308 westbound weave section which operates at Level of Service E in the PM peak.

Ramp terminus intersections were found to operate at acceptable Level of Service D or better. Under this alternative, the analysis suggests signalization would be implemented for ramp terminus intersections at:

- Interchange 303 (SR 611/Heller Drive/Exit 303 Connector Road),
- Interchange 304 (West Main Street/US209 Ramps),
- Interchange 305 (West Main Street/Westbound Ramps),
- Interchange 307 (Westbound On/Off Ramps)

Other ramp termini locations are unsignalized and operate at acceptable levels of service.

Alternative B adequately accommodates future traffic volumes and meets the project need to alleviate congestion.

Environmental Impacts

Wetland impacts for Alternative B are similar to A, however stream impacts are reduced over 400 linear feet. Residential impacts in the Myrtle Street/Jamie Court neighborhood appear to be avoidable with this alternative. However, two additional commercial displacements are added at the US 209/SR 209 intersection. Cultural resource impacts are similar to Alternative A. (See Table 6.1)

5.6 ALTERNATIVE C

Meeting Purpose and Needs

Alternative C meets the Purpose and Needs and Design Criteria for this project in the same way Alternative A does. Please refer to Section 5.4 for the expanded discussion.

Traffic Performance

Design year daily traffic volumes (2045) were developed for Alternative C utilizing a two percent yearly growth rate. Alternative C includes removal of existing ramps as well as proposed new ramps that currently are not provided for. Traffic volume assignments for proposed new ramps were developed similar to Alternative A traffic assignment methodology. Detailed information on the traffic assignments for Alternative C is provided in Appendix F.

Summary tables and the detailed capacity/level-of-service analysis worksheets for the Alternative C scenario are contained in Appendix G and H.

Using 2045 design year volumes, all freeway segments are expected to operate at Level of Service D or better during AM peak period, and Level of Service E or better during PM peak period. Compared to the No-Build alternative, this alternative provides an overall improvement in corridor Levels of Service during peak periods under design year conditions. Operationally, the Alternative C modified configuration within the westbound section between Interchanges 305-304 is shown to maintain a similar Level of Service to Alternative B, with access restricted from Interchange 305 westbound entrance ramp to US209 Southbound. This traffic movement is accommodated further south along Main Street at the proposed US209 southbound ramp access from West Main Street.

Ramp merges and diverges under Alternative C are expected to operate at similar conditions to Alternative A, with all merges operating at Level of Service D or better, with the exception of the merge from SR 611 to I-80 westbound (Interchange 303), which operates at Level of Service F in the PM peak. As noted in Alternative A, this is at the project limits where the proposed improvements transition to the existing two-lanes on I-80.

Weave areas in Alternative C operate at Level of Service D or better, with the exception of the Interchange 307 to 308 westbound weave section which operates at Level of Service E in the PM peak.

Ramp terminus intersections were found to operate at acceptable Level of Service D or better. Under this alternative, the analysis suggests signalization would be implemented for ramp terminus intersections at:

- Interchange 303 (SR 611/Heller Drive/Exit 303 Connector Road),
- Interchange 304 (West Main Street/US209 Ramps),
- Interchange 305 (West Main Street/Westbound Ramps),
- Interchange 307 (Westbound On/Off Ramps)

Other ramp termini locations are unsignalized and operate at acceptable levels of service.

Alternative C adequately accommodates future traffic volumes and meets the project need to alleviate congestion.

Environmental Impacts

Impacts for alternative C are consistent with those for Alternative A, although stream impacts are reduced to approximately 1650 feet. (See Table 6.1)

5.7 ALTERNATIVE F

Meeting Purpose and Needs

Alternative F meets the Purpose and Needs and Design Criteria for this project in the same way Alternative A does. Please refer to Section 5.4 for the expanded discussion.

Traffic Performance

Design year daily traffic volumes (2045) were developed for Alternative F utilizing a two percent yearly growth rate. Alternative F includes removal of existing ramps as well as proposed new ramps that currently are not provided for. Traffic volume assignments for proposed new ramps were developed similar to Alternative A traffic assignment methodology. Detailed information on the traffic assignments for Alternative F is provided in Appendix F.

Summary tables and the detailed capacity/level-of-service analysis worksheets for the Alternative F scenario are contained in Appendix G and H.

Using 2045 design year volumes, all freeway segments are expected to operate at Level of Service D or better during AM peak period, and Level of Service E or better during PM peak period. Compared to the No-Build alternative, this alternative provides an overall improvement in corridor Levels of Service during peak periods under design year conditions.

Ramp merges and diverges under Alternative F are expected to operate at similar conditions to Alternative A, with all merges operating at Level of Service D or better, with the exception of the merge from SR 611 to I-80 westbound (Interchange 303), which operates at Level of Service F in the PM peak. As noted in Alternative A, this is at the project limits where the proposed improvements transition to the existing two-lanes on I-80.

Under this alternative, a partial-diamond interchange is proposed at Interchange 303, with the westbound ramps terminating directly to SR 611 as opposed to the Connector Road. The ramp terminus intersection at SR 611 includes the westbound ramp approach with the opposing approach being the trumpet access road connector from the remaining Interchange 303 ramps. The intersection would be signalized and operates at a slightly improved Level of Service B under design year volumes when compared to Alternatives A, B, and C. However, the northbound approach (I-80 westbound Exit ramp) will require a 180-foot left turn storage. The westbound off-ramp should include queue detection to manage ramp volumes at the intersection during peak periods. Available sight distance on the westbound Exit ramp is also a concern under this alternative given the length of the peak period queues. Additionally, the southbound approach at the intersection will require approximately 350 feet of storage to adequately accommodate PM peak hour left turn volumes. Adequate queue storage is provided by the proposed trumpet interchange and lane configuration for the southbound approach.

Other ramp terminus intersections were found to operate at acceptable Level of Service D or better. Under this alternative, the analysis suggests signalization would be implemented for ramp terminus intersections at:

- Interchange 303 (SR 611/Exit 303 Connector Road),
- Interchange 304 (West Main Street/US209 Ramps),
- Interchange 305 (West Main Street/Westbound Ramps),
- Interchange 307 (Westbound On/Off Ramps)

Other ramp termini locations are unsignalized and operate at acceptable levels of service.

Alternative F adequately accommodates future traffic volumes and meets the project need to alleviate congestion.

Environmental Impacts

Alternative F results in nearly 150 acres of disturbance, including significant cuts into steep slopes at Interchange 303. This also results in a large area (126 acres) of potentially exposed acid rock.

Wetland impacts are consistent with Alternatives A through C, however stream impacts are nearly 2300 linear feet. In addition to the numerous replaced/added bridges noted under Alternative A, Alternative F adds impacts due to the extension of the western project limits.

The most notable impact associated with Alternative F is the residential acquisitions required in the Myrtle Street/Jamie Court community as well as along Bridge Street south of I-80. A total of 18 residences are anticipated to be acquired with this alternative. Commercial impacts, as with the previous alternatives, are centered on Interchange 305 and the US 209/SR 209 intersection. (See Table 6.1)

5.8 ALTERNATIVE G

Meeting Purpose and Needs

Alternative G meets the Purpose and Needs and Design Criteria for this project in the same way Alternative A does. Please refer to Section 5.4 for the expanded discussion.

Traffic Performance

Design year daily traffic volumes (2045) were developed for Alternative G utilizing a two percent yearly growth rate. Alternative G includes removal of existing ramps as well as proposed new ramps that currently are not provided for. Traffic volume assignments for proposed new ramps were developed similar to Alternative A traffic assignment methodology. Detailed information on the traffic assignments for Alternative G is provided in Appendix F.

Summary tables and the detailed capacity/level-of-service analysis worksheets for the Alternative G scenario are contained in Appendix G and H.

Using 2045 design year volumes, all freeway segments are expected to operate at Level of Service D or better during AM peak period, and Level of Service E or better during PM peak period. Compared to the No-Build alternative, this alternative provides an overall improvement in corridor Levels of Service during peak periods under design year conditions.

Ramp merges and diverges under Alternative G are expected to operate at similar conditions to Alternative A, with all merges operating at Level of Service D or better, with the exception of the merge from SR 611 to I-80 westbound (Interchange 303), which operates at Level of Service F in the PM peak. As noted in Alternative A, this is at the project limits where the proposed improvements transition to the existing two-lanes on I-80.

Alternative G includes the tight diamond at Interchange 303, along with the ‘trumpet’ access road connection to SR 611. The ramp terminus intersection at SR 611 under this alternative operates at a slightly improved Level of Service B when compared to Alternative F. The southbound approach left-turn storage requirements

(approximately 300 feet) are less than Alternative F due to the full diamond configuration and removal of the westbound Exit ramp leg at the intersection. This alternative (tight diamond interchange with trumpet connector road) is preferred.

Other ramp terminus intersections were found to operate at acceptable Level of Service D or better. Under this alternative, the analysis suggests signalization would be implemented for ramp terminus intersections at:

- Interchange 303 (SR 611/Exit 303 Connector Road),
- Interchange 304 (West Main Street/US209 Ramps),
- Interchange 305 (West Main Street/Westbound Ramps),
- Interchange 307 (Westbound On/Off Ramps)

Other ramp termini locations are unsignalized and operate at acceptable levels of service.

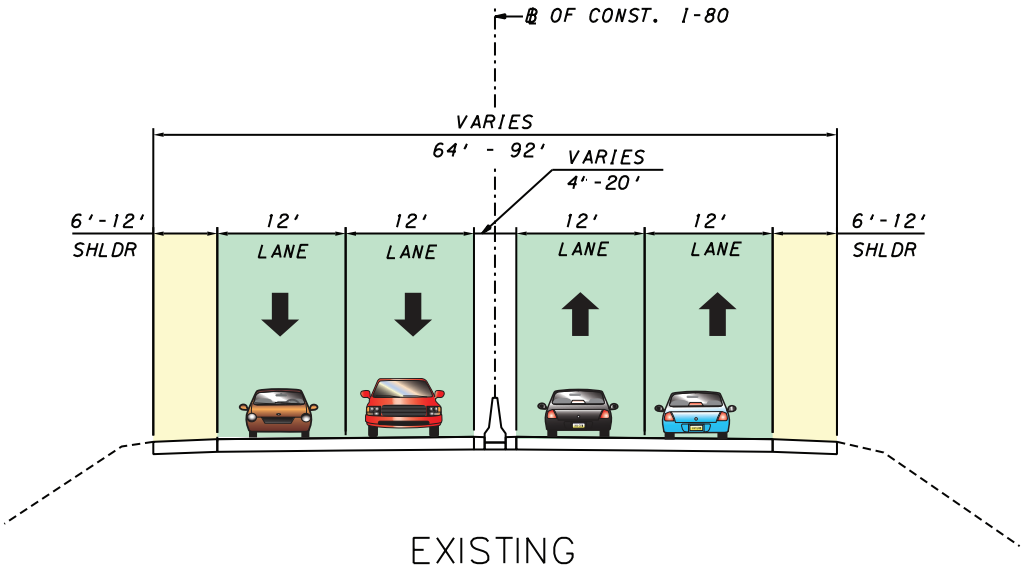
Alternative G adequately accommodates future traffic volumes and meets the project need to alleviate congestion.

Environmental Impacts

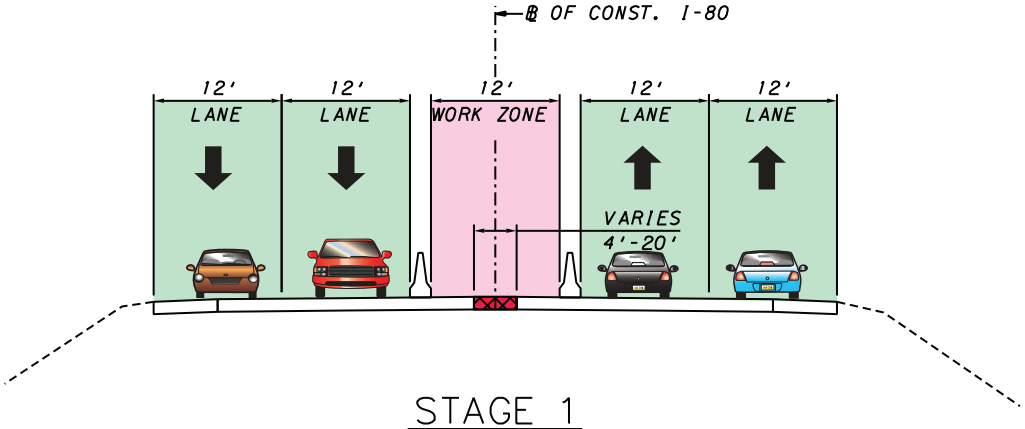
Impacts associated with Alternative G are very similar to those of F. The most notable difference is one less commercial acquisition required. (See Table 6.1)

5.9 HIGHWAY IMPROVEMENT TYPICAL SECTIONS

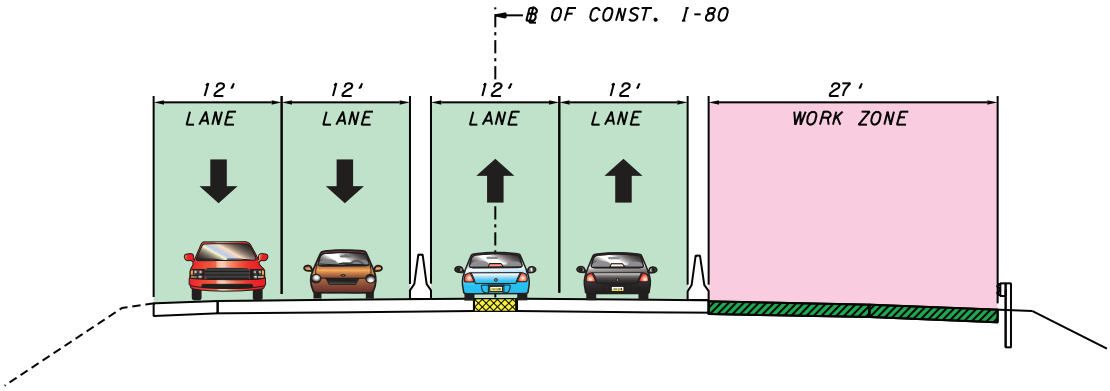
The typical sections for the highway improvement alternatives are shown on Figures 5.1 and 5.2. Included are the existing, construction staging (maintaining two lanes in each direction), and the proposed final typical section.



EXISTING



STAGE 1



STAGE 2

AECOM

I-80 RECONSTRUCTION

FIGURE 5.1
STAGING FIGURES

Sheet 1 of 2

Proposed Pavement

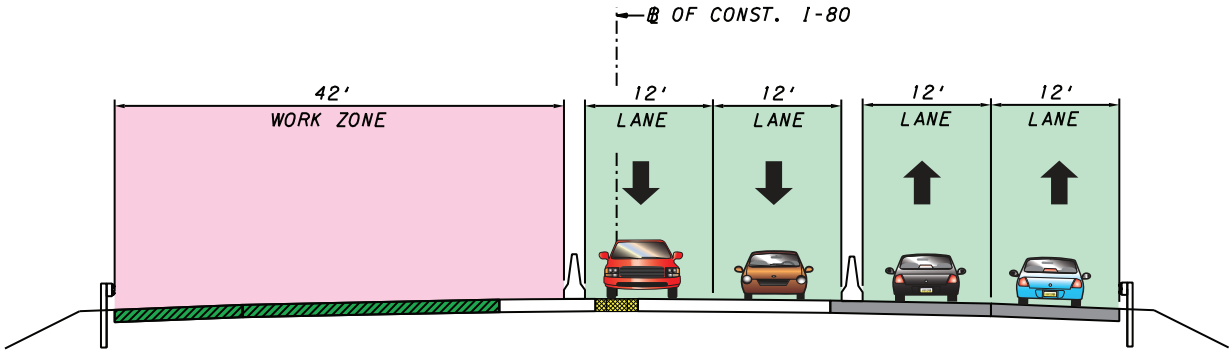
Temporary Pavement

Previously Built Temporary Pavement

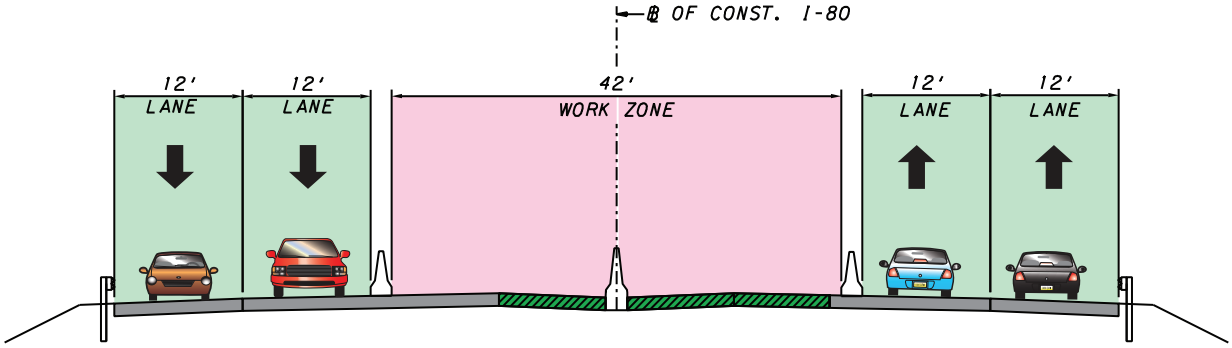
Previously Built Pavement

Travel Lane

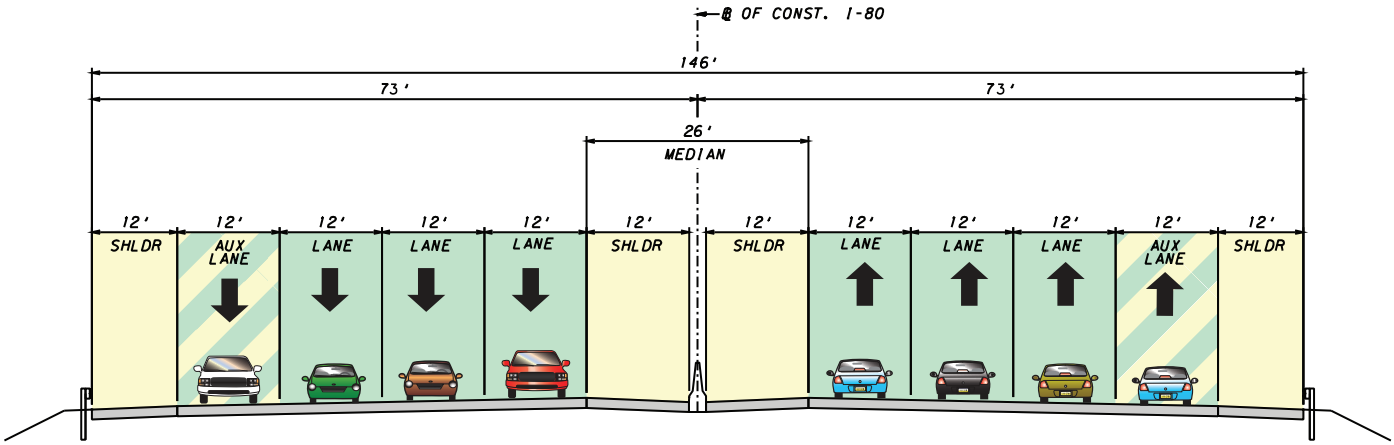
Shoulder



STAGE 3



STAGE 4



COMPLETION

AECOM

I-80 RECONSTRUCTION

FIGURE 5.1
STAGING FIGURES

Sheet 2 of 2

Proposed Pavement

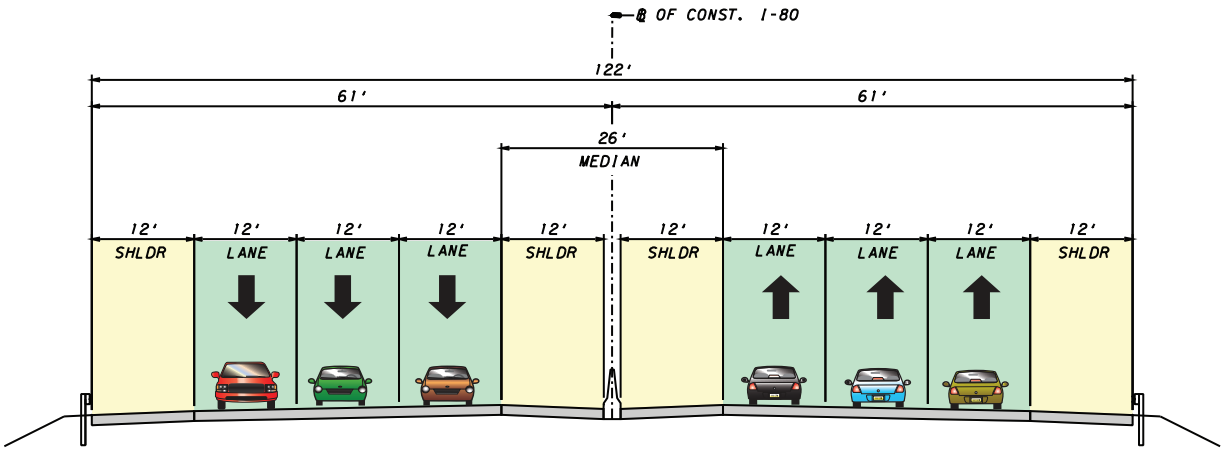
Temporary Pavement

Previously Built Temporary Pavement

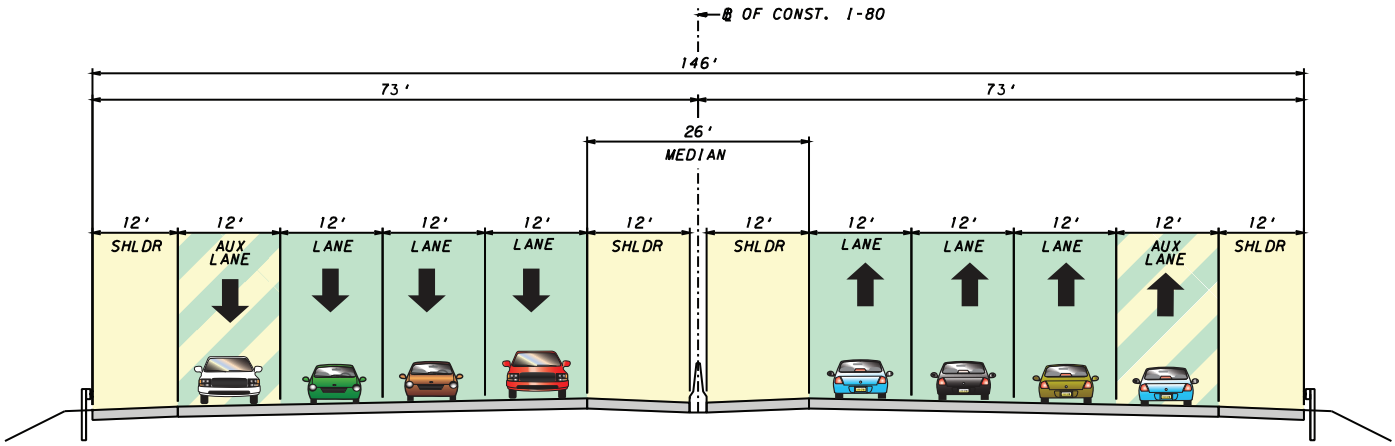
Previously Built Pavement

Travel Lane

Shoulder



ULTIMATE TYPICAL SECTION



ULTIMATE TYPICAL SECTION
WITH AUXILIARY LANE

AECOM

I-80 RECONSTRUCTION

FIGURE 5.2
ULTIMATE TYPICALS

- Previously Built Pavement
- Travel Lane
- Shoulder
- Auxiliary Lane

6. CONCLUSIONS

All build alternatives presented in this Phase I report meet the project's Purpose and Needs to improve safety, reduce congestion, and increase mobility throughout the corridor.

Neither the No Build nor the TSM alternatives meet the Purpose and Needs. While TSM alternatives (when implemented alone or in combination) do not satisfy the project needs and are not considered a viable standalone alternative, Park & Ride Facilities, Intelligent Transportation Systems (ITS) and Incident Management strategies discussed for the corridor offer significant improvements to roadway operations management and are beneficial from a safety and capacity standpoint, and should be considered for implementation as part of a selected alternative.

6.1 ENVIRONMENTAL IMPACTS

Based on current information, no notable differences in impacts to cultural resources exist between the various alternatives. This is subject to change if additional NR eligible resources are identified during the Phase II investigations. Impacts to socioeconomic resources – particularly required Right-of-Way acquisitions, show a clear difference between Alternatives A, B, and C and F and G (see Table 6.1). Alternatives F and G have more than double the residential acquisitions of A, B, and C, and would have a major impact on the Myrtle Street/Jamie Court/Sea Oat Lane community. Commercial acquisitions are more consistent between the two groups. Within A, B, and C, B has the fewest residential losses, but the greatest commercial impact of any of the five alternatives. Between F and G, there is a variation of one commercial property only.

As with the property acquisitions, natural resource impacts show a clear increase from Alternatives A, B, and C and F and G. Although wetland impacts are consistent, stream impacts increase notably, as does the overall disturbance area and the potential acid rock areas. There are no striking differences between F and G. But among A, B, and C, Alternative B clearly provides reduced impacts to streams as well as the lowest overall disturbance area.

TABLE 6.1 ENVIRONMENTAL IMPACTS

Resource	Alternative						
	A	B	C	F	G	H	I
Total Area of Disturbance (ac)	135.87	133.72	135.27	146.88	148.43	123.30	121.60
NWI Wetlands (ac)	0.789	0.785	0.790	0.781	0.781	1.170	1.020
Waterways (linear ft)	1,966.67	1,507.65	1,632.14	2,263.17	2,263.17	1,681.02	2,004.45
Class "A" Trout Stream-Pocono Ck (linear ft)	350.80	305.60	350.21	332.80	332.80	224.75	241.34
FEMA 100yr Floodplain (ac)	9.91	9.84	11.45	12.04	12.04	7.88	8.20
FEMA Floodway (ac)	3.69	3.72	3.67	3.71	3.71	3.27	3.29
Potential Acid Producing Sulfide Materials (ac)	118.93	118.42	118.60	126.26	127.57	106.07	104.12
Landuse-Government Service (ac)	0.56	0.50	0.56	0.27	0.27	1.70	0.45
Landuse-Industrial (ac)	0.37	0.20	0.37	0.15	0.15	0.01	0.01
Landuse-Public Recreation (ac)	0.18	0.18	0.19	0.19	0.19	0.18	0.18
Landuse-Residential (ac)	4.19	4.30	3.93	5.64	5.64	5.16	3.63
Landuse-Retail & Services (ac)	9.46	8.76	9.24	8.60	8.13	6.28	5.18
Steep Slope (15% and Greater) (ac)	6.19	5.69	5.87	8.54	8.54	6.26	7.69
ROW Acquisition - Residential (parcels)	8	4	8	18	18	11	12
ROW Acquisition - Commercial (parcels)	6	8	6	7	6	9	8

Data based on a 20-foot buffer from Proposed Edge of Shoulder

6.2 PHASE II ALTERNATIVE CONCLUSIONS

The engineering alternatives presented in Section 5, which have been developed based on LiDAR contouring and aerial information provided by Pennsylvania Spatial Data Access (PASDA) satisfy the purpose and needs of the project. They also meet the design criteria and avoid the need for design exceptions. Some alternatives have more favorable geometric features such as flatter horizontal curvature or have improved safety options as a result of bypass exits and braided ramps eliminating weaving. (See Table 6.2)

Some alternatives would require more Right-of-Way acquisition than others. However, right-of-way, as with all other impacts, would be further investigated in the Phase II analysis. For example, Alternatives F and G require more Right-of-Way acquisition east of Exit 304 because the mainline alignment is shifted to the south to avoid impacts to Pocono Creek and flattened in order to provide a more comfortable ride. These can be looked at in Phase II to balance engineering considerations with right-of-way and environmental impacts.

As noted in Table 6.2, many of the evaluation criteria for each highway build alternative are similar. Each highway build alternative meets the project purpose and needs, including providing geometry that meets current design criteria with no design exceptions anticipated. Each highway build alternative accommodates future traffic with a LOS E or better at all mainline sections, weave sections, ramps, and ramp termini intersections.

Each highway build alternative provides improved system continuity through full movement interchanges. While this adds additional ramps, the use of auxiliary lanes/roadways minimizes the number of additional conflict points along the I-80 mainline. The highest volume ramp is I-80 westbound to SR 209 southbound and weaving is eliminated or handled through the use of the auxiliary roads.

Alternatives A and C provides for “Good” system continuity while Alternative B provides only “Fair” system continuity since the auxiliary lanes and connections add conflict points and an additional weave location.

Alternative F and G are similar, however, Alternative G is considered better due to interchange 303 diamond configuration which is better for driver expectations than the Alternative F configuration.

Based on the preliminary designs and impact analyses to date, Alternatives A and G appear to provide improved engineering features while balancing environmental and right-of-way impacts and costs. While all alternatives meet the overall project needs, Alternative A provides a greater level of safety improvement by eliminating the conflicts associated with the weaves near Exit 304. And among Alternatives A, B, and C, A provides the median environmental impacts and costs. Likewise, both Alternatives F and G meet the project needs including improving system continuity by providing all movements at Exit 303. Alternative G, however, includes a design which better meets driver expectations by providing direct connections through the diamond interchange.

Alternatives H and I were developed to retain the current ramp movements at Exit 305 and incorporate the concept of a collector-distributor roadway between Exits 305 and 306. However, both Alternatives H and I provide only "Fair" system continuity as the ramp connection from Main Street to access US-209 Southbound is eliminated.

The relative merits of each alternative will continue to be evaluated as additional engineering and resource information is obtained, and as public input is received.

TABLE 6.2 COMPARISON MATRIX

Engineering and Traffic	Highway Improvement Alternative							
	No-Build	A	B	C	F	G	H	I
Meets Purpose and Needs	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Meets Min Accel Decel Lane Length	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Meets Min Superelevation Required	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Meets Vertical Clearance	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Meets Horizontal Clearance	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Requires Design Exception	-	No	No	No	No	No	No	No
System Continuity and Connections	Poor	Good	Fair	Good	Good	Good	Fair	Fair
Bypass Ramp Design (locations)	Poor (0)	Good (2)	Fair (1)	Good (2)	Good (2)	Good (2)	Fair (1)	Fair (0)
Mainline Weaving (locations)	Poor (2)	Good (4)*	Fair (5)*	Good (4)*	Good (4)*	Good (4)*	Good (4)*	Good (4)*
Safety	Poor	Good	Fair	Good	Good	Good	Good	Good
Geometric Curvature	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair
Meets Traffic Criteria	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
LOS (2045)	Poor	Good	Good	Good	Good	Good	Good	Good
Construction Cost ($in thousands)	$0	$568,956	$584,984	$580,661	$542,765	$535,166	$402,768	$403,261
Right-of-Way Cost ($ in thousands)	$0	$9,331	$9,126	$9,466	$10,901	$10,807	$8,346	$7,972
Utility Cost ($ in thousands)	$0	$934	$913	$947	$1,091	$1,081	$835	$798
Design Cost ($ in thousands)	$0	$56,896	$58,499	$58,067	$54,277	$53,517	$40,277	$40,327
See Appendices K and L for cost estimate worksheets								
** Weaving via long auxiliary lanes*								

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7. ADDENDUM

On November 20, 2013, a coordination meeting was conducted with representatives from FHWA and PennDOT to review the traffic comments to the Phase I Report. The outcome of the meeting was to develop additional design alternatives that incorporated the concept of a collector-distributor roadway between Exits 305 and 306, as well as an alternative that retains the current ramp movements at Exit 305. Alternatives H and I have been developed to incorporate these concepts. Included within this Section of the report is the information related to Alternatives H and I.

7.1 ADDITIONAL HIGHWAY IMPROVEMENT ALTERNATIVES

This supplements Section 3.3 of the Phase I Alternatives Analysis Report.

Alternative H

In comparison to Alternate A, Alternate H is a scaled back version which closely resembles the current interchange configurations while improving upon the existing movements. Minor alignment modifications were introduced to bring the corridor up to current design standards and to minimize impacts to adjacent properties and environmentally sensitive areas. This alternative does not significantly deviate from the existing footprint of I-80. The interchange modifications are as follows:

SR 611 Interchange (Exit 303): As compared to the existing interchange configuration this alternative incorporates improvements to Exit 303 including; adding an EB entrance ramp and WB exit ramp and improving traffic movements and conditions at the SR 611 intersection. Realignment of the existing driveway to the maintenance yard is necessary to accommodate the I-80 WB entrance ramp improvements.

US 209/Business 209/Dreher Avenue Interchanges (Exits 304, 305, and 306): As compared to the existing interchange configuration this alternative improves the existing movements at Exit 304 by eliminating the safety issue of the weave movement between Exits 304 and 305; however, this alternative removes the option of entering I-80 WB at Business 209 and exiting at Exit 305 for SR 209 SB. Business 209 no longer has a connection with SR 209 SB by way of I-80; Schafer's Schoolhouse Road, located 1-3/4 miles southward, would need to be utilized to make this movement. Outside of this change, all other existing movements have been maintained and the ramp geometrics were improved to current design criteria standards.

Exit 305 maintains all existing movements and incorporates geometric improvements to meet current design criteria. This alternative also incorporates a collector-distributor road on both

the north and south sides of I-80 between Business 209 and Dreher Avenue. Additional local road improvements will be necessary to facilitate the new CD road to the north.

SR 191 Interchange (Exit 307): This alternative is the same as Alternative A.

TABLE 7.1 RAMP NAMES AND CORRESPONDING MOVEMENTS

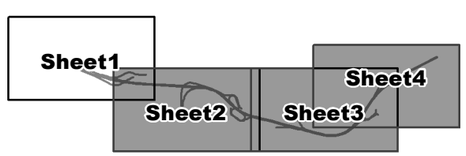
RAMP	MOVEMENT
Ramp A	I-80 Eastbound to SR 611
Ramp B	SR 611 to I-80 Eastbound
Ramp C	I-80 Westbound to SR 611
Ramp D	SR 611 to I-80 Westbound
Ramp G	I-80 Westbound to SR 209 Southbound
Ramp H	SR 209 Northbound to I-80 Eastbound
Ramp M	Dreher Ave to Business 209/Business 209 to I-80 Westbound
Ramp N	I-80 Eastbound to Business 209
Ramp O	Business 209 to Dreher Ave/Dreher Ave to I-80 Eastbound
Ramp P	I-80 Westbound to Dreher Ave
Ramp Q	I-80 Eastbound to SR 611 (Park Ave)
Ramp R	SR 191 to I-80 Westbound
Ramp S	I-80 Westbound to SR 191
Ramp T	SR 191 to I-80 Eastbound

N

0 200 400

Feet

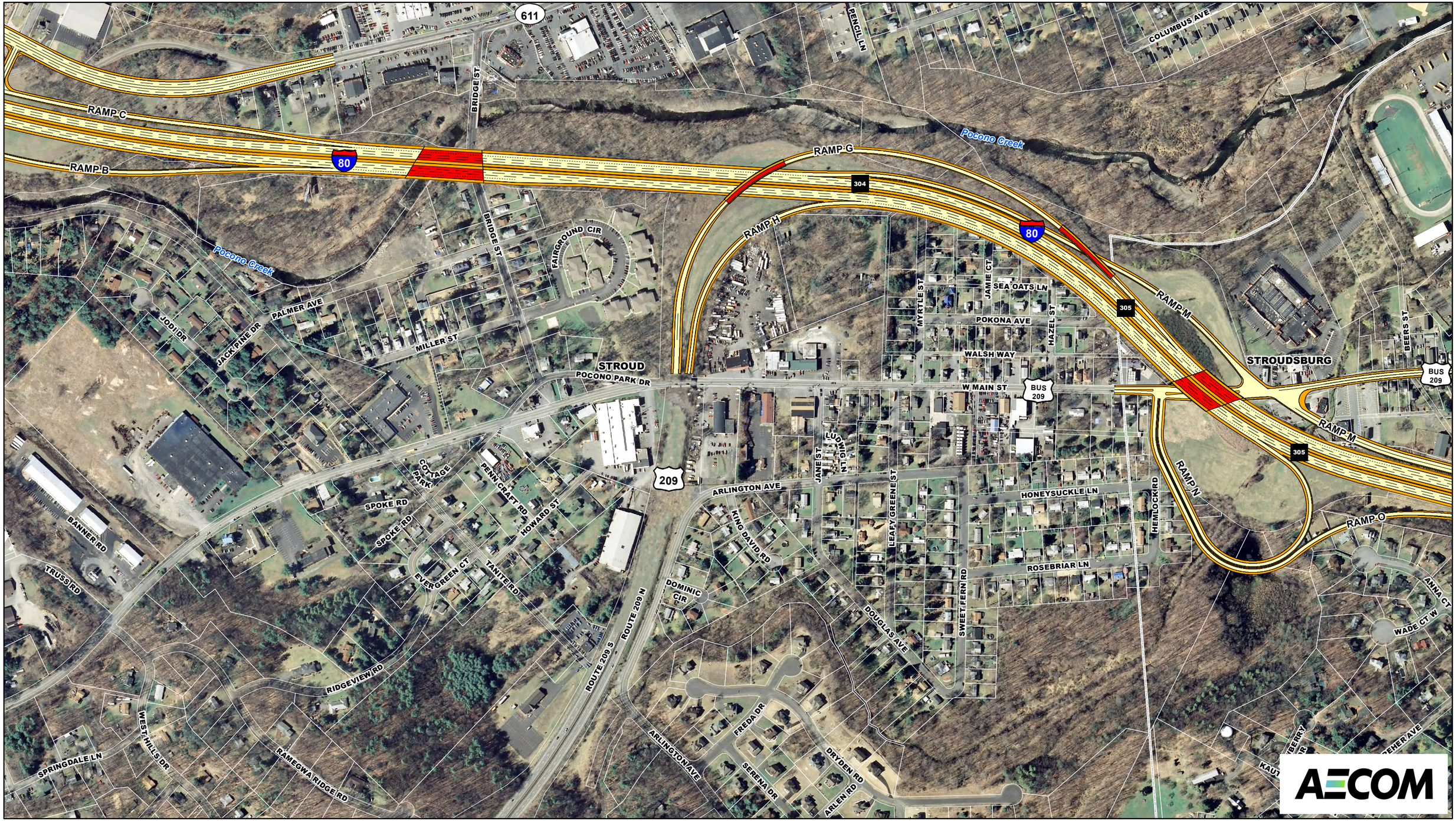
- Structure
- Shoulder or Barrier
- Travel Lane



I-80 RECONSTRUCTION

FIGURE 7.1: ALTERNATIVE H

Sheet 1 of 4



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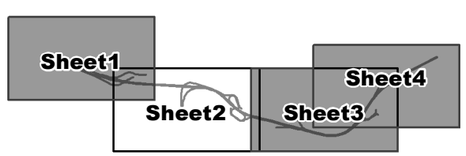
Feet

- Structure
- Shoulder or Barrier
- Travel Lane



I-80 RECONSTRUCTION

FIGURE 7.1: ALTERNATIVE H

Sheet 2 of 4

N

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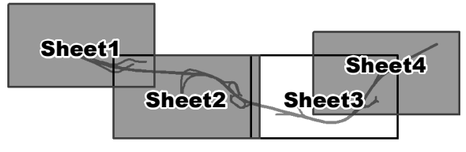
Feet

Structure

Shoulder or Barrier

Travel Lane



I-80 RECONSTRUCTION

FIGURE 7.1: ALTERNATIVE H

Sheet 3 of 4

AECOM

Alignment Will Tie Into Previously Constructed I-80 Section 05S

N

0 200 400

Feet

Structure

Shoulder or Barrier

Travel Lane

Sheet1

Sheet2

Sheet3

Sheet4

I-80 RECONSTRUCTION

FIGURE 7.1: ALTERNATIVE H

Sheet 4 of 4

AECOM

Alternative I

In comparison to Alternative A, Alternative I is a scaled back version which resembles the current interchange configurations while consolidating and improving upon the existing movements. Minor alignment modifications were introduced to bring the corridor up to current design standards and to minimize impacts to adjacent properties and environmentally sensitive areas. The alternative does have several impacts to environmental features that will be evaluated further as the design is progressed. The interchange modifications are as follows:

SR 611 Interchange (Exit 303): As compared to the existing interchange configuration this alternative incorporates improvements to Exit 303 including; adding an EB entrance ramp and WB exit ramp and improving traffic movements and conditions at the SR 611 intersection. The loop ramp configuration of the connector road provides additional vehicle queue length and free flow movements to/from SR 611 which will help accommodate for future residential and commercial growth of the surrounding area.

US 209/Business 209/Dreher Avenue Interchanges (Exits 304, 305, and 306): As compared to the existing interchange configuration this alternative improves the existing movements at Exit 304 by eliminating the safety issue of the weave movement between Exits 304 and 305; however, this alternative removes the option of entering I-80 WB at Business 209 and exiting at Exit 305 for SR 209 SB. Business 209 no longer has a connection with SR 209 SB by way of I-80; Schafer's Schoolhouse Road, located 1-3/4 miles southward, would need to be utilized to make this movement. Outside of this change, all other existing movements have been maintained and the ramp geometrics were improved to current design criteria standards.

Exit 305 maintains all existing movements and incorporates a collector distributor road to the south of I-80 to facilitate traffic between Business 209 and Dreher Avenue. This CD road has been implemented to allow for the removal of Exit 306.

In comparison to the other alternatives this interchange configuration has additional impacts to adjacent properties and environmentally sensitive areas that will need to be evaluated further as the design is progressed.

Exit 306 has been removed and the existing movements at Exit 306 have been consolidated with Exit 305. All the same existing movements for Exit 306 will be provided at Exit 305; however there is no longer direct access from I-80 WB to Dreher Avenue.

SR 191 Interchange (Exit 307): This alternative is the same as Alternative A.

TABLE 7.2 RAMP NAMES AND CORRESPONDING MOVEMENTS

RAMP	MOVEMENT
Ramp A	I-80 Eastbound to SR 611
Ramp B	SR 611 to I-80 Eastbound
Ramp C	I-80 Westbound to SR 611
Ramp D	SR 611 to I-80 Westbound
Ramp G	I-80 Westbound to SR 209 Southbound
Ramp H	SR 209 Northbound to I-80 Eastbound
Ramp M	Business 209 to I-80 Westbound
Ramp N	I-80 Eastbound to Business 209
Ramp O	Business 209/Dreher Ave to I-80 Eastbound
Ramp P	I-80 Westbound to Business 209
Ramp Q	I-80 Eastbound to SR 611 (Park Ave)
Ramp R	SR 191 to I-80 Westbound
Ramp S	I-80 Westbound to SR 191
Ramp T	SR 191 to I-80 Eastbound

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AECOM

N

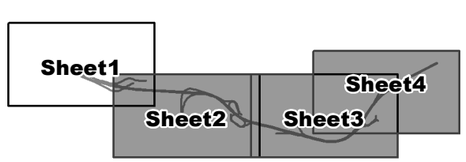
0 200 400

Feet

Structure

Shoulder or Barrier

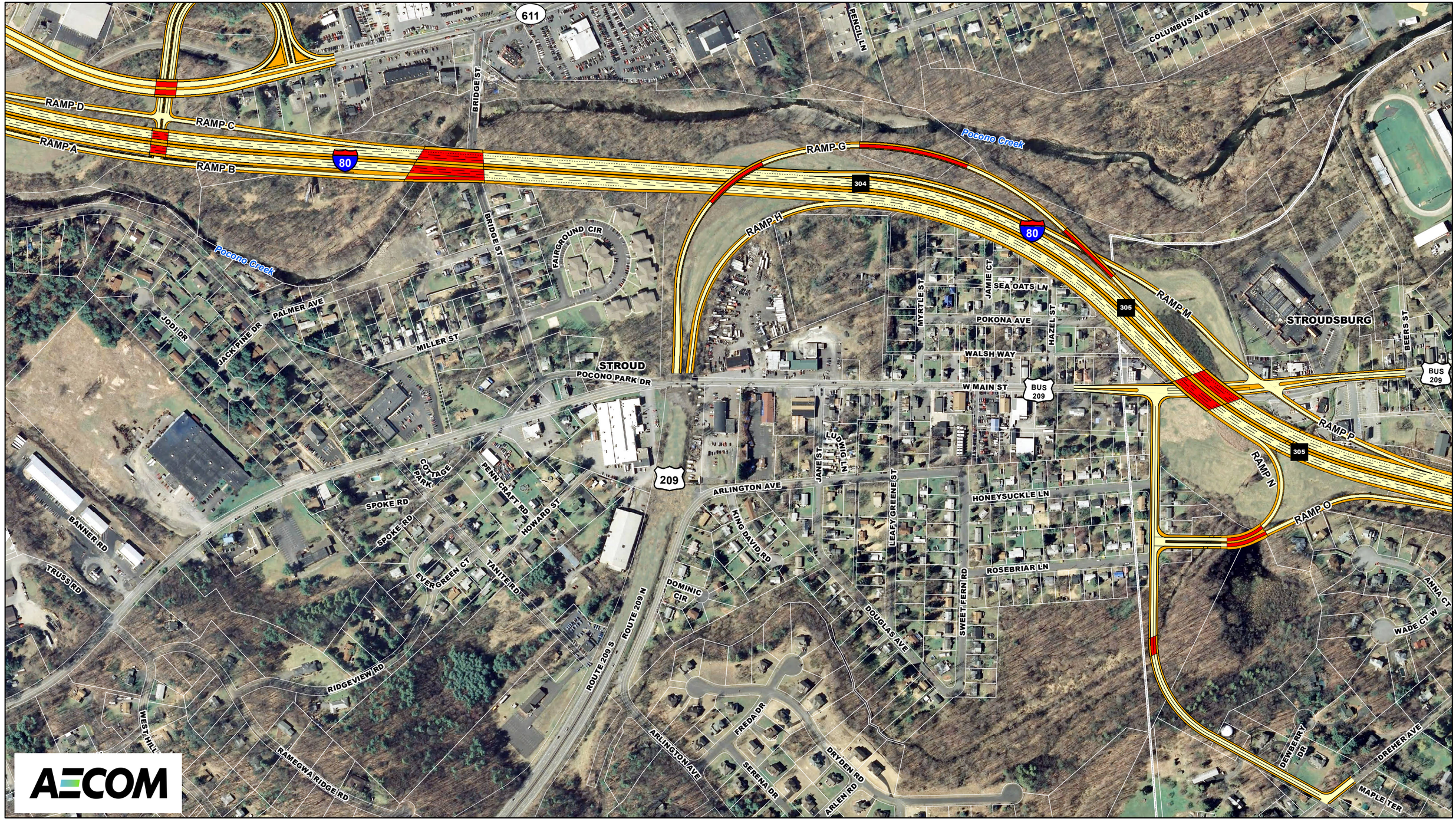
Travel Lane



I-80 RECONSTRUCTION

FIGURE 7.2: ALTERNATIVE I

Sheet 1 of 4



AECOM

N

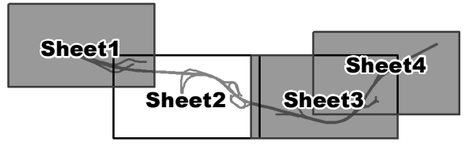
0 200 400

Feet

Structure

Shoulder or Barrier

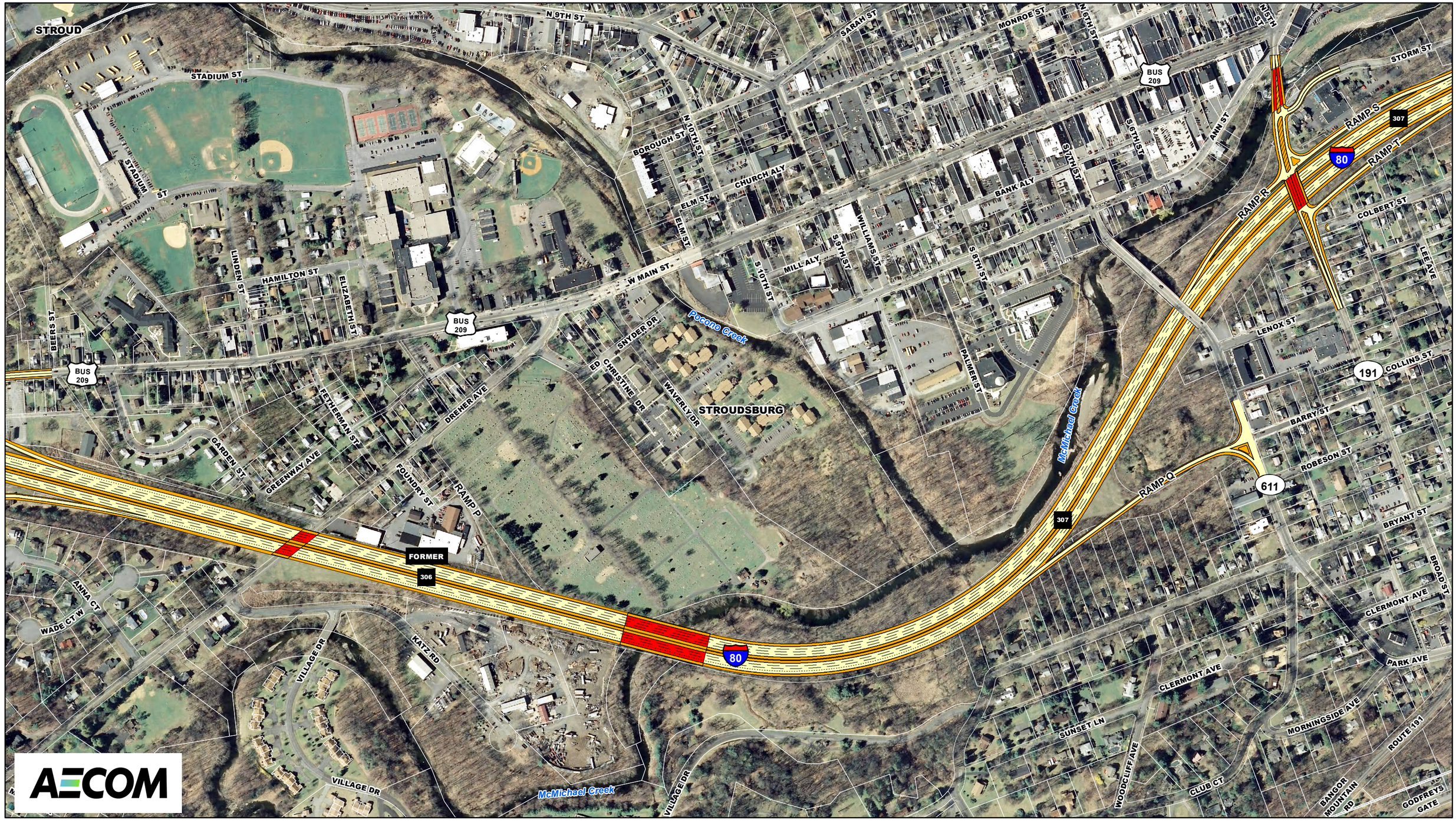
Travel Lane



I-80 RECONSTRUCTION

FIGURE 7.2: ALTERNATIVE I

Sheet 2 of 4



N

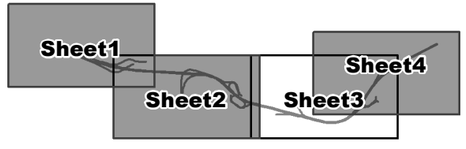
0 200 400

Feet

Structure

Shoulder or Barrier

Travel Lane



I-80 RECONSTRUCTION

FIGURE 7.2: ALTERNATIVE I

Sheet 3 of 4

Alignment Will Tie Into Previously Constructed I-80 Section 05S

N

0 200 400

Feet

- Structure
- Shoulder or Barrier
- Travel Lane

Sheet1 Sheet2 Sheet3 Sheet4

I-80 RECONSTRUCTION
FIGURE 7.2: ALTERNATIVE I

Sheet 4 of 4

7.2 PRELIMINARY ALTERNATIVE ASSESSMENTS—ALTERNATIVE H

This supplements Section 5 of the Phase I Alternatives Analysis Report.

Meeting Purpose and Needs

Alternative H meets the Purpose and Needs and Design Criteria for this project. It meets all design criteria in Appendix I thus providing 12-foot shoulders and a six-lane section. The six-lane section is warranted based on the developed construction staging scheme and results of the 2045 No-Build analysis which indicated that the majority of the corridor operates at LOS F with the existing two lane sections of I-80 in each direction.

While the proposed acceleration and deceleration lane lengths meet AASHTO requirements, the distance between successive ramps has also been updated to meet AASHTO and PennDOT design criteria. This will minimize traffic congestion by providing sufficient lengths for weaving. All proposed bridges over I-80 meet the minimum vertical distance of 16'-0" as required by STRAHNET. The horizontal clearance will provide 14 feet as required by PennDOT design criteria. Superelevations are revised to meet current design standards eliminating the safety concerns.

Roadside safety measures will also meet current design standards. System continuity is also enhanced by providing full movements on Interchange 303. All existing ramp movements are maintained except the Main Street on-ramp to I-80 westbound which does not provide access to SR 209 southbound. The Main Street on-ramp to I-80 eastbound connects to Dreher Avenue and combines with the Dreher Avenue on-ramp. The Main Street off-ramp from I-80 westbound is combined with the Dreher Avenue exit. A connector road is provided between Dreher Avenue and Main Street. These connections allow these ramps to be located further from the high volume US 209 ramps. Exit 307 did not allow for a full movement diamond interchange due to the newly built bridge abutment location at SR 611 however, a fourth movement is provided just west of the interchange.

Traffic Performance

Design year daily traffic volumes (2045) were developed for Alternative H utilizing a two percent yearly growth rate. As noted above, Alternative H includes the removal of an existing ramp connection, combining existing ramp entrances and exits, connector roads, as well as proposed new ramps that currently are not provided for at Interchange 303. Traffic volume assignments for proposed new ramps in Alternative H were developed considering both the removal of ramps and regional traffic patterns and current congested areas. For example, congestion at Interchange 302 just west of the project area was considered when assigning volumes to the new Interchange 303 configuration which provides a full movement interchange and also provides for all movements at the interchange terminus at SR 611. New ramps at Interchange 303 consider traffic that utilizes Business 209 to/from the south and Bridge Street to SR 611 and the Stroud Mall area. Detailed information on the traffic assignments for Alternative H is provided in Appendix L.

Using 2045 design year volumes, all freeway segments operate at Level of Service D or better during AM peak period, and Level of Service E or better during PM peak period. The segment located at the west limit of the project (between Interchange 302 and 303) experiences Level of Service F during PM peak period due to the bottleneck condition created at the project limits. Compared to the No-Build alternative, this alternative provides an improvement in Level of Service during peak periods under design year conditions.

During AM and PM peak periods, the westbound segments between Interchanges 306 to 307 operate at Level of Service E due to high volumes in this section of I-80 carrying westbound vehicles bound for US209 southbound access. Under the alternative, this westbound section of I-80 (Interchange 306 to 307) contains an auxiliary travel lane between the Interchange 307 on-ramp and the Interchange 306 off-ramp. Under this alternative, the Interchange 306 off-ramp also includes the Main Street exiting traffic which uses a connector road between Dreher Avenue and Main Street.

Ramp merge and diverge analyses indicate all merges and diverges will operate at Level of Service D or better, with the exception of the diverge from I-80 westbound to Dreher Avenue/ Main Street which operates at Level of Service E in the PM peak; and the merge from SR 611 to I-80 westbound (Interchange 303), which operates at Level of Service F in the PM peak. This is at the project limits where the proposed improvements transition to the existing two-lanes on I-80.

Weave analyses for this alternative indicate that all weaves within the reconstruction area will operate at Level of Service D or better, with the exception of the Interchange 307 to 308 westbound weave section which operates at Level of Service E in the PM peak.

Ramp terminus intersections were found to operate at acceptable Level of Service D or better. Under this alternative, the analysis suggests signalization would be implemented for ramp terminus intersections at:

- Interchange 303 (SR 611/Heller Drive/Exit 303 Connector Road),
- Interchange 305 (West Main Street/Westbound Ramps / WB Connector Road),
- Interchange 305 (West Main Street/Eastbound Ramps / EB Connector Road),
- Interchange 306 (Dreher Avenue /Westbound Ramps/ WB Connector Road),
- Interchange 307 (Westbound On/Off Ramps)

At the proposed diamond Interchange 303 (SR 611/ Heller Drive/Exit 303 Connector Road), queuing along the northbound approach of the Connector Road to SR 611 is anticipated to utilize the entire approach distance to the downstream intersection with I-80 westbound ramps (approximately 200 feet) in order to accommodate PM peak hour volumes.

Other ramp termini locations are unsignalized and operate at acceptable levels of service. Summary tables and the detailed capacity/level of-service analysis worksheets for the Alternative H scenario are contained in Appendix L.

The Main Street westbound ramp provides access to I-80 only and not to US 209 southbound. Additional traffic is expected to utilize Main Street south of I-80 to access US 209 southbound at the signalized intersection of US 209 /Schafers Schoolhouse Road. Main Street traffic is also anticipated to be reduced between the I-80 ramps and Bridge Street due to the new ramps at Interchange 303. The overall change in traffic on Main Street between I-80 ramps and Bridge Street is negligible (the increase due to no US 209 access is offset by the decrease due to the new Interchange 303 ramps).

Alternative H adequately accommodates future traffic volumes and meets the project need to alleviate congestion.

Environmental Impacts

Although Alternative H represents a scaled-back alternative in comparison to those previously proposed, some anticipated impacts are actually projected to increase. The increased size of the loop ramp at Exit 305 accounts for much of this. Both wetland and residential impacts are likely to be greater due to this design element. To a degree these are offset by the reduced cross section of the mainline, but not entirely. Commercial properties benefit more from the reduced width, with several fewer anticipated impacts.

7.3 PRELIMINARY ALTERNATIVE ASSESSMENTS—ALTERNATIVE I

This supplements Section 5 of the Phase I Alternatives Analysis Report.

Meeting Purpose and Needs

Alternative I meets the Purpose and Needs and Design Criteria for this project. It meets all design criteria in Appendix I thus providing 12-foot shoulders and a six-lane section. The six-lane section is warranted based on the developed construction staging scheme and results of the 2045 No-Build analysis which indicated that the majority of the corridor operates at LOS F with the existing two lane sections of I-80 in each direction.

While the proposed acceleration and deceleration lane lengths meet AASHTO requirements, the distance between successive ramps has also been updated to meet AASHTO and PennDOT design criteria. This will minimize traffic congestion by providing sufficient lengths for weaving. All proposed bridges over I-80 meet the minimum vertical distance of 16'-0" as required by STRAHNET. The horizontal clearance will provide 14 feet as required by PennDOT design criteria. Superelevations are revised to meet current design standards eliminating the safety concerns.

Roadside safety measures will also meet current design standards. Existing ramp movements are maintained except the following:

- Main Street on-ramp to I-80 westbound which does not provide access to SR 209 southbound.
- Dreher Avenue westbound off-ramp
- Dreher Avenue eastbound on-ramp

The I-80 eastbound on and off-ramp at Main Street (Exit 305) do not connect directly to Main Street. These ramps terminate at a new connector road between Main Street and Dreher Avenue. Current motorists using the Dreher Avenue eastbound on-ramp would be able to utilize the new connector road to access the I-80 eastbound on-ramp. Current motorists using the Dreher Avenue westbound exit would be able to utilize the next exit at Main Street and turn left or right to access their destination on Main Street or Dreher Avenue via the new connector road. System continuity is also enhanced by providing full movements on Interchange 303. Exit 307 did not allow for a full movement diamond interchange due to the newly built bridge abutment location at SR 611 however, a fourth movement is provided just west of the interchange.

Traffic Performance

Design year daily traffic volumes (2045) were developed for Alternative H utilizing a two percent yearly growth rate. As noted above, Alternative I includes the removal of existing ramps, combining existing ramp entrances and exits with a new connector road, as well as proposed new ramps that currently are not provided for at Interchange 303. Traffic volume assignments for proposed new ramps in Alternative I were developed considering both the removal of ramps and regional traffic patterns and current congested areas. For example, congestion at Interchange 302 just west of the project area was considered when assigning volumes to the new Interchange 303 configuration which provides a full movement interchange and also provides for all movements at the interchange terminus at SR 611. New ramps at Interchange 303 consider traffic that utilizes Business 209 to/from the south and Bridge Street to SR 611 and the Stroud Mall area. Detailed information on the traffic assignments for Alternative I is provided in Appendix L.

Using 2045 design year volumes, all freeway segments operate at Level of Service D or better during AM peak period, and Level of Service E or better during PM peak period. The segment located at the west limit of the project (between Interchange 302 and 303) experiences Level of Service F during PM peak period due to the bottleneck condition created at the project limits. Compared to the No-Build alternative, this alternative provides an improvement in Level of Service during peak periods under design year conditions.

During AM and PM peak periods, the westbound segments between Interchanges 306 to 307 operate at Level of Service E due to high volumes in this section of I-80 carrying westbound vehicles bound for US209 southbound access. Under the alternative, this westbound section of I-80 (Interchange 305 to 307) contains an auxiliary travel lane between the Interchange 307 on-ramp and the Interchange 305 off-ramp.

Ramp merge and diverge analyses indicate all merges and diverges will operate at Level of Service D or better, with the exception of the diverge from I-80 westbound to Interchange 305 - Main Street which operates at Level of Service E in the PM peak; and the merge from SR 611 to I-80 westbound (Interchange 303), which operates at Level of Service F in the PM peak. This is at the project limits where the proposed improvements transition to the existing two-lanes on I-80.

Weave analyses for this alternative indicate that all weaves within the reconstruction area will operate at Level of Service D or better, with the exception of the Interchange 307 to 308 westbound weave section which operates at Level of Service E in the PM peak.

Ramp terminus intersections were found to operate at acceptable Level of Service D or better. Under this alternative, the analysis suggests signalization would be implemented for ramp terminus intersections at:

- Interchange 303 (SR 611/Heller Drive/Exit 303 Connector Road),
- Interchange 305 (West Main Street/Westbound Ramps),
- Interchange 307 (Westbound On/Off Ramps)

At the proposed diamond Interchange 303 (SR 611/ Heller Drive/Exit 303 Connector Road), queuing along the northbound approach of the Connector Road to SR 611 is anticipated to utilize the entire approach distance to the downstream intersection with I-80 westbound ramps (approximately 200 feet) in order to accommodate PM peak hour volumes.

Other ramp termini locations are unsignalized and operate at acceptable levels of service. Summary tables and the detailed capacity/level of-service analysis worksheets for the Alternative I scenario are contained in Appendix L.

The Main Street westbound ramp provides access to I-80 only and not to US 209 southbound. Additional traffic is expected to utilize Main Street south of I-80 to access US 209 southbound at the signalized intersection of US 209 /Schaefer's Schoolhouse Road. Main Street traffic is also anticipated to be reduced between the I-80 ramps and Bridge Street due to the new ramps at Interchange 303. The overall change in traffic on Main Street between I-80 ramps and Bridge Street is negligible (the increase due to no US 209 access is offset by the decrease due to the new Interchange 303 ramps).

Alternative I adequately accommodates future traffic volumes and meets the project need to alleviate congestion.

Environmental Impacts

The impacts associated with Alternative I are similar to H, although there are some notable differences. The connector road to Dreher Avenue results in additional stream and floodplain impacts, and additional residential impacts. Wetland and commercial impacts, however, are reduced slightly.

Interstate 80 Reconstruction
Narrative Summary
Data Collection through Existing Conditions Analysis
July 15, 2013

Tasks associated with scheduling the project traffic data collection were performed in March 2013. A typical week with no holidays or special events was identified early enough in the month of April so as to allow adequate time for recount during the academic semester (if needed as a result of equipment malfunction). PennDOT personnel and local authorities were notified of the scheduled week of data collection. Tri-State Traffic Data, Inc. was responsible for the field traffic data collection.

Tube, video, and radar technology alternatives were evaluated for collecting traffic data on Interstate 80. Considerations included costs, limitations of the methods, and physical constraints at the count sites. PennDOT's permanent count station was not available due to the loops being inactive at the time of the data collection. It was determined that Wavetronix radar would be utilized for obtaining volume counts on the interstate. Because this method is less accurate for classifying vehicles, historical vehicle classification data was provided by the PennDOT Bureau of Planning and Research. Tube counters were employed for all non-interstate roadway count locations.

Continuous automatic traffic counts were obtained on the following project area roadways for the one week period from Thursday, April 4, 2013 through Thursday, April 11, 2013:

1. Interstate 80 west of Interchange 303
2. Interstate 80 eastbound off ramp to SR 611
3. Interstate 80 westbound on ramp from SR 611
4. SR 611 east of the Interstate 80 ramps
5. Interstate 80 westbound off ramp to SR 209
6. Interstate 80 eastbound on ramp from SR 209
7. West Main Street (SR 2012/BR 209) east of the SR 209 overpass
8. Interstate 80 eastbound off ramp to West Main Street (SR 2012/BR 209)
9. Interstate 80 eastbound on ramp from West Main Street (SR 2012/BR 209)
10. Interstate 80 westbound off ramp to West Main Street (SR 2012/BR 209)
11. Interstate 80 westbound on ramp from West Main Street (SR 2012/BR 209)
12. West Main Street (SR 2012/BR 209) east of the Interstate 80 ramps
13. Interstate 80 eastbound on ramp from Dreher Avenue (SR 2004)
14. Interstate 80 westbound off ramp to Dreher Avenue (SR 2004)
15. Dreher Avenue (SR 2004) between the Interstate 80 ramps
16. Interstate 80 eastbound on ramp from Park Avenue (SR 611)
17. Interstate 80 eastbound off ramp to Park Avenue (SR 611)
18. Interstate 80 westbound on ramp from Broad Street (SR 191)
19. Interstate 80 westbound off ramp to Broad Street (SR 191)
20. Park Avenue (SR 611) north of the Interstate 80 ramps
21. Broad Street (SR 191) south of the Interstate 80 ramps

22. Colbert Street
23. Lenox Street
24. Interstate 80 east of Interchange 307

Manual turning movement counts were conducted using a combination of personnel and video cameras for the twelve hour period from 6:30 A.M. to 6:30 P.M. on Friday, April 5, 2013 at the following unsignalized intersections:

1. SR 611 and Interstate 80 eastbound off ramp
2. SR 611 and Interstate 80 westbound on ramp
3. SR 611 and Shoppes at Stroud side road
4. West Main Street (SR 2012/BR 209) and Interstate 80 eastbound ramps
5. West Main Street (SR 2012/BR 209) and Interstate 80 westbound ramps
6. Dreher Avenue (SR 2004) and Interstate 80 eastbound on ramp
7. Dreher Avenue (SR 2004) and Interstate 80 westbound off ramp
8. Park Avenue (SR 611) and Interstate 80 eastbound ramps/Barry Street
9. Broad Street (SR 191) and Interstate 80 westbound ramps

Traffic counts were collected at the signalized project area intersections in Stroud Township and Stroudsburg Borough in fall 2010 as part of PennDOT's NEPA 611 CCIP Phase II traffic signal upgrade project. Opening year 2012 peak hour traffic volumes were developed for that project by applying a growth rate to the year 2010 volumes at a time when actual traffic growth was nonexistent or decreasing. The year 2012 volumes from the CCIP Phase II project were compared to the year 2013 volumes at adjacent intersections (obtained for this Interstate 80 project) and it was found that the volumes from the CCIP Phase II project were generally of the same order of magnitude or higher. Thus, no adjustments were made to the year 2012 volumes to establish the existing year 2013 peak hour volumes at the signalized intersections.

Traffic volume maps were prepared depicting existing daily, A.M. peak hour, and P.M. peak hour volumes in the project area. Existing annual average daily traffic volumes for the roadways were calculated by taking the average weekday (Monday through Friday) volume and multiplying it by the applicable traffic pattern group factor for April day of month in Table 355 of *2011 Pennsylvania Traffic Data* (PennDOT Pub. 601, August, 2012).

Existing A.M. and P.M. peak hour Levels of Service for unsignalized intersections, freeway segments, ramp merges and diverges, and weaving were determined in accordance with procedures defined in the *Highway Capacity Manual* (Transportation Research Board, 2010) using the Highway Capacity Software HCS 2010 program. For signalized intersections, the Synchro models developed for PennDOT's NEPA 611 CCIP Phase II project were updated to Version 8 of the software. Timings were verified relative to the current traffic signal permit plans. The HCM 2010 signalized intersection capacity analysis output of Synchro was utilized to obtain Levels of Service, except for locations with overlap phasing, exclusive pedestrian phases, more than four approaches, or detection farther than 20 feet from the stop bar. As the HCM 2010 methodology does not support these conditions, the Levels of Service generated by Synchro were reported.

EXISTING PEAK HOUR LEVELS OF SERVICE
FREEWAY SEGMENTS

Location	Existing Year 2013 A.M. Peak Hour LOS/Density (pc/mi/ln)	Existing Year 2013 P.M. Peak Hour LOS/Density (pc/mi/ln)
I-80 EB between Int. 303 and 304	B (12.5)	B (16.2)
I-80 EB between Int. 304 and 305	C (21.2)	C (24.0)
I-80 EB between Int. 305 and 306	C (21.9)	C (23.1)
I-80 EB between Int. 306 and 307	C (23.9)	C (23.2)
I-80 WB between Int. 303 and 304	A (10.4)	C (22.6)
I-80 WB between Int. 304 and 305	B (15.7)	E (39.2)
I-80 WB between Int. 305 and 306	B (15.9)	E (39.7)
I-80 WB between Int. 306 and 307	B (16.9)	E (42.5)

EXISTING PEAK HOUR LEVELS OF SERVICE
RAMP MERGES

Location	Existing Year 2013 A.M. Peak Hour LOS/Density (pc/mi/ln)	Existing Year 2013 P.M. Peak Hour LOS/Density (pc/mi/ln)
I-80 EB Int. 304 from Rt. 209	C (21.6)	C (24.7)
I-80 EB Int. 305 from W. Main St.	C (26.9)	D (28.8)
I-80 EB Int. 306 from Dreher Ave.	D (28.3)	D (29.0)
I-80 EB Int. 307 from Park Ave.	C (26.1)	C (27.0)
I-80 WB Int. 303 from Rt. 611	B (11.1)	C (24.4)
I-80 WB Int. 307 from Broad St.	C (22.4)	E (40.2)

EXISTING PEAK HOUR LEVELS OF SERVICE
RAMP DIVERGES

Location	Existing Year 2013 A.M. Peak Hour LOS/Density (pc/mi/ln)	Existing Year 2013 P.M. Peak Hour LOS/Density (pc/mi/ln)
I-80 EB Int. 303 to Rt. 611	B (14.9)	B (20.0)
I-80 EB Int. 305 to W. Main St.	D (28.0)	D (30.8)
I-80 EB Int. 307 to Park Ave.	D (30.8)	D (30.1)
I-80 WB Int. 305 to W. Main St.	C (22.3)	E (42.0)
I-80 WB Int. 306 to Dreher Ave.	C (23.3)	E (43.2)
I-80 WB Int. 307 to Broad St.	C (22.5)	E (41.7)

EXISTING PEAK HOUR LEVELS OF SERVICE
WEAVING SEGMENT

Location	Existing Year 2013 A.M. Peak Hour LOS/Density (pc/mi/ln)	Existing Year 2013 P.M. Peak Hour LOS/Density (pc/mi/ln)
I-80 WB Int. 305 to 304	B (12.1)	D (28.2)

EXISTING PEAK HOUR LEVELS OF SERVICE
UNSIGNALIZED INTERSECTIONS

Intersection	Existing Year 2013 A.M. Peak Hour LOS/Delay (seconds)	Existing Year 2013 P.M. Peak Hour LOS/Delay (seconds)
Int. 303 – SR 611 and I-80 EB Off Ramp		
I-80 Off Ramp NB right	B (14.7)	C (18.9)
Overall Intersection	*A (2.1)*	*A (2.6)*
Int. 303 – SR 611 and Shopping Ctr. Side Rd.		
SR 611 EB left	A (9.8)	B (11.0)
Shopping Center Rd. SB left/right	B (13.1)	C (15.7)
Overall Intersection	*A (0.3)*	*A (0.4)*
Int. 305 – W. Main St. and I-80 EB Ramps		
W. Main St. WB left/thru	A (9.5)	A (9.9)
I-80 Off Ramp NB left/right	B (11.6)	C (15.7)
Overall Intersection	*A (6.1)*	*A (7.6)*
Int. 305 – W. Main St. and I-80 WB Ramps		
W. Main St. EB left/thru	A (9.6)	B (11.9)
I-80 Off Ramp SB left/right	B (11.3)	C (22.0)
Overall Intersection	*A (5.9)*	*A (8.2)*
Int. 306 – Dreher Ave. and I-80 EB On Ramp		
Dreher Ave. WB left/thru	A (8.9)	A (8.8)
Overall Intersection	*A (3.5)*	*A (5.7)*
Int. 306 – Dreher Ave. and I-80 WB Off Ramp		
I-80 Off Ramp NB left/right	A (9.4)	A (9.8)
Overall Intersection	*A (2.2)*	*A (3.5)*
Int. 307 – Park Ave. and I-80 EB Ramps		
Park Ave. NB left/thru	A (8.6)	A (9.5)
I-80 Off Ramp EB left/right	C (16.2)	C (24.1)
Barry St. WB left/thru/right	B (10.4)	B (13.4)
Overall Intersection	*B (11.0)*	*B (12.0)*
Int. 307 – Broad St. and I-80 WB Ramps		
Broad St. NB left/thru	A (9.5)	B (12.1)
I-80 Off Ramp WB left/right	B (14.8)	C (21.8)
Overall Intersection	*A (7.8)*	*A (9.3)*

EXISTING PEAK HOUR LEVELS OF SERVICE
SIGNALIZED INTERSECTIONS – STROUD TOWNSHIP SYSTEM 1

Intersection	Existing Year 2013 A.M. Peak Hour LOS/Delay (seconds)	Existing Year 2013 P.M. Peak Hour LOS/Delay (seconds)
SR 611 and Shafers School House Road		
SR 611 EB thru/right	A (6.1)	A (4.6)
SR 611 WB left	A (7.5)	A (6.5)
SR 611 WB thru	A (3.8)	A (5.0)
Shafers Sch. House Rd. NB left	C (26.9)	D (36.5)
Shafers Sch. House Rd. NB right	C (27.5)	D (36.8)
Overall Intersection	*A (6.9)*	*A (6.9)*
SR 611 and Applegate Road/Terrace Drive		
SR 611 EB left	A (5.5)	A (9.4)
SR 611 EB thru/right	A (7.1)	A (6.0)
SR 611 WB left	A (8.7)	A (8.2)
SR 611 WB thru/right	A (4.9)	A (7.1)
Applegate Road NB left	C (23.4)	C (33.6)
Applegate Road NB thru/right	C (22.0)	C (31.7)
Terrace Drive SB left/thru/right	C (22.5)	C (31.2)
Overall Intersection	*A (8.0)*	*A (9.1)*
SR 611 and Pocono Commons Drive		
SR 611 EB left	B (18.0)	C (29.3)
SR 611 EB thru	A (4.4)	A (3.8)
SR 611 WB thru	B (12.5)	B (19.0)
SR 611 WB right	A (0.0)	A (0.0)
Pocono Commons Dr. SB left	B (18.8)	C (30.6)
Pocono Commons Dr. SB right	A (0.0)	A (0.0)
Overall Intersection	*B (11.3)*	*B (19.5)*

EXISTING PEAK HOUR LEVELS OF SERVICE
SIGNALIZED INTERSECTIONS – STROUD TOWNSHIP SYSTEM 2

Intersection	Existing Year 2013 A.M. Peak Hour LOS/Delay (seconds)	Existing Year 2013 P.M. Peak Hour LOS/Delay (seconds)
SR 611 and Bridge Street		
SR 611 EB thru	B (13.4)	C (20.5)
SR 611 EB right	A (0.8)	A (1.0)
SR 611 WB left	A (2.5)	A (9.6)
SR 611 WB thru	A (2.1)	A (4.5)
Bridge Street NB left	D (51.4)	D (50.2)
Bridge Street NB right	B (10.3)	A (9.3)
Overall Intersection	*B (11.3)*	*B (14.1)*
SR 611 and Stroud Mall Main Drive		
SR 611 EB left	A (3.8)	A (4.8)
SR 611 EB thru/right	A (1.4)	A (1.2)
SR 611 WB left	A (1.9)	A (2.5)
SR 611 WB thru	A (3.0)	A (4.6)
SR 611 WB right	A (0.0)	A (0.0)
Driveway NB left/thru/right	D (43.8)	D (38.9)
Stroud Mall Main Dr. SB left/thru	D (40.7)	D (41.7)
Stroud Mall Main Dr. SB right	A (0.0)	A (0.0)
Overall Intersection	*A (5.9)*	*A (6.5)*
SR 611 and Stroud Mall East Drive		
SR 611 EB left	A (5.1)	A (4.7)
SR 611 EB thru	A (0.7)	A (0.7)
SR 611 WB thru	B (12.0)	A (7.1)
SR 611 WB right	A (6.4)	A (3.5)
Stroud Mall East Dr. SB left	E (66.8)	E (56.1)
Stroud Mall East Dr. SB right	A (0.0)	A (0.0)
Overall Intersection	*A (7.6)*	*A (6.2)*

EXISTING PEAK HOUR LEVELS OF SERVICE
SIGNALIZED INTERSECTIONS – STROUD TOWNSHIP SYSTEM 2 (continued)

Intersection	Existing Year 2013 A.M. Peak Hour LOS/Delay (seconds)	Existing Year 2013 P.M. Peak Hour LOS/Delay (seconds)
SR 611 and Chipperfield Drive		
SR 611 EB left	C (21.9)	C (21.9)
SR 611 EB thru/right	B (10.5)	B (15.4)
SR 611 WB left	B (18.0)	B (19.3)
SR 611 WB thru	D (36.8)	C (32.9)
SR 611 WB right	B (18.9)	B (19.3)
Driveway NB left/thru	C (29.0)	D (49.1)
Driveway NB right	C (21.4)	C (20.2)
Chipperfield Drive SB left/thru	F (1896.7)*	F (1497.9)*
Chipperfield Drive SB right	C (23.8)	C (24.5)
Overall Intersection	*F (372.3)**	*F (260.3)**

* Significantly higher delay compared to what is calculated by Synchro

EXISTING PEAK HOUR LEVELS OF SERVICE
SIGNALIZED INTERSECTIONS – STROUDSBURG BOROUGH

Intersection	Existing Year 2013 A.M. Peak Hour LOS/Delay (seconds)	Existing Year 2013 P.M. Peak Hour LOS/Delay (seconds)
Main Street and Dreher Avenue		
Main Street EB left	D (41.3)	D (43.5)
Main Street EB thru/right	E (69.2)	D (51.2)
Main Street WB left	E (71.5)	D (39.8)
Main Street WB thru	C (31.8)	C (32.5)
Main Street WB right	A (7.4)	A (8.5)
Dreher Avenue NB left	D (39.3)	D (48.8)
Dreher Avenue NB thru/right	C (26.9)	B (12.9)
School Driveway SB left	F (133.9)	F (134.5)
School Driveway SB thru/right	B (18.2)	C (24.2)
Overall Intersection	*D (47.6)*	*D (41.4)*
Main Street and 9th Street		
Main Street EB left/thru/right	C (20.3)	F (83.6)
Main Street WB left/thru	C (26.0)	C (32.4)
Main Street WB right	C (24.9)	C (28.3)
9th Street NB left/thru/right	C (32.4)	D (42.4)
9th Street SB left	E (66.7)	F (141.1)
9th Street SB thru/right	C (27.0)	C (33.5)
Overall Intersection	*C (31.4)*	*E (70.5)*
Main Street and 8th Street		
Main Street EB left/thru/right	B (16.2)	B (14.2)
Main Street WB left/thru/right	B (14.7)	B (13.2)
8th Street NB left/thru/right	D (40.0)	C (34.4)
8th Street SB left/thru/right	C (29.1)	C (29.4)
Overall Intersection	*C (20.1)*	*B (19.2)*

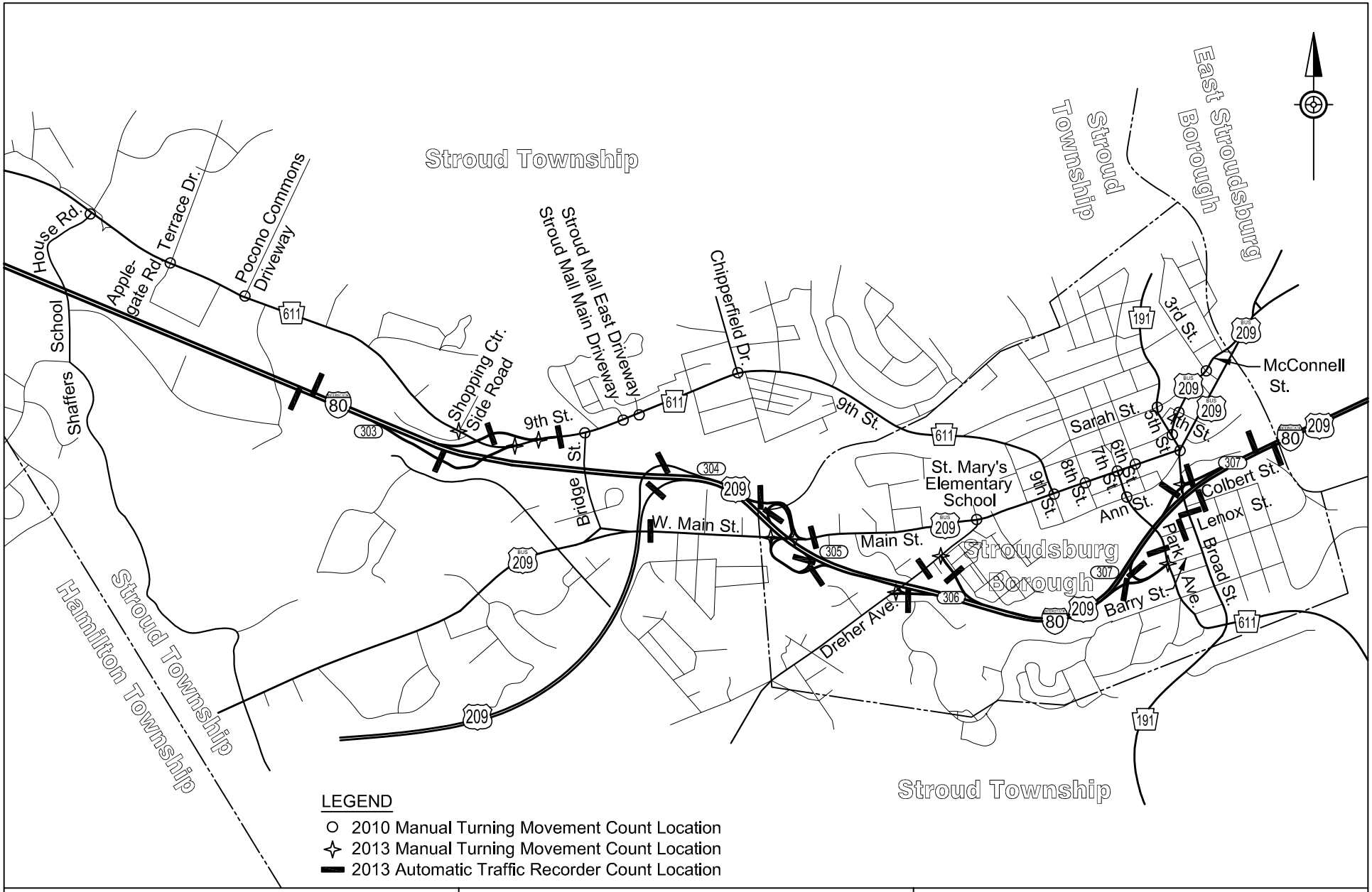
EXISTING PEAK HOUR LEVELS OF SERVICE
SIGNALIZED INTERSECTIONS – STROUDSBURG BOROUGH (continued)

Intersection	Existing Year 2013 A.M. Peak Hour LOS/Delay (seconds)	Existing Year 2013 P.M. Peak Hour LOS/Delay (seconds)
Main Street and 7th Street		
Main Street EB left/thru/right	B (12.9)	B (14.4)
Main Street WB left/thru/right	A (10.0)	B (18.1)
7th Street NB left/thru/right	D (48.7)	E (62.3)
7th Street SB left/thru/right	E (62.9)	E (75.4)
Overall Intersection	*C (26.1)*	*C (32.7)*
7th Street and Ann Street		
Ann Street WB left/thru/right	A (8.7)	B (17.4)
7th Street NB left/thru	B (12.8)	C (29.8)
7th Street SB thru/right	A (4.9)	A (4.7)
Overall Intersection	*A (9.3)*	*B (15.9)*
Main Street and 6th Street		
Main Street EB left/thru/right	B (12.4)	A (9.6)
Main Street WB left/thru/right	B (11.3)	B (15.9)
6th Street NB left/thru/right	E (60.4)	E (74.2)
Overall Intersection	*B (19.0)*	*C (23.2)*
Main Street and 5th Street/Broad Street		
Main Street EB thru/right	D (43.6)	D (45.2)
Broad Street NB left	C (21.2)	C (27.9)
Broad Street NB right	C (32.8)	D (36.8)
5th Street SB left	B (12.1)	B (15.0)
5th Street SB thru	C (30.7)	D (38.2)
5th Street SB right	A (4.1)	A (1.8)
Overall Intersection	*C (27.4)*	*C (31.7)*

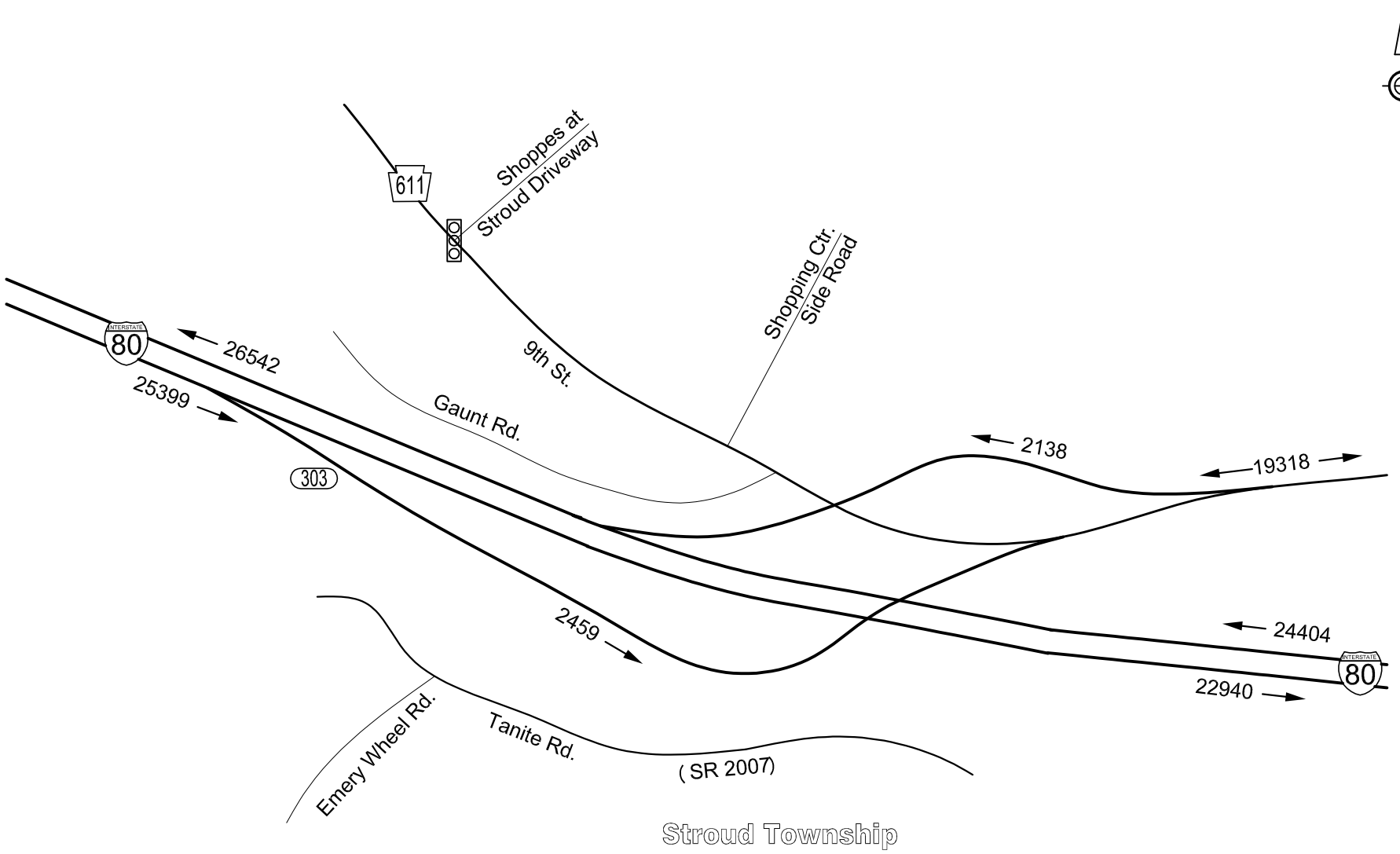
EXISTING PEAK HOUR LEVELS OF SERVICE
SIGNALIZED INTERSECTIONS – STROUDSBURG BOROUGH (continued)

Intersection	Existing Year 2013 A.M. Peak Hour LOS/Delay (seconds)	Existing Year 2013 P.M. Peak Hour LOS/Delay (seconds)
McConnell Street and 4th Street		
4th Street EB thru/right	B (18.8)	D (53.3)
4th Street WB left/thru	C (21.6)	F (86.1)
McConnell Street SB left/thru	A (3.7)	A (8.0)
McConnell Street SB thru	A (3.6)	A (7.5)
Overall Intersection	*A (6.9)*	*C (22.0)*
McConnell Street and 3rd Street		
3rd Street EB thru/right	B (17.7)	C (26.1)
3rd Street WB left/thru	B (16.6)	C (24.0)
McConnell Street SB left/thru	A (4.8)	A (6.1)
McConnell Street SB thru	A (4.5)	A (5.7)
McConnell Street SB right	A (3.2)	A (4.1)
Overall Intersection	*A (7.4)*	*B (10.5)*
5th Street and Sarah Street		
Sarah Street EB left/thru/right	A (7.6)	B (12.9)
Sarah Street WB left/thru	B (13.9)	B (10.2)
Sarah Street WB right	A (3.2)	A (2.5)
5th Street NB left/thru/right	B (10.9)	B (19.4)
5th Street SB left/thru/right	B (16.4)	C (23.6)
Overall Intersection	*B (12.3)*	*B (14.6)*

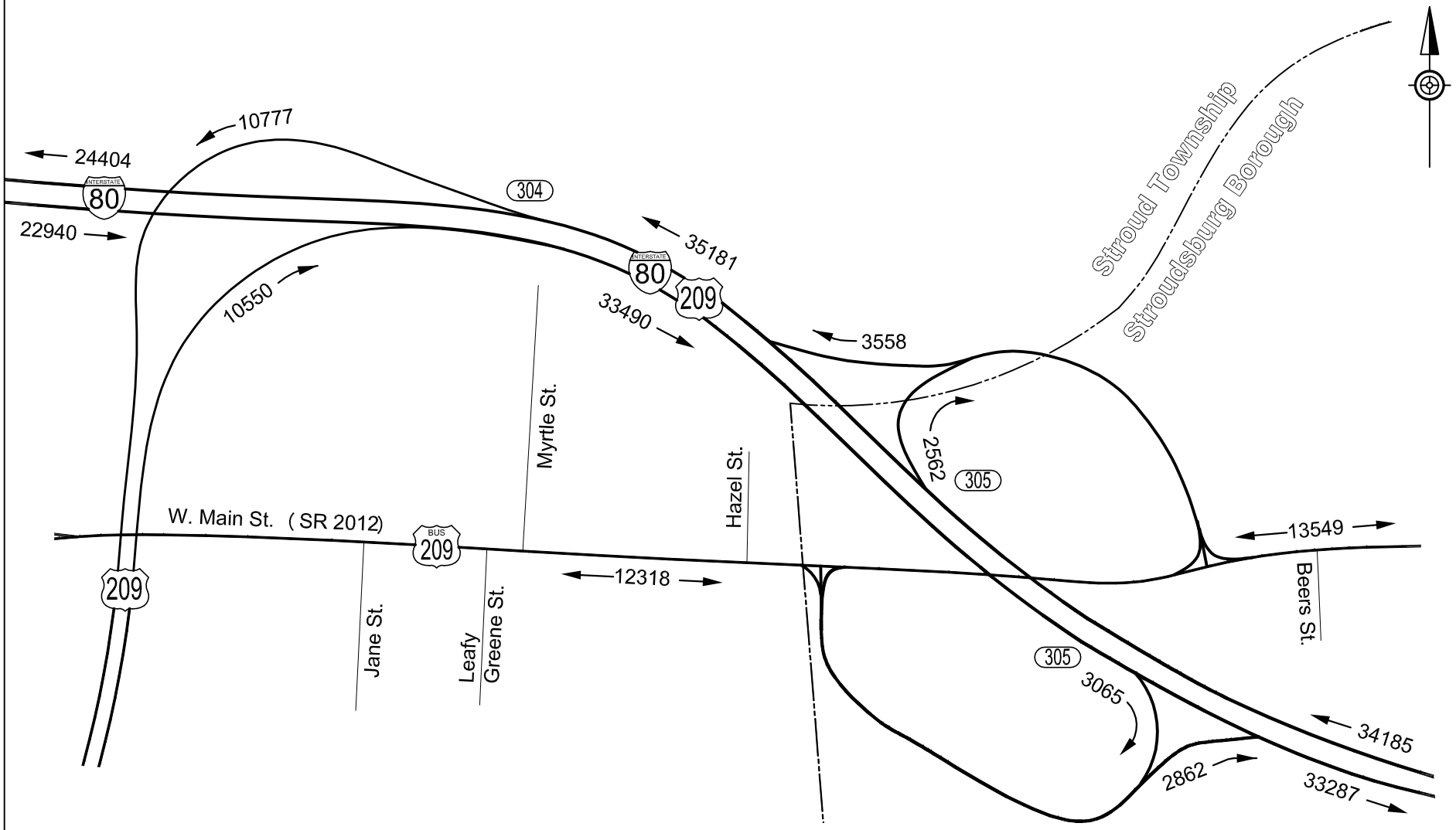
2045 TRAFFIC VOLUME MAPS



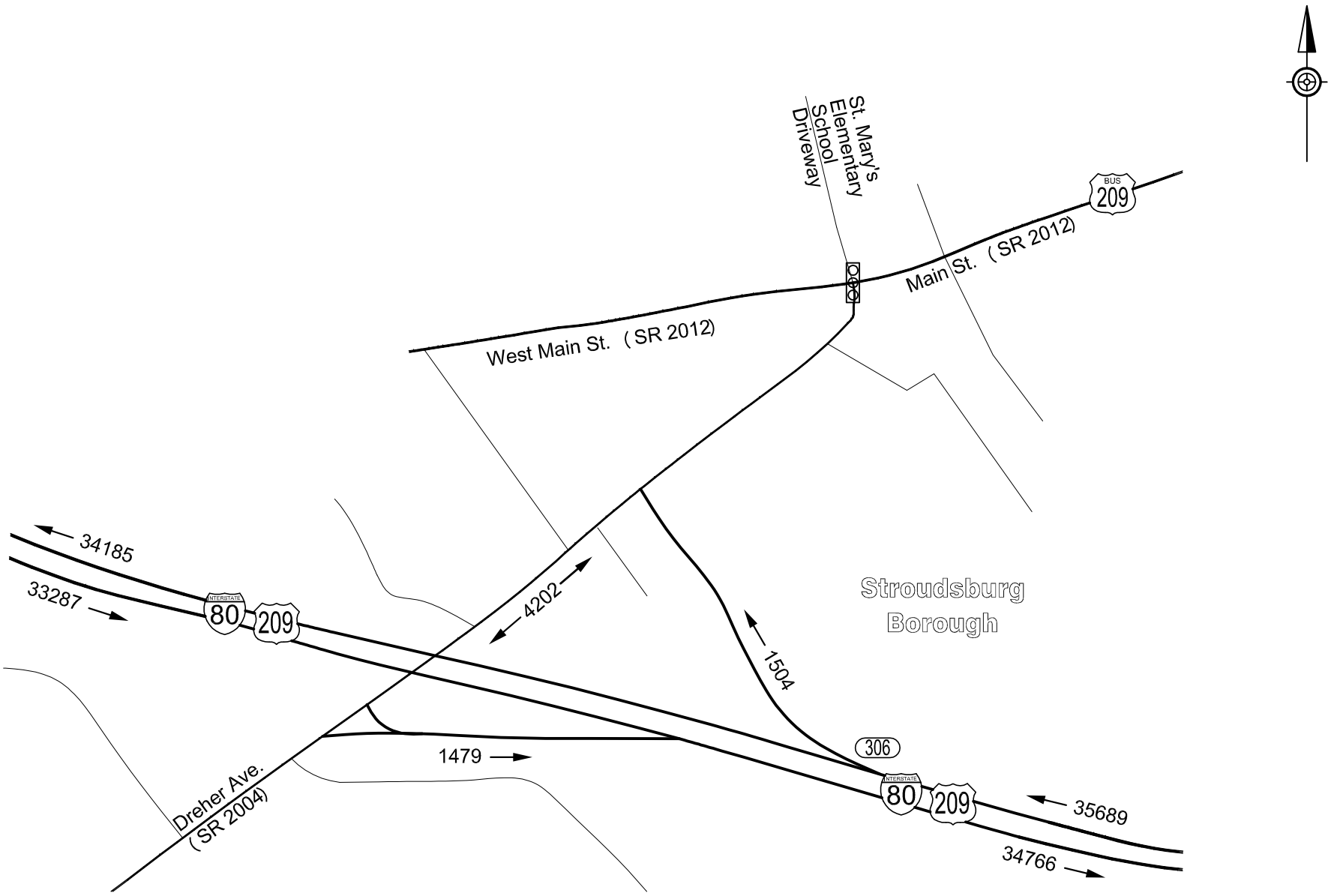
L&V Engineering, LLC PO Box 347 Honesdale, PA 18431 Project No. AECM1202	I-80 Reconstruction Monroe County	FIGURE 1 STUDY AREA



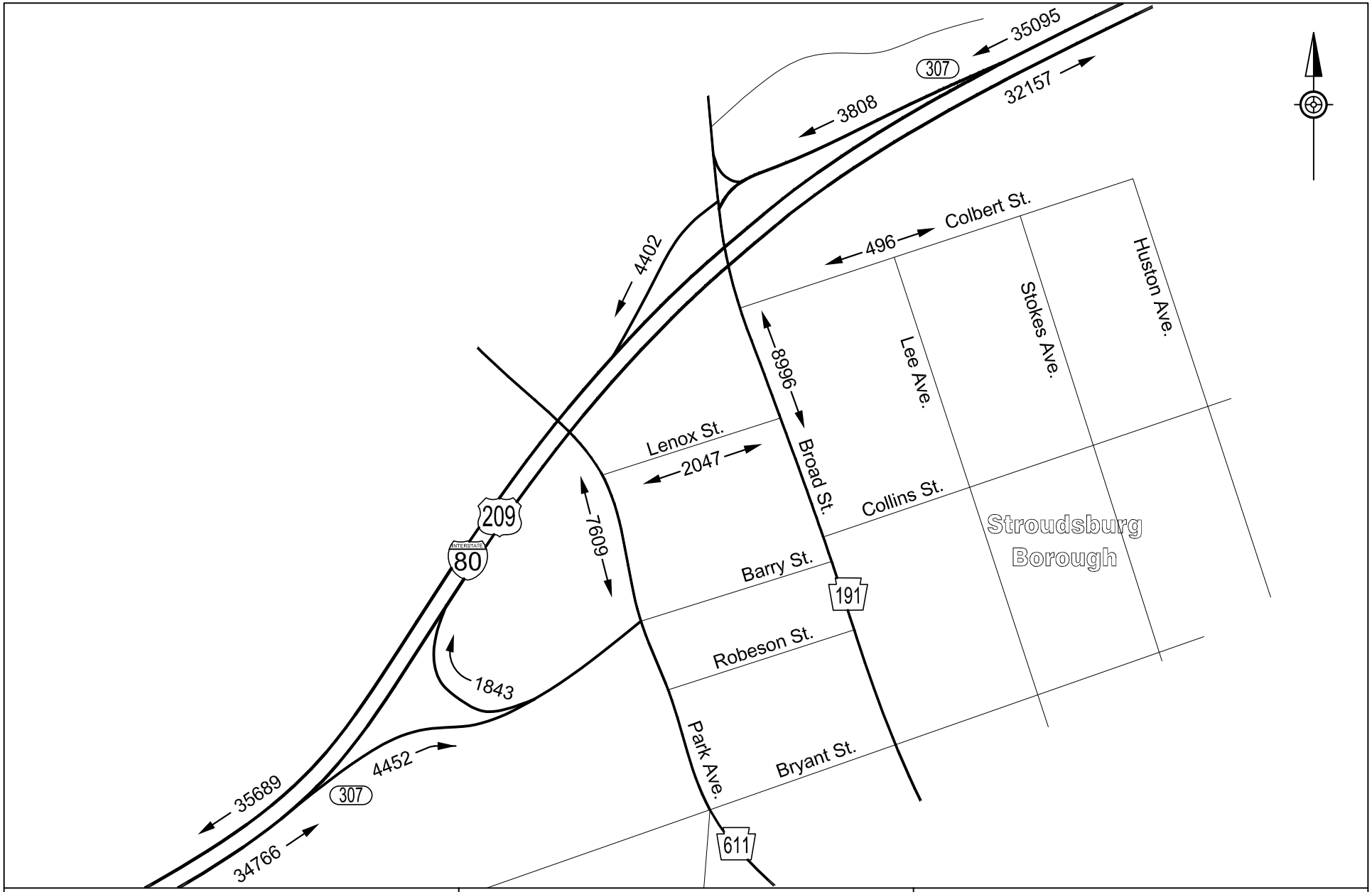
L&V Engineering, LLC PO Box 347 Honesdale, PA 18431 Project No. AECM1202	I-80 Reconstruction Monroe County	FIGURE 2 ANNUAL AVERAGE DAILY TRAFFIC VOLUMES



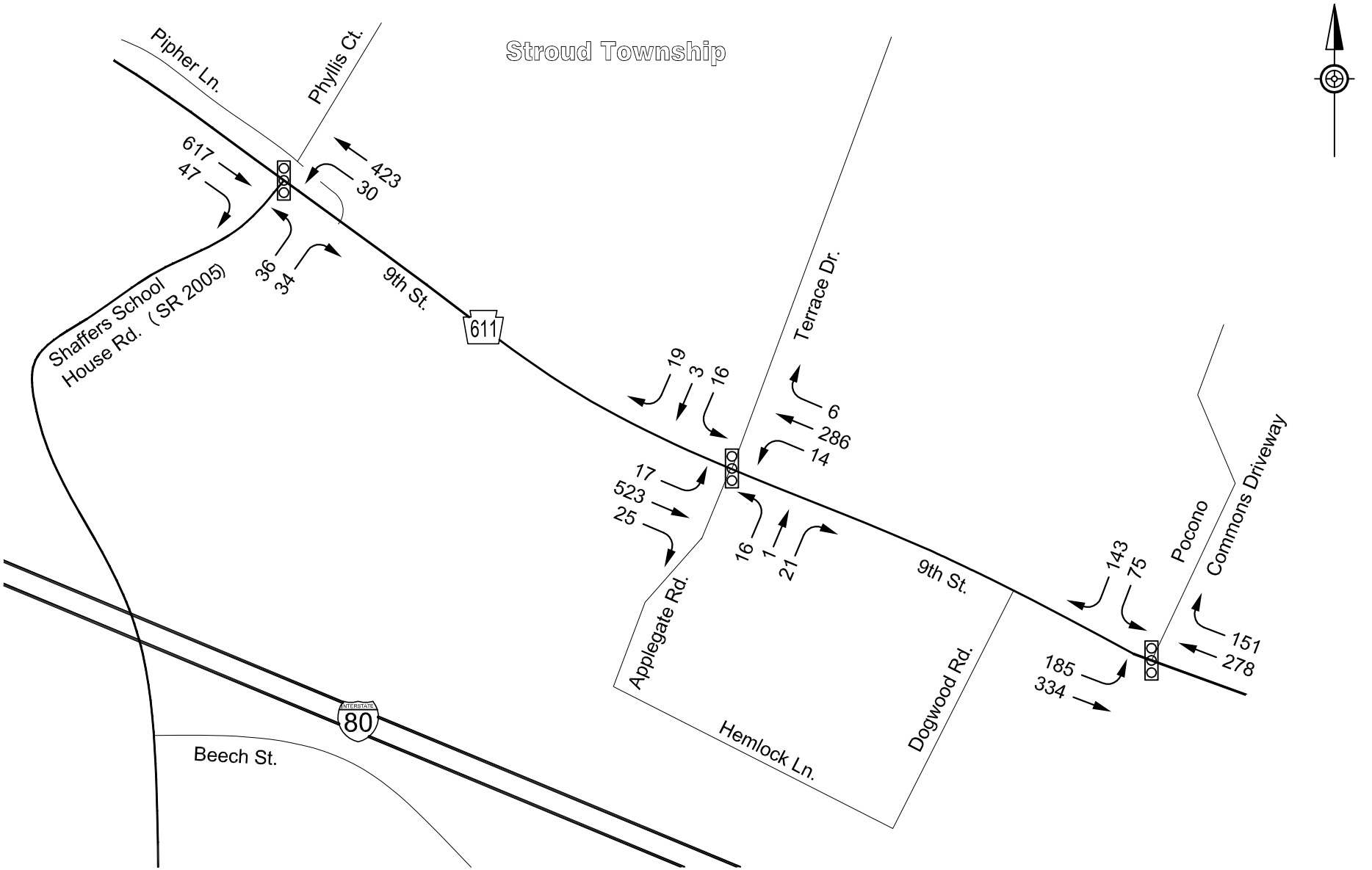
L&V Engineering, LLC PO Box 347 Honesdale, PA 18431 Project No. AECM1202	I-80 Reconstruction Monroe County	FIGURE 3 ANNUAL AVERAGE DAILY TRAFFIC VOLUMES



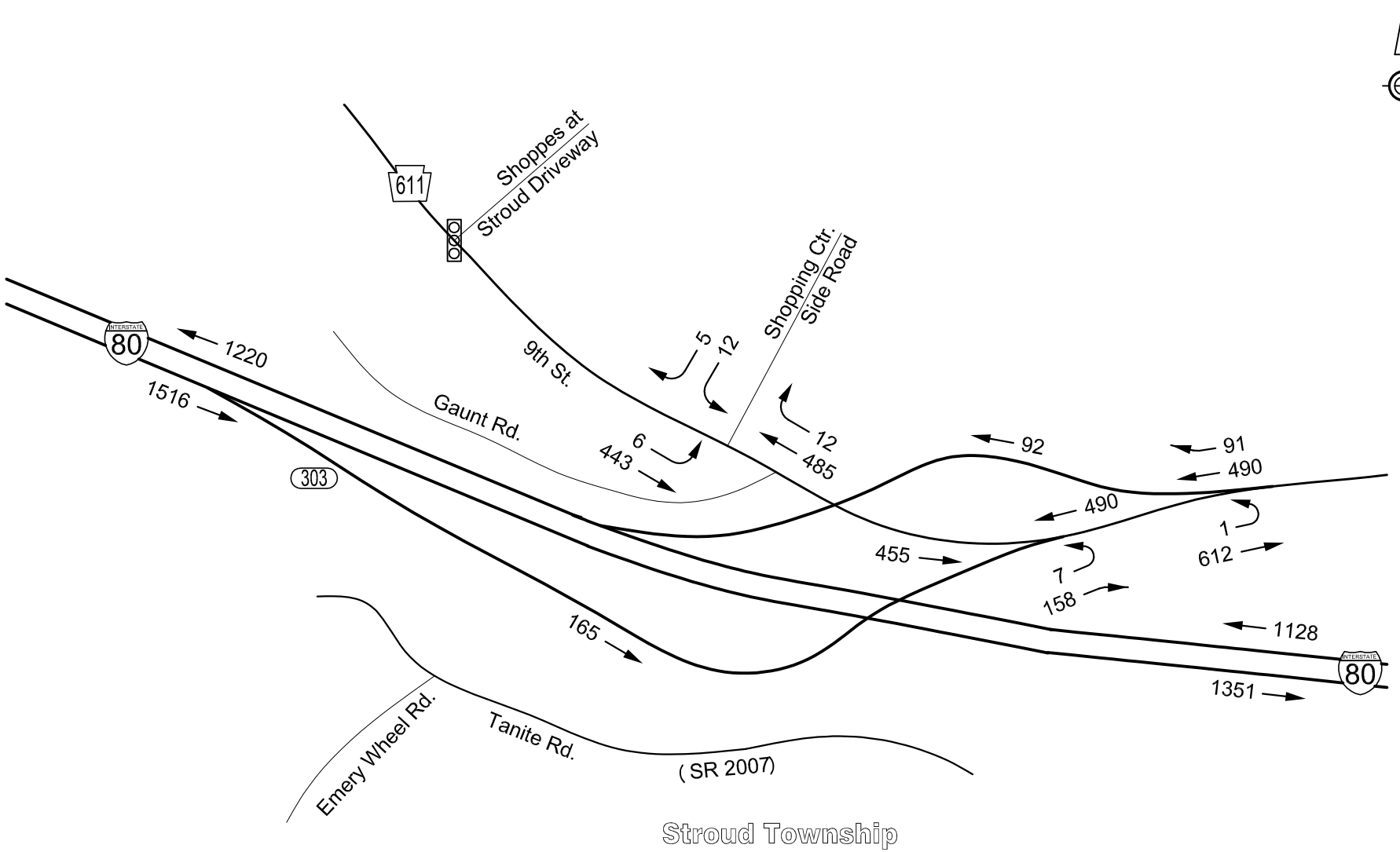
L&V Engineering, LLC PO Box 347 Honesdale, PA 18431 Project No. AECM1202	I-80 Reconstruction Monroe County	FIGURE 4 ANNUAL AVERAGE DAILY TRAFFIC VOLUMES



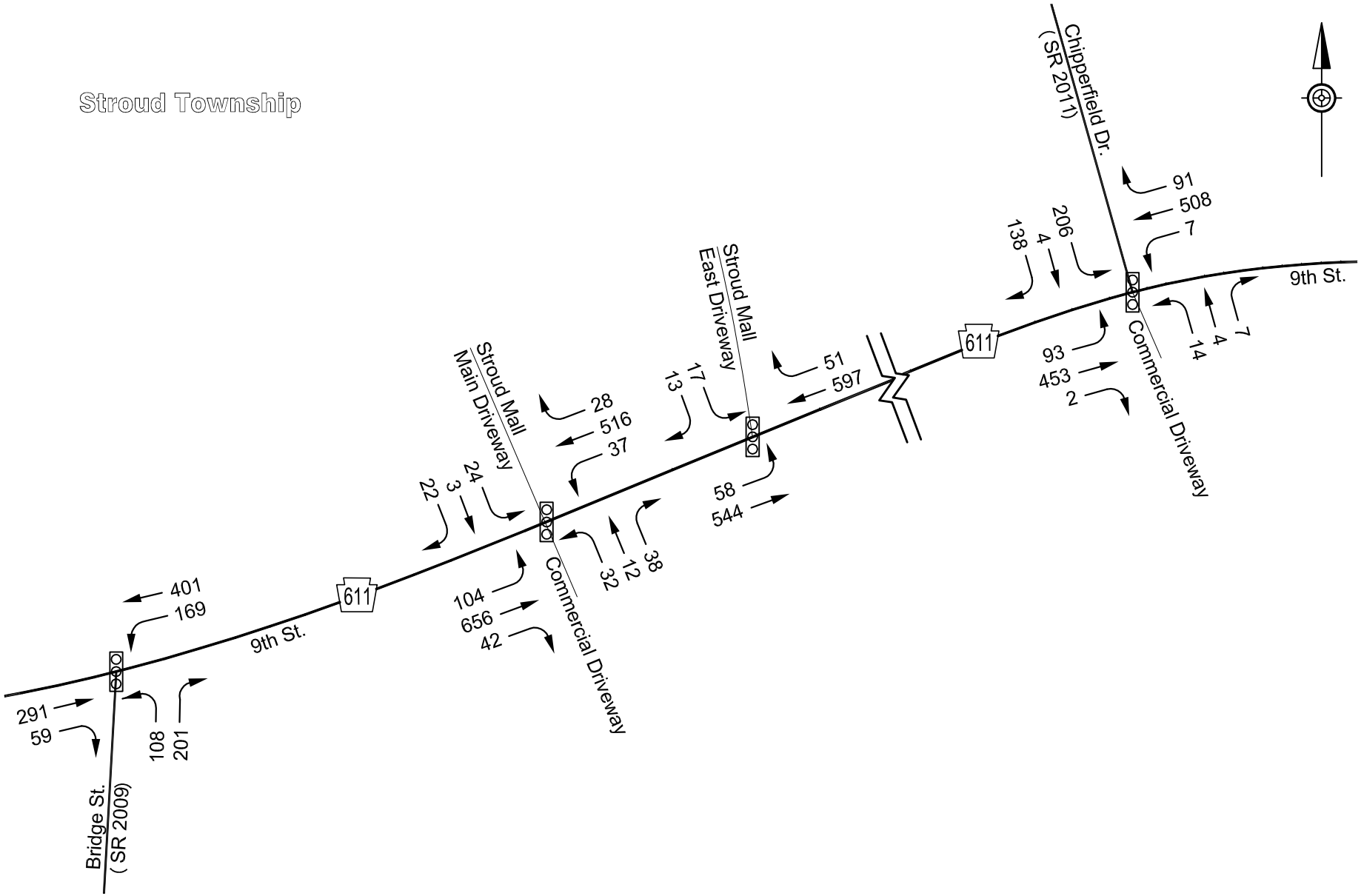
L&V Engineering, LLC PO Box 347 Honesdale, PA 18431 Project No. AECM1202	I-80 Reconstruction Monroe County	FIGURE 5 ANNUAL AVERAGE DAILY TRAFFIC VOLUMES



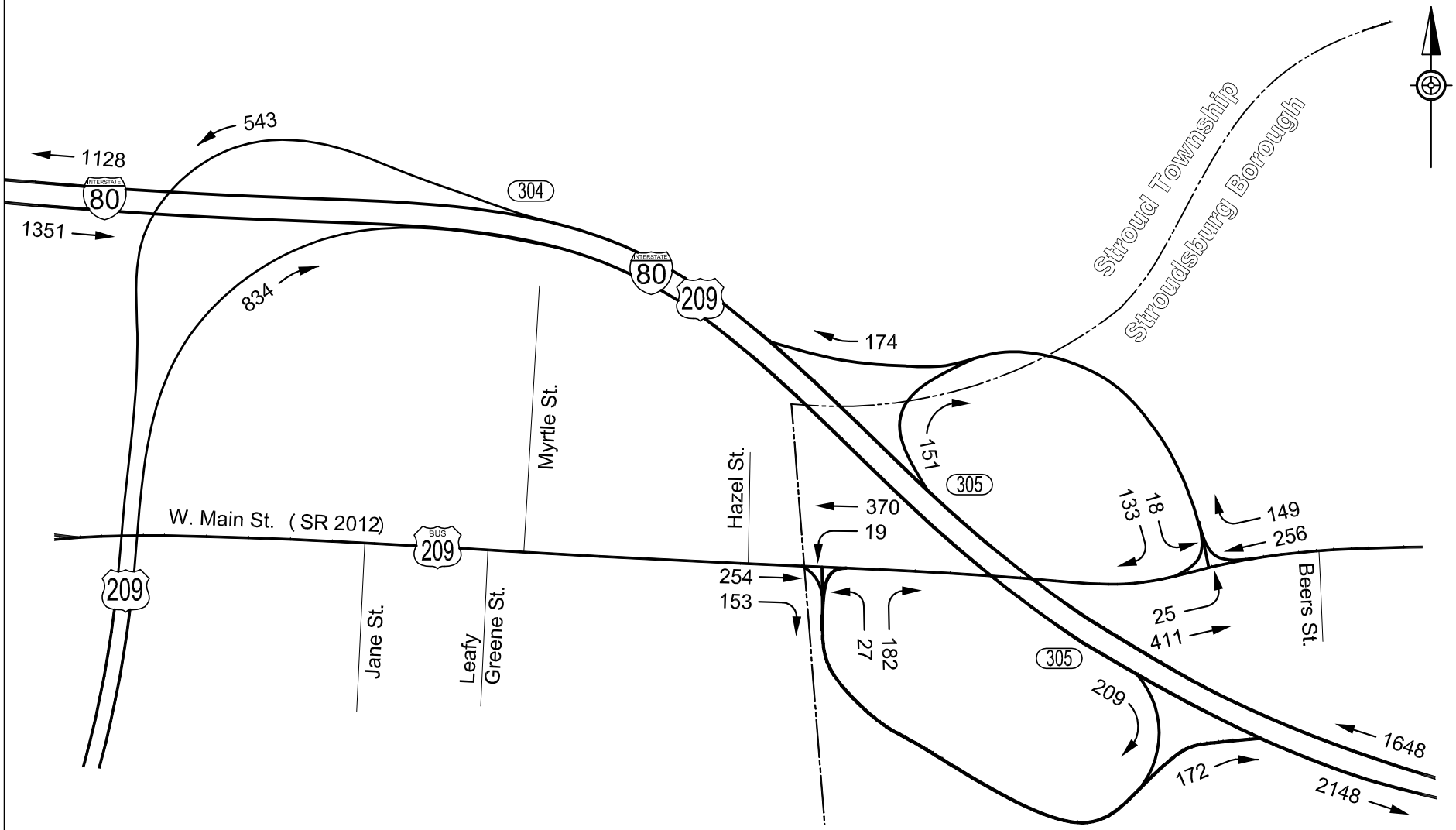
L&V Engineering, LLC PO Box 347 Honesdale, PA 18431 Project No. AECM1202	I-80 Reconstruction Monroe County	FIGURE 6 A.M. PEAK HOUR TRAFFIC VOLUMES



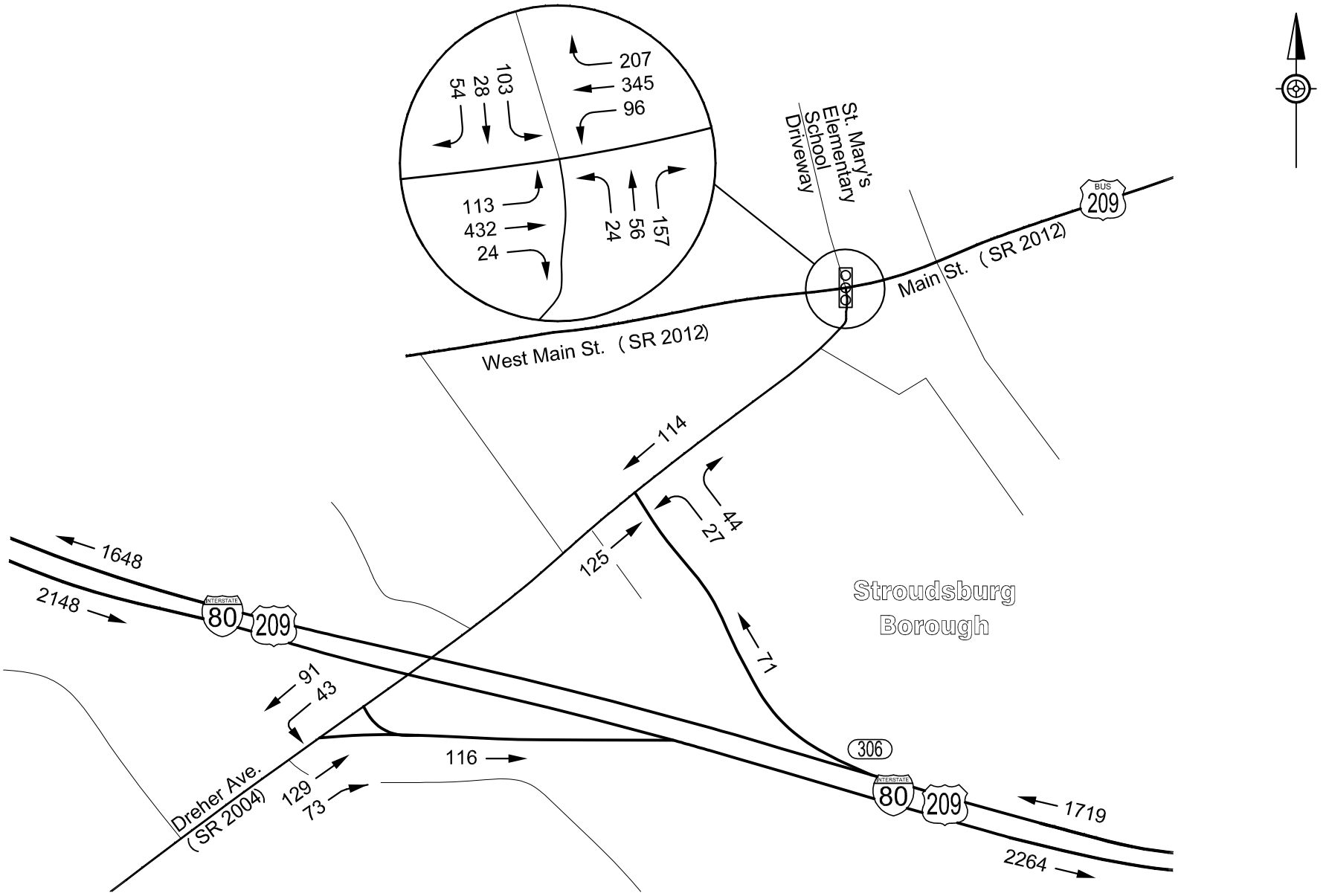
L&V Engineering, LLC PO Box 347 Honesdale, PA 18431 Project No. AECM1202	I-80 Reconstruction Monroe County	FIGURE 7 A.M. PEAK HOUR TRAFFIC VOLUMES



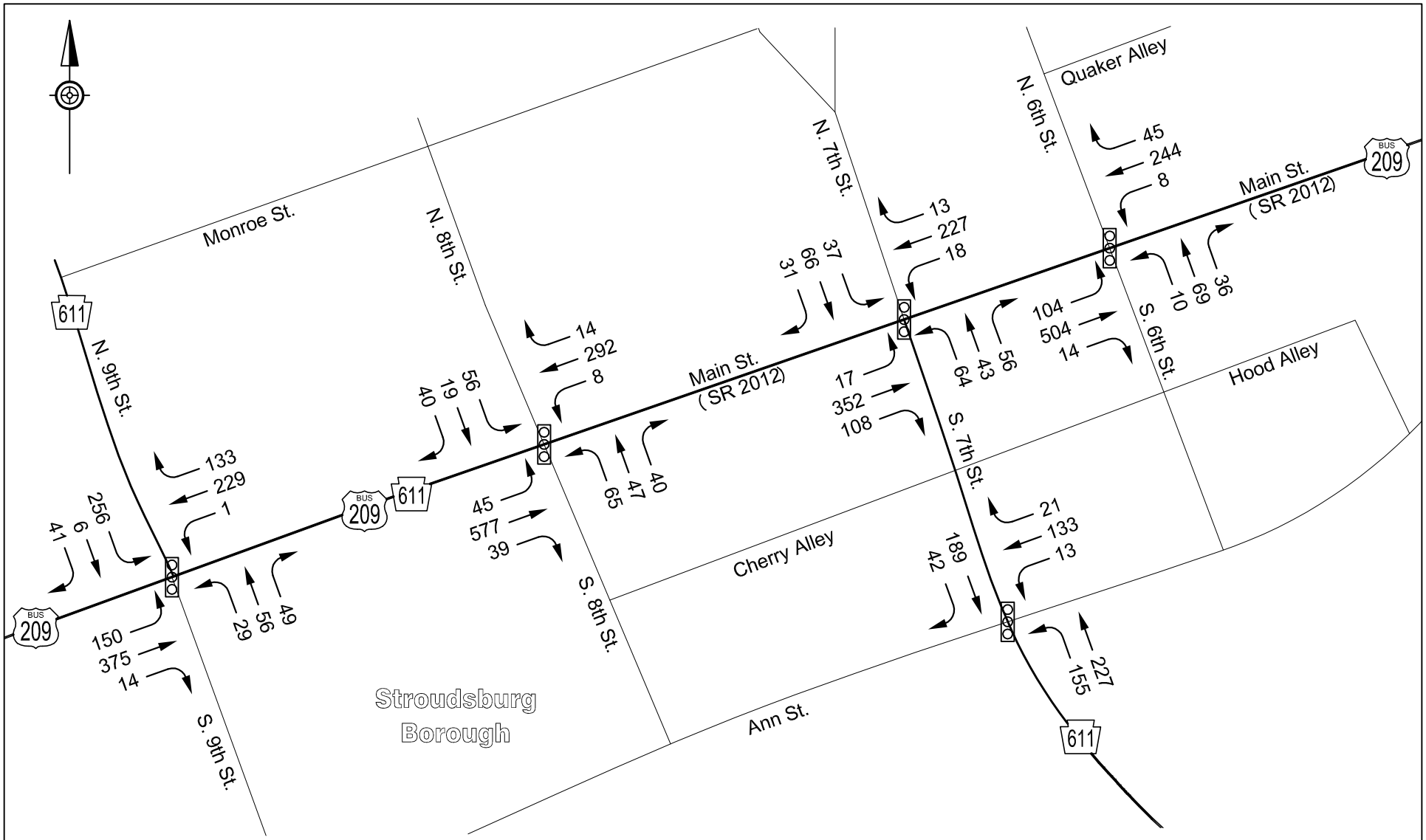
L&V Engineering, LLC PO Box 347 Honesdale, PA 18431 Project No. AECM1202	I-80 Reconstruction Monroe County	FIGURE 8 A.M. PEAK HOUR TRAFFIC VOLUMES



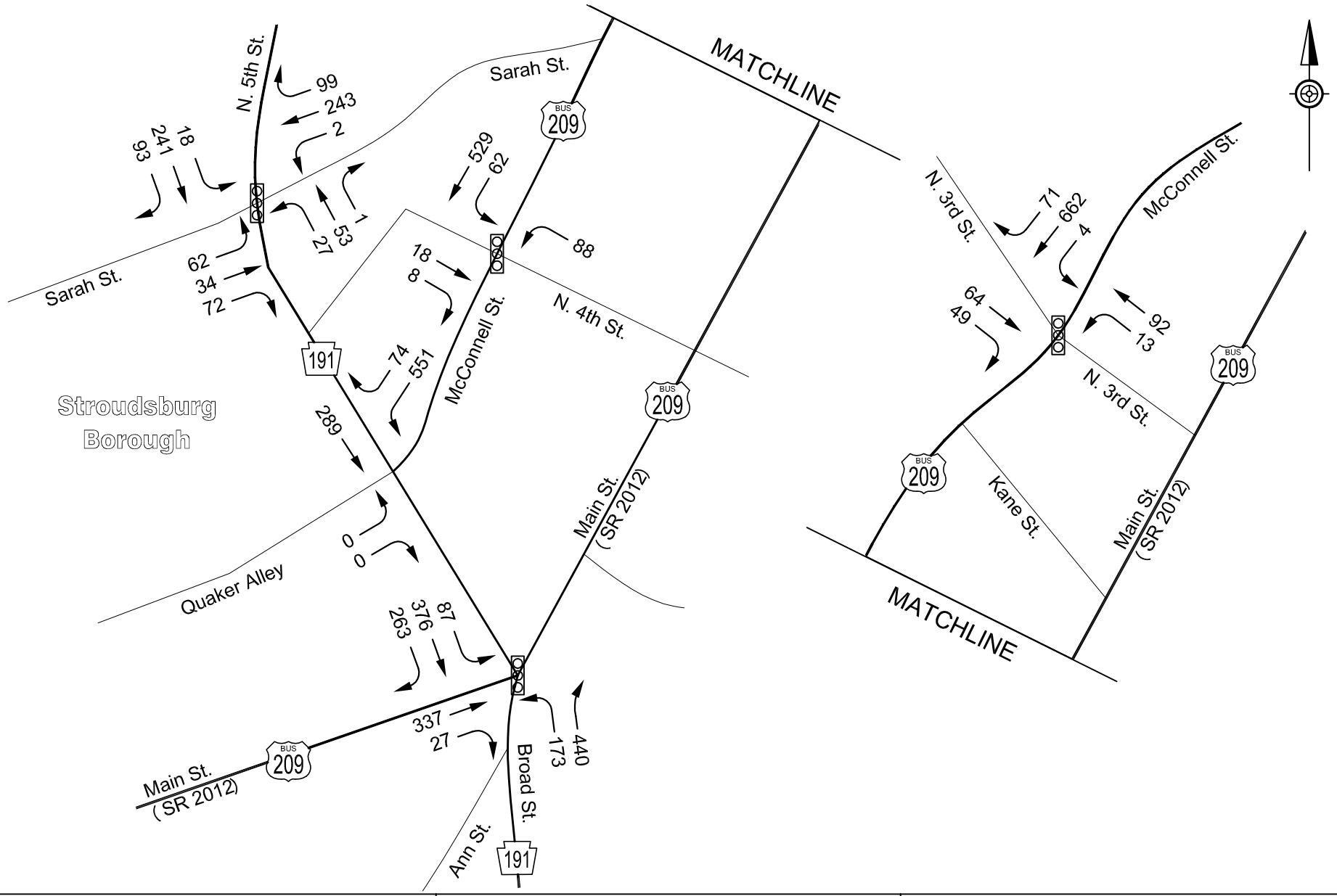
L&V Engineering, LLC PO Box 347 Honesdale, PA 18431 Project No. AECM1202	I-80 Reconstruction Monroe County	FIGURE 9 A.M. PEAK HOUR TRAFFIC VOLUMES



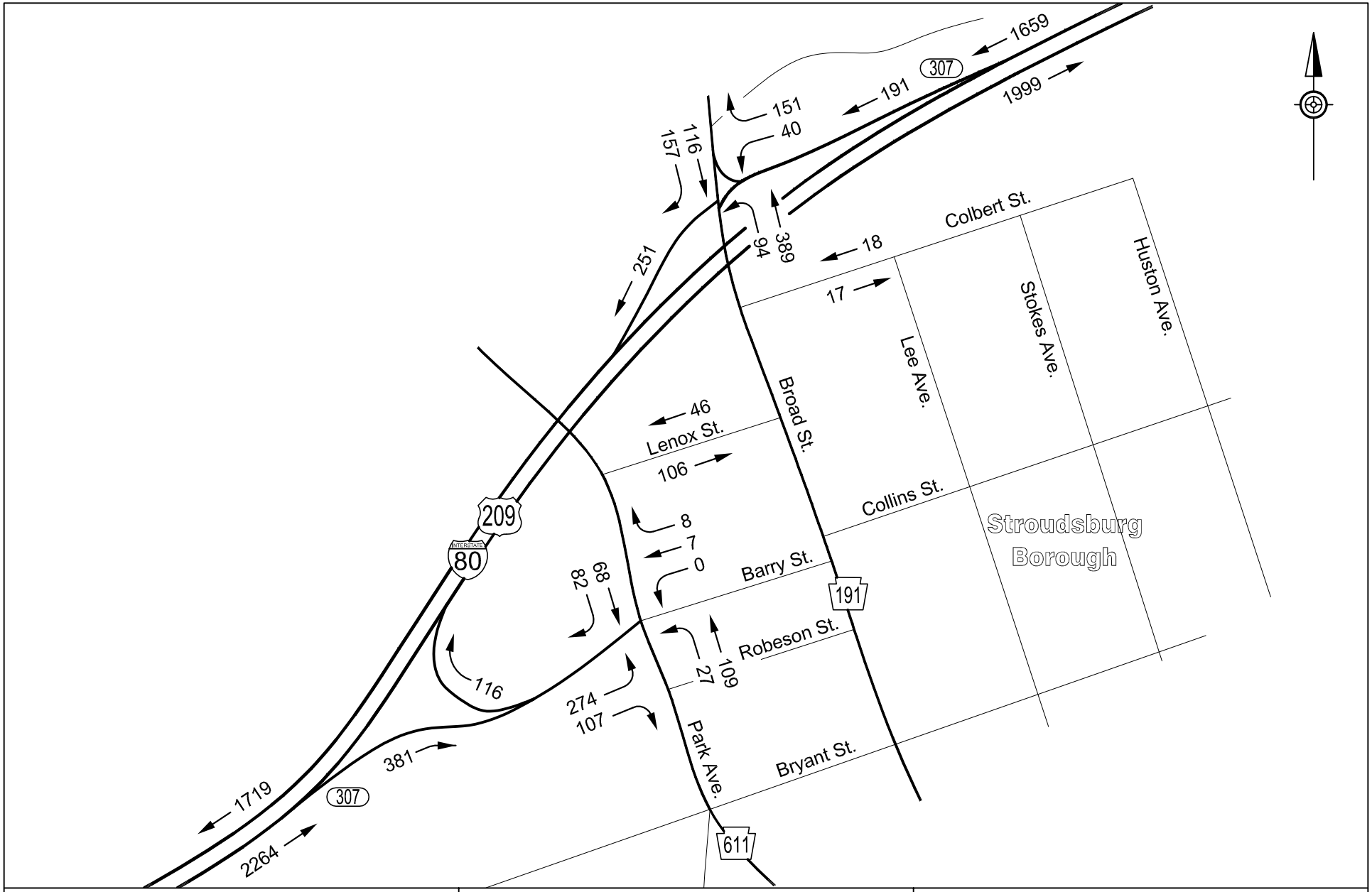
L&V Engineering, LLC PO Box 347 Honesdale, PA 18431 Project No. AECM1202	I-80 Reconstruction Monroe County	FIGURE 10 A.M. PEAK HOUR TRAFFIC VOLUMES



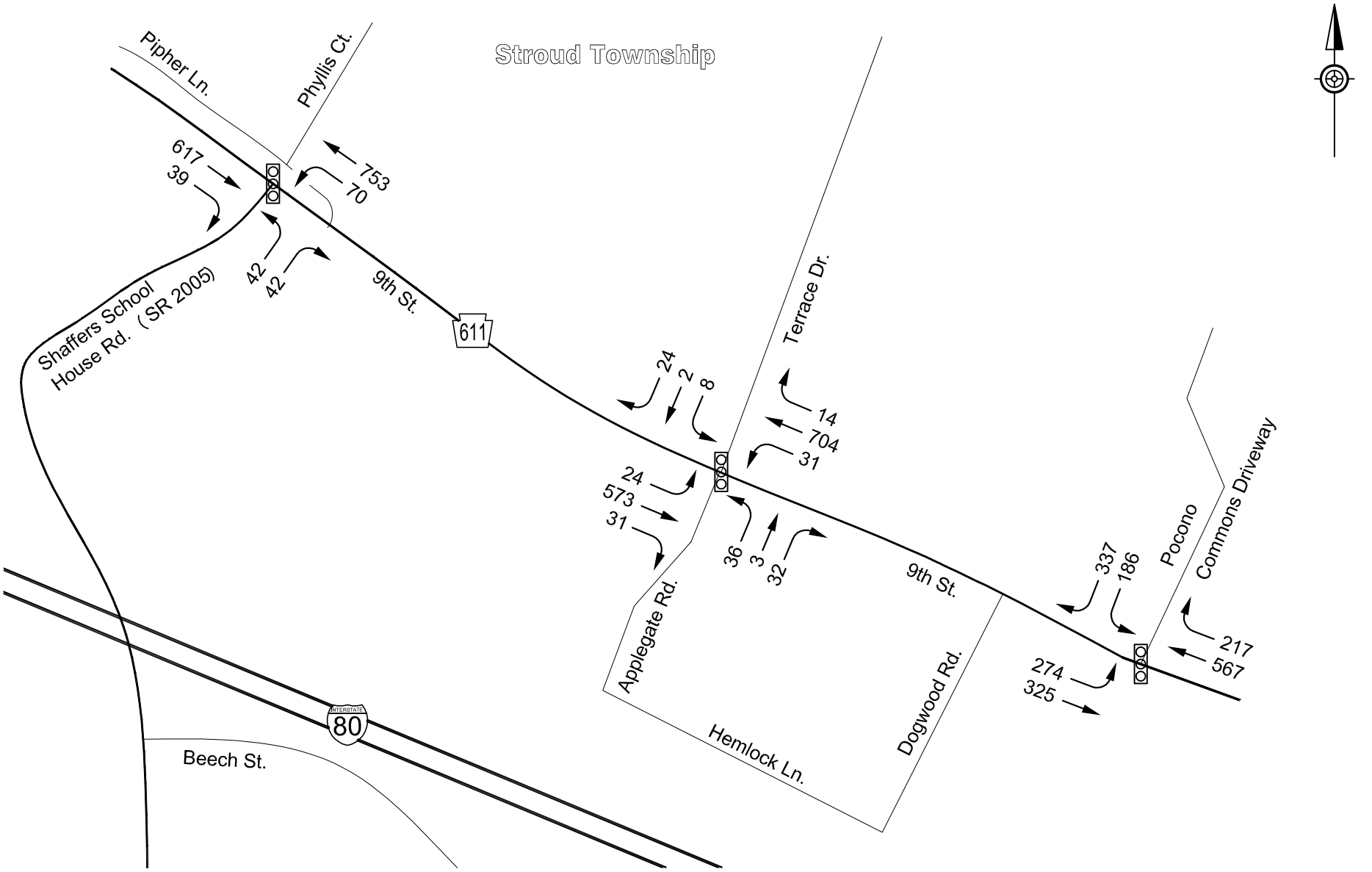
L&V Engineering, LLC PO Box 347 Honesdale, PA 18431 Project No. AECM1202	I-80 Reconstruction Monroe County	FIGURE 11 A.M. PEAK HOUR TRAFFIC VOLUMES



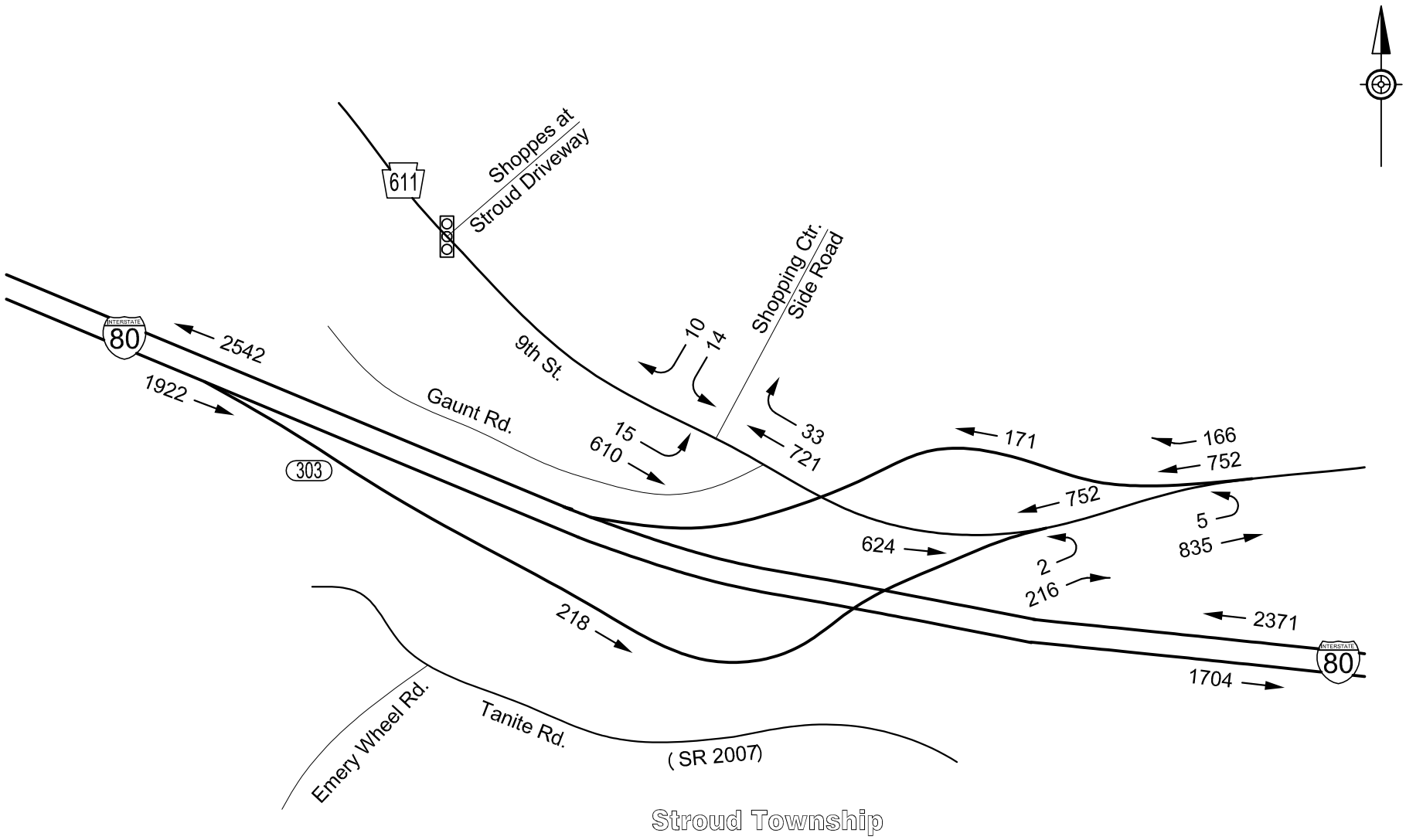
L&V Engineering, LLC PO Box 347 Honesdale, PA 18431 Project No. AECM1202	I-80 Reconstruction Monroe County	FIGURE 12 A.M. PEAK HOUR TRAFFIC VOLUMES



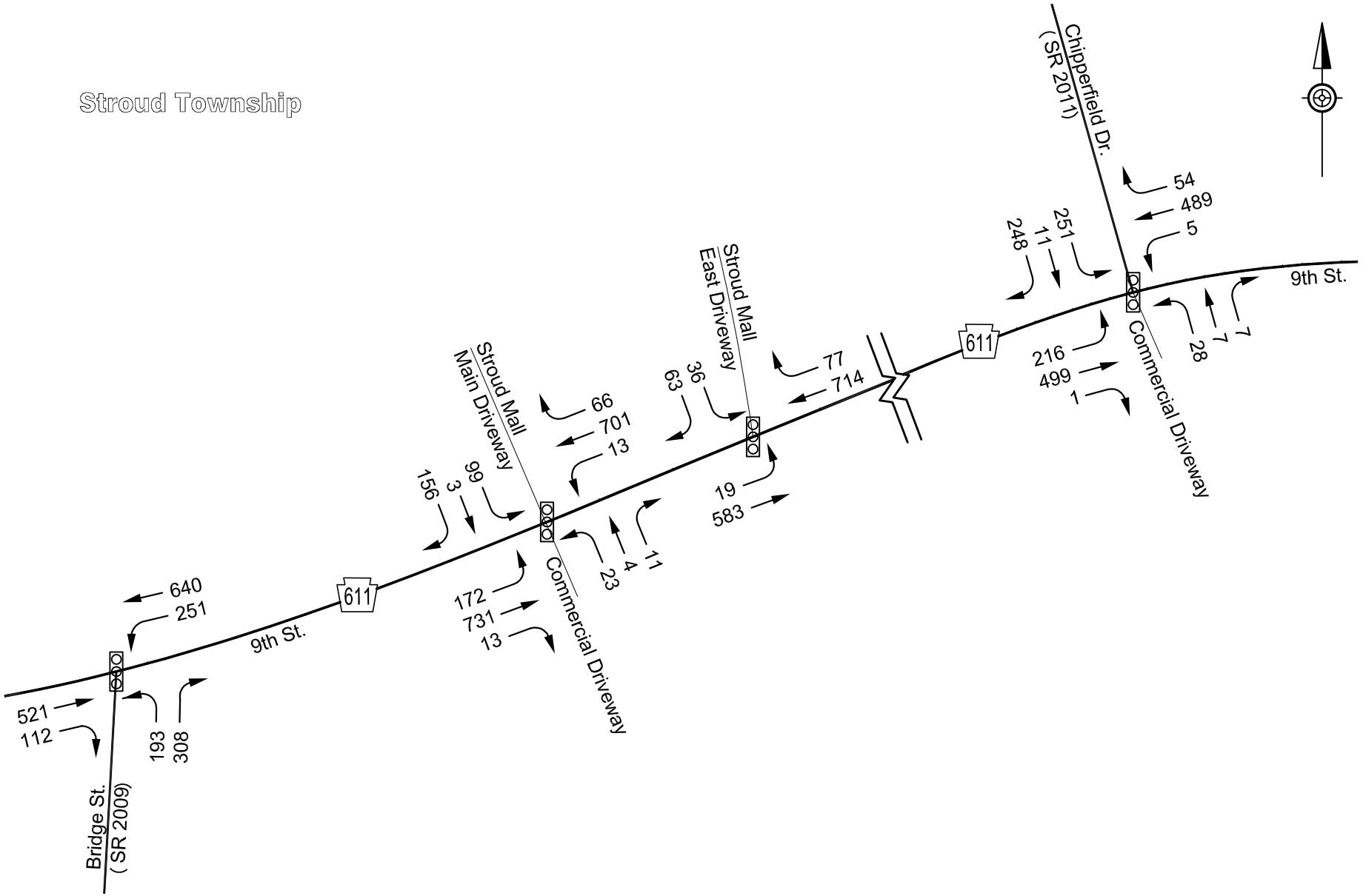
L&V Engineering, LLC PO Box 347 Honesdale, PA 18431 Project No. AECM1202	I-80 Reconstruction Monroe County	FIGURE 13 A.M. PEAK HOUR TRAFFIC VOLUMES



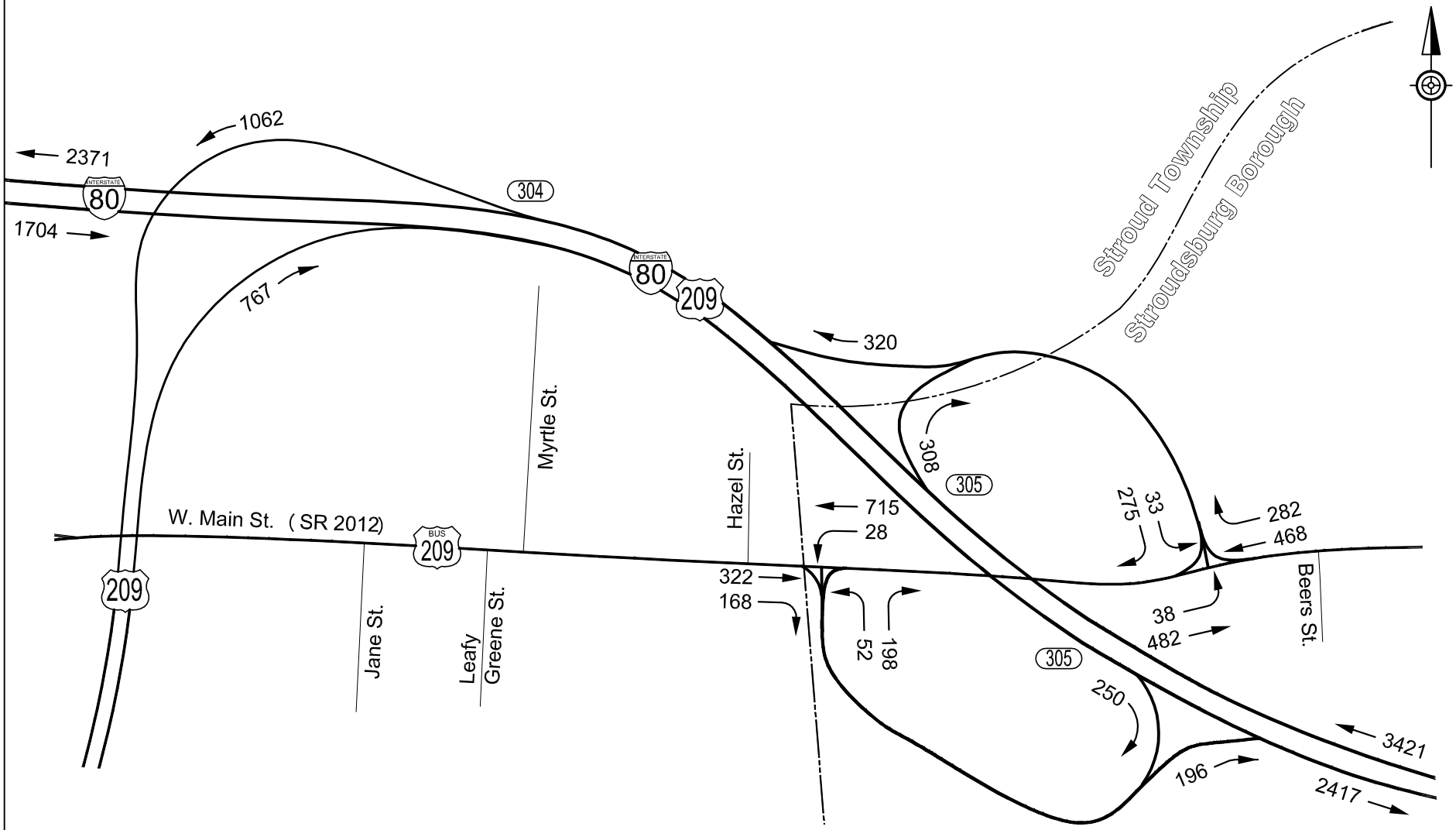
L&V Engineering, LLC PO Box 347 Honesdale, PA 18431 Project No. AECM1202	I-80 Reconstruction Monroe County	FIGURE 14 P.M. PEAK HOUR TRAFFIC VOLUMES



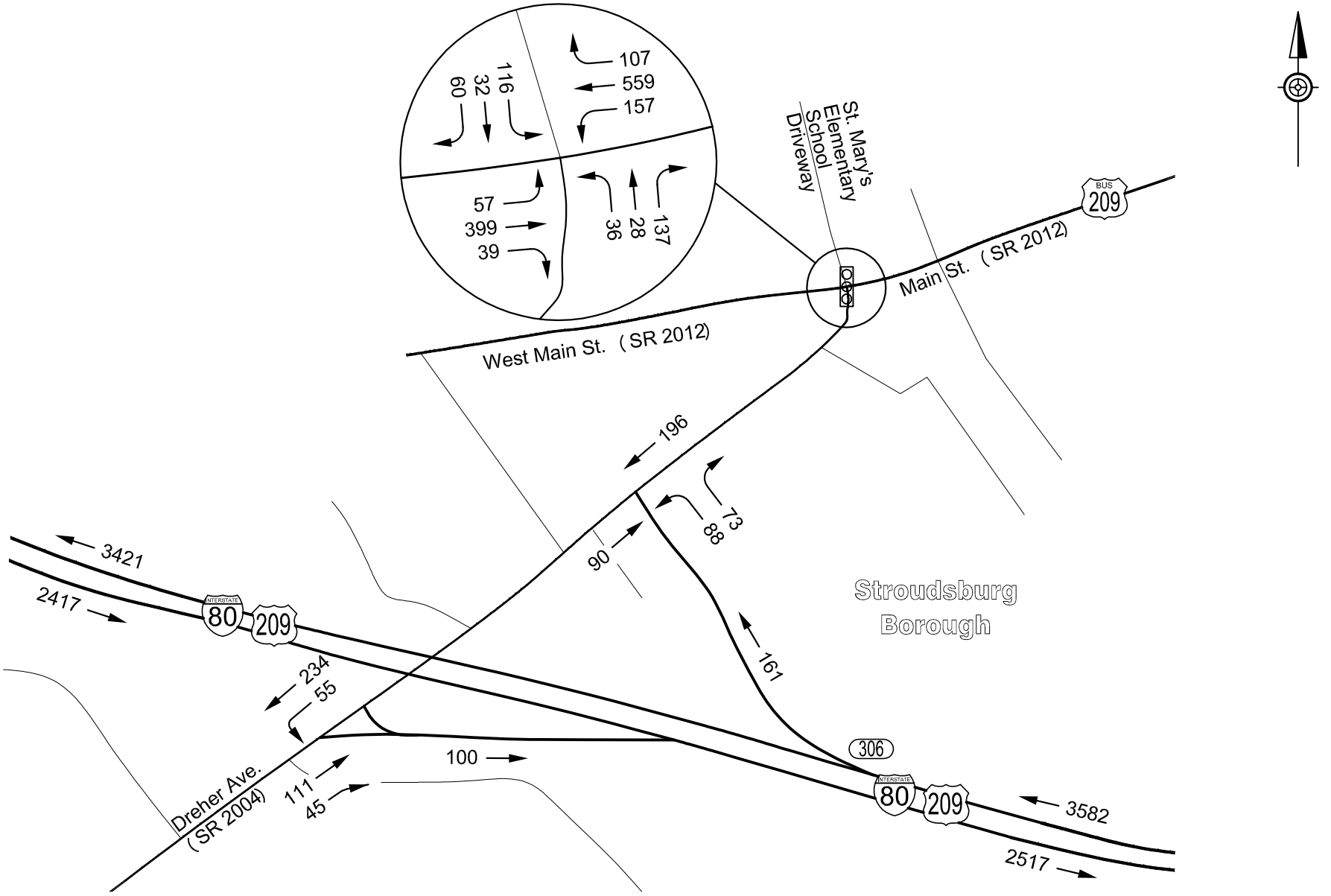
L&V Engineering, LLC PO Box 347 Honesdale, PA 18431 Project No. AECM1202	I-80 Reconstruction Monroe County	FIGURE 15 P.M. PEAK HOUR TRAFFIC VOLUMES



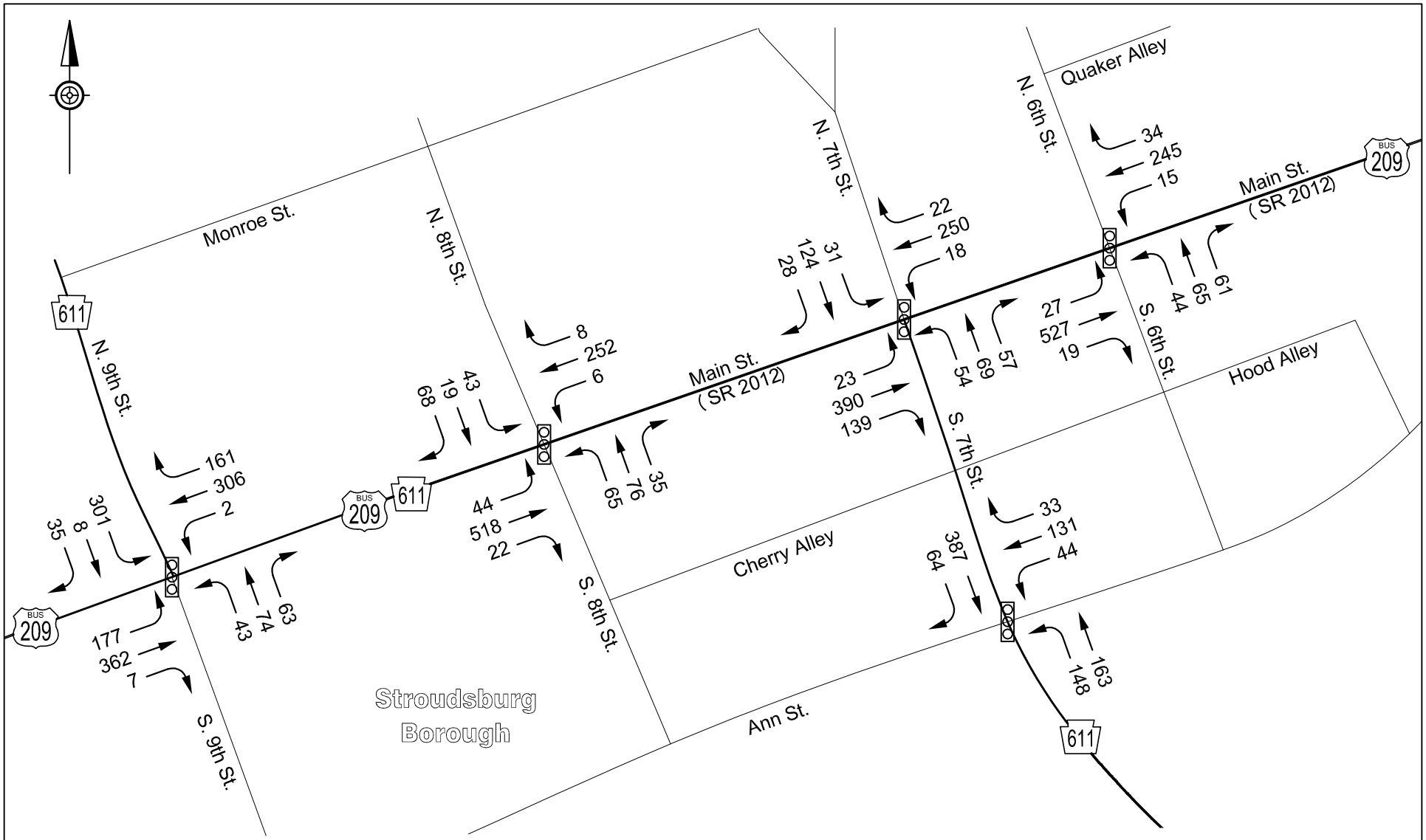
L&V Engineering, LLC PO Box 347 Honesdale, PA 18431 Project No. AECM1202	I-80 Reconstruction Monroe County	FIGURE 16 P.M. PEAK HOUR TRAFFIC VOLUMES



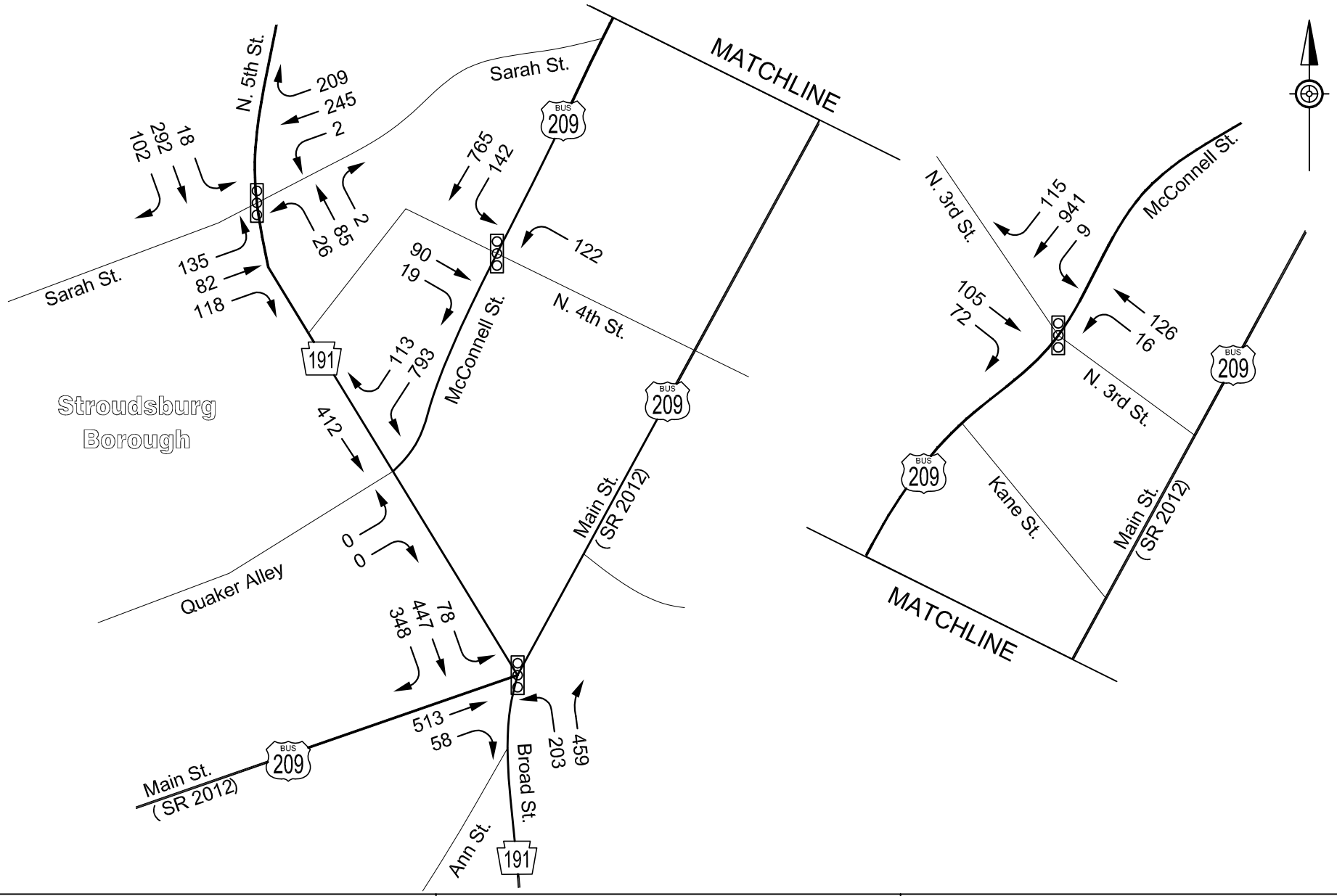
L&V Engineering, LLC PO Box 347 Honesdale, PA 18431 Project No. AECM1202	I-80 Reconstruction Monroe County	FIGURE 17 P.M. PEAK HOUR TRAFFIC VOLUMES



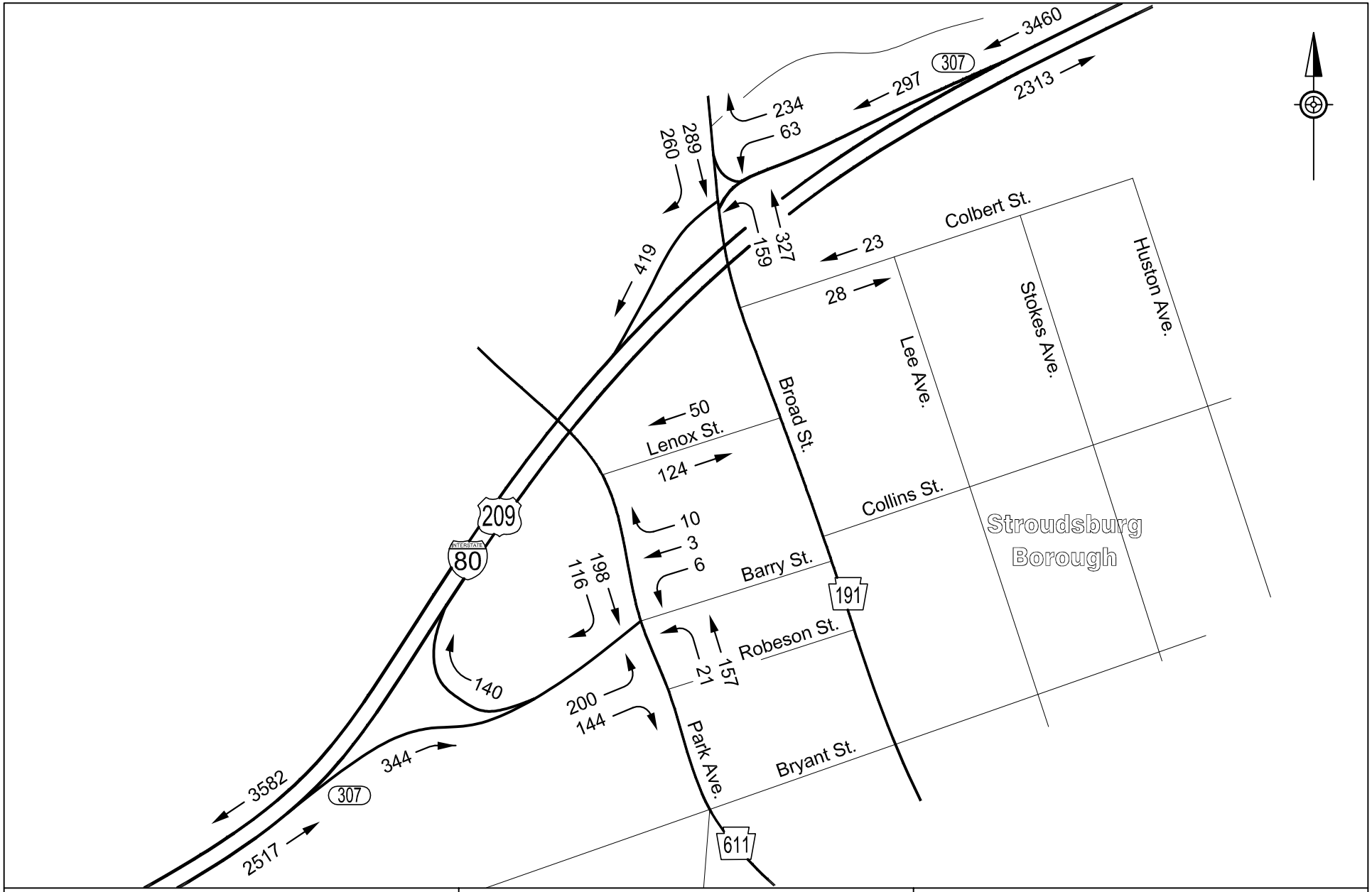
L&V Engineering, LLC PO Box 347 Honesdale, PA 18431 Project No. AECM1202	I-80 Reconstruction Monroe County	FIGURE 18 P.M. PEAK HOUR TRAFFIC VOLUMES



L&V Engineering, LLC PO Box 347 Honesdale, PA 18431 Project No. AECM1202	I-80 Reconstruction Monroe County	FIGURE 19 P.M. PEAK HOUR TRAFFIC VOLUMES



L&V Engineering, LLC PO Box 347 Honesdale, PA 18431 Project No. AECM1202	I-80 Reconstruction Monroe County	FIGURE 20 P.M. PEAK HOUR TRAFFIC VOLUMES



L&V Engineering, LLC PO Box 347 Honesdale, PA 18431 Project No. AECM1202	I-80 Reconstruction Monroe County	FIGURE 21 P.M. PEAK HOUR TRAFFIC VOLUMES

FREEWAY SEGMENT
HCS ANALYSIS

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*JMV*
Agency or Company	*L&V Engineering*
Date Performed	*6/20/2013*
Analysis Time Period	*A.M. Peak Hour*

Site Information

Highway/Direction of Travel	*I-80 Eastbound*
From/To	*Between Ints. 303 and 304*
Jurisdiction	
Analysis Year	*Existing 2013*

Project Description *Interstate 80 Reconstruction*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*1351*	veh/h	Peak-Hour Factor, PHF	*0.94*
AADT		veh/day	%Trucks and Buses, P_T	*10*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.862*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD	*1.67*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*5.0*	mph
FFS	*70.4*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*877*	pc/h/ln
S	*70.0*	mph
D = v_p / S	*12.5*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*JMV*
Agency or Company	*L&V Engineering*
Date Performed	*6/20/2013*
Analysis Time Period	*P.M. Peak Hour*

Site Information

Highway/Direction of Travel	*I-80 Eastbound*
From/To	*Between Ints. 303 and 304*
Jurisdiction	
Analysis Year	*Existing 2013*

Project Description *Interstate 80 Reconstruction*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*1704*	veh/h	Peak-Hour Factor, PHF	*0.94*
AADT		veh/day	%Trucks and Buses, P_T	*12*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.840*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD	*1.67*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*5.0*	mph
FFS	*70.4*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1135*	pc/h/ln
S	*70.0*	mph
D = v_p / S	*16.2*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*JMV*
Agency or Company	*L&V Engineering*
Date Performed	*6/20/2013*
Analysis Time Period	*A.M. Peak Hour*

Site Information

Highway/Direction of Travel	*I-80 Eastbound*
From/To	*Between Ints. 304 and 305*
Jurisdiction	
Analysis Year	*Existing 2013*

Project Description *Interstate 80 Reconstruction*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*2185*	veh/h	Peak-Hour Factor, PHF	*0.91*
AADT		veh/day	%Trucks and Buses, P_T	*10*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.862*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD	*1.67*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*5.0*	mph
FFS	*70.4*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1466*	pc/h/ln
S	*69.2*	mph
D = v_p / S	*21.2*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*JMV*
Agency or Company	*L&V Engineering*
Date Performed	*6/20/2013*
Analysis Time Period	*P.M. Peak Hour*

Site Information

Highway/Direction of Travel	*I-80 Eastbound*
From/To	*Between Ints. 304 and 305*
Jurisdiction	
Analysis Year	*Existing 2013*

Project Description *Interstate 80 Reconstruction*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*2471*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*12*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.840*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD	*1.67*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*5.0*	mph
FFS	*70.4*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1629*	pc/h/ln
S	*67.9*	mph
D = v_p / S	*24.0*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*JMV*
Agency or Company	*L&V Engineering*
Date Performed	*6/20/2013*
Analysis Time Period	*A.M. Peak Hour*

Site Information

Highway/Direction of Travel	*I-80 Eastbound*
From/To	*Between Ints. 305 and 306*
Jurisdiction	
Analysis Year	*Existing 2013*

Project Description *Interstate 80 Reconstruction*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*2148*	veh/h	Peak-Hour Factor, PHF	*0.87*
AADT		veh/day	%Trucks and Buses, P_T	*10*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.862*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD	*1.50*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*4.5*	mph
FFS	*70.9*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1507*	pc/h/ln
S	*68.9*	mph
D = v_p / S	*21.9*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*JMV*
Agency or Company	*L&V Engineering*
Date Performed	*6/20/2013*
Analysis Time Period	*P.M. Peak Hour*

Site Information

Highway/Direction of Travel	*I-80 Eastbound*
From/To	*Between Ints. 305 and 306*
Jurisdiction	
Analysis Year	*Existing 2013*

Project Description *Interstate 80 Reconstruction*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*2417*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*12*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.840*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD	*1.50*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*4.5*	mph
FFS	*70.9*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1577*	pc/h/ln
S	*68.4*	mph
D = v_p / S	*23.1*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*JMV*
Agency or Company	*L&V Engineering*
Date Performed	*6/20/2013*
Analysis Time Period	*A.M. Peak Hour*

Site Information

Highway/Direction of Travel	*I-80 Eastbound*
From/To	*Between Ints. 306 and 307*
Jurisdiction	
Analysis Year	*Existing 2013*

Project Description *Interstate 80 Reconstruction*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*2264*	veh/h	Peak-Hour Factor, PHF	*0.83*
AADT		veh/day	%Trucks and Buses, P_T	*8*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.885*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD	*1.83*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*5.3*	mph
FFS	*70.1*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1622*	pc/h/ln
S	*67.9*	mph
D = v_p / S	*23.9*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*JMV*
Agency or Company	*L&V Engineering*
Date Performed	*6/20/2013*
Analysis Time Period	*P.M. Peak Hour*

Site Information

Highway/Direction of Travel	*I-80 Eastbound*
From/To	*Between Ints. 306 and 307*
Jurisdiction	
Analysis Year	*Existing 2013*

Project Description *Interstate 80 Reconstruction*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*2517*	veh/h	Peak-Hour Factor, PHF	*0.97*
AADT		veh/day	%Trucks and Buses, P_T	*10*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.862*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD	*1.83*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*5.3*	mph
FFS	*70.1*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1584*	pc/h/ln
S	*68.3*	mph
D = v_p / S	*23.2*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*JMV*
Agency or Company	*L&V Engineering*
Date Performed	*6/20/2013*
Analysis Time Period	*A.M. Peak Hour*

Site Information

Highway/Direction of Travel	*I-80 Westbound*
From/To	*Between Ints. 303 and 304*
Jurisdiction	
Analysis Year	*Existing 2013*

Project Description *Interstate 80 Reconstruction*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*1128*	veh/h	Peak-Hour Factor, PHF	*0.97*
AADT		veh/day	%Trucks and Buses, P_T	*12*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.840*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD	*1.67*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*5.0*	mph
FFS	*70.4*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*728*	pc/h/ln
S	*70.0*	mph
D = v_p / S	*10.4*	pc/mi/ln
LOS	*A*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*JMV*
Agency or Company	*L&V Engineering*
Date Performed	*6/20/2013*
Analysis Time Period	*P.M. Peak Hour*

Site Information

Highway/Direction of Travel	*I-80 Westbound*
From/To	*Between Ints. 303 and 304*
Jurisdiction	
Analysis Year	*Existing 2013*

Project Description *Interstate 80 Reconstruction*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*2371*	veh/h	Peak-Hour Factor, PHF	*0.97*
AADT		veh/day	%Trucks and Buses, P_T	*13*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.830*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD	*1.67*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*5.0*	mph
FFS	*70.4*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1550*	pc/h/ln
S	*68.6*	mph
D = v_p / S	*22.6*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*JMV*
Agency or Company	*L&V Engineering*
Date Performed	*6/20/2013*
Analysis Time Period	*A.M. Peak Hour*

Site Information

Highway/Direction of Travel	*I-80 Westbound*
From/To	*Between Ints. 304 and 305*
Jurisdiction	
Analysis Year	*Existing 2013*

Project Description *Interstate 80 Reconstruction*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*1671*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*12*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.840*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD	*1.67*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*5.0*	mph
FFS	*70.4*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1102*	pc/h/ln
S	*70.0*	mph
D = v_p / S	*15.7*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*JMV*
Agency or Company	*L&V Engineering*
Date Performed	*6/20/2013*
Analysis Time Period	*P.M. Peak Hour*

Site Information

Highway/Direction of Travel	*I-80 Westbound*
From/To	*Between Ints. 304 and 305*
Jurisdiction	
Analysis Year	*Existing 2013*

Project Description *Interstate 80 Reconstruction*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3433*	veh/h	Peak-Hour Factor, PHF	*0.97*
AADT		veh/day	%Trucks and Buses, P_T	*13*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.830*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD	*1.67*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*5.0*	mph
FFS	*70.4*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2245*	pc/h/ln
S	*57.3*	mph
D = v_p / S	*39.2*	pc/mi/ln
LOS	*E*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*JMV*
Agency or Company	*L&V Engineering*
Date Performed	*6/20/2013*
Analysis Time Period	*A.M. Peak Hour*

Site Information

Highway/Direction of Travel	*I-80 Westbound*
From/To	*Between Ints. 305 and 306*
Jurisdiction	
Analysis Year	*Existing 2013*

Project Description *Interstate 80 Reconstruction*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*1648*	veh/h	Peak-Hour Factor, PHF	*0.93*
AADT		veh/day	%Trucks and Buses, P_T	*12*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.840*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD	*1.50*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*4.5*	mph
FFS	*70.9*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1110*	pc/h/ln
S	*70.0*	mph
D = v_p / S	*15.9*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*JMV*
Agency or Company	*L&V Engineering*
Date Performed	*6/20/2013*
Analysis Time Period	*P.M. Peak Hour*

Site Information

Highway/Direction of Travel	*I-80 Westbound*
From/To	*Between Ints. 305 and 306*
Jurisdiction	
Analysis Year	*Existing 2013*

Project Description *Interstate 80 Reconstruction*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3421*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*13*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.830*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD	*1.50*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*4.5*	mph
FFS	*70.9*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2260*	pc/h/ln
S	*57.0*	mph
D = v_p / S	*39.7*	pc/mi/ln
LOS	*E*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*JMV*
Agency or Company	*L&V Engineering*
Date Performed	*6/20/2013*
Analysis Time Period	*A.M. Peak Hour*

Site Information

Highway/Direction of Travel	*I-80 Westbound*
From/To	*Between Ints. 306 and 307*
Jurisdiction	
Analysis Year	*Existing 2013*

Project Description *Interstate 80 Reconstruction*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*1719*	veh/h	Peak-Hour Factor, PHF	*0.91*
AADT		veh/day	%Trucks and Buses, P_T	*12*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.840*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD	*1.83*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*5.3*	mph
FFS	*70.1*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1183*	pc/h/ln
S	*70.0*	mph
D = v_p / S	*16.9*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*JMV*
Agency or Company	*L&V Engineering*
Date Performed	*6/20/2013*
Analysis Time Period	*P.M. Peak Hour*

Site Information

Highway/Direction of Travel	*I-80 Westbound*
From/To	*Between Ints. 306 and 307*
Jurisdiction	
Analysis Year	*Existing 2013*

Project Description *Interstate 80 Reconstruction*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3582*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*12*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.840*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD	*1.83*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*5.3*	mph
FFS	*70.1*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2337*	pc/h/ln
S	*55.0*	mph
D = v_p / S	*42.5*	pc/mi/ln
LOS	*E*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

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RAMP JUNCTION
HCS ANALYSIS

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JMV	Freeway/Dir of Travel	I-80 Eastbound
Agency or Company	L&V Engineering	Junction	Int. 304 from Route 209
Date Performed	6/25/2013	Jurisdiction	
Analysis Time Period	A.M. Peak Hour	Analysis Year	Existing 2013

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N: 2	☑ Yes ☐ On
☑ No ☐ Off	Ramp Number of Lanes, N: 1	☐ No ☑ Off
L_{up} = ft	Acceleration Lane Length, L_A: 800	L_{down} = 1360 ft
V_u = veh/h	Deceleration Lane Length L_D:	V_D = 209 veh/h
	Freeway Volume, V_F: 1351	
	Ramp Volume, V_R: 834	
	Freeway Free-Flow Speed, S_{FF}: 70.0	
	Ramp Free-Flow Speed, S_{FR}: 35.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	1351	0.94	Rolling	10	1	0.862	0.95	1755
Ramp	834	0.94	Rolling	5	1	0.922	0.95	1013
UpStream								
DownStream	209	0.82	Rolling	2	0	0.971	0.95	276

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 1755 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	2768	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2768	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 21.6 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

M_S = 0.327 (Exibit 13-11)

S_R = 60.8 mph (Exhibit 13-11)

S_0 = N/A mph (Exhibit 13-11)

S = 60.8 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JMV	Freeway/Dir of Travel	I-80 Eastbound
Agency or Company	L&V Engineering	Junction	Int. 304 from Route 209
Date Performed	6/25/2013	Jurisdiction	
Analysis Time Period	P.M. Peak Hour	Analysis Year	Existing 2013

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	800
Deceleration Lane Length L_D	
Freeway Volume, V_F	1704
Ramp Volume, V_R	767
Freeway Free-Flow Speed, S_{FF}	70.0
Ramp Free-Flow Speed, S_{FR}	35.0

Downstream Adj Ramp

☑ Yes ☐ On

☐ No ☑ Off

L_{down} = 1360 ft

V_D = 250 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	1704	0.94	Rolling	12	1	0.840	0.95	2271
Ramp	767	0.94	Rolling	2	1	0.962	0.95	893
UpStream								
DownStream	250	0.86	Rolling	3	0	0.957	0.95	320

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 2271 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3164	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3164	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 24.7 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

M_S = 0.357 (Exibit 13-11)

S_R = 60.0 mph (Exhibit 13-11)

S_0 = N/A mph (Exhibit 13-11)

S = 60.0 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JMV	Freeway/Dir of Travel	I-80 Eastbound
Agency or Company	L&V Engineering	Junction	Int. 305 from W. Main Street
Date Performed	6/25/2013	Jurisdiction	
Analysis Time Period	A.M. Peak Hour	Analysis Year	Existing 2013

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp

☑ Yes ☐ On

☐ No ☑ Off

L_{up} = 800 ft

V_u = 209 veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	170
Deceleration Lane Length L_D	
Freeway Volume, V_F	1976
Ramp Volume, V_R	172
Freeway Free-Flow Speed, S_{FF}	70.0
Ramp Free-Flow Speed, S_{FR}	35.0

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	1976	0.91	Rolling	10	1	0.862	0.95	2651
Ramp	172	0.74	Rolling	0	0	1.000	0.95	245
UpStream	209	0.82	Rolling	2	0	0.971	0.95	276
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 2651 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	2896	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2896	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 26.9 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

M_S = 0.380 (Exibit 13-11)

S_R = 59.4 mph (Exhibit 13-11)

S_0 = N/A mph (Exhibit 13-11)

S = 59.4 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JMV	Freeway/Dir of Travel	I-80 Eastbound
Agency or Company	L&V Engineering	Junction	Int. 305 from W. Main Street
Date Performed	6/25/2013	Jurisdiction	
Analysis Time Period	P.M. Peak Hour	Analysis Year	Existing 2013

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☑ Yes ☐ On	Freeway Number of Lanes, N: 2	☐ Yes ☐ On
☐ No ☑ Off	Ramp Number of Lanes, N: 1	☑ No ☐ Off
L_{up} = 800 ft	Acceleration Lane Length, L_A: 170	L_{down} = ft
V_u = 250 veh/h	Deceleration Lane Length L_D:	V_D = veh/h
	Freeway Volume, V_F: 2221	
	Ramp Volume, V_R: 196	
	Freeway Free-Flow Speed, S_{FF}: 70.0	
	Ramp Free-Flow Speed, S_{FR}: 35.0	

Conversion to pc/h Under Base Conditions

	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2221	0.95	Rolling	12	1	0.840	0.95	2929
Ramp	196	0.96	Rolling	0	0	1.000	0.95	215
UpStream	250	0.86	Rolling	3	0	0.957	0.95	320
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 2929 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3144	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3144	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 28.8 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

M_S = 0.400 (Exibit 13-11)

S_R = 58.8 mph (Exhibit 13-11)

S_0 = N/A mph (Exhibit 13-11)

S = 58.8 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JMV	Freeway/Dir of Travel	I-80 Eastbound
Agency or Company	L&V Engineering	Junction	Int. 306 from Dreher Avenue
Date Performed	6/25/2013	Jurisdiction	
Analysis Time Period	A.M. Peak Hour	Analysis Year	Existing 2013

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	2	Downstream Adj Ramp	
☑ Yes	☑ On	Ramp Number of Lanes, N	1	☐ Yes	☐ On
☐ No	☐ Off	Acceleration Lane Length, L_A	320	☑ No	☐ Off
L_{up} =	2100 ft	Deceleration Lane Length L_D		L_{down} =	ft
V_u =	172 veh/h	Freeway Volume, V_F	2148	V_D =	veh/h
		Ramp Volume, V_R	116		
		Freeway Free-Flow Speed, S_{FF}	70.0		
		Ramp Free-Flow Speed, S_{FR}	35.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2148	0.87	Rolling	10	1	0.862	0.95	3015
Ramp	116	0.67	Rolling	1	0	0.985	0.95	185
UpStream	172	0.74	Rolling	0	0	1.000	0.95	245
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 3015 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3200	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3200	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 28.3 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

M_S = 0.394 (Exibit 13-11)

S_R = 59.0 mph (Exhibit 13-11)

S_0 = N/A mph (Exhibit 13-11)

S = 59.0 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JMV	Freeway/Dir of Travel	I-80 Eastbound
Agency or Company	L&V Engineering	Junction	Int. 306 from Dreher Avenue
Date Performed	6/25/2013	Jurisdiction	
Analysis Time Period	P.M. Peak Hour	Analysis Year	Existing 2013

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp
- ☑ Yes ☑ On
- ☐ No ☐ Off
- L_{up} = 2100 ft
- V_u = 196 veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	320
Deceleration Lane Length L_D	
Freeway Volume, V_F	2417
Ramp Volume, V_R	100
Freeway Free-Flow Speed, S_{FF}	70.0
Ramp Free-Flow Speed, S_{FR}	35.0

Downstream Adj Ramp
- ☐ Yes ☐ On
- ☑ No ☐ Off
- L_{down} = ft
- V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2417	0.96	Rolling	12	1	0.840	0.95	3154
Ramp	100	0.81	Rolling	1	0	0.985	0.95	132
UpStream	196	0.96	Rolling	0	0	1.000	0.95	215
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

- L_{EQ} = (Equation 13-6 or 13-7)
- P_{FM} = 1.000 using Equation (Exhibit 13-6)
- V_{12} = 3154 pc/h
- V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)
- Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No
- Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No
- If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3286	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3286	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

- D_R = 29.0 (pc/mi/ln)
- LOS = D (Exhibit 13-2)

Speed Determination

- M_S = 0.403 (Exibit 13-11)
- S_R = 58.7 mph (Exhibit 13-11)
- S_0 = N/A mph (Exhibit 13-11)
- S = 58.7 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

- L_{EQ} = (Equation 13-12 or 13-13)
- P_{FD} = using Equation (Exhibit 13-7)
- V_{12} = pc/h
- V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)
- Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
- Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
- If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

- D_R = (pc/mi/ln)
- LOS = (Exhibit 13-2)

Speed Determination

- D_s = (Exhibit 13-12)
- S_R = mph (Exhibit 13-12)
- S_0 = mph (Exhibit 13-12)
- S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JMV	Freeway/Dir of Travel	I-80 Eastbound
Agency or Company	L&V Engineering	Junction	Int. 307 from Park Avenue
Date Performed	6/25/2013	Jurisdiction	
Analysis Time Period	A.M. Peak Hour	Analysis Year	Existing 2013

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp
- ☑ Yes ☐ On
- ☐ No ☑ Off
- L_{up} = 950 ft
- V_u = 381 veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	240
Deceleration Lane Length L_D	
Freeway Volume, V_F	1883
Ramp Volume, V_R	116
Freeway Free-Flow Speed, S_{FF}	70.0
Ramp Free-Flow Speed, S_{FR}	35.0

Downstream Adj Ramp
- ☐ Yes ☐ On
- ☑ No ☐ Off
- L_{down} = ft
- V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	1883	0.83	Rolling	8	1	0.885	0.95	2699
Ramp	116	0.85	Rolling	4	0	0.943	0.95	152
UpStream	381	0.82	Rolling	6	0	0.917	0.95	533
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

- L_{EQ} = (Equation 13-6 or 13-7)
- P_{FM} = 1.000 using Equation (Exhibit 13-6)
- V_{12} = 2699 pc/h
- V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)
- Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No
- Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No
- If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	2851	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2851	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

- D_R = 26.1 (pc/mi/ln)
- LOS = C (Exhibit 13-2)

Speed Determination

- M_S = 0.372 (Exibit 13-11)
- S_R = 59.6 mph (Exhibit 13-11)
- S_0 = N/A mph (Exhibit 13-11)
- S = 59.6 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

- L_{EQ} = (Equation 13-12 or 13-13)
- P_{FD} = using Equation (Exhibit 13-7)
- V_{12} = pc/h
- V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)
- Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
- Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
- If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

- D_R = (pc/mi/ln)
- LOS = (Exhibit 13-2)

Speed Determination

- D_s = (Exhibit 13-12)
- S_R = mph (Exhibit 13-12)
- S_0 = mph (Exhibit 13-12)
- S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JMV	Freeway/Dir of Travel	I-80 Eastbound
Agency or Company	L&V Engineering	Junction	Int. 307 from Park Avenue
Date Performed	6/25/2013	Jurisdiction	
Analysis Time Period	P.M. Peak Hour	Analysis Year	Existing 2013

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp

☑ Yes ☐ On

☐ No ☑ Off

L_{up} = 950 ft

V_u = 344 veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	240
Deceleration Lane Length L_D	
Freeway Volume, V_F	2173
Ramp Volume, V_R	140
Freeway Free-Flow Speed, S_{FF}	70.0
Ramp Free-Flow Speed, S_{FR}	35.0

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2173	0.97	Rolling	10	1	0.862	0.95	2735
Ramp	140	0.63	Rolling	1	0	0.985	0.95	237
UpStream	344	0.84	Rolling	2	0	0.971	0.95	444
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 2735 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	2972	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2972	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 27.0 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

M_S = 0.380 (Exibit 13-11)

S_R = 59.3 mph (Exhibit 13-11)

S_0 = N/A mph (Exhibit 13-11)

S = 59.3 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JMV	Freeway/Dir of Travel	I-80 Westbound
Agency or Company	L&V Engineering	Junction	Int. 303 from Route 611
Date Performed	6/25/2013	Jurisdiction	
Analysis Time Period	A.M. Peak Hour	Analysis Year	Existing 2013

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp

☑ Yes ☐ On

☐ No ☑ Off

L_{up} = 4630 ft

V_u = 543 veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	1080
Deceleration Lane Length L_D	
Freeway Volume, V_F	1128
Ramp Volume, V_R	92
Freeway Free-Flow Speed, S_{FF}	70.0
Ramp Free-Flow Speed, S_{FR}	35.0

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	1128	0.97	Rolling	12	1	0.840	0.95	1457
Ramp	92	0.74	Rolling	2	0	0.971	0.95	135
UpStream	543	0.94	Rolling	8	1	0.885	0.95	687
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 1457 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	1592	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	1592	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 11.1 (pc/mi/ln)

LOS = B (Exhibit 13-2)

Speed Determination

M_S = 0.265 (Exibit 13-11)

S_R = 62.6 mph (Exhibit 13-11)

S_0 = N/A mph (Exhibit 13-11)

S = 62.6 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JMV	Freeway/Dir of Travel	I-80 Westbound
Agency or Company	L&V Engineering	Junction	Int. 303 from Route 611
Date Performed	6/25/2013	Jurisdiction	
Analysis Time Period	P.M. Peak Hour	Analysis Year	Existing 2013

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp

☑ Yes ☐ On

☐ No ☑ Off

L_{up} = 4630 ft

V_u = 1062 veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	1080
Deceleration Lane Length L_D	
Freeway Volume, V_F	2371
Ramp Volume, V_R	171
Freeway Free-Flow Speed, S_{FF}	70.0
Ramp Free-Flow Speed, S_{FR}	35.0

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2371	0.97	Rolling	13	1	0.830	0.95	3100
Ramp	171	0.87	Rolling	1	0	0.985	0.95	210
UpStream	1062	0.94	Rolling	2	1	0.962	0.95	1237
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 3100 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3310	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3310	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 24.4 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

M_S = 0.352 (Exibit 13-11)

S_R = 60.1 mph (Exhibit 13-11)

S_0 = N/A mph (Exhibit 13-11)

S = 60.1 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JMV	Freeway/Dir of Travel	I-80 Westbound
Agency or Company	L&V Engineering	Junction	Int. 307 from Broad Street
Date Performed	6/25/2013	Jurisdiction	
Analysis Time Period	A.M. Peak Hour	Analysis Year	Existing 2013

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp

☑ Yes ☐ On

☐ No ☑ Off

L_{up} = 1600 ft

V_u = 191 veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	180
Deceleration Lane Length L_D	
Freeway Volume, V_F	1468
Ramp Volume, V_R	251
Freeway Free-Flow Speed, S_{FF}	70.0
Ramp Free-Flow Speed, S_{FR}	35.0

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	1468	0.91	Rolling	12	1	0.840	0.95	2021
Ramp	251	0.91	Rolling	6	0	0.917	0.95	316
UpStream	191	0.90	Rolling	3	0	0.957	0.95	233
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 2021 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	2337	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2337	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 22.4 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

M_S = 0.349 (Exibit 13-11)

S_R = 60.2 mph (Exhibit 13-11)

S_0 = N/A mph (Exhibit 13-11)

S = 60.2 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JMV	Freeway/Dir of Travel	I-80 Westbound
Agency or Company	L&V Engineering	Junction	Int. 307 from Broad Street
Date Performed	6/25/2013	Jurisdiction	
Analysis Time Period	P.M. Peak Hour	Analysis Year	Existing 2013

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp

☑ Yes ☐ On

☐ No ☑ Off

L_{up} = 1600 ft

V_u = 297 veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	180
Deceleration Lane Length L_D	
Freeway Volume, V_F	3163
Ramp Volume, V_R	419
Freeway Free-Flow Speed, S_{FF}	70.0
Ramp Free-Flow Speed, S_{FR}	35.0

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3163	0.96	Rolling	12	1	0.840	0.95	4127
Ramp	419	0.89	Rolling	1	0	0.985	0.95	503
UpStream	297	0.88	Rolling	1	0	0.985	0.95	361
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 4127 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4630	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	4630	Exhibit 13-8	4600:All	Yes

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 40.2 (pc/mi/ln)

LOS = E (Exhibit 13-2)

Speed Determination

M_S = 0.708 (Exibit 13-11)

S_R = 50.2 mph (Exhibit 13-11)

S_0 = N/A mph (Exhibit 13-11)

S = 50.2 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R = mph (Exhibit 13-12)

S_0 = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JMV	Freeway/Dir of Travel	I-80 Eastbound
Agency or Company	L&V Engineering	Junction	Int. 303 to Route 611
Date Performed	6/25/2013	Jurisdiction	
Analysis Time Period	A.M. Peak Hour	Analysis Year	Existing 2013

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N: 2	☑ Yes ☑ On
☑ No ☐ Off	Ramp Number of Lanes, N: 1	☐ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A:	L_{down} = 5500 ft
V_u = veh/h	Deceleration Lane Length L_D: 700	V_D = 834 veh/h
	Freeway Volume, V_F: 1516	
	Ramp Volume, V_R: 165	
	Freeway Free-Flow Speed, S_{FF}: 70.0	
	Ramp Free-Flow Speed, S_{FR}: 35.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	1516	0.94	Rolling	10	1	0.862	0.95	1969
Ramp	165	0.72	Rolling	1	0	0.985	0.95	245
UpStream								
DownStream	834	0.94	Rolling	5	1	0.922	0.95	1013

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R = mph (Exhibit 13-11)

S_0 = mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 1969 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	1969	Exhibit 13-8	4800	No
$V_{FO} = V_F - V_R$	1724	Exhibit 13-8	4800	No
V_R	245	Exhibit 13-10	2000	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	1969	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 14.9 (pc/mi/ln)

LOS = B (Exhibit 13-2)

Speed Determination

D_s = 0.450 (Exhibit 13-12)

S_R = 57.4 mph (Exhibit 13-12)

S_0 = N/A mph (Exhibit 13-12)

S = 57.4 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JMV	Freeway/Dir of Travel	I-80 Eastbound
Agency or Company	L&V Engineering	Junction	Int. 303 to Route 611
Date Performed	6/25/2013	Jurisdiction	
Analysis Time Period	P.M. Peak Hour	Analysis Year	Existing 2013

Project Description Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N: 2	☑ Yes ☑ On
☑ No ☐ Off	Ramp Number of Lanes, N: 1	☐ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A:	L_{down} = 5500 ft
V_u = veh/h	Deceleration Lane Length L_D: 700	V_D = 767 veh/h
	Freeway Volume, V_F: 1922	
	Ramp Volume, V_R: 218	
	Freeway Free-Flow Speed, S_{FF}: 70.0	
	Ramp Free-Flow Speed, S_{FR}: 35.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	1922	0.94	Rolling	12	1	0.840	0.95	2561
Ramp	218	0.97	Rolling	1	0	0.985	0.95	240
UpStream								
DownStream	767	0.94	Rolling	2	1	0.962	0.95	893

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 2561 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	2561	Exhibit 13-8	4800	No
$V_{FO} = V_F - V_R$	2321	Exhibit 13-8	4800	No
V_R	240	Exhibit 13-10	2000	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	2561	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 20.0 (pc/mi/ln)

LOS = B (Exhibit 13-2)

Speed Determination

D_s = 0.450 (Exhibit 13-12)

S_R= 57.4 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 57.4 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JMV	Freeway/Dir of Travel	I-80 Eastbound
Agency or Company	L&V Engineering	Junction	Int. 305 to W. Main Street
Date Performed	6/25/2013	Jurisdiction	
Analysis Time Period	A.M. Peak Hour	Analysis Year	Existing 2013

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N: 2	☑ Yes ☑ On
☑ No ☐ Off	Ramp Number of Lanes, N: 1	☐ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A:	L_{down} = 700 ft
V_u = veh/h	Deceleration Lane Length L_D: 160	V_D = 172 veh/h
	Freeway Volume, V_F: 2185	
	Ramp Volume, V_R: 209	
	Freeway Free-Flow Speed, S_{FF}: 70.0	
	Ramp Free-Flow Speed, S_{FR}: 35.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2185	0.91	Rolling	10	1	0.862	0.95	2932
Ramp	209	0.82	Rolling	2	0	0.971	0.95	276
UpStream								
DownStream	172	0.74	Rolling	0	0	1.000	0.95	245

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R = mph (Exhibit 13-11)

S_0 = mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 2932 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	2932	Exhibit 13-8	4800	No
$V_{FO} = V_F - V_R$	2656	Exhibit 13-8	4800	No
V_R	276	Exhibit 13-10	2000	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	2932	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 28.0 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

D_s = 0.453 (Exhibit 13-12)

S_R = 57.3 mph (Exhibit 13-12)

S_0 = N/A mph (Exhibit 13-12)

S = 57.3 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JMV	Freeway/Dir of Travel	I-80 Eastbound
Agency or Company	L&V Engineering	Junction	Int. 305 to W. Main Street
Date Performed	6/25/2013	Jurisdiction	
Analysis Time Period	P.M. Peak Hour	Analysis Year	Existing 2013

Project Description Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N: 2	☑ Yes ☑ On
☑ No ☐ Off	Ramp Number of Lanes, N: 1	☐ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A:	L_{down} = 700 ft
V_u = veh/h	Deceleration Lane Length L_D: 160	V_D = 196 veh/h
	Freeway Volume, V_F: 2471	
	Ramp Volume, V_R: 250	
	Freeway Free-Flow Speed, S_{FF}: 70.0	
	Ramp Free-Flow Speed, S_{FR}: 35.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2471	0.95	Rolling	12	1	0.840	0.95	3258
Ramp	250	0.86	Rolling	3	0	0.957	0.95	320
UpStream								
DownStream	196	0.96	Rolling	0	0	1.000	0.95	215

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 3258 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	3258	Exhibit 13-8	4800	No
$V_{FO} = V_F - V_R$	2938	Exhibit 13-8	4800	No
V_R	320	Exhibit 13-10	2000	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3258	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 30.8 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

D_s = 0.457 (Exhibit 13-12)

S_R= 57.2 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 57.2 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JMV	Freeway/Dir of Travel	I-80 Eastbound
Agency or Company	L&V Engineering	Junction	Int. 307 to Park Avenue
Date Performed	6/25/2013	Jurisdiction	
Analysis Time Period	A.M. Peak Hour	Analysis Year	Existing 2013

Project Description Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N: 2	☑ Yes ☑ On
☑ No ☐ Off	Ramp Number of Lanes, N: 1	☐ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A:	L_{down} = 810 ft
V_u = veh/h	Deceleration Lane Length L_D: 150	V_D = 116 veh/h
	Freeway Volume, V_F: 2264	
	Ramp Volume, V_R: 381	
	Freeway Free-Flow Speed, S_{FF}: 70.0	
	Ramp Free-Flow Speed, S_{FR}: 35.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2264	0.83	Rolling	8	1	0.885	0.95	3245
Ramp	381	0.82	Rolling	6	0	0.917	0.95	533
UpStream								
DownStream	116	0.85	Rolling	4	0	0.943	0.95	152

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R = mph (Exhibit 13-11)

S_0 = mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 3245 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	3245	Exhibit 13-8	4800	No
$V_{FO} = V_F - V_R$	2712	Exhibit 13-8	4800	No
V_R	533	Exhibit 13-10	2000	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3245	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 30.8 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

D_s = 0.476 (Exhibit 13-12)

S_R = 56.7 mph (Exhibit 13-12)

S_0 = N/A mph (Exhibit 13-12)

S = 56.7 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JMV	Freeway/Dir of Travel	I-80 Eastbound
Agency or Company	L&V Engineering	Junction	Int. 307 to Park Avenue
Date Performed	6/25/2013	Jurisdiction	
Analysis Time Period	P.M. Peak Hour	Analysis Year	Existing 2013

Project Description Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N: 2	☑ Yes ☑ On
☑ No ☐ Off	Ramp Number of Lanes, N: 1	☐ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A:	L_{down} = 810 ft
V_u = veh/h	Deceleration Lane Length L_D: 150	V_D = 140 veh/h
	Freeway Volume, V_F: 2517	
	Ramp Volume, V_R: 344	
	Freeway Free-Flow Speed, S_{FF}: 70.0	
	Ramp Free-Flow Speed, S_{FR}: 35.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2517	0.97	Rolling	10	1	0.862	0.95	3168
Ramp	344	0.84	Rolling	2	0	0.971	0.95	444
UpStream								
DownStream	140	0.63	Rolling	1	0	0.985	0.95	237

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 3168 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	3168	Exhibit 13-8	4800	No
$V_{FO} = V_F - V_R$	2724	Exhibit 13-8	4800	No
V_R	444	Exhibit 13-10	2000	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3168	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 30.1 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

D_s = 0.468 (Exhibit 13-12)

S_R= 56.9 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 56.9 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JMV	Freeway/Dir of Travel	I-80 Westbound
Agency or Company	L&V Engineering	Junction	Int. 305 to W. Main Street
Date Performed	6/25/2013	Jurisdiction	
Analysis Time Period	A.M. Peak Hour	Analysis Year	Existing 2013

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N: 2	☑ Yes ☑ On
☑ No ☐ Off	Ramp Number of Lanes, N: 1	☐ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A:	L_{down} = 740 ft
V_u = veh/h	Deceleration Lane Length L_D: 120	V_D = 174 veh/h
	Freeway Volume, V_F: 1648	
	Ramp Volume, V_R: 151	
	Freeway Free-Flow Speed, S_{FF}: 70.0	
	Ramp Free-Flow Speed, S_{FR}: 35.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	1648	0.93	Rolling	12	1	0.840	0.95	2220
Ramp	151	0.84	Rolling	1	0	0.985	0.95	192
UpStream								
DownStream	174	0.87	Rolling	2	0	0.971	0.95	217

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R = mph (Exhibit 13-11)

S_0 = mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 2220 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	2220	Exhibit 13-8	4800	No
$V_{FO} = V_F - V_R$	2028	Exhibit 13-8	4800	No
V_R	192	Exhibit 13-10	2000	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	2220	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 22.3 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

D_s = 0.445 (Exhibit 13-12)

S_R = 57.5 mph (Exhibit 13-12)

S_0 = N/A mph (Exhibit 13-12)

S = 57.5 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JMV	Freeway/Dir of Travel	I-80 Westbound
Agency or Company	L&V Engineering	Junction	Int. 305 to W. Main Street
Date Performed	6/25/2013	Jurisdiction	
Analysis Time Period	P.M. Peak Hour	Analysis Year	Existing 2013

Project Description Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N: 2	☑ Yes ☑ On
☑ No ☐ Off	Ramp Number of Lanes, N: 1	☐ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A:	L_{down} = 740 ft
V_u = veh/h	Deceleration Lane Length L_D: 120	V_D = 320 veh/h
	Freeway Volume, V_F: 3421	
	Ramp Volume, V_R: 308	
	Freeway Free-Flow Speed, S_{FF}: 70.0	
	Ramp Free-Flow Speed, S_{FR}: 35.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3421	0.96	Rolling	13	1	0.830	0.95	4520
Ramp	308	0.90	Rolling	1	0	0.985	0.95	366
UpStream								
DownStream	320	0.78	Rolling	1	0	0.985	0.95	438

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R = mph (Exhibit 13-11)

S_0 = mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 4520 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	4520	Exhibit 13-8	4800	No
$V_{FO} = V_F - V_R$	4154	Exhibit 13-8	4800	No
V_R	366	Exhibit 13-10	2000	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	4520	Exhibit 13-8	4400:All	Yes

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 42.0 (pc/mi/ln)

LOS = E (Exhibit 13-2)

Speed Determination

D_s = 0.461 (Exhibit 13-12)

S_R = 57.1 mph (Exhibit 13-12)

S_0 = N/A mph (Exhibit 13-12)

S = 57.1 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JMV	Freeway/Dir of Travel	I-80 Westbound
Agency or Company	L&V Engineering	Junction	Int. 306 to Dreher Avenue
Date Performed	6/25/2013	Jurisdiction	
Analysis Time Period	A.M. Peak Hour	Analysis Year	Existing 2013

Project Description Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	2	Downstream Adj Ramp	
☑ Yes	☑ On	Ramp Number of Lanes, N	1	☐ Yes	☐ On
☐ No	☐ Off	Acceleration Lane Length, L_A		☑ No	☐ Off
L_{up} =	3680 ft	Deceleration Lane Length L_D	140	L_{down} =	ft
V_u =	251 veh/h	Freeway Volume, V_F	1719	V_D =	veh/h
		Ramp Volume, V_R	71		
		Freeway Free-Flow Speed, S_{FF}	70.0		
		Ramp Free-Flow Speed, S_{FR}	35.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	1719	0.91	Rolling	12	1	0.840	0.95	2366
Ramp	71	0.66	Rolling	3	0	0.957	0.95	118
UpStream	251	0.91	Rolling	6	0	0.917	0.95	316
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 2366 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	2366	Exhibit 13-8	4800	No
$V_{FO} = V_F - V_R$	2248	Exhibit 13-8	4800	No
V_R	118	Exhibit 13-10	2000	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	2366	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 23.3 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

D_s = 0.439 (Exhibit 13-12)

S_R= 57.7 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 57.7 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JMV	Freeway/Dir of Travel	I-80 Westbound
Agency or Company	L&V Engineering	Junction	Int. 306 to Dreher Avenue
Date Performed	6/25/2013	Jurisdiction	
Analysis Time Period	P.M. Peak Hour	Analysis Year	Existing 2013

Project Description Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	2	Downstream Adj Ramp	
☑ Yes	☑ On	Ramp Number of Lanes, N	1	☐ Yes	☐ On
☐ No	☐ Off	Acceleration Lane Length, L_A		☑ No	☐ Off
L_{up} =	3680 ft	Deceleration Lane Length L_D	140	L_{down} =	ft
V_u =	419 veh/h	Freeway Volume, V_F	3582	V_D =	veh/h
		Ramp Volume, V_R	161		
		Freeway Free-Flow Speed, S_{FF}	70.0		
		Ramp Free-Flow Speed, S_{FR}	35.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3582	0.96	Rolling	12	1	0.840	0.95	4674
Ramp	161	0.82	Rolling	3	0	0.957	0.95	216
UpStream	419	0.89	Rolling	1	0	0.985	0.95	503
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 4674 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	4674	Exhibit 13-8	4800	No
$V_{FO} = V_F - V_R$	4458	Exhibit 13-8	4800	No
V_R	216	Exhibit 13-10	2000	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	4674	Exhibit 13-8	4400:All	Yes

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 43.2 (pc/mi/ln)

LOS = E (Exhibit 13-2)

Speed Determination

D_s = 0.447 (Exhibit 13-12)

S_R= 57.5 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 57.5 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JMV	Freeway/Dir of Travel	I-80 Westbound
Agency or Company	L&V Engineering	Junction	Int. 307 to Broad Street
Date Performed	6/25/2013	Jurisdiction	
Analysis Time Period	A.M. Peak Hour	Analysis Year	Existing 2013

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N: 2	☑ Yes ☑ On
☑ No ☐ Off	Ramp Number of Lanes, N: 1	☐ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A:	L_{down} = 1470 ft
V_u = veh/h	Deceleration Lane Length L_D: 150	V_D = 251 veh/h
	Freeway Volume, V_F: 1659	
	Ramp Volume, V_R: 191	
	Freeway Free-Flow Speed, S_{FF}: 70.0	
	Ramp Free-Flow Speed, S_{FR}: 35.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	1659	0.91	Rolling	12	1	0.840	0.95	2284
Ramp	191	0.90	Rolling	3	0	0.957	0.95	233
UpStream								
DownStream	251	0.91	Rolling	6	0	0.917	0.95	316

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R = mph (Exhibit 13-11)

S_0 = mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 2284 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	2284	Exhibit 13-8	4800	No
$V_{FO} = V_F - V_R$	2051	Exhibit 13-8	4800	No
V_R	233	Exhibit 13-10	2000	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	2284	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 22.5 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

D_s = 0.449 (Exhibit 13-12)

S_R = 57.4 mph (Exhibit 13-12)

S_0 = N/A mph (Exhibit 13-12)

S = 57.4 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JMV	Freeway/Dir of Travel	I-80 Westbound
Agency or Company	L&V Engineering	Junction	Int. 307 to Broad Street
Date Performed	6/25/2013	Jurisdiction	
Analysis Time Period	P.M. Peak Hour	Analysis Year	Existing 2013

Project Description Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	2	Downstream Adj Ramp	
☐ Yes	☐ On	Ramp Number of Lanes, N	1	☑ Yes	☑ On
☑ No	☐ Off	Acceleration Lane Length, L_A		☐ No	☐ Off
L_{up} =	ft	Deceleration Lane Length L_D	150	L_{down} =	1470 ft
V_u =	veh/h	Freeway Volume, V_F	3460	V_D =	419 veh/h
		Ramp Volume, V_R	297		
		Freeway Free-Flow Speed, S_{FF}	70.0		
		Ramp Free-Flow Speed, S_{FR}	35.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3460	0.96	Rolling	12	1	0.840	0.95	4515
Ramp	297	0.88	Rolling	1	0	0.985	0.95	361
UpStream								
DownStream	419	0.89	Rolling	1	0	0.985	0.95	503

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 4515 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	4515	Exhibit 13-8	4800	No
$V_{FO} = V_F - V_R$	4154	Exhibit 13-8	4800	No
V_R	361	Exhibit 13-10	2000	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	4515	Exhibit 13-8	4400:All	Yes

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 41.7 (pc/mi/ln)

LOS = E (Exhibit 13-2)

Speed Determination

D_s = 0.460 (Exhibit 13-12)

S_R= 57.1 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 57.1 mph (Exhibit 13-13)

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WEAVE HCS ANALYSIS

FREEWAY WEAVING WORKSHEET

General Information

Analyst	JMV
Agency/Company	L&V Engineering
Date Performed	6/27/2013
Analysis Time Period	A.M. Peak Hour

Site Information

Freeway/Dir of Travel	I-80 Westbound
Weaving Segment Location	Int. 305 to 304
Analysis Year	Existing 2013

Project Description *Interstate 80 Reconstruction*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	3	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_S	565ft	Freeway maximum capacity, C_{IFL}	2400
Freeway free-flow speed, FFS	70 mph	Terrain type	Rolling

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	1018	0.95	12	1	2.5	2.0	0.840	0.95	1342
V_{RF}	110	0.87	2	0	2.5	2.0	0.971	0.95	137
V_{FR}	479	0.94	8	1	2.5	2.0	0.885	0.95	606
V_{RR}	64	0.87	2	0	2.5	2.0	0.971	0.95	80
V_{NW}	1422							V =	2165
V_W	743								
VR	0.343								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	743 lc/h
Interchange density, ID	1.7 int/mi	Weaving lane changes, LC_W	869 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	21 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	890 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	137

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	2165 pc/h	Weaving intensity factor, W	0.323
Weaving segment capacity, c_w	4742 veh/h	Weaving segment speed, S	59.5 mph
Weaving segment v/c ratio	0.364	Average weaving speed, S_W	56.6 mph
Weaving segment density, D	12.1 pc/mi/ln	Average non-weaving speed, S_{NW}	61.2 mph
Level of Service, LOS	B	Maximum weaving length, L_{MAX}	6052 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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FREEWAY WEAVING WORKSHEET

General Information

Analyst	JMV
Agency/Company	L&V Engineering
Date Performed	6/27/2013
Analysis Time Period	P.M. Peak Hour

Site Information

Freeway/Dir of Travel	I-80 Westbound
Weaving Segment Location	Int. 305 to 304
Analysis Year	Existing 2013

Project Description *Interstate 80 Reconstruction*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	3	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_S	565ft	Freeway maximum capacity, C_{IFL}	2400
Freeway free-flow speed, FFS	70 mph	Terrain type	Rolling

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	2148	0.97	13	1	2.5	2.0	0.830	0.95	2809
V_{RF}	223	0.78	1	0	2.5	2.0	0.985	0.95	305
V_{FR}	965	0.94	2	1	2.5	2.0	0.962	0.95	1124
V_{RR}	97	0.78	1	0	2.5	2.0	0.985	0.95	133
V_{NW}	2942							V =	4371
V_W	1429								
VR	0.327								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	1429 lc/h
Interchange density, ID	1.7 int/mi	Weaving lane changes, LC_W	1555 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	334 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	1889 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	283

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	4371 pc/h	Weaving intensity factor, W	0.586
Weaving segment capacity, c_w	4716 veh/h	Weaving segment speed, S	51.7 mph
Weaving segment v/c ratio	0.731	Average weaving speed, S_W	49.7 mph
Weaving segment density, D	28.2 pc/mi/ln	Average non-weaving speed, S_{NW}	52.7 mph
Level of Service, LOS	D	Maximum weaving length, L_{MAX}	5875 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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UNSIGNALIZED INTERSECTION HCS ANALYSIS

TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*JMV*
Agency/Co.	*L&V Engineering*
Date Performed	*6/17/2013*
Analysis Time Period	*A.M. Peak Hour*

Site Information

Intersection	*SR 611 & I-80 EB Off Ramp*
Jurisdiction	
Analysis Year	*Existing 2013*

Project Description *Interstate 80 Reconstruction*

East/West Street: *SR 611 (N. 9th Street)*	North/South Street: *I-80 EB Off Ramp*
Intersection Orientation: *East-West*	Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		*455*			*490*	
Peak-Hour Factor, PHF	*1.00*	*0.88*	*1.00*	*1.00*	*0.87*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*0*	*517*	*0*	*0*	*563*	*0*
Percent Heavy Vehicles	*0*	--	--	*0*	--	--
Median Type	*Two Way Left Turn Lane*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration		*T*			*T*	
Upstream Signal		*0*			*0*	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)			*158*			
Peak-Hour Factor, PHF	*1.00*	*1.00*	*0.72*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*0*	*0*	*219*	*0*	*0*	*0*
Percent Heavy Vehicles	*0*	*0*	*1*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*1*			*0*
Lanes	*0*	*0*	*1*	*0*	*0*	*0*
Configuration			*R*			

Delay, Queue Length, and Level of Service

Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration					*R*			
v (veh/h)					*219*			
C (m) (veh/h)					*588*			
v/c					*0.37*			
95% queue length					*1.72*			
Control Delay (s/veh)					*14.7*			
LOS					*B*			
Approach Delay (s/veh)	--	--	*14.7*					
Approach LOS	--	--	*B*					

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TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*JMV*
Agency/Co.	*L&V Engineering*
Date Performed	*6/17/2013*
Analysis Time Period	*P.M. Peak Hour*

Site Information

Intersection	*SR 611 & I-80 EB Off Ramp*
Jurisdiction	
Analysis Year	*Existing 2013*

Project Description *Interstate 80 Reconstruction*

East/West Street: *SR 611 (N. 9th Street)* | North/South Street: *I-80 EB Off Ramp*

Intersection Orientation: *East-West* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		*624*			*752*	
Peak-Hour Factor, PHF	*1.00*	*0.92*	*1.00*	*1.00*	*0.96*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*0*	*678*	*0*	*0*	*783*	*0*
Percent Heavy Vehicles	*0*	--	--	*0*	--	--
Median Type	*Two Way Left Turn Lane*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration		*T*			*T*	
Upstream Signal		*0*			*0*	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)			*216*			
Peak-Hour Factor, PHF	*1.00*	*1.00*	*0.98*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*0*	*0*	*220*	*0*	*0*	*0*
Percent Heavy Vehicles	*0*	*0*	*1*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*1*			*0*
Lanes	*0*	*0*	*1*	*0*	*0*	*0*
Configuration			*R*			

Delay, Queue Length, and Level of Service

Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration					*R*			
v (veh/h)					*220*			
C (m) (veh/h)					*475*			
v/c					*0.46*			
95% queue length					*2.41*			
Control Delay (s/veh)					*18.9*			
LOS					*C*			
Approach Delay (s/veh)	--	--	*18.9*					
Approach LOS	--	--	*C*					

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Two-Way Stop Controlled Intersection Level of Service Calculations
Interchange 303 SR 611 and I-80 Eastbound Off Ramp
Existing Year 2013

A.M. Peak Hour

Movement	Volume	Delay
SR 611 EB thru	455	0
SR 611 WB thru	490	0
I-80 EB Off Ramp NB right	158	14.7
Overall LOS	1103	2.1 A

P.M. Peak Hour

Movement	Volume	Delay
SR 611 EB thru	624	0
SR 611 WB thru	752	0
I-80 EB Off Ramp NB right	216	18.9
Overall LOS	1592	2.6 A

TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*JMV*
Agency/Co.	*L&V Engineering*
Date Performed	*6/17/2013*
Analysis Time Period	*A.M. Peak Hour*

Site Information

Intersection	*SR 611 & Shopping Ctr Side Rd*
Jurisdiction	
Analysis Year	*Existing 2013*

Project Description *Interstate 80 Reconstruction*

East/West Street: *SR 611 (N. 9th Street)* | North/South Street: *Shopping Center Side Road*

Intersection Orientation: *East-West* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*6*	*443*			*485*	*12*
Peak-Hour Factor, PHF	*0.38*	*0.86*	*1.00*	*1.00*	*0.88*	*0.60*
Hourly Flow Rate, HFR (veh/h)	*15*	*515*	*0*	*0*	*551*	*19*
Percent Heavy Vehicles	*0*	--	--	*0*	--	--
Median Type	*Two Way Left Turn Lane*					
RT Channelized			*0*			*0*
Lanes	*1*	*1*	*0*	*0*	*1*	*0*
Configuration	*L*	*T*				*TR*
Upstream Signal		*0*			*0*	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)				*12*		*5*
Peak-Hour Factor, PHF	*1.00*	*1.00*	*1.00*	*0.60*	*1.00*	*0.63*
Hourly Flow Rate, HFR (veh/h)	*0*	*0*	*0*	*19*	*0*	*7*
Percent Heavy Vehicles	*0*	*0*	*0*	*0*	*0*	*0*
Percent Grade (%)		*0*			*-2*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration					*LR*	

Delay, Queue Length, and Level of Service

Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*						*LR*	
v (veh/h)	*15*						*26*	
C (m) (veh/h)	*763*						*473*	
v/c	*0.02*						*0.05*	
95% queue length	*0.06*						*0.17*	
Control Delay (s/veh)	*9.8*						*13.1*	
LOS	*A*						*B*	
Approach Delay (s/veh)	--	--					*13.1*	
Approach LOS	--	--					*B*	

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TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*JMV*
Agency/Co.	*L&V Engineering*
Date Performed	*6/17/2013*
Analysis Time Period	*P.M. Peak Hour*

Site Information

Intersection	*SR 611 & Shopping Ctr Side Rd*
Jurisdiction	
Analysis Year	*Existing 2013*

Project Description *Interstate 80 Reconstruction*

East/West Street: *SR 611 (N. 9th Street)* | North/South Street: *Shopping Center Side Road*

Intersection Orientation: *East-West* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*15*	*610*			*721*	*33*
Peak-Hour Factor, PHF	*0.54*	*0.91*	*1.00*	*1.00*	*0.96*	*0.69*
Hourly Flow Rate, HFR (veh/h)	*27*	*670*	*0*	*0*	*751*	*47*
Percent Heavy Vehicles	*0*	--	--	*0*	--	--
Median Type	*Two Way Left Turn Lane*					
RT Channelized			*0*			*0*
Lanes	*1*	*1*	*0*	*0*	*1*	*0*
Configuration	*L*	*T*				*TR*
Upstream Signal		*0*			*0*	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)				*14*		*10*
Peak-Hour Factor, PHF	*1.00*	*1.00*	*1.00*	*0.70*	*1.00*	*0.50*
Hourly Flow Rate, HFR (veh/h)	*0*	*0*	*0*	*20*	*0*	*20*
Percent Heavy Vehicles	*0*	*0*	*0*	*0*	*0*	*0*
Percent Grade (%)		*0*			*-2*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration					*LR*	

Delay, Queue Length, and Level of Service

Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*						*LR*	
v (veh/h)	*27*						*40*	
C (m) (veh/h)	*630*						*376*	
v/c	*0.04*						*0.11*	
95% queue length	*0.13*						*0.35*	
Control Delay (s/veh)	*11.0*						*15.7*	
LOS	*B*						*C*	
Approach Delay (s/veh)	--	--				*15.7*		
Approach LOS	--	--				*C*		

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Two-Way Stop Controlled Intersection Level of Service Calculations
Interchange 303 SR 611 and Shopping Center Side Road
Existing Year 2013

A.M. Peak Hour

Movement	Volume	Delay
SR 611 EB left	6	9.8
SR 611 EB thru	443	0
SR 611 WB thru	485	0
SR 611 WB right	12	0
Shopping Ctr Side Rd SB left	12	13.1
Shopping Ctr Side Rd SB right	5	13.1
Overall	963	0.3
LOS		A

P.M. Peak Hour

Movement	Volume	Delay
SR 611 EB left	15	11.0
SR 611 EB thru	610	0
SR 611 WB thru	721	0
SR 611 WB right	33	0
Shopping Ctr Side Rd SB left	14	15.7
Shopping Ctr Side Rd SB right	10	15.7
Overall	1403	0.4
LOS		A

TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*JMV*
Agency/Co.	*L&V Engineering*
Date Performed	*6/17/2013*
Analysis Time Period	*A.M. Peak Hour*

Site Information

Intersection	*W. Main Street & I-80 EB Ramps*
Jurisdiction	
Analysis Year	*Existing 2013*

Project Description *Interstate 80 Reconstruction*

East/West Street: *W. Main Street (SR 2012)* | North/South Street: *I-80 EB Ramps*

Intersection Orientation: *East-West* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		*254*	*153*	*19*	*370*	
Peak-Hour Factor, PHF	*1.00*	*0.95*	*0.81*	*0.43*	*0.91*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*0*	*267*	*188*	*44*	*406*	*0*
Percent Heavy Vehicles	*0*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*1*	*0*	*1*	*0*
Configuration		*T*	*R*	*LT*		
Upstream Signal		*0*			*0*	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*27*		*182*			
Peak-Hour Factor, PHF	*0.75*	*1.00*	*0.77*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*36*	*0*	*236*	*0*	*0*	*0*
Percent Heavy Vehicles	*4*	*0*	*2*	*0*	*0*	*0*
Percent Grade (%)	*-1*			*0*		
Flared Approach		*Y*			*N*	
Storage		*5*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration		*LR*				

Delay, Queue Length, and Level of Service

Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*LT*		*LR*				
v (veh/h)		*44*		*272*				
C (m) (veh/h)		*836*		*944*				
v/c		*0.05*		*0.29*				
95% queue length		*0.17*		*1.20*				
Control Delay (s/veh)		*9.5*		*11.6*				
LOS		*A*		*B*				
Approach Delay (s/veh)	--	--	*11.6*					
Approach LOS	--	--	*B*					

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TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*JMV*
Agency/Co.	*L&V Engineering*
Date Performed	*6/17/2013*
Analysis Time Period	*P.M. Peak Hour*

Site Information

Intersection	*W. Main Street & I-80 EB Ramps*
Jurisdiction	
Analysis Year	*Existing 2013*

Project Description *Interstate 80 Reconstruction*

East/West Street: *W. Main Street (SR 2012)* | North/South Street: *I-80 EB Ramps*

Intersection Orientation: *East-West* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		*322*	*168*	*28*	*715*	
Peak-Hour Factor, PHF	*1.00*	*0.90*	*0.93*	*0.70*	*0.88*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*0*	*357*	*180*	*40*	*812*	*0*
Percent Heavy Vehicles	*0*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*1*	*0*	*1*	*0*
Configuration		*T*	*R*	*LT*		
Upstream Signal		*0*			*0*	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*52*		*198*			
Peak-Hour Factor, PHF	*0.87*	*1.00*	*0.85*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*59*	*0*	*232*	*0*	*0*	*0*
Percent Heavy Vehicles	*2*	*0*	*3*	*0*	*0*	*0*
Percent Grade (%)	*-1*			*0*		
Flared Approach		*Y*			*N*	
Storage		*5*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration		*LR*				

Delay, Queue Length, and Level of Service

Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*LT*		*LR*				
v (veh/h)		*40*		*291*				
C (m) (veh/h)		*777*		*904*				
v/c		*0.05*		*0.32*				
95% queue length		*0.16*		*1.40*				
Control Delay (s/veh)		*9.9*		*15.7*				
LOS		*A*		*C*				
Approach Delay (s/veh)	--	--	*15.7*					
Approach LOS	--	--	*C*					

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Two-Way Stop Controlled Intersection Level of Service Calculations
Interchange 305 W. Main Street (SR 2012) and I-80 Eastbound Ramps
Existing Year 2013

A.M. Peak Hour

Movement	Volume	Delay
W. Main Street EB thru	254	0
W. Main Street EB right	153	0
W. Main Street WB left	19	9.5
W. Main Street WB thru	370	9.5
I-80 EB Off Ramp NB left	27	11.6
I-80 EB Off Ramp NB right	182	11.6
Overall	1005	6.1
LOS		A

P.M. Peak Hour

Movement	Volume	Delay
W. Main Street EB thru	322	0
W. Main Street EB right	168	0
W. Main Street WB left	28	9.9
W. Main Street WB thru	715	9.9
I-80 EB Off Ramp NB left	52	15.7
I-80 EB Off Ramp NB right	198	15.7
Overall	1483	7.6
LOS		A

TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*JMV*
Agency/Co.	*L&V Engineering*
Date Performed	*6/17/2013*
Analysis Time Period	*A.M. Peak Hour*

Site Information

Intersection	*W. Main Street & I-80 WB Ramps*
Jurisdiction	
Analysis Year	*Existing 2013*

Project Description *Interstate 80 Reconstruction*

East/West Street: *W. Main Street (SR 2012)* | North/South Street: *I-80 WB Ramps*

Intersection Orientation: *East-West* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*25*	*411*			*256*	*149*
Peak-Hour Factor, PHF	*0.69*	*0.85*	*1.00*	*1.00*	*0.87*	*0.83*
Hourly Flow Rate, HFR (veh/h)	*36*	*483*	*0*	*0*	*294*	*179*
Percent Heavy Vehicles	*4*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*1*
Configuration	*LT*				*T*	*R*
Upstream Signal		*0*			*0*	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)				*18*		*133*
Peak-Hour Factor, PHF	*1.00*	*1.00*	*1.00*	*0.75*	*1.00*	*0.85*
Hourly Flow Rate, HFR (veh/h)	*0*	*0*	*0*	*24*	*0*	*156*
Percent Heavy Vehicles	*0*	*0*	*0*	*0*	*0*	*1*
Percent Grade (%)	*0*			*-1*		
Flared Approach		*N*			*Y*	
Storage		*0*			*1*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration					*LR*	

Delay, Queue Length, and Level of Service

Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LT*						*LR*	
v (veh/h)	*36*						*180*	
C (m) (veh/h)	*813*						*918*	
v/c	*0.04*						*0.20*	
95% queue length	*0.14*						*0.73*	
Control Delay (s/veh)	*9.6*						*11.3*	
LOS	*A*						*B*	
Approach Delay (s/veh)	--	--				*11.3*		
Approach LOS	--	--				*B*		

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TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*JMV*
Agency/Co.	*L&V Engineering*
Date Performed	*6/17/2013*
Analysis Time Period	*P.M. Peak Hour*

Site Information

Intersection	*W. Main Street & I-80 WB Ramps*
Jurisdiction	
Analysis Year	*Existing 2013*

Project Description *Interstate 80 Reconstruction*

East/West Street: *W. Main Street (SR 2012)* | North/South Street: *I-80 WB Ramps*

Intersection Orientation: *East-West* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*38*	*482*			*468*	*282*
Peak-Hour Factor, PHF	*0.79*	*0.91*	*1.00*	*1.00*	*0.91*	*0.73*
Hourly Flow Rate, HFR (veh/h)	*48*	*529*	*0*	*0*	*514*	*386*
Percent Heavy Vehicles	*3*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*1*
Configuration	*LT*				*T*	*R*
Upstream Signal		*0*			*0*	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)				*33*		*275*
Peak-Hour Factor, PHF	*1.00*	*1.00*	*1.00*	*0.83*	*1.00*	*0.85*
Hourly Flow Rate, HFR (veh/h)	*0*	*0*	*0*	*39*	*0*	*323*
Percent Heavy Vehicles	*0*	*0*	*0*	*0*	*0*	*1*
Percent Grade (%)	*0*			*-1*		
Flared Approach		*N*			*Y*	
Storage		*0*			*1*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration					*LR*	

Delay, Queue Length, and Level of Service

Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LT*						*LR*	
v (veh/h)	*48*						*362*	
C (m) (veh/h)	*572*						*565*	
v/c	*0.08*						*0.64*	
95% queue length	*0.27*						*4.54*	
Control Delay (s/veh)	*11.9*						*22.0*	
LOS	*B*						*C*	
Approach Delay (s/veh)	--	--				*22.0*		
Approach LOS	--	--				*C*		

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Two-Way Stop Controlled Intersection Level of Service Calculations
Interchange 305 W. Main Street (SR 2012) and I-80 Westbound Ramps
Existing Year 2013

A.M. Peak Hour

Movement	Volume	Delay
W. Main Street EB left	25	9.6
W. Main Street EB thru	411	9.6
W. Main Street WB thru	256	0
W. Main Street WB right	149	0
I-80 WB Off Ramp SB left	18	11.3
I-80 WB Off Ramp SB right	133	11.3
Overall	992	5.9
LOS		A

P.M. Peak Hour

Movement	Volume	Delay
W. Main Street EB left	38	11.9
W. Main Street EB thru	482	11.9
W. Main Street WB thru	468	0
W. Main Street WB right	282	0
I-80 WB Off Ramp SB left	33	22.0
I-80 WB Off Ramp SB right	275	22.0
Overall	1578	8.2
LOS		A

TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*JMV*
Agency/Co.	*L&V Engineering*
Date Performed	*6/18/2013*
Analysis Time Period	*A.M. Peak Hour*

Site Information

Intersection	*Dreher Ave. & I-80 EB On Ramp*
Jurisdiction	
Analysis Year	*Existing 2013*

Project Description *Interstate 80 Reconstruction*

East/West Street: *Dreher Avenue (SR 2004)* | North/South Street: *I-80 EB On Ramp*

Intersection Orientation: *East-West* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		*129*	*73*	*43*	*91*	
Peak-Hour Factor, PHF	*1.00*	*0.85*	*0.59*	*0.90*	*0.95*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*0*	*151*	*123*	*47*	*95*	*0*
Percent Heavy Vehicles	*0*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration			*TR*	*LT*		
Upstream Signal		*0*			*0*	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)						
Peak-Hour Factor, PHF	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*0*	*0*	*0*	*0*	*0*	*0*
Percent Heavy Vehicles	*0*	*0*	*0*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration						

Delay, Queue Length, and Level of Service

Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*LT*						
v (veh/h)		*47*						
C (m) (veh/h)		*968*						
v/c		*0.05*						
95% queue length		*0.15*						
Control Delay (s/veh)		*8.9*						
LOS		*A*						
Approach Delay (s/veh)	--	--						
Approach LOS	--	--						

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TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*JMV*
Agency/Co.	*L&V Engineering*
Date Performed	*6/18/2013*
Analysis Time Period	*P.M. Peak Hour*

Site Information

Intersection	*Dreher Ave. & I-80 EB On Ramp*
Jurisdiction	
Analysis Year	*Existing 2013*

Project Description *Interstate 80 Reconstruction*

East/West Street: *Dreher Avenue (SR 2004)* | North/South Street: *I-80 EB On Ramp*

Intersection Orientation: *East-West* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		*111*	*45*	*55*	*234*	
Peak-Hour Factor, PHF	*1.00*	*0.82*	*0.66*	*0.76*	*0.79*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*0*	*135*	*68*	*72*	*296*	*0*
Percent Heavy Vehicles	*0*	--	--	*2*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration			*TR*	*LT*		
Upstream Signal		*0*			*0*	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)						
Peak-Hour Factor, PHF	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*0*	*0*	*0*	*0*	*0*	*0*
Percent Heavy Vehicles	*0*	*0*	*0*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration						

Delay, Queue Length, and Level of Service

Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*LT*						
v (veh/h)		*72*						
C (m) (veh/h)		*1015*						
v/c		*0.07*						
95% queue length		*0.23*						
Control Delay (s/veh)		*8.8*						
LOS		*A*						
Approach Delay (s/veh)	--	--						
Approach LOS	--	--						

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Two-Way Stop Controlled Intersection Level of Service Calculations
Interchange 306 Dreher Avenue (SR 2004) and I-80 Eastbound On Ramp
Existing Year 2013

A.M. Peak Hour

Movement	Volume	Delay
Dreher Avenue EB thru	129	0
Dreher Avenue EB right	73	0
Dreher Avenue WB left	43	8.9
Dreher Avenue WB thru	91	8.9
Overall	336	3.5
LOS		A

P.M. Peak Hour

Movement	Volume	Delay
Dreher Avenue EB thru	111	0
Dreher Avenue EB right	45	0
Dreher Avenue WB left	55	8.8
Dreher Avenue WB thru	234	8.8
Overall	445	5.7
LOS		A

TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*JMV*
Agency/Co.	*L&V Engineering*
Date Performed	*6/18/2013*
Analysis Time Period	*A.M. Peak Hour*

Site Information

Intersection	*Dreher Ave. & I-80 WB Off Ramp*
Jurisdiction	
Analysis Year	*Existing 2013*

Project Description *Interstate 80 Reconstruction*

East/West Street: *Dreher Avenue (SR 2004)* | North/South Street: *I-80 WB Off Ramp*

Intersection Orientation: *East-West* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		*125*			*114*	
Peak-Hour Factor, PHF	*1.00*	*0.80*	*1.00*	*1.00*	*0.77*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*0*	*156*	*0*	*0*	*148*	*0*
Percent Heavy Vehicles	*0*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration		*T*			*T*	
Upstream Signal		*0*			*0*	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*27*		*44*			
Peak-Hour Factor, PHF	*0.61*	*1.00*	*0.69*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*44*	*0*	*63*	*0*	*0*	*0*
Percent Heavy Vehicles	*0*	*0*	*5*	*0*	*0*	*0*
Percent Grade (%)	*-1*			*0*		
Flared Approach		*Y*			*N*	
Storage		*1*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration		*LR*				

Delay, Queue Length, and Level of Service

Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration				*LR*				
v (veh/h)				*107*				
C (m) (veh/h)				*1593*				
v/c				*0.07*				
95% queue length				*0.22*				
Control Delay (s/veh)				*9.4*				
LOS				*A*				
Approach Delay (s/veh)	--	--	*9.4*					
Approach LOS	--	--	*A*					

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TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*JMV*
Agency/Co.	*L&V Engineering*
Date Performed	*6/18/2013*
Analysis Time Period	*P.M. Peak Hour*

Site Information

Intersection	*Dreher Ave. & I-80 WB Off Ramp*
Jurisdiction	
Analysis Year	*Existing 2013*

Project Description *Interstate 80 Reconstruction*

East/West Street: *Dreher Avenue (SR 2004)* | North/South Street: *I-80 WB Off Ramp*

Intersection Orientation: *East-West* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		*90*			*196*	
Peak-Hour Factor, PHF	*1.00*	*0.94*	*1.00*	*1.00*	*0.71*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*0*	*95*	*0*	*0*	*276*	*0*
Percent Heavy Vehicles	*0*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration		*T*			*T*	
Upstream Signal		*0*			*0*	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*88*		*73*			
Peak-Hour Factor, PHF	*0.88*	*1.00*	*0.65*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*100*	*0*	*112*	*0*	*0*	*0*
Percent Heavy Vehicles	*2*	*0*	*4*	*0*	*0*	*0*
Percent Grade (%)		*-1*			*0*	
Flared Approach		*Y*			*N*	
Storage		*1*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration		*LR*				

Delay, Queue Length, and Level of Service

Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration				*LR*				
v (veh/h)				*212*				
C (m) (veh/h)				*1529*				
v/c				*0.14*				
95% queue length				*0.48*				
Control Delay (s/veh)				*9.8*				
LOS				*A*				
Approach Delay (s/veh)	--	--	*9.8*					
Approach LOS	--	--	*A*					

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Two-Way Stop Controlled Intersection Level of Service Calculations
Interchange 306 Dreher Avenue (SR 2004) and I-80 Westbound Off Ramp
Existing Year 2013

A.M. Peak Hour

Movement	Volume	Delay
Dreher Avenue EB thru	125	0
Dreher Avenue WB thru	114	0
I-80 WB Off Ramp NB left	27	9.4
I-80 WB Off Ramp NB right	44	9.4
Overall	310	2.2
LOS		A

P.M. Peak Hour

Movement	Volume	Delay
Dreher Avenue EB thru	90	0
Dreher Avenue WB thru	196	0
I-80 WB Off Ramp NB left	88	9.8
I-80 WB Off Ramp NB right	73	9.8
Overall	447	3.5
LOS		A

TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*JMV*
Agency/Co.	*L&V Engineering*
Date Performed	*6/18/2013*
Analysis Time Period	*A.M. Peak Hour*

Site Information

Intersection	*Park Avenue & I-80 EB Ramps*
Jurisdiction	
Analysis Year	*Existing 2013*

Project Description *Interstate 80 Reconstruction*

East/West Street: *I-80 EB Ramps/Barry Street*	North/South Street: *Park Avenue (SR 611)*
Intersection Orientation: *North-South*	Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*27*	*109*			*68*	*82*
Peak-Hour Factor, PHF	*0.84*	*0.83*	*1.00*	*1.00*	*0.85*	*0.82*
Hourly Flow Rate, HFR (veh/h)	*32*	*131*	*0*	*0*	*79*	*100*
Percent Heavy Vehicles	*4*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LT*					*TR*
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*274*		*107*	*0*	*7*	*8*
Peak-Hour Factor, PHF	*0.77*	*1.00*	*0.92*	*0.90*	*0.58*	*0.67*
Hourly Flow Rate, HFR (veh/h)	*355*	*0*	*116*	*0*	*12*	*11*
Percent Heavy Vehicles	*4*	*0*	*8*	*0*	*14*	*13*
Percent Grade (%)	*-1*			*-3*		
Flared Approach		*Y*			*N*	
Storage		*1*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*1*	*0*
Configuration		*LR*			*LTR*	

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LT*			*LTR*			*LR*	
v (veh/h)	*32*			*23*			*471*	
C (m) (veh/h)	*1030*			*690*			*785*	
v/c	*0.03*			*0.03*			*0.60*	
95% queue length	*0.10*			*0.10*			*4.08*	
Control Delay (s/veh)	*8.6*			*10.4*			*16.2*	
LOS	*A*			*B*			*C*	
Approach Delay (s/veh)	--	--	*10.4*			*16.2*		
Approach LOS	--	--	*B*			*C*		

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TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*JMV*
Agency/Co.	*L&V Engineering*
Date Performed	*6/18/2013*
Analysis Time Period	*P.M. Peak Hour*

Site Information

Intersection	*Park Avenue & I-80 EB Ramps*
Jurisdiction	
Analysis Year	*Existing 2013*

Project Description *Interstate 80 Reconstruction*

East/West Street: *I-80 EB Ramps/Barry Street*	North/South Street: *Park Avenue (SR 611)*
Intersection Orientation: *North-South*	Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*21*	*157*			*198*	*116*
Peak-Hour Factor, PHF	*0.66*	*0.79*	*1.00*	*1.00*	*0.75*	*0.60*
Hourly Flow Rate, HFR (veh/h)	*31*	*198*	*0*	*0*	*264*	*193*
Percent Heavy Vehicles	*0*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LT*					*TR*
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*200*		*144*	*6*	*3*	*10*
Peak-Hour Factor, PHF	*0.83*	*1.00*	*0.78*	*0.50*	*0.38*	*0.63*
Hourly Flow Rate, HFR (veh/h)	*240*	*0*	*184*	*12*	*7*	*15*
Percent Heavy Vehicles	*1*	*0*	*3*	*0*	*0*	*10*
Percent Grade (%)	*-1*			*-3*		
Flared Approach		*Y*			*N*	
Storage		*1*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*1*	*0*
Configuration		*LR*			*LTR*	

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LT*			*LTR*			*LR*	
v (veh/h)	*31*			*34*			*424*	
C (m) (veh/h)	*836*			*461*			*601*	
v/c	*0.04*			*0.07*			*0.71*	
95% queue length	*0.12*			*0.24*			*5.71*	
Control Delay (s/veh)	*9.5*			*13.4*			*24.1*	
LOS	*A*			*B*			*C*	
Approach Delay (s/veh)	--	--	*13.4*			*24.1*		
Approach LOS	--	--	*B*			*C*		

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Two-Way Stop Controlled Intersection Level of Service Calculations
Interchange 307 Park Avenue (SR 611) and I-80 Eastbound Ramps
Existing Year 2013

A.M. Peak Hour

Movement	Volume	Delay
Park Avenue NB left	27	8.6
Park Avenue NB thru	109	8.6
Park Avenue SB thru	68	0
Park Avenue SB right	82	0
I-80 EB Off Ramp EB left	274	16.2
I-80 EB Off Ramp EB right	107	16.2
Barry Street WB left	0	10.4
Barry Street WB thru	7	10.4
Barry Street WB right	8	10.4
Overall	682	11.0
LOS		B

P.M. Peak Hour

Movement	Volume	Delay
Park Avenue NB left	21	9.5
Park Avenue NB thru	157	9.5
Park Avenue SB thru	198	0
Park Avenue SB right	116	0
I-80 EB Off Ramp EB left	200	24.1
I-80 EB Off Ramp EB right	144	24.1
Barry Street WB left	6	13.4
Barry Street WB thru	3	13.4
Barry Street WB right	10	13.4
Overall	855	12.0
LOS		B

TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*JMV*
Agency/Co.	*L&V Engineering*
Date Performed	*6/18/2013*
Analysis Time Period	*A.M. Peak Hour*

Site Information

Intersection	*Broad Street & I-80 WB Ramps*
Jurisdiction	
Analysis Year	*Existing 2013*

Project Description *Interstate 80 Reconstruction*

East/West Street: *I-80 WB Ramps* | North/South Street: *Broad Street (SR 191)*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*94*	*389*			*116*	*157*
Peak-Hour Factor, PHF	*0.78*	*0.78*	*1.00*	*1.00*	*0.88*	*0.84*
Hourly Flow Rate, HFR (veh/h)	*120*	*498*	*0*	*0*	*131*	*186*
Percent Heavy Vehicles	*2*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LT*					*TR*
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)				*40*		*151*
Peak-Hour Factor, PHF	*1.00*	*1.00*	*1.00*	*0.83*	*1.00*	*0.88*
Hourly Flow Rate, HFR (veh/h)	*0*	*0*	*0*	*48*	*0*	*171*
Percent Heavy Vehicles	*0*	*0*	*0*	*3*	*0*	*3*
Percent Grade (%)	*0*			*-1*		
Flared Approach		*N*			*Y*	
Storage		*0*			*2*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration					*LR*	

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LT*			*LR*				
v (veh/h)	*120*			*219*				
C (m) (veh/h)	*925*			*777*				
v/c	*0.13*			*0.28*				
95% queue length	*0.45*			*1.16*				
Control Delay (s/veh)	*9.5*			*14.8*				
LOS	*A*			*B*				
Approach Delay (s/veh)	--	--	*14.8*					
Approach LOS	--	--	*B*					

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TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*JMV*
Agency/Co.	*L&V Engineering*
Date Performed	*6/18/2013*
Analysis Time Period	*P.M. Peak Hour*

Site Information

Intersection	*Broad Street & I-80 WB Ramps*
Jurisdiction	
Analysis Year	*Existing 2013*

Project Description *Interstate 80 Reconstruction*

East/West Street: *I-80 WB Ramps* | North/South Street: *Broad Street (SR 191)*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*159*	*327*			*289*	*260*
Peak-Hour Factor, PHF	*0.72*	*0.92*	*1.00*	*1.00*	*0.94*	*0.83*
Hourly Flow Rate, HFR (veh/h)	*220*	*355*	*0*	*0*	*307*	*313*
Percent Heavy Vehicles	*1*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LT*					*TR*
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)				*63*		*234*
Peak-Hour Factor, PHF	*1.00*	*1.00*	*1.00*	*0.79*	*1.00*	*0.91*
Hourly Flow Rate, HFR (veh/h)	*0*	*0*	*0*	*79*	*0*	*257*
Percent Heavy Vehicles	*0*	*0*	*0*	*3*	*0*	*1*
Percent Grade (%)	*0*			*-1*		
Flared Approach		*N*			*Y*	
Storage		*0*			*2*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration					*LR*	

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LT*			*LR*				
v (veh/h)	*220*			*336*				
C (m) (veh/h)	*727*			*646*				
v/c	*0.30*			*0.52*				
95% queue length	*1.28*			*3.02*				
Control Delay (s/veh)	*12.1*			*21.8*				
LOS	*B*			*C*				
Approach Delay (s/veh)	--	--	*21.8*					
Approach LOS	--	--	*C*					

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Two-Way Stop Controlled Intersection Level of Service Calculations
Interchange 307 Broad Street (SR 191) and I-80 Westbound Ramps
Existing Year 2013

A.M. Peak Hour

Movement	Volume	Delay
Broad Street NB left	94	9.5
Broad Street NB thru	389	9.5
Broad Street SB thru	116	0
Broad Street SB right	157	0
I-80 WB Off Ramp WB left	40	14.8
I-80 WB Off Ramp WB right	151	14.8
Overall	947	7.8
LOS		A

P.M. Peak Hour

Movement	Volume	Delay
Broad Street NB left	159	12.1
Broad Street NB thru	327	12.1
Broad Street SB thru	289	0
Broad Street SB right	260	0
I-80 WB Off Ramp WB left	63	21.8
I-80 WB Off Ramp WB right	234	21.8
Overall	1332	9.3
LOS		A

SIGNALIZED INTERSECTION HCS ANALYSIS

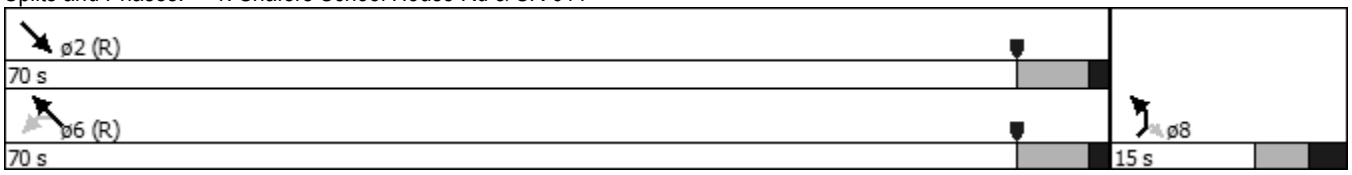
Lane Group	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Volume (vph)	617	47	30	423	36	34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	11	10	14
Grade (%)	2%			-1%	4%	
Storage Length (ft)		0	150		0	165
Storage Lanes		0	1		1	1
Taper Length (ft)			100		25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.991					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1689	0	1639	1758	1603	1593
Flt Permitted			0.340		0.950	
Satd. Flow (perm)	1689	0	587	1758	1603	1593
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	13					47
Link Speed (mph)	45			45	30	
Link Distance (ft)	1000			1522	500	
Travel Time (s)	15.2			23.1	11.4	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.89	0.92	0.78	0.88	0.71	0.73
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	4%	43%	7%	5%	3%	6%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Adj. Flow (vph)	693	51	38	481	51	47
Shared Lane Traffic (%)						
Lane Group Flow (vph)	744	0	38	481	51	47
Turn Type	NA		Perm	NA	NA	Perm
Protected Phases	2			6	8	
Permitted Phases			6			8
Detector Phase	2		6	6	8	8
Switch Phase						
Minimum Initial (s)	4.0		4.0	4.0	4.0	4.0
Minimum Split (s)	13.0		13.0	13.0	13.0	13.0
Total Split (s)	70.0		70.0	70.0	15.0	15.0
Total Split (%)	82.4%		82.4%	82.4%	17.6%	17.6%
Maximum Green (s)	64.0		64.0	64.0	9.0	9.0
Yellow Time (s)	4.5		4.5	4.5	3.5	3.5
All-Red Time (s)	1.5		1.5	1.5	2.5	2.5
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0		6.0	6.0	6.0	6.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	5.5		5.5	5.5	3.0	3.0
Minimum Gap (s)	2.5		2.5	2.5	0.2	0.2

Lane Group	SET	SER	NWL	NWT	NEL	NER
Time Before Reduce (s)	15.0		15.0	15.0	0.0	0.0
Time To Reduce (s)	14.0		14.0	14.0	0.0	0.0
Recall Mode	C-Min		C-Min	C-Min	None	None
Walk Time (s)						
Flash Dont Walk (s)						
Pedestrian Calls (#/hr)						
Act Effct Green (s)	68.3		68.3	68.3	8.2	8.2
Actuated g/C Ratio	0.80		0.80	0.80	0.10	0.10
v/c Ratio	0.55		0.08	0.34	0.33	0.24
Control Delay	6.0		3.4	3.8	40.9	13.9
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	6.0		3.4	3.8	40.9	13.9
LOS	A		A	A	D	B
Approach Delay	6.0			3.8	28.0	
Approach LOS	A			A	C	
Queue Length 50th (ft)	128		4	60	26	0
Queue Length 95th (ft)	237		10	101	45	20
Internal Link Dist (ft)	920			1442	420	
Turn Bay Length (ft)			150			165
Base Capacity (vph)	1369		475	1423	178	219
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	0.54		0.08	0.34	0.29	0.21

Intersection Summary

Area Type: Other
Cycle Length: 85
Actuated Cycle Length: 85
Offset: 19 (22%), Referenced to phase 2:SET and 6:NWTL, Start of Yellow
Natural Cycle: 50
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.55
Intersection Signal Delay: 6.8 Intersection LOS: A
Intersection Capacity Utilization 48.7% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 1: Shafers School House Rd & SR 611



Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Volume (veh/h)	617	47	30	423	36	34
Number	2	12	1	6	3	18
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
Adj Sat Flow veh/h/ln	176.3	188.1	178.5	181.9	180.8	182.7
Lanes	1	0	1	1	1	1
Cap, veh/h	1143	84	473	1281	102	92
Arrive On Green	0.70	0.70	0.70	0.70	0.06	0.06
Sat Flow, veh/h	1623	119	683	1819	1722	1553
Grp Volume(v), veh/h	0	744	38	481	51	47
Grp Sat Flow(s),veh/h/ln	0	1742	683	1819	1722	1553
Q Serve(g_s), s	0.0	11.2	1.5	5.4	1.5	1.5
Cycle Q Clear(g_c), s	0.0	11.2	12.7	5.4	1.5	1.5
Prop In Lane		0.07	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	0	1227	473	1281	102	92
V/C Ratio(X)	0.00	0.61	0.08	0.38	0.50	0.51
Avail Cap(c_a), veh/h	0	2200	854	2297	306	276
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.98	0.98	1.00	1.00
Uniform Delay (d), s/veh	0.0	3.9	7.2	3.0	23.1	23.1
Incr Delay (d2), s/veh	0.0	2.2	0.3	0.8	3.8	4.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	0.0	2.8	0.2	1.4	0.7	0.7
Lane Grp Delay (d), s/veh	0.0	6.1	7.5	3.8	26.9	27.5
Lane Grp LOS		A	A	A	C	C
Approach Vol, veh/h	744			519	98	
Approach Delay, s/veh	6.1			4.1	27.2	
Approach LOS	A			A	C	

Timer						
Assigned Phs	2			6		
Phs Duration (G+Y+Rc), s	41.7			41.7		
Change Period (Y+Rc), s	6.0			6.0		
Max Green Setting (Gmax), s	64.0			64.0		
Max Q Clear Time (g_c+I1), s	13.2			14.7		
Green Ext Time (p_c), s	21.2			21.0		

Intersection Summary						
HCM 2010 Ctrl Delay			6.9			
HCM 2010 LOS			A			

Notes

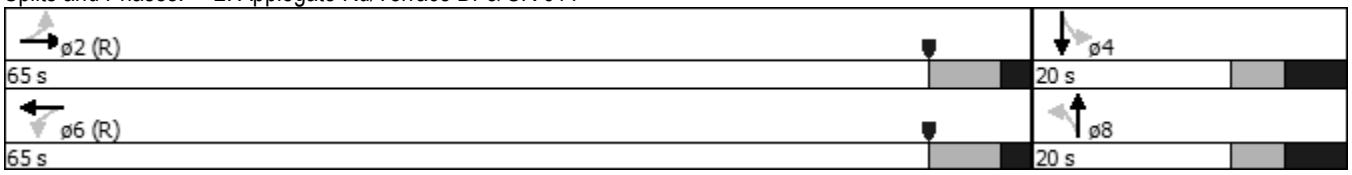
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	17	523	25	14	286	6	16	1	21	16	3	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	11	11	10	11	11	11	13	13	10	10	10
Grade (%)		1%			1%			2%			-4%	
Storage Length (ft)	75		0	75		0	75		0	0		0
Storage Lanes	1		0	1		0	1		0	0		0
Taper Length (ft)	90			90			50			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		1.00										
Frt		0.990			0.995			0.866			0.928	
Flt Protected	0.950			0.950			0.950				0.983	
Satd. Flow (prot)	1581	1753	0	1676	1719	0	1727	1683	0	0	1610	0
Flt Permitted	0.556			0.380			0.711				0.868	
Satd. Flow (perm)	926	1753	0	670	1719	0	1293	1683	0	0	1422	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		9			5			33			38	
Link Speed (mph)		45			45			25			25	
Link Distance (ft)		1522			906			500			500	
Travel Time (s)		23.1			13.7			13.6			13.6	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)			2									
Peak Hour Factor	0.50	0.85	0.60	0.65	0.87	0.50	0.94	0.25	0.63	0.63	0.38	0.50
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	6%	3%	4%	0%	6%	0%	0%	0%	0%	7%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	34	615	42	22	329	12	17	4	33	25	8	38
Shared Lane Traffic (%)												
Lane Group Flow (vph)	34	657	0	22	341	0	17	37	0	0	71	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	2	2		6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	13.5	13.5		13.5	13.5		14.5	14.5		14.5	14.5	
Total Split (s)	65.0	65.0		65.0	65.0		20.0	20.0		20.0	20.0	
Total Split (%)	76.5%	76.5%		76.5%	76.5%		23.5%	23.5%		23.5%	23.5%	
Maximum Green (s)	58.5	58.5		58.5	58.5		12.5	12.5		12.5	12.5	
Yellow Time (s)	4.5	4.5		4.5	4.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	2.0	2.0		2.0	2.0		4.0	4.0		4.0	4.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Lost Time (s)	6.5	6.5		6.5	6.5		7.5	7.5			7.5	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	6.0	6.0		6.0	6.0		3.0	3.0		3.0	3.0	
Minimum Gap (s)	3.0	3.0		3.0	3.0		0.2	0.2		0.2	0.2	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Time Before Reduce (s)	25.0	25.0		25.0	25.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)	10.0	10.0		10.0	10.0		0.0	0.0		0.0	0.0	
Recall Mode	C-Min	C-Min		C-Min	C-Min		None	None		None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)	67.0	67.0		67.0	67.0		7.9	7.9			7.9	
Actuated g/C Ratio	0.79	0.79		0.79	0.79		0.09	0.09			0.09	
v/c Ratio	0.05	0.47		0.04	0.25		0.14	0.20			0.43	
Control Delay	1.5	2.1		2.6	2.3		36.6	16.5			27.8	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Delay	1.5	2.1		2.6	2.3		36.6	16.5			27.8	
LOS	A	A		A	A		D	B			C	
Approach Delay		2.1			2.3			22.8			27.8	
Approach LOS		A			A			C			C	
Queue Length 50th (ft)	0	7		1	13		9	2			17	
Queue Length 95th (ft)	4	57		4	42		27	0			11	
Internal Link Dist (ft)		1442			826			420			420	
Turn Bay Length (ft)	75			75			75					
Base Capacity (vph)	730	1384		528	1356		190	275			241	
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	0.05	0.47		0.04	0.25		0.09	0.13			0.29	

Intersection Summary

Area Type: Other
Cycle Length: 85
Actuated Cycle Length: 85
Offset: 35 (41%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow
Natural Cycle: 50
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.47
Intersection Signal Delay: 4.7 Intersection LOS: A
Intersection Capacity Utilization 49.6% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 2: Applegate Rd/Terrace Dr & SR 611



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	17	523	25	14	286	6	16	1	21	16	3	19
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	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
Adj Sat Flow veh/h/ln	178.3	183.4	189.0	189.0	178.7	189.0	188.1	195.6	195.6	193.8	189.1	193.8
Lanes	1	1	0	1	1	0	1	1	0	0	1	0
Cap, veh/h	684	1069	73	476	1081	39	198	16	130	134	24	68
Arrive On Green	0.63	0.63	0.63	0.63	0.63	0.63	0.09	0.09	0.09	0.09	0.09	0.09
Sat Flow, veh/h	991	1695	116	785	1714	62	1368	183	1507	415	274	793
Grp Volume(v), veh/h	34	0	657	22	0	341	17	0	37	71	0	0
Grp Sat Flow(s),veh/h/ln	991	0	1811	785	0	1776	1368	0	1690	1482	0	0
Q Serve(g_s), s	0.8	0.0	10.4	0.8	0.0	4.3	0.6	0.0	1.0	1.3	0.0	0.0
Cycle Q Clear(g_c), s	5.1	0.0	10.4	11.2	0.0	4.3	3.0	0.0	1.0	2.4	0.0	0.0
Prop In Lane	1.00		0.06	1.00		0.04	1.00		0.89	0.35		0.54
Lane Grp Cap(c), veh/h	684	0	1143	476	0	1120	198	0	146	226	0	0
V/C Ratio(X)	0.05	0.00	0.58	0.05	0.00	0.30	0.09	0.00	0.25	0.31	0.00	0.00
Avail Cap(c_a), veh/h	1231	0	2141	909	0	2100	426	0	427	484	0	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)	0.83	0.00	0.83	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	5.3	0.0	5.3	8.5	0.0	4.2	23.2	0.0	21.1	21.7	0.0	0.0
Incr Delay (d2), s/veh	0.1	0.0	1.8	0.2	0.0	0.7	0.2	0.0	0.9	0.8	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 Back of Q (50%), veh/ln	0.2	0.0	3.3	0.1	0.0	1.4	0.2	0.0	0.4	0.9	0.0	0.0
Lane Grp Delay (d), s/veh	5.5	0.0	7.1	8.7	0.0	4.9	23.4	0.0	22.0	22.5	0.0	0.0
Lane Grp LOS	A		A	A		A	C		C	C		
Approach Vol, veh/h		691			363			54			71	
Approach Delay, s/veh		7.0			5.1			22.4			22.5	
Approach LOS		A			A			C			C	

Timer												
Assigned Phs		2			6			8			4	
Phs Duration (G+Y+Rc), s		37.7			37.7			11.8			11.8	
Change Period (Y+Rc), s		6.5			6.5			7.5			7.5	
Max Green Setting (Gmax), s		58.5			58.5			12.5			12.5	
Max Q Clear Time (g_c+I1), s		12.4			13.2			5.0			4.4	
Green Ext Time (p_c), s		18.1			18.0			0.2			0.2	

Intersection Summary		
HCM 2010 Ctrl Delay		8.0
HCM 2010 LOS		A

Notes

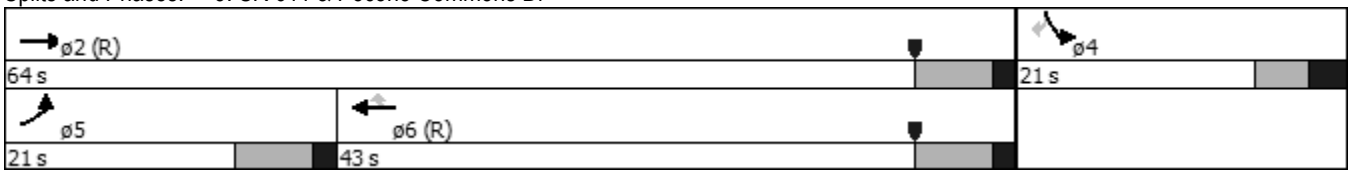
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	185	334	278	151	75	143
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	14	13	16
Grade (%)		-1%	1%		-2%	
Storage Length (ft)	175			280	0	150
Storage Lanes	1			1	2	1
Taper Length (ft)	90				25	
Lane Util. Factor	0.97	1.00	1.00	1.00	0.97	1.00
Ped Bike Factor						
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	3417	1768	1800	1697	3514	1761
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	3417	1768	1800	1697	3514	1761
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				199		161
Link Speed (mph)		45	45		25	
Link Distance (ft)		340	1000		500	
Travel Time (s)		5.2	15.2		13.6	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.87	0.91	0.89	0.76	0.74	0.89
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	8%	5%	1%	4%	5%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)		0%	0%		0%	
Adj. Flow (vph)	213	367	312	199	101	161
Shared Lane Traffic (%)						
Lane Group Flow (vph)	213	367	312	199	101	161
Turn Type	Prot	NA	NA	Perm	NA	Perm
Protected Phases	5	2	6		4	
Permitted Phases				6		4
Detector Phase	5	2	6	6	4	4
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	13.5	13.5	13.5	13.5	13.0	13.0
Total Split (s)	21.0	64.0	43.0	43.0	21.0	21.0
Total Split (%)	24.7%	75.3%	50.6%	50.6%	24.7%	24.7%
Maximum Green (s)	14.5	57.5	36.5	36.5	15.0	15.0
Yellow Time (s)	5.0	5.0	5.0	5.0	3.5	3.5
All-Red Time (s)	1.5	1.5	1.5	1.5	2.5	2.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	6.5	6.5	6.0	6.0
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?						
Vehicle Extension (s)	2.0	5.5	5.5	5.5	2.0	2.0
Minimum Gap (s)	0.2	2.5	2.5	2.5	0.2	0.2

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Time Before Reduce (s)	0.0	15.0	15.0	15.0	0.0	0.0
Time To Reduce (s)	0.0	14.0	14.0	14.0	0.0	0.0
Recall Mode	None	C-Min	C-Min	C-Min	None	None
Walk Time (s)						
Flash Dont Walk (s)						
Pedestrian Calls (#/hr)						
Act Effct Green (s)	9.6	65.4	49.3	49.3	7.1	7.1
Actuated g/C Ratio	0.11	0.77	0.58	0.58	0.08	0.08
v/c Ratio	0.55	0.27	0.30	0.19	0.35	0.55
Control Delay	36.0	4.6	10.9	2.1	39.4	13.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	36.0	4.6	10.9	2.1	39.4	13.8
LOS	D	A	B	A	D	B
Approach Delay		16.1	7.5		23.6	
Approach LOS		B	A		C	
Queue Length 50th (ft)	56	42	77	0	26	0
Queue Length 95th (ft)	85	141	147	17	40	52
Internal Link Dist (ft)		260	920		420	
Turn Bay Length (ft)	175			280		150
Base Capacity (vph)	582	1360	1043	1067	620	443
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.37	0.27	0.30	0.19	0.16	0.36

Intersection Summary

Area Type: Other
Cycle Length: 85
Actuated Cycle Length: 85
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow, Master Intersection
Natural Cycle: 45
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.55
Intersection Signal Delay: 14.3 Intersection LOS: B
Intersection Capacity Utilization 39.1% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 3: SR 611 & Pocono Commons Dr



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	185	334	278	151	75	143
Number	5	2	6	16	7	14
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
Adj Sat Flow veh/h/ln	185.4	176.8	180.0	194.7	191.9	190.1
Lanes	2	1	1	1	2	1
Cap, veh/h	364	1110	654	601	237	108
Arrive On Green	0.11	0.63	0.36	0.00	0.07	0.00
Sat Flow, veh/h	3425	1768	1800	1655	3546	1616
Grp Volume(v), veh/h	213	367	312	0	101	0
Grp Sat Flow(s),veh/h/ln	1713	1768	1800	1655	1773	1616
Q Serve(g_s), s	2.4	4.0	5.5	0.0	1.1	0.0
Cycle Q Clear(g_c), s	2.4	4.0	5.5	0.0	1.1	0.0
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	364	1110	654	601	237	108
V/C Ratio(X)	0.59	0.33	0.48	0.00	0.43	0.00
Avail Cap(c_a), veh/h	1213	2482	1605	1475	1299	592
HCM Platoon Ratio	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
Uniform Delay (d), s/veh	17.4	3.6	10.0	0.0	18.4	0.0
Incr Delay (d2), s/veh	0.6	0.8	2.5	0.0	0.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	0.9	1.1	2.3	0.0	0.5	0.0
Lane Grp Delay (d), s/veh	18.0	4.4	12.5	0.0	18.8	0.0
Lane Grp LOS	B	A	B		B	
Approach Vol, veh/h		580	312		101	
Approach Delay, s/veh		9.4	12.5		18.8	
Approach LOS		A	B		B	

Timer						
Assigned Phs	5	2	6			
Phs Duration (G+Y+Rc), s	10.9	32.2	21.4			
Change Period (Y+Rc), s	6.5	6.5	6.5			
Max Green Setting (Gmax), s	14.5	57.5	36.5			
Max Q Clear Time (g_c+I1), s	4.4	6.0	7.5			
Green Ext Time (p_c), s	0.3	8.3	7.4			

Intersection Summary						
HCM 2010 Ctrl Delay			11.3			
HCM 2010 LOS			B			

Notes

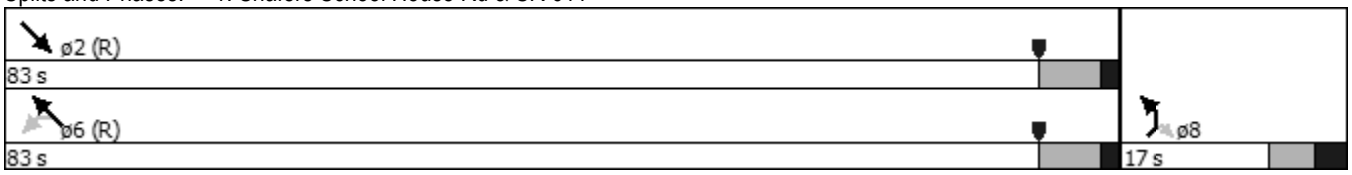
Lane Group	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Volume (vph)	617	39	70	753	42	42
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	11	10	14
Grade (%)	2%			-1%	4%	
Storage Length (ft)		0	150		0	165
Storage Lanes		0	1		1	1
Taper Length (ft)			100		25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.989					0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1720	0	1624	1810	1603	1563
Flt Permitted			0.358		0.950	
Satd. Flow (perm)	1720	0	612	1810	1603	1563
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	14					51
Link Speed (mph)	45			45	30	
Link Distance (ft)	1000			1522	500	
Travel Time (s)	15.2			23.1	11.4	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.94	0.66	0.87	0.88	0.71	0.83
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	22%	8%	2%	3%	8%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Adj. Flow (vph)	656	59	80	856	59	51
Shared Lane Traffic (%)						
Lane Group Flow (vph)	715	0	80	856	59	51
Turn Type	NA		Perm	NA	NA	Perm
Protected Phases	2			6	8	
Permitted Phases			6			8
Detector Phase	2		6	6	8	8
Switch Phase						
Minimum Initial (s)	4.0		4.0	4.0	4.0	4.0
Minimum Split (s)	13.0		13.0	13.0	13.0	13.0
Total Split (s)	83.0		83.0	83.0	17.0	17.0
Total Split (%)	83.0%		83.0%	83.0%	17.0%	17.0%
Maximum Green (s)	77.0		77.0	77.0	11.0	11.0
Yellow Time (s)	4.5		4.5	4.5	3.5	3.5
All-Red Time (s)	1.5		1.5	1.5	2.5	2.5
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0		6.0	6.0	6.0	6.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	5.5		5.5	5.5	3.0	3.0
Minimum Gap (s)	2.5		2.5	2.5	0.2	0.2

Lane Group	SET	SER	NWL	NWT	NEL	NER
Time Before Reduce (s)	15.0		15.0	15.0	0.0	0.0
Time To Reduce (s)	14.0		14.0	14.0	0.0	0.0
Recall Mode	C-Min		C-Min	C-Min	None	None
Walk Time (s)						
Flash Dont Walk (s)						
Pedestrian Calls (#/hr)						
Act Effct Green (s)	82.5		82.5	82.5	9.0	9.0
Actuated g/C Ratio	0.82		0.82	0.82	0.09	0.09
v/c Ratio	0.50		0.16	0.57	0.41	0.27
Control Delay	5.2		2.2	3.4	50.5	15.4
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	5.2		2.2	3.4	50.5	15.4
LOS	A		A	A	D	B
Approach Delay	5.2			3.3	34.2	
Approach LOS	A			A	C	
Queue Length 50th (ft)	124		5	71	36	0
Queue Length 95th (ft)	229		12	83	58	29
Internal Link Dist (ft)	920			1442	420	
Turn Bay Length (ft)			150			165
Base Capacity (vph)	1426		506	1498	181	222
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	0.50		0.16	0.57	0.33	0.23

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 89 (89%), Referenced to phase 2:SET and 6:NWTL, Start of Yellow
Natural Cycle: 55
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.57
Intersection Signal Delay: 6.0 Intersection LOS: A
Intersection Capacity Utilization 57.0% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 1: Shafers School House Rd & SR 611



Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Volume (veh/h)	617	39	70	753	42	42
Number	2	12	1	6	3	18
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
Adj Sat Flow veh/h/ln	179.9	188.1	176.8	187.2	180.8	179.3
Lanes	1	0	1	1	1	1
Cap, veh/h	1242	112	527	1429	99	87
Arrive On Green	0.76	0.76	0.76	0.76	0.06	0.06
Sat Flow, veh/h	1627	146	696	1872	1722	1524
Grp Volume(v), veh/h	0	715	80	856	59	51
Grp Sat Flow(s),veh/h/ln	0	1773	696	1872	1722	1524
Q Serve(g_s), s	0.0	10.7	3.4	13.3	2.2	2.2
Cycle Q Clear(g_c), s	0.0	10.7	14.2	13.3	2.2	2.2
Prop In Lane		0.08	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	0	1353	527	1429	99	87
V/C Ratio(X)	0.00	0.53	0.15	0.60	0.60	0.58
Avail Cap(c_a), veh/h	0	2040	797	2154	283	250
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.84	0.84	1.00	1.00
Uniform Delay (d), s/veh	0.0	3.1	5.9	3.5	30.8	30.8
Incr Delay (d2), s/veh	0.0	1.5	0.5	1.6	5.7	6.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	0.0	2.7	0.5	3.5	1.1	1.0
Lane Grp Delay (d), s/veh	0.0	4.6	6.5	5.0	36.5	36.8
Lane Grp LOS		A	A	A	D	D
Approach Vol, veh/h	715			936	110	
Approach Delay, s/veh	4.6			5.1	36.6	
Approach LOS	A			A	D	

Timer						
Assigned Phs	2			6		
Phs Duration (G+Y+Rc), s	57.1			57.1		
Change Period (Y+Rc), s	6.0			6.0		
Max Green Setting (Gmax), s	77.0			77.0		
Max Q Clear Time (g_c+I1), s	12.7			16.2		
Green Ext Time (p_c), s	36.0			34.9		

Intersection Summary						
HCM 2010 Ctrl Delay			6.9			
HCM 2010 LOS			A			

Notes

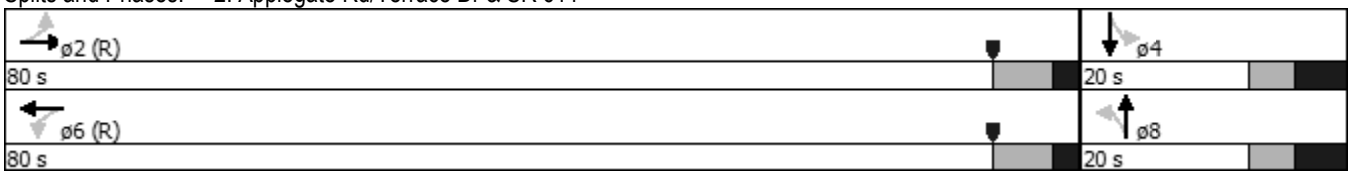
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	24	573	31	31	704	14	36	3	32	8	2	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	11	11	10	11	11	11	13	13	10	10	10
Grade (%)		1%			1%			2%			-4%	
Storage Length (ft)	75		0	75		0	75		0	0		0
Storage Lanes	1		0	1		0	1		0	0		0
Taper Length (ft)	90			90			50			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.991			0.996			0.883			0.903	
Flt Protected	0.950			0.950			0.950				0.990	
Satd. Flow (prot)	1676	1794	0	1676	1803	0	1727	1677	0	0	1572	0
Flt Permitted	0.325			0.376			0.720				0.912	
Satd. Flow (perm)	573	1794	0	663	1803	0	1309	1677	0	0	1448	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		8			4			43			41	
Link Speed (mph)		45			45			25			25	
Link Distance (ft)		1522			906			500			500	
Travel Time (s)		23.1			13.7			13.6			13.6	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.82	0.91	0.81	0.66	0.94	0.65	0.71	0.25	0.75	0.67	0.50	0.58
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	3%	0%	0%	4%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	29	630	38	47	749	22	51	12	43	12	4	41
Shared Lane Traffic (%)												
Lane Group Flow (vph)	29	668	0	47	771	0	51	55	0	0	57	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	2	2		6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	13.5	13.5		13.5	13.5		14.5	14.5		14.5	14.5	
Total Split (s)	80.0	80.0		80.0	80.0		20.0	20.0		20.0	20.0	
Total Split (%)	80.0%	80.0%		80.0%	80.0%		20.0%	20.0%		20.0%	20.0%	
Maximum Green (s)	73.5	73.5		73.5	73.5		12.5	12.5		12.5	12.5	
Yellow Time (s)	4.5	4.5		4.5	4.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	2.0	2.0		2.0	2.0		4.0	4.0		4.0	4.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Lost Time (s)	6.5	6.5		6.5	6.5		7.5	7.5			7.5	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	6.0	6.0		6.0	6.0		3.0	3.0		3.0	3.0	
Minimum Gap (s)	3.0	3.0		3.0	3.0		0.2	0.2		0.2	0.2	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Time Before Reduce (s)	25.0	25.0		25.0	25.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)	10.0	10.0		10.0	10.0		0.0	0.0		0.0	0.0	
Recall Mode	C-Min	C-Min		C-Min	C-Min		None	None		None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)	80.6	80.6		80.6	80.6		9.3	9.3			9.3	
Actuated g/C Ratio	0.81	0.81		0.81	0.81		0.09	0.09			0.09	
v/c Ratio	0.06	0.46		0.09	0.53		0.42	0.28			0.33	
Control Delay	3.8	5.2		2.0	2.8		52.3	20.3			23.4	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Delay	3.8	5.2		2.0	2.8		52.3	20.3			23.4	
LOS	A	A		A	A		D	C			C	
Approach Delay		5.2			2.8			35.7			23.4	
Approach LOS		A			A			D			C	
Queue Length 50th (ft)	4	126		2	36		31	7			10	
Queue Length 95th (ft)	m9	211		m4	67		52	0			14	
Internal Link Dist (ft)		1442			826			420			420	
Turn Bay Length (ft)	75			75			75					
Base Capacity (vph)	463	1450		535	1457		165	250			218	
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	0.06	0.46		0.09	0.53		0.31	0.22			0.26	

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 67 (67%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow
Natural Cycle: 55
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.53
Intersection Signal Delay: 6.5 Intersection LOS: A
Intersection Capacity Utilization 58.3% ICU Level of Service B
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Applegate Rd/Terrace Dr & SR 611



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	24	573	31	31	704	14	36	3	32	8	2	24
Number	5	2	12	1	6	16	3	8	18	7	4	14
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
Adj Sat Flow veh/h/ln	189.0	187.3	189.0	189.0	187.2	189.0	188.1	191.1	195.6	193.8	188.4	193.8
Lanes	1	1	0	1	1	0	1	1	0	0	1	0
Cap, veh/h	456	1241	75	525	1285	38	187	35	126	79	25	111
Arrive On Green	0.71	0.71	0.71	0.71	0.71	0.71	0.10	0.10	0.10	0.10	0.10	0.10
Sat Flow, veh/h	706	1749	105	777	1810	53	1369	366	1313	192	259	1155
Grp Volume(v), veh/h	29	0	668	47	0	771	51	0	55	57	0	0
Grp Sat Flow(s),veh/h/ln	706	0	1854	777	0	1863	1369	0	1680	1606	0	0
Q Serve(g_s), s	1.5	0.0	11.8	2.1	0.0	14.8	2.6	0.0	2.2	0.0	0.0	0.0
Cycle Q Clear(g_c), s	16.3	0.0	11.8	13.9	0.0	14.8	4.9	0.0	2.2	2.3	0.0	0.0
Prop In Lane	1.00		0.06	1.00		0.03	1.00		0.78	0.21		0.72
Lane Grp Cap(c), veh/h	456	0	1316	525	0	1323	187	0	161	214	0	0
V/C Ratio(X)	0.06	0.00	0.51	0.09	0.00	0.58	0.27	0.00	0.34	0.27	0.00	0.00
Avail Cap(c_a), veh/h	675	0	1891	766	0	1900	294	0	291	335	0	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)	0.87	0.00	0.87	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	9.2	0.0	4.7	7.9	0.0	5.2	32.8	0.0	30.5	30.5	0.0	0.0
Incr Delay (d2), s/veh	0.2	0.0	1.2	0.3	0.0	1.9	0.8	0.0	1.3	0.7	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 Back of Q (50%), veh/ln	0.3	0.0	3.8	0.4	0.0	5.0	0.9	0.0	1.0	1.0	0.0	0.0
Lane Grp Delay (d), s/veh	9.4	0.0	6.0	8.2	0.0	7.1	33.6	0.0	31.7	31.2	0.0	0.0
Lane Grp LOS	A		A	A		A	C		C	C		
Approach Vol, veh/h		697			818			106			57	
Approach Delay, s/veh		6.1			7.1			32.6			31.2	
Approach LOS		A			A			C			C	

Timer												
Assigned Phs		2			6			8			4	
Phs Duration (G+Y+Rc), s		57.7			57.7			14.4			14.4	
Change Period (Y+Rc), s		6.5			6.5			7.5			7.5	
Max Green Setting (Gmax), s		73.5			73.5			12.5			12.5	
Max Q Clear Time (g_c+I1), s		18.3			16.8			6.9			4.3	
Green Ext Time (p_c), s		32.9			33.4			0.3			0.4	

Intersection Summary												
HCM 2010 Ctrl Delay			9.1									
HCM 2010 LOS			A									

Notes

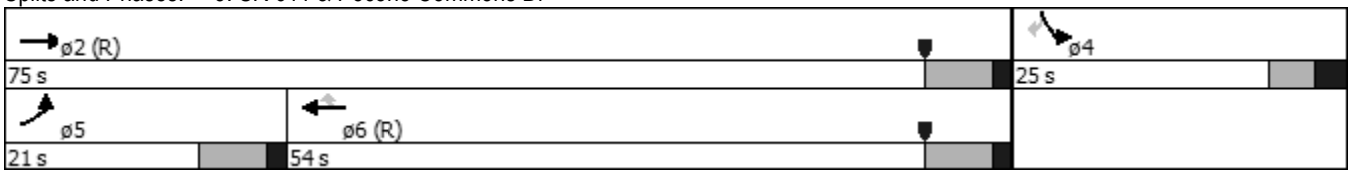
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	274	325	567	217	186	337
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	14	13	16
Grade (%)		-1%	1%		-2%	
Storage Length (ft)	175			280	0	150
Storage Lanes	1			1	2	1
Taper Length (ft)	90				25	
Lane Util. Factor	0.97	1.00	1.00	1.00	0.97	1.00
Ped Bike Factor						
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	3484	1872	1872	1697	3583	1812
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	3484	1872	1872	1697	3583	1812
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				241		387
Link Speed (mph)		45	45		25	
Link Distance (ft)		340	1000		500	
Travel Time (s)		5.2	15.2		13.6	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.74	0.89	0.85	0.90	0.83	0.70
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	2%	1%	1%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)		0%	0%		0%	
Adj. Flow (vph)	370	365	667	241	224	481
Shared Lane Traffic (%)						
Lane Group Flow (vph)	370	365	667	241	224	481
Turn Type	Prot	NA	NA	Perm	NA	Perm
Protected Phases	5	2	6		4	
Permitted Phases				6		4
Detector Phase	5	2	6	6	4	4
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	13.5	13.5	13.5	13.5	13.0	13.0
Total Split (s)	21.0	75.0	54.0	54.0	25.0	25.0
Total Split (%)	21.0%	75.0%	54.0%	54.0%	25.0%	25.0%
Maximum Green (s)	14.5	68.5	47.5	47.5	19.0	19.0
Yellow Time (s)	5.0	5.0	5.0	5.0	3.5	3.5
All-Red Time (s)	1.5	1.5	1.5	1.5	2.5	2.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	6.5	6.5	6.0	6.0
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?						
Vehicle Extension (s)	2.0	5.5	5.5	5.5	2.0	2.0
Minimum Gap (s)	0.2	2.5	2.5	2.5	0.2	0.2

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Time Before Reduce (s)	0.0	15.0	15.0	15.0	0.0	0.0
Time To Reduce (s)	0.0	14.0	14.0	14.0	0.0	0.0
Recall Mode	None	C-Min	C-Min	C-Min	None	None
Walk Time (s)						
Flash Dont Walk (s)						
Pedestrian Calls (#/hr)						
Act Effct Green (s)	14.0	74.8	54.3	54.3	12.7	12.7
Actuated g/C Ratio	0.14	0.75	0.54	0.54	0.13	0.13
v/c Ratio	0.76	0.26	0.66	0.23	0.49	0.85
Control Delay	46.9	3.8	21.7	2.6	43.5	23.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	46.9	3.8	21.7	2.6	43.5	23.8
LOS	D	A	C	A	D	C
Approach Delay		25.5	16.6		30.0	
Approach LOS		C	B		C	
Queue Length 50th (ft)	107	16	281	0	71	57
Queue Length 95th (ft)	122	84	436	39	90	56
Internal Link Dist (ft)		260	920		420	
Turn Bay Length (ft)	175			280		150
Base Capacity (vph)	523	1401	1016	1031	680	657
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.71	0.26	0.66	0.23	0.33	0.73

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow, Master Intersection
Natural Cycle: 65
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.85
Intersection Signal Delay: 23.4 Intersection LOS: C
Intersection Capacity Utilization 61.1% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 3: SR 611 & Pocono Commons Dr



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	274	325	567	217	186	337
Number	5	2	6	16	7	14
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
Adj Sat Flow veh/h/ln	189.1	187.2	187.2	194.7	195.7	195.7
Lanes	2	1	1	1	2	1
Cap, veh/h	484	1352	915	808	343	158
Arrive On Green	0.14	0.72	0.49	0.00	0.09	0.00
Sat Flow, veh/h	3493	1872	1872	1655	3615	1663
Grp Volume(v), veh/h	370	365	667	0	224	0
Grp Sat Flow(s),veh/h/ln	1747	1872	1872	1655	1808	1663
Q Serve(g_s), s	7.0	4.6	19.3	0.0	4.1	0.0
Cycle Q Clear(g_c), s	7.0	4.6	19.3	0.0	4.1	0.0
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	484	1352	915	808	343	158
V/C Ratio(X)	0.76	0.27	0.73	0.00	0.65	0.00
Avail Cap(c_a), veh/h	741	1877	1301	1150	1005	462
HCM Platoon Ratio	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
Uniform Delay (d), s/veh	28.4	3.3	13.9	0.0	29.8	0.0
Incr Delay (d2), s/veh	1.0	0.5	5.1	0.0	0.8	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	2.9	1.4	8.7	0.0	1.8	0.0
Lane Grp Delay (d), s/veh	29.3	3.8	19.0	0.0	30.6	0.0
Lane Grp LOS	C	A	B		C	
Approach Vol, veh/h		735	667		224	
Approach Delay, s/veh		16.6	19.0		30.6	
Approach LOS		B	B		C	

Timer						
Assigned Phs	5	2	6			
Phs Duration (G+Y+Rc), s	16.0	55.8	39.9			
Change Period (Y+Rc), s	6.5	6.5	6.5			
Max Green Setting (Gmax), s	14.5	68.5	47.5			
Max Q Clear Time (g_c+I1), s	9.0	6.6	21.3			
Green Ext Time (p_c), s	0.5	16.3	12.0			

Intersection Summary			
HCM 2010 Ctrl Delay		19.5	
HCM 2010 LOS		B	

Notes

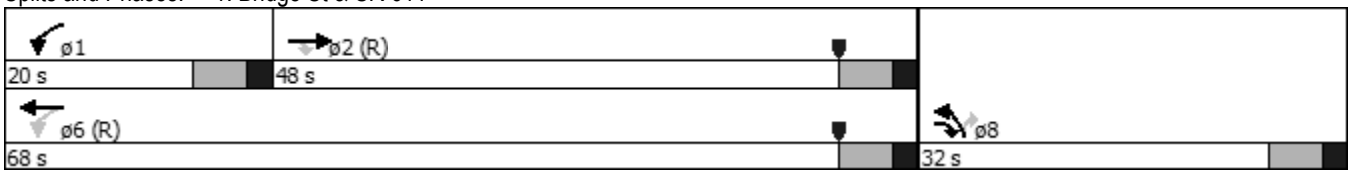
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	291	59	169	401	108	201
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	14	11	12
Grade (%)	-3%			3%	8%	
Storage Length (ft)		185	270		0	145
Storage Lanes		1	1		1	1
Taper Length (ft)			85		25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt		0.850				0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1759	1524	1653	1901	1580	1505
Flt Permitted			0.473		0.950	
Satd. Flow (perm)	1759	1524	823	1901	1580	1505
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		88				258
Link Speed (mph)	35			35	35	
Link Distance (ft)	1000			629	500	
Travel Time (s)	19.5			12.3	9.7	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.86	0.67	0.92	0.96	0.73	0.78
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	6%	4%	4%	5%	6%	3%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Adj. Flow (vph)	338	88	184	418	148	258
Shared Lane Traffic (%)						
Lane Group Flow (vph)	338	88	184	418	148	258
Turn Type	NA	pm+ov	pm+pt	NA	NA	Perm
Protected Phases	2	8	1	6	8	
Permitted Phases		2	6			8
Detector Phase	2	8	1	6	8	8
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	13.0	13.0	13.0	13.0	13.0	13.0
Total Split (s)	48.0	32.0	20.0	68.0	32.0	32.0
Total Split (%)	48.0%	32.0%	20.0%	68.0%	32.0%	32.0%
Maximum Green (s)	42.0	26.0	14.0	62.0	26.0	26.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?						
Vehicle Extension (s)	6.0	3.0	3.0	6.0	3.0	3.0
Minimum Gap (s)	3.0	0.2	0.2	3.0	0.2	0.2

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Time Before Reduce (s)	22.0	0.0	0.0	22.0	0.0	0.0
Time To Reduce (s)	11.0	0.0	0.0	11.0	0.0	0.0
Recall Mode	C-Min	None	None	C-Min	None	None
Walk Time (s)						
Flash Dont Walk (s)						
Pedestrian Calls (#/hr)						
Act Effct Green (s)	58.1	78.9	73.2	73.2	14.8	14.8
Actuated g/C Ratio	0.58	0.79	0.73	0.73	0.15	0.15
v/c Ratio	0.33	0.07	0.27	0.30	0.63	0.58
Control Delay	13.4	0.8	2.5	2.1	51.4	10.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.4	0.8	2.5	2.1	51.4	10.3
LOS	B	A	A	A	D	B
Approach Delay	10.8			2.3	25.3	
Approach LOS	B			A	C	
Queue Length 50th (ft)	103	0	9	22	90	0
Queue Length 95th (ft)	190	4	19	37	113	35
Internal Link Dist (ft)	920			549	420	
Turn Bay Length (ft)		185	270			145
Base Capacity (vph)	1021	1398	718	1391	410	582
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.33	0.06	0.26	0.30	0.36	0.44

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 16 (16%), Referenced to phase 2:EBT and 6:WBTL, Start of Yellow
Natural Cycle: 50
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.63
Intersection Signal Delay: 11.3 Intersection LOS: B
Intersection Capacity Utilization 45.7% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 1: Bridge St & SR 611



HCM 2010 analysis expects strict NEMA phasing.

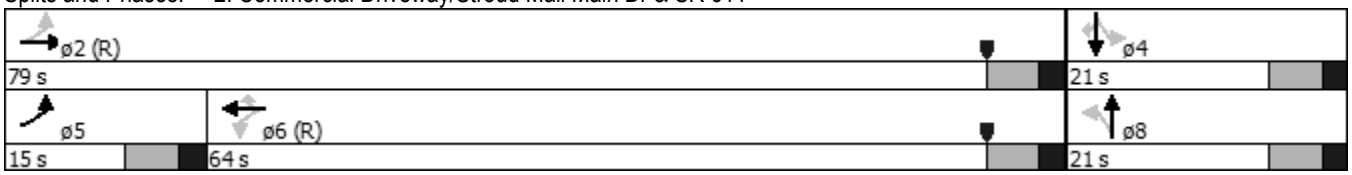
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	104	656	42	37	516	28	32	12	38	24	3	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	15	16	16	16	16	14	14	15
Grade (%)		0%			0%			-1%			-5%	
Storage Length (ft)	230		0	75		150	0		0	0		125
Storage Lanes	1		0	1		1	0		0	0		1
Taper Length (ft)	80			60			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		1.00		1.00								
Frt		0.987				0.850		0.940				0.850
Flt Protected	0.950			0.950				0.980			0.961	
Satd. Flow (prot)	1770	1838	0	1805	1972	1830	0	1967	0	0	1861	1734
Flt Permitted	0.341			0.363				0.848			0.663	
Satd. Flow (perm)	635	1838	0	690	1972	1830	0	1702	0	0	1284	1734
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		13				98		34				98
Link Speed (mph)		35			35			25			25	
Link Distance (ft)		629			306			500			500	
Travel Time (s)		12.3			6.0			13.6			13.6	
Confl. Peds. (#/hr)			1	1								
Confl. Bikes (#/hr)												
Peak Hour Factor	0.65	0.90	0.59	0.97	0.90	0.65	0.68	0.69	0.75	0.72	0.38	0.66
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	0%	0%	6%	0%	0%	0%	3%	9%	0%	5%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	160	729	71	38	573	43	47	17	51	33	8	33
Shared Lane Traffic (%)												
Lane Group Flow (vph)	160	800	0	38	573	43	0	115	0	0	41	33
Turn Type	pm+pt	NA		Perm	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	5	2			6			8			4	
Permitted Phases	2			6		6	8			4		4
Detector Phase	5	2		6	6	6	8	8		4	4	4
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	13.0	13.0		13.0	13.0	13.0	13.0	13.0		13.0	13.0	13.0
Total Split (s)	15.0	79.0		64.0	64.0	64.0	21.0	21.0		21.0	21.0	21.0
Total Split (%)	15.0%	79.0%		64.0%	64.0%	64.0%	21.0%	21.0%		21.0%	21.0%	21.0%
Maximum Green (s)	9.0	73.0		58.0	58.0	58.0	15.0	15.0		15.0	15.0	15.0
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0		2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0			0.0	0.0
Total Lost Time (s)	6.0	6.0		6.0	6.0	6.0		6.0			6.0	6.0
Lead/Lag	Lead			Lag	Lag	Lag						
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	0.2		0.2	0.2	0.2	3.0	3.0		3.0	3.0	3.0
Minimum Gap (s)	0.2	0.2		0.2	0.2	0.2	0.2	0.2		0.2	0.2	0.2

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Time Before Reduce (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Recall Mode	None	C-Max		C-Max	C-Max	C-Max	None	None		None	None	None
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)	77.8	77.8		64.1	64.1	64.1		10.2			10.2	10.2
Actuated g/C Ratio	0.78	0.78		0.64	0.64	0.64		0.10			0.10	0.10
v/c Ratio	0.28	0.56		0.09	0.45	0.04		0.56			0.32	0.12
Control Delay	3.8	5.2		1.4	2.4	0.1		40.0			46.5	1.0
Queue Delay	0.0	0.1		0.0	0.3	0.0		0.0			0.0	0.0
Total Delay	3.8	5.4		1.4	2.7	0.1		40.0			46.5	1.0
LOS	A	A		A	A	A		D			D	A
Approach Delay		5.1			2.4			40.0			26.2	
Approach LOS		A			A			D			C	
Queue Length 50th (ft)	14	90		1	8	0		50			25	0
Queue Length 95th (ft)	25	243		m2	18	1		70			23	0
Internal Link Dist (ft)		549			226			420			420	
Turn Bay Length (ft)	230			75		150						125
Base Capacity (vph)	596	1432		442	1264	1208		284			192	343
Starvation Cap Reductn	0	110		0	213	0		0			0	0
Spillback Cap Reductn	0	0		0	0	0		0			0	0
Storage Cap Reductn	0	0		0	0	0		0			0	0
Reduced v/c Ratio	0.27	0.61		0.09	0.55	0.04		0.40			0.21	0.10

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow, Master Intersection
Natural Cycle: 55
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.56
Intersection Signal Delay: 7.2 Intersection LOS: A
Intersection Capacity Utilization 66.8% ICU Level of Service C
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Commercial Driveway/Stroud Mall Main Dr & SR 611



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	104	656	42	37	516	28	32	12	38	24	3	22
Number	5	2	12	1	6	16	3	8	18	7	4	14
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
Adj Sat Flow veh/h/ln	186.3	186.6	190.0	190.0	186.4	197.6	198.6	196.0	198.6	202.5	188.9	192.9
Lanes	1	1	0	1	1	1	0	1	0	0	1	1
Cap, veh/h	678	1313	128	540	1249	1125	107	31	66	149	29	143
Arrive On Green	0.10	1.00	1.00	0.89	0.89	0.00	0.09	0.09	0.09	0.09	0.09	0.00
Sat Flow, veh/h	1774	1674	163	690	1864	1680	606	352	763	909	333	1640
Grp Volume(v), veh/h	160	0	800	38	573	0	115	0	0	41	0	0
Grp Sat Flow(s),veh/h/ln	1774	0	1837	690	1864	1680	1720	0	0	1243	0	1640
Q Serve(g_s), s	2.5	0.0	0.0	0.6	5.3	0.0	3.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	2.5	0.0	0.0	0.6	5.3	0.0	5.9	0.0	0.0	2.9	0.0	0.0
Prop In Lane	1.00		0.09	1.00		1.00	0.41		0.44	0.80		1.00
Lane Grp Cap(c), veh/h	678	0	1441	540	1249	1125	204	0	0	178	0	143
V/C Ratio(X)	0.24	0.00	0.56	0.07	0.46	0.00	0.56	0.00	0.00	0.23	0.00	0.00
Avail Cap(c_a), veh/h	761	0	1441	540	1249	1125	324	0	0	284	0	264
HCM Platoon Ratio	2.00	2.00	2.00	1.33	1.33	1.33	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.90	0.00	0.90	0.88	0.88	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	3.6	0.0	0.0	1.7	2.0	0.0	41.4	0.0	0.0	40.0	0.0	0.0
Incr Delay (d2), s/veh	0.2	0.0	1.4	0.2	1.1	0.0	2.4	0.0	0.0	0.7	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 Back of Q (50%), veh/ln	0.7	0.0	0.6	0.1	1.6	0.0	2.8	0.0	0.0	0.9	0.0	0.0
Lane Grp Delay (d), s/veh	3.8	0.0	1.4	1.9	3.0	0.0	43.8	0.0	0.0	40.7	0.0	0.0
Lane Grp LOS	A		A	A	A		D			D		
Approach Vol, veh/h		960			611			115			41	
Approach Delay, s/veh		1.8			3.0			43.8			40.7	
Approach LOS		A			A			D			D	

Timer												
Assigned Phs	5	2			6			8			4	
Phs Duration (G+Y+Rc), s	10.6	79.0			68.4			14.1			14.1	
Change Period (Y+Rc), s	6.0	6.0			6.0			6.0			6.0	
Max Green Setting (Gmax), s	9.0	73.0			58.0			15.0			15.0	
Max Q Clear Time (g_c+I1), s	4.5	2.0			7.3			7.9			4.9	
Green Ext Time (p_c), s	0.2	0.3			0.3			0.3			0.4	

Intersection Summary												
HCM 2010 Ctrl Delay			5.9									
HCM 2010 LOS			A									

Notes

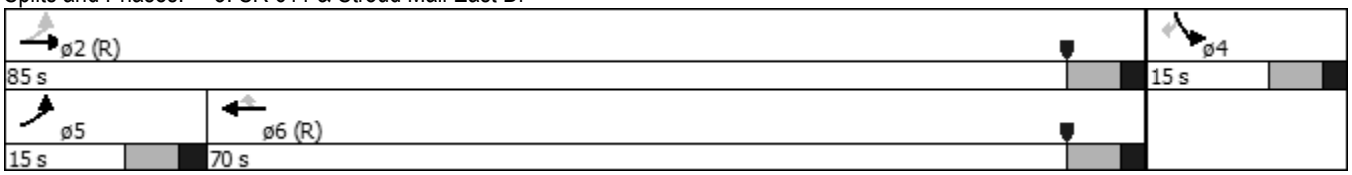
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	58	544	597	51	17	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	12	11	11	14	15
Grade (%)		0%	0%		0%	
Storage Length (ft)	115			250	0	150
Storage Lanes	1			1	1	1
Taper Length (ft)	60				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1711	1827	1766	1531	1816	1518
Flt Permitted	0.330				0.950	
Satd. Flow (perm)	594	1827	1766	1531	1816	1518
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				72		22
Link Speed (mph)		35	35		25	
Link Distance (ft)		306	1705		500	
Travel Time (s)		6.0	33.2		13.6	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.86	0.85	0.91	0.71	0.57	0.60
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	4%	4%	2%	6%	17%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)		0%	0%		0%	
Adj. Flow (vph)	67	640	656	72	30	22
Shared Lane Traffic (%)						
Lane Group Flow (vph)	67	640	656	72	30	22
Turn Type	pm+pt	NA	NA	Perm	NA	Perm
Protected Phases	5	2	6		4	
Permitted Phases	2			6		4
Detector Phase	5	2	6	6	4	4
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	13.0	13.0	13.0	13.0	13.0	13.0
Total Split (s)	15.0	85.0	70.0	70.0	15.0	15.0
Total Split (%)	15.0%	85.0%	70.0%	70.0%	15.0%	15.0%
Maximum Green (s)	9.0	79.0	64.0	64.0	9.0	9.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	0.2	0.2	0.2	3.0	3.0
Minimum Gap (s)	0.2	0.2	0.2	0.2	0.2	0.2

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Time Before Reduce (s)	0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	None	C-Max	C-Max	C-Max	None	None
Walk Time (s)						
Flash Dont Walk (s)						
Pedestrian Calls (#/hr)						
Act Effct Green (s)	85.6	88.0	76.9	76.9	7.1	7.1
Actuated g/C Ratio	0.86	0.88	0.77	0.77	0.07	0.07
v/c Ratio	0.12	0.40	0.48	0.06	0.23	0.17
Control Delay	1.6	1.9	2.3	0.1	47.6	20.4
Queue Delay	0.0	0.2	0.0	0.0	0.0	0.0
Total Delay	1.6	2.1	2.3	0.1	47.6	20.4
LOS	A	A	A	A	D	C
Approach Delay		2.0	2.1		36.1	
Approach LOS		A	A		D	
Queue Length 50th (ft)	3	66	26	0	18	0
Queue Length 95th (ft)	m8	74	m27	m1	29	11
Internal Link Dist (ft)		226	1625		420	
Turn Bay Length (ft)	115			250		150
Base Capacity (vph)	608	1607	1357	1193	163	156
Starvation Cap Reductn	0	304	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.11	0.49	0.48	0.06	0.18	0.14

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 99 (99%), Referenced to phase 2:EBTL and 6:WBT, Start of Yellow
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.48
Intersection Signal Delay: 3.3 Intersection LOS: A
Intersection Capacity Utilization 53.1% ICU Level of Service A
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: SR 611 & Stroud Mall East Dr



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	58	544	597	51	17	13
Number	5	2	6	16	7	14
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
Adj Sat Flow veh/h/ln	186.3	182.7	182.7	186.3	186.4	168.9
Lanes	1	1	1	1	1	1
Cap, veh/h	511	1549	1367	1185	41	33
Arrive On Green	0.07	1.00	0.50	0.50	0.02	0.00
Sat Flow, veh/h	1774	1827	1827	1583	1775	1436
Grp Volume(v), veh/h	67	640	656	72	30	0
Grp Sat Flow(s),veh/h/ln	1774	1827	1827	1583	1775	1436
Q Serve(g_s), s	0.7	0.0	22.0	2.2	1.6	0.0
Cycle Q Clear(g_c), s	0.7	0.0	22.0	2.2	1.6	0.0
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	511	1549	1367	1185	41	33
V/C Ratio(X)	0.13	0.41	0.48	0.06	0.73	0.00
Avail Cap(c_a), veh/h	620	1549	1367	1185	172	139
HCM Platoon Ratio	2.00	2.00	0.67	0.67	1.00	1.00
Upstream Filter(I)	0.81	0.81	0.58	0.58	1.00	0.00
Uniform Delay (d), s/veh	5.0	0.0	11.3	6.4	45.2	0.0
Incr Delay (d2), s/veh	0.1	0.7	0.7	0.1	21.6	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	0.3	0.3	10.0	0.6	1.0	0.0
Lane Grp Delay (d), s/veh	5.1	0.7	12.0	6.4	66.8	0.0
Lane Grp LOS	A	A	B	A	E	
Approach Vol, veh/h		707	728		30	
Approach Delay, s/veh		1.1	11.5		66.8	
Approach LOS		A	B		E	

Timer			
Assigned Phs	5	2	6
Phs Duration (G+Y+Rc), s	9.3	85.0	75.7
Change Period (Y+Rc), s	6.0	6.0	6.0
Max Green Setting (Gmax), s	9.0	79.0	64.0
Max Q Clear Time (g_c+I1), s	2.7	2.0	24.0
Green Ext Time (p_c), s	0.1	0.3	0.3

Intersection Summary	
HCM 2010 Ctrl Delay	7.6
HCM 2010 LOS	A

Notes

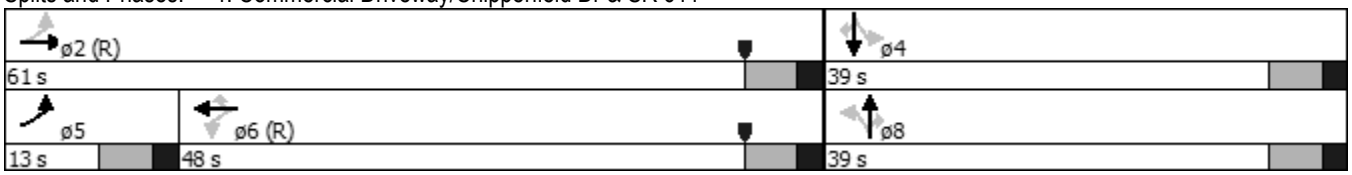
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	93	453	2	7	508	91	14	4	7	206	4	138
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	12	12	10	10	15	12	12	14	12	12	14
Grade (%)		-1%			1%			0%			1%	
Storage Length (ft)	100		0	230		215	0		90	0		200
Storage Lanes	1		0	1		1	0		1	0		1
Taper Length (ft)	60			40			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.998				0.850			0.850			0.850
Flt Protected	0.950			0.950				0.967			0.953	
Satd. Flow (prot)	1553	1783	0	1676	1697	1637	0	1837	1511	*1687	1558	1680
Flt Permitted	0.153			0.467				0.755			0.712	
Satd. Flow (perm)	250	1783	0	824	1697	1637	0	1434	1511	*1687	1164	1680
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1				108			98			157
Link Speed (mph)		35			35			25			35	
Link Distance (ft)		1705			1000			500			500	
Travel Time (s)		33.2			19.5			13.6			9.7	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.67	0.87	0.25	0.58	0.81	0.80	0.81	0.50	0.58	0.57	0.50	0.88
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	9%	7%	0%	0%	4%	8%	0%	0%	14%	16%	0%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	139	521	8	12	627	114	17	8	12	361	8	157
Shared Lane Traffic (%)												
Lane Group Flow (vph)	139	529	0	12	627	114	0	25	12	0	369	157
Turn Type	pm+pt	NA		Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2			6			8			4	
Permitted Phases	2			6		6	8		8	4		4
Detector Phase	5	2		6	6	6	8	8	8	4	4	4
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	13.0	13.0		13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0
Total Split (s)	13.0	61.0		48.0	48.0	48.0	39.0	39.0	39.0	39.0	39.0	39.0
Total Split (%)	13.0%	61.0%		48.0%	48.0%	48.0%	39.0%	39.0%	39.0%	39.0%	39.0%	39.0%
Maximum Green (s)	7.0	55.0		42.0	42.0	42.0	33.0	33.0	33.0	33.0	33.0	33.0
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0	0.0		0.0	0.0
Total Lost Time (s)	6.0	6.0		6.0	6.0	6.0		6.0	6.0		6.0	6.0
Lead/Lag	Lead			Lag	Lag	Lag						
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	6.0		6.0	6.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0
Minimum Gap (s)	0.2	3.0		3.0	3.0	3.0	0.2	0.2	0.2	0.2	0.2	0.2

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Time Before Reduce (s)	0.0	22.0		22.0	22.0	22.0	0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	10.0		10.0	10.0	10.0	0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	None	C-Min		C-Min	C-Min	C-Min	None	None	None	None	None	None
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)	55.2	55.2		42.2	42.2	42.2		32.8	32.8		32.8	32.8
Actuated g/C Ratio	0.55	0.55		0.42	0.42	0.42		0.33	0.33		0.33	0.33
v/c Ratio	0.61	0.54		0.03	0.88	0.15		0.05	0.02		0.97	0.24
Control Delay	21.9	15.4		17.6	42.0	4.6		23.3	0.0		73.5	4.9
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0	0.0		0.0	0.0
Total Delay	21.9	15.4		17.6	42.0	4.6		23.3	0.0		73.5	4.9
LOS	C	B		B	D	A		C	A		E	A
Approach Delay		16.8			35.9			15.8			53.1	
Approach LOS		B			D			B			D	
Queue Length 50th (ft)	40	248		4	359	2		11	0		229	0
Queue Length 95th (ft)	54	267		10	439	25		16	0		156	40
Internal Link Dist (ft)		1625			920			420			420	
Turn Bay Length (ft)	100			230		215			90			200
Base Capacity (vph)	229	986		349	717	755		474	565		385	660
Starvation Cap Reductn	0	0		0	0	0		0	0		0	0
Spillback Cap Reductn	0	0		0	0	0		0	0		0	0
Storage Cap Reductn	0	0		0	0	0		0	0		0	0
Reduced v/c Ratio	0.61	0.54		0.03	0.87	0.15		0.05	0.02		0.96	0.24

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 41 (41%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.97
Intersection Signal Delay: 33.6 Intersection LOS: C
Intersection Capacity Utilization 65.2% ICU Level of Service C
Analysis Period (min) 15
* User Entered Value

Splits and Phases: 4: Commercial Driveway/Chipperfield Dr & SR 611



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	93	453	2	7	508	91	14	4	7	206	4	138
Number	5	2	12	1	6	16	3	8	18	7	4	14
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
Adj Sat Flow veh/h/ln	175.2	178.6	191.0	189.0	181.8	182.0	190.0	190.0	173.3	189.0	163.5	192.8
Lanes	1	1	0	1	1	1	0	1	1	0	1	1
Cap, veh/h	250	943	14	425	746	635	62	18	500	73	0	556
Arrive On Green	0.09	0.71	0.71	0.41	0.41	0.41	0.34	0.34	0.34	0.34	0.34	0.34
Sat Flow, veh/h	1668	1755	27	884	1818	1547	0	54	1473	0	0	1638
Grp Volume(v), veh/h	139	0	529	12	627	114	25	0	12	369	0	157
Grp Sat Flow(s),veh/h/ln	1668	0	1782	884	1818	1547	54	0	1473	0	0	1638
Q Serve(g_s), s	4.5	0.0	13.6	0.8	30.2	4.6	0.0	0.0	0.5	0.0	0.0	6.8
Cycle Q Clear(g_c), s	4.5	0.0	13.6	2.1	30.2	4.6	33.0	0.0	0.5	33.0	0.0	6.8
Prop In Lane	1.00		0.02	1.00		1.00	0.68		1.00	0.98		1.00
Lane Grp Cap(c), veh/h	250	0	957	425	746	635	81	0	500	73	0	556
V/C Ratio(X)	0.56	0.00	0.55	0.03	0.84	0.18	0.31	0.00	0.02	5.04	0.00	0.28
Avail Cap(c_a), veh/h	261	0	1007	444	785	668	81	0	500	73	0	556
HCM Platoon Ratio	1.33	1.33	1.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.93	0.00	0.93	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	19.7	0.0	8.4	17.9	25.8	18.3	26.8	0.0	21.4	48.6	0.0	23.5
Incr Delay (d2), s/veh	2.2	0.0	2.1	0.1	11.0	0.6	2.2	0.0	0.0	1848.1	0.0	0.3
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 Back of Q (50%), veh/ln	1.7	0.0	4.6	0.2	15.2	1.8	0.5	0.0	0.2	39.4	0.0	2.8
Lane Grp Delay (d), s/veh	21.9	0.0	10.5	18.0	36.8	18.9	29.0	0.0	21.4	1896.7	0.0	23.8
Lane Grp LOS	C		B	B	D	B	C		C	F		C
Approach Vol, veh/h		668			753			37			526	
Approach Delay, s/veh		12.9			33.8			26.5			1337.7	
Approach LOS		B			C			C			F	

Timer

Assigned Phs	5	2			6			8			4	
Phs Duration (G+Y+Rc), s	12.4	58.3			45.9			39.0			39.0	
Change Period (Y+Rc), s	6.0	6.0			6.0			6.0			6.0	
Max Green Setting (Gmax), s	7.0	55.0			42.0			33.0			33.0	
Max Q Clear Time (g_c+I1), s	6.5	15.6			32.2			35.0			35.0	
Green Ext Time (p_c), s	0.0	21.9			7.7			0.0			0.0	

Intersection Summary

HCM 2010 Ctrl Delay			372.3									
HCM 2010 LOS			F									

Notes

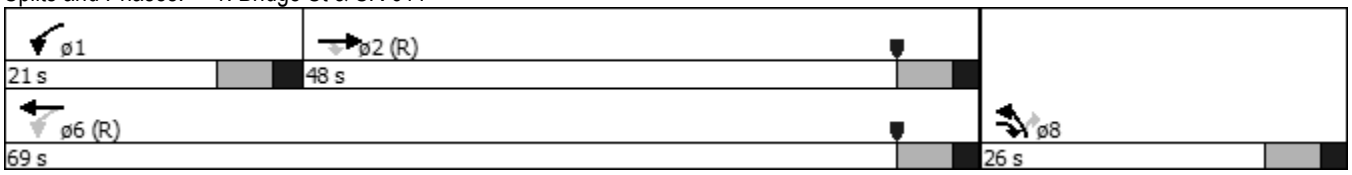
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	521	112	251	640	193	308
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	14	11	12
Grade (%)	-3%			3%	8%	
Storage Length (ft)		185	270		0	145
Storage Lanes		1	1		1	1
Taper Length (ft)			85		25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt		0.850				0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1828	1538	1702	1957	1658	1505
Flt Permitted			0.289		0.950	
Satd. Flow (perm)	1828	1538	518	1957	1658	1505
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		118				328
Link Speed (mph)	35			35	35	
Link Distance (ft)	1000			629	500	
Travel Time (s)	19.5			12.3	9.7	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.94	0.95	0.93	0.93	0.95	0.94
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	3%	1%	2%	1%	3%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Adj. Flow (vph)	554	118	270	688	203	328
Shared Lane Traffic (%)						
Lane Group Flow (vph)	554	118	270	688	203	328
Turn Type	NA	pm+ov	pm+pt	NA	NA	Perm
Protected Phases	2	8	1	6	8	
Permitted Phases		2	6			8
Detector Phase	2	8	1	6	8	8
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	13.0	13.0	13.0	13.0	13.0	13.0
Total Split (s)	48.0	26.0	21.0	69.0	26.0	26.0
Total Split (%)	50.5%	27.4%	22.1%	72.6%	27.4%	27.4%
Maximum Green (s)	42.0	20.0	15.0	63.0	20.0	20.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?						
Vehicle Extension (s)	6.0	3.0	3.0	6.0	3.0	3.0
Minimum Gap (s)	3.0	0.2	0.2	3.0	0.2	0.2

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Time Before Reduce (s)	22.0	0.0	0.0	22.0	0.0	0.0
Time To Reduce (s)	11.0	0.0	0.0	11.0	0.0	0.0
Recall Mode	C-Min	None	None	C-Min	None	None
Walk Time (s)						
Flash Dont Walk (s)						
Pedestrian Calls (#/hr)						
Act Effct Green (s)	49.4	71.8	66.5	66.5	16.5	16.5
Actuated g/C Ratio	0.52	0.76	0.70	0.70	0.17	0.17
v/c Ratio	0.58	0.10	0.54	0.50	0.71	0.62
Control Delay	20.5	1.0	9.6	4.4	50.2	9.3
Queue Delay	0.0	0.0	0.0	0.1	0.0	0.0
Total Delay	20.5	1.0	9.6	4.5	50.2	9.3
LOS	C	A	A	A	D	A
Approach Delay	17.1			6.0	24.9	
Approach LOS	B			A	C	
Queue Length 50th (ft)	224	0	28	74	115	0
Queue Length 95th (ft)	382	13	55	86	184	71
Internal Link Dist (ft)	920			549	420	
Turn Bay Length (ft)		185	270			145
Base Capacity (vph)	949	1244	549	1370	349	575
Starvation Cap Reductn	0	0	0	97	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.58	0.09	0.49	0.54	0.58	0.57

Intersection Summary

Area Type: Other
Cycle Length: 95
Actuated Cycle Length: 95
Offset: 12 (13%), Referenced to phase 2:EBT and 6:WBTL, Start of Yellow
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.71
Intersection Signal Delay: 14.1 Intersection LOS: B
Intersection Capacity Utilization 67.0% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 1: Bridge St & SR 611



HCM 2010 analysis expects strict NEMA phasing.

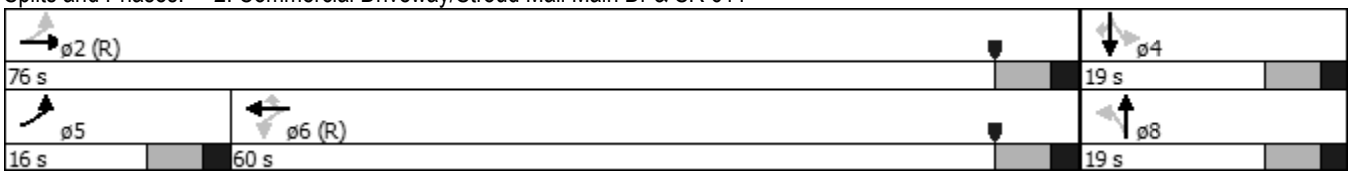
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	172	731	13	13	701	66	23	4	11	99	3	156
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	15	16	16	16	16	14	14	15
Grade (%)		0%			0%			-1%			-5%	
Storage Length (ft)	230		0	75		150	0		0	0		125
Storage Lanes	1		0	1		1	0		0	0		1
Taper Length (ft)	80			60			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		1.00		1.00				1.00				0.98
Frt		0.997				0.850		0.972				0.850
Flt Protected	0.950			0.950				0.974			0.954	
Satd. Flow (prot)	1787	1875	0	1805	2049	1830	0	2049	0	0	1982	1803
Flt Permitted	0.232			0.357				0.772			0.787	
Satd. Flow (perm)	436	1875	0	678	2049	1830	0	1621	0	0	1635	1760
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		3				103		12				181
Link Speed (mph)		35			35			25			25	
Link Distance (ft)		629			306			500			500	
Travel Time (s)		12.3			6.0			13.6			13.6	
Confl. Peds. (#/hr)			3	3			1					1
Confl. Bikes (#/hr)			1									
Peak Hour Factor	0.84	0.91	0.75	0.60	0.96	0.86	0.69	0.25	0.83	0.89	0.75	0.86
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	1%	1%	0%	0%	2%	0%	0%	0%	0%	0%	0%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	205	803	17	22	730	77	33	16	13	111	4	181
Shared Lane Traffic (%)												
Lane Group Flow (vph)	205	820	0	22	730	77	0	62	0	0	115	181
Turn Type	pm+pt	NA		Perm	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	5	2			6			8			4	
Permitted Phases	2			6		6	8			4		4
Detector Phase	5	2		6	6	6	8	8		4	4	4
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	13.0	13.0		13.0	13.0	13.0	13.0	13.0		13.0	13.0	13.0
Total Split (s)	16.0	76.0		60.0	60.0	60.0	19.0	19.0		19.0	19.0	19.0
Total Split (%)	16.8%	80.0%		63.2%	63.2%	63.2%	20.0%	20.0%		20.0%	20.0%	20.0%
Maximum Green (s)	10.0	70.0		54.0	54.0	54.0	13.0	13.0		13.0	13.0	13.0
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0		2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0			0.0	0.0
Total Lost Time (s)	6.0	6.0		6.0	6.0	6.0		6.0			6.0	6.0
Lead/Lag	Lead			Lag	Lag	Lag						
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	0.2		0.2	0.2	0.2	3.0	3.0		3.0	3.0	3.0
Minimum Gap (s)	0.2	0.2		0.2	0.2	0.2	0.2	0.2		0.2	0.2	0.2

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Time Before Reduce (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Recall Mode	None	C-Max		C-Max	C-Max	C-Max	None	None		None	None	None
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)	71.9	71.9		57.5	57.5	57.5		11.1			11.1	11.1
Actuated g/C Ratio	0.76	0.76		0.61	0.61	0.61		0.12			0.12	0.12
v/c Ratio	0.46	0.58		0.05	0.59	0.07		0.31			0.61	0.50
Control Delay	8.5	7.2		2.7	6.6	0.2		35.9			53.2	10.9
Queue Delay	0.0	0.1		0.0	0.7	0.0		0.0			0.0	0.0
Total Delay	8.5	7.3		2.7	7.4	0.2		35.9			53.2	10.9
LOS	A	A		A	A	A		D			D	B
Approach Delay		7.5			6.6			35.9			27.3	
Approach LOS		A			A			D			C	
Queue Length 50th (ft)	22	102		2	94	0		28			66	0
Queue Length 95th (ft)	84	374		m2	116	m1		13			99	51
Internal Link Dist (ft)		549			226			420			420	
Turn Bay Length (ft)	230			75		150						125
Base Capacity (vph)	472	1420		410	1239	1147		232			223	397
Starvation Cap Reductn	0	77		0	225	0		0			0	0
Spillback Cap Reductn	0	0		0	0	0		0			0	0
Storage Cap Reductn	0	0		0	0	0		0			0	0
Reduced v/c Ratio	0.43	0.61		0.05	0.72	0.07		0.27			0.52	0.46

Intersection Summary

Area Type: Other
Cycle Length: 95
Actuated Cycle Length: 95
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow, Master Intersection
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.61
Intersection Signal Delay: 10.6 Intersection LOS: B
Intersection Capacity Utilization 70.2% ICU Level of Service C
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Commercial Driveway/Stroud Mall Main Dr & SR 611



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	172	731	13	13	701	66	23	4	11	99	3	156
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		1.00	1.00		0.99	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
Adj Sat Flow veh/h/ln	188.1	188.2	190.0	190.0	193.7	197.6	198.6	198.6	198.6	202.5	202.5	200.5
Lanes	1	1	0	1	1	1	0	1	0	0	1	1
Cap, veh/h	582	1418	30	515	1247	1081	136	65	37	221	5	162
Arrive On Green	0.13	1.00	1.00	0.86	0.86	0.00	0.09	0.09	0.09	0.09	0.09	0.00
Sat Flow, veh/h	1792	1835	39	677	1937	1680	791	681	390	1503	54	1705
Grp Volume(v), veh/h	205	0	820	22	730	0	62	0	0	115	0	0
Grp Sat Flow(s),veh/h/ln	1792	0	1874	677	1937	1680	1862	0	0	1557	0	1705
Q Serve(g_s), s	3.4	0.0	0.0	0.4	9.8	0.0	0.0	0.0	0.0	3.7	0.0	0.0
Cycle Q Clear(g_c), s	3.4	0.0	0.0	0.4	9.8	0.0	2.7	0.0	0.0	6.5	0.0	0.0
Prop In Lane	1.00		0.02	1.00		1.00	0.53		0.21	0.97		1.00
Lane Grp Cap(c), veh/h	582	0	1448	515	1247	1081	238	0	0	226	0	162
V/C Ratio(X)	0.35	0.00	0.57	0.04	0.59	0.00	0.26	0.00	0.00	0.51	0.00	0.00
Avail Cap(c_a), veh/h	668	0	1448	515	1247	1081	317	0	0	299	0	245
HCM Platoon Ratio	2.00	2.00	2.00	1.33	1.33	1.33	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.77	0.00	0.77	0.80	0.80	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	4.5	0.0	0.0	2.3	3.0	0.0	38.3	0.0	0.0	39.9	0.0	0.0
Incr Delay (d2), s/veh	0.3	0.0	1.2	0.1	1.6	0.0	0.6	0.0	0.0	1.8	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 Back of Q (50%), veh/ln	0.9	0.0	0.5	0.1	2.9	0.0	1.4	0.0	0.0	2.7	0.0	0.0
Lane Grp Delay (d), s/veh	4.8	0.0	1.2	2.5	4.6	0.0	38.9	0.0	0.0	41.7	0.0	0.0
Lane Grp LOS	A		A	A	A		D			D		
Approach Vol, veh/h		1025			752			62			115	
Approach Delay, s/veh		2.0			4.6			38.9			41.7	
Approach LOS		A			A			D			D	

Timer												
Assigned Phs	5	2			6			8			4	
Phs Duration (G+Y+Rc), s	11.7	76.0			64.3			14.6			14.6	
Change Period (Y+Rc), s	6.0	6.0			6.0			6.0			6.0	
Max Green Setting (Gmax), s	10.0	70.0			54.0			13.0			13.0	
Max Q Clear Time (g_c+I1), s	5.4	2.0			11.8			4.7			8.5	
Green Ext Time (p_c), s	0.3	0.3			0.3			0.4			0.2	

Intersection Summary												
HCM 2010 Ctrl Delay			6.5									
HCM 2010 LOS			A									

Notes

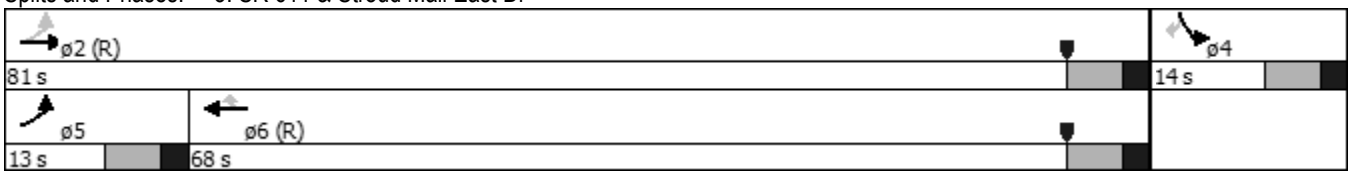
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	19	583	714	77	36	63
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	12	11	11	14	15
Grade (%)		0%	0%		0%	
Storage Length (ft)	115			250	0	150
Storage Lanes	1			1	1	1
Taper Length (ft)	60				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1745	1863	1801	1561	1925	1742
Flt Permitted	0.249				0.950	
Satd. Flow (perm)	457	1863	1801	1561	1925	1742
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				105		77
Link Speed (mph)		35	35		25	
Link Distance (ft)		306	1705		500	
Travel Time (s)		6.0	33.2		13.6	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.75	0.90	0.87	0.73	0.57	0.82
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	2%	2%	0%	0%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)		0%	0%		0%	
Adj. Flow (vph)	25	648	821	105	63	77
Shared Lane Traffic (%)						
Lane Group Flow (vph)	25	648	821	105	63	77
Turn Type	pm+pt	NA	NA	Perm	NA	Perm
Protected Phases	5	2	6		4	
Permitted Phases	2			6		4
Detector Phase	5	2	6	6	4	4
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	13.0	13.0	13.0	13.0	13.0	13.0
Total Split (s)	13.0	81.0	68.0	68.0	14.0	14.0
Total Split (%)	13.7%	85.3%	71.6%	71.6%	14.7%	14.7%
Maximum Green (s)	7.0	75.0	62.0	62.0	8.0	8.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	0.2	0.2	0.2	3.0	3.0
Minimum Gap (s)	0.2	0.2	0.2	0.2	0.2	0.2

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Time Before Reduce (s)	0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	None	C-Max	C-Max	C-Max	None	None
Walk Time (s)						
Flash Dont Walk (s)						
Pedestrian Calls (#/hr)						
Act Effct Green (s)	78.0	79.2	74.3	74.3	7.3	7.3
Actuated g/C Ratio	0.82	0.83	0.78	0.78	0.08	0.08
v/c Ratio	0.06	0.42	0.58	0.08	0.43	0.38
Control Delay	2.4	3.3	3.6	0.1	50.6	15.6
Queue Delay	0.0	0.3	0.0	0.0	0.0	0.0
Total Delay	2.4	3.6	3.6	0.1	50.6	15.6
LOS	A	A	A	A	D	B
Approach Delay		3.5	3.2		31.3	
Approach LOS		A	A		C	
Queue Length 50th (ft)	1	85	44	0	37	0
Queue Length 95th (ft)	m4	130	87	m0	48	34
Internal Link Dist (ft)		226	1625		420	
Turn Bay Length (ft)	115			250		150
Base Capacity (vph)	469	1552	1409	1244	162	217
Starvation Cap Reductn	0	344	0	0	0	0
Spillback Cap Reductn	0	0	23	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.54	0.59	0.08	0.39	0.35

Intersection Summary

Area Type: Other
Cycle Length: 95
Actuated Cycle Length: 95
Offset: 93 (98%), Referenced to phase 2:EBTL and 6:WBT, Start of Yellow
Natural Cycle: 65
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.58
Intersection Signal Delay: 5.6 Intersection LOS: A
Intersection Capacity Utilization 51.5% ICU Level of Service A
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: SR 611 & Stroud Mall East Dr



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	19	583	714	77	36	63
Number	5	2	6	16	7	14
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
Adj Sat Flow veh/h/ln	190.0	186.3	186.3	190.0	197.6	193.7
Lanes	1	1	1	1	1	1
Cap, veh/h	442	1535	1374	1191	83	73
Arrive On Green	0.04	1.00	0.74	0.74	0.04	0.00
Sat Flow, veh/h	1810	1863	1863	1615	1882	1647
Grp Volume(v), veh/h	25	648	821	105	63	0
Grp Sat Flow(s),veh/h/ln	1810	1863	1863	1615	1882	1647
Q Serve(g_s), s	0.3	0.0	18.8	1.7	3.0	0.0
Cycle Q Clear(g_c), s	0.3	0.0	18.8	1.7	3.0	0.0
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	442	1535	1374	1191	83	73
V/C Ratio(X)	0.06	0.42	0.60	0.09	0.76	0.00
Avail Cap(c_a), veh/h	544	1535	1374	1191	165	145
HCM Platoon Ratio	2.00	2.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.79	0.79	0.77	0.77	1.00	0.00
Uniform Delay (d), s/veh	4.6	0.0	5.6	3.4	43.0	0.0
Incr Delay (d2), s/veh	0.0	0.7	1.5	0.1	13.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	0.1	0.3	6.5	0.5	1.7	0.0
Lane Grp Delay (d), s/veh	4.7	0.7	7.1	3.5	56.1	0.0
Lane Grp LOS	A	A	A	A	E	
Approach Vol, veh/h		673	926		63	
Approach Delay, s/veh		0.8	6.7		56.1	
Approach LOS		A	A		E	

Timer

Assigned Phs	5	2	6
Phs Duration (G+Y+Rc), s	7.9	81.0	73.1
Change Period (Y+Rc), s	6.0	6.0	6.0
Max Green Setting (Gmax), s	7.0	75.0	62.0
Max Q Clear Time (g_c+I1), s	2.3	2.0	20.8
Green Ext Time (p_c), s	0.0	0.3	0.3

Intersection Summary

HCM 2010 Ctrl Delay	6.2
HCM 2010 LOS	A

Notes

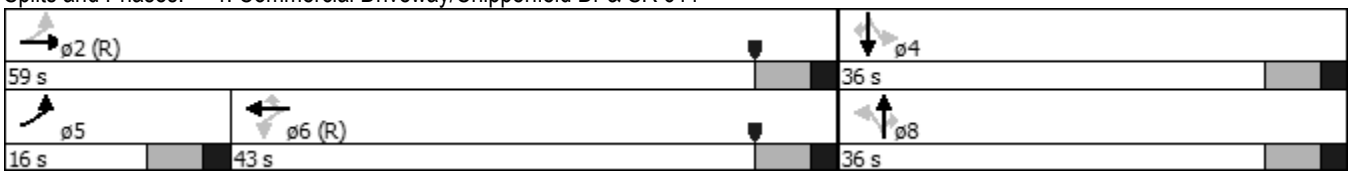
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	216	499	1	5	489	54	28	7	7	251	11	248
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	12	12	10	10	15	12	12	14	12	12	14
Grade (%)		-1%			1%			0%			1%	
Storage Length (ft)	100		0	230		215	0		90	0		200
Storage Lanes	1		0	1		1	0		1	0		1
Taper Length (ft)	60			40			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00					0.98			0.98		1.00	
Frt		0.999				0.850			0.850			0.850
Flt Protected	0.950			0.950				0.960			0.955	
Satd. Flow (prot)	1660	1889	0	1676	1747	1733	0	1824	1723	*1687	1772	1697
Flt Permitted	0.245			0.467				0.575			0.706	
Satd. Flow (perm)	428	1889	0	824	1747	1694	0	1092	1683	*1687	1307	1697
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1				103			103			264
Link Speed (mph)		35			35			25			35	
Link Distance (ft)		1705			1000			500			500	
Travel Time (s)		33.2			19.5			13.6			9.7	
Confl. Peds. (#/hr)	2					2			2	2		
Confl. Bikes (#/hr)												
Peak Hour Factor	0.88	0.95	0.25	0.42	0.95	0.91	0.72	0.88	0.58	0.84	0.50	0.94
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	1%	0%	0%	1%	2%	0%	0%	0%	2%	0%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	245	525	4	12	515	59	39	8	12	299	22	264
Shared Lane Traffic (%)												
Lane Group Flow (vph)	245	529	0	12	515	59	0	47	12	0	321	264
Turn Type	pm+pt	NA		Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2			6			8			4	
Permitted Phases	2			6		6	8		8	4		4
Detector Phase	5	2		6	6	6	8	8	8	4	4	4
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	13.0	13.0		13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0
Total Split (s)	16.0	59.0		43.0	43.0	43.0	36.0	36.0	36.0	36.0	36.0	36.0
Total Split (%)	16.8%	62.1%		45.3%	45.3%	45.3%	37.9%	37.9%	37.9%	37.9%	37.9%	37.9%
Maximum Green (s)	10.0	53.0		37.0	37.0	37.0	30.0	30.0	30.0	30.0	30.0	30.0
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0	0.0		0.0	0.0
Total Lost Time (s)	6.0	6.0		6.0	6.0	6.0		6.0	6.0		6.0	6.0
Lead/Lag	Lead			Lag	Lag	Lag						
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	6.0		6.0	6.0	6.0	3.0	3.0	3.0	3.0	3.0	3.0
Minimum Gap (s)	0.2	3.0		3.0	3.0	3.0	0.2	0.2	0.2	0.2	0.2	0.2

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Time Before Reduce (s)	0.0	22.0		22.0	22.0	22.0	0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	10.0		10.0	10.0	10.0	0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	None	C-Min		C-Min	C-Min	C-Min	None	None	None	None	None	None
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)	56.1	56.1		39.9	39.9	39.9		26.9	26.9		26.9	26.9
Actuated g/C Ratio	0.59	0.59		0.42	0.42	0.42		0.28	0.28		0.28	0.28
v/c Ratio	0.63	0.47		0.03	0.70	0.08		0.15	0.02		0.87	0.39
Control Delay	20.1	14.5		18.6	30.3	1.2		25.3	0.1		56.1	5.0
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0	0.0		0.0	0.0
Total Delay	20.1	14.5		18.6	30.3	1.2		25.3	0.1		56.1	5.0
LOS	C	B		B	C	A		C	A		E	A
Approach Delay		16.2			27.1			20.2			33.1	
Approach LOS		B			C			C			C	
Queue Length 50th (ft)	68	152		5	274	0		20	0		175	0
Queue Length 95th (ft)	155	332		7	394	7		46	0		127	54
Internal Link Dist (ft)		1625			920			420			420	
Turn Bay Length (ft)	100			230		215			90			200
Base Capacity (vph)	390	1116		349	741	777		344	601		412	716
Starvation Cap Reductn	0	0		0	0	0		0	0		0	0
Spillback Cap Reductn	0	0		0	0	0		0	0		0	0
Storage Cap Reductn	0	0		0	0	0		0	0		0	0
Reduced v/c Ratio	0.63	0.47		0.03	0.70	0.08		0.14	0.02		0.78	0.37

Intersection Summary

Area Type: Other
Cycle Length: 95
Actuated Cycle Length: 95
Offset: 43 (45%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow
Natural Cycle: 70
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.87
Intersection Signal Delay: 24.5 Intersection LOS: C
Intersection Capacity Utilization 73.9% ICU Level of Service D
Analysis Period (min) 15
* User Entered Value

Splits and Phases: 4: Commercial Driveway/Chipperfield Dr & SR 611



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	216	499	1	5	489	54	28	7	7	251	11	248
Number	5	2	12	1	6	16	3	8	18	7	4	14
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
Adj Sat Flow veh/h/ln	187.2	189.1	191.0	189.0	187.2	192.8	190.0	190.0	197.6	189.0	185.6	194.7
Lanes	1	1	0	1	1	1	0	1	1	0	1	1
Cap, veh/h	368	1001	8	391	680	594	73	9	557	77	0	549
Arrive On Green	0.10	0.53	0.53	0.36	0.36	0.36	0.33	0.33	0.33	0.33	0.33	0.33
Sat Flow, veh/h	1783	1874	14	883	1872	1634	0	26	1675	0	0	1650
Grp Volume(v), veh/h	245	0	529	12	515	59	47	0	12	321	0	264
Grp Sat Flow(s),veh/h/ln	1783	0	1888	883	1872	1634	26	0	1675	0	0	1650
Q Serve(g_s), s	7.3	0.0	16.3	0.8	21.8	2.1	0.0	0.0	0.4	0.0	0.0	11.5
Cycle Q Clear(g_c), s	7.3	0.0	16.3	1.8	21.8	2.1	30.0	0.0	0.4	30.0	0.0	11.5
Prop In Lane	1.00		0.01	1.00		1.00	0.83		1.00	0.93		1.00
Lane Grp Cap(c), veh/h	368	0	1008	391	680	594	82	0	557	77	0	549
V/C Ratio(X)	0.67	0.00	0.52	0.03	0.76	0.10	0.58	0.00	0.02	4.16	0.00	0.48
Avail Cap(c_a), veh/h	380	0	1110	433	768	671	82	0	557	77	0	549
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)	0.91	0.00	0.91	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	18.0	0.0	13.6	19.1	25.2	18.9	39.6	0.0	20.2	45.1	0.0	23.9
Incr Delay (d2), s/veh	3.9	0.0	1.8	0.1	7.7	0.3	9.5	0.0	0.0	1452.8	0.0	0.7
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 Back of Q (50%), veh/ln	3.3	0.0	7.1	0.2	11.0	0.9	1.3	0.0	0.2	32.9	0.0	4.7
Lane Grp Delay (d), s/veh	21.9	0.0	15.4	19.3	32.9	19.3	49.1	0.0	20.2	1497.9	0.0	24.5
Lane Grp LOS	C		B	B	C	B	D		C	F		C
Approach Vol, veh/h		774			586			59			585	
Approach Delay, s/veh		17.4			31.2			43.2			833.0	
Approach LOS		B			C			D			F	
Timer												
Assigned Phs	5	2			6			8			4	
Phs Duration (G+Y+Rc), s	15.4	54.1			38.8			36.0			36.0	
Change Period (Y+Rc), s	6.0	6.0			6.0			6.0			6.0	
Max Green Setting (Gmax), s	10.0	53.0			37.0			30.0			30.0	
Max Q Clear Time (g_c+I1), s	9.3	18.3			23.8			32.0			32.0	
Green Ext Time (p_c), s	0.1	17.2			9.0			0.0			0.0	
Intersection Summary												
HCM 2010 Ctrl Delay			260.3									
HCM 2010 LOS			F									
Notes												

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	113	432	24	96	345	207	24	56	157	103	28	54
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	14	12	11	12	14	12	14	16	14	14	12
Grade (%)		-1%			0%			1%			1%	
Storage Length (ft)	145		0	125		210	85		0	105		0
Storage Lanes	1		0	1		1	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.988				0.850		0.886			0.901	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1435	1716	0	1468	1598	1409	1469	1525	0	1567	1487	0
Flt Permitted	0.524			0.105			0.699			0.328		
Satd. Flow (perm)	791	1716	0	162	1598	1409	1081	1525	0	541	1487	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		4				225		123			59	
Link Speed (mph)		35			35			35			25	
Link Distance (ft)		538			949			624			208	
Travel Time (s)		10.5			18.5			12.2			5.7	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.92	0.90	0.58	0.79	0.93	0.92	0.66	0.92	0.81	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	10%	4%	24%	7%	7%	10%	10%	10%	4%	10%	10%	10%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	123	480	41	122	371	225	36	61	194	112	30	59
Shared Lane Traffic (%)												
Lane Group Flow (vph)	123	521	0	122	371	225	36	255	0	112	89	0
Turn Type	Perm	NA		pm+pt	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2		1	6			8			4	
Permitted Phases	2			6		6	8			4		
Detector Phase	2	2		1	6	6	8	8		4	4	
Switch Phase												
Minimum Initial (s)	10.0	10.0		5.0	10.0	10.0	7.0	7.0		7.0	7.0	
Minimum Split (s)	17.0	17.0		12.0	17.0	17.0	13.0	13.0		13.0	13.0	
Total Split (s)	43.0	43.0		12.0	55.0	55.0	31.0	31.0		31.0	31.0	
Total Split (%)	35.8%	35.8%		10.0%	45.8%	45.8%	25.8%	25.8%		25.8%	25.8%	
Maximum Green (s)	36.0	36.0		5.0	48.0	48.0	25.0	25.0		25.0	25.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	3.0	3.0		3.0	3.0	3.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	-2.0	-2.0		-2.0	-2.0	0.0	-2.0	-2.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0	7.0	4.0	4.0		6.0	6.0	
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Minimum Gap (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	

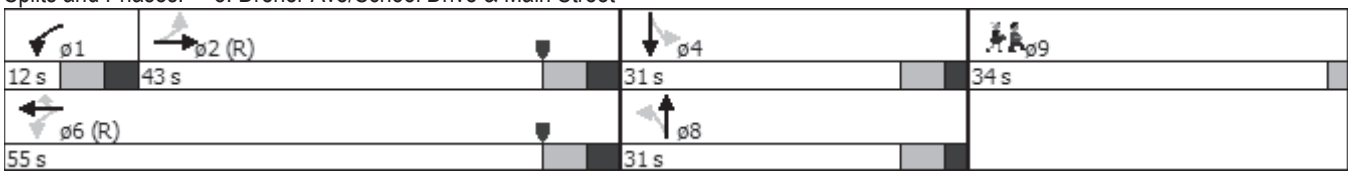
Lane Group	ø9
Lane Configurations	
Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Grade (%)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Ped Bike Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Confl. Peds. (#/hr)	
Confl. Bikes (#/hr)	
Peak Hour Factor	
Growth Factor	
Heavy Vehicles (%)	
Bus Blockages (#/hr)	
Parking (#/hr)	
Mid-Block Traffic (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	1.0
Minimum Split (s)	34.0
Total Split (s)	34.0
Total Split (%)	28%
Maximum Green (s)	32.0
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Minimum Gap (s)	3.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Time Before Reduce (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Recall Mode	C-Max	C-Max		None	C-Max	C-Max	None	None		None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)	38.0	38.0		50.0	50.0	48.0	27.0	27.0		25.0	25.0	
Actuated g/C Ratio	0.32	0.32		0.42	0.42	0.40	0.22	0.22		0.21	0.21	
v/c Ratio	0.49	0.95		0.85	0.56	0.32	0.15	0.58		1.00	0.25	
Control Delay	41.3	69.2		71.5	31.8	7.4	39.3	26.9		133.9	18.2	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	41.3	69.2		71.5	31.8	7.4	39.3	26.9		133.9	18.2	
LOS	D	E		E	C	A	D	C		F	B	
Approach Delay		63.9			30.9			28.5			82.7	
Approach LOS		E			C			C			F	
Queue Length 50th (ft)	77	392		65	254	25	23	90		87	19	
Queue Length 95th (ft)	142	#615		#123	359	81	38	180		#209	65	
Internal Link Dist (ft)		458			869			544			128	
Turn Bay Length (ft)	145			125		210	85			105		
Base Capacity (vph)	250	546		143	665	698	243	438		112	356	
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	
Reduced v/c Ratio	0.49	0.95		0.85	0.56	0.32	0.15	0.58		1.00	0.25	

Intersection Summary

Area Type: CBD
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 114 (95%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow
Natural Cycle: 110
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.00
Intersection Signal Delay: 47.6 Intersection LOS: D
Intersection Capacity Utilization 69.8% ICU Level of Service C
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 8: Dreher Ave/School Drive & Main Street



Lane Group	ø9
Time Before Reduce (s)	0.0
Time To Reduce (s)	0.0
Recall Mode	Ped
Walk Time (s)	7.0
Flash Dont Walk (s)	25.0
Pedestrian Calls (#/hr)	15
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

HCM 2010 methodology does not support exclusive ped or hold phases.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	150	375	14	1	229	133	29	56	49	256	6	41
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	12	11	11	12	11	11	11	10	10	10
Grade (%)		4%			1%			5%			-2%	
Storage Length (ft)	0		0	0		0	0		0	135		0
Storage Lanes	0		0	0		1	0		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.989				0.850		0.955			0.875	
Flt Protected		0.986			0.999			0.986		0.950		
Satd. Flow (prot)	0	2759	0	0	1551	1276	0	1508	0	1487	1410	0
Flt Permitted		0.706			0.993			0.899		0.585		
Satd. Flow (perm)	0	1976	0	0	1542	1276	0	1375	0	916	1410	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		25			25			25			35	
Link Distance (ft)		352			552			437			1438	
Travel Time (s)		7.9			5.2			11.9			4.1	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.89	0.94	0.32	0.25	0.87	0.79	0.56	0.82	0.82	0.96	0.50	0.68
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	5%	3%	0%	0%	6%	2%	0%	0%	2%	3%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)		0	0			0						
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	169	399	44	4	263	168	52	68	60	267	12	60
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	612	0	0	267	168	0	180	0	267	72	0
Turn Type	pm+pt	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2			6			8			4	
Permitted Phases	2			6		6	8			4		
Detector Phase	5	2		6	6	6	8	8		4	4	
Switch Phase												
Minimum Initial (s)	5.0	10.0		10.0	10.0	10.0	7.0	7.0		7.0	7.0	
Minimum Split (s)	9.5	14.5		14.5	14.5	14.5	13.0	13.0		13.0	13.0	
Total Split (s)	9.5	46.0		36.5	36.5	36.5	50.0	50.0		50.0	50.0	
Total Split (%)	7.9%	38.3%		30.4%	30.4%	30.4%	41.7%	41.7%		41.7%	41.7%	
Maximum Green (s)	5.0	41.5		32.0	32.0	32.0	44.0	44.0		44.0	44.0	
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	1.5	1.5		1.5	1.5	1.5	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		-0.5			-0.5	-0.5		-2.0		-2.0	-2.0	
Total Lost Time (s)		4.0			4.0	4.0		4.0		4.0	4.0	
Lead/Lag	Lead			Lag	Lag	Lag						
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Minimum Gap (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	

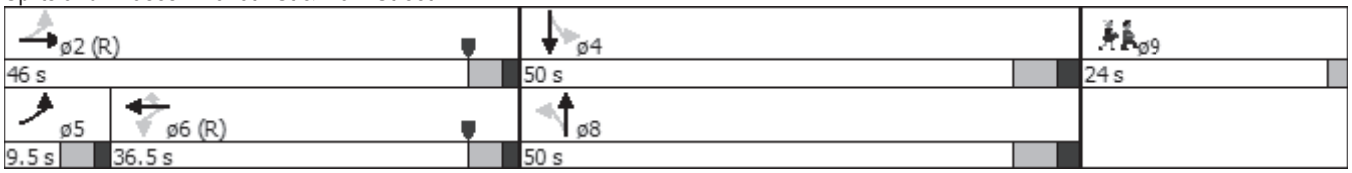
Lane Group	ø9
Lane Configurations	
Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Grade (%)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Ped Bike Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Confl. Peds. (#/hr)	
Confl. Bikes (#/hr)	
Peak Hour Factor	
Growth Factor	
Heavy Vehicles (%)	
Bus Blockages (#/hr)	
Parking (#/hr)	
Mid-Block Traffic (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	1.0
Minimum Split (s)	24.0
Total Split (s)	24.0
Total Split (%)	20%
Maximum Green (s)	22.0
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Minimum Gap (s)	3.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Time Before Reduce (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Recall Mode	None	C-Max		C-Max	C-Max	C-Max	None	None		None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		48.4			48.4	48.4		39.6		39.6	39.6	
Actuated g/C Ratio		0.40			0.40	0.40		0.33		0.33	0.33	
v/c Ratio		0.77			0.43	0.33		0.40		0.88	0.15	
Control Delay		20.3			26.0	24.9		32.4		66.7	27.0	
Queue Delay		0.0			0.0	0.0		0.0		0.0	0.0	
Total Delay		20.3			26.0	24.9		32.4		66.7	27.0	
LOS		C			C	C		C		E	C	
Approach Delay		20.3			25.5			32.4			58.3	
Approach LOS		C			C			C			E	
Queue Length 50th (ft)		189			144	90		104		188	38	
Queue Length 95th (ft)		m248			186	115		142		#318	37	
Internal Link Dist (ft)		272			472			357			1358	
Turn Bay Length (ft)										135		
Base Capacity (vph)		796			621	514		527		351	540	
Starvation Cap Reductn		0			0	0		0		0	0	
Spillback Cap Reductn		0			0	0		0		0	0	
Storage Cap Reductn		0			0	0		0		0	0	
Reduced v/c Ratio		0.77			0.43	0.33		0.34		0.76	0.13	

Intersection Summary

Area Type: CBD
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 42 (35%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.88
Intersection Signal Delay: 31.4 Intersection LOS: C
Intersection Capacity Utilization 62.7% ICU Level of Service B
Analysis Period (min) 15
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.

Splits and Phases: 9: 9th St & Main Street



Lane Group	ø9
Time Before Reduce (s)	0.0
Time To Reduce (s)	0.0
Recall Mode	Ped
Walk Time (s)	8.0
Flash Dont Walk (s)	14.0
Pedestrian Calls (#/hr)	15
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

HCM 2010 methodology does not support exclusive ped or hold phases.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	45	577	39	8	292	14	65	47	40	56	19	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	13	13	13	10	10	10	10	10	10
Grade (%)		0%			0%			1%			-1%	
Storage Length (ft)	0		0	0		0	0		0	0		0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.987			0.992			0.964			0.954	
Flt Protected		0.996			0.998			0.981			0.978	
Satd. Flow (prot)	0	*3502	0	0	*1772	0	0	*1760	0	0	*1624	0
Flt Permitted		0.877			0.961			0.820			0.739	
Satd. Flow (perm)	0	*3021	0	0	*1733	0	0	*1405	0	0	*1397	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		552			555			340			310	
Travel Time (s)		8.5			8.2			9.3			8.5	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.66	0.89	0.57	0.50	0.81	0.58	0.86	0.69	0.77	0.88	0.68	0.83
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	4%	2%	0%	0%	3%	0%	2%	0%	5%	2%	0%	5%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)		0	0	0	0	0	0	0	0			
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	68	648	68	16	360	24	76	68	52	64	28	48
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	784	0	0	400	0	0	196	0	0	140	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	2	2		6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		7.0	7.0		7.0	7.0	
Minimum Split (s)	14.5	14.5		14.5	14.5		12.5	12.5		12.5	12.5	
Total Split (s)	22.5	22.5		22.5	22.5		15.5	15.5		15.5	15.5	
Total Split (%)	37.5%	37.5%		37.5%	37.5%		25.8%	25.8%		25.8%	25.8%	
Maximum Green (s)	18.0	18.0		18.0	18.0		10.0	10.0		10.0	10.0	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	1.5	1.5		1.5	1.5		2.5	2.5		2.5	2.5	
Lost Time Adjust (s)		-2.0			-2.0			-2.0			-2.0	
Total Lost Time (s)		2.5			2.5			3.5			3.5	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	

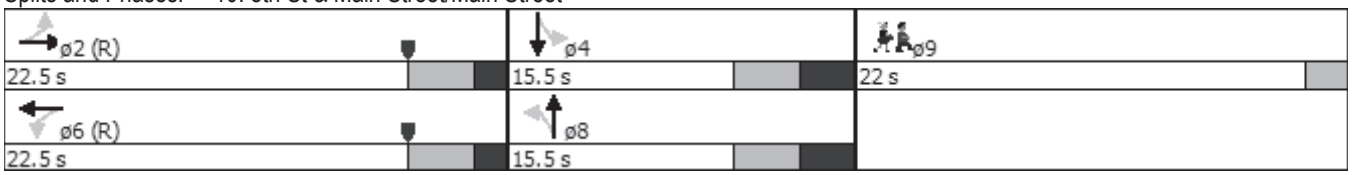
Lane Group	ø9
Lane Configurations	
Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Grade (%)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Ped Bike Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Confl. Peds. (#/hr)	
Confl. Bikes (#/hr)	
Peak Hour Factor	
Growth Factor	
Heavy Vehicles (%)	
Bus Blockages (#/hr)	
Parking (#/hr)	
Mid-Block Traffic (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	1.0
Minimum Split (s)	22.0
Total Split (s)	22.0
Total Split (%)	37%
Maximum Green (s)	20.0
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Minimum Gap (s)	3.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None		None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		22.3			22.3			11.7			11.7	
Actuated g/C Ratio		0.37			0.37			0.20			0.20	
v/c Ratio		0.70			0.62			0.72			0.52	
Control Delay		16.2			14.7			40.0			29.1	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		16.2			14.7			40.0			29.1	
LOS		B			B			D			C	
Approach Delay		16.2			14.7			40.0			29.1	
Approach LOS		B			B			D			C	
Queue Length 50th (ft)		148			121			66			45	
Queue Length 95th (ft)		204			144			92			67	
Internal Link Dist (ft)		472			475			260			230	
Turn Bay Length (ft)												
Base Capacity (vph)		1124			645			281			279	
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		0.70			0.62			0.70			0.50	

Intersection Summary

Area Type: CBD
Cycle Length: 60
Actuated Cycle Length: 60
Offset: 36 (60%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.72
Intersection Signal Delay: 20.1 Intersection LOS: C
Intersection Capacity Utilization 57.7% ICU Level of Service B
Analysis Period (min) 15
* User Entered Value

Splits and Phases: 10: 8th St & Main Street/Main Street



Lane Group	ø9
Time Before Reduce (s)	0.0
Time To Reduce (s)	0.0
Recall Mode	Ped
Walk Time (s)	7.0
Flash Dont Walk (s)	11.0
Pedestrian Calls (#/hr)	15
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

HCM 2010 methodology does not support exclusive ped or hold phases.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	17	352	108	18	227	13	64	43	56	37	66	31
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	13	13	13	14	14	14	11	11	11
Grade (%)		-1%			2%			4%			-1%	
Storage Length (ft)	0		0	0		0	0		0	0		0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.966			0.991			0.954			0.974	
Flt Protected		0.997			0.995			0.981			0.983	
Satd. Flow (prot)	0	2748	0	0	1478	0	0	1604	0	0	1432	0
Flt Permitted		0.925			0.926			0.738			0.777	
Satd. Flow (perm)	0	2549	0	0	1375	0	0	1207	0	0	1132	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		555			308			456			331	
Travel Time (s)		15.1			8.4			12.4			9.0	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.61	0.88	0.87	0.64	0.87	0.65	0.80	0.72	0.78	0.54	0.69	0.78
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	6%	6%	2%	0%	6%	0%	5%	0%	7%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)		0	0	0	0	0				0	0	0
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	28	400	124	28	261	20	80	60	72	69	96	40
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	552	0	0	309	0	0	212	0	0	205	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	2	2		6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		7.0	7.0		7.0	7.0	
Minimum Split (s)	15.0	15.0		15.0	15.0		12.0	12.0		12.0	12.0	
Total Split (s)	55.0	55.0		55.0	55.0		43.0	43.0		43.0	43.0	
Total Split (%)	45.8%	45.8%		45.8%	45.8%		35.8%	35.8%		35.8%	35.8%	
Maximum Green (s)	50.0	50.0		50.0	50.0		38.0	38.0		38.0	38.0	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		-2.0			-2.0			-2.0			-2.0	
Total Lost Time (s)		3.0			3.0			3.0			3.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	

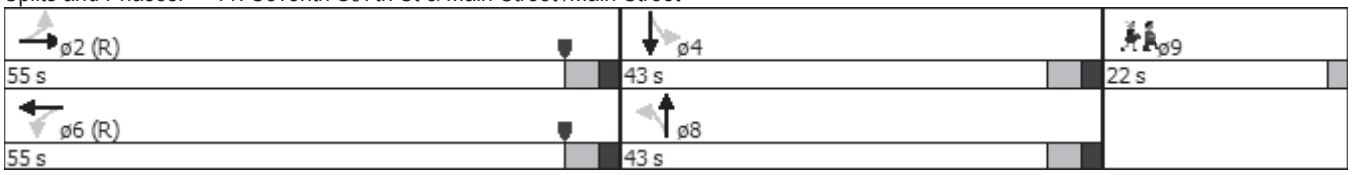
Lane Group	ø9
Lane Configurations	
Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Grade (%)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Ped Bike Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Confl. Peds. (#/hr)	
Confl. Bikes (#/hr)	
Peak Hour Factor	
Growth Factor	
Heavy Vehicles (%)	
Bus Blockages (#/hr)	
Parking (#/hr)	
Mid-Block Traffic (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	1.0
Minimum Split (s)	22.0
Total Split (s)	22.0
Total Split (%)	18%
Maximum Green (s)	20.0
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Minimum Gap (s)	3.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None		None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		64.2			64.2			27.8			27.8	
Actuated g/C Ratio		0.54			0.54			0.23			0.23	
v/c Ratio		0.40			0.42			0.76			0.79	
Control Delay		12.9			9.6			48.7			62.9	
Queue Delay		0.0			0.4			0.0			0.0	
Total Delay		12.9			10.0			48.7			62.9	
LOS		B			A			D			E	
Approach Delay		12.9			10.0			48.7			62.9	
Approach LOS		B			A			D			E	
Queue Length 50th (ft)		121			38			112			150	
Queue Length 95th (ft)		152			60			124			153	
Internal Link Dist (ft)		475			228			376			251	
Turn Bay Length (ft)												
Base Capacity (vph)		1364			736			402			377	
Starvation Cap Reductn		0			127			0			0	
Spillback Cap Reductn		7			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.41			0.51			0.53			0.54	

Intersection Summary

Area Type: CBD
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow, Master Intersection
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.79
Intersection Signal Delay: 26.1 Intersection LOS: C
Intersection Capacity Utilization 53.2% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 11: Seventh St/7th St & Main Street /Main Street



Lane Group	ø9
Time Before Reduce (s)	0.0
Time To Reduce (s)	0.0
Recall Mode	Ped
Walk Time (s)	9.0
Flash Dont Walk (s)	11.0
Pedestrian Calls (#/hr)	15
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

HCM 2010 methodology does not support exclusive ped or hold phases.

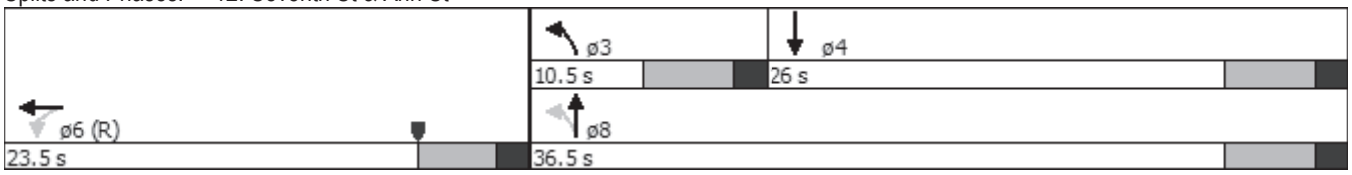
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	13	133	21	155	227	0	0	189	42
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	16	16	16	16	16	16	10	10	10
Grade (%)		0%			2%			-5%			0%	
Storage Length (ft)	0		0	0		0	0		0	0		0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt					0.981						0.974	
Flt Protected					0.995			0.981				
Satd. Flow (prot)	0	0	0	0	1783	0	0	2131	0	0	1530	0
Flt Permitted					0.995			0.678				
Satd. Flow (perm)	0	0	0	0	1783	0	0	1473	0	0	1530	0
Right Turn on Red			No			Yes			No			Yes
Satd. Flow (RTOR)					15						23	
Link Speed (mph)		25			25			35			25	
Link Distance (ft)		273			284			513			456	
Travel Time (s)		7.4			7.7			10.0			12.4	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.92	0.92	0.92	0.65	0.90	0.75	0.95	0.92	0.92	0.92	0.76	0.70
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	0%	0%	15%	2%	14%	1%	2%	0%	0%	2%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)				0	0	0					0	0
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	0	0	0	20	148	28	163	247	0	0	249	60
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	196	0	0	410	0	0	309	0
Turn Type				Perm	NA		pm+pt	NA			NA	
Protected Phases					6		3	8			4	
Permitted Phases				6			8					
Detector Phase				6	6		3	8			4	
Switch Phase												
Minimum Initial (s)				10.0	10.0		5.0	7.0			7.0	
Minimum Split (s)				23.0	23.0		10.5	20.5			20.5	
Total Split (s)				23.5	23.5		10.5	36.5			26.0	
Total Split (%)				39.2%	39.2%		17.5%	60.8%			43.3%	
Maximum Green (s)				18.5	18.5		5.0	31.0			20.5	
Yellow Time (s)				3.5	3.5		4.0	4.0			4.0	
All-Red Time (s)				1.5	1.5		1.5	1.5			1.5	
Lost Time Adjust (s)					-1.0			-1.0			-1.0	
Total Lost Time (s)					4.0			4.5			4.5	
Lead/Lag							Lead				Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)				3.0	3.0		3.0	3.0			3.0	
Minimum Gap (s)				3.0	3.0		3.0	3.0			3.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Time Before Reduce (s)				0.0	0.0		0.0	0.0			0.0	
Time To Reduce (s)				0.0	0.0		0.0	0.0			0.0	
Recall Mode				C-Max	C-Max		None	None			None	
Walk Time (s)				7.0	7.0			7.0			7.0	
Flash Dont Walk (s)				11.0	11.0			8.0			8.0	
Pedestrian Calls (#/hr)				8	8			1			3	
Act Effct Green (s)					25.8			25.7			25.7	
Actuated g/C Ratio					0.43			0.43			0.43	
v/c Ratio					0.25			0.65			0.46	
Control Delay					13.2			17.9			11.1	
Queue Delay					0.0			0.0			0.0	
Total Delay					13.2			17.9			11.1	
LOS					B			B			B	
Approach Delay					13.2			17.9			11.1	
Approach LOS					B			B			B	
Queue Length 50th (ft)					41			108			61	
Queue Length 95th (ft)					94			155			76	
Internal Link Dist (ft)		193			204			433			376	
Turn Bay Length (ft)												
Base Capacity (vph)					775			785			692	
Starvation Cap Reductn					0			0			0	
Spillback Cap Reductn					0			0			0	
Storage Cap Reductn					0			0			0	
Reduced v/c Ratio					0.25			0.52			0.45	

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 60
Offset: 0 (0%), Referenced to phase 6:WBTL, Start of Yellow
Natural Cycle: 55
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.65
Intersection Signal Delay: 14.6 Intersection LOS: B
Intersection Capacity Utilization 52.8% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 12: Seventh St & Ann St



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	0	13	133	21	155	227	0	0	189	42
Number				1	6	16	3	8	18	7	4	14
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	0.90	1.00	1.00	1.00	1.00	1.00	1.00	0.90
Adj Sat Flow veh/h/ln				195.6	186.2	195.6	202.5	199.3	0.0	0.0	187.0	190.0
Lanes				0	1	0	0	1	0	0	1	0
Cap, veh/h				74	546	103	284	393	0	0	474	114
Arrive On Green				0.44	0.44	0.42	0.36	0.36	0.00	0.00	0.72	0.68
Sat Flow, veh/h				166	1228	232	469	1087	0	0	1311	316
Grp Volume(v), veh/h				196	0	0	410	0	0	0	0	309
Grp Sat Flow(s),veh/h/ln				1627	0	0	1556	0	0	0	0	1627
Q Serve(g_s), s				3.3	0.0	0.0	0.1	0.0	0.0	0.0	0.0	3.8
Cycle Q Clear(g_c), s				3.3	0.0	0.0	9.9	0.0	0.0	0.0	0.0	3.8
Prop In Lane				0.10		0.14	0.40		0.00	0.00		0.19
Lane Grp Cap(c), veh/h				724	0	0	677	0	0	0	0	588
V/C Ratio(X)				0.27	0.00	0.00	0.61	0.00	0.00	0.00	0.00	0.53
Avail Cap(c_a), veh/h				724	0	0	1244	0	0	0	0	798
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00
Upstream Filter(I)				1.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.52
Uniform Delay (d), s/veh				7.7	0.0	0.0	11.9	0.0	0.0	0.0	0.0	4.6
Incr Delay (d2), s/veh				0.9	0.0	0.0	0.9	0.0	0.0	0.0	0.0	0.4
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 Back of Q (50%), veh/ln				1.3	0.0	0.0	3.0	0.0	0.0	0.0	0.0	1.0
Lane Grp Delay (d), s/veh				8.7	0.0	0.0	12.8	0.0	0.0	0.0	0.0	4.9
Lane Grp LOS				A			B					A
Approach Vol, veh/h					196			410			309	
Approach Delay, s/veh					8.7			12.8			4.9	
Approach LOS					A			B			A	
Timer												
Assigned Phs					6		3	8			4	
Phs Duration (G+Y+Rc), s					23.5		0.0	20.3			20.3	
Change Period (Y+Rc), s					5.0		5.5	5.5			5.5	
Max Green Setting (Gmax), s					18.5		5.0	31.0			20.5	
Max Q Clear Time (g_c+I1), s					5.3		0.0	11.9			5.8	
Green Ext Time (p_c), s					0.4		0.0	2.9			2.7	
Intersection Summary												
HCM 2010 Ctrl Delay			9.3									
HCM 2010 LOS			A									
Notes												

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	104	504	14	8	244	45	10	69	36	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	16	16	16	11	11	11	12	12	12
Grade (%)		-1%			2%			-1%			0%	
Storage Length (ft)	0		0	0		0	0		0	0		0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.995			0.977			0.957				
Flt Protected		0.989			0.998			0.996				
Satd. Flow (prot)	0	2867	0	0	1619	0	0	1569	0	0	0	0
Flt Permitted		0.752			0.973			0.996				
Satd. Flow (perm)	0	2180	0	0	1579	0	0	1569	0	0	0	0
Right Turn on Red			Yes			Yes			No			No
Satd. Flow (RTOR)		5			14							
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		308			744			383			229	
Travel Time (s)		6.0			14.5			7.5			4.5	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.70	0.96	0.58	0.67	0.86	0.75	0.63	0.66	0.64	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	3%	7%	0%	5%	0%	0%	0%	3%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)		0	0	0	0	0						
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	149	525	24	12	284	60	16	105	56	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	698	0	0	356	0	0	177	0	0	0	0
Turn Type	Perm	NA		Perm	NA		Perm	NA				
Protected Phases		2			6			4				
Permitted Phases	2			6			4					
Detector Phase	2	2		6	6		4	4				
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		7.0	7.0				
Minimum Split (s)	15.0	15.0		15.0	15.0		12.0	12.0				
Total Split (s)	70.0	70.0		70.0	70.0		31.0	31.0				
Total Split (%)	58.3%	58.3%		58.3%	58.3%		25.8%	25.8%				
Maximum Green (s)	65.0	65.0		65.0	65.0		26.0	26.0				
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5				
All-Red Time (s)	1.5	1.5		1.5	1.5		1.5	1.5				
Lost Time Adjust (s)		-1.0			-1.0			-1.0				
Total Lost Time (s)		4.0			4.0			4.0				
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0				
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	3.0				

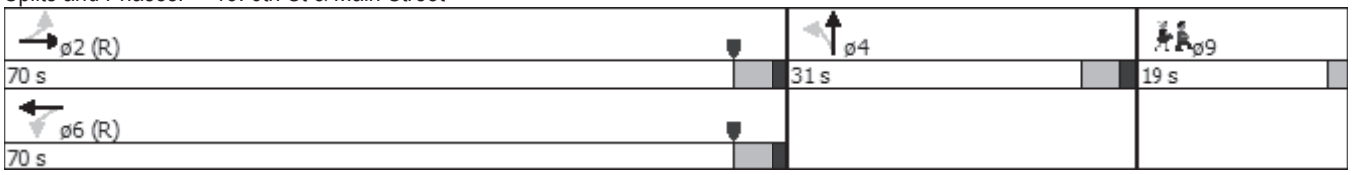
Lane Group	ø9
Lane Configurations	
Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Grade (%)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Ped Bike Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Confl. Peds. (#/hr)	
Confl. Bikes (#/hr)	
Peak Hour Factor	
Growth Factor	
Heavy Vehicles (%)	
Bus Blockages (#/hr)	
Parking (#/hr)	
Mid-Block Traffic (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	1.0
Minimum Split (s)	19.0
Total Split (s)	19.0
Total Split (%)	16%
Maximum Green (s)	17.0
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Minimum Gap (s)	3.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0				
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0				
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None				
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		73.3			73.3			19.7				
Actuated g/C Ratio		0.61			0.61			0.16				
v/c Ratio		0.52			0.37			0.69				
Control Delay		12.2			11.3			60.4				
Queue Delay		0.2			0.0			0.0				
Total Delay		12.4			11.3			60.4				
LOS		B			B			E				
Approach Delay		12.4			11.3			60.4				
Approach LOS		B			B			E				
Queue Length 50th (ft)		94			118			131				
Queue Length 95th (ft)		120			130			136				
Internal Link Dist (ft)		228			664			303			149	
Turn Bay Length (ft)												
Base Capacity (vph)		1332			969			353				
Starvation Cap Reductn		153			0			0				
Spillback Cap Reductn		0			14			0				
Storage Cap Reductn		0			0			0				
Reduced v/c Ratio		0.59			0.37			0.50				

Intersection Summary

Area Type: CBD
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 5 (4%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.69
Intersection Signal Delay: 19.0 Intersection LOS: B
Intersection Capacity Utilization 54.2% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 13: 6th St & Main Street



Lane Group	ø9
Time Before Reduce (s)	0.0
Time To Reduce (s)	0.0
Recall Mode	Ped
Walk Time (s)	7.0
Flash Dont Walk (s)	10.0
Pedestrian Calls (#/hr)	15
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

HCM 2010 methodology does not support exclusive ped or hold phases.

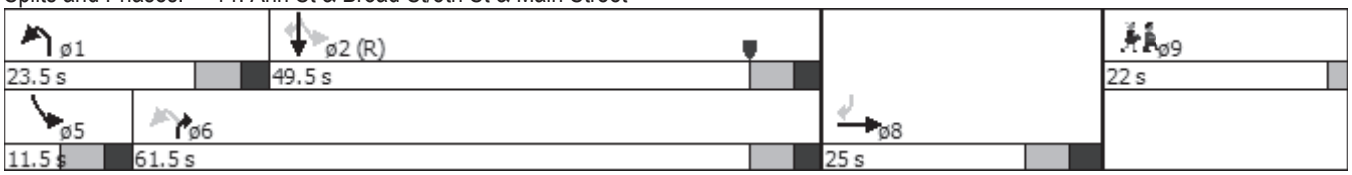
Lane Group	EBT	EBR	NBL2	NBR	SBL	SBT	SBR2	ø9
Lane Configurations								
Volume (vph)	337	27	173	440	87	376	263	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	11	11	10	11	10	10	11	
Grade (%)	-5%					2%		
Storage Length (ft)		0		0	0			
Storage Lanes		0		1	1			
Taper Length (ft)					25			
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	
Ped Bike Factor								
Frt	0.986			0.850			0.850	
Flt Protected			0.950		0.950			
Satd. Flow (prot)	*3372	0	1494	1371	*1752	*1793	1337	
Flt Permitted			0.275		0.950			
Satd. Flow (perm)	*3372	0	432	1371	*1752	*1792	1337	
Right Turn on Red				No	No		Yes	
Satd. Flow (RTOR)							325	
Link Speed (mph)	25					25		
Link Distance (ft)	744					298		
Travel Time (s)	20.3					8.2		
Confl. Peds. (#/hr)								
Confl. Bikes (#/hr)								
Peak Hour Factor	0.87	0.68	0.80	0.92	0.64	0.88	0.81	
Growth Factor	100%	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	2%	0%	2%	3%	2%	5%	4%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	
Parking (#/hr)								
Mid-Block Traffic (%)	0%					0%		
Adj. Flow (vph)	387	40	216	478	136	427	325	
Shared Lane Traffic (%)								
Lane Group Flow (vph)	427	0	216	478	136	427	325	
Turn Type	NA		custom	custom	pm+pt	NA	custom	
Protected Phases	8		1	6	5	2		9
Permitted Phases			6		2		2 8	
Detector Phase	8		1	6	5	2	2 8	
Switch Phase								
Minimum Initial (s)	7.0		5.0	10.0	5.0	10.0		1.0
Minimum Split (s)	14.0		12.5	16.5	11.5	16.5		22.0
Total Split (s)	25.0		23.5	61.5	11.5	49.5		22.0
Total Split (%)	20.8%		19.6%	51.3%	9.6%	41.3%		18%
Maximum Green (s)	18.0		17.0	55.0	5.0	43.0		20.0
Yellow Time (s)	4.0		4.0	4.0	4.0	4.0		2.0
All-Red Time (s)	3.0		2.5	2.5	2.5	2.5		0.0
Lost Time Adjust (s)	-2.5		0.0	-2.5	-2.5	-2.5		
Total Lost Time (s)	4.5		6.5	4.0	4.0	4.0		
Lead/Lag			Lead	Lag	Lead	Lag		
Lead-Lag Optimize?								
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0		3.0
Minimum Gap (s)	3.0		3.0	3.0	3.0	3.0		3.0

Lane Group	EBT	EBR	NBL2	NBR	SBL	SBT	SBR2	ø9
Time Before Reduce (s)	0.0		0.0	0.0	0.0	0.0		0.0
Time To Reduce (s)	0.0		0.0	0.0	0.0	0.0		0.0
Recall Mode	None		None	None	None	C-Max		Ped
Walk Time (s)								7.0
Flash Dont Walk (s)								13.0
Pedestrian Calls (#/hr)								15
Act Effct Green (s)	20.0		66.3	57.6	56.9	49.0	71.0	
Actuated g/C Ratio	0.17		0.55	0.48	0.47	0.41	0.59	
v/c Ratio	0.76		0.60	0.73	0.16	0.58	0.35	
Control Delay	43.6		21.2	32.8	12.1	30.7	4.1	
Queue Delay	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	43.6		21.2	32.8	12.1	30.7	4.1	
LOS	D		C	C	B	C	A	
Approach Delay	43.6					18.1		
Approach LOS	D					B		
Queue Length 50th (ft)	144		83	288	48	246	13	
Queue Length 95th (ft)	206		113	429	49	327	42	
Internal Link Dist (ft)	664					218		
Turn Bay Length (ft)			190					
Base Capacity (vph)	576		391	658	830	732	927	
Starvation Cap Reductn	0		0	0	0	0	0	
Spillback Cap Reductn	0		0	0	0	0	0	
Storage Cap Reductn	0		0	0	0	0	0	
Reduced v/c Ratio	0.74		0.55	0.73	0.16	0.58	0.35	

Intersection Summary

Area Type: CBD
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 105 (88%), Referenced to phase 2:SBTL, Start of Yellow
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.76
Intersection Signal Delay: 27.4 Intersection LOS: C
Intersection Capacity Utilization 57.3% ICU Level of Service B
Analysis Period (min) 15
* User Entered Value

Splits and Phases: 14: Ann St & Broad St/5th St & Main Street



HCM 2010 methodology does not support more than 4 approaches.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	18	8	88	1	0	0	0	0	62	529	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	15	15	15	14	14	14	12	12	12	14	14	14
Grade (%)		1%			-1%			0%			1%	
Storage Length (ft)	0		0	0		0	0		0	0		0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00
Ped Bike Factor												
Frt		0.939										
Flt Protected					0.953						0.994	
Satd. Flow (prot)	0	*862	0	*619	1665	0	0	0	0	0	*1459	0
Flt Permitted					0.696						0.994	
Satd. Flow (perm)	0	*862	0	*606	1216	0	0	0	0	0	*1459	0
Right Turn on Red			Yes			No			No			Yes
Satd. Flow (RTOR)		20										
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		163			256			357			512	
Travel Time (s)		4.4			7.0			7.6			14.0	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.92	0.75	0.40	0.82	0.92	0.92	0.92	0.92	0.92	0.74	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	0%	0%	5%	0%	0%	0%	0%	0%	0%	3%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	0	24	20	107	1	0	0	0	0	84	575	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	44	0	0	108	0	0	0	0	0	659	0
Turn Type		NA		Perm	NA					Perm	NA	
Protected Phases		4			8						6	
Permitted Phases				8						6		
Detector Phase		4		8	8					6	6	
Switch Phase												
Minimum Initial (s)		7.0		7.0	7.0					10.0	10.0	
Minimum Split (s)		22.0		22.0	22.0					21.0	21.0	
Total Split (s)		22.0		22.0	22.0					38.0	38.0	
Total Split (%)		36.7%		36.7%	36.7%					63.3%	63.3%	
Maximum Green (s)		17.0		17.0	17.0					33.0	33.0	
Yellow Time (s)		3.5		3.5	3.5					3.5	3.5	
All-Red Time (s)		1.5		1.5	1.5					1.5	1.5	
Lost Time Adjust (s)		-1.0			0.0						-1.0	
Total Lost Time (s)		4.0			5.0						4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)		3.0		3.0	3.0					3.0	3.0	
Minimum Gap (s)		3.0		3.0	3.0					3.0	3.0	

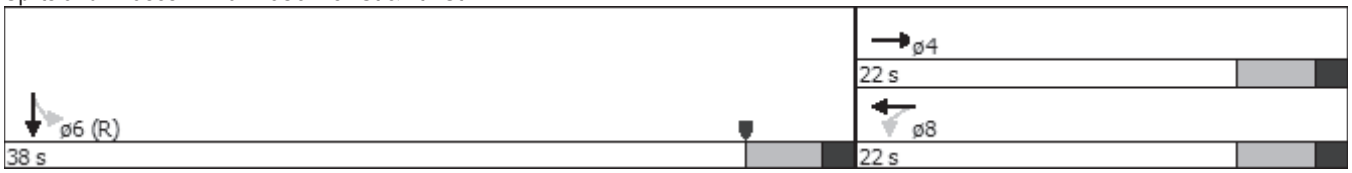
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Time Before Reduce (s)		0.0		0.0	0.0					0.0	0.0	
Time To Reduce (s)		0.0		0.0	0.0					0.0	0.0	
Recall Mode		None		None	None					C-Max	C-Max	
Walk Time (s)		7.0		7.0	7.0					7.0	7.0	
Flash Dont Walk (s)		10.0		10.0	10.0					9.0	9.0	
Pedestrian Calls (#/hr)		8		1	1					8	8	
Act Effct Green (s)		12.2			11.2						43.0	
Actuated g/C Ratio		0.20			0.19						0.72	
v/c Ratio		0.23			0.48						0.63	
Control Delay		15.0			27.8						7.4	
Queue Delay		0.0			0.0						0.0	
Total Delay		15.0			27.8						7.4	
LOS		B			C						A	
Approach Delay		15.0			27.8						7.4	
Approach LOS		B			C						A	
Queue Length 50th (ft)		7			36						10	
Queue Length 95th (ft)		21			67						#185	
Internal Link Dist (ft)		83			176			277			432	
Turn Bay Length (ft)												
Base Capacity (vph)		272			344						1046	
Starvation Cap Reductn		0			0						0	
Spillback Cap Reductn		0			0						0	
Storage Cap Reductn		0			0						0	
Reduced v/c Ratio		0.16			0.31						0.63	

Intersection Summary

Area Type: CBD
Cycle Length: 60
Actuated Cycle Length: 60
Offset: 31 (52%), Referenced to phase 6:SBTL, Start of Yellow
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.63
Intersection Signal Delay: 10.5 Intersection LOS: B
Intersection Capacity Utilization 37.9% ICU Level of Service A
Analysis Period (min) 15

* User Entered Value
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 20: McConnell St & 4th St



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	18	8	88	1	0	0	0	0	62	529	0
Number	7	4	14	3	8	18				1	6	16
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
Adj Sat Flow veh/h/ln	0.0	177.0	177.0	178.7	170.3	0.0				177.0	172.4	0.0
Lanes	0	1	0	0	1	0				0	2	0
Cap, veh/h	0	137	115	284	2	0				286	2062	0
Arrive On Green	0.00	0.15	0.13	0.15	0.13	0.00				0.68	0.68	0.00
Sat Flow, veh/h	0	894	745	1043	14	0				417	3011	0
Grp Volume(v), veh/h	0	0	44	108	0	0				343	316	0
Grp Sat Flow(s),veh/h/ln	0	0	1638	1057	0	0				1704	1724	0
Q Serve(g_s), s	0.0	0.0	1.2	4.1	0.0	0.0				3.9	3.5	0.0
Cycle Q Clear(g_c), s	0.0	0.0	1.2	5.2	0.0	0.0				3.9	3.5	0.0
Prop In Lane	0.00		0.45	0.99		0.00				0.24		0.00
Lane Grp Cap(c), veh/h	0	0	252	307	0	0				1167	1181	0
V/C Ratio(X)	0.00	0.00	0.17	0.35	0.00	0.00				0.29	0.27	0.00
Avail Cap(c_a), veh/h	0	0	594	567	0	0				1167	1181	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	0.00	1.00	1.00	0.00	0.00				1.00	1.00	0.00
Uniform Delay (d), s/veh	0.0	0.0	18.5	21.0	0.0	0.0				3.1	3.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.3	0.7	0.0	0.0				0.6	0.6	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 Back of Q (50%), veh/ln	0.0	0.0	0.5	1.2	0.0	0.0				1.3	1.1	0.0
Lane Grp Delay (d), s/veh	0.0	0.0	18.8	21.6	0.0	0.0				3.7	3.6	0.0
Lane Grp LOS			B	C						A	A	
Approach Vol, veh/h		44			108						659	
Approach Delay, s/veh		18.8			21.6						3.7	
Approach LOS		B			C						A	

Timer												
Assigned Phs		4			8						6	
Phs Duration (G+Y+Rc), s		11.6			11.6						38.0	
Change Period (Y+Rc), s		5.0			5.0						5.0	
Max Green Setting (Gmax), s		17.0			17.0						33.0	
Max Q Clear Time (g_c+I1), s		3.2			7.2						0.0	
Green Ext Time (p_c), s		0.4			0.3						0.0	

Intersection Summary												
HCM 2010 Ctrl Delay			6.9									
HCM 2010 LOS			A									

Notes

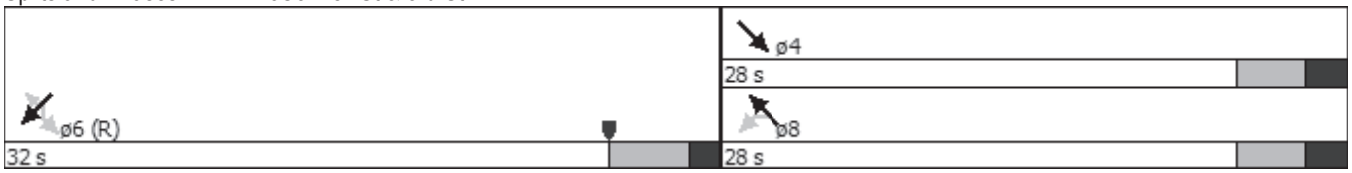
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	0	64	49	13	92	0	0	0	0	4	662	71
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	12	12	12	12	12	12	13	11	14
Grade (%)		1%			-2%			0%			-1%	
Storage Length (ft)	0		0	0		0	0		0	0		175
Storage Lanes	0		0	0		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00
Ped Bike Factor												
Frt		0.935										0.850
Flt Protected					0.992						0.999	
Satd. Flow (prot)	0	*1762	0	0	*1857	0	0	0	0	0	*1931	1513
Flt Permitted					0.932						0.999	
Satd. Flow (perm)	0	*1762	0	0	*1857	0	0	0	0	0	*1931	1513
Right Turn on Red			Yes			No			No			Yes
Satd. Flow (RTOR)		64										88
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		348			248			268			452	
Travel Time (s)		9.5			6.8			7.3			7.7	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.92	0.94	0.77	0.65	0.92	0.92	0.92	0.92	0.92	0.33	0.86	0.81
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	0%	0%	0%	6%	2%	8%	3%	0%	0%	3%	3%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	0	68	64	20	100	0	0	0	0	12	770	88
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	132	0	0	120	0	0	0	0	0	782	88
Turn Type		NA		Perm	NA					Perm	NA	Perm
Protected Phases		4			8						6	
Permitted Phases				8						6		6
Detector Phase		4		8	8					6	6	6
Switch Phase												
Minimum Initial (s)		7.0		7.0	7.0					10.0	10.0	10.0
Minimum Split (s)		28.0		28.0	28.0					21.0	21.0	21.0
Total Split (s)		28.0		28.0	28.0					32.0	32.0	32.0
Total Split (%)		46.7%		46.7%	46.7%					53.3%	53.3%	53.3%
Maximum Green (s)		23.0		23.0	23.0					27.0	27.0	27.0
Yellow Time (s)		3.0		3.0	3.0					3.5	3.5	3.5
All-Red Time (s)		2.0		2.0	2.0					1.5	1.5	1.5
Lost Time Adjust (s)		-1.0			-1.0						-1.0	-1.0
Total Lost Time (s)		4.0			4.0						4.0	4.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)		3.0		3.0	3.0					3.0	3.0	3.0
Minimum Gap (s)		3.0		3.0	3.0					3.0	3.0	3.0

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Time Before Reduce (s)		0.0		0.0	0.0					0.0	0.0	0.0
Time To Reduce (s)		0.0		0.0	0.0					0.0	0.0	0.0
Recall Mode		None		None	None					C-Max	C-Max	C-Max
Walk Time (s)		9.0		9.0	9.0					7.0	7.0	7.0
Flash Dont Walk (s)		14.0		14.0	14.0					9.0	9.0	9.0
Pedestrian Calls (#/hr)		5		5	5					1	1	1
Act Effct Green (s)		12.5			12.5						42.7	42.7
Actuated g/C Ratio		0.21			0.21						0.71	0.71
v/c Ratio		0.32			0.31						0.57	0.08
Control Delay		11.9			20.3						10.7	2.3
Queue Delay		0.0			0.0						0.0	0.0
Total Delay		11.9			20.3						10.7	2.3
LOS		B			C						B	A
Approach Delay		11.9			20.3						9.9	
Approach LOS		B			C						A	
Queue Length 50th (ft)		22			39						58	0
Queue Length 95th (ft)		43			56						#216	15
Internal Link Dist (ft)		268			168			188			372	
Turn Bay Length (ft)												175
Base Capacity (vph)		743			742						1373	1101
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		0.18			0.16						0.57	0.08

Intersection Summary

Area Type: CBD
Cycle Length: 60
Actuated Cycle Length: 60
Offset: 13 (22%), Referenced to phase 6:SWTL, Start of Yellow
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.57
Intersection Signal Delay: 11.2 Intersection LOS: B
Intersection Capacity Utilization 40.0% ICU Level of Service A
Analysis Period (min) 15
* User Entered Value
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 21: McConnell St & 3rd St



Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (veh/h)	0	64	49	13	92	0	0	0	0	4	662	71
Number	7	4	14	3	8	18				1	6	16
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
Adj Sat Flow veh/h/ln	0.0	170.1	170.1	172.7	164.5	0.0				178.7	166.9	173.5
Lanes	0	1	0	0	1	0				0	2	1
Cap, veh/h	0	142	133	121	227	0				31	2108	946
Arrive On Green	0.00	0.18	0.15	0.18	0.18	0.00				0.64	0.64	0.64
Sat Flow, veh/h	0	807	760	143	1293	0				49	3287	1475
Grp Volume(v), veh/h	0	0	132	120	0	0				409	373	88
Grp Sat Flow(s),veh/h/ln	0	0	1567	1436	0	0				1667	1669	1475
Q Serve(g_s), s	0.0	0.0	3.3	0.2	0.0	0.0				5.1	4.5	1.0
Cycle Q Clear(g_c), s	0.0	0.0	3.3	3.5	0.0	0.0				5.1	4.5	1.0
Prop In Lane	0.00		0.48	0.17		0.00				0.03		1.00
Lane Grp Cap(c), veh/h	0	0	275	348	0	0				1069	1070	946
V/C Ratio(X)	0.00	0.00	0.48	0.34	0.00	0.00				0.38	0.35	0.09
Avail Cap(c_a), veh/h	0	0	861	917	0	0				1069	1070	946
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	0.00	1.00	1.00	0.00	0.00				1.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	0.0	16.4	16.0	0.0	0.0				3.7	3.6	3.0
Incr Delay (d2), s/veh	0.0	0.0	1.3	0.6	0.0	0.0				1.0	0.9	0.2
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 Back of Q (50%), veh/ln	0.0	0.0	1.3	1.1	0.0	0.0				1.6	1.4	0.3
Lane Grp Delay (d), s/veh	0.0	0.0	17.7	16.6	0.0	0.0				4.8	4.5	3.2
Lane Grp LOS			B	B						A	A	A
Approach Vol, veh/h		132			120						870	
Approach Delay, s/veh		17.7			16.6						4.5	
Approach LOS		B			B						A	

Timer												
Assigned Phs		4			8						6	
Phs Duration (G+Y+Rc), s		11.7			11.7						32.0	
Change Period (Y+Rc), s		5.0			5.0						5.0	
Max Green Setting (Gmax), s		23.0			23.0						27.0	
Max Q Clear Time (g_c+I1), s		5.3			5.5						7.1	
Green Ext Time (p_c), s		0.8			0.8						2.2	

Intersection Summary												
HCM 2010 Ctrl Delay			7.4									
HCM 2010 LOS			A									

Notes

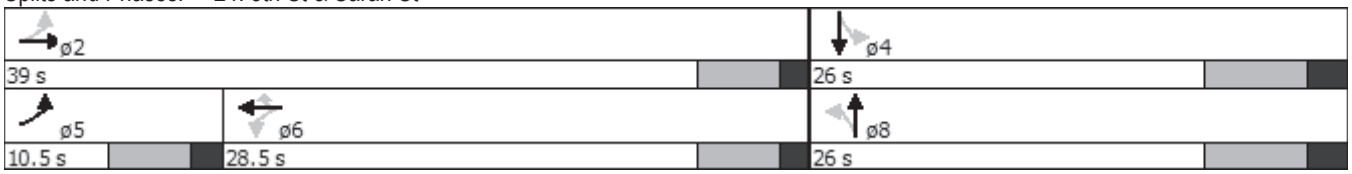
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	62	34	72	2	243	99	27	53	1	18	241	93
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	16	12	12	12	11	11	11	16	16	16
Grade (%)		-6%			7%			14%			-10%	
Storage Length (ft)	0		0	0		150	0		0	0		0
Storage Lanes	0		0	0		1	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.939				0.850		0.999			0.965	
Flt Protected		0.984			0.999			0.985			0.997	
Satd. Flow (prot)	0	1660	0	0	1632	1389	0	1492	0	0	1894	0
Flt Permitted		0.807			0.996			0.827			0.974	
Satd. Flow (perm)	0	1361	0	0	1627	1389	0	1253	0	0	1850	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		92				159		1			28	
Link Speed (mph)		25			35			35			35	
Link Distance (ft)		447			479			476			360	
Travel Time (s)		12.2			9.3			9.3			7.0	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.91	0.77	0.78	0.50	0.75	0.64	0.96	0.83	0.92	0.56	0.74	0.75
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	0%	0%	0%	1%	1%	0%	2%	0%	0%	5%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)	0	0	0									
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	68	44	92	4	324	155	28	64	1	32	326	124
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	204	0	0	328	155	0	93	0	0	482	0
Turn Type	pm+pt	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2			6			8			4	
Permitted Phases	2			6		6	8			4		
Detector Phase	5	2		6	6	6	8	8		4	4	
Switch Phase												
Minimum Initial (s)	5.0	10.0		10.0	10.0	10.0	7.0	7.0		7.0	7.0	
Minimum Split (s)	10.5	28.5		28.5	28.5	28.5	26.0	26.0		26.0	26.0	
Total Split (s)	10.5	39.0		28.5	28.5	28.5	26.0	26.0		26.0	26.0	
Total Split (%)	16.2%	60.0%		43.8%	43.8%	43.8%	40.0%	40.0%		40.0%	40.0%	
Maximum Green (s)	5.0	33.5		23.0	23.0	23.0	19.0	19.0		19.0	19.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	5.0	5.0		5.0	5.0	
All-Red Time (s)	1.5	1.5		1.5	1.5	1.5	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		-1.5			-1.5	-1.5		-1.5			-1.5	
Total Lost Time (s)		4.0			4.0	4.0		5.5			5.5	
Lead/Lag	Lead			Lag	Lag	Lag						
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	5.0	5.0		5.0	5.0	
Minimum Gap (s)	3.0	3.0		3.0	3.0	3.0	2.5	2.5		2.5	2.5	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Time Before Reduce (s)	0.0	0.0		3.0	3.0	3.0	26.0	26.0		26.0	26.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0	0.0	10.0	10.0		10.0	10.0	
Recall Mode	None	None		None	None	None	Min	Min		Min	Min	
Walk Time (s)		11.0		11.0	11.0	11.0	7.0	7.0		7.0	7.0	
Flash Dont Walk (s)		12.0		12.0	12.0	12.0	12.0	12.0		12.0	12.0	
Pedestrian Calls (#/hr)		1		3	3	3	1	1		5	5	
Act Effct Green (s)		16.3			16.3	16.3		15.8			15.8	
Actuated g/C Ratio		0.39			0.39	0.39		0.38			0.38	
v/c Ratio		0.35			0.52	0.24		0.20			0.68	
Control Delay		7.6			13.9	3.2		10.9			16.4	
Queue Delay		0.0			0.0	0.0		0.0			0.0	
Total Delay		7.6			13.9	3.2		10.9			16.4	
LOS		A			B	A		B			B	
Approach Delay		7.6			10.5			10.9			16.4	
Approach LOS		A			B			B			B	
Queue Length 50th (ft)		17			57	0		13			79	
Queue Length 95th (ft)		42			97	8		42			152	
Internal Link Dist (ft)		367			399			396			280	
Turn Bay Length (ft)						150						
Base Capacity (vph)		1158			989	906		637			955	
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		0.18			0.33	0.17		0.15			0.50	

Intersection Summary

Area Type: CBD
Cycle Length: 65
Actuated Cycle Length: 42
Natural Cycle: 65
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.68
Intersection Signal Delay: 12.3 Intersection LOS: B
Intersection Capacity Utilization 58.3% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 24: 5th St & Sarah St



HCM 2010 analysis expects stop-line detection. Detectors can not be further than 20 feet from the stop bar.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	57	399	39	157	559	107	36	28	137	116	32	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	14	12	11	12	14	12	14	16	14	14	12
Grade (%)		-1%			0%			1%			1%	
Storage Length (ft)	145		0	125		210	85		0	105		0
Storage Lanes	1		0	1		1	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.988				0.850		0.872			0.902	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1337	1728	0	1525	1613	1397	1483	1522	0	1567	1488	0
Flt Permitted	0.320			0.195			0.669			0.389		
Satd. Flow (perm)	451	1728	0	313	1613	1397	1044	1522	0	642	1488	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		3				80		178			58	
Link Speed (mph)		35			35			35			25	
Link Distance (ft)		538			949			624			208	
Travel Time (s)		10.5			18.5			12.2			5.7	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.92	0.86	0.92	0.91	0.92	0.92	0.81	0.92	0.77	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	18%	4%	14%	3%	6%	11%	9%	10%	3%	10%	10%	10%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	62	464	42	173	608	116	44	30	178	126	35	65
Shared Lane Traffic (%)												
Lane Group Flow (vph)	62	506	0	173	608	116	44	208	0	126	100	0
Turn Type	Perm	NA		pm+pt	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2		1	6			8			4	
Permitted Phases	2			6		6	8			4		
Detector Phase	2	2		1	6	6	8	8		4	4	
Switch Phase												
Minimum Initial (s)	10.0	10.0		5.0	10.0	10.0	7.0	7.0		7.0	7.0	
Minimum Split (s)	17.0	17.0		12.0	17.0	17.0	13.0	13.0		13.0	13.0	
Total Split (s)	58.0	58.0		18.0	76.0	76.0	40.0	40.0		40.0	40.0	
Total Split (%)	38.7%	38.7%		12.0%	50.7%	50.7%	26.7%	26.7%		26.7%	26.7%	
Maximum Green (s)	51.0	51.0		11.0	69.0	69.0	34.0	34.0		34.0	34.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	3.0	3.0		3.0	3.0	3.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	-2.0	-2.0		-2.0	-2.0	0.0	-2.0	-2.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0	7.0	4.0	4.0		6.0	6.0	
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Minimum Gap (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	

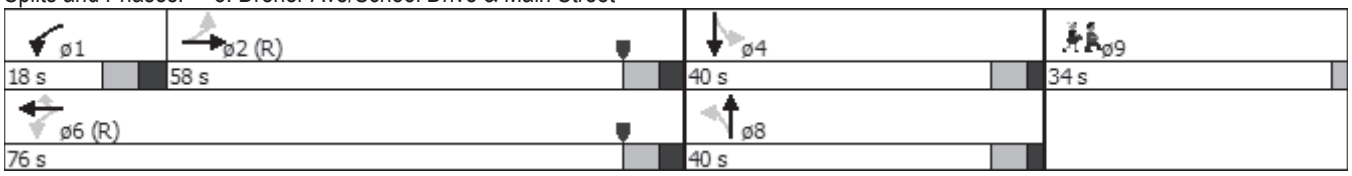
Lane Group	ø9
Lane Configurations	
Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Grade (%)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Ped Bike Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Confl. Peds. (#/hr)	
Confl. Bikes (#/hr)	
Peak Hour Factor	
Growth Factor	
Heavy Vehicles (%)	
Bus Blockages (#/hr)	
Parking (#/hr)	
Mid-Block Traffic (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	1.0
Minimum Split (s)	34.0
Total Split (s)	34.0
Total Split (%)	23%
Maximum Green (s)	32.0
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Minimum Gap (s)	3.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Time Before Reduce (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Recall Mode	C-Max	C-Max		None	C-Max	C-Max	None	None		None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)	56.7	56.7		75.0	75.0	73.0	32.0	32.0		30.0	30.0	
Actuated g/C Ratio	0.38	0.38		0.50	0.50	0.49	0.21	0.21		0.20	0.20	
v/c Ratio	0.36	0.77		0.66	0.75	0.16	0.20	0.45		0.98	0.29	
Control Delay	43.5	51.2		39.8	32.5	8.5	48.8	12.9		134.5	24.2	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	43.5	51.2		39.8	32.5	8.5	48.8	12.9		134.5	24.2	
LOS	D	D		D	C	A	D	B		F	C	
Approach Delay		50.3			30.8			19.1			85.7	
Approach LOS		D			C			B			F	
Queue Length 50th (ft)	45	449		85	340	13	34	23		120	33	
Queue Length 95th (ft)	95	565		166	438	49	64	97		#246	87	
Internal Link Dist (ft)		458			869			544			128	
Turn Bay Length (ft)	145			125		210	85			105		
Base Capacity (vph)	170	655		265	806	721	250	500		145	382	
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	
Reduced v/c Ratio	0.36	0.77		0.65	0.75	0.16	0.18	0.42		0.87	0.26	

Intersection Summary

Area Type: CBD
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 58 (39%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow
Natural Cycle: 110
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.98
Intersection Signal Delay: 41.4 Intersection LOS: D
Intersection Capacity Utilization 75.9% ICU Level of Service D
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 8: Dreher Ave/School Drive & Main Street



Lane Group	ø9
Time Before Reduce (s)	0.0
Time To Reduce (s)	0.0
Recall Mode	Ped
Walk Time (s)	7.0
Flash Dont Walk (s)	25.0
Pedestrian Calls (#/hr)	15
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

HCM 2010 methodology does not support exclusive ped or hold phases.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	177	362	7	2	306	161	43	74	63	301	8	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	12	11	11	12	11	11	11	10	10	10
Grade (%)		4%			1%			5%			-2%	
Storage Length (ft)	0		0	0		0	0		0	135		0
Storage Lanes	0		0	0		1	0		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.996				0.850		0.954			0.867	
Flt Protected		0.980			0.999			0.989		0.950		
Satd. Flow (prot)	0	2708	0	0	1596	1252	0	1494	0	1516	1378	0
Flt Permitted		0.596			0.993			0.919		0.504		
Satd. Flow (perm)	0	1647	0	0	1586	1252	0	1388	0	804	1378	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		25			25			25			35	
Link Distance (ft)		352			552			437			1438	
Travel Time (s)		7.9			5.2			11.9			4.1	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.57	0.85	0.35	0.50	0.81	0.77	0.77	0.64	0.72	0.91	1.00	0.55
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	9%	3%	0%	0%	3%	4%	2%	3%	0%	1%	13%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)		0	0			0						
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	311	426	20	4	378	209	56	116	88	331	8	64
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	757	0	0	382	209	0	260	0	331	72	0
Turn Type	pm+pt	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2			6			8			4	
Permitted Phases	2			6		6	8			4		
Detector Phase	5	2		6	6	6	8	8		4	4	
Switch Phase												
Minimum Initial (s)	5.0	10.0		10.0	10.0	10.0	7.0	7.0		7.0	7.0	
Minimum Split (s)	9.5	14.5		14.5	14.5	14.5	13.0	13.0		13.0	13.0	
Total Split (s)	9.5	68.0		58.5	58.5	58.5	58.0	58.0		58.0	58.0	
Total Split (%)	6.3%	45.3%		39.0%	39.0%	39.0%	38.7%	38.7%		38.7%	38.7%	
Maximum Green (s)	5.0	63.5		54.0	54.0	54.0	52.0	52.0		52.0	52.0	
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	1.5	1.5		1.5	1.5	1.5	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		-0.5			-0.5	-0.5		-2.0		-2.0	-2.0	
Total Lost Time (s)		4.0			4.0	4.0		4.0		4.0	4.0	
Lead/Lag	Lead			Lag	Lag	Lag						
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Minimum Gap (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	

Lane Group	ø9
Lane Configurations	
Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Grade (%)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Ped Bike Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Confl. Peds. (#/hr)	
Confl. Bikes (#/hr)	
Peak Hour Factor	
Growth Factor	
Heavy Vehicles (%)	
Bus Blockages (#/hr)	
Parking (#/hr)	
Mid-Block Traffic (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	1.0
Minimum Split (s)	24.0
Total Split (s)	24.0
Total Split (%)	16%
Maximum Green (s)	22.0
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Minimum Gap (s)	3.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Time Before Reduce (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Recall Mode	None	C-Max		C-Max	C-Max	C-Max	None	None		None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		64.0			64.0	64.0		54.0		54.0	54.0	
Actuated g/C Ratio		0.43			0.43	0.43		0.36		0.36	0.36	
v/c Ratio		1.45dl			0.57	0.39		0.52		1.15	0.15	
Control Delay		83.6			31.5	28.3		42.4		141.1	33.5	
Queue Delay		0.0			1.0	0.0		0.0		0.0	0.0	
Total Delay		83.6			32.4	28.3		42.4		141.1	33.5	
LOS		F			C	C		D		F	C	
Approach Delay		83.6			31.0			42.4			121.8	
Approach LOS		F			C			D			F	
Queue Length 50th (ft)		~423			238	128		200		~378	48	
Queue Length 95th (ft)		#506			277	156		191		#579	87	
Internal Link Dist (ft)		272			472			357			1358	
Turn Bay Length (ft)										135		
Base Capacity (vph)		702			676	534		499		289	496	
Starvation Cap Reductn		0			112	0		0		0	0	
Spillback Cap Reductn		0			0	0		0		0	0	
Storage Cap Reductn		0			0	0		0		0	0	
Reduced v/c Ratio		1.08			0.68	0.39		0.52		1.15	0.15	

Intersection Summary

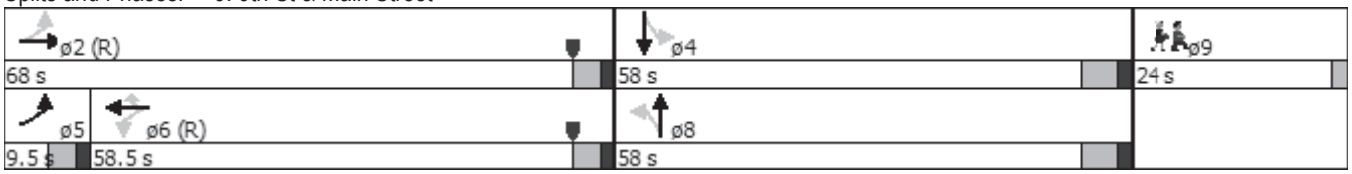
Area Type: CBD
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 62 (41%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow
Natural Cycle: 150
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.15
Intersection Signal Delay: 70.5 Intersection LOS: E
Intersection Capacity Utilization 78.2% ICU Level of Service D
Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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

dl Defacto Left Lane. Recode with 1 though lane as a left lane.

Splits and Phases: 9: 9th St & Main Street



Lane Group	ø9
Time Before Reduce (s)	0.0
Time To Reduce (s)	0.0
Recall Mode	Ped
Walk Time (s)	8.0
Flash Dont Walk (s)	14.0
Pedestrian Calls (#/hr)	15
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

HCM 2010 methodology does not support exclusive ped or hold phases.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	44	518	22	6	252	8	65	76	35	43	19	68
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	13	13	13	10	10	10	10	10	10
Grade (%)		0%			0%			1%			-1%	
Storage Length (ft)	0		0	0		0	0		0	0		0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.993			0.995			0.968			0.931	
Flt Protected		0.995			0.998			0.984			0.984	
Satd. Flow (prot)	0	*3502	0	0	*1772	0	0	*1760	0	0	*1624	0
Flt Permitted		0.899			0.973			0.835			0.818	
Satd. Flow (perm)	0	*3021	0	0	*1733	0	0	*1405	0	0	*1397	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		552			555			340			310	
Travel Time (s)		8.5			8.2			9.3			8.5	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.73	0.93	0.69	0.50	0.86	0.67	0.90	0.79	0.67	0.77	0.68	0.77
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	7%	2%	5%	0%	1%	0%	3%	0%	3%	2%	0%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)		0	0	0	0	0	0	0	0			
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	60	557	32	12	293	12	72	96	52	56	28	88
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	649	0	0	317	0	0	220	0	0	172	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	2	2		6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		7.0	7.0		7.0	7.0	
Minimum Split (s)	14.5	14.5		14.5	14.5		12.5	12.5		12.5	12.5	
Total Split (s)	27.5	27.5		27.5	27.5		25.5	25.5		25.5	25.5	
Total Split (%)	36.7%	36.7%		36.7%	36.7%		34.0%	34.0%		34.0%	34.0%	
Maximum Green (s)	23.0	23.0		23.0	23.0		20.0	20.0		20.0	20.0	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	1.5	1.5		1.5	1.5		2.5	2.5		2.5	2.5	
Lost Time Adjust (s)		-2.0			-2.0			-2.0			-2.0	
Total Lost Time (s)		2.5			2.5			3.5			3.5	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	

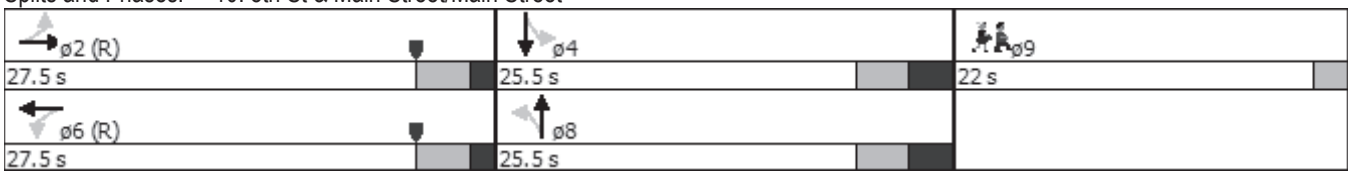
Lane Group	ø9
Lane Configurations	
Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Grade (%)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Ped Bike Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Confl. Peds. (#/hr)	
Confl. Bikes (#/hr)	
Peak Hour Factor	
Growth Factor	
Heavy Vehicles (%)	
Bus Blockages (#/hr)	
Parking (#/hr)	
Mid-Block Traffic (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	1.0
Minimum Split (s)	22.0
Total Split (s)	22.0
Total Split (%)	29%
Maximum Green (s)	20.0
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Minimum Gap (s)	3.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None		None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		30.9			30.9			18.1			18.1	
Actuated g/C Ratio		0.41			0.41			0.24			0.24	
v/c Ratio		0.52			0.44			0.65			0.51	
Control Delay		14.2			13.2			34.4			29.4	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		14.2			13.2			34.4			29.4	
LOS		B			B			C			C	
Approach Delay		14.2			13.2			34.4			29.4	
Approach LOS		B			B			C			C	
Queue Length 50th (ft)		164			79			91			68	
Queue Length 95th (ft)		m155			167			128			84	
Internal Link Dist (ft)		472			475			260			230	
Turn Bay Length (ft)												
Base Capacity (vph)		1245			714			412			409	
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		0.52			0.44			0.53			0.42	

Intersection Summary

Area Type: CBD
Cycle Length: 75
Actuated Cycle Length: 75
Offset: 44 (59%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.65
Intersection Signal Delay: 19.2 Intersection LOS: B
Intersection Capacity Utilization 58.6% ICU Level of Service B
Analysis Period (min) 15
* User Entered Value
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 10: 8th St & Main Street/Main Street



Lane Group	ø9
Time Before Reduce (s)	0.0
Time To Reduce (s)	0.0
Recall Mode	Ped
Walk Time (s)	7.0
Flash Dont Walk (s)	11.0
Pedestrian Calls (#/hr)	15
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

HCM 2010 methodology does not support exclusive ped or hold phases.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	23	390	139	18	250	22	54	69	57	31	124	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	13	13	13	14	14	14	11	11	11
Grade (%)		-1%			2%			4%			-1%	
Storage Length (ft)	0		0	0		0	0		0	0		0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.963			0.984			0.963			0.975	
Flt Protected		0.998			0.997			0.983			0.988	
Satd. Flow (prot)	0	2815	0	0	1532	0	0	1633	0	0	1432	0
Flt Permitted		0.922			0.938			0.680			0.801	
Satd. Flow (perm)	0	2600	0	0	1441	0	0	1130	0	0	1161	0
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		555			308			456			331	
Travel Time (s)		15.1			8.4			12.4			9.0	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.82	0.79	0.81	0.75	0.74	0.46	0.59	0.72	0.79	0.48	0.86	0.58
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	3%	1%	0%	1%	0%	4%	3%	4%	0%	1%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)		0	0	0	0	0				0	0	0
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	28	494	172	24	338	48	92	96	72	65	144	48
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	694	0	0	410	0	0	260	0	0	257	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	2	2		6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		7.0	7.0		7.0	7.0	
Minimum Split (s)	15.0	15.0		15.0	15.0		12.0	12.0		12.0	12.0	
Total Split (s)	72.0	72.0		72.0	72.0		56.0	56.0		56.0	56.0	
Total Split (%)	48.0%	48.0%		48.0%	48.0%		37.3%	37.3%		37.3%	37.3%	
Maximum Green (s)	67.0	67.0		67.0	67.0		51.0	51.0		51.0	51.0	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		-2.0			-2.0			-2.0			-2.0	
Total Lost Time (s)		3.0			3.0			3.0			3.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	

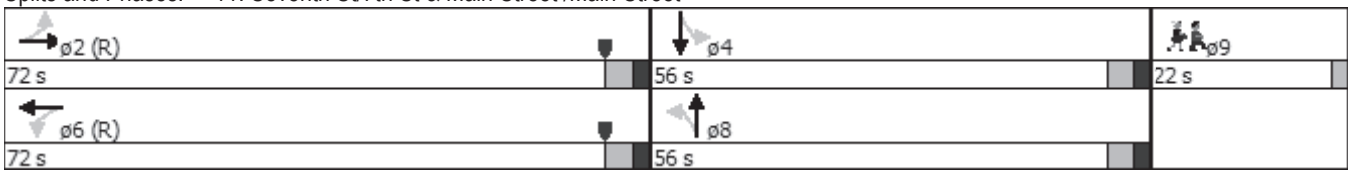
Lane Group	ø9
Lane Configurations	
Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Grade (%)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Ped Bike Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Confl. Peds. (#/hr)	
Confl. Bikes (#/hr)	
Peak Hour Factor	
Growth Factor	
Heavy Vehicles (%)	
Bus Blockages (#/hr)	
Parking (#/hr)	
Mid-Block Traffic (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	1.0
Minimum Split (s)	22.0
Total Split (s)	22.0
Total Split (%)	15%
Maximum Green (s)	20.0
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Minimum Gap (s)	3.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None		None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		82.7			82.7			39.3			39.3	
Actuated g/C Ratio		0.55			0.55			0.26			0.26	
v/c Ratio		0.48			0.52			0.88			0.85	
Control Delay		14.4			17.2			62.2			75.4	
Queue Delay		0.0			0.8			0.1			0.0	
Total Delay		14.4			18.1			62.3			75.4	
LOS		B			B			E			E	
Approach Delay		14.4			18.1			62.3			75.4	
Approach LOS		B			B			E			E	
Queue Length 50th (ft)		152			151			248			239	
Queue Length 95th (ft)		166			160			224			300	
Internal Link Dist (ft)		475			228			376			251	
Turn Bay Length (ft)												
Base Capacity (vph)		1432			794			399			410	
Starvation Cap Reductn		0			159			4			0	
Spillback Cap Reductn		7			8			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.49			0.65			0.66			0.63	

Intersection Summary

Area Type: CBD
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow, Master Intersection
Natural Cycle: 70
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.88
Intersection Signal Delay: 32.7 Intersection LOS: C
Intersection Capacity Utilization 58.5% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 11: Seventh St/7th St & Main Street /Main Street



Lane Group	ø9
Time Before Reduce (s)	0.0
Time To Reduce (s)	0.0
Recall Mode	Ped
Walk Time (s)	9.0
Flash Dont Walk (s)	11.0
Pedestrian Calls (#/hr)	15
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

HCM 2010 methodology does not support exclusive ped or hold phases.

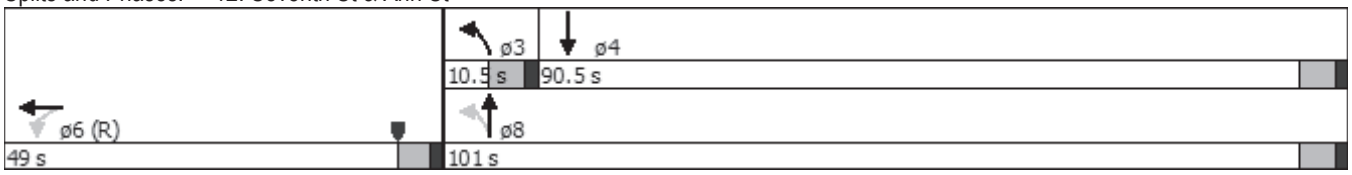
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	44	131	33	148	163	0	0	387	64
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	16	16	16	16	16	16	10	10	10
Grade (%)		0%			2%			-5%			0%	
Storage Length (ft)	0		0	0		0	0		0	0		0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt					0.978						0.977	
Flt Protected					0.986			0.977				
Satd. Flow (prot)	0	0	0	0	1830	0	0	2124	0	0	1546	0
Flt Permitted					0.986			0.429				
Satd. Flow (perm)	0	0	0	0	1830	0	0	933	0	0	1546	0
Right Turn on Red			No			Yes			No			Yes
Satd. Flow (RTOR)					7						12	
Link Speed (mph)		25			25			35			25	
Link Distance (ft)		273			284			513			456	
Travel Time (s)		7.4			7.7			10.0			12.4	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.92	0.92	0.92	0.52	0.82	0.69	0.82	0.80	0.92	0.92	0.91	0.73
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	0%	0%	2%	1%	0%	1%	2%	0%	0%	1%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)				0	0	0					0	0
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	0	0	0	85	160	48	180	204	0	0	425	88
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	293	0	0	384	0	0	513	0
Turn Type				Perm	NA		pm+pt	NA			NA	
Protected Phases					6		3	8			4	
Permitted Phases				6			8					
Detector Phase				6	6		3	8			4	
Switch Phase												
Minimum Initial (s)				10.0	10.0		5.0	7.0			7.0	
Minimum Split (s)				23.0	23.0		10.5	20.5			20.5	
Total Split (s)				49.0	49.0		10.5	101.0			90.5	
Total Split (%)				32.7%	32.7%		7.0%	67.3%			60.3%	
Maximum Green (s)				44.0	44.0		5.0	95.5			85.0	
Yellow Time (s)				3.5	3.5		4.0	4.0			4.0	
All-Red Time (s)				1.5	1.5		1.5	1.5			1.5	
Lost Time Adjust (s)					-1.0			-1.0			-1.0	
Total Lost Time (s)					4.0			4.5			4.5	
Lead/Lag							Lead				Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)				3.0	3.0		3.0	3.0			3.0	
Minimum Gap (s)				3.0	3.0		3.0	3.0			3.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Time Before Reduce (s)				0.0	0.0		0.0	0.0			0.0	
Time To Reduce (s)				0.0	0.0		0.0	0.0			0.0	
Recall Mode				C-Max	C-Max		None	None			None	
Walk Time (s)				7.0	7.0			7.0			7.0	
Flash Dont Walk (s)				11.0	11.0			8.0			8.0	
Pedestrian Calls (#/hr)				14	14			2			2	
Act Effct Green (s)					62.7			78.8			78.8	
Actuated g/C Ratio					0.42			0.53			0.53	
v/c Ratio					0.38			0.78			0.63	
Control Delay					35.6			38.9			23.1	
Queue Delay					0.0			0.0			1.6	
Total Delay					35.6			38.9			24.7	
LOS					D			D			C	
Approach Delay					35.6			38.9			24.7	
Approach LOS					D			D			C	
Queue Length 50th (ft)					193			294			291	
Queue Length 95th (ft)					294			268			325	
Internal Link Dist (ft)		193			204			433			376	
Turn Bay Length (ft)												
Base Capacity (vph)					768			600			934	
Starvation Cap Reductn					0			0			248	
Spillback Cap Reductn					0			0			0	
Storage Cap Reductn					0			0			0	
Reduced v/c Ratio					0.38			0.64			0.75	

Intersection Summary

Area Type: Other
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 115 (77%), Referenced to phase 6:WBTL, Start of Yellow
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.78
Intersection Signal Delay: 32.0 Intersection LOS: C
Intersection Capacity Utilization 63.2% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 12: Seventh St & Ann St



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	0	44	131	33	148	163	0	0	387	64
Number				1	6	16	3	8	18	7	4	14
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	0.90	1.00	1.00	1.00	1.00	1.00	1.00	0.90
Adj Sat Flow veh/h/ln				195.6	193.4	195.6	202.5	199.5	0.0	0.0	188.4	190.0
Lanes				0	1	0	0	1	0	0	1	0
Cap, veh/h				229	431	129	246	264	0	0	596	123
Arrive On Green				0.47	0.47	0.46	0.44	0.44	0.00	0.00	0.87	0.85
Sat Flow, veh/h				484	911	273	437	604	0	0	1364	282
Grp Volume(v), veh/h				293	0	0	384	0	0	0	0	513
Grp Sat Flow(s),veh/h/ln				1669	0	0	1040	0	0	0	0	1646
Q Serve(g_s), s				10.7	0.0	0.0	0.1	0.0	0.0	0.0	0.0	10.1
Cycle Q Clear(g_c), s				10.7	0.0	0.0	34.3	0.0	0.0	0.0	0.0	10.1
Prop In Lane				0.29		0.16	0.47		0.00	0.00		0.17
Lane Grp Cap(c), veh/h				790	0	0	510	0	0	0	0	719
V/C Ratio(X)				0.37	0.00	0.00	0.75	0.00	0.00	0.00	0.00	0.71
Avail Cap(c_a), veh/h				790	0	0	1270	0	0	0	0	1490
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00
Upstream Filter(I)				1.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.42
Uniform Delay (d), s/veh				16.0	0.0	0.0	27.5	0.0	0.0	0.0	0.0	4.1
Incr Delay (d2), s/veh				1.3	0.0	0.0	2.3	0.0	0.0	0.0	0.0	0.6
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 Back of Q (50%), veh/ln				4.6	0.0	0.0	8.2	0.0	0.0	0.0	0.0	1.8
Lane Grp Delay (d), s/veh				17.4	0.0	0.0	29.8	0.0	0.0	0.0	0.0	4.7
Lane Grp LOS				B			C					A
Approach Vol, veh/h					293			384			513	
Approach Delay, s/veh					17.4			29.8			4.7	
Approach LOS					B			C			A	
Timer												
Assigned Phs					6		3	8			4	
Phs Duration (G+Y+Rc), s					49.0		0.0	46.2			46.2	
Change Period (Y+Rc), s					5.0		5.5	5.5			5.5	
Max Green Setting (Gmax), s					44.0		5.0	95.5			85.0	
Max Q Clear Time (g_c+I1), s					12.7		0.0	36.3			12.1	
Green Ext Time (p_c), s					0.7		0.0	4.6			4.7	
Intersection Summary												
HCM 2010 Ctrl Delay			15.9									
HCM 2010 LOS			B									
Notes												

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	27	527	19	15	245	34	44	65	61	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	16	16	16	11	11	11	12	12	12
Grade (%)		-1%			2%			-1%			0%	
Storage Length (ft)	0		0	0		0	0		0	0		0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.994			0.982			0.955				
Flt Protected		0.997			0.997			0.988				
Satd. Flow (prot)	0	2945	0	0	1677	0	0	1554	0	0	0	0
Flt Permitted		0.897			0.935			0.988				
Satd. Flow (perm)	0	2650	0	0	1573	0	0	1554	0	0	0	0
Right Turn on Red			Yes			Yes			No			No
Satd. Flow (RTOR)		4			7							
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		308			744			383			229	
Travel Time (s)		6.0			14.5			7.5			4.5	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.61	0.90	0.68	0.63	0.83	0.71	0.79	0.68	0.80	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	2%	0%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)		0	0	0	0	0						
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	44	586	28	24	295	48	56	96	76	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	658	0	0	367	0	0	228	0	0	0	0
Turn Type	Perm	NA		Perm	NA		Perm	NA				
Protected Phases		2			6			4				
Permitted Phases	2			6			4					
Detector Phase	2	2		6	6		4	4				
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		7.0	7.0				
Minimum Split (s)	15.0	15.0		15.0	15.0		12.0	12.0				
Total Split (s)	78.0	78.0		78.0	78.0		53.0	53.0				
Total Split (%)	52.0%	52.0%		52.0%	52.0%		35.3%	35.3%				
Maximum Green (s)	73.0	73.0		73.0	73.0		48.0	48.0				
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5				
All-Red Time (s)	1.5	1.5		1.5	1.5		1.5	1.5				
Lost Time Adjust (s)		-1.0			-1.0			-1.0				
Total Lost Time (s)		4.0			4.0			4.0				
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0				
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	3.0				

Lane Group	ø9
Lane Configurations	
Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Grade (%)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Ped Bike Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Confl. Peds. (#/hr)	
Confl. Bikes (#/hr)	
Peak Hour Factor	
Growth Factor	
Heavy Vehicles (%)	
Bus Blockages (#/hr)	
Parking (#/hr)	
Mid-Block Traffic (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	1.0
Minimum Split (s)	19.0
Total Split (s)	19.0
Total Split (%)	13%
Maximum Green (s)	17.0
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Minimum Gap (s)	3.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0				
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0				
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None				
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		94.4			94.4			28.6				
Actuated g/C Ratio		0.63			0.63			0.19				
v/c Ratio		0.39			0.37			0.77				
Control Delay		9.2			15.9			74.2				
Queue Delay		0.5			0.0			0.0				
Total Delay		9.6			15.9			74.2				
LOS		A			B			E				
Approach Delay		9.6			15.9			74.2				
Approach LOS		A			B			E				
Queue Length 50th (ft)		150			179			214				
Queue Length 95th (ft)		200			259			207				
Internal Link Dist (ft)		228			664			303			149	
Turn Bay Length (ft)												
Base Capacity (vph)		1669			992			507				
Starvation Cap Reductn		542			0			0				
Spillback Cap Reductn		0			0			0				
Storage Cap Reductn		0			0			0				
Reduced v/c Ratio		0.58			0.37			0.45				

Intersection Summary

Area Type: CBD
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 28 (19%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.77
Intersection Signal Delay: 23.2 Intersection LOS: C
Intersection Capacity Utilization 47.8% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 13: 6th St & Main Street

Lane Group	ø9
Time Before Reduce (s)	0.0
Time To Reduce (s)	0.0
Recall Mode	Ped
Walk Time (s)	7.0
Flash Dont Walk (s)	10.0
Pedestrian Calls (#/hr)	15
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

HCM 2010 methodology does not support exclusive ped or hold phases.

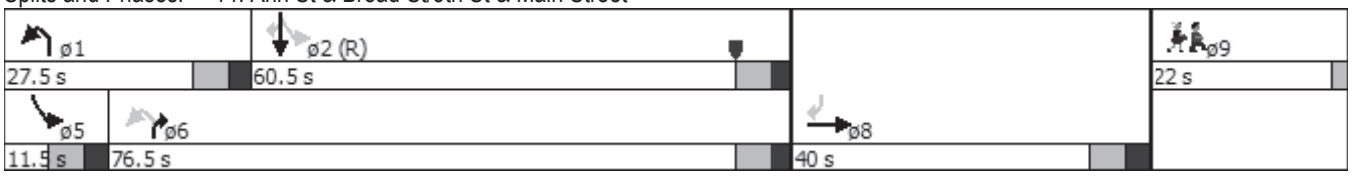
Lane Group	EBT	EBR	NBL2	NBR	SBL	SBT	SBR2	ø9
Lane Configurations								
Volume (vph)	513	58	203	459	78	447	348	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	11	11	10	11	10	10	11	
Grade (%)	-5%					2%		
Storage Length (ft)		0		0	0			
Storage Lanes		0		1	1			
Taper Length (ft)					25			
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	
Ped Bike Factor								
Frt	0.985			0.850			0.850	
Flt Protected			0.950		0.950			
Satd. Flow (prot)	*3372	0	1509	1398	*1752	*1793	1377	
Flt Permitted			0.243		0.950			
Satd. Flow (perm)	*3372	0	386	1398	*1752	*1792	1377	
Right Turn on Red				No	No		Yes	
Satd. Flow (RTOR)							382	
Link Speed (mph)	25					25		
Link Distance (ft)	744					298		
Travel Time (s)	20.3					8.2		
Confl. Peds. (#/hr)								
Confl. Bikes (#/hr)								
Peak Hour Factor	0.92	0.91	0.91	0.96	0.81	0.95	0.91	
Growth Factor	100%	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	0%	0%	1%	1%	3%	2%	1%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	
Parking (#/hr)								
Mid-Block Traffic (%)	0%					0%		
Adj. Flow (vph)	558	64	223	478	96	471	382	
Shared Lane Traffic (%)								
Lane Group Flow (vph)	622	0	223	478	96	471	382	
Turn Type	NA		custom	custom	pm+pt	NA	custom	
Protected Phases	8		1	6	5	2		9
Permitted Phases			6		2		2 8	
Detector Phase	8		1	6	5	2	2 8	
Switch Phase								
Minimum Initial (s)	7.0		5.0	10.0	5.0	10.0		1.0
Minimum Split (s)	14.0		12.5	16.5	11.5	16.5		22.0
Total Split (s)	40.0		27.5	76.5	11.5	60.5		22.0
Total Split (%)	26.7%		18.3%	51.0%	7.7%	40.3%		15%
Maximum Green (s)	33.0		21.0	70.0	5.0	54.0		20.0
Yellow Time (s)	4.0		4.0	4.0	4.0	4.0		2.0
All-Red Time (s)	3.0		2.5	2.5	2.5	2.5		0.0
Lost Time Adjust (s)	-2.5		0.0	-2.5	-2.5	-2.5		
Total Lost Time (s)	4.5		6.5	4.0	4.0	4.0		
Lead/Lag			Lead	Lag	Lead	Lag		
Lead-Lag Optimize?								
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0		3.0
Minimum Gap (s)	3.0		3.0	3.0	3.0	3.0		3.0

Lane Group	EBT	EBR	NBL2	NBR	SBL	SBT	SBR2	ø9
Time Before Reduce (s)	0.0		0.0	0.0	0.0	0.0		0.0
Time To Reduce (s)	0.0		0.0	0.0	0.0	0.0		0.0
Recall Mode	None		None	None	None	C-Max		Ped
Walk Time (s)								7.0
Flash Dont Walk (s)								13.0
Pedestrian Calls (#/hr)								15
Act Effct Green (s)	33.9		82.7	73.4	70.3	62.2	98.2	
Actuated g/C Ratio	0.23		0.55	0.49	0.47	0.41	0.65	
v/c Ratio	0.82		0.66	0.70	0.12	0.63	0.37	
Control Delay	45.2		27.9	36.8	15.0	37.1	1.8	
Queue Delay	0.0		0.0	0.0	0.0	1.1	0.0	
Total Delay	45.2		27.9	36.8	15.0	38.2	1.8	
LOS	D		C	D	B	D	A	
Approach Delay	45.2					21.2		
Approach LOS	D					C		
Queue Length 50th (ft)	235		114	361	36	354	10	
Queue Length 95th (ft)	330		169	506	m47	m450	m22	
Internal Link Dist (ft)	664					218		
Turn Bay Length (ft)			190					
Base Capacity (vph)	798		370	684	821	743	1043	
Starvation Cap Reductn	0		0	0	0	106	0	
Spillback Cap Reductn	0		0	0	0	0	0	
Storage Cap Reductn	0		0	0	0	0	0	
Reduced v/c Ratio	0.78		0.60	0.70	0.12	0.74	0.37	

Intersection Summary

Area Type: CBD
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 112 (75%), Referenced to phase 2:SBTL, Start of Yellow
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.82
Intersection Signal Delay: 31.7 Intersection LOS: C
Intersection Capacity Utilization 66.9% ICU Level of Service C
Analysis Period (min) 15
* User Entered Value
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 14: Ann St & Broad St/5th St & Main Street



HCM 2010 methodology does not support more than 4 approaches.

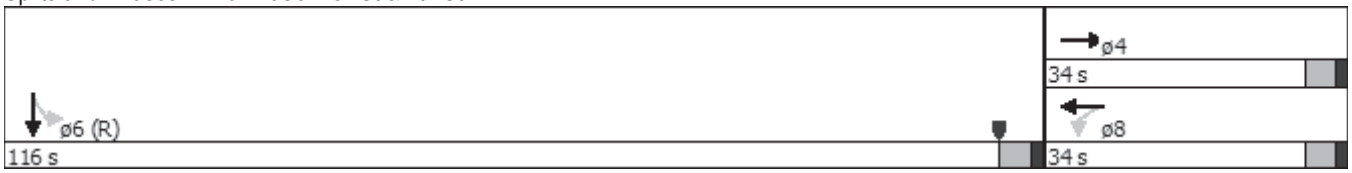
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	90	19	122	1	0	0	0	0	142	765	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	15	15	15	14	14	14	12	12	12	14	14	14
Grade (%)		1%			-1%			0%			1%	
Storage Length (ft)	0		0	0		0	0		0	0		0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00
Ped Bike Factor												
Frt		0.977										
Flt Protected					0.953						0.992	
Satd. Flow (prot)	0	*862	0	*619	1730	0	0	0	0	0	*1459	0
Flt Permitted					0.481						0.992	
Satd. Flow (perm)	0	*862	0	*606	873	0	0	0	0	0	*1459	0
Right Turn on Red			Yes			No			No			Yes
Satd. Flow (RTOR)		6										
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		163			256			357			512	
Travel Time (s)		4.4			7.0			7.6			14.0	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.92	0.75	0.79	0.78	0.92	0.92	0.92	0.92	0.92	0.85	0.89	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	0%	0%	1%	0%	0%	0%	0%	0%	1%	1%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	0	120	24	156	1	0	0	0	0	167	860	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	144	0	0	157	0	0	0	0	0	1027	0
Turn Type		NA		Perm	NA					Perm	NA	
Protected Phases		4			8						6	
Permitted Phases				8						6		
Detector Phase		4		8	8					6	6	
Switch Phase												
Minimum Initial (s)		7.0		7.0	7.0					10.0	10.0	
Minimum Split (s)		22.0		22.0	22.0					21.0	21.0	
Total Split (s)		34.0		34.0	34.0					116.0	116.0	
Total Split (%)		22.7%		22.7%	22.7%					77.3%	77.3%	
Maximum Green (s)		29.0		29.0	29.0					111.0	111.0	
Yellow Time (s)		3.5		3.5	3.5					3.5	3.5	
All-Red Time (s)		1.5		1.5	1.5					1.5	1.5	
Lost Time Adjust (s)		-1.0			0.0						-1.0	
Total Lost Time (s)		4.0			5.0						4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)		3.0		3.0	3.0					3.0	3.0	
Minimum Gap (s)		3.0		3.0	3.0					3.0	3.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Time Before Reduce (s)		0.0		0.0	0.0					0.0	0.0	
Time To Reduce (s)		0.0		0.0	0.0					0.0	0.0	
Recall Mode		None		None	None					C-Max	C-Max	
Walk Time (s)		7.0		7.0	7.0					7.0	7.0	
Flash Dont Walk (s)		10.0		10.0	10.0					9.0	9.0	
Pedestrian Calls (#/hr)		3		3	3					21	21	
Act Effct Green (s)		29.1			28.1						112.9	
Actuated g/C Ratio		0.19			0.19						0.75	
v/c Ratio		0.84			0.96						0.94	
Control Delay		91.8			120.7						27.0	
Queue Delay		0.0			0.0						0.1	
Total Delay		91.8			120.7						27.1	
LOS		F			F						C	
Approach Delay		91.8			120.7						27.1	
Approach LOS		F			F						C	
Queue Length 50th (ft)		131			153						305	
Queue Length 95th (ft)		#183			#299						#634	
Internal Link Dist (ft)		83			176			277			432	
Turn Bay Length (ft)												
Base Capacity (vph)		177			168						1098	
Starvation Cap Reductn		0			0						0	
Spillback Cap Reductn		0			0						2	
Storage Cap Reductn		0			0						0	
Reduced v/c Ratio		0.81			0.93						0.94	

Intersection Summary

Area Type: CBD
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 112 (75%), Referenced to phase 6:SBTL, Start of Yellow
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.96
Intersection Signal Delay: 45.2 Intersection LOS: D
Intersection Capacity Utilization 49.8% ICU Level of Service A
Analysis Period (min) 15
* User Entered Value
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 20: McConnell St & 4th St



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	90	19	122	1	0	0	0	0	142	765	0
Number	7	4	14	3	8	18				1	6	16
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
Adj Sat Flow veh/h/ln	0.0	177.0	177.0	178.7	177.0	0.0				177.0	175.2	0.0
Lanes	0	1	0	0	1	0				0	2	0
Cap, veh/h	0	286	57	192	1	0				403	2193	0
Arrive On Green	0.00	0.20	0.19	0.20	0.19	0.00				0.75	0.75	0.00
Sat Flow, veh/h	0	1432	286	743	5	0				540	2937	0
Grp Volume(v), veh/h	0	0	144	157	0	0				534	493	0
Grp Sat Flow(s),veh/h/ln	0	0	1719	748	0	0				1725	1752	0
Q Serve(g_s), s	0.0	0.0	11.0	19.0	0.0	0.0				17.0	14.9	0.0
Cycle Q Clear(g_c), s	0.0	0.0	11.0	30.0	0.0	0.0				17.0	14.9	0.0
Prop In Lane	0.00		0.17	0.99		0.00				0.31		0.00
Lane Grp Cap(c), veh/h	0	0	344	197	0	0				1288	1308	0
V/C Ratio(X)	0.00	0.00	0.42	0.80	0.00	0.00				0.41	0.38	0.00
Avail Cap(c_a), veh/h	0	0	344	197	0	0				1288	1308	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	0.00	1.00	1.00	0.00	0.00				1.00	1.00	0.00
Uniform Delay (d), s/veh	0.0	0.0	52.5	66.3	0.0	0.0				7.0	6.7	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.8	19.8	0.0	0.0				1.0	0.8	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 Back of Q (50%), veh/ln	0.0	0.0	5.0	7.2	0.0	0.0				6.9	6.2	0.0
Lane Grp Delay (d), s/veh	0.0	0.0	53.3	86.1	0.0	0.0				8.0	7.5	0.0
Lane Grp LOS			D	F						A	A	
Approach Vol, veh/h		144			157						1027	
Approach Delay, s/veh		53.3			86.1						7.8	
Approach LOS		D			F						A	

Timer	
Assigned Phs	4	8	6
Phs Duration (G+Y+Rc), s	34.0	34.0	116.0
Change Period (Y+Rc), s	5.0	5.0	5.0
Max Green Setting (Gmax), s	29.0	29.0	111.0
Max Q Clear Time (g_c+I1), s	13.0	32.0	0.0
Green Ext Time (p_c), s	1.0	0.0	0.0

Intersection Summary	
HCM 2010 Ctrl Delay	22.0
HCM 2010 LOS	C

Notes

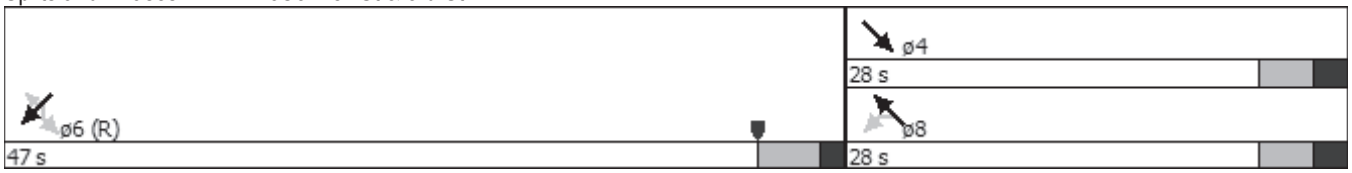
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	0	105	72	16	126	0	0	0	0	9	941	115
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	11	11	11	12	12	12	12	12	12	13	11	14
Grade (%)		1%			-2%			0%			-1%	
Storage Length (ft)	0		0	0		0	0		0	0		175
Storage Lanes	0		0	0		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00
Ped Bike Factor												
Frt		0.949										0.850
Flt Protected					0.991						0.999	
Satd. Flow (prot)	0	*1762	0	0	*1857	0	0	0	0	0	*1931	1558
Flt Permitted					0.874						0.999	
Satd. Flow (perm)	0	*1762	0	0	*1857	0	0	0	0	0	*1931	1558
Right Turn on Red			Yes			No			No			Yes
Satd. Flow (RTOR)		43										155
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		348			248			268			452	
Travel Time (s)		9.5			6.8			7.3			7.7	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.92	0.80	0.90	0.57	0.96	0.92	0.92	0.92	0.92	0.56	0.97	0.74
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%	1%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	0	131	80	28	131	0	0	0	0	16	970	155
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	211	0	0	159	0	0	0	0	0	986	155
Turn Type		NA		Perm	NA					Perm	NA	Perm
Protected Phases		4			8						6	
Permitted Phases				8						6		6
Detector Phase		4		8	8					6	6	6
Switch Phase												
Minimum Initial (s)		7.0		7.0	7.0					10.0	10.0	10.0
Minimum Split (s)		28.0		28.0	28.0					21.0	21.0	21.0
Total Split (s)		28.0		28.0	28.0					47.0	47.0	47.0
Total Split (%)		37.3%		37.3%	37.3%					62.7%	62.7%	62.7%
Maximum Green (s)		23.0		23.0	23.0					42.0	42.0	42.0
Yellow Time (s)		3.0		3.0	3.0					3.5	3.5	3.5
All-Red Time (s)		2.0		2.0	2.0					1.5	1.5	1.5
Lost Time Adjust (s)		-1.0			-1.0						-1.0	-1.0
Total Lost Time (s)		4.0			4.0						4.0	4.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)		3.0		3.0	3.0					3.0	3.0	3.0
Minimum Gap (s)		3.0		3.0	3.0					3.0	3.0	3.0

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Time Before Reduce (s)		0.0		0.0	0.0					0.0	0.0	0.0
Time To Reduce (s)		0.0		0.0	0.0					0.0	0.0	0.0
Recall Mode		None		None	None					C-Max	C-Max	C-Max
Walk Time (s)		9.0		9.0	9.0					7.0	7.0	7.0
Flash Dont Walk (s)		14.0		14.0	14.0					9.0	9.0	9.0
Pedestrian Calls (#/hr)		6		6	6					3	3	3
Act Effct Green (s)		14.6			14.6						52.4	52.4
Actuated g/C Ratio		0.19			0.19						0.70	0.70
v/c Ratio		0.56			0.44						0.73	0.14
Control Delay		26.1			28.9						13.5	1.5
Queue Delay		0.0			0.0						0.0	0.0
Total Delay		26.1			28.9						13.5	1.5
LOS		C			C						B	A
Approach Delay		26.1			28.9						11.9	
Approach LOS		C			C						B	
Queue Length 50th (ft)		72			67						115	0
Queue Length 95th (ft)		96			100						#341	12
Internal Link Dist (ft)		268			168			188			372	
Turn Bay Length (ft)												175
Base Capacity (vph)		593			594						1348	1134
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		0.36			0.27						0.73	0.14

Intersection Summary

Area Type: CBD
Cycle Length: 75
Actuated Cycle Length: 75
Offset: 19 (25%), Referenced to phase 6:SWTL, Start of Yellow
Natural Cycle: 70
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.73
Intersection Signal Delay: 15.6 Intersection LOS: B
Intersection Capacity Utilization 58.1% ICU Level of Service B
Analysis Period (min) 15
* User Entered Value
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 21: McConnell St & 3rd St



Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (veh/h)	0	105	72	16	126	0	0	0	0	9	941	115
Number	7	4	14	3	8	18				1	6	16
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
Adj Sat Flow veh/h/ln	0.0	169.5	170.1	172.7	172.7	0.0				178.7	170.2	178.7
Lanes	0	1	0	0	1	0				0	2	1
Cap, veh/h	0	197	120	88	228	0				36	2259	1025
Arrive On Green	0.00	0.20	0.18	0.20	0.20	0.00				0.67	0.67	0.67
Sat Flow, veh/h	0	986	602	106	1140	0				53	3348	1519
Grp Volume(v), veh/h	0	0	211	159	0	0				516	470	155
Grp Sat Flow(s),veh/h/ln	0	0	1589	1246	0	0				1699	1702	1519
Q Serve(g_s), s	0.0	0.0	7.8	0.8	0.0	0.0				9.0	7.9	2.4
Cycle Q Clear(g_c), s	0.0	0.0	7.8	8.6	0.0	0.0				9.0	7.9	2.4
Prop In Lane	0.00		0.38	0.18		0.00				0.03		1.00
Lane Grp Cap(c), veh/h	0	0	318	316	0	0				1146	1148	1025
V/C Ratio(X)	0.00	0.00	0.66	0.50	0.00	0.00				0.45	0.41	0.15
Avail Cap(c_a), veh/h	0	0	598	592	0	0				1146	1148	1025
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	0.00	1.00	1.00	0.00	0.00				1.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	0.0	23.7	22.8	0.0	0.0				4.8	4.7	3.8
Incr Delay (d2), s/veh	0.0	0.0	2.4	1.2	0.0	0.0				1.3	1.1	0.3
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 Back of Q (50%), veh/ln	0.0	0.0	3.2	2.2	0.0	0.0				3.3	2.8	0.7
Lane Grp Delay (d), s/veh	0.0	0.0	26.1	24.0	0.0	0.0				6.1	5.7	4.1
Lane Grp LOS			C	C						A	A	A
Approach Vol, veh/h		211			159						1141	
Approach Delay, s/veh		26.1			24.0						5.7	
Approach LOS		C			C						A	

Timer												
Assigned Phs		4			8						6	
Phs Duration (G+Y+Rc), s		16.7			16.7						47.0	
Change Period (Y+Rc), s		5.0			5.0						5.0	
Max Green Setting (Gmax), s		23.0			23.0						42.0	
Max Q Clear Time (g_c+I1), s		9.8			10.6						11.0	
Green Ext Time (p_c), s		1.1			1.1						3.3	

Intersection Summary		
HCM 2010 Ctrl Delay	10.5	
HCM 2010 LOS	B	

Notes

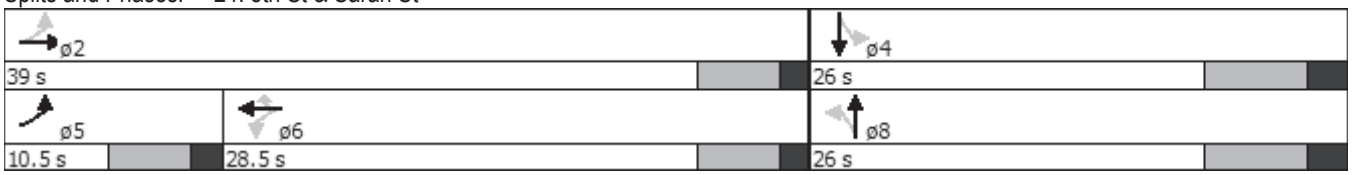
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	135	82	118	2	245	209	26	85	2	18	292	102
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	16	16	16	12	12	12	11	11	11	16	16	16
Grade (%)		-6%			7%			14%			-10%	
Storage Length (ft)	0		0	0		150	0		0	0		0
Storage Lanes	0		0	0		1	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.955				0.850		0.996			0.964	
Flt Protected		0.980			0.999			0.984			0.997	
Satd. Flow (prot)	0	1681	0	0	1648	1403	0	1507	0	0	1937	0
Flt Permitted		0.748			0.995			0.733			0.976	
Satd. Flow (perm)	0	1283	0	0	1642	1403	0	1122	0	0	1897	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		60				243		2			30	
Link Speed (mph)		25			35			35			35	
Link Distance (ft)		447			479			476			360	
Travel Time (s)		12.2			9.3			9.3			7.0	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.84	0.85	0.92	0.50	0.84	0.86	0.54	0.85	0.50	0.75	0.94	0.82
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)	0	0	0									
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	161	96	128	4	292	243	48	100	4	24	311	124
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	385	0	0	296	243	0	152	0	0	459	0
Turn Type	pm+pt	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2			6			8			4	
Permitted Phases	2			6		6	8			4		
Detector Phase	5	2		6	6	6	8	8		4	4	
Switch Phase												
Minimum Initial (s)	5.0	10.0		10.0	10.0	10.0	7.0	7.0		7.0	7.0	
Minimum Split (s)	10.5	28.5		28.5	28.5	28.5	26.0	26.0		26.0	26.0	
Total Split (s)	10.5	39.0		28.5	28.5	28.5	26.0	26.0		26.0	26.0	
Total Split (%)	16.2%	60.0%		43.8%	43.8%	43.8%	40.0%	40.0%		40.0%	40.0%	
Maximum Green (s)	5.0	33.5		23.0	23.0	23.0	19.0	19.0		19.0	19.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	5.0	5.0		5.0	5.0	
All-Red Time (s)	1.5	1.5		1.5	1.5	1.5	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		-1.5			-1.5	-1.5		-1.5			-1.5	
Total Lost Time (s)		4.0			4.0	4.0		5.5			5.5	
Lead/Lag	Lead			Lag	Lag	Lag						
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	5.0	5.0		5.0	5.0	
Minimum Gap (s)	3.0	3.0		3.0	3.0	3.0	2.5	2.5		2.5	2.5	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Time Before Reduce (s)	0.0	0.0		3.0	3.0	3.0	26.0	26.0		26.0	26.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0	0.0	10.0	10.0		10.0	10.0	
Recall Mode	None	None		None	None	None	Min	Min		Min	Min	
Walk Time (s)		11.0		11.0	11.0	11.0	7.0	7.0		7.0	7.0	
Flash Dont Walk (s)		12.0		12.0	12.0	12.0	12.0	12.0		12.0	12.0	
Pedestrian Calls (#/hr)		1		1	1	1	1	1		1	1	
Act Effct Green (s)		22.8			22.8	22.8		15.7			15.7	
Actuated g/C Ratio		0.47			0.47	0.47		0.32			0.32	
v/c Ratio		0.61			0.39	0.31		0.42			0.73	
Control Delay		12.9			10.2	2.5		19.4			23.6	
Queue Delay		0.0			0.0	0.0		0.0			0.0	
Total Delay		12.9			10.2	2.5		19.4			23.6	
LOS		B			B	A		B			C	
Approach Delay		12.9			6.7			19.4			23.6	
Approach LOS		B			A			B			C	
Queue Length 50th (ft)		61			50	0		33			105	
Queue Length 95th (ft)		130			96	24		89			#280	
Internal Link Dist (ft)		367			399			396			280	
Turn Bay Length (ft)						150						
Base Capacity (vph)		969			980	935		512			881	
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		0.40			0.30	0.26		0.30			0.52	

Intersection Summary

Area Type: CBD
Cycle Length: 65
Actuated Cycle Length: 48.8
Natural Cycle: 65
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.73
Intersection Signal Delay: 14.6 Intersection LOS: B
Intersection Capacity Utilization 73.0% ICU Level of Service D
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 24: 5th St & Sarah St



HCM 2010 analysis expects stop-line detection. Detectors can not be further than 20 feet from the stop bar.

AECOM

To: **Project File (60284833.425 Traffic)**

Subject: ***I-80 Section 17M Reconstruction - Future Traffic Growth Projections***

From: **Ed Reagle, PE**

Date: **June 13, 2013**

This technical memorandum has been developed to document a background review and recommendation on the assumptions to be used in development of future traffic volumes for the Interstate 80 (I-80) Section 17M Reconstruction project. The reconstruction project spans from Stroud Township (Exit 303) to the Borough of East Stroudsburg in Monroe County, Pennsylvania. The section of I-80 within the study area is classified as urban interstate and consists of two (2) lanes of traffic in the eastbound and westbound directions.

A variety of sources have been reviewed to determine the range of growth rates that have been previously estimated in transportation studies in the corridor. Table 1 (below) includes an overview of historic growth rates utilized in previous studies along with current data trends observed in traffic data obtained from DRJTBC and PennDOT.

A review of recent transportation studies in the project corridor suggests an expected growth rate of 1.9%-2.5% to the design year (anticipated build year) of 2038. The maximum growth rate of 2.5% was utilized in the 2005 I-80 Corridor Study Technical Memorandum, and is referred to as a value obtained through referencing sources including population estimates, the PennDOT Traffic Data Manual, and other projects within the corridor. Since the time of the I-80 Corridor Study, the yearly growth factors reported by the PennDOT Traffic Manual have decreased. Using an average from the yearly growth factors reported from 2001-2011 in the current PennDOT Traffic Information Report yields a value of 2.1%.

Table 1: Interstate 80 AADT Growth Rate Comparison

Source	Author	Annual Growth Rate
Technical Memorandum I-80 Corridor Study – Traffic Growth and Future I-80 Mainline LOS (June 29, 2005)	McCormick Taylor	2.5% (assumed annual growth to 2030 between 1.9 – 3.0%)
DRJTBC Northerly Crossing Study (July 31, 2006)	Baker	1.9% (Assumed annual growth to 2030)
Interchange Alternative Comparison/Point of Access Study Interstate I-80, Section 05S East Stroudsburg Interchange (January 2008)	Wilbur Smith Associates	2.0% (Assumed annual growth to 2032)
DRJTBC 2012 Traffic Engineering Report – Year 2013 Toll Bridge Traffic Volume and Revenue Projections (Westbound Traffic Data, February 12, 2013)	Pennoni Associates Inc.	-1.9% (5-year average 2008-2012)
DRJTBC Historic Traffic Count Data (I-80 Delaware Water Gap Bridge, Bi-Directional Data)	Delaware River Joint Toll Bridge Commission	-1.8% (4-year average 2009-2012)
PennDOT Bureau of Planning Traffic Volume Data (I-80 Mainline, Interchange 302-306)	PennDOT	-1.4% (9-year span 2001-2010 growth trend)
PennDOT Bureau of Planning Traffic Volume Data (I-80 Mainline, Interchange 306-309)	PennDOT	-0.7% (9-year span 2001-2010 growth trend)

Current Traffic Data Trend

A review of recent traffic data from the past five years indicates an overall decrease in AADT volumes along the I-80 corridor within the study area. Volume data collected by Tri-State Traffic Data in 2013 along the I-80 mainline suggests this trend has continued into the current year. This pattern is anticipated to be a reflection of the current state of the economy and employment trends within the area, and not a depiction of the overall potential for long-term growth trends.

Planning Perspective

The current population (2012 estimate) for Monroe County is 168,800 in comparison to the Monroe County 2020 Comprehensive Plan estimate of between 177,000 and 221,000 in the year 2020. The overall population growth trend from 2000-2012 suggests the potential for a future traffic growth rate more on course with the rates utilized in the transportation studies listed in Table 1, as opposed to recent traffic growth rates observed in the review of current trends.

As noted, PennDOT Bureau of Planning statewide growth factors for interstates indicates 23% overall growth from 2002 to 2011 (2.1% per year). Statewide traffic trends from 1992-2001 indicate a 20.1% growth and from 2002-2011 a 36.3% growth.

Monroe 2020 Comprehensive Plan Update

The Monroe County Comprehensive Plan Update was recently published. The Plan update includes general population/ employment, Commuter Rail Line project, and significant development information.

The plan update indicates that the population has been stagnate over the past few years and is not anticipated to change until there are significant economic sector improvements. A low and moderate projection was included which would increase population by about 2% and 4% through 2020. The plan update indicates there are several large land developments proposed including the Kalahari Resort (combination water park, hotel and conference center at a site located at Pocono Manor) and Camelback Hotel and Water Park which have the potential to generate additional traffic in the region.

The first section of the passenger rail service proposed from Scranton to Hoboken, NJ is in construction. This section is from Port Morris, NJ to Andover, NJ. The two remaining sections from NJ to Stroudsburg, PA, and from Stroudsburg to Scranton are unfunded at this time. Whether the line will be funded and constructed is unknown at this time. Therefore, no adjustments to the future traffic volumes will be made.

Recommendations

A 2.0% yearly percentage growth rate is recommended to capture the traffic growth potential of the study area to the design year of 2045. Current traffic volumes were projected to the design year 2045. This is based on construction completion in 2025, with 20 years beyond for the design year of 2045.

SUMMARY OF HISTORIC DATA FROM BUREAU OF PLANNING
MAINLINE I-80

Source of Data: PennDOT Bureau of Planning

Interchange 302-306

	2009 data	11/18/2009			2010 data	11/2/2009			
	EB	WB	TOTAL		EB	WB	TOTAL		% change
ADT	28,304	27019	55,323		22713	21537	44,250		-20.02%
AM peak hour	2142	1496	3,638		1823	1376	3,199		-12.07%
PM peak hour	2189	2509	4,698		1701	2271	3,972		-15.45%

Interchange 306-309

	2009 data	7/21/2009			2010 data	11/3/2009			
	EB	WB	TOTAL		EB	WB	TOTAL		% change
ADT	31,726	32187	63,913		28146	31825	59,971		-6.17%
AM peak hour	2580	1890	4,470		2117	1796	3,913		-12.46%
PM peak hour	3296	2186	5,482		1915	3304	5,219		-4.80%

DRJTBC I-80 BRIDGE (DELAWARE WATER GAP)

	2009 data	2010 data	2011 data		2009-2010	2010-2011
	TOTAL	TOTAL	TOTAL		% change	% change
ADT	53,900	55,400	51,800		2.71%	-6.95%
AM peak hour						
PM peak hour						

Data from DRJTBC website

DRJTBC I-80 BRIDGE (DELAWARE WATER GAP)

	2007 data	2008 data	2009 data	2010 data	2011 data	2012 data
	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL
ADT	27,475	26,617	26,631	26,366	25,225	24,975
AM peak hour						
PM peak hour						

Data from DRJTBC 2012 Traffic Engineering Report Year 2013 Volume and Revenue Projections - Pennoni

2007-2008	2008-2009	2009-2010	2010-2011
% change	% change	% change	% change
-3.22%	0.05%	-1.00%	-4.52%

Tri-State Traffic Counts (2013) - No Seasonal Adjustment Utilized

Weekday Vol.

West of Interchange 303

2013 data	4/1/2013			
EB	WB	TOTAL		% change
23727	24904	48,631		10%
1508	1379	2,887		-10%
1340	2061	3,401		-14%

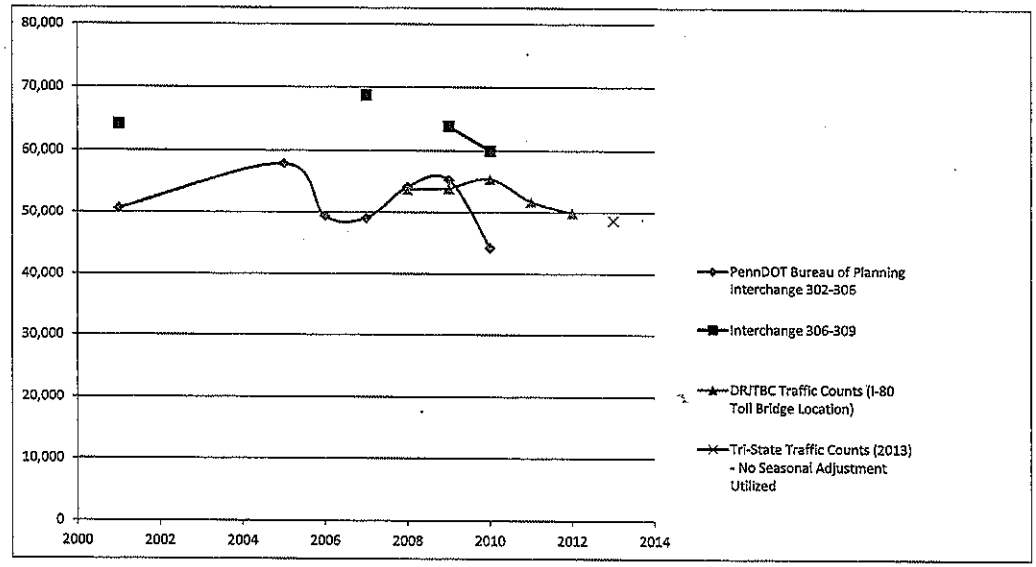
Weekday Vol.

East of Interchange 307

2013 data	4/1/2013			
EB	WB	TOTAL		% change
30103	31476	61,579		3%
2022	1745	3,767		-4%
1717	2206	3,923		-25%

AADT Comparison (Year-To-Year)

Year	PennDOT Bureau of Planning Interchange 302-306	% increase	Interchange 306-309	% increase	DRJTBC Traffic Counts (I-80 Toll Bridge Location)	% Increase	Tri-State Traffic Counts (2013) - No Seasonal Adjustment Utilized	DRJTBC 2012 Traffic Engr Report - WB Toll Volumes	% Increase
2001	50,637		64,182						
2005	57,895	14.3							
2006	49,368	-14.7							
2007	49,018	-0.7	68,750	7.1				27,475	
2008	54,122	10.4			53,700			26,617	-3.1
2009	55,323	2.2	63,913	-7.0	53,900	0.4		26,631	0.1
2010	44,250	-20.0	59,971	-6.2	55,400	2.8		26,366	-1.0
2011					51,800	-6.5		25,225	-4.3
2012					49,900	-3.7		24,975	-1.0
2013							48,631		
		-0.13		-0.1		-0.07			-0.09
		-0.04		-0.2		-0.09			



Ramps AADT Comparison

Census Data Trends

Table 370
Yearly Growth Factors

The yearly growth factors (shown in the following tables) are used to compute the current estimated average daily traffic for count data that is older than the current year. The factor application is applied by Traffic Pattern Group (TPG) and is used to calculate total vehicles and truck estimates. A limited amount of count data is processed through the Yearly Growth Factor table, since most traffic counts are for the current year.

To use this table, select the base year of the count from the "YEAR" column and multiply it by the percentage under the corresponding "TPG" row.

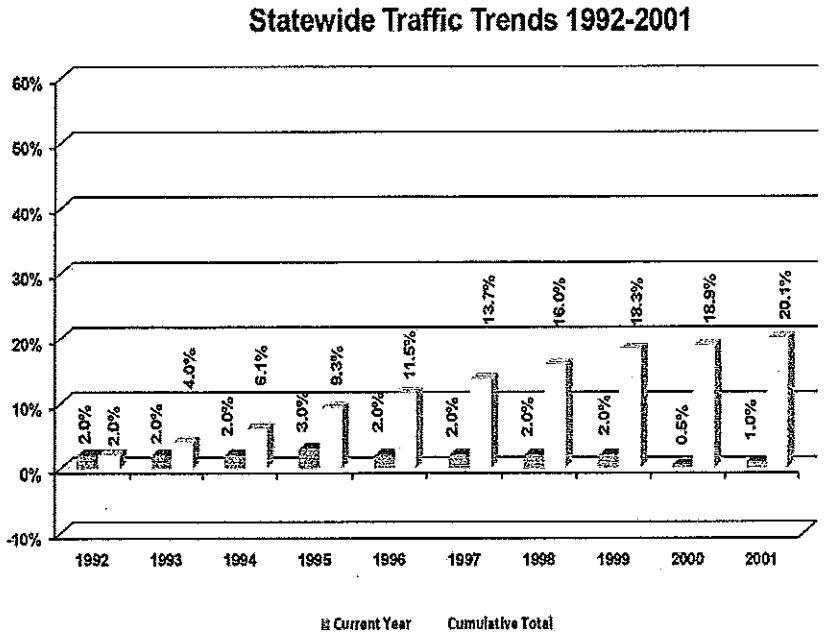
For example, to determine the current year estimate (2011) of a 2002 base year count having a TPG 5, multiply 1.074 (7.4%) by the AADT of the 2002 count.

Yearly Growth Factors: 2001-2011										
TPG	01-02	02-03	03-04	04-05	05-06	06-07	07-08	08-09	09-10	10-11
TPG1	3.0%	3.0%	3.2%	3.2%	2.9%	3.0%	2.4%	1.0%	0.0%	-0.7%
TPG2	3.0%	3.0%	3.3%	3.2%	3.0%	3.0%	2.4%	2.2%	1.6%	1.7%
TPG3	1.8%	1.0%	1.4%	1.1%	0.7%	1.1%	0.2%	0.3%	0.2%	-0.6%
TPG4	1.8%	1.3%	1.7%	1.6%	1.2%	1.3%	0.8%	0.5%	0.3%	-0.3%
TPG5	1.8%	1.0%	1.4%	1.1%	0.7%	1.1%	0.2%	0.3%	0.2%	-0.6%
TPG6	1.9%	1.3%	1.7%	1.6%	1.2%	1.3%	0.8%	0.5%	0.3%	-0.3%
TPG7	1.9%	1.3%	1.7%	1.6%	1.2%	1.3%	0.8%	0.5%	0.3%	-0.3%
TPG8	1.9%	1.3%	1.7%	1.6%	1.2%	1.3%	0.8%	0.5%	0.3%	-0.3%
TPG9	1.9%	1.3%	1.7%	1.6%	1.2%	1.3%	0.8%	0.5%	0.3%	-0.3%
TPG10	1.0%	1.0%	1.7%	1.6%	1.2%	1.3%	0.8%	0.5%	0.3%	-0.3%

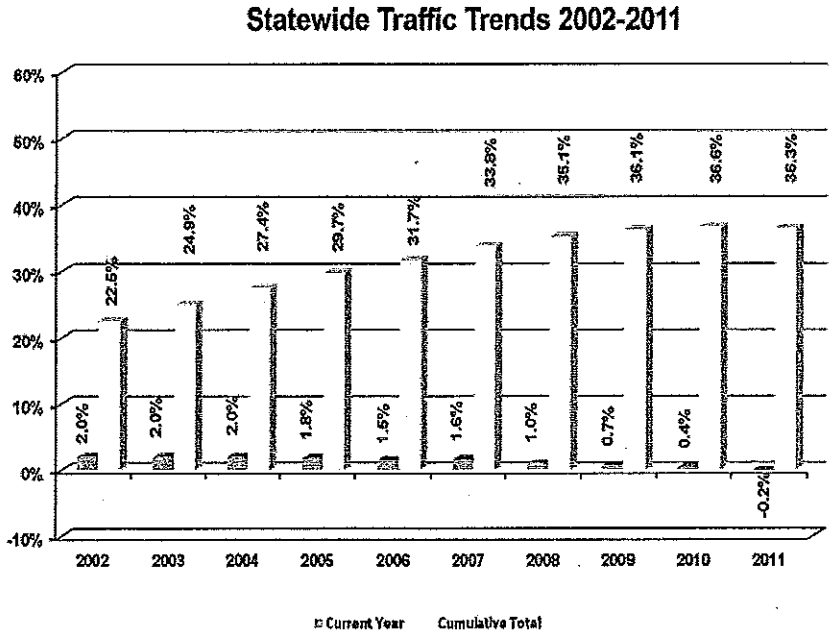
The table below shows yearly growth percentages by TPG for 2001 through 2011.

Yearly Growth Factors: 2001-2011										
TPG	01-02	02-03	03-04	04-05	05-06	06-07	07-08	08-09	09-10	10-11
TPG1	23.0%	19.4%	15.9%	12.3%	8.8%	5.8%	2.7%	0.3%	-0.7%	-0.7%
TPG2	29.7%	26.0%	22.3%	18.4%	14.7%	11.4%	8.1%	5.6%	3.3%	1.7%
TPG3	7.4%	5.5%	4.5%	3.0%	1.9%	1.2%	0.1%	-0.1%	-0.4%	-0.6%
TPG4	10.7%	8.7%	7.3%	5.5%	3.9%	2.6%	1.3%	0.5%	0.0%	-0.3%
TPG5	7.4%	5.5%	4.5%	3.0%	1.9%	1.2%	0.1%	-0.1%	-0.4%	-0.6%
TPG6	10.8%	8.7%	7.3%	5.5%	3.9%	2.6%	1.3%	0.5%	0.0%	-0.3%
TPG7	10.8%	8.7%	7.3%	5.5%	3.9%	2.6%	1.3%	0.5%	0.0%	-0.3%
TPG8	10.8%	8.7%	7.3%	5.5%	3.9%	2.6%	1.3%	0.5%	0.0%	-0.3%
TPG9	10.8%	8.7%	7.3%	5.5%	3.9%	2.6%	1.3%	0.5%	0.0%	-0.3%
TPG10	9.5%	8.4%	7.3%	5.5%	3.9%	2.6%	1.3%	0.5%	0.0%	-0.3%

STATEWIDE TRAFFIC TRENDS 1992-2001



STATEWIDE TRAFFIC TRENDS 2002-2011



pennsylvania
DEPARTMENT OF TRANSPORTATION

U.S.Department of Transportation
Federal Highway Administration

AECOM

I-80 Reconstruction – Crash Data Summary

Five-year crash data records (2008-2012) were obtained from the Pennsylvania Department of Transportation for the I-80 main line sections within the project area. Crash reports in the identified sections have been evaluated and presented in graphic form following this summary. The following is a summarization of information taken from the crash data records.

A total of 239 crashes were reported over the 3.45 mile reconstruction segment during the five year period (2008-2012), including 43% Hit Fixed Object and 31% Rear-End collisions. These types of crashes on an interstate are typical where congestion and geometry deficiencies exist.

Crash rates for seven (7) separate segments were calculated for each direction (see tables attached) to compare average crash rates with the current Statewide Accident Average for similar road type, which was obtained from PennDOT Accident Records Systems Homogeneous Report.

The majority of segments display average crash rates that exceed the current statewide average for urban interstates (0.56). The highest average crash rate for crashes grouped by segment within the project area (obtained from PennDOT crash data) occurred in segment 3050/3051 (SR8013 Interchange), with the crash rates reaching 0.84 (westbound) and 1.09 (eastbound).

I-80 between Interchange 303 to Interchange 304

Immediately west of Interchange 303 (PA Route 611) approaching the eastbound exit and westbound entrance ramps, no crash clusters are observed at the acceleration and deceleration areas to the interchange. Some rear-end collisions were reported on the mainline section, suggesting at least some drivers in this area are reacting to speed variation in traffic flow created by accelerating or decelerating traffic. One fatality accident occurred in the eastbound direction just past the ramp exit gore area.

Within the I-80 segment from Interchange 303 (PA Route 611) to Interchange 304 (US209), the number of crashes increases with the majority reported as fixed object collisions (motorists hitting median barrier or guiderail). A number of small accident crash clusters (3 accidents or less) are shown in this area. Some rear-end collisions are evident in this section, suggesting the possibly some driver reaction to the reduced speed limit signage heading eastbound.

I-80 between Interchange 304 to Interchange 305

The area immediately east of Interchange 304 shows the highest number of crashes within the project area on I-80. The majority of eastbound crashes within this segment are fixed object collisions with motorists hitting median barrier or guiderail in the curve section. Some rear end collisions are shown within the eastbound deceleration ramp area to Interchange 305 exit, suggesting the possibility of insufficient deceleration lengths affecting mainline free flow in this area. Crash cluster data from PennDOT also indicates a “Hit Barrier” cluster in this area.

A significant number of westbound crashes are rear-end collisions, suggesting driver reaction to the weave section involving traffic merging from the Interchange 305 entrance ramp and traffic exiting to for the Interchange 304 westbound exit to US209.

I-80 between Interchange 305 to Interchange 306

The area between Interchange 305 (W. Main Street) and Interchange 306 (Dreher Ave) contains no noticeable crash clusters. No operational issues are evident from crash data in this section.

I-80 between Interchange 306 to Interchange 307

Within the I-80 segment between Interchange 306 (Dreher Ave) and Interchange 307 (Park Ave), the majority of crashes reported are fixed object collisions involving motorists hitting median barrier or guiderail.

Some westbound crashes are same direction sideswipe collisions approaching the Interchange 306 westbound exit ramp, suggesting a possible driver reaction to combination of the roadway curve section and exiting vehicles at Interchange 306.

A small cluster of rear-end collision crashes is noted within the Interchange 307 (Park Avenue) eastbound section, suggesting driver reaction to oncoming traffic from the eastbound entrance ramp at this interchange. A sideswipe accident was also reported within this section. A small cluster of rear-end and side-swipe collision crashes is also evident at Interchange 307 (Broad Street) in the westbound section, suggesting driver reaction to decelerating (diverging) or accelerating (merging) vehicles in the westbound direction.

Within this section, one fatality accident occurred in the eastbound direction within the curve approaching Exit 307 (Park Avenue), and one fatality accident occurred in the eastbound direction at the Park Avenue overpass location.

Monroe County: portion of SR0080 (EB) (E02656-related)

Sorted by County, Route, Number of Crashes

Date Range: 1/1/2008 to 12/31/2012

USER ID / QUERY ID:

Area of Interest: (In County 45 On State Route 0080(P) Between Segment 3030 Offset 0 and Segment 3080 Offset 2625)

coswald / 0520130702009

DISTRICT	COUNTY		ROUTE	SEGMENT	MIN OFFSET	MAX OFFSET	LENGTH	CRASHES	TOT_INJ	MAJ_INJ	FATAL	AVG ADT	CRASH RATE	HOMOG. RATE (5YR)	DELTA
05	45	MONROE	0080	3050	21	2600	0.50	22	15	0	0	22212	1.09	0.56	1.95
05	45	MONROE	0080	3044	940	2606	0.50	19	22	2	0	22212	0.94	0.56	1.68
05	45	MONROE	0080	3064	411	2624	0.50	17	12	1	2	28146	0.66	0.56	1.18
05	45	MONROE	0080	3060	795	2570	0.50	15	8	0	0	28146	0.59	0.56	1.05
05	45	MONROE	0080	3054	22	1990	0.50	14	10	0	0	22212	0.69	0.56	1.23
05	45	MONROE	0080	3074	88	2376	0.54	12	5	0	0	28146	0.44	0.56	0.78
05	45	MONROE	0080	3070	122	2095	0.46	12	8	1	0	28146	0.51	0.56	0.91
05	45	MONROE	0080	3080	100	1681	0.50	10	10	1	0	28146	0.39	0.56	0.70
05	45	MONROE	0080	3040	1	2356	0.50	9	2	0	1	22212	0.44	0.56	0.79
05	45	MONROE	0080	3034	528	2424	0.50	8	3	0	0	22212	0.39	0.56	0.70
05	45	MONROE	0080	3030	21	2671	0.50	6	8	3	0	22212	0.30	0.56	0.53

IMPORTANT: This traffic engineering and safety study is confidential pursuant to 75 Pa. C.S. §3754 and 23 U.S.C. §409 and may not be disclosed or used in litigation without written permission from PennDOT.

Monroe County: portion of SR0080 (WB) (E02656-related)

Sorted by County, Route, Number of Crashes

Date Range: 1/1/2008 to 12/31/2012

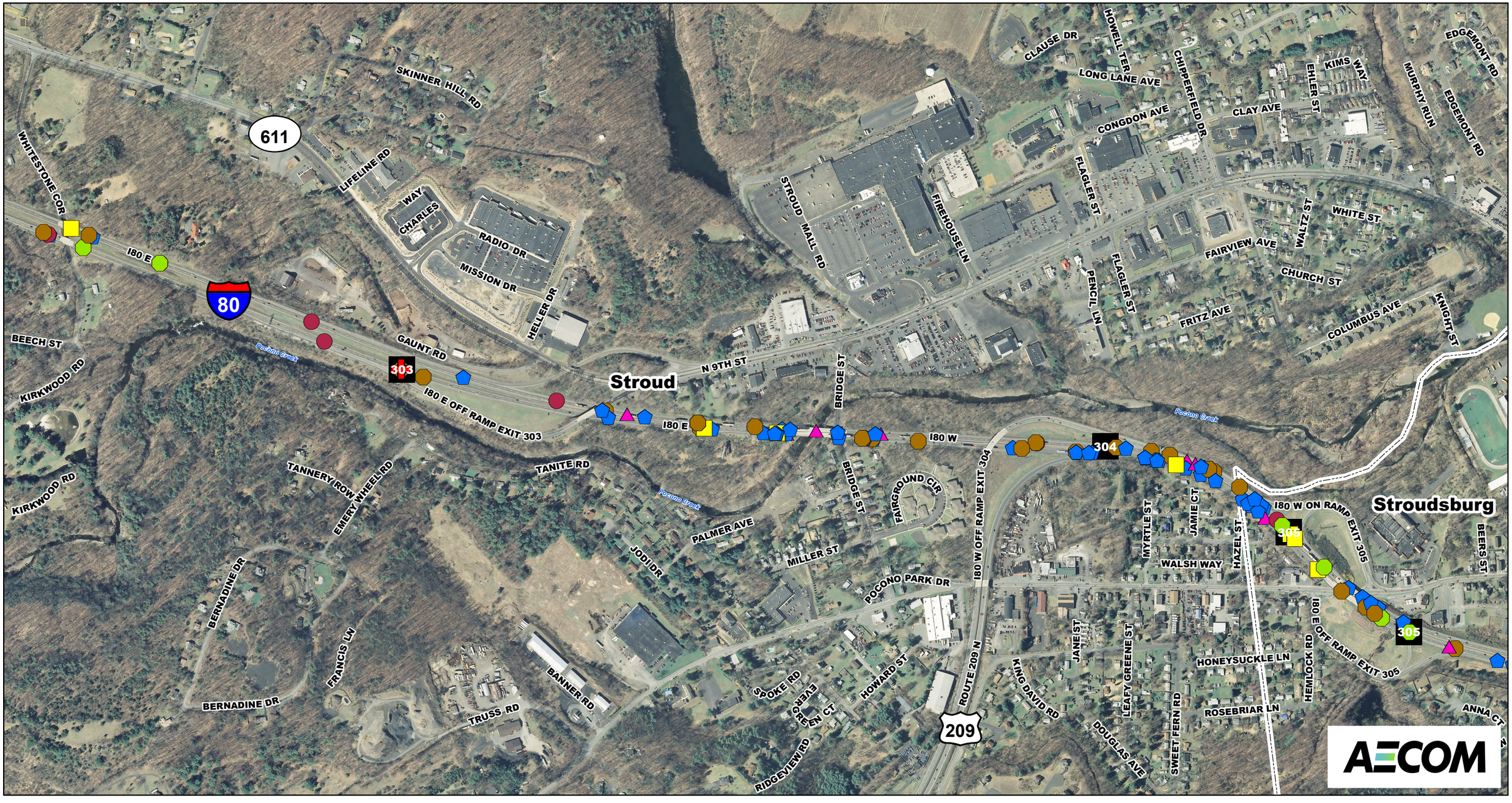
USER ID / QUERY ID:

Area of Interest: (In County 45 On State Route 0080(S) Between Segment 3031 Offset 0 and Segment 3081 Offset 2621)

coswald / 0520130702010

DISTRICT	COUNTY		ROUTE	SEGMENT	MIN OFFSET	MAX OFFSET	LENGTH	CRASHES	TOT_INJ	MAJ_INJ	FATAL	AVG ADT	CRASH RATE	HOMOG. RATE (5YR)	DELTA
05	45	MONROE	0080	3075	49	2792	0.53	54	38	1	1	31825	1.75	0.56	3.12
05	45	MONROE	0080	3071	172	2404	0.46	25	14	0	0	31825	0.94	0.56	1.68
05	45	MONROE	0080	3055	12	2605	0.50	21	14	3	0	30066	0.77	0.56	1.38
05	45	MONROE	0080	3051	25	2628	0.51	18	9	1	0	23332	0.84	0.56	1.49
05	45	MONROE	0080	3061	887	2539	0.50	15	9	0	0	30066	0.55	0.56	0.98
05	45	MONROE	0080	3081	390	1761	0.50	13	8	1	0	31825	0.45	0.56	0.80
05	45	MONROE	0080	3065	393	2579	0.49	13	4	0	0	31825	0.46	0.56	0.82
05	45	MONROE	0080	3045	601	2436	0.50	12	12	0	0	23332	0.56	0.56	1.00
05	45	MONROE	0080	3031	539	2555	0.50	11	7	1	0	23332	0.52	0.56	0.92
05	45	MONROE	0080	3035	439	2559	0.50	9	3	0	0	23332	0.43	0.56	0.76
05	45	MONROE	0080	3041	50	2644	0.50	6	5	0	0	23332	0.28	0.56	0.50

IMPORTANT: This traffic engineering and safety study is confidential pursuant to 75 Pa. C.S. §3754 and 23 U.S.C. §409 and may not be disclosed or used in litigation without written permission from PennDOT.



N

0 300 600

Feet

- Fatality (3)
- Angle (14)
- Head-On (2)
- Hit Fixed Object (103)
- Non-Collision (16)
- Rear-End (74)
- Same Direction Sideswipe (16)
- Pedestrian (1)
- Unknown (13)

Note: 239 accidents in the study area with 3 being fatal.

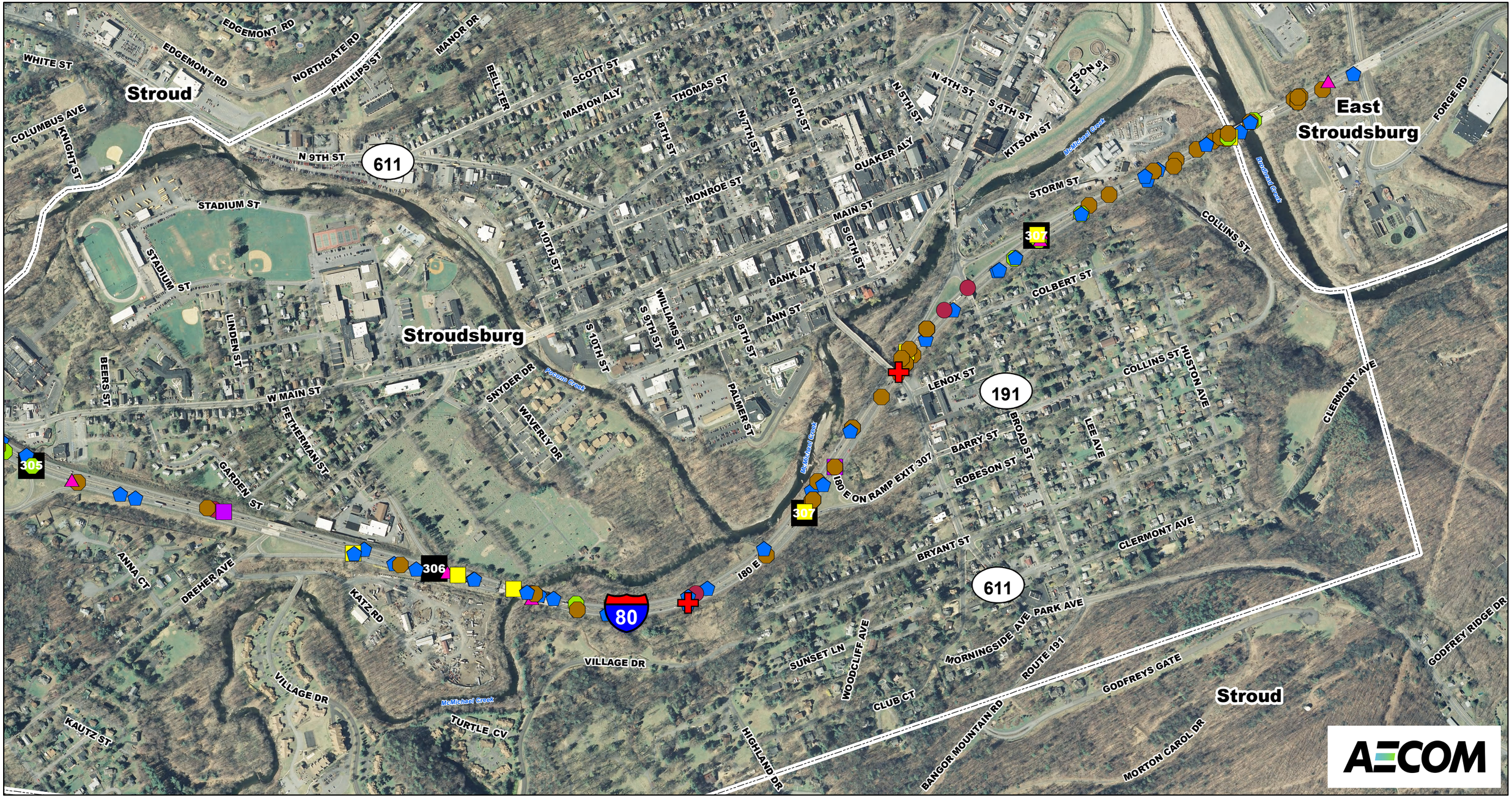
I-80 RECONSTRUCTION

Accident Analysis Map

1/1/08 - 12/31/12

Sheet 1 of 2

Source: CDART, 2013



N

0 300 600

Feet

- Fatality (3)
- Angle (14)
- Head-On (2)
- Hit Fixed Object (103)
- Non-Collision (16)
- Rear-End (74)
- Same Direction Sideswipe (16)
- Pedestrian (1)
- Unknown (13)

Note: 239 accidents in the study area with 3 being fatal.

I-80 RECONSTRUCTION

Accident Analysis Map

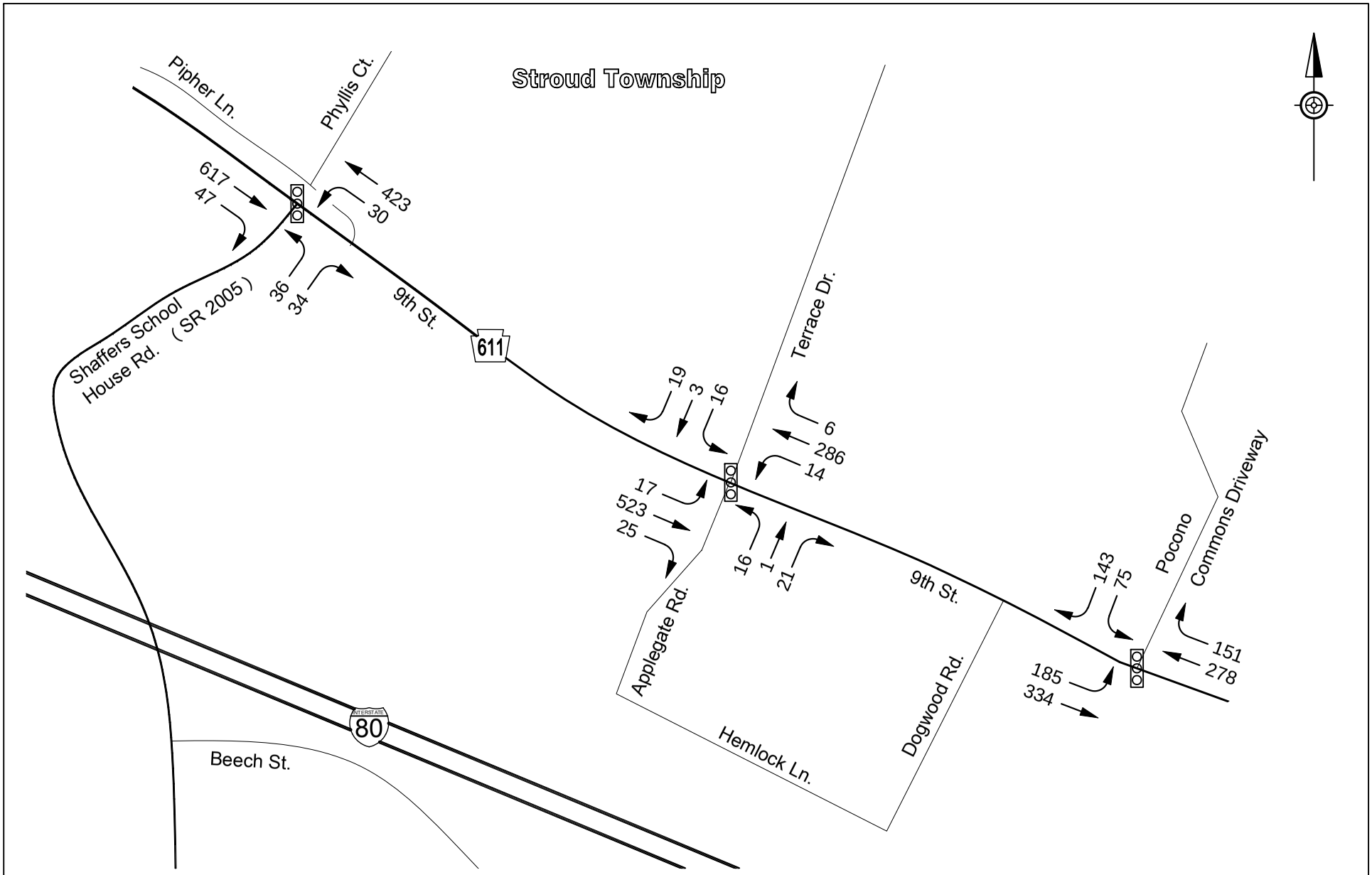
1/1/08 - 12/31/12

Sheet 2 of 2

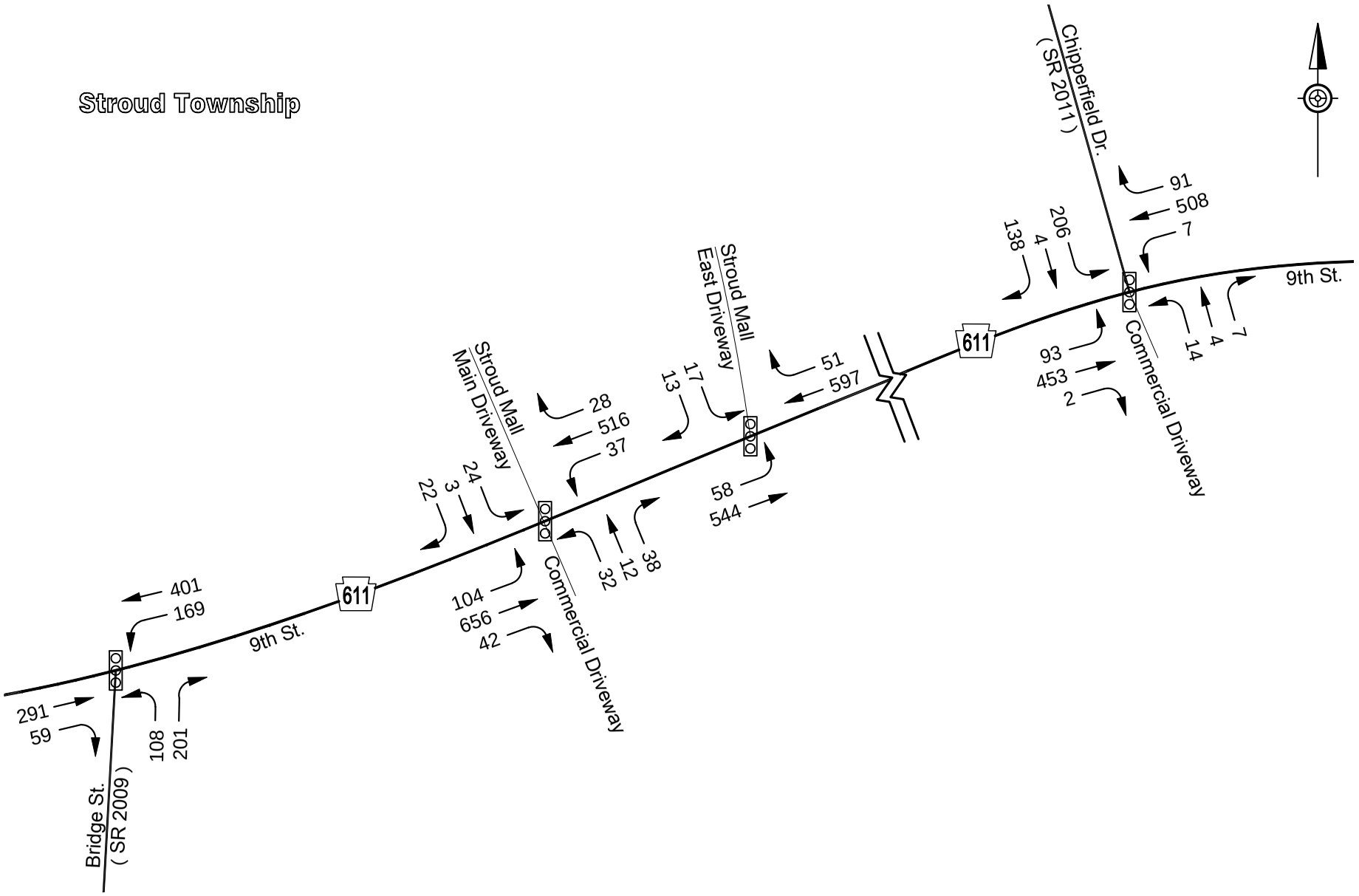
Source: CDART, 2013

AECOM

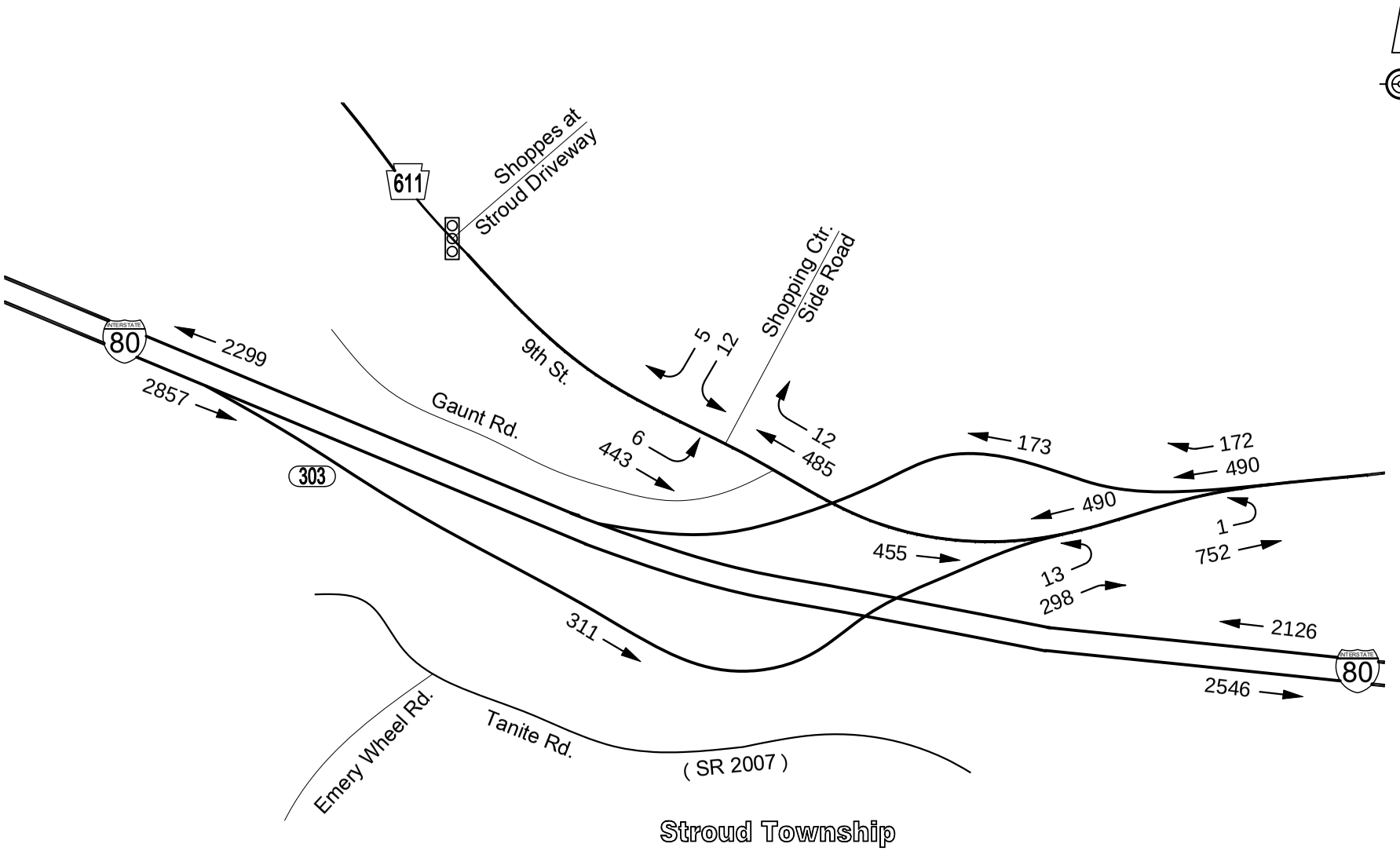
2045 TRAFFIC VOLUME MAPS



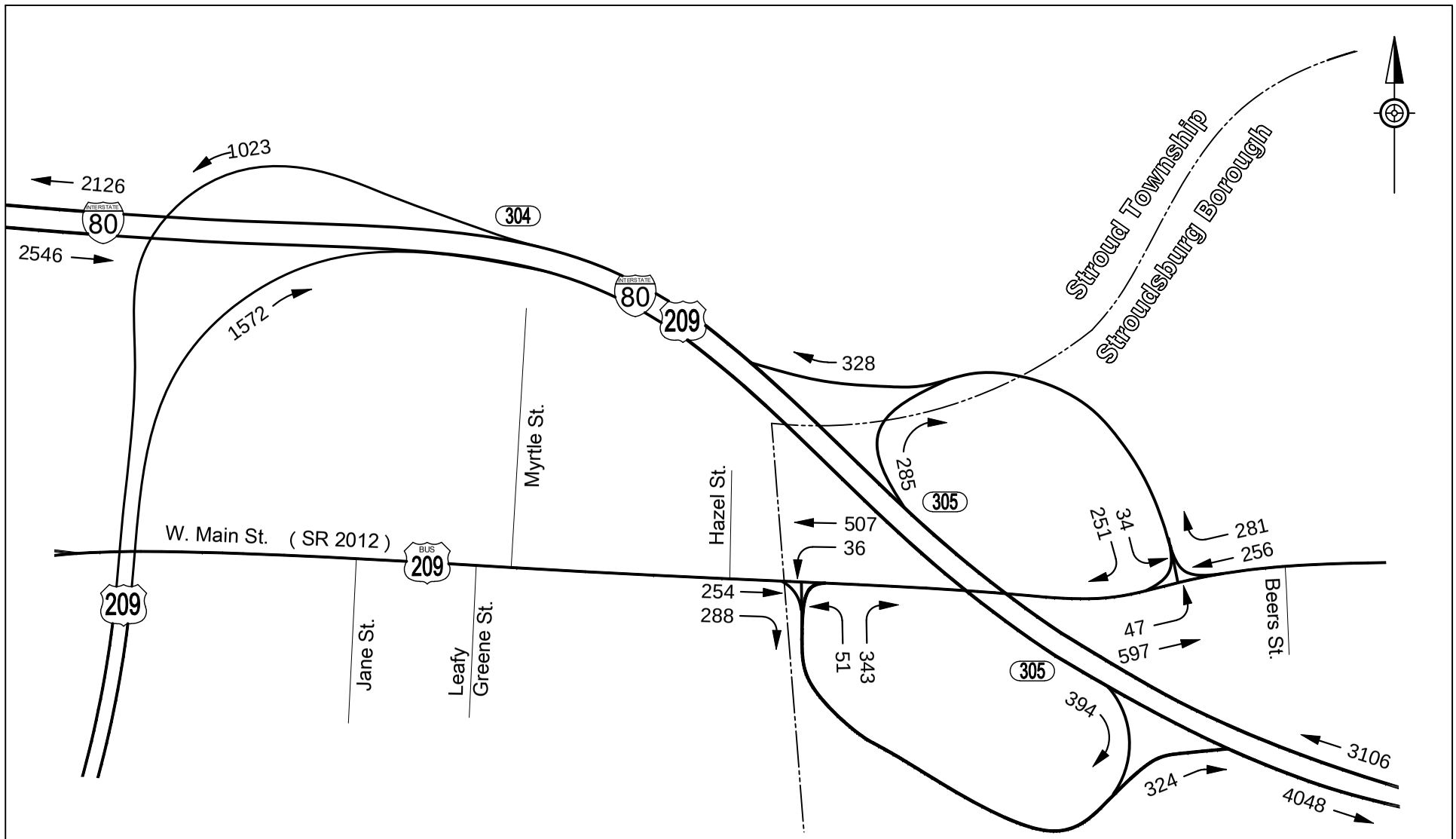
AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 1 NO-BUILD A.M. PEAK HOUR 2045 TRAFFIC VOLUMES



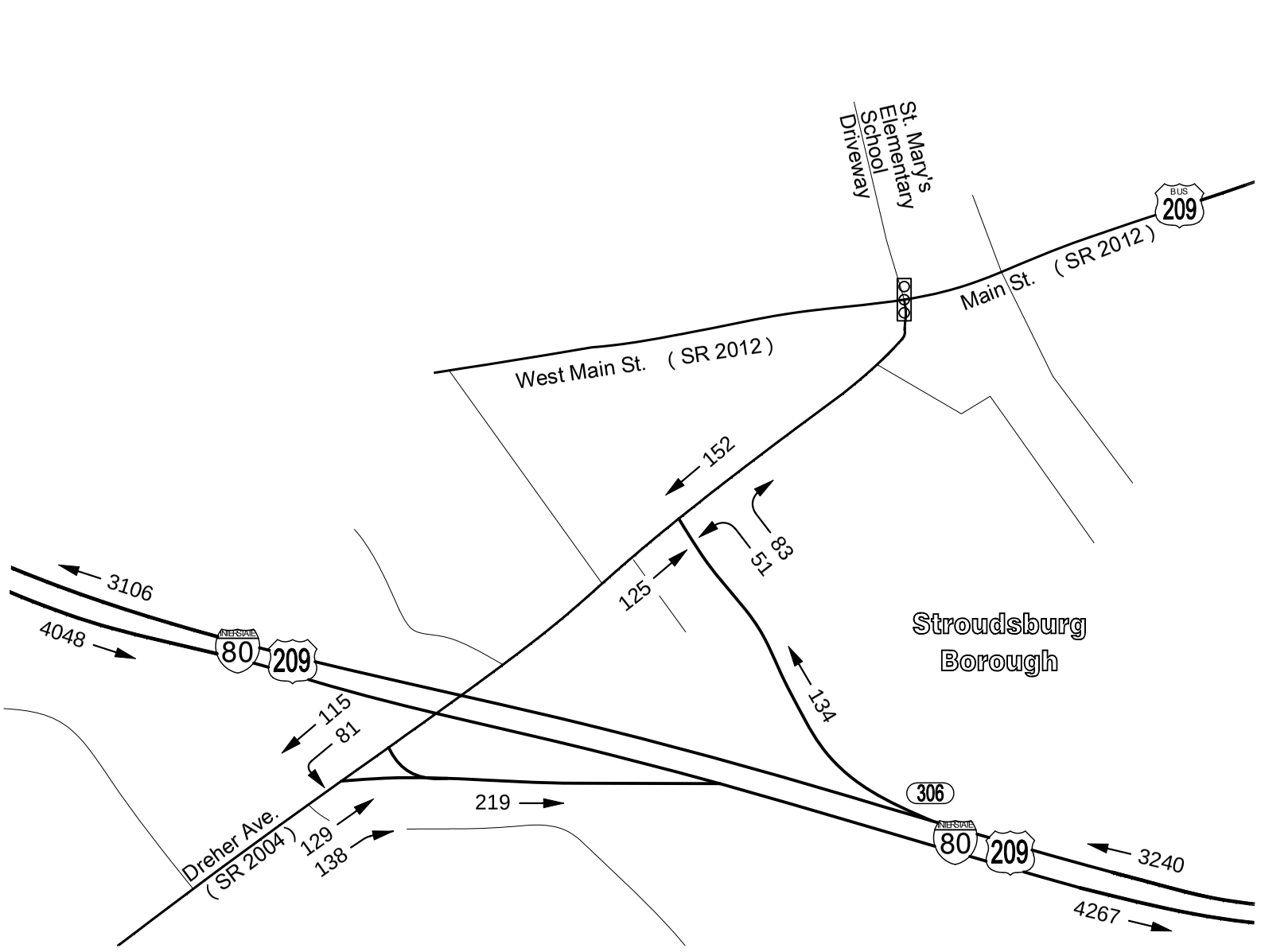
AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 3 NO-BUILD A.M. PEAK HOUR 2045 TRAFFIC VOLUMES



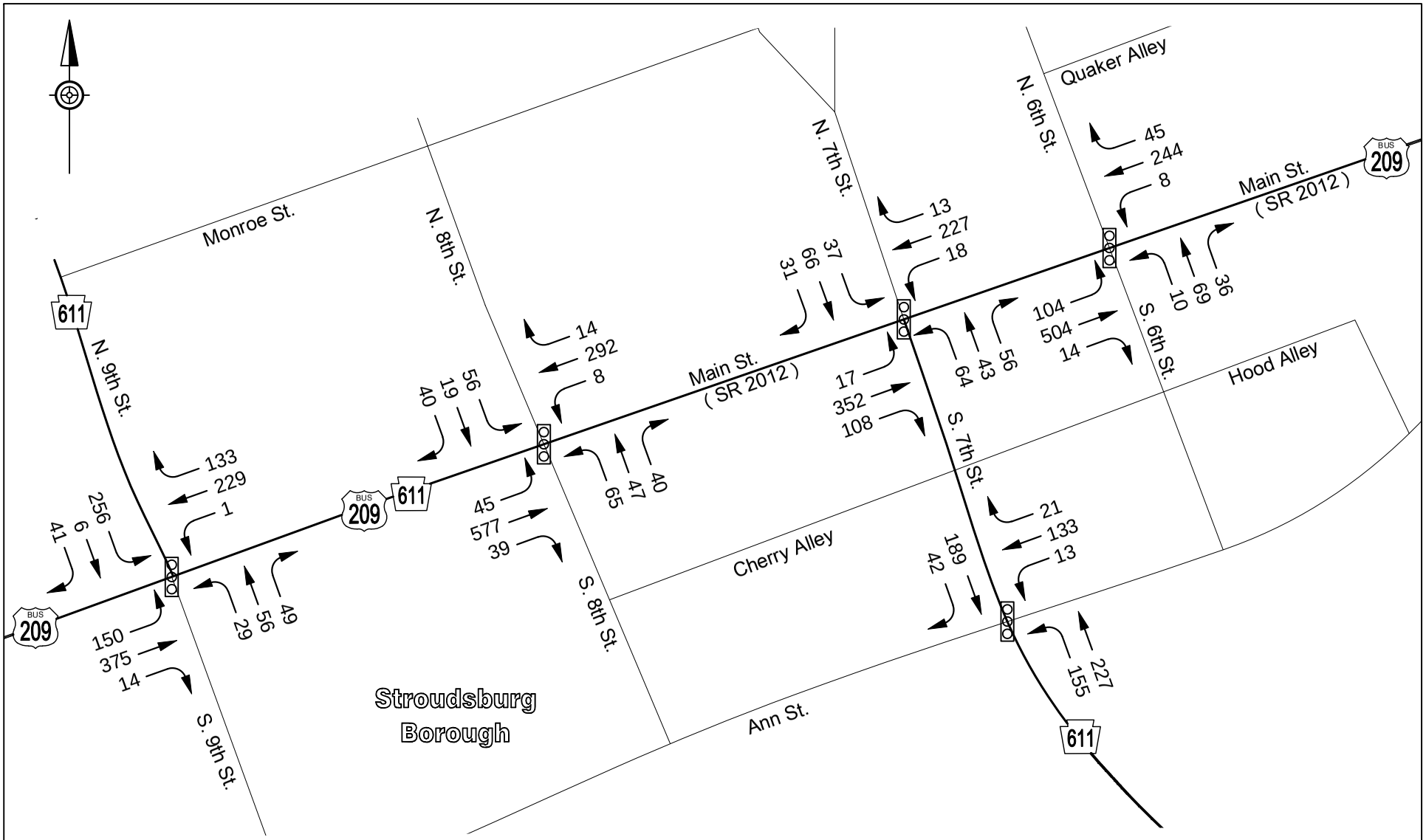
AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 2 NO-BUILD A.M. PEAK HOUR 2045 TRAFFIC VOLUMES



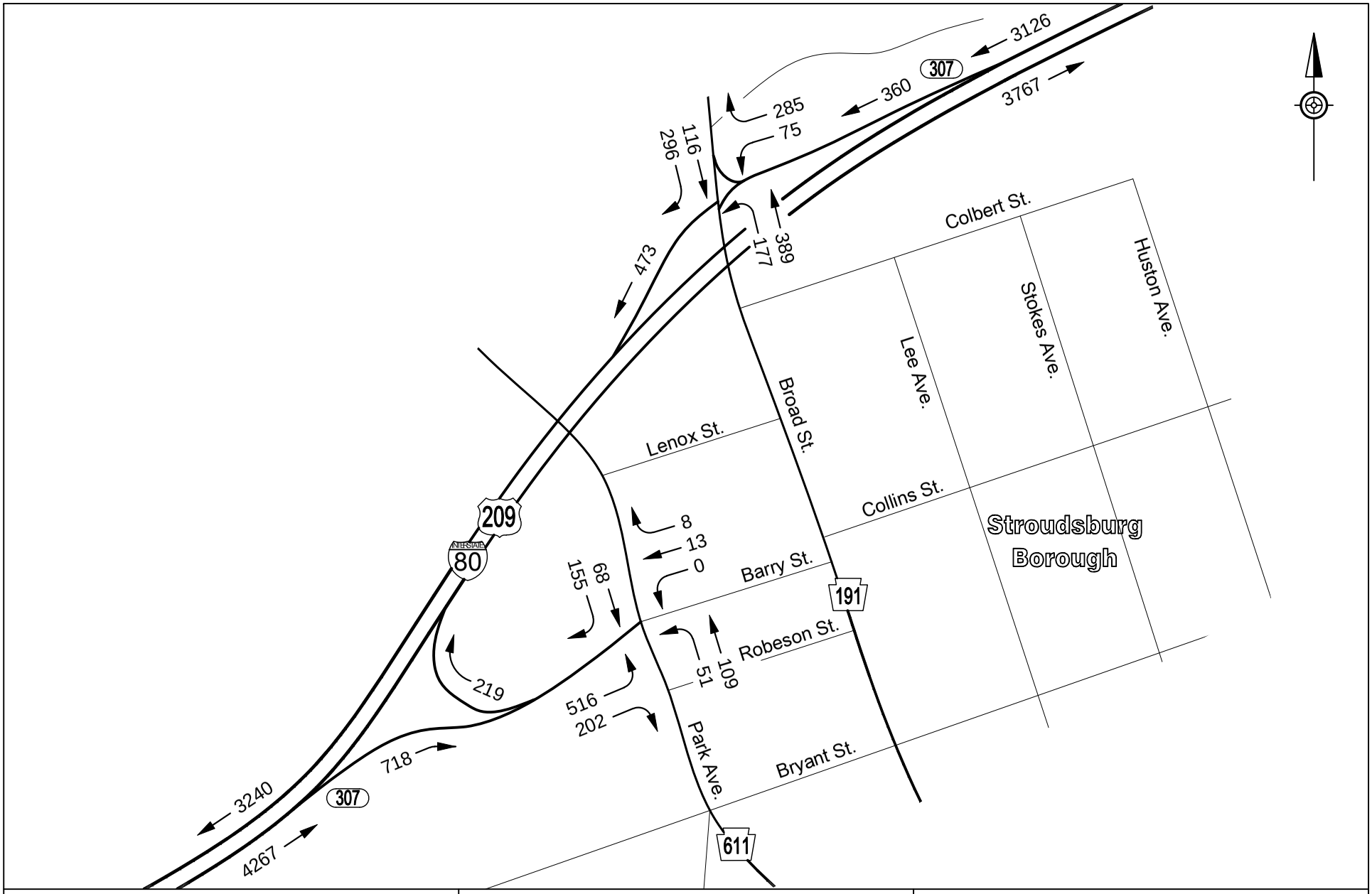
AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 4 NO-BUILD A.M. PEAK HOUR 2045 TRAFFIC VOLUMES



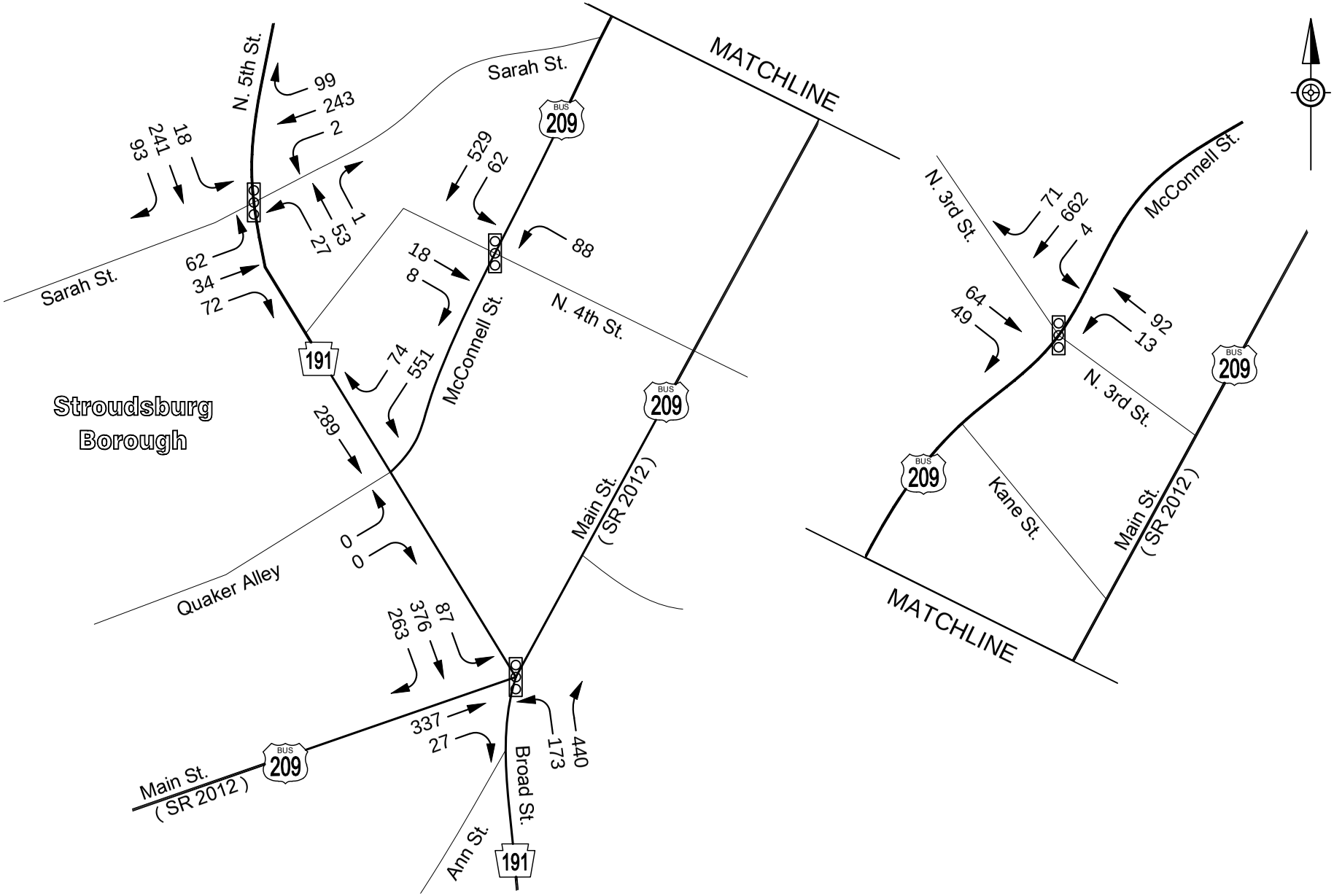
AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 5 NO-BUILD A.M. PEAK HOUR 2045 TRAFFIC VOLUMES



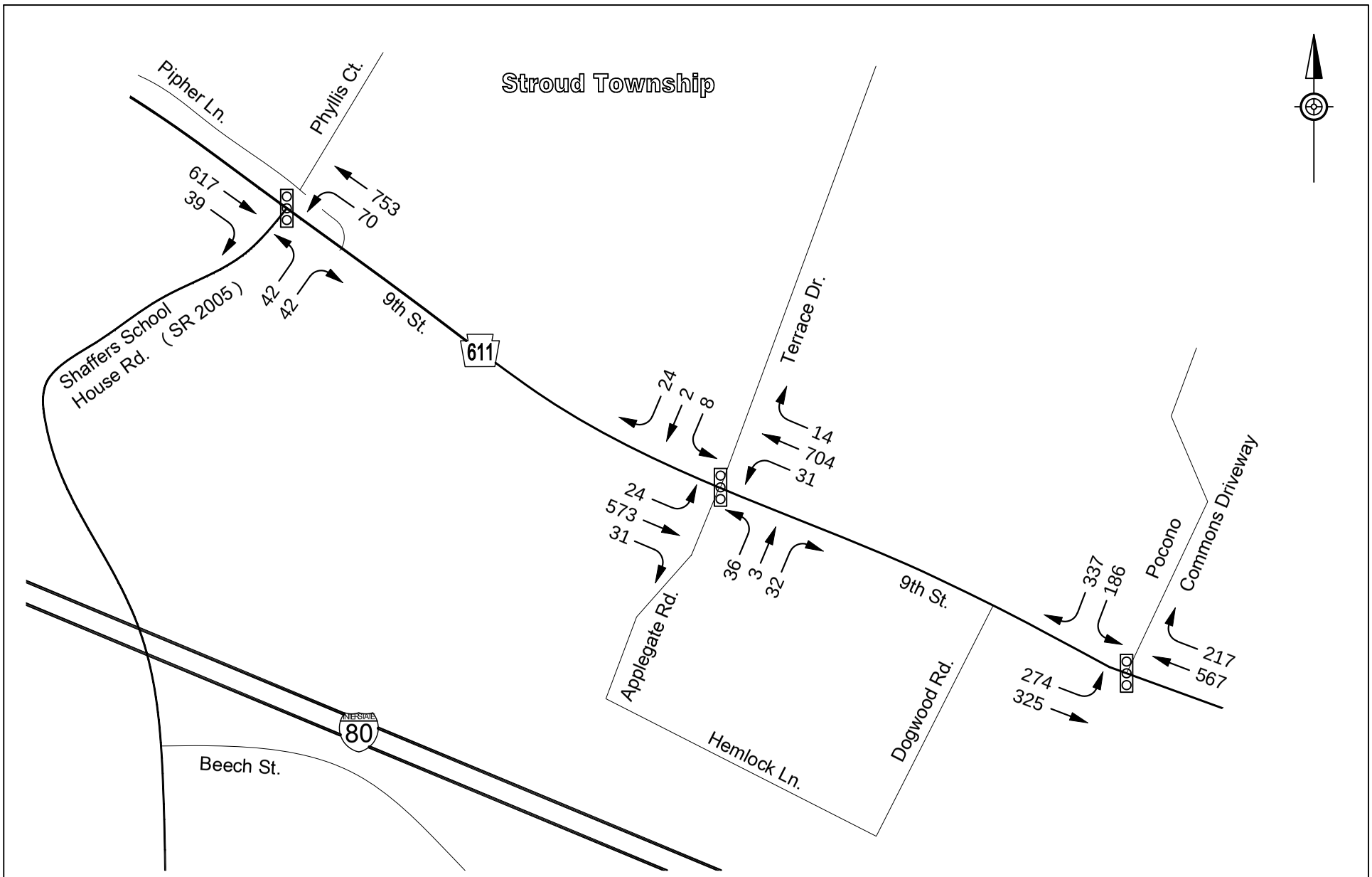
AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 6 NO-BUILD A.M. PEAK HOUR 2045 TRAFFIC VOLUMES



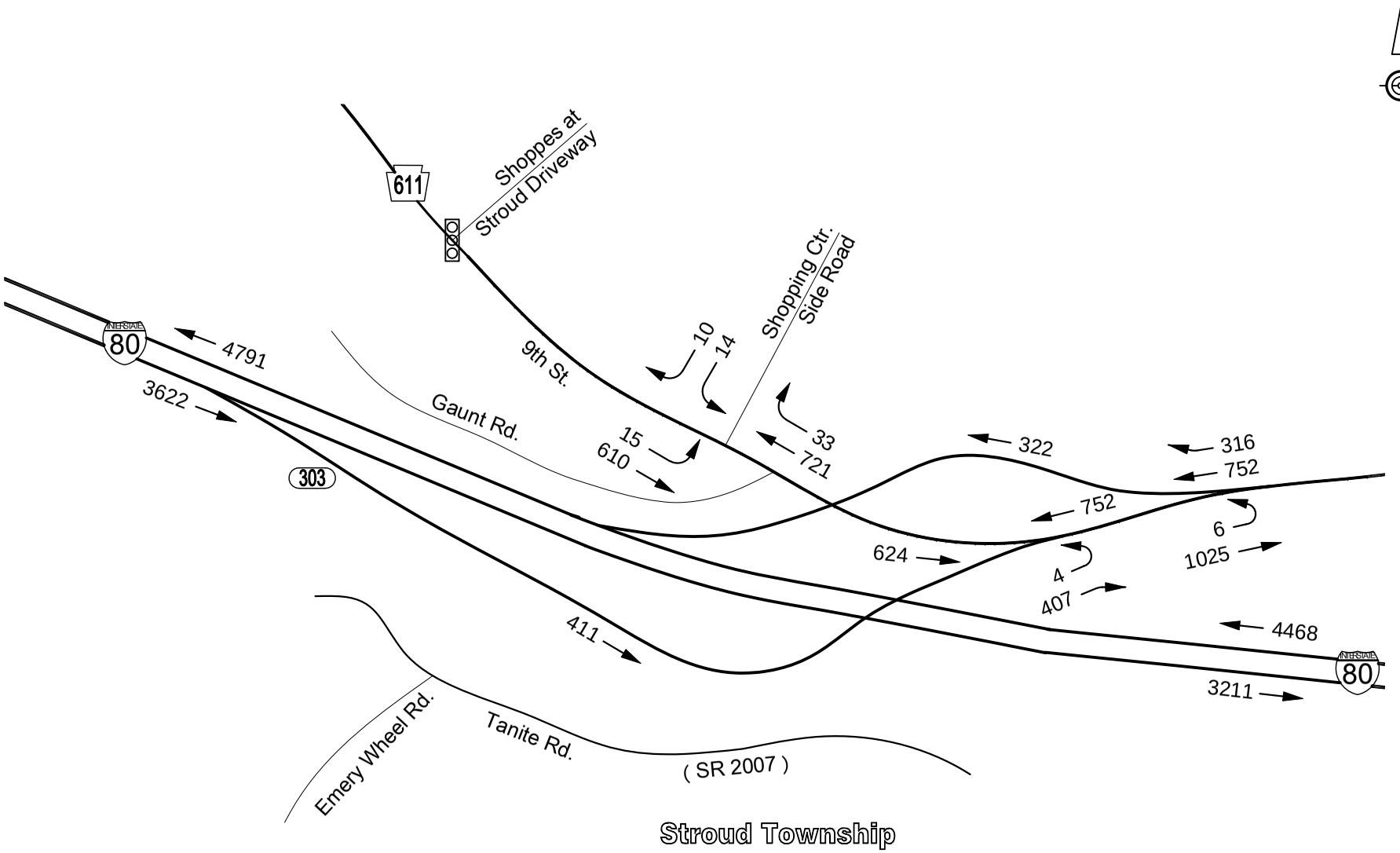
AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 8 NO-BUILD A.M. PEAK HOUR 2045 TRAFFIC VOLUMES



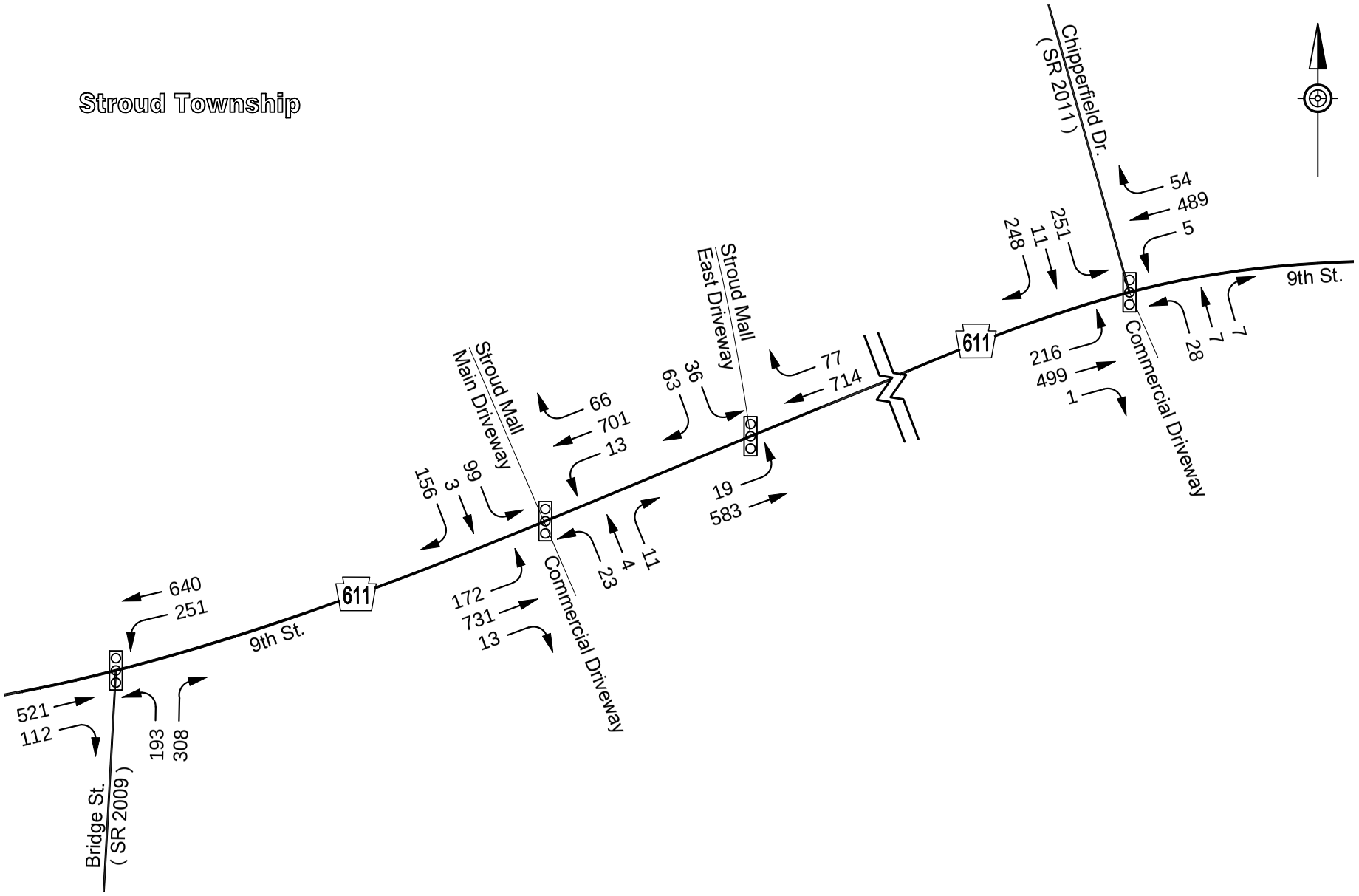
AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 7 NO-BUILD A.M. PEAK HOUR 2045 TRAFFIC VOLUMES



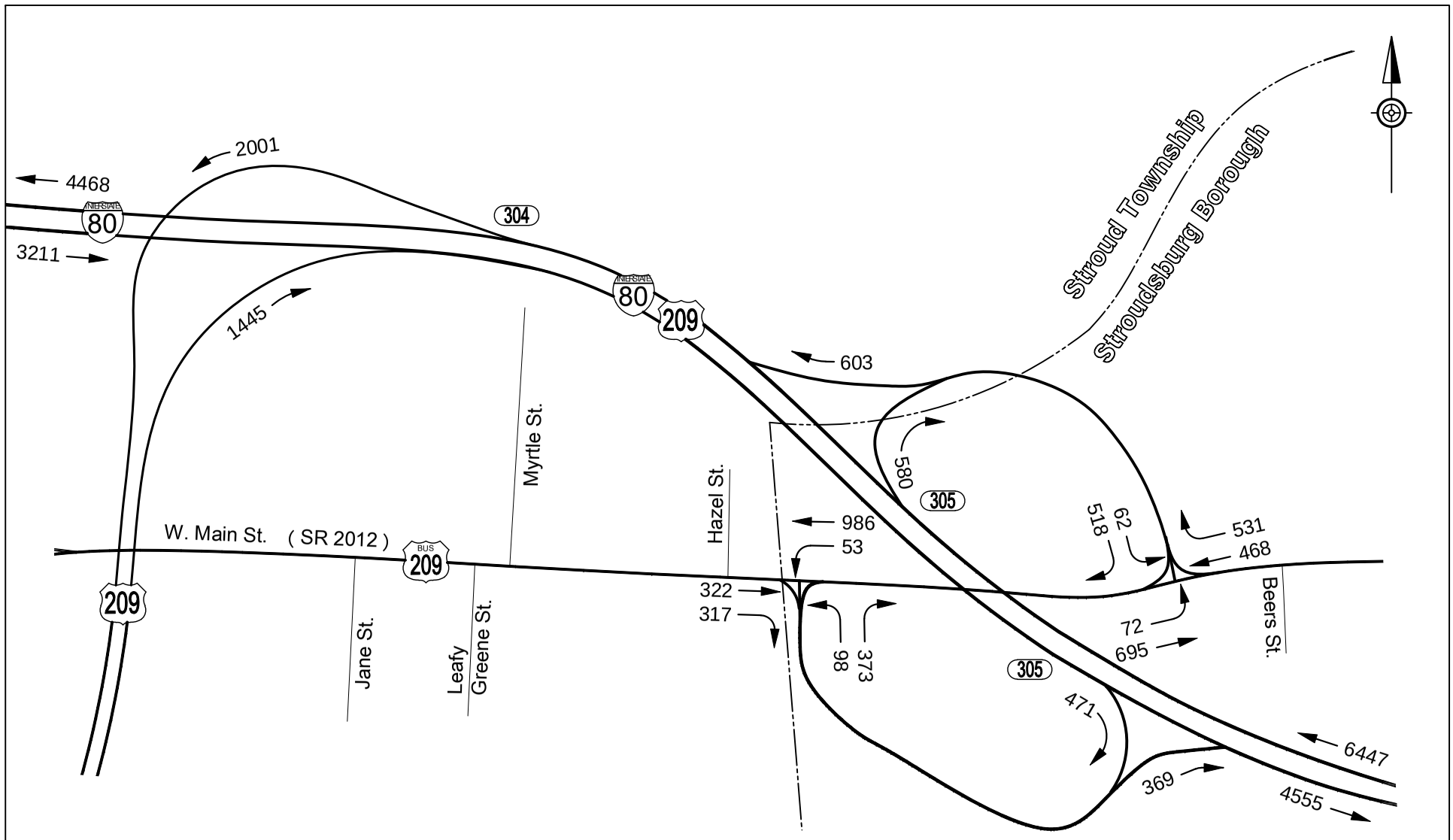
AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 9 NO-BUILD P.M. PEAK HOUR 2045 TRAFFIC VOLUMES



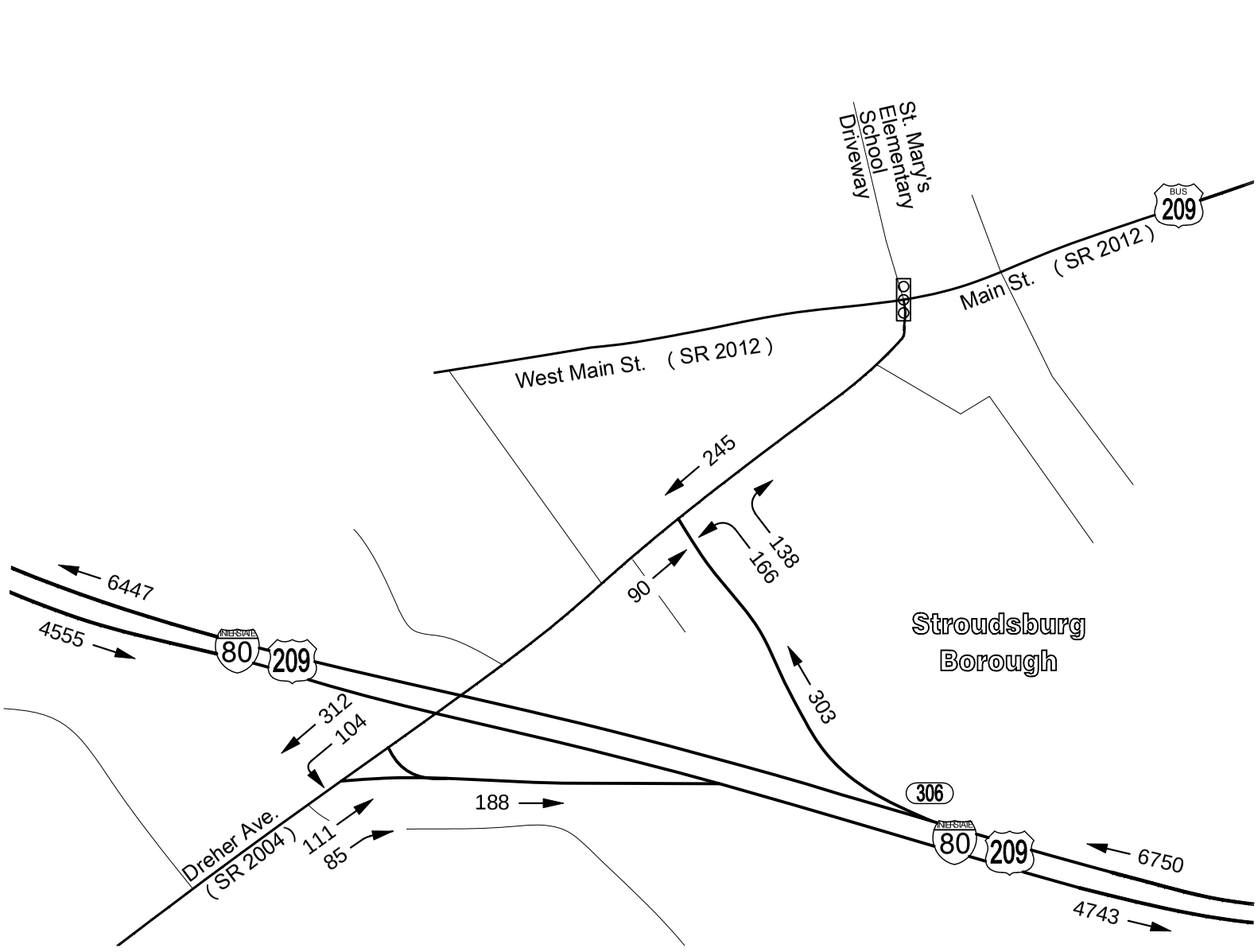
AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 10 NO-BUILD P.M. PEAK HOUR 2045 TRAFFIC VOLUMES



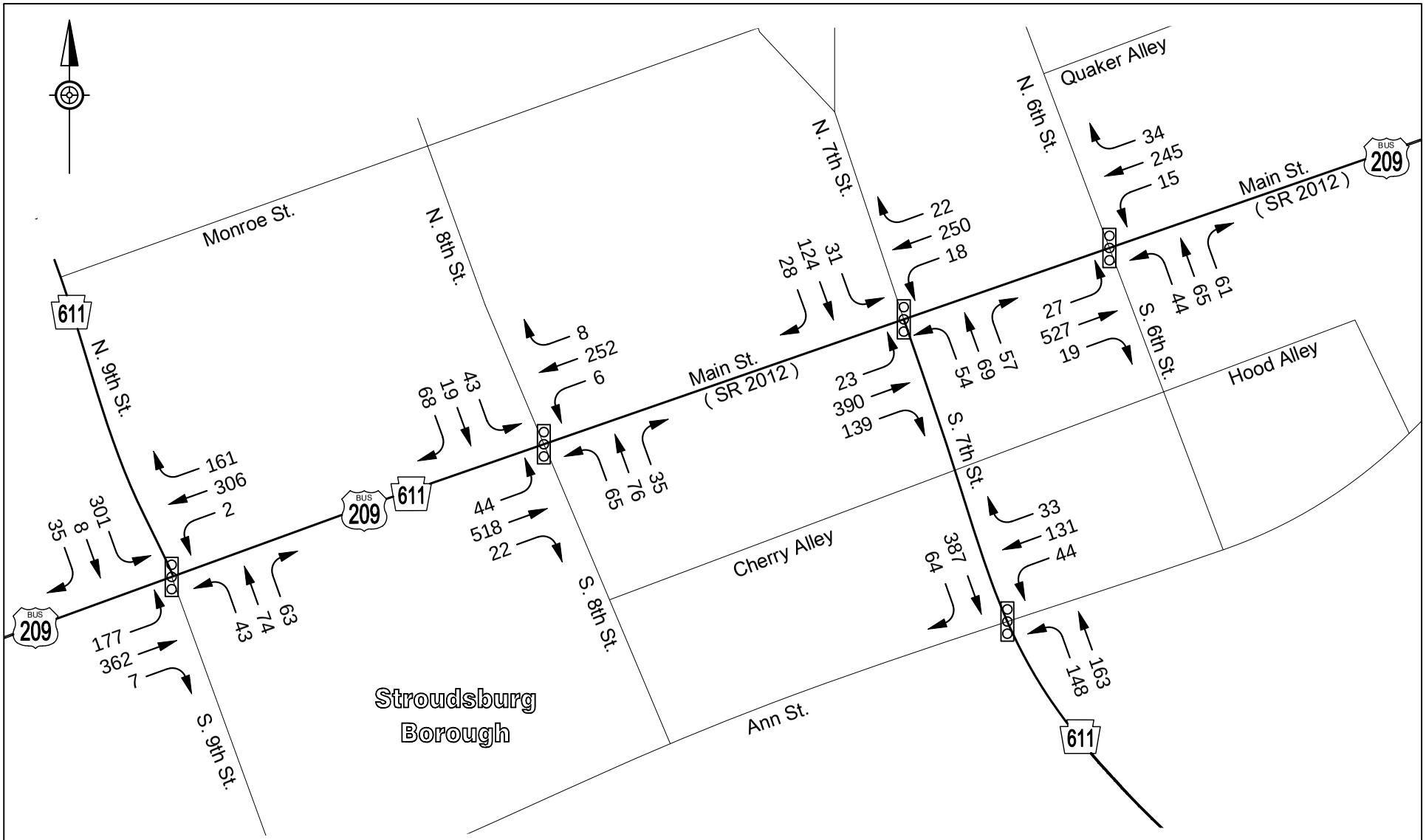
AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 11 NO-BUILD P.M. PEAK HOUR 2045 TRAFFIC VOLUMES



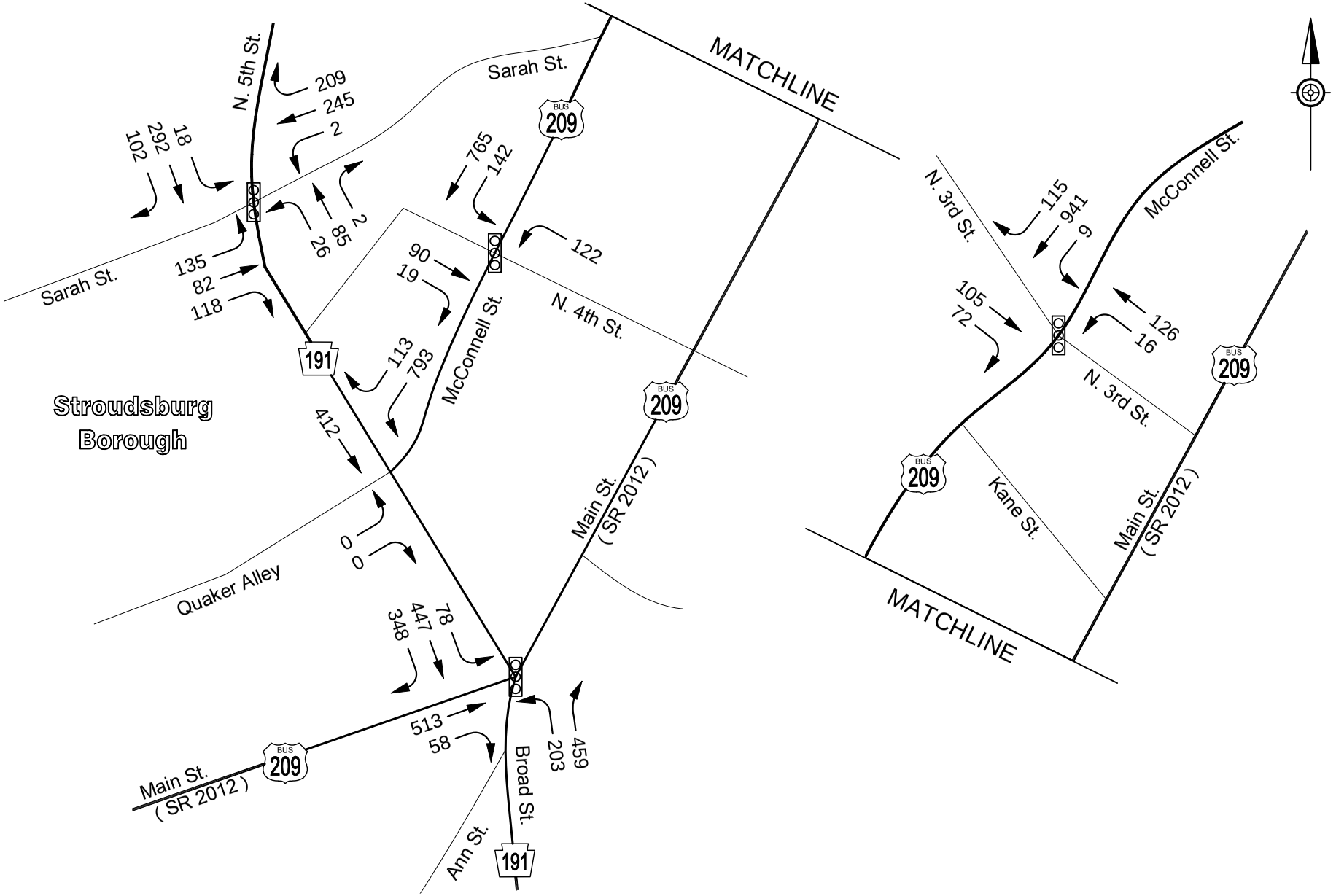
AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 12 NO-BUILD P.M. PEAK HOUR 2045 TRAFFIC VOLUMES



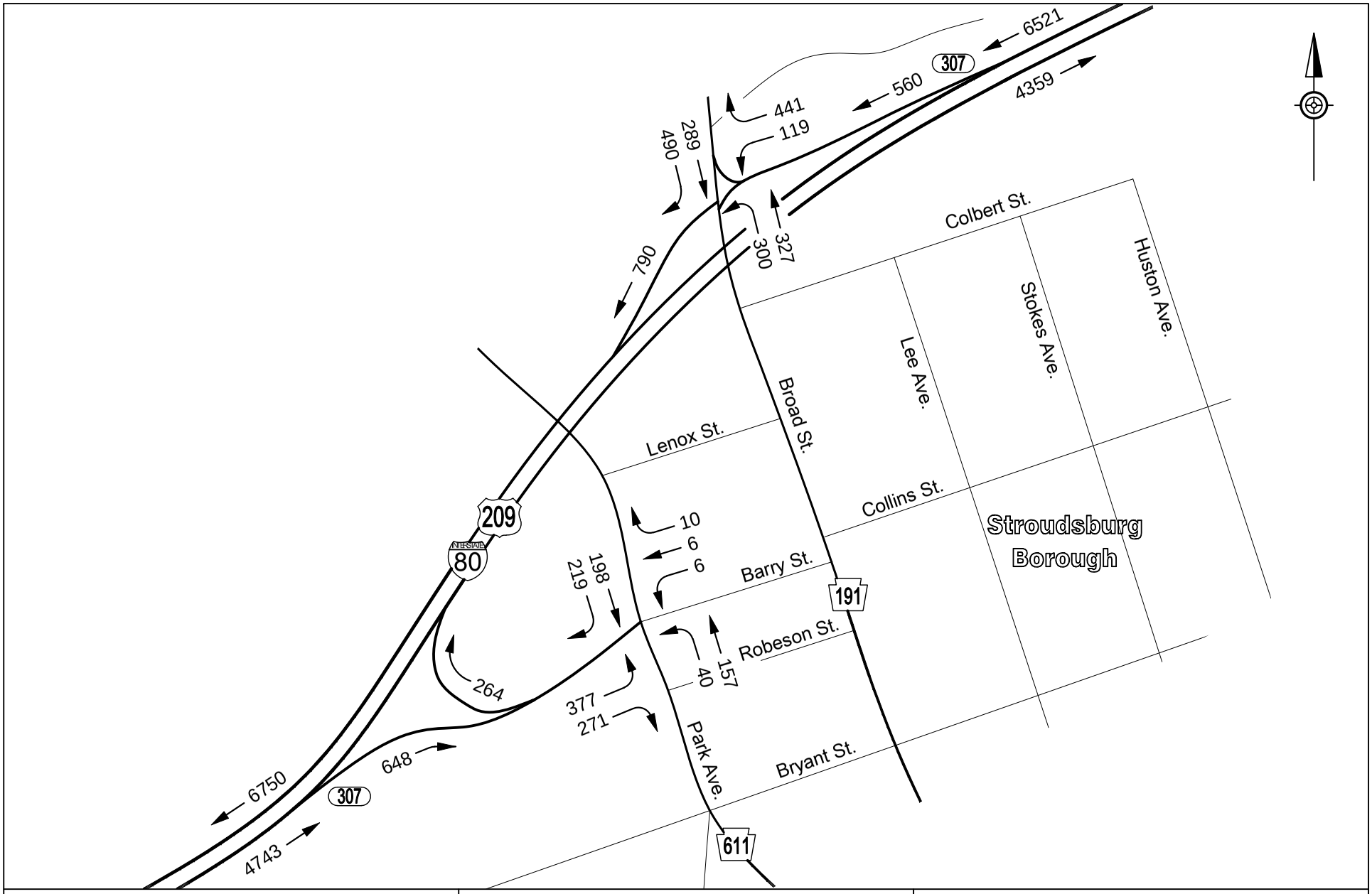
AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 13 NO-BUILD P.M. PEAK HOUR 2045 TRAFFIC VOLUMES



AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 14 NO-BUILD P.M. PEAK HOUR 2045 TRAFFIC VOLUMES



AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 15 NO-BUILD P.M. PEAK HOUR 2045 TRAFFIC VOLUMES



AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 16 NO-BUILD P.M. PEAK HOUR 2045 TRAFFIC VOLUMES

FREEWAY SEGMENT
HCS ANALYSIS

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*AJM*
Agency or Company	*AECOM*
Date Performed	*7/22/2013*
Analysis Time Period	*A.M. Peak Hour*

Site Information

Highway/Direction of Travel	*I-80 Eastbound*
From/To	*Between Ints. 303 and 304*
Jurisdiction	
Analysis Year	*No Build 2045*

Project Description *Interstate 80 Reconstruction*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*2546*	veh/h	Peak-Hour Factor, PHF	*0.94*
AADT		veh/day	%Trucks and Buses, P_T	*10*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.862*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD	*1.67*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*5.0*	mph
FFS	*70.4*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1654*	pc/h/ln
S	*67.6*	mph
D = v_p / S	*24.5*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 10-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*AJM*	Highway/Direction of Travel	*I-80 Eastbound*
Agency or Company	*AECOM*	From/To	*Between Ints. 303 and 304*
Date Performed	*7/24/2013*	Jurisdiction	
Analysis Time Period	*P.M. Peak Hour*	Analysis Year	*No Build 2025*

Project Description *Interstate 80 Reconstruction*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3211*	veh/h	Peak-Hour Factor, PHF	*0.94*
AADT		veh/day	%Trucks and Buses, P_T	*12*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.840*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD	*1.67*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*5.0*	mph
FFS	*70.4*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2139*	pc/h/ln
S	*59.8*	mph
D = v_p / S	*35.8*	pc/mi/ln
LOS	*E*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

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f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

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HCS 2010™ Version 6.41 Generated: 7/24/2013 12:46 PM

BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*AJM*	Highway/Direction of Travel	*I-80 Eastbound*
Agency or Company	*AECOM*	From/To	*Between Ints. 304 and 305*
Date Performed	*7/24/2013*	Jurisdiction	
Analysis Time Period	*A.M. Peak Hour*	Analysis Year	*No Build 2045*

Project Description *Interstate 80 Reconstruction*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4118*	veh/h	Peak-Hour Factor, PHF	*0.91*
AADT		veh/day	%Trucks and Buses, P_T	*10*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.862*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD	*1.67*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*5.0*	mph
FFS	*70.4*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2763*	pc/h/ln
S	*41.7*	mph
D = v_p / S	*66.3*	pc/mi/ln
LOS	*F*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 10-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*AJM*
Agency or Company	*AECOM*
Date Performed	*7/24/2013*
Analysis Time Period	*P.M. Peak Hour*

Site Information

Highway/Direction of Travel	*I-80 Eastbound*
From/To	*Between Ints. 304 and 305*
Jurisdiction	
Analysis Year	*No Build 2045*

Project Description *Interstate 80 Reconstruction*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4656*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*12*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.840*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD	*1.67*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*5.0*	mph
FFS	*70.4*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*3070*	pc/h/ln
S	*29.4*	mph
D = v_p / S	*104.3*	pc/mi/ln
LOS	*F*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

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f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*AJM*	Highway/Direction of Travel	*I-80 Eastbound*
Agency or Company	*AECOM*	From/To	*Between Ints. 305 and 306*
Date Performed	*7/24/2013*	Jurisdiction	
Analysis Time Period	*A.M. Peak Hour*	Analysis Year	*No Build 2045*

Project Description *Interstate 80 Reconstruction*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4048*	veh/h	Peak-Hour Factor, PHF	*0.87*
AADT		veh/day	%Trucks and Buses, P_T	*10*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.862*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD	*1.50*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*4.5*	mph
FFS	*70.9*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2841*	pc/h/ln
S	*38.8*	mph
D = v_p / S	*73.3*	pc/mi/ln
LOS	*F*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 10-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*AJM*	Highway/Direction of Travel	*I-80 Eastbound*
Agency or Company	*AECOM*	From/To	*Between Ints. 305 and 306*
Date Performed	*7/24/2013*	Jurisdiction	
Analysis Time Period	*P.M. Peak Hour*	Analysis Year	*No Build 2045*

Project Description *Interstate 80 Reconstruction*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4555*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*12*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.840*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD	*1.50*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*4.5*	mph
FFS	*70.9*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2972*	pc/h/ln
S	*33.6*	mph
D = v_p / S	*88.5*	pc/mi/ln
LOS	*F*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*AJM*	Highway/Direction of Travel	*I-80 Eastbound*
Agency or Company	*AECOM*	From/To	*Between Ints. 306 and 307*
Date Performed	*7/24/2013*	Jurisdiction	
Analysis Time Period	*A.M. Peak Hour*	Analysis Year	*No Build 2045*

Project Description *Interstate 80 Reconstruction*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4267*	veh/h	Peak-Hour Factor, PHF	*0.83*
AADT		veh/day	%Trucks and Buses, P_T	*8*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.885*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD	*1.83*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*5.3*	mph
FFS	*70.1*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*3058*	pc/h/ln
S	*30.0*	mph
D = v_p / S	*102.1*	pc/mi/ln
LOS	*F*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*AJM*
Agency or Company	*AECOM*
Date Performed	*7/24/2013*
Analysis Time Period	*P.M. Peak Hour*

Site Information

Highway/Direction of Travel	*I-80 Eastbound*
From/To	*Between Ints. 306 and 307*
Jurisdiction	
Analysis Year	*No Build 2045*

Project Description *Interstate 80 Reconstruction*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4743*	veh/h	Peak-Hour Factor, PHF	*0.97*
AADT		veh/day	%Trucks and Buses, P_T	*10*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.862*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD	*1.83*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*5.3*	mph
FFS	*70.1*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2985*	pc/h/ln
S	*33.0*	mph
D = v_p / S	*90.3*	pc/mi/ln
LOS	*F*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 10-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*AJM*
Agency or Company	*AECOM*
Date Performed	*7/24/2013*
Analysis Time Period	*A.M. Peak Hour*

Site Information

Highway/Direction of Travel	*I-80 Westbound*
From/To	*Between Ints. 303 and 304*
Jurisdiction	
Analysis Year	*No Build 2045*

Project Description *Interstate 80 Reconstruction*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*2126*	veh/h	Peak-Hour Factor, PHF	*0.97*
AADT		veh/day	%Trucks and Buses, P_T	*12*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.840*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD	*1.67*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*5.0*	mph
FFS	*70.4*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1373*	pc/h/ln
S	*69.7*	mph
D = v_p / S	*19.7*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 10-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*AJM*
Agency or Company	*AECOM*
Date Performed	*7/24/2013*
Analysis Time Period	*P.M. Peak Hour*

Site Information

Highway/Direction of Travel	*I-80 Westbound*
From/To	*Between Ints. 303 and 304*
Jurisdiction	
Analysis Year	*No Build 2045*

Project Description *Interstate 80 Reconstruction*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4468*	veh/h	Peak-Hour Factor, PHF	*0.97*
AADT		veh/day	%Trucks and Buses, P_T	*13*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.830*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD	*1.67*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*5.0*	mph
FFS	*70.4*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2921*	pc/h/ln
S	*35.6*	mph
D = v_p / S	*82.0*	pc/mi/ln
LOS	*F*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 10-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*AJM*	Highway/Direction of Travel	*I-80 Westbound*
Agency or Company	*AECOM*	From/To	*Between Ints. 304 and 305*
Date Performed	*7/24/2013*	Jurisdiction	
Analysis Time Period	*A.M. Peak Hour*	Analysis Year	*No Build 2045*

Project Description *Interstate 80 Reconstruction*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3149*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*12*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.840*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD	*1.67*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*5.0*	mph
FFS	*70.4*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2076*	pc/h/ln
S	*61.1*	mph
D = v_p / S	*34.0*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 10-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*AJM*	Highway/Direction of Travel	*I-80 Westbound*
Agency or Company	*AECOM*	From/To	*Between Ints. 304 and 305*
Date Performed	*7/24/2013*	Jurisdiction	
Analysis Time Period	*P.M. Peak Hour*	Analysis Year	*No Build 2045*

Project Description *Interstate 80 Reconstruction*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*6470*	veh/h	Peak-Hour Factor, PHF	*0.97*
AADT		veh/day	%Trucks and Buses, P_T	*13*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.830*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD	*1.67*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*5.0*	mph
FFS	*70.4*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*4230*	pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
LOS	*F*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 10-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*AJM*	Highway/Direction of Travel	*I-80 Westbound*
Agency or Company	*AECOM*	From/To	*Between Ints. 305 and 306*
Date Performed	*7/24/2013*	Jurisdiction	
Analysis Time Period	*A.M. Peak Hour*	Analysis Year	*No Build 2045*

Project Description *Interstate 80 Reconstruction*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3106*	veh/h	Peak-Hour Factor, PHF	*0.93*
AADT		veh/day	%Trucks and Buses, P_T	*12*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.840*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD	*1.50*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*4.5*	mph
FFS	*70.9*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2092*	pc/h/ln
S	*60.8*	mph
D = v_p / S	*34.4*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*AJM*	Highway/Direction of Travel	*I-80 Westbound*
Agency or Company	*AECOM*	From/To	*Between Ints. 305 and 306*
Date Performed	*7/24/2013*	Jurisdiction	
Analysis Time Period	*P.M. Peak Hour*	Analysis Year	*No Build 2045*

Project Description *Interstate 80 Reconstruction*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*6447*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*13*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.830*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD	*1.50*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*4.5*	mph
FFS	*70.9*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*4259*	pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
LOS	*F*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 10-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*AJM*	Highway/Direction of Travel	*I-80 Westbound*
Agency or Company	*AECOM*	From/To	*Between Ints. 306 and 307*
Date Performed	*7/24/2013*	Jurisdiction	
Analysis Time Period	*A.M. Peak Hour*	Analysis Year	*No Build 2045*

Project Description *Interstate 80 Reconstruction*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3240*	veh/h	Peak-Hour Factor, PHF	*0.91*
AADT		veh/day	%Trucks and Buses, P_T	*12*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.840*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD	*1.83*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*5.3*	mph
FFS	*70.1*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2230*	pc/h/ln
S	*57.7*	mph
D = v_p / S	*38.7*	pc/mi/ln
LOS	*E*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*AJM*	Highway/Direction of Travel	*I-80 Westbound*
Agency or Company	*AECOM*	From/To	*Between Ints. 306 and 307*
Date Performed	*7/24/2013*	Jurisdiction	
Analysis Time Period	*P.M. Peak Hour*	Analysis Year	*No Build 2045*

Project Description *Interstate 80 Reconstruction*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*6750*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*12*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.840*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD	*1.83*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*5.3*	mph
FFS	*70.1*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*4404*	pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
LOS	*F*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 10-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

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RAMP JUNCTION
HCS ANALYSIS

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	AJM	Freeway/Dir of Travel	I-80 Eastbound
Agency or Company	AECOM	Junction	Int. 304 from Route 209
Date Performed	7/24/2013	Jurisdiction	
Analysis Time Period	A.M. Peak Hour	Analysis Year	No Build 2045

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{up} = ft
V_u = veh/h

Terrain: Rolling

S_{FF} = 70.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp
☑ Yes ☐ On
☐ No ☑ Off
L_{down} = 1360 ft
V_D = 394 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2546	0.94	Rolling	10	1	0.862	0.95	3307
Ramp	1572	0.94	Rolling	5	1	0.922	0.95	1910
UpStream								
DownStream	394	0.82	Rolling	2	0	0.971	0.95	521

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 using Equation (Exhibit 25-5)

V_{12} = 3307 pc/h

V_3 or V_{av34} = 0 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	5217	Exhibit 25-7		Yes

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	5217	Exhibit 25-7	4600:All	Yes

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 40.3 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Determination

M_S = 0.984 (Exibit 25-19)

S_R = 42.4 mph (Exhibit 25-19)

S_0 = N/A mph (Exhibit 25-19)

S = 42.4 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	AJM	Freeway/Dir of Travel	I-80 Eastbound
Agency or Company	AECOM	Junction	Int. 304 from Route 209
Date Performed	7/24/2013	Jurisdiction	
Analysis Time Period	P.M. Peak Hour	Analysis Year	No Build 2045

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{up} = ft
V_u = veh/h

Terrain: Rolling

S_{FF} = 70.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp
☑ Yes ☐ On
☐ No ☑ Off
L_{down} = 1360 ft
V_D = 471 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3211	0.94	Rolling	12	1	0.840	0.95	4279
Ramp	1445	0.94	Rolling	2	1	0.962	0.95	1683
UpStream								
DownStream	471	0.86	Rolling	3	0	0.957	0.95	602

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 using Equation (Exhibit 25-5)

V_{12} = 4279 pc/h

V_3 or V_{av34} = 0 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	5962	Exhibit 25-7		Yes

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	5962	Exhibit 25-7	4600:All	Yes

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 46.2 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Determination

M_S = 1.780 (Exibit 25-19)

S_R = 20.2 mph (Exhibit 25-19)

S_0 = N/A mph (Exhibit 25-19)

S = 20.2 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	AJM	Freeway/Dir of Travel	I-80 Eastbound
Agency or Company	AECOM	Junction	Int. 305 from W. Main Street
Date Performed	7/24/2013	Jurisdiction	
Analysis Time Period	A.M. Peak Hour	Analysis Year	No Build 2045

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp: ☑ Yes ☐ On ☐ No ☑ Off

L_{up} = 800 ft

V_u = 394 veh/h

Terrain: Rolling

S_{FF} = 70.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3724	0.91	Rolling	10	1	0.862	0.95	4997
Ramp	324	0.74	Rolling	0	0	1.000	0.95	461
UpStream	394	0.82	Rolling	2	0	0.971	0.95	521
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 using Equation (Exhibit 25-5)

V_{12} = 4997 pc/h

V_3 or V_{av34} = 0 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	5458	Exhibit 25-7		Yes

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	5458	Exhibit 25-7	4600:All	Yes

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 46.8 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Determination

M_S = 1.224 (Exibit 25-19)

S_R = 35.7 mph (Exhibit 25-19)

S_0 = N/A mph (Exhibit 25-19)

S = 35.7 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_S = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	AJM	Freeway/Dir of Travel	I-80 Eastbound
Agency or Company	AECOM	Junction	Int. 305 from W. Main Street
Date Performed	7/24/2013	Jurisdiction	
Analysis Time Period	P.M. Peak Hour	Analysis Year	No Build 2045

Project Description Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp
☑ Yes ☐ On
☐ No ☑ Off
L_{up} = 800 ft
V_u = 471 veh/h

Terrain: Rolling

S_{FF} = 70.0 mph S_{FR} = 35.0 mph
Sketch (show lanes, L_A, L_D,V_R,V_f)

Downstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{down} = ft
V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4186	0.95	Rolling	12	1	0.840	0.95	5519
Ramp	369	0.96	Rolling	0	0	1.000	0.95	405
UpStream	471	0.86	Rolling	3	0	0.957	0.95	602
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$
L_{EQ} = (Equation 25-2 or 25-3)
P_{FM} = 1.000 using Equation (Exhibit 25-5)
V_{12} = 5519 pc/h
V_3 or V_{av34} 0 pc/h (Equation 25-4 or 25-5)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No
If Yes,V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	5924	Exhibit 25-7		Yes

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	5924	Exhibit 25-7	4600:All	Yes

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$
D_R = 50.4 (pc/mi/ln)
LOS = F (Exhibit 25-4)

Speed Determination

M_S = 1.767 (Exibit 25-19)
S_R= 20.5 mph (Exhibit 25-19)
S_0= N/A mph (Exhibit 25-19)
S = 20.5 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$
L_{EQ} = (Equation 25-8 or 25-9)
P_{FD} = using Equation (Exhibit 25-12)
V_{12} = pc/h
V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
If Yes,V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$
D_R = (pc/mi/ln)
LOS = (Exhibit 25-4)

Speed Determination

D_S = (Exhibit 25-19)
S_R= mph (Exhibit 25-19)
S_0= mph (Exhibit 25-19)
S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	AJM	Freeway/Dir of Travel	I-80 Eastbound
Agency or Company	AECOM	Junction	Int. 306 from Dreher Avenue
Date Performed	7/24/2013	Jurisdiction	
Analysis Time Period	A.M. Peak Hour	Analysis Year	No Build 2045

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp
☑ Yes ☑ On
☐ No ☐ Off
L_{up} = 2100 ft
V_u = 324 veh/h

Terrain: Rolling
S_{FF} = 70.0 mph S_{FR} = 35.0 mph
Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{down} = ft
V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4048	0.87	Rolling	10	1	0.862	0.95	5681
Ramp	219	0.67	Rolling	1	0	0.985	0.95	349
UpStream	324	0.74	Rolling	0	0	1.000	0.95	461
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$
L_{EQ} = (Equation 25-2 or 25-3)
P_{FM} = 1.000 using Equation (Exhibit 25-5)
V_{12} = 5681 pc/h
V_3 or V_{av34} = 0 pc/h (Equation 25-4 or 25-5)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No
If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	6030	Exhibit 25-7		Yes

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	6030	Exhibit 25-7	4600:All	Yes

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$
D_R = 50.3 (pc/mi/ln)
LOS = F (Exhibit 25-4)

Speed Determination

M_S = 1.920 (Exibit 25-19)
S_R = 16.2 mph (Exhibit 25-19)
S_0 = N/A mph (Exhibit 25-19)
S = 16.2 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$
L_{EQ} = (Equation 25-8 or 25-9)
P_{FD} = using Equation (Exhibit 25-12)
V_{12} = pc/h
V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$
D_R = (pc/mi/ln)
LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)
S_R = mph (Exhibit 25-19)
S_0 = mph (Exhibit 25-19)
S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	AJM	Freeway/Dir of Travel	I-80 Eastbound
Agency or Company	AECOM	Junction	Int. 306 from Dreher Avenue
Date Performed	7/24/2013	Jurisdiction	
Analysis Time Period	P.M. Peak Hour	Analysis Year	No Build 2045

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp
☑ Yes ☑ On
☐ No ☐ Off
L_{up} = 2100 ft
V_u = 369 veh/h

Terrain: Rolling

S_{FF} = 70.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{down} = ft
V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4555	0.96	Rolling	12	1	0.840	0.95	5943
Ramp	188	0.81	Rolling	1	0	0.985	0.95	248
UpStream	369	0.96	Rolling	0	0	1.000	0.95	405
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 using Equation (Exhibit 25-5)

V_{12} = 5943 pc/h

V_3 or V_{av34} = 0 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	6191	Exhibit 25-7		Yes

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	6191	Exhibit 25-7	4600:All	Yes

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 51.6 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Determination

M_S = 2.203 (Exibit 25-19)

S_R = 8.3 mph (Exhibit 25-19)

S_0 = N/A mph (Exhibit 25-19)

S = 8.3 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	AJM	Freeway/Dir of Travel	I-80 Eastbound
Agency or Company	AECOM	Junction	Int. 307 from Park Avenue
Date Performed	7/24/2013	Jurisdiction	
Analysis Time Period	A.M. Peak Hour	Analysis Year	No Build 2045

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp
☑ Yes ☐ On
☐ No ☑ Off
L_{up} = 950 ft
V_u = 718 veh/h

Terrain: Rolling

S_{FF} = 70.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{down} = ft
V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3549	0.83	Rolling	8	1	0.885	0.95	5086
Ramp	219	0.85	Rolling	4	0	0.943	0.95	287
UpStream	718	0.82	Rolling	6	0	0.917	0.95	1005
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 using Equation (Exhibit 25-5)

V_{12} = 5086 pc/h

V_3 or V_{av34} = 0 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	5373	Exhibit 25-7		Yes

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	5373	Exhibit 25-7	4600:All	Yes

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 45.7 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Determination

M_S = 1.145 (Exibit 25-19)

S_R = 37.9 mph (Exhibit 25-19)

S_0 = N/A mph (Exhibit 25-19)

S = 37.9 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	AJM	Freeway/Dir of Travel	I-80 Eastbound
Agency or Company	AECOM	Junction	Int. 307 from Park Avenue
Date Performed	7/24/2013	Jurisdiction	
Analysis Time Period	P.M. Peak Hour	Analysis Year	No Build 2045

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp
☑ Yes ☐ On
☐ No ☑ Off
L_{up} = 950 ft
V_u = 648 veh/h

Terrain: Rolling

S_{FF} = 70.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{down} = ft
V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4095	0.97	Rolling	10	1	0.862	0.95	5155
Ramp	264	0.63	Rolling	1	0	0.985	0.95	448
UpStream	648	0.84	Rolling	2	0	0.971	0.95	836
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 using Equation (Exhibit 25-5)

V_{12} = 5155 pc/h

V_3 or V_{av34} = 0 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	5603	Exhibit 25-7		Yes

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	5603	Exhibit 25-7	4600:All	Yes

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 47.5 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Determination

M_S = 1.362 (Exibit 25-19)

S_R = 31.9 mph (Exhibit 25-19)

S_0 = N/A mph (Exhibit 25-19)

S = 31.9 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_S = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	AJM	Freeway/Dir of Travel	I-80 Westbound
Agency or Company	AECOM	Junction	Int. 303 from Route 611
Date Performed	7/24/2013	Jurisdiction	
Analysis Time Period	A.M. Peak Hour	Analysis Year	No Build 2045

Project Description Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp
☑ Yes ☐ On
☐ No ☑ Off
L_{up} = 4630 ft
V_u = 1023 veh/h

Terrain: Rolling

S_{FF} = 70.0 mph S_{FR} = 35.0 mph
Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{down} = ft
V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2126	0.97	Rolling	12	1	0.840	0.95	2745
Ramp	173	0.74	Rolling	2	0	0.971	0.95	253
UpStream	1023	0.94	Rolling	8	1	0.885	0.95	1295
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$
L_{EQ} = (Equation 25-2 or 25-3)
P_{FM} = 1.000 using Equation (Exhibit 25-5)
V_{12} = 2745 pc/h
V_3 or V_{av34} = 0 pc/h (Equation 25-4 or 25-5)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No
If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	2998	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2998	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$
D_R = 22.0 (pc/mi/ln)
LOS = C (Exhibit 25-4)

Speed Determination

M_S = 0.324 (Exibit 25-19)
S_R = 60.9 mph (Exhibit 25-19)
S_0 = N/A mph (Exhibit 25-19)
S = 60.9 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$
L_{EQ} = (Equation 25-8 or 25-9)
P_{FD} = using Equation (Exhibit 25-12)
V_{12} = pc/h
V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$
D_R = (pc/mi/ln)
LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)
S_R = mph (Exhibit 25-19)
S_0 = mph (Exhibit 25-19)
S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	AJM	Freeway/Dir of Travel	I-80 Westbound
Agency or Company	AECOM	Junction	Int. 303 from Route 611
Date Performed	7/24/2013	Jurisdiction	
Analysis Time Period	P.M. Peak Hour	Analysis Year	No Build 2045

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp
☑ Yes ☐ On
☐ No ☑ Off
L_{up} = 4630 ft
V_u = 2001 veh/h

Terrain: Rolling
S_{FF} = 70.0 mph S_{FR} = 35.0 mph
Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{down} = ft
V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4468	0.97	Rolling	13	1	0.830	0.95	5843
Ramp	322	0.87	Rolling	1	0	0.985	0.95	395
UpStream	2001	0.94	Rolling	2	1	0.962	0.95	2330
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$
L_{EQ} = (Equation 25-2 or 25-3)
P_{FM} = 1.000 using Equation (Exhibit 25-5)
V_{12} = 5843 pc/h
V_3 or V_{av34} = 0 pc/h (Equation 25-4 or 25-5)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No
If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	6238	Exhibit 25-7		Yes

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	6238	Exhibit 25-7	4600:All	Yes

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$
D_R = 47.2 (pc/mi/ln)
LOS = F (Exhibit 25-4)

Speed Determination

M_S = 2.242 (Exibit 25-19)
S_R = 7.2 mph (Exhibit 25-19)
S_0 = N/A mph (Exhibit 25-19)
S = 7.2 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$
L_{EQ} = (Equation 25-8 or 25-9)
P_{FD} = using Equation (Exhibit 25-12)
V_{12} = pc/h
V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$
D_R = (pc/mi/ln)
LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)
S_R = mph (Exhibit 25-19)
S_0 = mph (Exhibit 25-19)
S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	AJM	Freeway/Dir of Travel	I-80 Westbound
Agency or Company	AECOM	Junction	Int. 307 from Broad Street
Date Performed	7/24/2013	Jurisdiction	
Analysis Time Period	A.M. Peak Hour	Analysis Year	No Build 2045

Project Description Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp	Terrain: Rolling	Downstream Adj Ramp
☑ Yes ☐ On		☐ Yes ☐ On
☐ No ☑ Off		☑ No ☐ Off
L_{up} = 1600 ft	S_{FF} = 70.0 mph S_{FR} = 35.0 mph	L_{down} = ft
V_u = 360 veh/h	Sketch (show lanes, L_A, L_D, V_R, V_f)	V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2766	0.91	Rolling	12	1	0.840	0.95	3807
Ramp	473	0.91	Rolling	6	0	0.917	0.95	596
UpStream	360	0.90	Rolling	3	0	0.957	0.95	440
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 using Equation (Exhibit 25-5)

V_{12} = 3807 pc/h

V_3 or V_{av34} = 0 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4403	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	4403	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 38.4 (pc/mi/ln)

LOS = E (Exhibit 25-4)

Speed Determination

M_S = 0.627 (Exibit 25-19)

S_R = 52.4 mph (Exhibit 25-19)

S_0 = N/A mph (Exhibit 25-19)

S = 52.4 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	AJM	Freeway/Dir of Travel	I-80 Westbound
Agency or Company	AECOM	Junction	Int. 307 from Broad Street
Date Performed	7/24/2013	Jurisdiction	
Analysis Time Period	P.M. Peak Hour	Analysis Year	No Build 2045

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp
☑ Yes ☐ On
☐ No ☑ Off
L_{up} = 1600 ft
V_u = 560 veh/h

Terrain: Rolling

S_{FF} = 70.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{down} = ft
V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	5961	0.96	Rolling	12	1	0.840	0.95	7778
Ramp	790	0.89	Rolling	1	0	0.985	0.95	948
UpStream	560	0.88	Rolling	1	0	0.985	0.95	680
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 using Equation (Exhibit 25-5)

V_{12} = 7778 pc/h

V_3 or V_{av34} = 0 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	8726	Exhibit 25-7		Yes

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	8726	Exhibit 25-7	4600:All	Yes

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 72.0 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Determination

M_S = 24.336 (Exibit 25-19)

S_R = -611.4 mph (Exhibit 25-19)

S_0 = N/A mph (Exhibit 25-19)

S = -611.4 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_S = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	AJM	Freeway/Dir of Travel	I-80 Eastbound
Agency or Company	AECOM	Junction	Int. 303 to Route 611
Date Performed	7/24/2013	Jurisdiction	
Analysis Time Period	A.M. Peak Hour	Analysis Year	No Build 2045

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{up} = ft
V_u = veh/h

Terrain: Rolling

S_{FF} = 70.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp
☑ Yes ☑ On
☐ No ☐ Off
L_{down} = 5500 ft
V_D = 1572 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2857	0.94	Rolling	10	1	0.862	0.95	3711
Ramp	311	0.72	Rolling	1	0	0.985	0.95	461
UpStream								
DownStream	1572	0.94	Rolling	5	1	0.922	0.95	1910

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)
P_{FM} = using Equation (Exhibit 25-5)
V_{12} = pc/h
V_3 or V_{av34} pc/h (Equation 25-4 or 25-5)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 25-7		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 25-7		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)
LOS = (Exhibit 25-4)

Speed Determination

M_S = (Exibit 25-19)
S_R = mph (Exhibit 25-19)
S_0 = mph (Exhibit 25-19)
S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)
P_{FD} = 1.000 using Equation (Exhibit 25-12)
V_{12} = 3711 pc/h
V_3 or V_{av34} 0 pc/h (Equation 25-15 or 25-16)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No
If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	3711	Exhibit 25-14	4800	No
$V_{FO} = V_F - V_R$	3250	Exhibit 25-14	4800	No
V_R	461	Exhibit 25-3	2000	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3711	Exhibit 25-14	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 29.9 (pc/mi/ln)
LOS = D (Exhibit 25-4)

Speed Determination

D_s = 0.469 (Exhibit 25-19)
S_R = 56.9 mph (Exhibit 25-19)
S_0 = N/A mph (Exhibit 25-19)
S = 56.9 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	AJM	Freeway/Dir of Travel	I-80 Eastbound
Agency or Company	AECOM	Junction	Int. 303 to Route 611
Date Performed	7/24/2013	Jurisdiction	
Analysis Time Period	P.M. Peak Hour	Analysis Year	No Build 2045

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp	Terrain: Rolling	Downstream Adj Ramp
☐ Yes ☐ On		☑ Yes ☑ On
☑ No ☐ Off		☐ No ☐ Off
L_{up} = ft		L_{down} = 5500 ft
V_u = veh/h	S_{FF} = 70.0 mph S_{FR} = 35.0 mph Sketch (show lanes, L_A, L_D, V_R, V_f)	V_D = 1445 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3622	0.94	Rolling	12	1	0.840	0.95	4827
Ramp	411	0.97	Rolling	1	0	0.985	0.95	453
UpStream								
DownStream	1445	0.94	Rolling	2	1	0.962	0.95	1683

Merge Areas | Diverge Areas

Estimation of v_{12}

Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 using Equation (Exhibit 25-12)

V_{12} = 4827 pc/h

V_3 or V_{av34} 0 pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 25-7		

	Actual	Capacity		LOS F?
V_F	4827	Exhibit 25-14	4800	Yes
$V_{FO} = V_F - V_R$	4374	Exhibit 25-14	4800	No
V_R	453	Exhibit 25-3	2000	No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 25-7		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	4827	Exhibit 25-14	4400:All	Yes

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = 39.5 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Determination

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

D_s = 0.469 (Exhibit 25-19)

S_R = 56.9 mph (Exhibit 25-19)

S_0 = N/A mph (Exhibit 25-19)

S = 56.9 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	AJM	Freeway/Dir of Travel	I-80 Eastbound
Agency or Company	AECOM	Junction	Int. 305 to W. Main Street
Date Performed	7/24/2013	Jurisdiction	
Analysis Time Period	A.M. Peak Hour	Analysis Year	No Build 2045

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Rolling

S_{FF} = 70.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☑ Yes ☑ On ☐ No ☐ Off

L_{down} = 700 ft

V_D = 324 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	4118	0.91	Rolling	10	1	0.862	0.95	5526
Ramp	394	0.82	Rolling	2	0	0.971	0.95	521
UpStream								
DownStream	324	0.74	Rolling	0	0	1.000	0.95	461

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 25-7		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 25-7		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 using Equation (Exhibit 25-12)

V_{12} = 5526 pc/h

V_3 or V_{av34} 0 pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	5526	Exhibit 25-14	4800	Yes
$V_{FO} = V_F - V_R$	5005	Exhibit 25-14	4800	Yes
V_R	521	Exhibit 25-3	2000	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	5526	Exhibit 25-14	4400:All	Yes

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 50.3 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Determination

D_s = 0.475 (Exhibit 25-19)

S_R = 56.7 mph (Exhibit 25-19)

S_0 = N/A mph (Exhibit 25-19)

S = 56.7 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	AJM	Freeway/Dir of Travel	I-80 Eastbound
Agency or Company	AECOM	Junction	Int. 305 to W. Main Street
Date Performed	7/24/2013	Jurisdiction	
Analysis Time Period	P.M. Peak Hour	Analysis Year	No Build 2045

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp	Terrain: Rolling	Downstream Adj Ramp
☐ Yes ☐ On		☑ Yes ☑ On
☑ No ☐ Off		☐ No ☐ Off
L_{up} = ft		L_{down} = 700 ft
V_u = veh/h	S_{FF} = 70.0 mph S_{FR} = 35.0 mph Sketch (show lanes, L_A, L_D, V_R, V_f)	V_D = 369 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4657	0.95	Rolling	12	1	0.840	0.95	6141
Ramp	471	0.86	Rolling	3	0	0.957	0.95	602
UpStream								
DownStream	369	0.96	Rolling	0	0	1.000	0.95	405

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 25-7		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 25-7		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 using Equation (Exhibit 25-12)

V_{12} = 6141 pc/h

V_3 or V_{av34} 0 pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	6141	Exhibit 25-14	4800	Yes
$V_{FO} = V_F - V_R$	5539	Exhibit 25-14	4800	Yes
V_R	602	Exhibit 25-3	2000	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	6141	Exhibit 25-14	4400:All	Yes

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 55.6 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Determination

D_s = 0.482 (Exhibit 25-19)

S_R = 56.5 mph (Exhibit 25-19)

S_0 = N/A mph (Exhibit 25-19)

S = 56.5 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	AJM	Freeway/Dir of Travel	I-80 Eastbound
Agency or Company	AECOM	Junction	Int. 307 to Park Avenue
Date Performed	7/24/2013	Jurisdiction	
Analysis Time Period	A.M. Peak Hour	Analysis Year	No Build 2045

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp	Terrain: Rolling	Downstream Adj Ramp
☐ Yes ☐ On		☑ Yes ☑ On
☑ No ☐ Off		☐ No ☐ Off
L_{up} = ft		L_{down} = 810 ft
V_u = veh/h	S_{FF} = 70.0 mph S_{FR} = 35.0 mph Sketch (show lanes, L_A, L_D, V_R, V_f)	V_D = 219 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4267	0.83	Rolling	8	1	0.885	0.95	6115
Ramp	718	0.82	Rolling	6	0	0.917	0.95	1005
UpStream								
DownStream	219	0.85	Rolling	4	0	0.943	0.95	287

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 25-7		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 25-7		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 using Equation (Exhibit 25-12)

V_{12} = 6115 pc/h

V_3 or V_{av34} 0 pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	6115	Exhibit 25-14	4800	Yes
$V_{FO} = V_F - V_R$	5110	Exhibit 25-14	4800	Yes
V_R	1005	Exhibit 25-3	2000	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	6115	Exhibit 25-14	4400:All	Yes

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 55.5 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Determination

D_s = 0.518 (Exhibit 25-19)

S_R = 55.5 mph (Exhibit 25-19)

S_0 = N/A mph (Exhibit 25-19)

S = 55.5 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	AJM	Freeway/Dir of Travel	I-80 Eastbound
Agency or Company	AECOM	Junction	Int. 307 to Park Avenue
Date Performed	7/24/2013	Jurisdiction	
Analysis Time Period	P.M. Peak Hour	Analysis Year	No Build 2045

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Rolling

S_{FF} = 70.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☑ Yes ☑ On ☐ No ☐ Off

L_{down} = 810 ft

V_D = 264 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	4743	0.97	Rolling	10	1	0.862	0.95	5971
Ramp	648	0.84	Rolling	2	0	0.971	0.95	836
UpStream								
DownStream	264	0.63	Rolling	1	0	0.985	0.95	448

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 25-7		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 25-7		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 using Equation (Exhibit 25-12)

V_{12} = 5971 pc/h

V_3 or V_{av34} 0 pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	5971	Exhibit 25-14	4800	Yes
$V_{FO} = V_F - V_R$	5135	Exhibit 25-14	4800	Yes
V_R	836	Exhibit 25-3	2000	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	5971	Exhibit 25-14	4400:All	Yes

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 54.3 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Determination

D_s = 0.503 (Exhibit 25-19)

S_R = 55.9 mph (Exhibit 25-19)

S_0 = N/A mph (Exhibit 25-19)

S = 55.9 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	AJM	Freeway/Dir of Travel	I-80 Westbound
Agency or Company	AECOM	Junction	Int. 305 to W. Main Street
Date Performed	7/24/2013	Jurisdiction	
Analysis Time Period	A.M. Peak Hour	Analysis Year	No Build 2045

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Rolling

S_{FF} = 70.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☑ Yes ☑ On ☐ No ☐ Off

L_{down} = 740 ft

V_D = 328 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3106	0.93	Rolling	12	1	0.840	0.95	4184
Ramp	285	0.84	Rolling	1	0	0.985	0.95	363
UpStream								
DownStream	328	0.87	Rolling	2	0	0.971	0.95	409

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 25-7		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 25-7		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 using Equation (Exhibit 25-12)

V_{12} = 4184 pc/h

V_3 or V_{av34} 0 pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	4184	Exhibit 25-14	4800	No
$V_{FO} = V_F - V_R$	3821	Exhibit 25-14	4800	No
V_R	363	Exhibit 25-3	2000	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	4184	Exhibit 25-14	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 39.2 (pc/mi/ln)

LOS = E (Exhibit 25-4)

Speed Determination

D_s = 0.461 (Exhibit 25-19)

S_R = 57.1 mph (Exhibit 25-19)

S_0 = N/A mph (Exhibit 25-19)

S = 57.1 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	AJM	Freeway/Dir of Travel	I-80 Westbound
Agency or Company	AECOM	Junction	Int. 305 to W. Main Street
Date Performed	7/24/2013	Jurisdiction	
Analysis Time Period	P.M. Peak Hour	Analysis Year	No Build 2045

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Rolling

S_{FF} = 70.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☑ Yes ☑ On ☐ No ☐ Off

L_{down} = 740 ft

V_D = 603 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	6447	0.96	Rolling	13	1	0.830	0.95	8518
Ramp	580	0.90	Rolling	1	0	0.985	0.95	689
UpStream								
DownStream	603	0.78	Rolling	1	0	0.985	0.95	826

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 using Equation (Exhibit 25-12)

V_{12} = 8518 pc/h

V_3 or V_{av34} 0 pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 25-7		

Capacity Checks

	Actual	Capacity		LOS F?
V_F	8518	Exhibit 25-14	4800	Yes
$V_{FO} = V_F - V_R$	7829	Exhibit 25-14	4800	Yes
V_R	689	Exhibit 25-3	2000	No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 25-7		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	8518	Exhibit 25-14	4400:All	Yes

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = 76.4 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Determination

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Speed Determination

D_s = 0.490 (Exhibit 25-19)

S_R = 56.3 mph (Exhibit 25-19)

S_0 = N/A mph (Exhibit 25-19)

S = 56.3 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	AJM	Freeway/Dir of Travel	I-80 Westbound
Agency or Company	AECOM	Junction	Int. 306 to Dreher Avenue
Date Performed	7/24/2013	Jurisdiction	
Analysis Time Period	A.M. Peak Hour	Analysis Year	No Build 2045

Project Description Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp
☑ Yes ☑ On
☐ No ☐ Off
L_{up} = 3680 ft
V_u = 473 veh/h

Terrain: Rolling
S_{FF} = 70.0 mph S_{FR} = 35.0 mph
Sketch (show lanes, L_A, L_D,V_R,V_f)

Downstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{down} = ft
V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3240	0.91	Rolling	12	1	0.840	0.95	4460
Ramp	134	0.66	Rolling	3	0	0.957	0.95	223
UpStream	473	0.91	Rolling	6	0	0.917	0.95	596
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$
L_{EQ} = (Equation 25-2 or 25-3)
P_{FM} = using Equation (Exhibit 25-5)
V_{12} = pc/h
V_3 or V_{av34} pc/h (Equation 25-4 or 25-5)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
If Yes,V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 25-7		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 25-7		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$
D_R = (pc/mi/ln)
LOS = (Exhibit 25-4)

Speed Determination

M_S = (Exibit 25-19)
S_R= mph (Exhibit 25-19)
S_0= mph (Exhibit 25-19)
S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$
L_{EQ} = (Equation 25-8 or 25-9)
P_{FD} = 1.000 using Equation (Exhibit 25-12)
V_{12} = 4460 pc/h
V_3 or V_{av34} 0 pc/h (Equation 25-15 or 25-16)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No
If Yes,V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	4460	Exhibit 25-14	4800	No
$V_{FO} = V_F - V_R$	4237	Exhibit 25-14	4800	No
V_R	223	Exhibit 25-3	2000	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	4460	Exhibit 25-14	4400:All	Yes

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$
D_R = 41.3 (pc/mi/ln)
LOS = E (Exhibit 25-4)

Speed Determination

D_s = 0.448 (Exhibit 25-19)
S_R= 57.5 mph (Exhibit 25-19)
S_0= N/A mph (Exhibit 25-19)
S = 57.5 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	AJM	Freeway/Dir of Travel	I-80 Westbound
Agency or Company	AECOM	Junction	Int. 306 to Dreher Avenue
Date Performed	7/24/2013	Jurisdiction	
Analysis Time Period	P.M. Peak Hour	Analysis Year	No Build 2045

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp: ☑ Yes ☑ On ☐ No ☐ Off

L_{up} = 3680 ft

V_u = 790 veh/h

Terrain: Rolling

S_{FF} = 70.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	6750	0.96	Rolling	12	1	0.840	0.95	8808
Ramp	303	0.82	Rolling	3	0	0.957	0.95	406
UpStream	790	0.89	Rolling	1	0	0.985	0.95	948
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 25-7		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 25-7		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 using Equation (Exhibit 25-12)

V_{12} = 8808 pc/h

V_3 or V_{av34} 0 pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	8808	Exhibit 25-14	4800	Yes
$V_{FO} = V_F - V_R$	8402	Exhibit 25-14	4800	Yes
V_R	406	Exhibit 25-3	2000	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	8808	Exhibit 25-14	4400:All	Yes

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 78.7 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Determination

D_s = 0.465 (Exhibit 25-19)

S_R = 57.0 mph (Exhibit 25-19)

S_0 = N/A mph (Exhibit 25-19)

S = 57.0 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	AJM	Freeway/Dir of Travel	I-80 Westbound
Agency or Company	AECOM	Junction	Int. 307 to Broad Street
Date Performed	7/24/2013	Jurisdiction	
Analysis Time Period	A.M. Peak Hour	Analysis Year	No Build 2045

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Rolling

S_{FF} = 70.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☑ Yes ☑ On ☐ No ☐ Off

L_{down} = 1470 ft

V_D = 473 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3126	0.91	Rolling	12	1	0.840	0.95	4303
Ramp	360	0.90	Rolling	3	0	0.957	0.95	440
UpStream								
DownStream	473	0.91	Rolling	6	0	0.917	0.95	596

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 25-7		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 25-7		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 using Equation (Exhibit 25-12)

V_{12} = 4303 pc/h

V_3 or V_{av34} 0 pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	4303	Exhibit 25-14	4800	No
$V_{FO} = V_F - V_R$	3863	Exhibit 25-14	4800	No
V_R	440	Exhibit 25-3	2000	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	4303	Exhibit 25-14	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 39.9 (pc/mi/ln)

LOS = E (Exhibit 25-4)

Speed Determination

D_s = 0.468 (Exhibit 25-19)

S_R = 56.9 mph (Exhibit 25-19)

S_0 = N/A mph (Exhibit 25-19)

S = 56.9 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	AJM	Freeway/Dir of Travel	I-80 Westbound
Agency or Company	AECOM	Junction	Int. 307 to Broad Street
Date Performed	7/24/2013	Jurisdiction	
Analysis Time Period	P.M. Peak Hour	Analysis Year	No Build 2045

Project Description Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{up} = ft
V_u = veh/h

Terrain: Rolling

S_{FF} = 70.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D,V_R,V_f)

Downstream Adj Ramp
☑ Yes ☑ On
☐ No ☐ Off
L_{down} = 1470 ft
V_D = 790 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	6521	0.96	Rolling	12	1	0.840	0.95	8509
Ramp	560	0.88	Rolling	1	0	0.985	0.95	680
UpStream								
DownStream	790	0.89	Rolling	1	0	0.985	0.95	948

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)
P_{FM} = using Equation (Exhibit 25-5)
V_{12} = pc/h
V_3 or V_{av34} pc/h (Equation 25-4 or 25-5)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
If Yes,V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 25-7		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 25-7		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)
LOS = (Exhibit 25-4)

Speed Determination

M_S = (Exibit 25-19)
S_R= mph (Exhibit 25-19)
S_0= mph (Exhibit 25-19)
S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)
P_{FD} = 1.000 using Equation (Exhibit 25-12)
V_{12} = 8509 pc/h
V_3 or V_{av34} 0 pc/h (Equation 25-15 or 25-16)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No
If Yes,V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	8509	Exhibit 25-14	4800	Yes
$V_{FO} = V_F - V_R$	7829	Exhibit 25-14	4800	Yes
V_R	680	Exhibit 25-3	2000	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	8509	Exhibit 25-14	4400:All	Yes

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 76.1 (pc/mi/ln)
LOS = F (Exhibit 25-4)

Speed Determination

D_s = 0.489 (Exhibit 25-19)
S_R= 56.3 mph (Exhibit 25-19)
S_0= N/A mph (Exhibit 25-19)
S = 56.3 mph (Exhibit 25-15)

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WEAVE HCS ANALYSIS

Interstate 80 Reconstruction

FREEWAY WEAVING WORKSHEET

General Information

Analyst	JRE
Agency/Company	AECOM
Date Performed	7/24/2013
Analysis Time Period	A.M. Peak Hour

Site Information

Freeway/Dir of Travel	I-80 Westbound
Weaving Segment Location	Int. 305 to 304
Analysis Year	No Build 2045

Project Description *Interstate 80 Reconstruction*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	3	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_S	565ft	Freeway maximum capacity, C_{IFL}	2400
Freeway free-flow speed, FFS	70 mph	Terrain type	Rolling

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	1930	0.95	12	1	2.5	2.0	0.840	0.95	2545
V_{RF}	196	0.87	2	0	2.5	2.0	0.971	0.95	244
V_{FR}	891	0.94	8	1	2.5	2.0	0.885	0.95	1127
V_{RR}	132	0.87	2	0	2.5	2.0	0.971	0.95	165
V_{NW}	2710							V =	4081
V_W	1371								
VR	0.336								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	1371 lc/h
Interchange density, ID	1.7 int/mi	Weaving lane changes, LC_W	1497 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	287 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	1784 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	260

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	4081 pc/h	Weaving intensity factor, W	0.560
Weaving segment capacity, c_w	4756 veh/h	Weaving segment speed, S	52.4 mph
Weaving segment v/c ratio	0.685	Average weaving speed, S_W	50.3 mph
Weaving segment density, D	25.9 pc/mi/ln	Average non-weaving speed, S_{NW}	53.6 mph
Level of Service, LOS	C	Maximum weaving length, L_{MAX}	5973 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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Interstate 80 Reconstruction

FREEWAY WEAVING WORKSHEET

General Information

Analyst	JRE
Agency/Company	AECOM
Date Performed	7/24/2013
Analysis Time Period	P.M. Peak Hour

Site Information

Freeway/Dir of Travel	I-80 Westbound
Weaving Segment Location	Int. 305 to 304
Analysis Year	No Build 2045

Project Description *Interstate 80 Reconstruction*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	3	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_S	565ft	Freeway maximum capacity, C_{IFL}	2400
Freeway free-flow speed, FFS	70 mph	Terrain type	Rolling

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	4108	0.97	13	1	2.5	2.0	0.830	0.95	5372
V_{RF}	360	0.78	1	0	2.5	2.0	0.985	0.95	493
V_{FR}	1758	0.94	2	1	2.5	2.0	0.962	0.95	2047
V_{RR}	243	0.78	1	0	2.5	2.0	0.985	0.95	333
V_{NW}	5705							V =	8245
V_W	2540								
VR	0.308								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	lc/h
Interchange density, ID	1.7 int/mi	Weaving lane changes, LC_W	lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	369

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	8245 pc/h	Weaving intensity factor, W	
Weaving segment capacity, c_w	4752 veh/h	Weaving segment speed, S	mph
Weaving segment v/c ratio	1.368	Average weaving speed, S_W	mph
Weaving segment density, D	pc/mi/ln	Average non-weaving speed, S_{NW}	mph
Level of Service, LOS	F	Maximum weaving length, L_{MAX}	5671 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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UNSIGNALIZED INTERSECTION HCS ANALYSIS

TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*AJM*
Agency/Co.	*AECOM*
Date Performed	*8/2/2013*
Analysis Time Period	*A.M. Peak Hour*

Site Information

Intersection	*SR 611 & I-80 EB Off Ramp*
Jurisdiction	
Analysis Year	*No Build 2045*

Project Description *Interstate 80 Reconstruction*

East/West Street: *SR 611 (N. 9th Street)* North/South Street: *I-80 EB Off Ramp*

Intersection Orientation: *East-West* Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		*857*			*923*	
Peak-Hour Factor, PHF	*1.00*	*0.88*	*1.00*	*1.00*	*0.87*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*0*	*973*	*0*	*0*	*1060*	*0*
Percent Heavy Vehicles	*0*	--	--	*0*	--	--
Median Type	*Two Way Left Turn Lane*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration		*T*			*T*	
Upstream Signal		*0*			*0*	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)			*298*			
Peak-Hour Factor, PHF	*1.00*	*1.00*	*0.72*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*0*	*0*	*413*	*0*	*0*	*0*
Percent Heavy Vehicles	*0*	*0*	*1*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*1*			*0*
Lanes	*0*	*0*	*1*	*0*	*0*	*0*
Configuration			*R*			

Delay, Queue Length, and Level of Service

Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration					*R*			
v (veh/h)					*413*			
C (m) (veh/h)					*320*			
v/c					*1.29*			
95% queue length					*19.55*			
Control Delay (s/veh)					*185.6*			
LOS					*F*			
Approach Delay (s/veh)	--	--	*185.6*					
Approach LOS	--	--	*F*					

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TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*AJM*
Agency/Co.	*AECOM*
Date Performed	*8/2/2013*
Analysis Time Period	*P.M. Peak Hour*

Site Information

Intersection	*SR 611 & I-80 EB Off Ramp*
Jurisdiction	
Analysis Year	*No Build 2045*

Project Description *Interstate 80 Reconstruction*

East/West Street: *SR 611 (N. 9th Street)* North/South Street: *I-80 EB Off Ramp*

Intersection Orientation: *East-West* Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		*1176*			*1417*	
Peak-Hour Factor, PHF	*1.00*	*0.92*	*1.00*	*1.00*	*0.96*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*0*	*1278*	*0*	*0*	*1476*	*0*
Percent Heavy Vehicles	*0*	--	--	*0*	--	--
Median Type	*Two Way Left Turn Lane*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration		*T*			*T*	
Upstream Signal		*0*			*0*	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)			*407*			
Peak-Hour Factor, PHF	*1.00*	*1.00*	*0.98*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*0*	*0*	*415*	*0*	*0*	*0*
Percent Heavy Vehicles	*0*	*0*	*1*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*1*			*0*
Lanes	*0*	*0*	*1*	*0*	*0*	*0*
Configuration			*R*			

Delay, Queue Length, and Level of Service

Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration					*R*			
v (veh/h)					*415*			
C (m) (veh/h)					*211*			
v/c					*1.97*			
95% queue length					*30.59*			
Control Delay (s/veh)					*489.4*			
LOS					*F*			
Approach Delay (s/veh)	--	--	*489.4*					
Approach LOS	--	--	*F*					

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TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*AJM*
Agency/Co.	*AECOM*
Date Performed	*8/2/2013*
Analysis Time Period	*A.M. Peak Hour*

Site Information

Intersection	*SR 611 & Shopping Ctr Side Rd*
Jurisdiction	
Analysis Year	*No Build 2045*

Project Description *Interstate 80 Reconstruction*

East/West Street: *SR 611 (N. 9th Street)* North/South Street: *Shopping Center Side Road*

Intersection Orientation: *East-West* Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*11*	*835*			*914*	*23*
Peak-Hour Factor, PHF	*0.38*	*0.86*	*1.00*	*1.00*	*0.88*	*0.60*
Hourly Flow Rate, HFR (veh/h)	*28*	*970*	*0*	*0*	*1038*	*38*
Percent Heavy Vehicles	*0*	--	--	*0*	--	--
Median Type	*Two Way Left Turn Lane*					
RT Channelized			*0*			*0*
Lanes	*1*	*1*	*0*	*0*	*1*	*0*
Configuration	*L*	*T*				*TR*
Upstream Signal		*0*			*0*	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)				*23*		*9*
Peak-Hour Factor, PHF	*1.00*	*1.00*	*1.00*	*0.60*	*1.00*	*0.63*
Hourly Flow Rate, HFR (veh/h)	*0*	*0*	*0*	*38*	*0*	*14*
Percent Heavy Vehicles	*0*	*0*	*0*	*0*	*0*	*0*
Percent Grade (%)		*0*			*-2*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration					*LR*	

Delay, Queue Length, and Level of Service

Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*						*LR*	
v (veh/h)	*28*						*52*	
C (m) (veh/h)	*503*						*239*	
v/c	*0.06*						*0.22*	
95% queue length	*0.18*						*0.81*	
Control Delay (s/veh)	*12.6*						*24.2*	
LOS	*B*						*C*	
Approach Delay (s/veh)	--	--					*24.2*	
Approach LOS	--	--					*C*	

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TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*AJM*
Agency/Co.	*AECOM*
Date Performed	*8/2/2013*
Analysis Time Period	*P.M. Peak Hour*

Site Information

Intersection	*SR 611 & Shopping Ctr Side Rd*
Jurisdiction	
Analysis Year	*No Build 2045*

Project Description *Interstate 80 Reconstruction*

East/West Street: *SR 611 (N. 9th Street)* North/South Street: *Shopping Center Side Road*

Intersection Orientation: *East-West* Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*28*	*1150*			*1359*	*62*
Peak-Hour Factor, PHF	*0.54*	*0.91*	*1.00*	*1.00*	*0.96*	*0.69*
Hourly Flow Rate, HFR (veh/h)	*51*	*1263*	*0*	*0*	*1415*	*89*
Percent Heavy Vehicles	*0*	--	--	*0*	--	--
Median Type	*Two Way Left Turn Lane*					
RT Channelized			*0*			*0*
Lanes	*1*	*1*	*0*	*0*	*1*	*0*
Configuration	*L*	*T*				*TR*
Upstream Signal		*0*			*0*	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)				*26*		*19*
Peak-Hour Factor, PHF	*1.00*	*1.00*	*1.00*	*0.70*	*1.00*	*0.50*
Hourly Flow Rate, HFR (veh/h)	*0*	*0*	*0*	*37*	*0*	*38*
Percent Heavy Vehicles	*0*	*0*	*0*	*0*	*0*	*0*
Percent Grade (%)		*0*			*-2*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration					*LR*	

Delay, Queue Length, and Level of Service

Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*L*						*LR*	
v (veh/h)	*51*						*75*	
C (m) (veh/h)	*348*						*152*	
v/c	*0.15*						*0.49*	
95% queue length	*0.51*						*2.35*	
Control Delay (s/veh)	*17.1*						*49.8*	
LOS	*C*						*E*	
Approach Delay (s/veh)	--	--				*49.8*		
Approach LOS	--	--				*E*		

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TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*AJM*
Agency/Co.	*AECOM*
Date Performed	*8/2/2013*
Analysis Time Period	*A.M. Peak Hour*

Site Information

Intersection	*W. Main Street & I-80 EB Ramps*
Jurisdiction	
Analysis Year	*No Build 2045*

Project Description *Interstate 80 Reconstruction*

East/West Street: *W. Main Street (SR 2012)* North/South Street: *I-80 EB Ramps*

Intersection Orientation: *East-West* Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		*479*	*288*	*36*	*697*	
Peak-Hour Factor, PHF	*1.00*	*0.95*	*0.81*	*0.43*	*0.91*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*0*	*504*	*355*	*83*	*765*	*0*
Percent Heavy Vehicles	*0*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*1*	*0*	*1*	*0*
Configuration		*T*	*R*	*LT*		
Upstream Signal		*0*			*0*	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*51*		*343*			
Peak-Hour Factor, PHF	*0.75*	*1.00*	*0.77*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*68*	*0*	*445*	*0*	*0*	*0*
Percent Heavy Vehicles	*4*	*0*	*2*	*0*	*0*	*0*
Percent Grade (%)	*-1*			*0*		
Flared Approach		*Y*			*N*	
Storage		*5*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration		*LR*				

Delay, Queue Length, and Level of Service

Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*LT*		*LR*				
v (veh/h)		*83*		*513*				
C (m) (veh/h)		*601*		*695*				
v/c		*0.14*		*0.74*				
95% queue length		*0.48*		*6.56*				
Control Delay (s/veh)		*11.9*		*29.0*				
LOS		*B*		*D*				
Approach Delay (s/veh)	--	--	*29.0*					
Approach LOS	--	--	*D*					

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TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*AJM*
Agency/Co.	*AECOM*
Date Performed	*8/2/2013*
Analysis Time Period	*P.M. Peak Hour*

Site Information

Intersection	*W. Main Street & I-80 EB Ramps*
Jurisdiction	
Analysis Year	*No Build 2045*

Project Description *Interstate 80 Reconstruction*

East/West Street: *W. Main Street (SR 2012)* North/South Street: *I-80 EB Ramps*

Intersection Orientation: *East-West* Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		*607*	*317*	*53*	*1347*	
Peak-Hour Factor, PHF	*1.00*	*0.90*	*0.93*	*0.70*	*0.88*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*0*	*674*	*340*	*75*	*1530*	*0*
Percent Heavy Vehicles	*0*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*1*	*0*	*1*	*0*
Configuration		*T*	*R*	*LT*		
Upstream Signal		*0*			*0*	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*98*		*373*			
Peak-Hour Factor, PHF	*0.87*	*1.00*	*0.85*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*112*	*0*	*438*	*0*	*0*	*0*
Percent Heavy Vehicles	*2*	*0*	*3*	*0*	*0*	*0*
Percent Grade (%)	*-1*			*0*		
Flared Approach		*Y*			*N*	
Storage		*5*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration		*LR*				

Delay, Queue Length, and Level of Service

Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*LT*		*LR*				
v (veh/h)		*75*		*550*				
C (m) (veh/h)		*525*		*155*				
v/c		*0.14*		*3.55*				
95% queue length		*0.50*		*53.25*				
Control Delay (s/veh)		*13.0*		*1206*				
LOS		*B*		*F*				
Approach Delay (s/veh)	--	--	*1206*					
Approach LOS	--	--	*F*					

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TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*AJM*
Agency/Co.	*AECOM*
Date Performed	*8/2/2013*
Analysis Time Period	*A.M. Peak Hour*

Site Information

Intersection	*W. Main Street & I-80 WB Ramps*
Jurisdiction	
Analysis Year	*No Build 2045*

Project Description *Interstate 80 Reconstruction*

East/West Street: *W. Main Street (SR 2012)* North/South Street: *I-80 WB Ramps*

Intersection Orientation: *East-West* Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*47*	*775*			*482*	*281*
Peak-Hour Factor, PHF	*0.69*	*0.85*	*1.00*	*1.00*	*0.87*	*0.83*
Hourly Flow Rate, HFR (veh/h)	*68*	*911*	*0*	*0*	*554*	*338*
Percent Heavy Vehicles	*4*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*1*
Configuration	*LT*				*T*	*R*
Upstream Signal		*0*			*0*	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)				*34*		*251*
Peak-Hour Factor, PHF	*1.00*	*1.00*	*1.00*	*0.75*	*1.00*	*0.85*
Hourly Flow Rate, HFR (veh/h)	*0*	*0*	*0*	*45*	*0*	*295*
Percent Heavy Vehicles	*0*	*0*	*0*	*0*	*0*	*1*
Percent Grade (%)	*0*			*-1*		
Flared Approach		*N*			*Y*	
Storage		*0*			*1*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration					*LR*	

Delay, Queue Length, and Level of Service

Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LT*						*LR*	
v (veh/h)	*68*						*340*	
C (m) (veh/h)	*576*						*520*	
v/c	*0.12*						*0.65*	
95% queue length	*0.40*						*4.69*	
Control Delay (s/veh)	*12.1*						*24.1*	
LOS	*B*						*C*	
Approach Delay (s/veh)	--	--				*24.1*		
Approach LOS	--	--				*C*		

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TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*AJM*
Agency/Co.	*AECOM*
Date Performed	*8/2/2013*
Analysis Time Period	*P.M. Peak Hour*

Site Information

Intersection	*W. Main Street & I-80 WB Ramps*
Jurisdiction	
Analysis Year	*No Build 2045*

Project Description *Interstate 80 Reconstruction*

East/West Street: *W. Main Street (SR 2012)* | North/South Street: *I-80 WB Ramps*

Intersection Orientation: *East-West* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*72*	*908*			*882*	*531*
Peak-Hour Factor, PHF	*0.79*	*0.91*	*1.00*	*1.00*	*0.91*	*0.73*
Hourly Flow Rate, HFR (veh/h)	*91*	*997*	*0*	*0*	*969*	*727*
Percent Heavy Vehicles	*3*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*1*
Configuration	*LT*				*T*	*R*
Upstream Signal		*0*			*0*	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)				*62*		*518*
Peak-Hour Factor, PHF	*1.00*	*1.00*	*1.00*	*0.83*	*1.00*	*0.85*
Hourly Flow Rate, HFR (veh/h)	*0*	*0*	*0*	*74*	*0*	*609*
Percent Heavy Vehicles	*0*	*0*	*0*	*0*	*0*	*1*
Percent Grade (%)		*0*			*-1*	
Flared Approach		*N*			*Y*	
Storage		*0*			*1*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration					*LR*	

Delay, Queue Length, and Level of Service

Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LT*						*LR*	
v (veh/h)	*91*						*683*	
C (m) (veh/h)	*289*						*195*	
v/c	*0.31*						*3.50*	
95% queue length	*1.31*						*64.94*	
Control Delay (s/veh)	*23.1*						*1175*	
LOS	*C*						*F*	
Approach Delay (s/veh)	--	--				*1175*		
Approach LOS	--	--				*F*		

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TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*AJM*
Agency/Co.	*AECOM*
Date Performed	*8/2/2013*
Analysis Time Period	*A.M. Peak Hour*

Site Information

Intersection	*Dreher Ave. & I-80 EB On Ramp*
Jurisdiction	
Analysis Year	*No Build 2045*

Project Description *Interstate 80 Reconstruction*

East/West Street: *Dreher Avenue (SR 2004)* North/South Street: *I-80 EB On Ramp*

Intersection Orientation: *East-West* Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		*243*	*138*	*81*	*171*	
Peak-Hour Factor, PHF	*1.00*	*0.85*	*0.59*	*0.90*	*0.95*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*0*	*285*	*233*	*90*	*180*	*0*
Percent Heavy Vehicles	*0*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration			*TR*	*LT*		
Upstream Signal		*0*			*0*	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)						
Peak-Hour Factor, PHF	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*0*	*0*	*0*	*0*	*0*	*0*
Percent Heavy Vehicles	*0*	*0*	*0*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration						

Delay, Queue Length, and Level of Service

Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*LT*						
v (veh/h)		*90*						
C (m) (veh/h)		*796*						
v/c		*0.11*						
95% queue length		*0.38*						
Control Delay (s/veh)		*10.1*						
LOS		*B*						
Approach Delay (s/veh)	--	--						
Approach LOS	--	--						

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TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*AJM*
Agency/Co.	*AECOM*
Date Performed	*8/2/2013*
Analysis Time Period	*P.M. Peak Hour*

Site Information

Intersection	*Dreher Ave. & I-80 EB On Ramp*
Jurisdiction	
Analysis Year	*No Build 2045*

Project Description *Interstate 80 Reconstruction*

East/West Street: *Dreher Avenue (SR 2004)* North/South Street: *I-80 EB On Ramp*

Intersection Orientation: *East-West* Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		*209*	*85*	*104*	*441*	
Peak-Hour Factor, PHF	*1.00*	*0.82*	*0.66*	*0.76*	*0.79*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*0*	*254*	*128*	*136*	*558*	*0*
Percent Heavy Vehicles	*0*	--	--	*2*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration			*TR*	*LT*		
Upstream Signal		*0*			*0*	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)						
Peak-Hour Factor, PHF	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*0*	*0*	*0*	*0*	*0*	*0*
Percent Heavy Vehicles	*0*	*0*	*0*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration						

Delay, Queue Length, and Level of Service

Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*LT*						
v (veh/h)		*136*						
C (m) (veh/h)		*880*						
v/c		*0.15*						
95% queue length		*0.55*						
Control Delay (s/veh)		*9.8*						
LOS		*A*						
Approach Delay (s/veh)	--	--						
Approach LOS	--	--						

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TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*AJM*
Agency/Co.	*AECOM*
Date Performed	*8/2/2013*
Analysis Time Period	*A.M. Peak Hour*

Site Information

Intersection	*Dreher Ave. & I-80 WB Off Ramp*
Jurisdiction	
Analysis Year	*No Build 2045*

Project Description *Interstate 80 Reconstruction*

East/West Street: *Dreher Avenue (SR 2004)* North/South Street: *I-80 WB Off Ramp*

Intersection Orientation: *East-West* Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		*236*			*215*	
Peak-Hour Factor, PHF	*1.00*	*0.80*	*1.00*	*1.00*	*0.77*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*0*	*294*	*0*	*0*	*279*	*0*
Percent Heavy Vehicles	*0*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration		*T*			*T*	
Upstream Signal		*0*			*0*	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*51*		*83*			
Peak-Hour Factor, PHF	*0.61*	*1.00*	*0.69*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*83*	*0*	*120*	*0*	*0*	*0*
Percent Heavy Vehicles	*0*	*0*	*5*	*0*	*0*	*0*
Percent Grade (%)	*-1*			*0*		
Flared Approach		*Y*			*N*	
Storage		*1*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration		*LR*				

Delay, Queue Length, and Level of Service

Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration				*LR*				
v (veh/h)				*203*				
C (m) (veh/h)				*1328*				
v/c				*0.15*				
95% queue length				*0.54*				
Control Delay (s/veh)				*11.3*				
LOS				*B*				
Approach Delay (s/veh)	--	--	*11.3*					
Approach LOS	--	--	*B*					

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TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*AJM*
Agency/Co.	*AECOM*
Date Performed	*8/2/2013*
Analysis Time Period	*P.M. Peak Hour*

Site Information

Intersection	*Dreher Ave. & I-80 WB Off Ramp*
Jurisdiction	
Analysis Year	*No Build 2045*

Project Description *Interstate 80 Reconstruction*

East/West Street: *Dreher Avenue (SR 2004)* North/South Street: *I-80 WB Off Ramp*

Intersection Orientation: *East-West* Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		*170*			*369*	
Peak-Hour Factor, PHF	*1.00*	*0.94*	*1.00*	*1.00*	*0.71*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*0*	*180*	*0*	*0*	*519*	*0*
Percent Heavy Vehicles	*0*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration		*T*			*T*	
Upstream Signal		*0*			*0*	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*166*		*138*			
Peak-Hour Factor, PHF	*0.88*	*1.00*	*0.65*	*1.00*	*1.00*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*188*	*0*	*212*	*0*	*0*	*0*
Percent Heavy Vehicles	*2*	*0*	*4*	*0*	*0*	*0*
Percent Grade (%)	*-1*			*0*		
Flared Approach		*Y*			*N*	
Storage		*1*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration		*LR*				

Delay, Queue Length, and Level of Service

Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration				*LR*				
v (veh/h)				*400*				
C (m) (veh/h)				*807*				
v/c				*0.50*				
95% queue length				*2.79*				
Control Delay (s/veh)				*13.8*				
LOS				*B*				
Approach Delay (s/veh)	--	--	*13.8*					
Approach LOS	--	--	*B*					

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TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*AJM*
Agency/Co.	*AECOM*
Date Performed	*8/2/2013*
Analysis Time Period	*A.M. Peak Hour*

Site Information

Intersection	*Park Avenue & I-80 EB Ramps*
Jurisdiction	
Analysis Year	*No Build 2045*

Project Description *Interstate 80 Reconstruction*

East/West Street: *I-80 EB Ramps/Barry Street* | North/South Street: *Park Avenue (SR 611)*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*51*	*205*			*128*	*155*
Peak-Hour Factor, PHF	*0.84*	*0.83*	*1.00*	*1.00*	*0.85*	*0.82*
Hourly Flow Rate, HFR (veh/h)	*60*	*246*	*0*	*0*	*150*	*189*
Percent Heavy Vehicles	*4*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LT*					*TR*
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*516*		*202*	*0*	*13*	*15*
Peak-Hour Factor, PHF	*0.77*	*1.00*	*0.92*	*0.90*	*0.58*	*0.67*
Hourly Flow Rate, HFR (veh/h)	*670*	*0*	*219*	*0*	*22*	*22*
Percent Heavy Vehicles	*4*	*0*	*8*	*0*	*14*	*13*
Percent Grade (%)	*-1*			*-3*		
Flared Approach		*Y*			*N*	
Storage		*1*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*1*	*0*
Configuration		*LR*			*LTR*	

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LT*			*LTR*			*LR*	
v (veh/h)	*60*			*44*			*889*	
C (m) (veh/h)	*906*			*499*			*454*	
v/c	*0.07*			*0.09*			*1.96*	
95% queue length	*0.21*			*0.29*			*59.94*	
Control Delay (s/veh)	*9.3*			*12.9*			*459.7*	
LOS	*A*			*B*			*F*	
Approach Delay (s/veh)	--	--	*12.9*			*459.7*		
Approach LOS	--	--	*B*			*F*		

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TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*AJM*
Agency/Co.	*AECOM*
Date Performed	*8/2/2013*
Analysis Time Period	*P.M. Peak Hour*

Site Information

Intersection	*Park Avenue & I-80 EB Ramps*
Jurisdiction	
Analysis Year	*No Build 2045*

Project Description *Interstate 80 Reconstruction*

East/West Street: *I-80 EB Ramps/Barry Street* | North/South Street: *Park Avenue (SR 611)*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*40*	*296*			*373*	*219*
Peak-Hour Factor, PHF	*0.66*	*0.79*	*1.00*	*1.00*	*0.75*	*0.60*
Hourly Flow Rate, HFR (veh/h)	*60*	*374*	*0*	*0*	*497*	*364*
Percent Heavy Vehicles	*0*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LT*					*TR*
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*377*		*271*	*11*	*6*	*19*
Peak-Hour Factor, PHF	*0.83*	*1.00*	*0.78*	*0.50*	*0.38*	*0.63*
Hourly Flow Rate, HFR (veh/h)	*454*	*0*	*347*	*22*	*15*	*30*
Percent Heavy Vehicles	*1*	*0*	*3*	*0*	*0*	*10*
Percent Grade (%)	*-1*			*-3*		
Flared Approach		*Y*			*N*	
Storage		*1*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*1*	*0*
Configuration		*LR*			*LTR*	

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LT*			*LTR*			*LR*	
v (veh/h)	*60*			*67*			*801*	
C (m) (veh/h)	*601*			*104*			*217*	
v/c	*0.10*			*0.64*			*3.69*	
95% queue length	*0.33*			*3.21*			*76.91*	
Control Delay (s/veh)	*11.7*			*87.8*			*1255*	
LOS	*B*			*F*			*F*	
Approach Delay (s/veh)	--	--	*87.8*			*1255*		
Approach LOS	--	--	*F*			*F*		

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TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*AJM*
Agency/Co.	*AECOM*
Date Performed	*8/2/2013*
Analysis Time Period	*A.M. Peak Hour*

Site Information

Intersection	*Broad Street & I-80 WB Ramps*
Jurisdiction	
Analysis Year	*No Build 2045*

Project Description *Interstate 80 Reconstruction*

East/West Street: *I-80 WB Ramps* | North/South Street: *Broad Street (SR 191)*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*177*	*733*			*219*	*296*
Peak-Hour Factor, PHF	*0.78*	*0.78*	*1.00*	*1.00*	*0.88*	*0.84*
Hourly Flow Rate, HFR (veh/h)	*226*	*939*	*0*	*0*	*248*	*352*
Percent Heavy Vehicles	*2*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LT*					*TR*
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)				*75*		*285*
Peak-Hour Factor, PHF	*1.00*	*1.00*	*1.00*	*0.83*	*1.00*	*0.88*
Hourly Flow Rate, HFR (veh/h)	*0*	*0*	*0*	*90*	*0*	*323*
Percent Heavy Vehicles	*0*	*0*	*0*	*3*	*0*	*3*
Percent Grade (%)		*0*			*-1*	
Flared Approach		*N*			*Y*	
Storage		*0*			*2*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration					*LR*	

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LT*			*LR*				
v (veh/h)	*226*			*413*				
C (m) (veh/h)	*736*			*213*				
v/c	*0.31*			*1.94*				
95% queue length	*1.30*			*30.14*				
Control Delay (s/veh)	*12.0*			*476.9*				
LOS	*B*			*F*				
Approach Delay (s/veh)	--	--	*476.9*					
Approach LOS	--	--	*F*					

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TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*AJM*
Agency/Co.	*AECOM*
Date Performed	*8/2/2013*
Analysis Time Period	*P.M. Peak Hour*

Site Information

Intersection	*Broad Street & I-80 WB Ramps*
Jurisdiction	
Analysis Year	*No Build 2045*

Project Description *Interstate 80 Reconstruction*

East/West Street: *I-80 WB Ramps* | North/South Street: *Broad Street (SR 191)*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*300*	*616*			*545*	*490*
Peak-Hour Factor, PHF	*0.72*	*0.92*	*1.00*	*1.00*	*0.94*	*0.83*
Hourly Flow Rate, HFR (veh/h)	*416*	*669*	*0*	*0*	*579*	*590*
Percent Heavy Vehicles	*1*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LT*					*TR*
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)				*119*		*441*
Peak-Hour Factor, PHF	*1.00*	*1.00*	*1.00*	*0.79*	*1.00*	*0.91*
Hourly Flow Rate, HFR (veh/h)	*0*	*0*	*0*	*150*	*0*	*484*
Percent Heavy Vehicles	*0*	*0*	*0*	*3*	*0*	*1*
Percent Grade (%)		*0*			*-1*	
Flared Approach		*N*			*Y*	
Storage		*0*			*2*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration					*LR*	

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LT*			*LR*				
v (veh/h)	*416*			*634*				
C (m) (veh/h)	*461*			*16*				
v/c	*0.90*			*39.63*				
95% queue length	*9.99*			*80.21*				
Control Delay (s/veh)	*51.3*			*17839*				
LOS	*F*			*F*				
Approach Delay (s/veh)	--	--	*17839*					
Approach LOS	--	--	*F*					

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I-80 Reconstruction – Interchange 303 to Interchange 307

Alternative Build Condition - Volume Growth

Design-year peak hour traffic volumes (2045) were developed for **Alternative A, B, C, F, and G** utilizing a two percent yearly growth rate on mainline sections and mainline ramps.

The yearly traffic growth of 2% was not applied to local routes – under the build alternatives, the mainline ramp volume increases were assigned to carry through the local network.

Alternative Build Condition - Volume Assignment

Volumes were assigned for Alternative A, B, C, F, and G using the design year traffic volume projections combined with the volume reassignment matrix (by segment/ramp) as seen below. Alternative A includes removal of existing ramps as well as proposed new ramps that currently are not provided for. Traffic volume assignments for proposed new ramps in Alternative A were developed considering both the removal of ramps and regional traffic patterns and current congested areas.

In addition, the I-80 Origin-Destination Study completed in April 2005 (McCormick Taylor) was referenced to use existing interchange-to-interchange travel patterns where possible in the traffic reassignment to new/removed ramp facilities. The relevant tables from the O-D study are also attached for reference.

Detailed information on the traffic assignments for Alternative A is provided below.

Interchange 303

The volumes for Interchange 303 were modified to consider additional traffic reassigned from existing volumes that currently utilizes:

- Interchange 302 (PA33) to access PA 611 (to/from large retail developments on PA611 just west of Interchange 303 area)
- Bridge Street to access PA611 (to/from south direction)
- Interchange 305 (W Main St) westbound exit to access PA611

The volumes were assigned to the concept of Route 611 (and Stroud mall area) bound traffic having new entrance access to eastbound I-80 and exit access from westbound I-80. Existing congestion at Interchange 302 just west of the project area was considered when assigning volumes to the new Interchange 303 configuration which provides a full movement interchange and also provides for all movements at the interchange terminus at *Route* 611.

Interchange 304

The volumes for Interchange 304 under the alternative scenarios include I-80 eastbound and westbound traffic to/from US209, as well as West Main Street (via US209 Northbound and Southbound access). The volumes were assigned to consider additional traffic reassigned from existing volumes that currently utilizes:

- Interchange 305 (W Main St access – eastbound ramps at Interchange 305 to be eliminated; most traffic expected to utilize proposed US209 access ramps)
- Interchange 302 (PA33) to access PA 611 (to/from large retail developments on PA611 just west of Interchange 303 area)
- Bridge Street to access PA611 (to/from south direction)

The proposed I-80 westbound flyover ramp access from US209 northbound volume was determined using traffic patterns from the 2005 O-D study for existing vehicles traveling northbound US209 and exiting at the existing Interchange 305 eastbound exit ramp.

New ramps at Interchange 304 also consider traffic that utilizes Business Route 209 to/from the south and Bridge Street to PA Route 611 and the Stroud Mall area.

Interchange 305

The volumes for Interchange 305 were modified to consider the elimination of eastbound access ramps under the proposed alternative scenarios, along with traffic reassigned from westbound access that will potentially utilize the Interchange 303 proposed westbound exit. The volumes for Interchange 305 were modified to consider additional traffic reassigned from existing volumes that currently utilize:

- Interchange 305 to access West Main Street (westbound access will be maintained, eastbound access to be eliminated)
- Bridge Street to access PA611 (to/from south direction)
- Interchange 305 (W Main St) westbound exit to access PA611

Interchange 306

The volumes for Interchange 306 were modified to consider additional traffic reassigned from existing volumes that currently utilizes:

- Interchange 305 to access West Main Street from eastbound exit (to be eliminated) – reassigned volume portion to Interchange 306 exit ramp to Dreher Ave
- Interchange 305 to access West Main Street from eastbound entrance (to be eliminated) – reassigned volume portion to Interchange 306 entrance ramp from Dreher Ave

Interchange 307

The volumes for Interchange 307 were modified to consider additional traffic reassigned from existing volumes that currently utilizes:

- Interchange 307 (at Park Avenue) to access I-80 eastbound (ramp to be eliminated) - reassigned volume portion to proposed Interchange 307 (Broad Street) entrance ramp to I-80 eastbound

Table 1 – 2045 Build AM Peak Hour Volumes – Freeway Segments

Location	No Build	Build Option A	Build Option B	Build Option C	Build Option F	Build Option G
I-80 EB between Int. 302 and 303	2857	2689	2689	2689	2689	2689
I-80 EB between Int. 303 and 304	2546	2473	2473	2473	2473	2473
I-80 EB between Int. 304 and 305	4118	Vw 2347, Vnw 2985	Vw 2347, Vnw 2985	Vw 2347, Vnw 2985	Vw 2347, Vnw 2985	Vw 2347, Vnw 2985
I-80 EB between Int. 305 and 306	4048					
I-80 EB between Int. 306 and 307	4267	Vnw 4971, Vw 1007	Vnw 4971, Vw 1007	Vnw 4971, Vw 1007	Vnw 4971, Vw 1007	Vnw 4971, Vw 1007
I-80 EB between Int. 307 and 308		Vnw 3421, Vw 1377	Vnw 3421, Vw 1377	Vnw 3421, Vw 1377	Vnw 3421, Vw 1377	Vnw 3421, Vw 1377
I-80 WB between Int. 308 to Int. 307		Vnw 2923, Vw 1004	Vnw 2923, Vw 1004	Vnw 2923, Vw 1004	Vnw 2923, Vw 1004	Vnw 2923, Vw 1004
I-80 WB between Int. 307 and 306	3240	3240	3240	3240	3240	3240
I-80 WB between Int. 306 and 305	3106	3106	3106	3106	3106	3106
I-80 WB between Int. 305 Diverge and 304 Diverge	-	-	2927	2927	-	-
I-80 WB Ramp/Auxiliary Int. 305 to Int. 304	Vnw 2710, Vw 1371	Vnw 1327, Vw 363	-	-	-	-
I-80 WB between Int. 305 and 304	3149	1798	1798	1798	1798	1798
I-80 WB between Int. 305 Merge and 304 Merge	-	-	1994	-	1994	-
I-80 WB Ramp/Auxiliary Int. 304 to Int. 303 Exit	-	Vnw 272 Vw 241	Vnw 272 Vw 241	Vnw 272 Vw 241	Vnw 272 Vw 241	Vnw 272 Vw 241
I-80 WB between Int. 304 and 303 (Mainline)	2126	2136	2136	2136	2136	2136
I-80 WB between Int. 303 and 302	2299	2309	2309	2309	2309	2309

X – Freeway Segment according to HCS+™

X – Weave according to HCS+™

Table 2 – 2045 Build PM Peak Hour Volumes – Freeway Segments

Location	No Build	Build Option A	Build Option B	Build Option C	Build Option F	Build Option G
I-80 EB between Int. 302 and 303	3622	3390	3390	3390	3390	3390
I-80 EB between Int. 303 and 304	3211	3305	3305	3305	3305	3305
I-80 EB between Int. 304 and 305	4657	Vnw 3758, Vw 2243	Vnw 3758, Vw 2243	Vnw 3758, Vw 2243	Vnw 3758, Vw 2243	Vnw 3758, Vw 2243
I-80 EB between Int. 305 and 306	4555					
I-80 EB between Int. 306 and 307	4743	Vnw 5172, Vw 911	Vnw 5172, Vw 911	Vnw 5172, Vw 911	Vnw 5172, Vw 911	Vnw 5172, Vw 911
I-80 EB between Int. 307 to Int. 308		Vnw 4493 Vw 1077	Vnw 4493 Vw 1077	Vnw 4493 Vw 1077	Vnw 4493 Vw 1077	Vnw 4493 Vw 1077
I-80 WB between Int. 308 to Int. 307		Vnw 6377 Vw 1774	Vnw 6377 Vw 1774	Vnw 6377 Vw 1774	Vnw 6377 Vw 1774	Vnw 6377 Vw 1774
I-80 WB between Int. 307 and 306	6750	6750	6750	6750	6750	6750
I-80 WB between Int. 306 and 305	6447	6447	6447	6447	6447	6447
I-80 WB between Int. 305 Diverge and 304 Diverge	-	-	6070	6070	-	-
I-80 WB Ramp/Auxiliary Int. 305 to Int. 304	Vnw 5705 Vw 2540	Vnw 2595, Vw 677	-	-	-	-
I-80 WB between Int. 305 and 304	6470	3865	3865	3865	3865	3865
I-80 WB between Int. 305 Merge and 304 Merge	-	-	4225	-	4225	-
I-80 WB Ramp/Auxiliary Int. 304 to Int. 303 Exit	-	Vnw 427, Vw 447	Vnw 427, Vw 447	Vnw 427, Vw 447	Vnw 427, Vw 447	Vnw 427, Vw 447
I-80 WB between Int. 303 and 304 (Mainline)	4468	4414	4414	4414	4414	4414
I-80 WB between Int. 302 and 303	4791	4736	4736	4736	4736	4736

X – LOS (Freeway Segment) according to HCS+™
X – LOS (Weave) according to HCS+™

Table 3 – 2045 Build AM Peak Hour Volumes – Ramp Merges						
Location	**No Build**	**Build Option A**	**Build Option B**	**Build Option C**	**Build Option F**	**Build Option G**
I-80 EB Int. 303 from Rt. 611	-	170	170	170	173	173
I-80 EB Int. 304 from Rt. 209	1572	-	-	-	-	-
I-80 EB Int. 305 from W. Main St.	324	-	-	-	-	-
I-80 EB Int. 306 from Dreher Ave.	219	-	-	-	-	-
I-80 EB Int. 307 from Park Ave.	219	-	-	-	-	-
I-80 WB Int. 303 from Rt. 611	173	173	173	173	173	173
I-80 WB Int. 304 from Rt. 209	-	338	142	142	142	142
I-80 WB Int. 305 from Main St	-	-	196	-	196	-
I-80 WB Int. 307 from Broad St.	473	-	-	-	-	-

Table 4 – 2045 Build PM Peak Hour Volumes – Ramp Merges						
Location	**No Build**	**Build Option A**	**Build Option B**	**Build Option C**	**Build Option F**	**Build Option G**
I-80 EB Int. 303 from Rt. 611	-	239	239	239	322	322
I-80 EB Int. 304 from Rt. 209	1445	-	-	-	-	-
I-80 EB Int. 305 from W. Main St.	369	-	-	-	-	-
I-80 EB Int. 306 from Dreher Ave.	188	-	-	-	-	-
I-80 EB Int. 307 from Park Ave.	264	-	-	-	-	-
I-80 WB Int. 303 from Rt. 611	322	322	322	322	322	322
I-80 WB Int. 304 from Rt. 209	-	548	188	188	188	188
I-80 WB Int. 305 from Main St	-	-	360	-	360	-
I-80 WB Int. 307 from Broad St.	790	-	-	-	-	-

Table 5 – 2045 Build AM Peak Hour Volumes – Ramp Diverges						
Location	**No Build**	**Build Option A**	**Build Option B**	**Build Option C**	**Build Option F**	**Build Option G**
I-80 EB Int. 303 to Rt. 611	311	386	243	386	386	386
I-80 EB Int. 305 to W. Main St.	394	-	-	-	-	-
I-80 EB Int. 307 to Park Ave.	718	-	-	-	-	-
I-80 WB Int. 304 to Rt. 209	-	-	1129	1129	-	-
I-80 WB Int. 305 to W. Main St.	285	1308	179	179	179	179
I-80 WB Int. 306 to Dreher Ave.	134	134	134	134	134	134
I-80 WB Int. 307 to Broad St.	360	-	-	-	-	-

Table 6 – 2045 Build PM Peak Hour Volumes – Ramp Diverges						
Location	**No Build**	**Build Option A**	**Build Option B**	**Build Option C**	**Build Option F**	**Build Option G**
I-80 EB Int. 303 to Rt. 611	411	544	324	544	544	544
I-80 EB Int. 305 to W. Main St.	471	-	-	-	-	-
I-80 EB Int. 307 to Park Ave.	648	-	-	-	-	-
I-80 WB Int. 304 to Rt. 209	-	-	2205	2205	-	-
I-80 WB Int. 305 to W. Main St.	580	2582	377	377	377	377
I-80 WB Int. 306 to Dreher Ave.	303	303	303	303	303	303
I-80 WB Int. 307 to Broad St.	560	-	-	-	-	-

Table 7 - 2045 Build AM Peak Hour Volumes - Ramp Terminus Intersections						
Intersection	**No Build**	**Build Option 1A**	**Build Option 1B**	**Build Option 1C**	**Build Option 1F**	**Build Option 1G**
Int. 303 – Heller Dr Connector and I-80 EB Ramps (Unsignalized)	-	413	413	413	413	413
Int. 303 – Heller Dr Connector and I-80 WB Ramps (Unsignalized)	-	692	692	692	-	692
Int 303 - Heller Dr Connector and PA611 (Alts 1A-1C, Signalized)	-	1657	1657	1657	-	-
Int 303 – Loop Access Rd and PA611 (Alts F & G, Signalized)	-	-	-	-	1622	1622
Int 304 – I-80 EB Off Ramp/US209 SB On Ramp and W. Main St	-	960	960	960	960	960
Int 304 – I-80 EB On Ramp /US209 NB Off Ramp and W. Main St	-	1050	1050	1050	1050	1050
Int. 305 – W. Main St. and I-80 EB Ramps (Unsignalized)	1342	-	-	-	-	-
Int. 305 – W. Main St. and I-80 WB Ramps	980	1042	1042	1042	1042	1042
Int. 306 – Dreher Ave. and I-80 EB On Ramp (+ Off Ramp, Alts A-G) (Unsignalized)	555	744	744	744	744	744
Int. 307A – Park Ave. and I-80 EB Ramp (Unsignalized)	1122	903	903	-	903	903
Int. 307A – Lennox Ave. and I-80 EB Ramp	-	-	-	941	-	-
Int. 307B – Broad St. and I-80 WB Ramps	1338	1338	1338	1338	1338	1338
Int. 307B – Broad St. and I-80 EB Ramp (Unsignalized)	-	905	905	905	905	905

Table 8 - 2045 Build PM Peak Hour Volumes - Ramp Terminus Intersections						
Intersection	**No Build**	**Build Option 1A**	**Build Option 1B**	**Build Option 1C**	**Build Option 1F**	**Build Option 1G**
Int. 303 – Heller Dr Connector and I-80 EB Ramps (Unsignalized)	-	563	563	563	563	563
Int. 303 – Heller Dr Connector and I-80 WB Ramps (Unsignalized)	-	1089	1089	1089	-	1089
Int 303 - Heller Dr Connector and PA611 (Alts 1A-1C, Signalized)	-	2492	2492	2492	-	-
Int 303 – Loop Access Rd and PA611 (Alts F & G, Signalized)	-	-	-	-	2202	2202
Int 304 – I-80 EB Off Ramp/US209 SB On Ramp and W. Main St	-	1445	1445	1445	1445	1445
Int 304 – I-80 EB On Ramp /US209 NB Off Ramp and W. Main St	-	1529	1529	1529	1529	1529
Int. 305 – W. Main St. and I-80 EB Ramps (Unsignalized)	1877	-	-	-	-	-
Int. 305 – W. Main St. and I-80 WB Ramps	1947	1677	1677	1677	1677	1677
Int. 306 – Dreher Ave. and I-80 EB On Ramp (+ Off Ramp, Alts A-G) (Unsignalized)	533	747	747	747	747	747
Int. 307A – Park Ave. and I-80 EB Ramp (Unsignalized)	1286	1003	1003	-	1003	1003
Int. 307A – Lennox Ave. and I-80 EB Ramp	-	-	-	1053	-	-
Int. 307B – Broad St. and I-80 WB Ramps	1966	1966	1966	1966	1966	1966
Int. 307B – Broad St. and I-80 EB Ramp (Unsignalized)	-	1218	1218	1218	1218	1218

I-80 RECONSTRUCTION
Alt 1A AM Peak

I-80 SEGMENT / RAMP	DIR	ANALYSIS TYPE	EXISTING 2013 VOLUME	EXISTING ALT 1A VOLUME	NOTES	GROWTH RATE	ALT 1A 2025 VOLUME	ALT 1A 2045 VOLUME	ASSIGN TO OTHER ROADWAYS
Eastbound I-80 (West of Int 303)	EB	FREEWAY SEGMENT	1516	1427	Balance from West	0.02	1810	2689	
Int 303 (EB Exit to PA611 Connector)	EB	DIVERGE	165	129	(Int 303 EB Exit) - (Int 304 (US209SB Exit to Main St Bus 209)) + (20% of 33% Int 302 EB Exit - Use Right Turn Vol onto PA611)	0.02	164	243	
Int 303 (EB Entrance from PA611 Connector)	EB	MERGE	-	90	(10% Int 305 EB Entrance) + (33% Int 302 EB Entrance - Use Left Turn Vol onto PA33)	0.02	114	170	
Eastbound I-80 (between Int 303 - Int 304)	EB	FREEWAY SEGMENT	1351	1388	Balance from West	0.02	1760	2616	
Int 304 (EB Exit to US209) (ALT 1A)	EB	DIVERGE	-	26	(Int 303 EB Exit - 22% of EB Right Turn Volume at Bridge St/PA611 bound to Bus209/Shafer Rd, % estimated from ADT ratio PA611 to Bridge St) + (50% Int 305 EB Exit Left Turns)	0.02	33	49	
Int 304 (EB Exit to Main St Bus 209)	EB	DIVERGE	-	50	(Int 305 EB Exit - Use 50% Left Turns + 20% Right Turns)	0.02	63	94	
Int 304 (EB Entrance from Main St Bus 209)	EB	MERGE	-	138	(80% Int 305 EB Entrance)	0.02	175	260	
Int 304 (EB Entrance from US209)	EB	MERGE	834	779	(Int 304 EB Entrance) - (Int 304 NB Bus 209 Exit)	0.02	988	1468	
Int 304 (US209SB Entrance from Main St Bus 209)	SB	MERGE	-	70	(40.3% Int 305 WB Entrance - from O-D heads US209 SB)	0.02	89	132	
Int 304 (US209NB Exit to Main St Bus 209)	NB	DIVERGE		55	(Int 305 EB Exit - Use 30% Right Turns - Approx 25% of 34.2% shown in O-D Study)	0.02	70	104	
Eastbound I-80 (between Int 304 - Int 305)	EB	FREEWAY SEGMENT	2185	2229	Balance from West	0.02	2827	4201	
Int 305 (EB Exit to Main St Bus 209) [Int 305 ELIMINATED]	EB	DIVERGE	209	-	Reassigned to Int 303 (EB Exit), Int 304 (EB Exit), Int 306 (EB Exit) - and according to O-D Figure 14	0.02	-	-	
Int 305 (EB Entrance from Main St Bus 209) [Int 305 ELIMINATED]	EB	MERGE	172	-	Reassigned to Int 303 (EB On Ramp), Int 304 (EB On-ramp) and Int 306 (EB On Ramp)	0.02	-	-	
Eastbound I-80 (between Int 305 - Int 306)	EB	FREEWAY SEGMENT	2148	2229	Balance from West	0.02	2827	4201	
Int 306 (EB Exit to Dreher Ave) (ALT 1A)	EB	DIVERGE	-	91	(50% Int 305 EB Exit Right turn - Note: includes 10% of 34.2% of O-D Study)	0.02	115	171	
Int 306 (EB Entrance from Dreher Ave)	EB	MERGE	116	126	(Int 306 EB Ent) + (50% Left Turns Int 305 Entrance onto Ramp)	0.02	160	237	
Eastbound I-80 (between Int 306 - Int 307)	EB	FREEWAY SEGMENT	2264	2264	Balance from West	0.02	2871	4267	
Int 307A (EB Exit to Park Ave)	EB	DIVERGE	381	381	Constant	0.02	483	718	
Int 307A (EB Entrance from Park Ave)	EB	MERGE	116	-	Reassigned to Int 307B	0.02	-	-	
Eastbound I-80 (between Int 307A - Int 307B) (ALT)	EB	FREEWAY SEGMENT	-	1883	Balance from West	0.02	2388	3549	
Int 307B (EB Entrance from PA191) (ALT)	EB	MERGE	-	116	Reassigned volume from eliminated Int 307A EB Entrance Ramp	0.02	147	219	
Eastbound I-80 (East of Int 307)	EB	FREEWAY SEGMENT	1999	1999	Balance from West	0.02	2535	3767	
Westbound I-80 (East of Int 307)	WB	FREEWAY SEGMENT	1659	1659	Balance from West	0.02	2104	3126	
Int 307B (WB Exit to PA191)	WB	DIVERGE	191	191	Constant	0.02	242	360	
Int 307B (WB Entrance from PA191)	WB	MERGE	251	251	Constant	0.02	318	473	
Westbound I-80 (between Int 306 - Int 307)	WB	FREEWAY SEGMENT	1719	1719	Balance from West	0.02	2180	3240	
Int 306 (WB Exit to Dreher Ave)	WB	DIVERGE	71	71	Constant	0.02	90	134	
Westbound I-80 (between Int 305 - Int 306)	WB	FREEWAY SEGMENT	1648	1648	Balance from West	0.02	2090	3106	
Int 305 (WB Exit to Main St)	WB	DIVERGE	151	95	(Int 305 WB Exit) - (Int 303 WB to PA611)	0.02	120	179	
Int 305 (WB Entrance from Main St)	WB	MERGE	174	104	(Int 305 WB Entrance) - (Int 304 US209SB Entrance from Main St Bus 209)	0.02	132	196	
Westbound I-80 (between Int 304 - Int 305)	WB	FREEWAY SEGMENT	1671	1657	Balance from West	0.02	2101	3123	
Int 304 (WB Exit to US209)	WB	DIVERGE	543	543	Constant	0.02	689	1023	
Int 304 (WB Entrance from US209) (ALT)	WB	MERGE	-	75	(80% of 33% Int 302 Right Turns at PA611) + (O-D Fig 13 - 11.9% US209NB to Exit 305 ~92 veh - 20% west on Main Bus 209)	0.02	95	142	
Westbound I-80 (between Int 303 - Int 304)	WB	FREEWAY SEGMENT	1128	1189	Balance from West	0.02	1508	2241	
Int 303 (WB Exit to PA611) (ALT)	WB	DIVERGE	-	56	(5% Int 302 WB Exit Right Turn to PA611) + (30% Int 305 WB Exit - note 89% head west Bus209 PM Peak)	0.02	71	106	
Int 303 (WB Entrance from PA611)	WB	MERGE	92	92	Constant	0.02	117	173	
Westbound I-80 (West of Int 303)	WB	FREEWAY SEGMENT	1220	1225	Balance from West	0.02	1554	2309	

PA-611/Bridge Street	NB	NBL	108	
	EB	EBR	59	

PA-611/PA-33 (Just North of Interchange 302)		RIGHT TURN	210	
		LEFT TURN	221	

*Note 2013 Volumes developed using actual 2004-2013 growth on EB/WB mainline (11.5% EB, 7.9% WB)

Int 302 SUPPLEMENTAL DATA - Taken from I-80 Corridor Study			2004	2013
Int 302 (EB I-80 Exit to NB PA33 / PA611)			140	156
Int 302 (EB I-80 Entrance from SB PA33 / PA611)			346	386
Int 302 (WB I-80 Exit to NB PA33 / PA611)			531	573
Int 302 (WB I-80 Entrance from SB PA33 / PA611)			224	242

I-80 RECONSTRUCTION
Alt 1A PM Peak

I-80 SEGMENT / RAMP	DIR	ANALYSIS TYPE	EXISTING 2013 VOLUME	EXISTING ALT 1A VOLUME	NOTES	GROWTH RATE	ALT 1A 2025 VOLUME	ALT 1A 2045 VOLUME	ASSIGN TO OTHER ROADWAYS
Eastbound I-80 (West of Int 303)	EB	FREEWAY SEGMENT	1922	1799	Balance from West	0.02	2282	3390	
Int 303 (EB Exit to PA611 Connector)	EB	DIVERGE	218	172	(Int 303 EB Exit) - (Int 304 (US209SB Exit to Main St Bus 209)) + (20% of 33% Int 302 EB Exit - Use Right Turn Vol onto PA611)	0.02	218	324	
Int 303 (EB Entrance from PA611 Connector)	EB	MERGE	-	127	(10% Int 305 EB Entrance) + (33% Int 302 EB Entrance - Use Left Turn Vol onto PA33)	0.02	161	239	
Eastbound I-80 (between Int 303 - Int 304)	EB	FREEWAY SEGMENT	1704	1754	Balance from West	0.02	2224	3305	
Int 304 (EB Exit to US209) (ALT 1A)	EB	DIVERGE	-	51	(Int 303 EB Exit - 22% of EB Right Turn Volume at Bridge St/PA611 bound to Bus209/Shafer Rd, % estimated from ADT ratio PA611 to Bridge St) + (50% Int 305 EB Exit Left Turns)	0.02	65	96	
Int 304 (EB Exit to Main St Bus 209)	EB	DIVERGE	-	66	(Int 305 EB Exit - Use 50% Left Turns + 20% Right Turns)	0.02	84	124	
Int 304 (EB Entrance from Main St Bus 209)	EB	MERGE	-	157	(80% Int 305 EB Entrance)	0.02	199	296	
Int 304 (EB Entrance from US209)	EB	MERGE	767	708	(Int 304 EB Entrance) - (Int 304 NB Bus 209 Exit)	0.02	898	1334	
Int 304 (US209SB Entrance from Main St Bus 209)	SB	MERGE	-	129	(40.3% Int 305 WB Entrance - from O-D heads US209 SB)	0.02	164	243	
Int 304 (US209NB Exit to Main St Bus 209)	NB	DIVERGE		59	(Int 305 EB Exit - Use 30% Right Turns - Approx 25% of 34.2% shown in O-D Study)	0.02	75	111	
Eastbound I-80 (between Int 304 - Int 305)	EB	FREEWAY SEGMENT	2471	2502	Balance from West	0.02	3173	4715	
Int 305 (EB Exit to Main St Bus 209) [Int 305 ELIMINATED]	EB	DIVERGE	250	-	Reassigned to Int 303 (EB Exit), Int 304 (EB Exit), Int 306 (EB Exit) - and according to O-D Figure 14	0.02	-	-	
Int 305 (EB Entrance from Main St Bus 209) [Int 305 ELIMINATED]	EB	MERGE	196	-	Reassigned to Int 303 (EB On Ramp), Int 304 (EB On-ramp) and Int 306 (EB On Ramp)	0.02	-	-	
Eastbound I-80 (between Int 305 - Int 306)	EB	FREEWAY SEGMENT	2417	2502	Balance from West	0.02	3173	4715	
Int 306 (EB Exit to Dreher Ave) (ALT 1A)	EB	DIVERGE	-	99	(50% Int 305 EB Exit Right turn - Note: includes 10% of 34.2% of O-D Study)	0.02	126	187	
Int 306 (EB Entrance from Dreher Ave)	EB	MERGE	100	114	(Int 306 EB Ent) + (50% Left Turns Int 305 Entrance onto Ramp)	0.02	145	215	
Eastbound I-80 (between Int 306 - Int 307)	EB	FREEWAY SEGMENT	2517	2517	Balance from West	0.02	3192	4743	
Int 307A (EB Exit to Park Ave)	EB	DIVERGE	344	344	Constant	0.02	436	648	
Int 307A (EB Entrance from Park Ave)	EB	MERGE	140	-	Reassigned to Int 307B	0.02	-	-	
Eastbound I-80 (between Int 307A - Int 307B) (ALT)	EB	FREEWAY SEGMENT	-	2173	Balance from West	0.02	2756	4095	
Int 307B (EB Entrance from PA191) (ALT)	EB	MERGE	-	140	Reassigned volume from eliminated Int 307A EB Entrance Ramp	0.02	178	264	
Eastbound I-80 (East of Int 307)	EB	FREEWAY SEGMENT	2313	2313	Balance from West	0.02	2933	4359	
Westbound I-80 (East of Int 307)	WB	FREEWAY SEGMENT	3460	3460	Balance from West	0.02	4388	6521	
Int 307B (WB Exit to PA191)	WB	DIVERGE	297	297	Constant	0.02	377	560	
Int 307B (WB Entrance from PA191)	WB	MERGE	419	419	Constant	0.02	531	790	
Westbound I-80 (between Int 306 - Int 307)	WB	FREEWAY SEGMENT	3582	3582	Balance from West	0.02	4543	6750	
Int 306 (WB Exit to Dreher Ave)	WB	DIVERGE	161	161	Constant	0.02	204	303	
Westbound I-80 (between Int 305 - Int 306)	WB	FREEWAY SEGMENT	3421	3421	Balance from West	0.02	4339	6447	
Int 305 (WB Exit to Main St)	WB	DIVERGE	308	200	(Int 305 WB Exit) - (Int 303 WB to PA611)	0.02	254	377	
Int 305 (WB Entrance from Main St)	WB	MERGE	320	191	(Int 305 WB Entrance) - (Int 304 US209SB Entrance from Main St Bus 209)	0.02	242	360	
Westbound I-80 (between Int 304 - Int 305)	WB	FREEWAY SEGMENT	3433	3412	Balance from West	0.02	4327	6430	
Int 304 (WB Exit to US209)	WB	DIVERGE	1062	1062	Constant	0.02	1347	2001	
Int 304 (WB Entrance from US209) (ALT)	WB	MERGE	-	100	(80% of 33% Int 302 Right Turns at PA611) + (O-D Fig 13 - 11.9% US209NB to Exit 305 ~92 veh - 20% west on Main Bus 209)	0.02	127	188	
Westbound I-80 (between Int 303 - Int 304)	WB	FREEWAY SEGMENT	2371	2450	Balance from West	0.02	3107	4617	
Int 303 (WB Exit to PA611) (ALT)	WB	DIVERGE	-	108	(5% Int 302 WB Exit Right Turn to PA611) + (30% Int 305 WB Exit - note 89% head west Bus209 PM Peak)	0.02	137	204	
Int 303 (WB Entrance from PA611)	WB	MERGE	171	171	Constant	0.02	217	322	
Westbound I-80 (West of Int 303)	WB	FREEWAY SEGMENT	2542	2513	Balance from West	0.02	3187	4736	

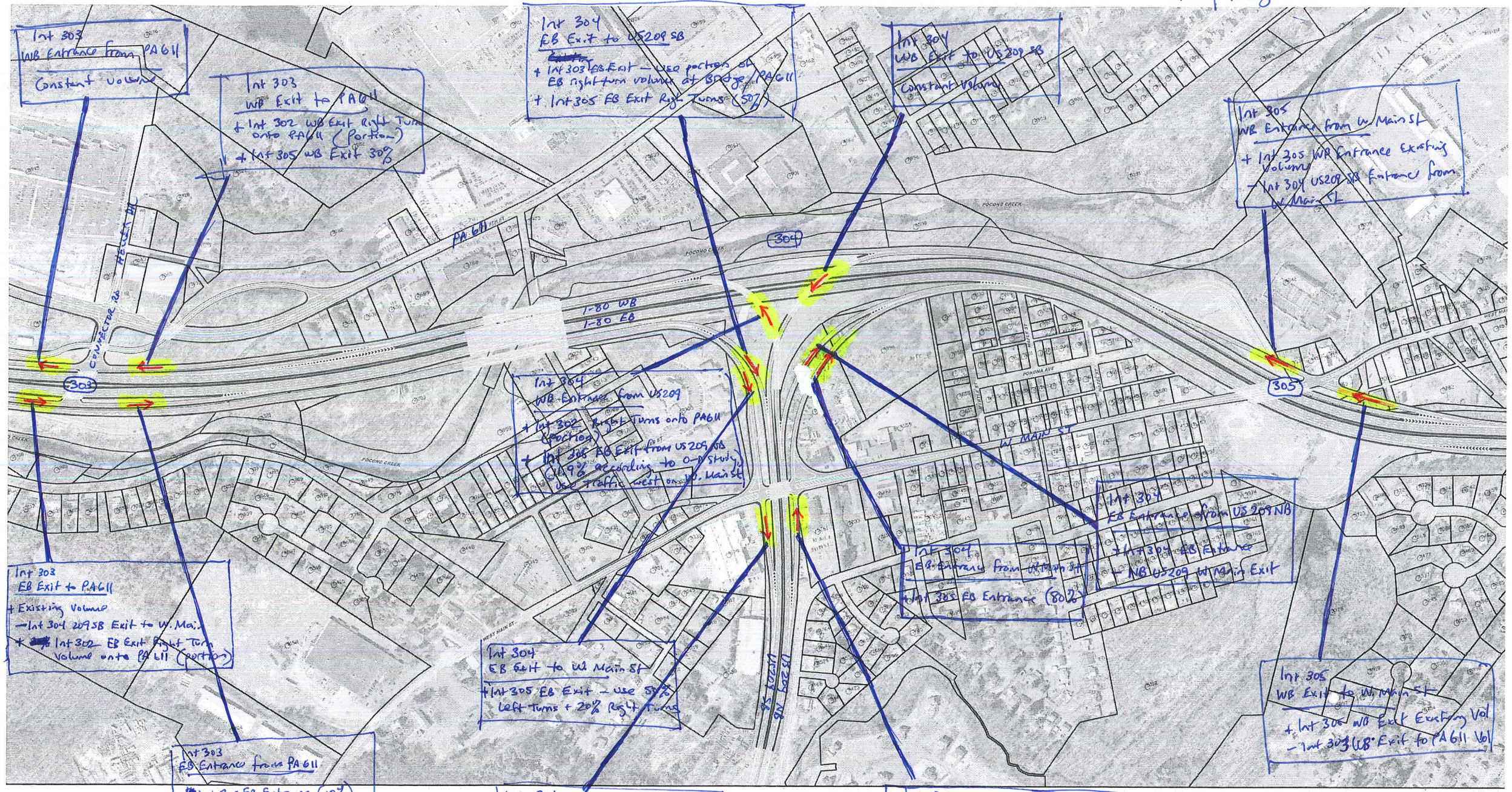
PA-611/Bridge Street	NB	NBL	193	
	EB	EBR	112	

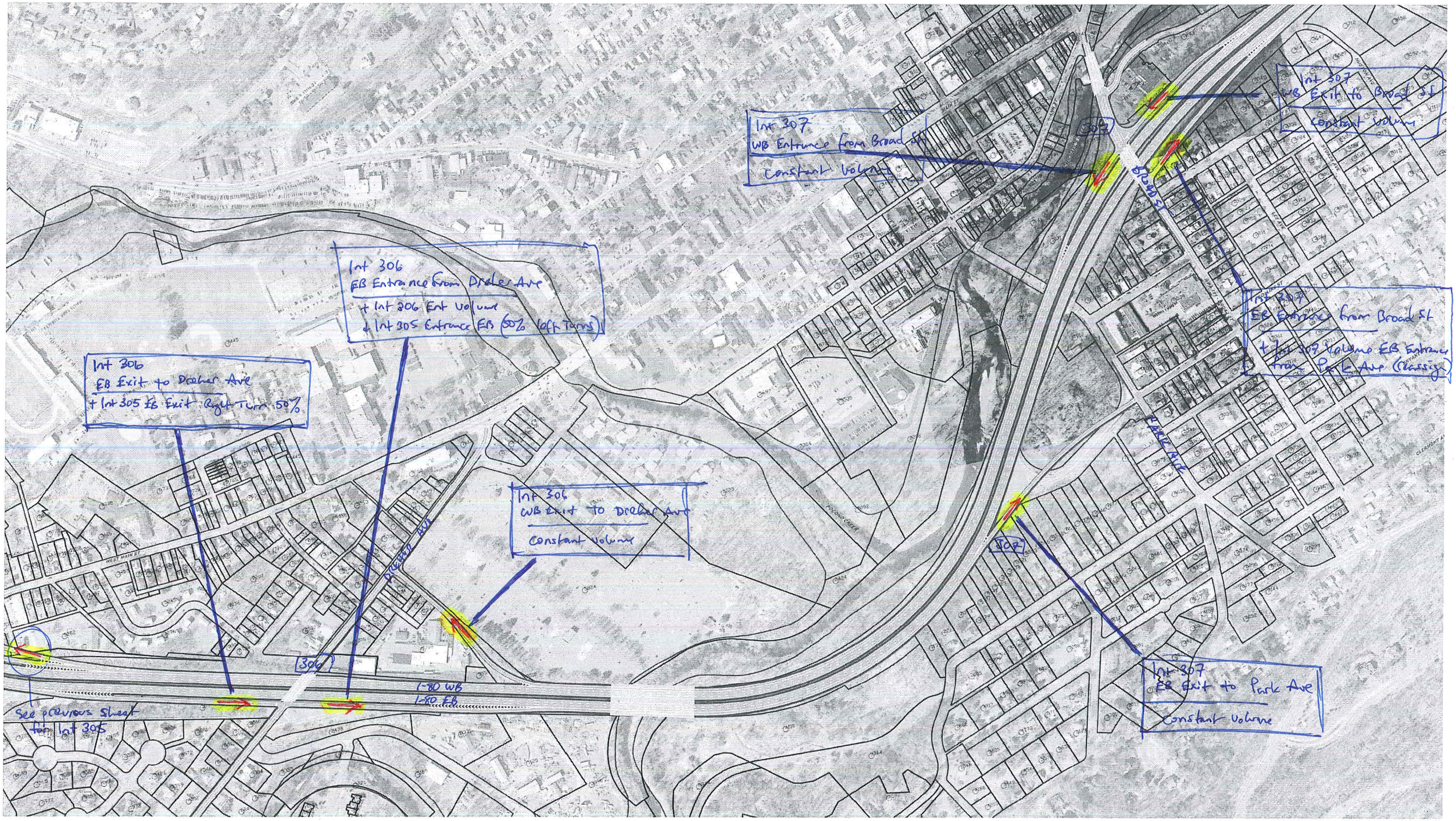
PA-611/PA-33 (Just North of Interchange 302)		RIGHT TURN	309	
		LEFT TURN	326	

*Note 2013 Volumes developed using actual 2004-2013 growth on EB/WB mainline (11.5% EB, 7.9% WB)

Int 302 SUPPLEMENTAL DATA - Taken from I-80 Corridor Study			2004	2013
Int 302 (EB I-80 Exit to NB PA33 / PA611)			140	156
Int 302 (EB I-80 Entrance from SB PA33 / PA611)			346	386
Int 302 (WB I-80 Exit to NB PA33 / PA611)			531	573
Int 302 (WB I-80 Entrance from SB PA33 / PA611)			224	242

I-80 Reconstruction
Ramp Assignment Scenarios




Int 306
EB Exit to Dealer Ave
+ Int 305 EB Exit Right Turn 50%
Int 306
EB Entrance from Dealer Ave
+ Int 306 Ext Volume
+ Int 305 Entrance EB (60% Left Turns)
Int 306
WB Exit to Dealer Ave
Constant Volume
Int 307
WB Entrance from Broad St
Constant Volume
Int 307
WB Exit to Broad St
Constant Volume
Int 307
EB Entrance from Broad St
+ Int 307 Volume EB Entrance from Park Ave (Classic)
Int 307
EB Exit to Park Ave
Constant Volume
See previous sheet for Int 305
306
307
I-80 WB
I-80 EB
DEALERS AVE
BROAD ST
PARK AVE
WEST MAIN ST

Distribution Percentages of Entering Westbound Traffic

From:	To: Intchg	Exits 310	309	308	307	306	305	304	302	299	298	Main	Total
Entrances	Tolls	4.1%	12.6%	7.0%	5.9%	2.3%	4.4%	11.4%	8.0%	8.7%	6.5%	28.9%	100%
	310		13.0%	14.4%	7.3%	4.0%	7.9%	16.8%	11.1%	10.6%	6.3%	8.6%	100%
	309			9.7%	10.3%	4.4%	8.9%	25.5%	11.3%	12.7%	4.9%	12.3%	100%
	308				10.2%	4.8%	8.9%	29.3%	11.8%	13.4%	6.3%	15.3%	100%
	307					8.6%	9.5%	29.5%	13.7%	16.6%	6.7%	15.4%	100%
	305							40.3%	13.6%	15.5%	10.8%	19.8%	100%
	303								15.4%	31.6%	18.5%	34.4%	100%
	302									14.5%	10.2%	75.3%	100%
	302									23.7%	17.9%	58.4%	100%
	299										9.1%	90.9%	100%

Peak Hour Volumes of Entering Westbound Traffic

From:	To: Intchg	Exits 310	309	308	307	306	305	304	302	299	298	Main*	Total Volume
Entrances	Tolls	111	341	190	159	62	119	308	217	236	175	*781*	2698
	310		78	86	44	24	48	101	67	64	38	*52*	600
	309			79	84	36	73	208	93	104	40	*101*	818
	308				83	39	73	238	96	109	51	*125*	815
	307					47	52	162	75	91	37	*84*	548
	305							153	52	59	41	*75*	381
	303								33	67	39	*73*	213
	302									150	106	*779*	1034
	302									53	40	*131*	224
	299										25	*248*	273

** Italicized numbers refer to estimated values.*

Distribution Percentages of Entering Eastbound Traffic

From:	To: Intchg	Exits 299	302	302	303	305	307	308	309	310	Main	Total
Entrances	Main	6.4%	10.5%	1.9%	3.3%	3.2%	4.1%	5.3%	4.2%	1.9%	59.2%	100%
	298	4.1%	25.4%	3.0%	10.6%	7.6%	10.0%	10.3%	8.0%	4.6%	16.5%	100%
	299		14.1%	3.1%	11.3%	5.6%	11.2%	13.5%	11.4%	4.3%	25.6%	100%
	302			3.3%	10.1%	6.4%	15.2%	21.5%	14.7%	8.1%	20.8%	100%
	304					11.9%	21.1%	27.5%	24.4%	8.2%	6.7%	100%
	305						27.2%	30.0%	5.8%	13.7%	23.3%	100%
	306						26.5%	28.2%	21.8%	12.4%	11.1%	100%
	307							41.5%	10.1%	26.6%	21.7%	100%
	308								34.4%	29.4%	36.1%	100%
	309									40.0%	60.0%	100%
	310										100%	100%

Peak Hour Volumes of Entering Eastbound Traffic

	Intchg	Exits 299	302	302	303	305	307	308	309	310	Main	Total Volume
Entrances	Main	102	165	30	52	51	65	84	66	30	936	1581
	298	17	104	12	43	31	41	42	33	19	68	412
	299		132	28	105	52	105	126	106	40	239	934
	302			11	35	22	53	74	51	28	72	346
	304					105	185	242	214	72	59	877
	305						72	80	15	36	62	265
	306						29	31	24	14	12	111
	307							67	16	43	35	162
	308								122	104	128	354
	309									124	185	309
	310										*103**	0

** Italicized numbers refer to estimated values.*

Distribution Percentages of Exiting Westbound Traffic

From:	To: Intchg	310	309	308	307	306	305	304	302	299	298	Main
Entrances	Tolls	100%	79.9%	49.4%	40.5%	26.9%	29.9%	23.6%	31.3%	25.9%	31.5%	38.5%
	310		20.1%	24.7%	12.3%	11.4%	13.2%	8.5%	10.6%	7.7%	7.5%	2.8%
	309			25.9%	27.1%	19.9%	23.1%	20.2%	16.9%	14.4%	9.1%	6.3%
	308				20.2%	16.2%	17.4%	17.4%	13.3%	11.4%	8.8%	5.9%
	307					25.6%	16.4%	15.5%	13.5%	12.5%	8.2%	5.2%
	305							14.8%	9.4%	8.2%	9.4%	4.7%
	303								4.9%	7.7%	7.4%	3.8%
	302									7.8%	9.0%	18.1%
	302									4.5%	5.6%	5.0%
	299										3.6%	9.8%
Total		100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Peak Hour Volumes of Exiting Westbound Traffic

From:	To: Intchg	310	309	308	307	306	305	304	302	299	298	Main*
Entrances	Tolls	420	656	179	133	44	79	319	166	212	119	*830*
	310		166	89	41	18	35	115	56	63	28	*61*
	309			94	89	32	61	273	90	118	34	*136*
	308				67	26	46	236	71	93	33	*127*
	307					41	43	210	72	102	31	*112*
	305							200	50	67	35	*101*
	303								26	63	28	*81*
	302									64	34	*391*
	302									37	21	*107*
	299										14	*211*
Total		420	822	362	330	162	264	1353	531	820	378	2157

** Italicized numbers refer to estimated values.*

Distribution Percentages of Exiting Eastbound Traffic

From: \ To:	Intchg	Exits 299	302	302	303	305	307	308	309	310	Main
Entrances	Main	74.0%	28.7%	25.2%	14.4%	14.3%	7.5%	7.3%	6.9%	4.1%	39.3%
	298	26.0%	38.2%	21.5%	25.1%	18.3%	10.1%	7.8%	7.2%	5.5%	6.0%
	299		33.1%	34.6%	41.9%	21.1%	17.5%	16.0%	16.1%	8.0%	14.5%
	302			18.7%	18.7%	12.1%	11.9%	12.7%	10.4%	7.5%	5.9%
	304					34.2%	25.1%	24.8%	26.2%	11.6%	2.9%
	305						20.0%	16.7%	3.8%	11.9%	6.2%
	306						8.0%	6.4%	5.9%	4.4%	1.2%
	307							8.4%	2.4%	8.4%	2.1%
	308								21.0%	23.5%	8.9%
	309									15.0%	6.9%
	310										6.1%
Total		100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Peak Hour Volumes of Exiting Eastbound Traffic

	Intchg	Exits 299	302	302	303	305	307	308	309	310	Main
Entrances	Main	223	197	35	34	33	31	38	60	15	664
	298	79	262	30	60	43	42	41	63	20	101
	299		228	48	100	49	73	83	140	28	246
	302			26	45	28	49	66	90	27	100
	304					80	104	129	228	41	49
	305						83	87	33	43	105
	306						33	34	52	16	21
	307							44	21	30	36
	308								182	84	150
	309									53	116
	310										*103**
Total Volume		302	687	140	239	234	414	521	869	357	1691

** Italicized numbers refer to estimated values.*

Table 1 – 2045 Build AM Peak Hour Level of Service – Freeway Segments						
Location	**No Build**	**Build Option A**	**Build Option B**	**Build Option C**	**Build Option F**	**Build Option G**
I-80 EB between Int. 302 and 303	D	D	D	D	D	D
I-80 EB between Int. 303 and 304	C	C	C	C	C	C
I-80 EB between Int. 304 and 305	F	C	C	C	C	C
I-80 EB between Int. 305 and 306	F					
I-80 EB between Int. 306 and 307	F	C	C	C	C	C
I-80 EB between Int. 307 and 308	F	C	C	C	C	C
I-80 WB between Int. 308 to Int. 307	E	B	B	B	B	B
I-80 WB between Int. 307 and 306	E	C	C	C	C	C
I-80 WB between Int. 306 and 305	D	B	B	B	B	B
I-80 WB between Int. 305 Diverge and 304 Diverge	-	-	B	B	-	-
I-80 WB Ramp/Auxiliary Int. 305 to Int. 304	C	B	-	-	-	-
I-80 WB between Int. 305 and 304	D	B	B	B	B	B
I-80 WB between Int. 305 Merge and 304 Merge	-	-	B	-	B	-
I-80 WB Ramp/Auxiliary Int. 304 to Int. 303 Exit	-	A	A	A	A	A
I-80 WB between Int. 304 and 303 (Mainline)	C	B	B	B	B	B
I-80 WB between Int. 303 and 302	C	C	C	C	C	C
X – LOS (Freeway Segment) according to HCS+™ X – LOS (Weave) according to HCS+™						

Table 2 – 2045 Build PM Peak Hour Level of Service – Freeway Segments

Location	No Build	Build Option A	Build Option B	Build Option C	Build Option F	Build Option G
I-80 EB between Int. 302 and 303	E	E	E	E	E	E
I-80 EB between Int. 303 and 304	E	C	C	C	C	C
I-80 EB between Int. 304 and 305	F	C	C	C	C	C
I-80 EB between Int. 305 and 306	F					
I-80 EB between Int. 306 and 307	F	C	C	C	C	C
I-80 EB between Int. 307 to Int. 308	F	C	C	C	C	C
I-80 WB between Int. 308 to Int. 307	F	E	E	E	E	E
I-80 WB between Int. 307 and 306	F	E	E	E	E	E
I-80 WB between Int. 306 and 305	F	E	E	E	E	E
I-80 WB between Int. 305 Diverge and 304 Diverge	-	-	D	D	-	-
I-80 WB Ramp/Auxiliary Int. 305 to Int. 304	F	D	-	-	-	-
I-80 WB between Int. 305 and 304	F	D	D	D	D	D
I-80 WB between Int. 305 Merge and 304 Merge	-	-	D	-	D	-
I-80 WB Ramp/Auxiliary Int. 304 to Int. 303 Exit	-	A	A	A	A	A
I-80 WB between Int. 303 and 304 (Mainline)	F	D	D	D	D	D
I-80 WB between Int. 302 and 303	F	F	F	F	F	F

X – LOS (Freeway Segment) according to HCS+™
X – LOS (Weave) according to HCS+™

Table 3 – 2045 Build AM Peak Hour Level of Service – Ramp Merges						
Location	**No Build**	**Build Option A**	**Build Option B**	**Build Option C**	**Build Option F**	**Build Option G**
I-80 EB Int. 303 from Rt. 611	-	B	B	B	B	B
I-80 EB Int. 304 from Rt. 209	F	-	-	-	-	-
I-80 EB Int. 305 from W. Main St.	F	-	-	-	-	-
I-80 EB Int. 306 from Dreher Ave.	F	-	-	-	-	-
I-80 EB Int. 307 from Park Ave.	F	-	-	-	-	-
I-80 WB Int. 303 from Rt. 611	C	C	C	C	B	B
I-80 WB Int. 304 from Rt. 209	-	B	B	B	B	B
I-80 WB Int. 305 from Main St	-	-	B	-	B	-
I-80 WB Int. 307 from Broad St.	E	-	-	-	-	-

Table 4 – 2045 Build PM Peak Hour Level of Service – Ramp Merges						
Location	**No Build**	**Build Option A**	**Build Option B**	**Build Option C**	**Build Option F**	**Build Option G**
I-80 EB Int. 303 from Rt. 611	-	C	C	C	C	C
I-80 EB Int. 304 from Rt. 209	F	-	-	-	-	-
I-80 EB Int. 305 from W. Main St.	F	-	-	-	-	-
I-80 EB Int. 306 from Dreher Ave.	F	-	-	-	-	-
I-80 EB Int. 307 from Park Ave.	F	-	-	-	-	-
I-80 WB Int. 303 from Rt. 611	F	F	F	F	C	C
I-80 WB Int. 304 from Rt. 209	-	D	C	D	C	D
I-80 WB Int. 305 from Main St	-	-	C	-	C	-
I-80 WB Int. 307 from Broad St.	F	-	-	-	-	-

Table 5 – 2045 Build AM Peak Hour Level of Service – Ramp Diverges						
Location	**No Build**	**Build Option A**	**Build Option B**	**Build Option C**	**Build Option F**	**Build Option G**
I-80 EB Int. 303 to Rt. 611	D	A	B	A	A	A
I-80 EB Int. 305 to W. Main St.	F	-	-	-	-	-
I-80 EB Int. 307 to Park Ave.	F	-	-	-	-	-
I-80 WB Int. 304 to Rt. 209	-	-	A	A	-	-
I-80 WB Int. 305 to W. Main St.	E	B	B	B	A	A
I-80 WB Int. 306 to Dreher Ave.	E	B	B	B	B	B
I-80 WB Int. 307 to Broad St.	E	-	-	-	-	-

Table 6 – 2045 Build PM Peak Hour Level of Service – Ramp Diverges						
Location	**No Build**	**Build Option A**	**Build Option B**	**Build Option C**	**Build Option F**	**Build Option G**
I-80 EB Int. 303 to Rt. 611	F	B	C	B	B	B
I-80 EB Int. 305 to W. Main St.	F	-	-	-	-	-
I-80 EB Int. 307 to Park Ave.	F	-	-	-	-	-
I-80 WB Int. 304 to Rt. 209	-	-	C	C	-	-
I-80 WB Int. 305 to W. Main St.	F	C	D	D	C	C
I-80 WB Int. 306 to Dreher Ave.	F	D	D	D	D	D
I-80 WB Int. 307 to Broad St.	F	-	-	-	-	-

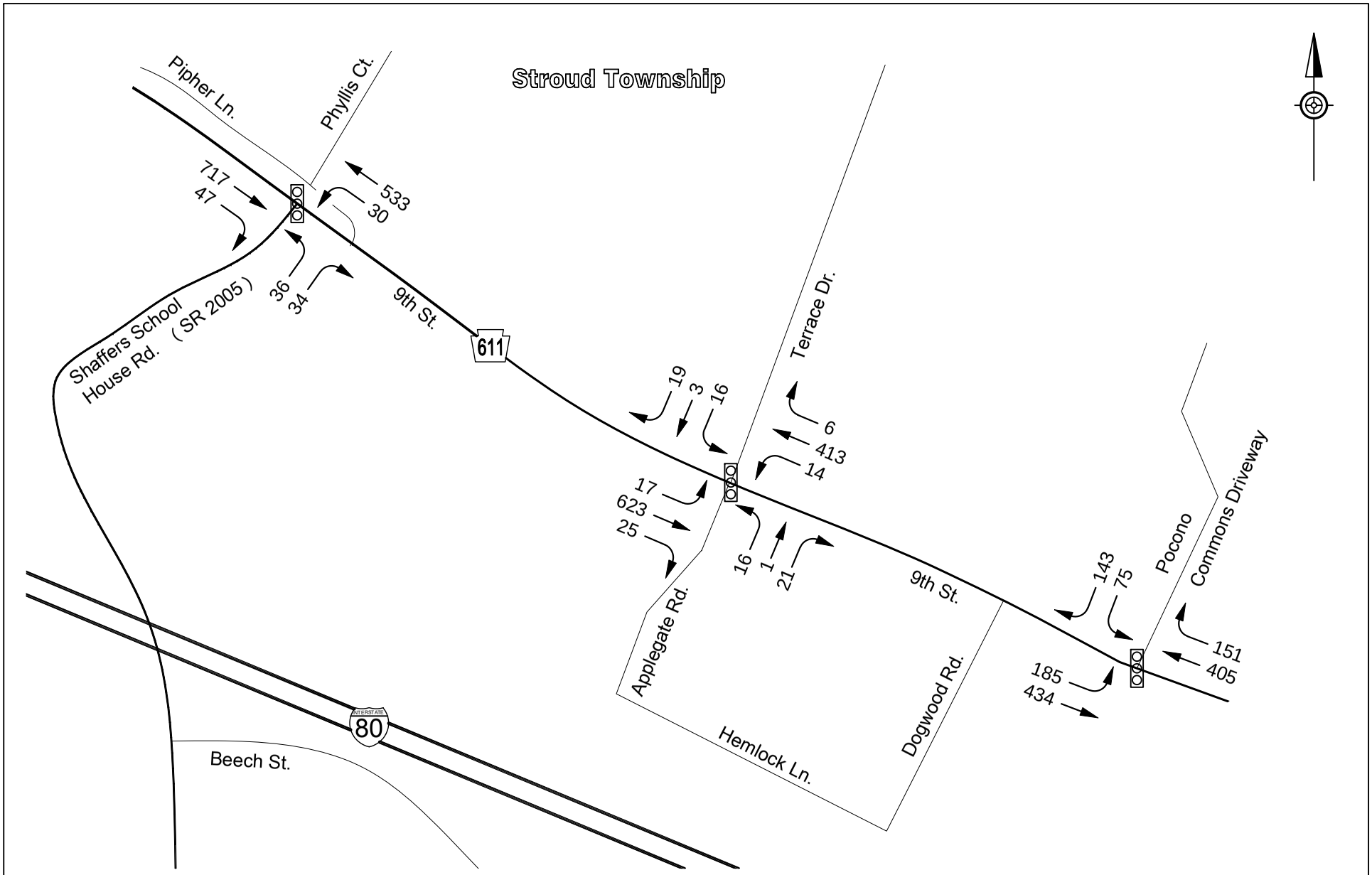
Table 7 - 2045 Build AM Peak Hour Level of Service - Ramp Terminus Intersections						
Intersection	**No Build**	**Build Option 1A**	**Build Option 1B**	**Build Option 1C**	**Build Option 1F**	**Build Option 1G**
Int. 303 – Heller Dr Connector and I-80 EB Ramps (Unsignalized)	-	EB Approach C (15.3s)	EB Approach C (15.3s)	EB Approach C (15.3s)	EB Approach C (15.3s)	EB Approach C (15.3s)
Int. 303 – Heller Dr Connector and I-80 WB Ramps (Unsignalized)	-	WB Approach B (10.2s)	WB Approach B (10.2s)	WB Approach B (10.2s)	-	WB Approach B (10.2s)
Int 303 - Heller Dr Connector and PA611 (Alts 1A-1C, Signalized)	-	Signalized C (26.3s)	Signalized C (26.3s)	Signalized C (26.3s)	-	-
Int 303 – Loop Access Rd and PA611 (Alts F & G, Signalized)	-	-	-	-	Signalized B (13.1s)	Signalized B (12.3s)
Int 304 – I-80 EB Off Ramp/US209 SB On Ramp and W. Main St	-	Unsignalized SBL Approach D (26.6s)	Unsignalized SBL Approach D (26.6s)	Unsignalized SBL Approach D (26.6s)	Unsignalized SBL Approach D (26.6s)	Unsignalized SBL Approach D (26.6s)
	-	Signalized B (16.3s)	Signalized B (16.3s)	Signalized B (16.3s)	Signalized B (16.3s)	Signalized B (16.3s)
Int 304 – I-80 EB On Ramp /US209 NB Off Ramp and W. Main St	-	Unsignalized NBL Approach D (26.6s)	Unsignalized NBL Approach D (26.6s)	Unsignalized NBL Approach D (26.6s)	Unsignalized NBL Approach D (26.6s)	Unsignalized NBL Approach D (26.6s)
	-	Signalized B (16.3s)	Signalized B (16.3s)	Signalized B (16.3s)	Signalized B (16.3s)	Signalized B (16.3s)
Int. 305 – W. Main St. and I-80 EB Ramps (Unsignalized)	NB Approach D (29.0s)	-	-	-	-	-
Int. 305 – W. Main St. and I-80 WB Ramps	Unsignalized SB Approach C (24.1s)	Unsignalized NBL Approach C (18.8s)	Unsignalized NBL Approach C (18.8s)	Unsignalized NBL Approach C (18.8s)	Unsignalized NBL Approach C (18.8s)	Unsignalized NBL Approach C (18.8s)
	Signalized D (47.0s)	Signalized D (47.0s)	Signalized D (47.0s)	Signalized D (47.0s)	Signalized D (47.0s)	Signalized D (47.0s)
Int. 306 – Dreher Ave. and I-80 EB On Ramp (+ Off Ramp, Alts A-G) (Unsignalized)	WBL Approach B (10.1s)	SB Approach C (16.5s)	SB Approach C (16.5s)	SB Approach C (16.5s)	SB Approach C (16.5s)	SB Approach C (16.5s)
Int. 307A – Park Ave. and I-80 EB Ramp (Unsignalized)	EB Approach D (29.2s)	EB Approach D (29.2s)	EB Approach D (29.2s)	-	EB Approach D (29.2s)	EB Approach D (29.2s)
Int. 307A – Lennox Ave. and I-80 EB Ramp	-	-	-	EB Approach D (35.4s)	-	-
Int. 307B – Broad St. and I-80 WB Ramps	Unsignalized WB Approach F (476s)	Unsignalized WB Approach F (476s)	Unsignalized WB Approach F (476s)	Unsignalized WB Approach F (476s)	Unsignalized WB Approach F (476s)	Unsignalized WB Approach F (476s)
	Signalized C (30.1s)	Signalized C (30.1s)	Signalized C (30.1s)	Signalized C (30.1s)	Signalized C (30.1s)	Signalized C (30.1s)
Int. 307B – Broad St. and I-80 EB Ramp (Unsignalized)	-	Unsignalized A (3.6s)	Unsignalized A (3.6s)	Unsignalized A (3.6s)	Unsignalized A (3.6s)	Unsignalized A (3.6s)

Note: All Signalized Intersection Level of Service results reported in accordance with HCM 2010.

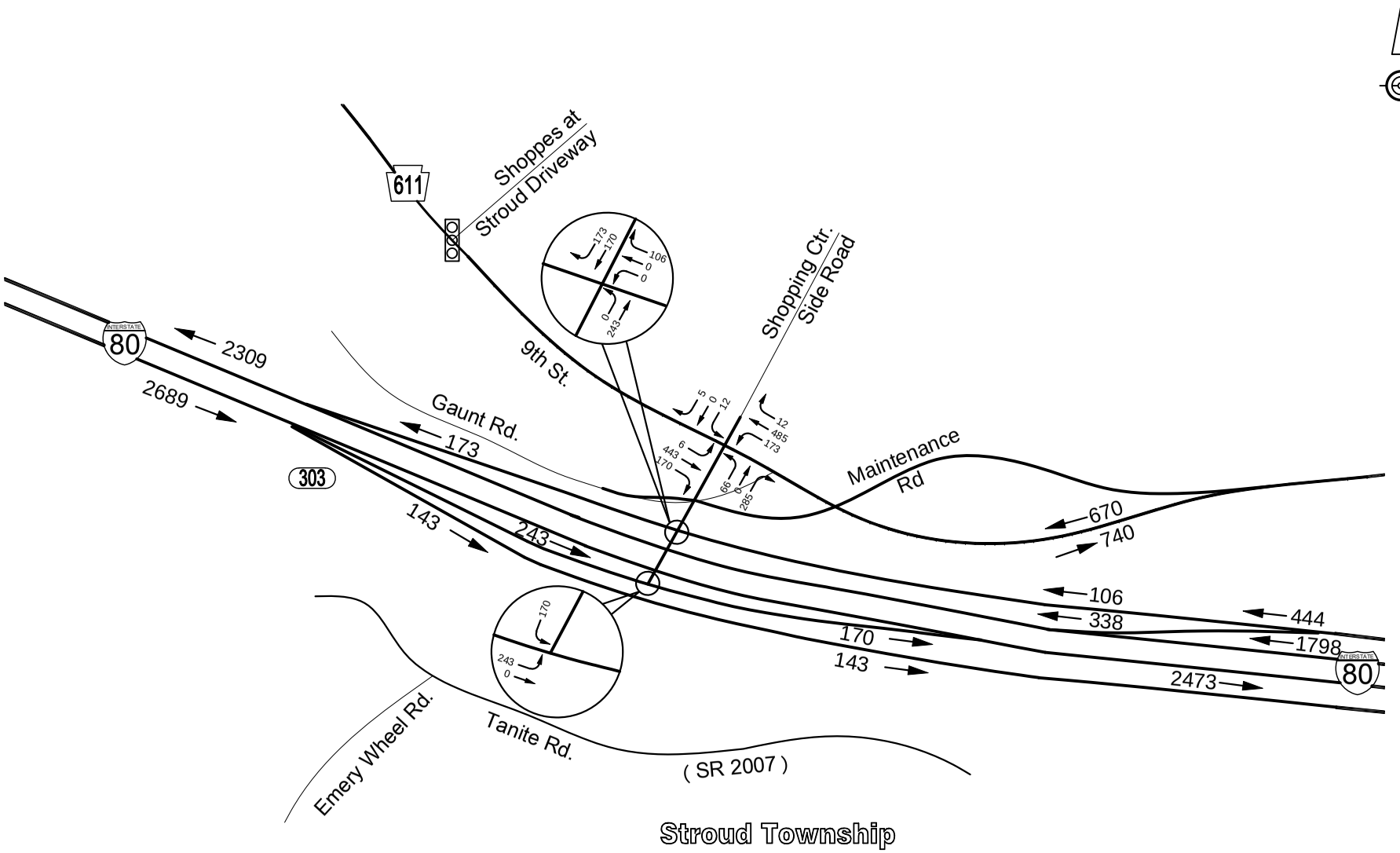
Table 8 - 2045 Build PM Peak Hour Level of Service - Ramp Terminus Intersections						
Intersection	**No Build**	**Build Option 1A**	**Build Option 1B**	**Build Option 1C**	**Build Option 1F**	**Build Option 1G**
Int. 303 – Heller Dr Connector and I-80 EB Ramps (Unsignalized)	-	EB Approach D (27.9s)	EB Approach D (27.9s)	EB Approach D (27.9s)	EB Approach D (27.9)	EB Approach D (27.9s)
Int. 303 – Heller Dr Connector and I-80 WB Ramps (Unsignalized)	-	WB Approach B (12.0s)	WB Approach B (12.0s)	WB Approach B (12.0s)	-	WB Approach B (12.0s)
Int 303 - Heller Dr Connector and PA611	-	Signalized D (43.2s)	Signalized D (43.2s)	Signalized D (43.2s)	-	-
Int 303 – Loop Connector Rd and PA611 (Alts F & G, Signalized)	-	-	-	-	Signalized B (12.6s)	Signalized B (15.8s)
Int 304 – I-80 EB Off Ramp/US209 SB On Ramp and W. Main St	-	Unsignalized SBL Approach F (88.1s)	Unsignalized SBL Approach F (88.1s)	Unsignalized SBL Approach F (88.1s)	Unsignalized SBL Approach F (88.1s)	Unsignalized SBL Approach F (88.1s)
		Signalized B (14.4s)	Signalized B (14.4s)	Signalized B (14.4s)	Signalized B (14.4s)	Signalized B (14.4s)
Int 304 – I-80 EB On Ramp /US209 NB Off Ramp and W. Main St	-	Unsignalized SBL Approach F (63.8s)	Unsignalized SBL Approach F (63.8s)	Unsignalized SBL Approach F (63.8s)	Unsignalized SBL Approach F (63.8s)	Unsignalized SBL Approach F (63.8s)
	-	Signalized B (14.4s)	Signalized B (14.4s)	Signalized B (14.4s)	Signalized B (14.4s)	Signalized B (14.4s)
Int. 305 – W. Main St. and I-80 EB Ramps	NB Approach F (1206s)	-	-	-	-	-
Int. 305 – W. Main St. and I-80 WB Ramps	SB Approach F (1175s)	NBL Approach F (234.2s)	NBL Approach F (234.2s)	NBL Approach F (234.2s)	NBL Approach F (234.2s)	NBL Approach F (234.2s)
	Signalized C (24.6s)	Signalized C (24.6s)	Signalized C (24.6s)	Signalized C (24.6s)	Signalized C (24.6s)	Signalized C (24.6s)
Int. 306 – Dreher Ave. and I-80 EB On Ramp (+ Off Ramp, Alts A-G) (Unsignalized)	WBL Approach A (9.8s)	SB Approach C (19.8s)	SB Approach C (19.8s)	SB Approach C (19.8s)	SB Approach C (19.8s)	SB Approach C (19.8s)
Int. 307A – Park Ave. and I-80 EB Ramp (Unsignalized)	EB Approach D (32.4s)	EB Approach D (32.4s)	EB Approach D (32.4s)	-	EB Approach D (32.4s)	EB Approach D (32.4s)
Int. 307A – Lennox Ave. and I-80 EB Ramp (Unsignalized)	-	-	-	EB Approach D (34.1s)	-	-
Int. 307B – Broad St. and I-80 WB Ramps	Unsignalized F (2775s)	Unsignalized F (2775s)	Unsignalized F (2775s)	Unsignalized F (2775s)	Unsignalized F (2775s)	Unsignalized F (2775s)
	Signalized E (70.7s)	Signalized E (70.7s)	Signalized E (70.7s)	Signalized E (70.7s)	Signalized E (70.7s)	Signalized E (70.7s)
Int. 307B – Broad St. and I-80 EB Ramp (Unsignalized)	-	Unsignalized B (2.7s)	Unsignalized B (2.7s)	Unsignalized B (2.7s)	Unsignalized B (2.7s)	Unsignalized B (2.7s)

Note: All Signalized Intersection Level of Service results reported in accordance with HCM 2010.

2045 TRAFFIC VOLUME MAPS



AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 1 ALTERNATIVE 1A A.M. PEAK HOUR 2045 TRAFFIC VOLUMES



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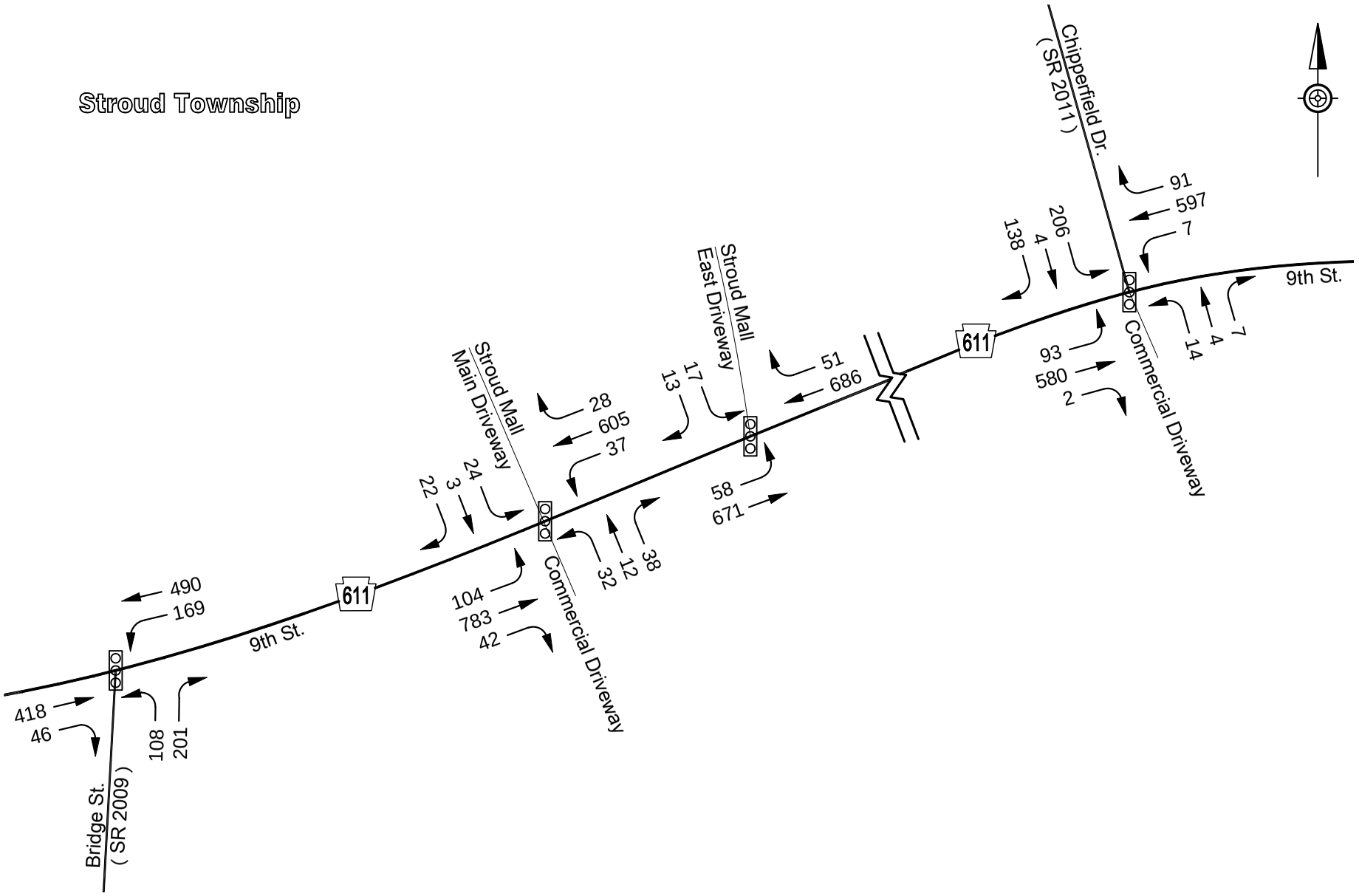
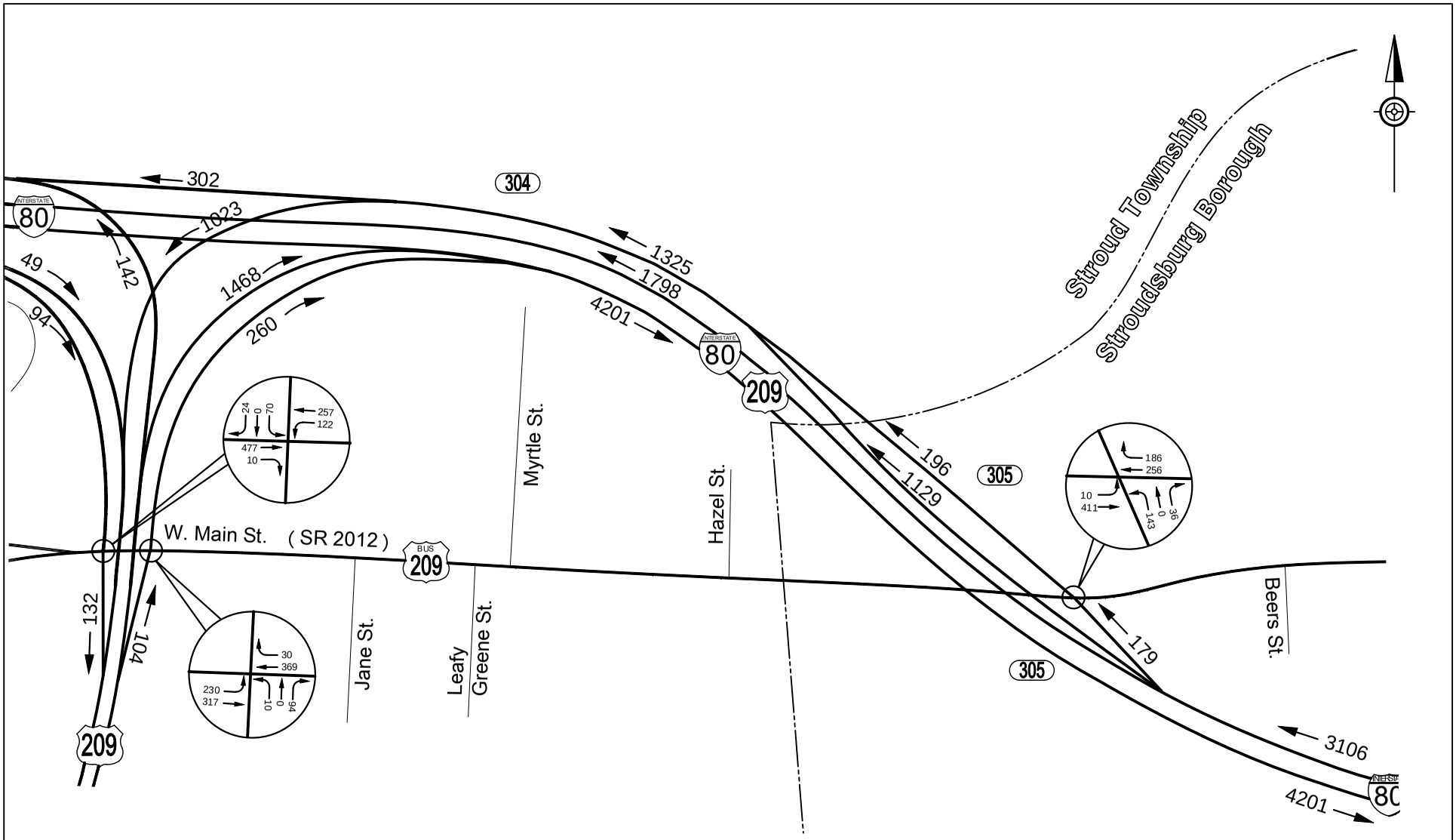
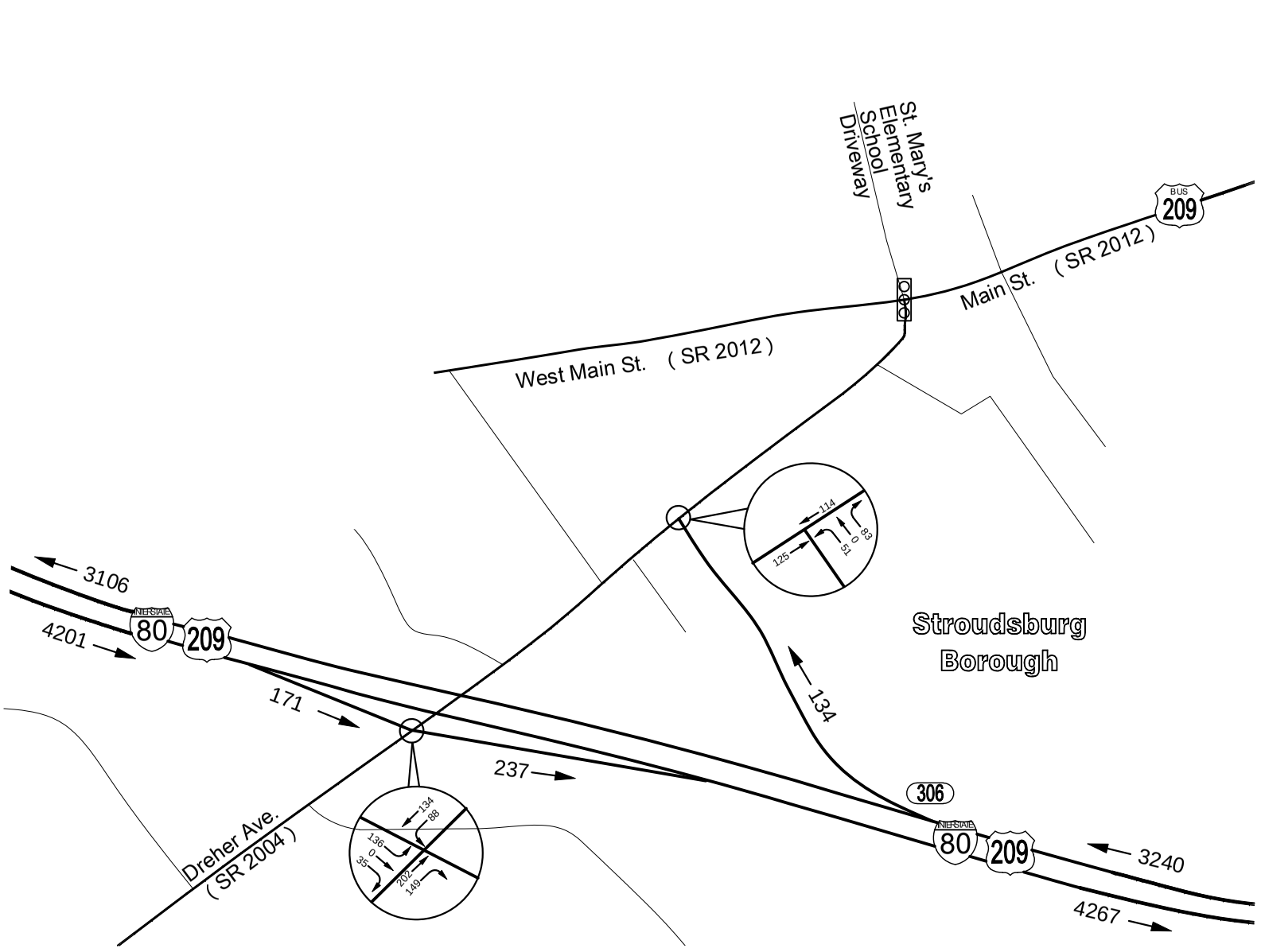


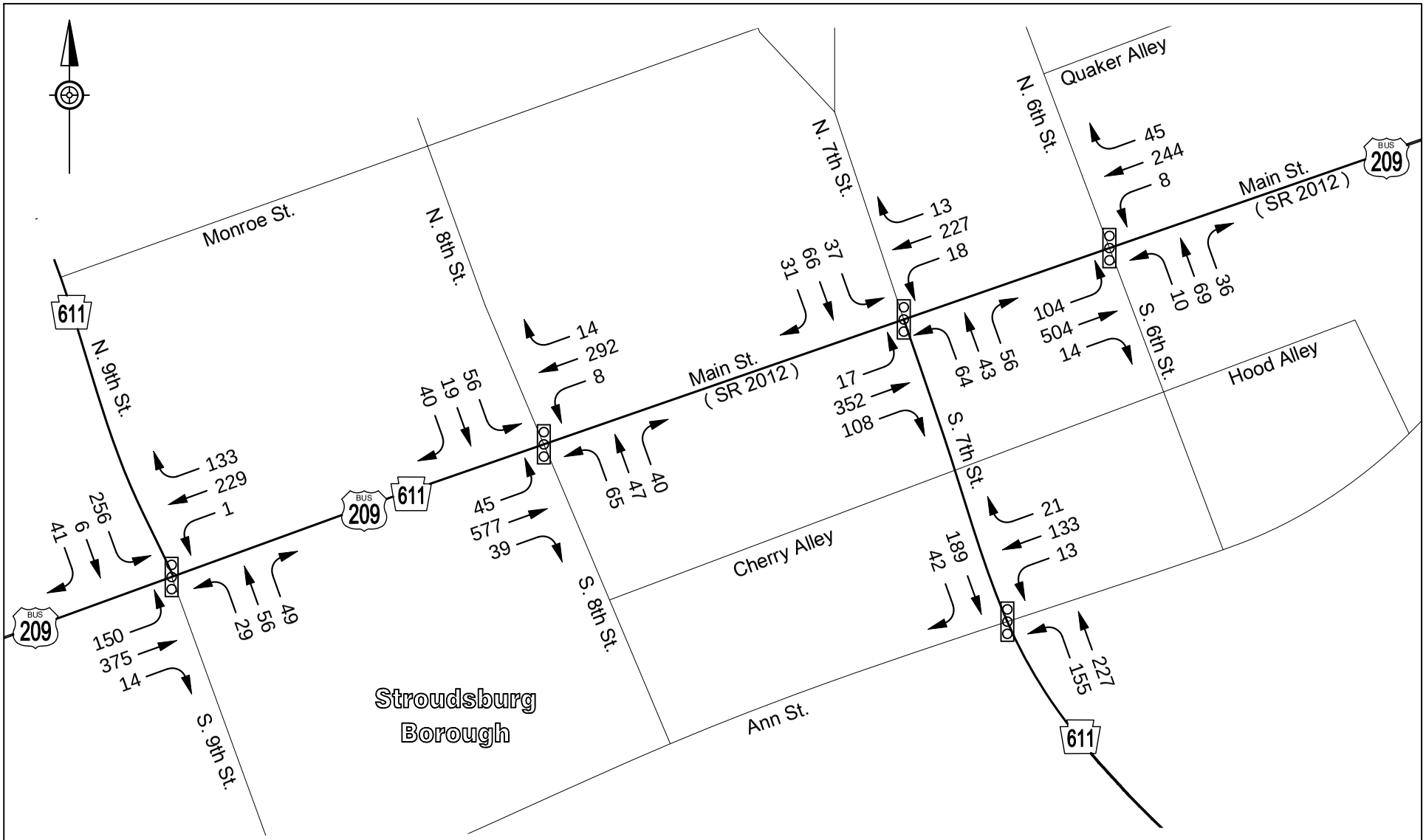
AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 3 ALTERNATIVE 1A A.M. PEAK HOUR 2045 TRAFFIC VOLUMES



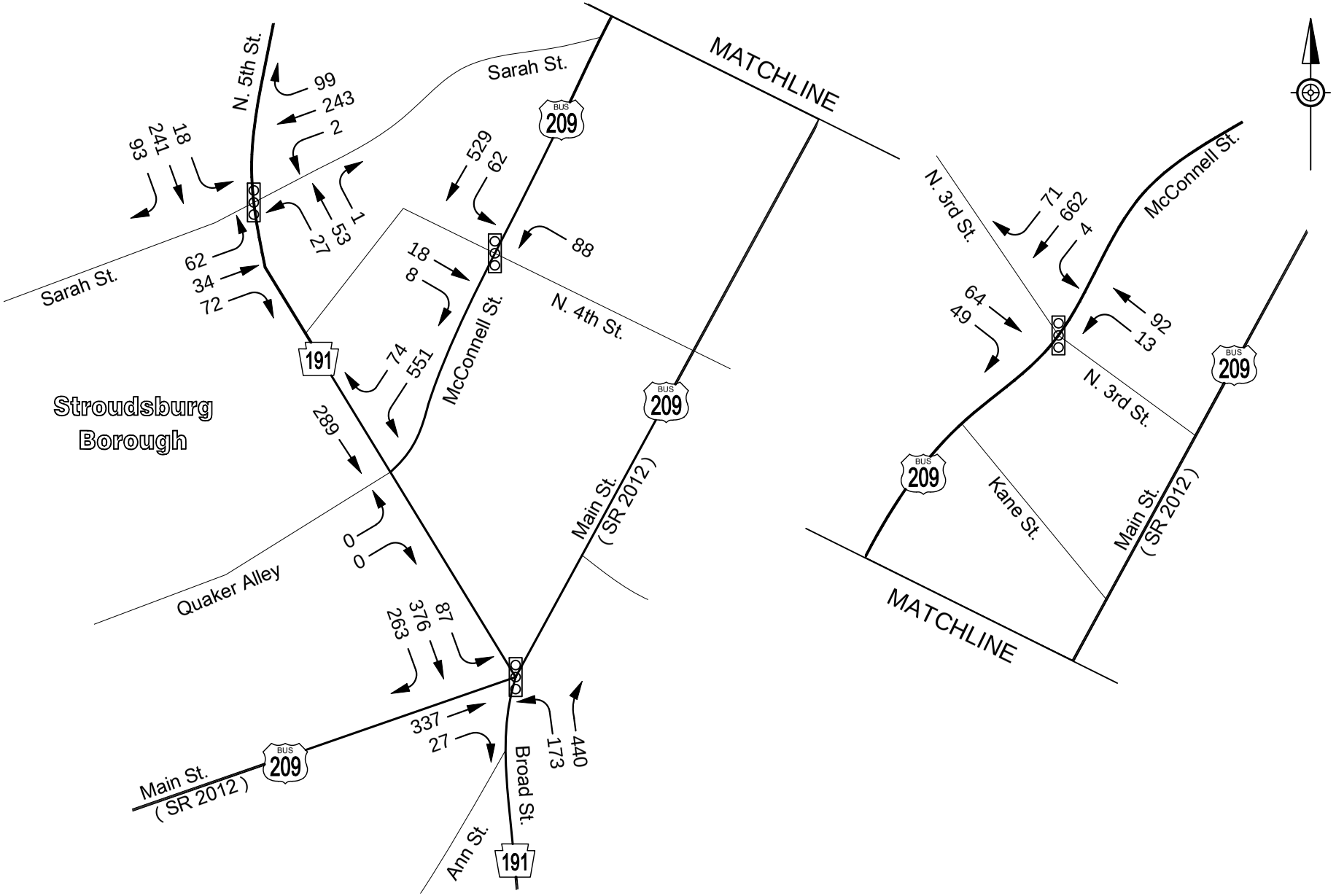
AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 4 ALTERNATIVE 1A A.M. PEAK HOUR 2045 TRAFFIC VOLUMES



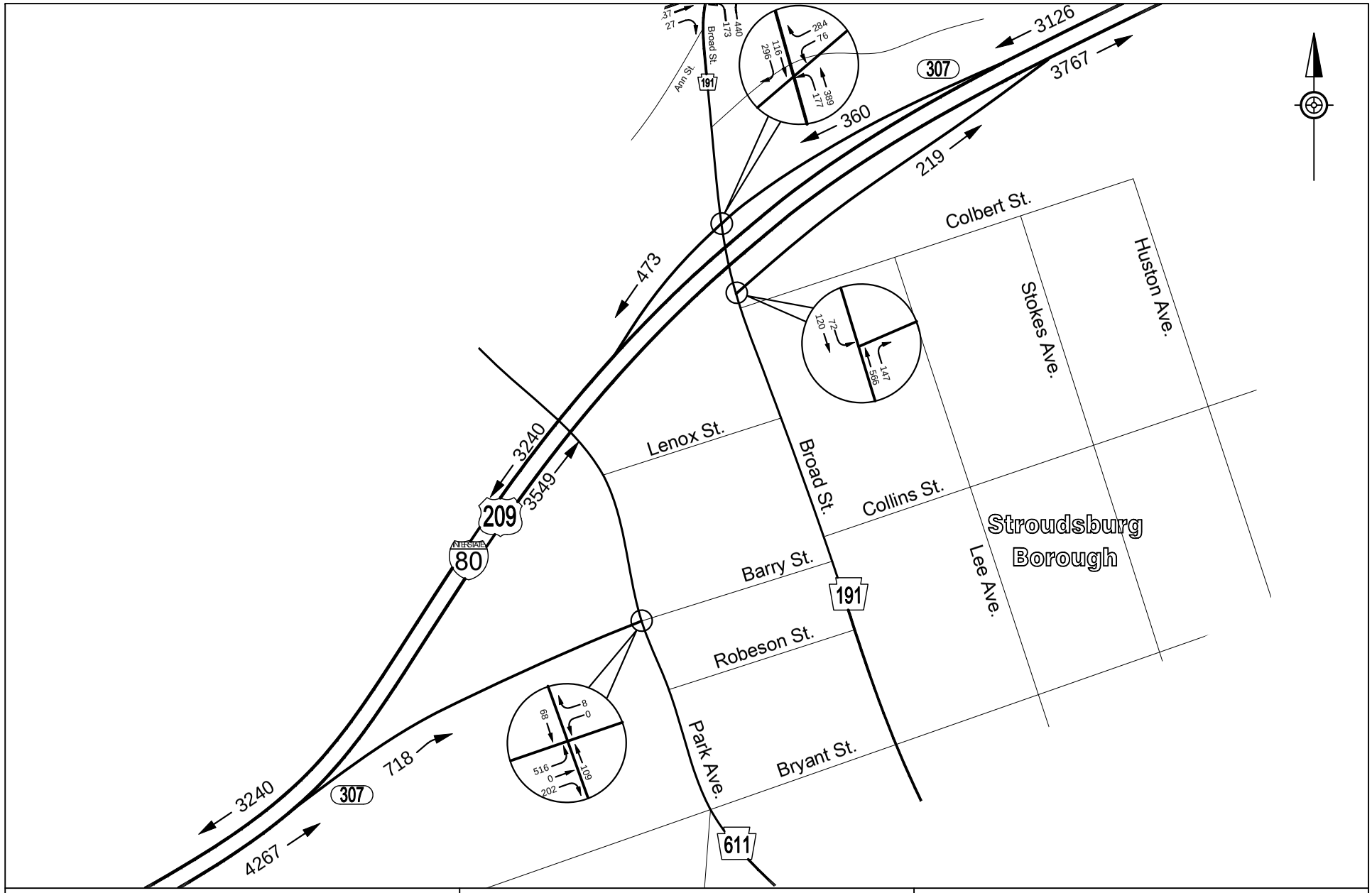
AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 5 ALTERNATIVE 1A A.M. PEAK HOUR 2045 TRAFFIC VOLUMES



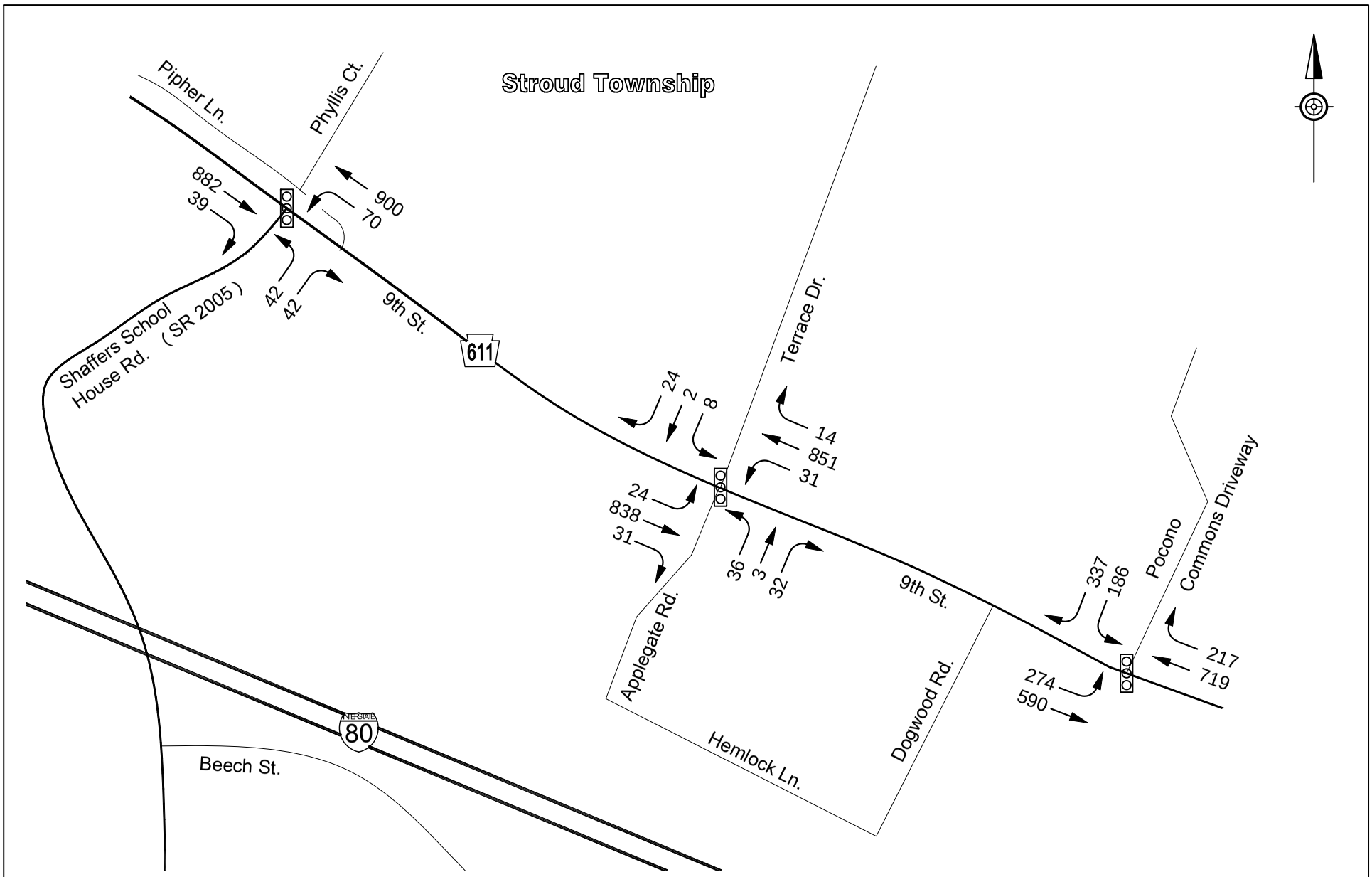
AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 6 ALTERNATIVE 1A A.M. PEAK HOUR 2045 TRAFFIC VOLUMES



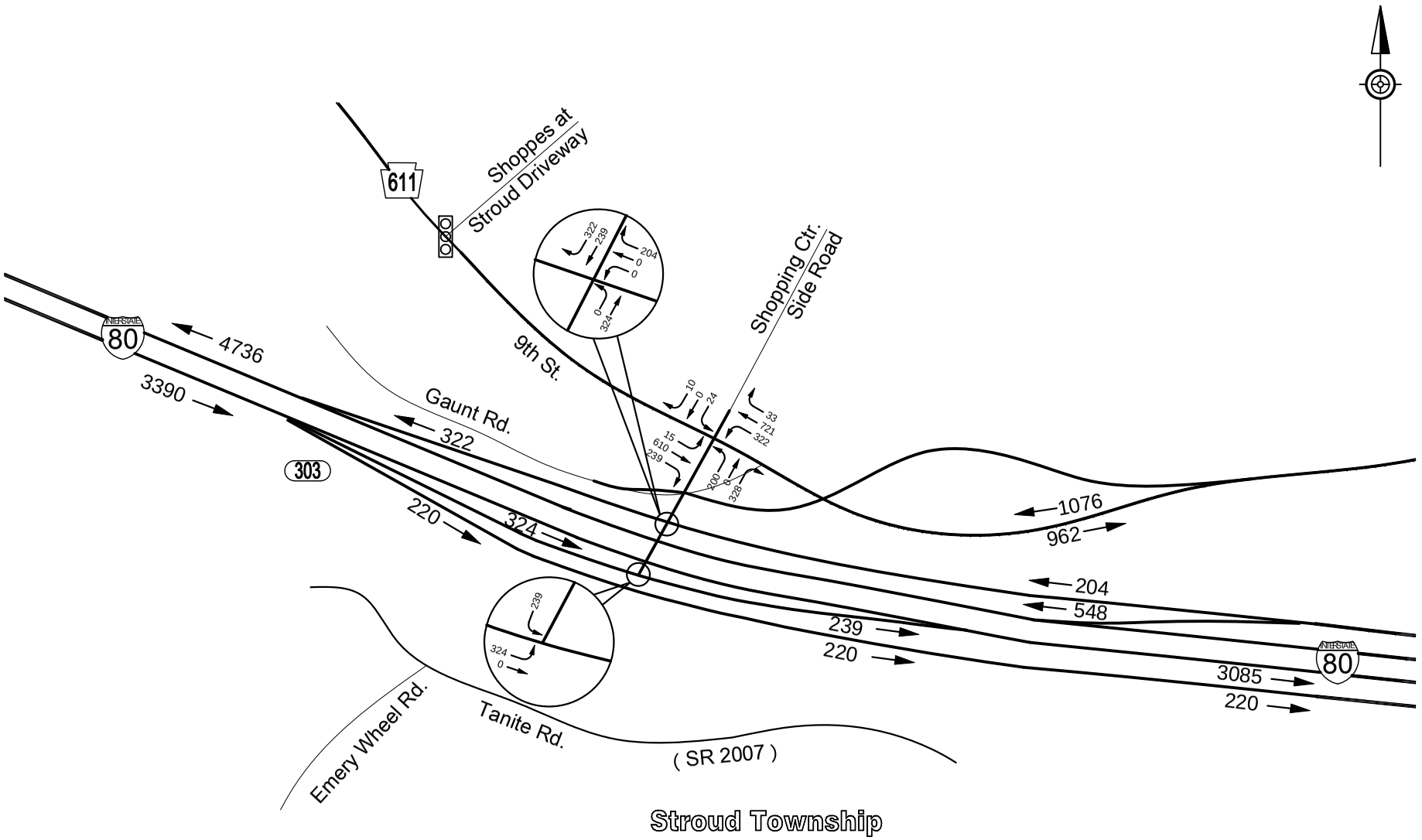
AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 7 ALTERNATIVE 1A A.M. PEAK HOUR 2045 TRAFFIC VOLUMES



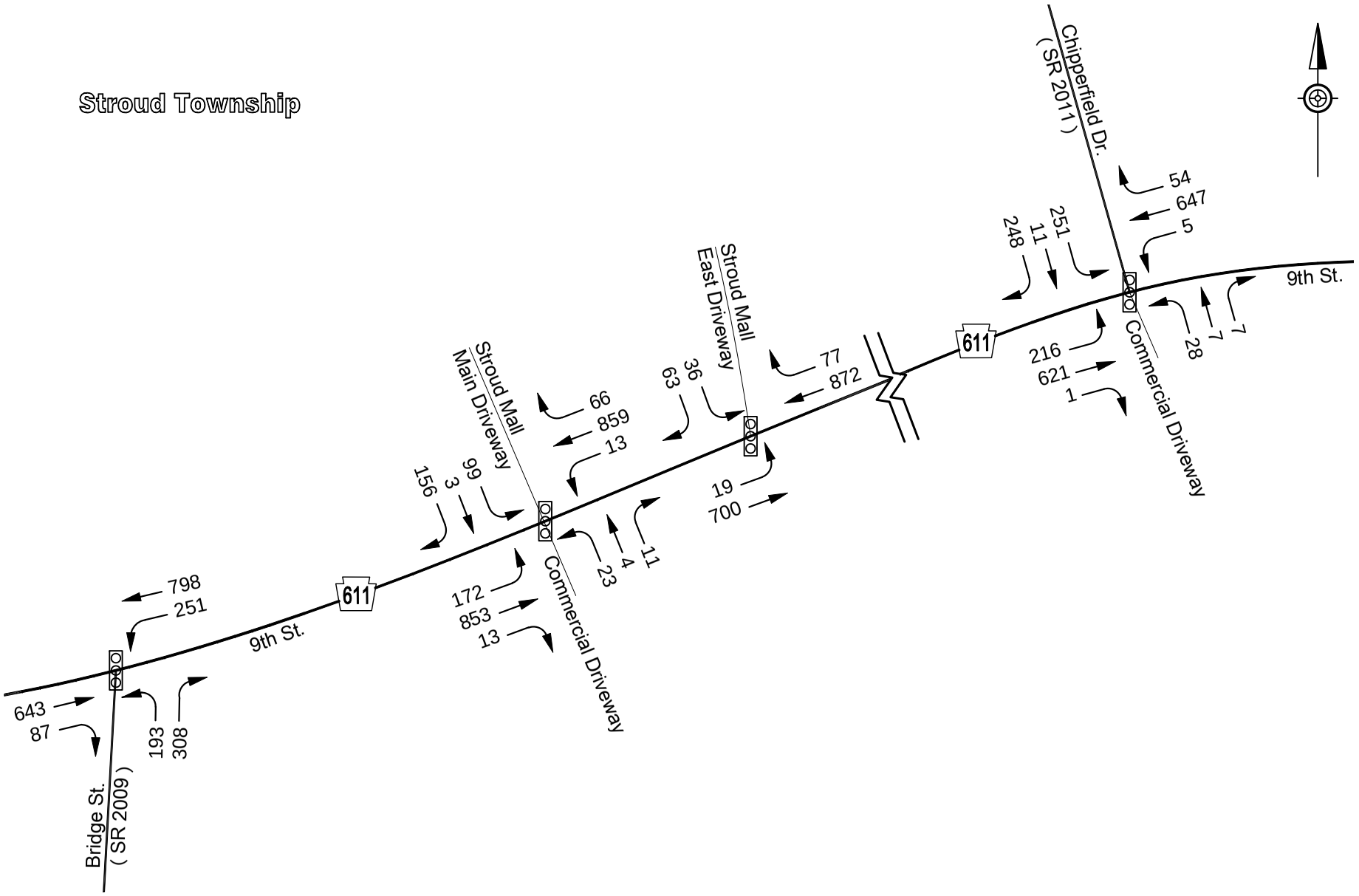
AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 8 ALTERNATIVE 1A A.M. PEAK HOUR 2045 TRAFFIC VOLUMES



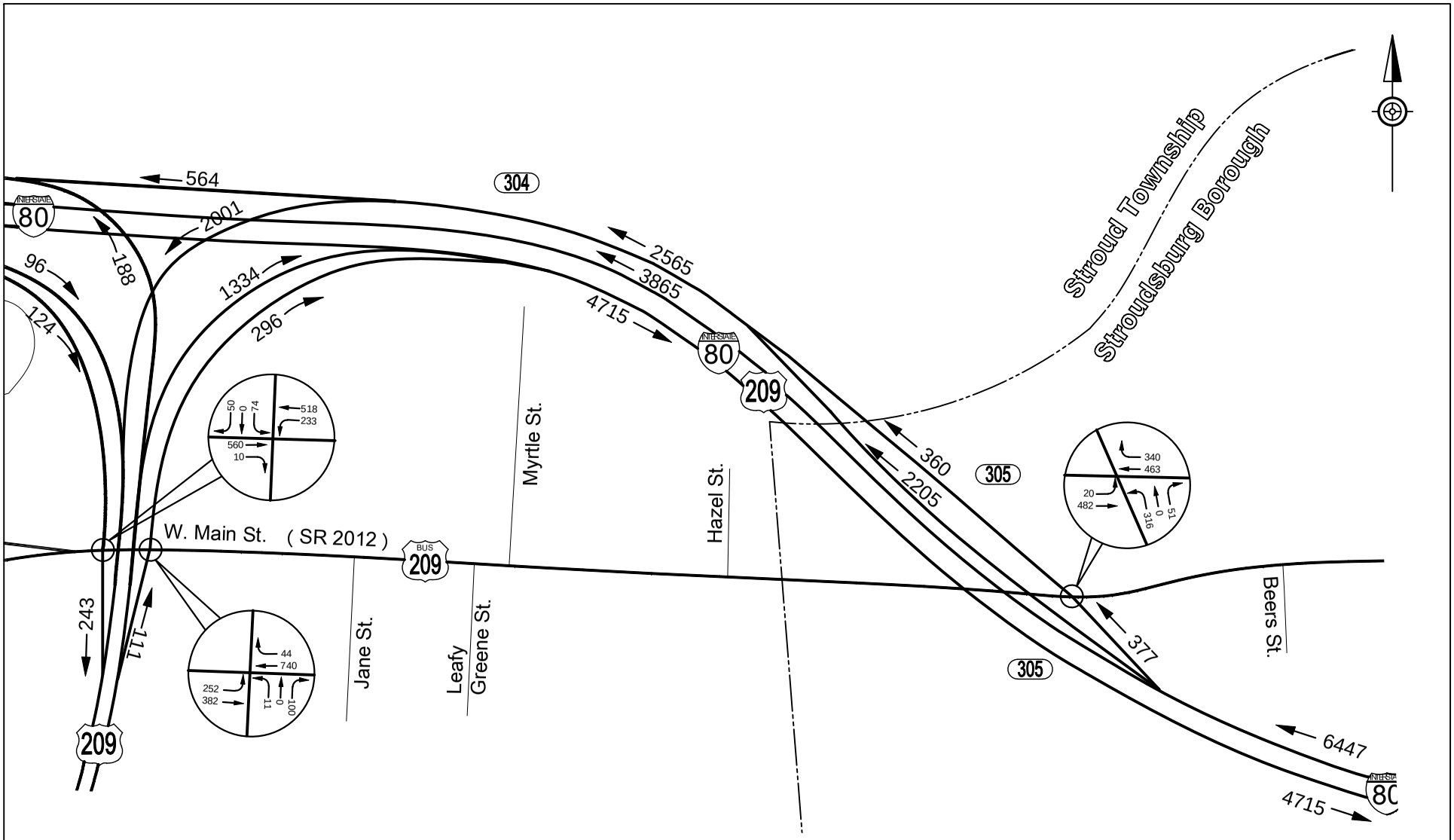
AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 9 ALTERNATIVE 1A P.M. PEAK HOUR 2045 TRAFFIC VOLUMES



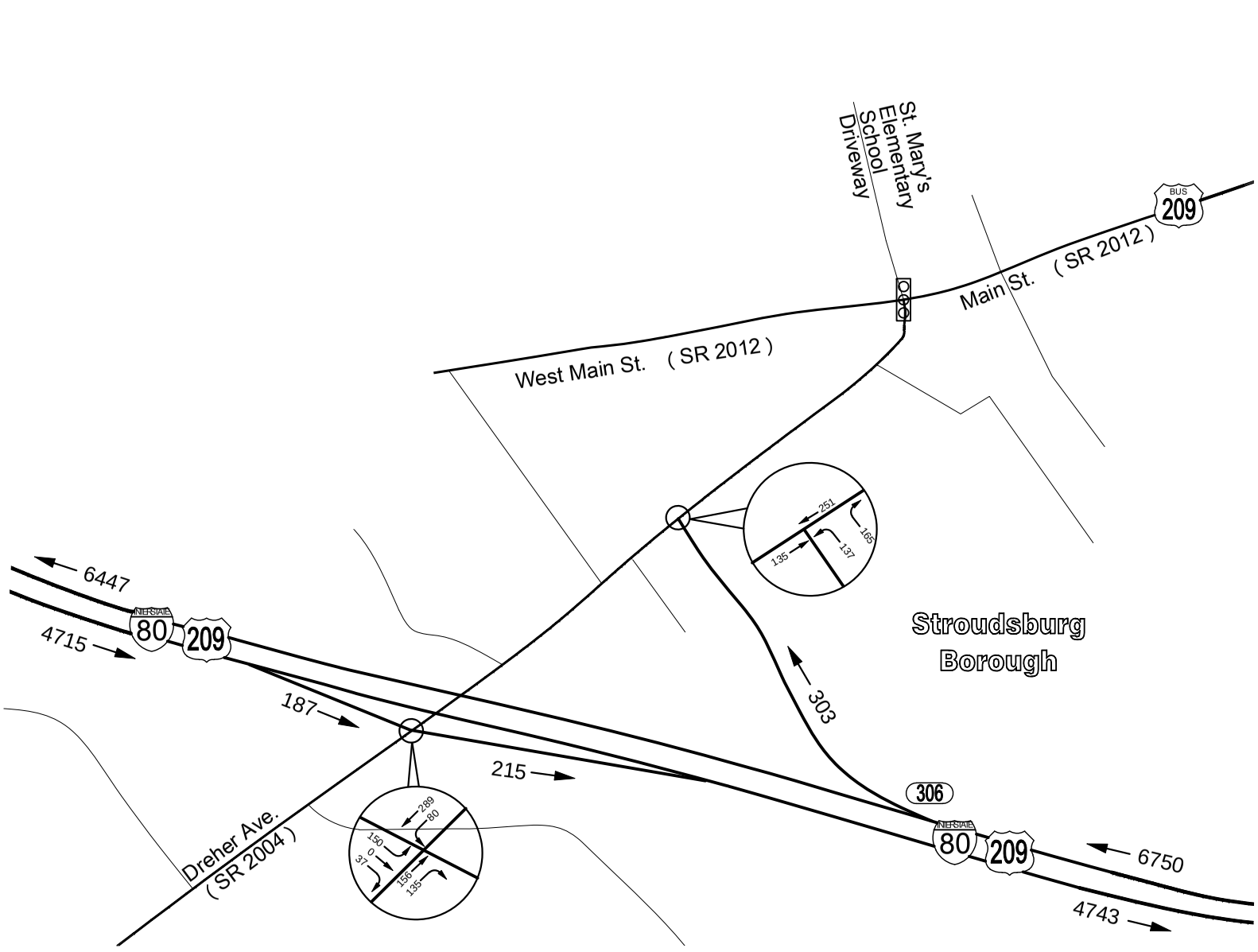
AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 10 ALTERNATIVE 1A P.M. PEAK HOUR 2045 TRAFFIC VOLUMES



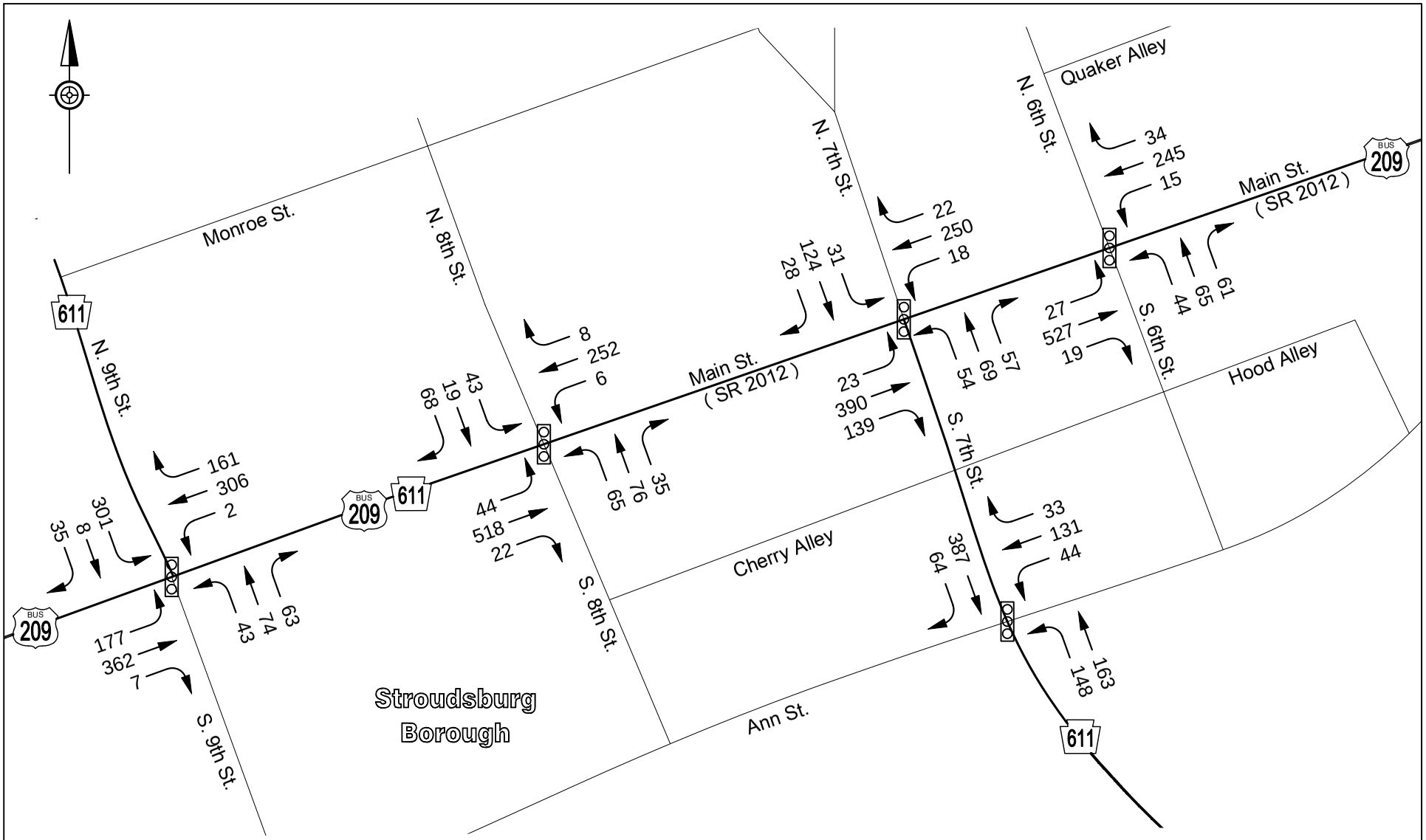
AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 11 ALTERNATIVE 1A P.M. PEAK HOUR 2045 TRAFFIC VOLUMES



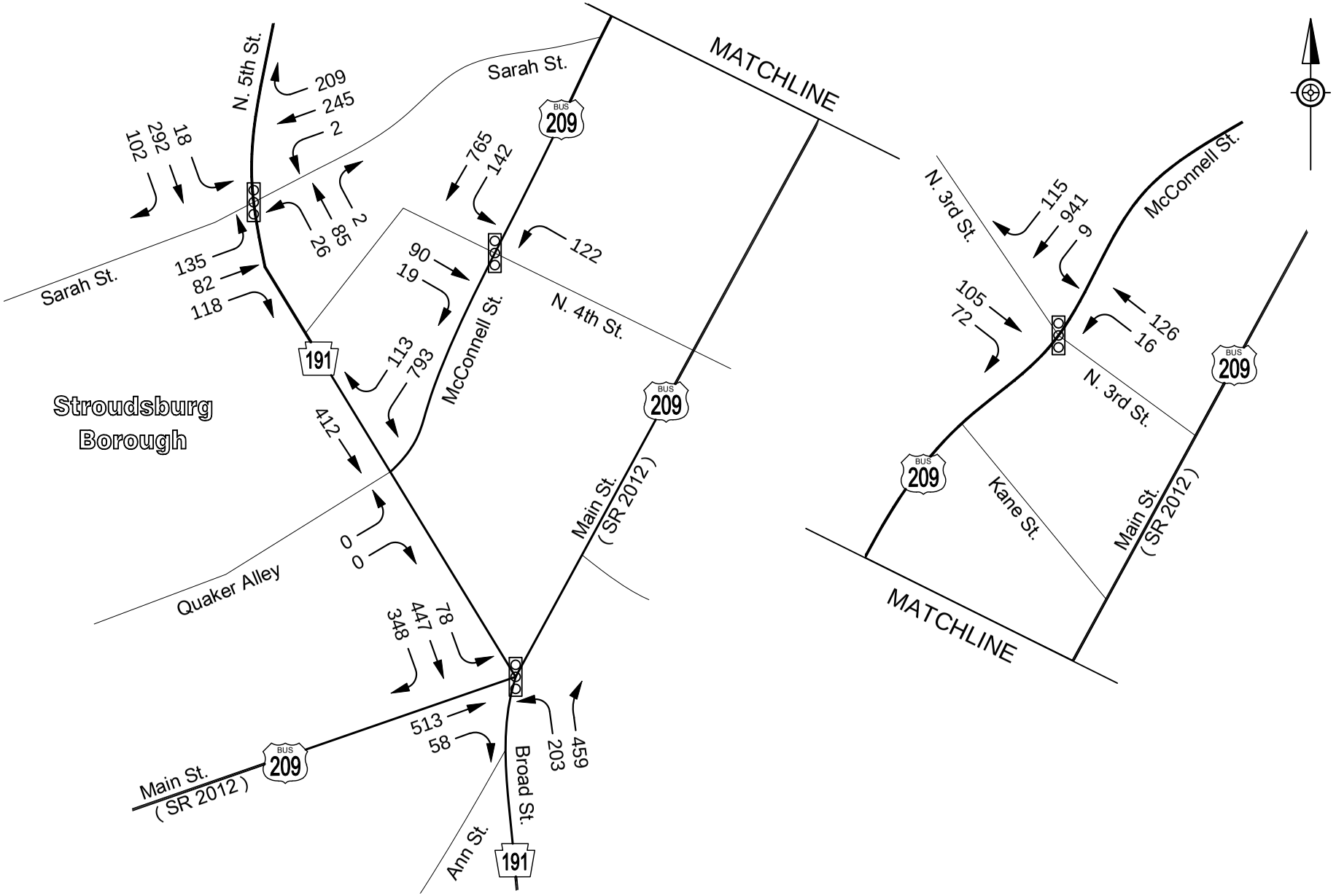
AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 12 ALTERNATIVE 1A P.M. PEAK HOUR 2045 TRAFFIC VOLUMES



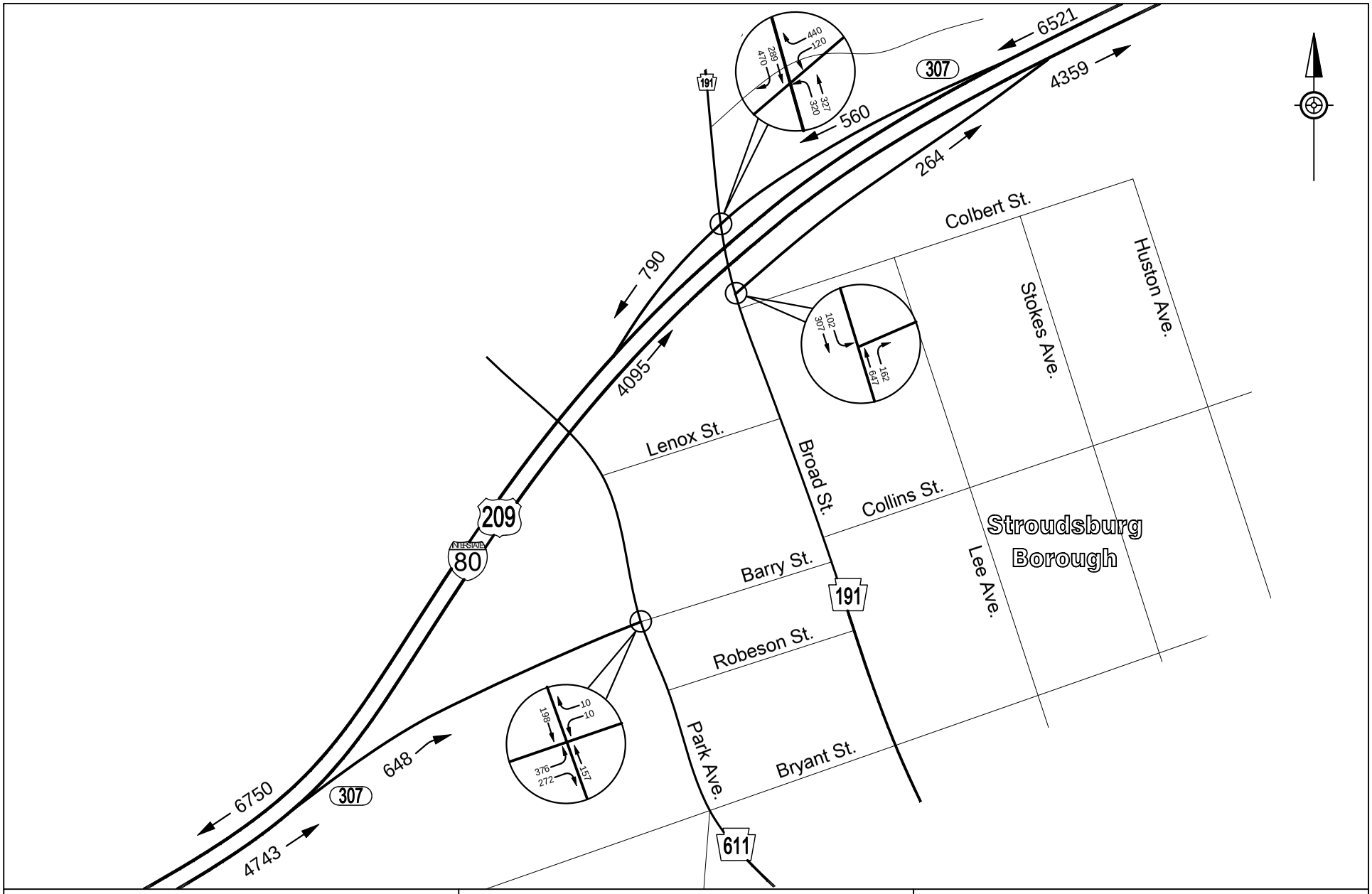
AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 13 ALTERNATIVE 1A P.M. PEAK HOUR 2045 TRAFFIC VOLUMES



AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 14 ALTERNATIVE 1A P.M. PEAK HOUR 2045 TRAFFIC VOLUMES



AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 15 ALTERNATIVE 1A P.M. PEAK HOUR 2045 TRAFFIC VOLUMES



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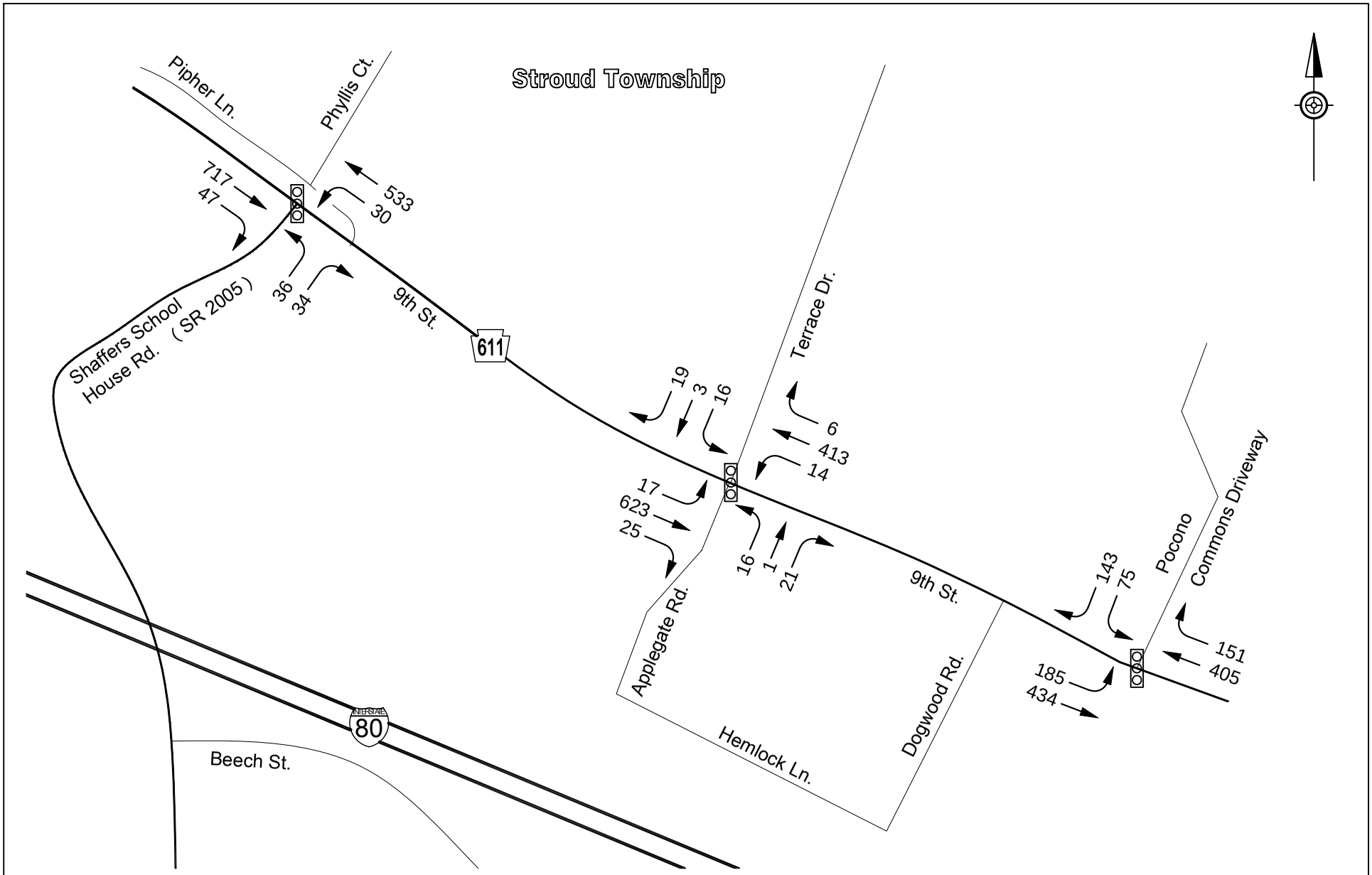
Philadelphia, PA 19103

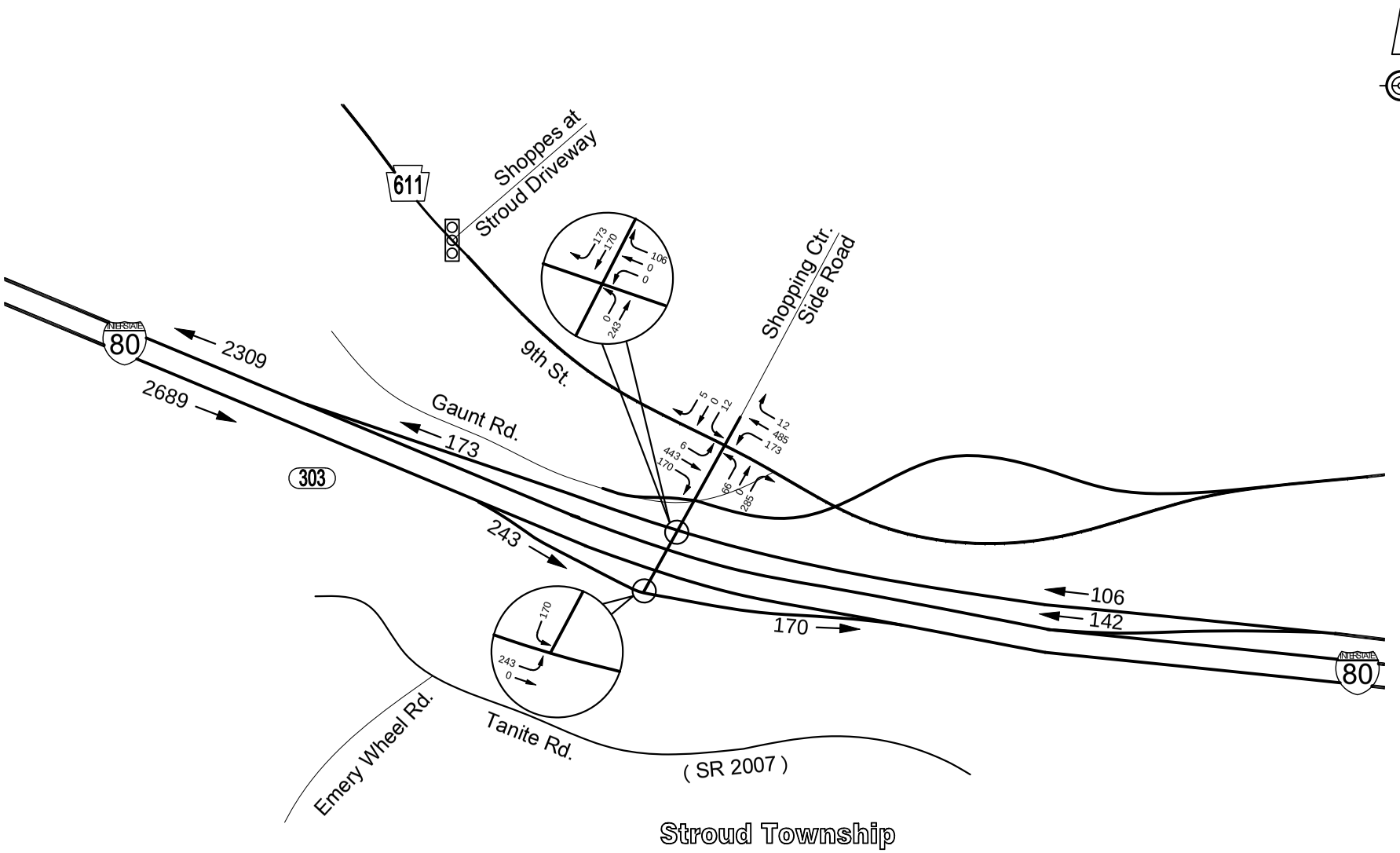
I-80 Reconstruction

Monroe County

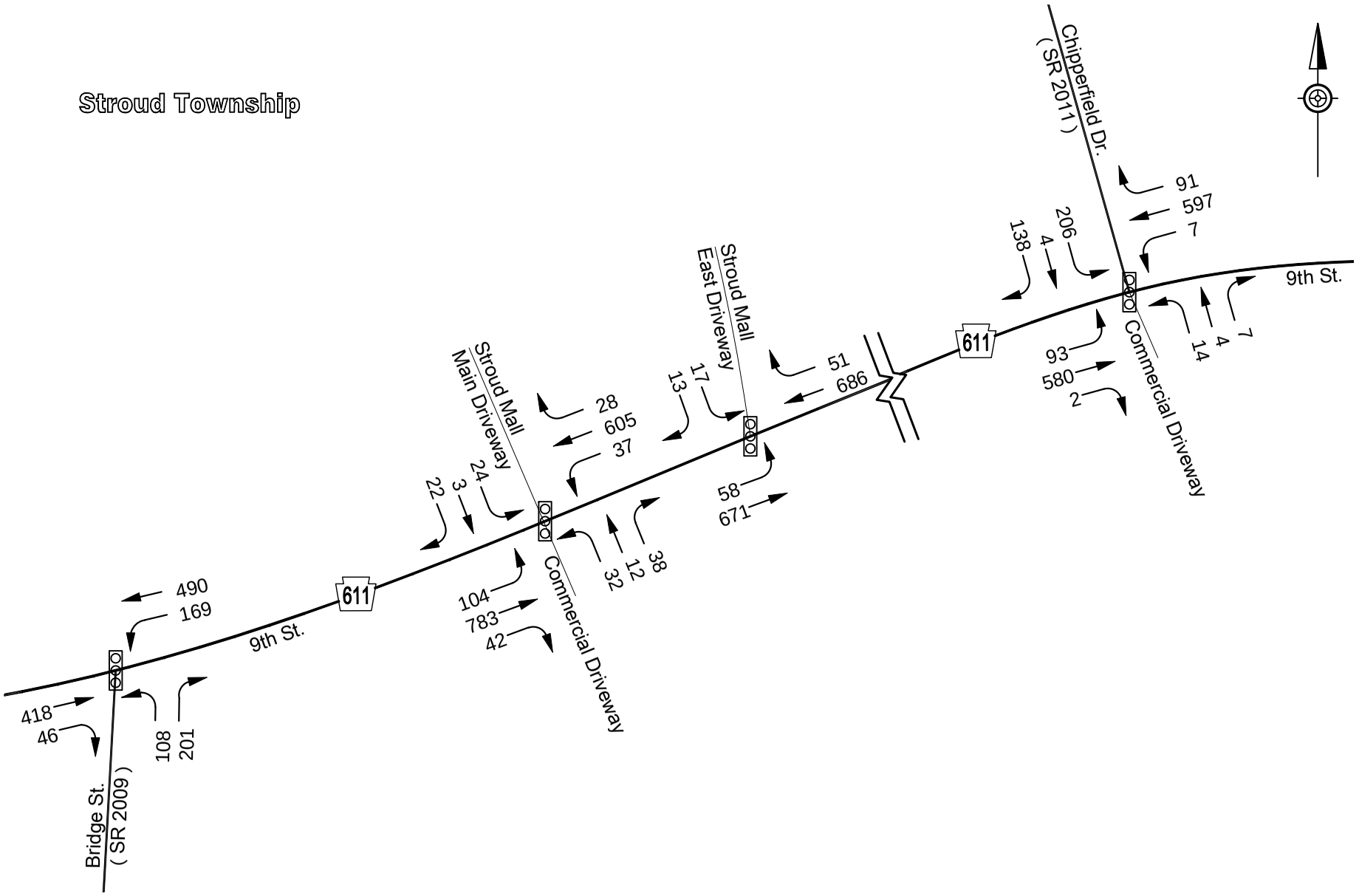
FIGURE 16
ALTERNATIVE 1A
P.M. PEAK HOUR
2045 TRAFFIC VOLUMES



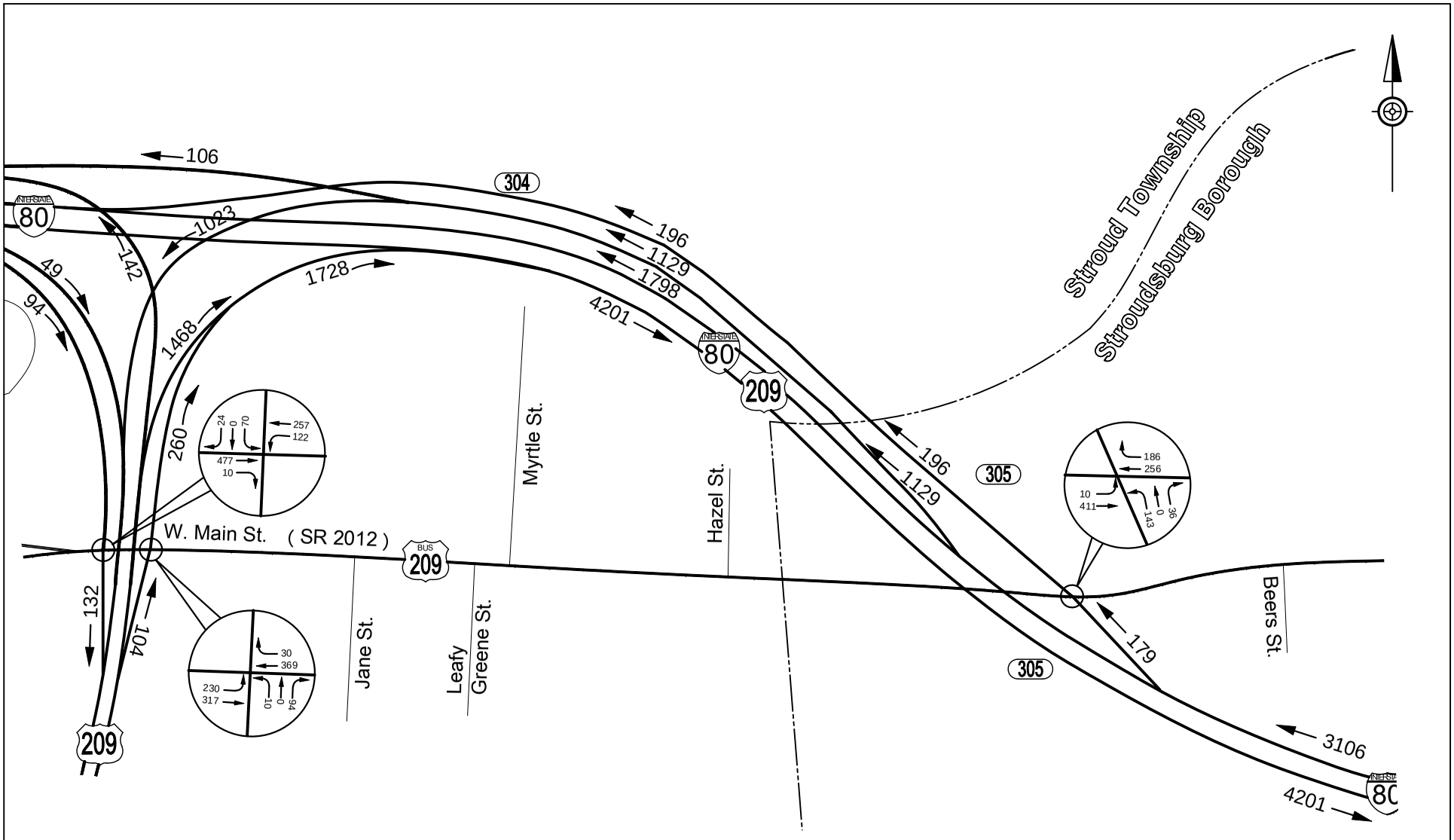
AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 1 ALTERNATIVE 1B A.M. PEAK HOUR 2045 TRAFFIC VOLUMES



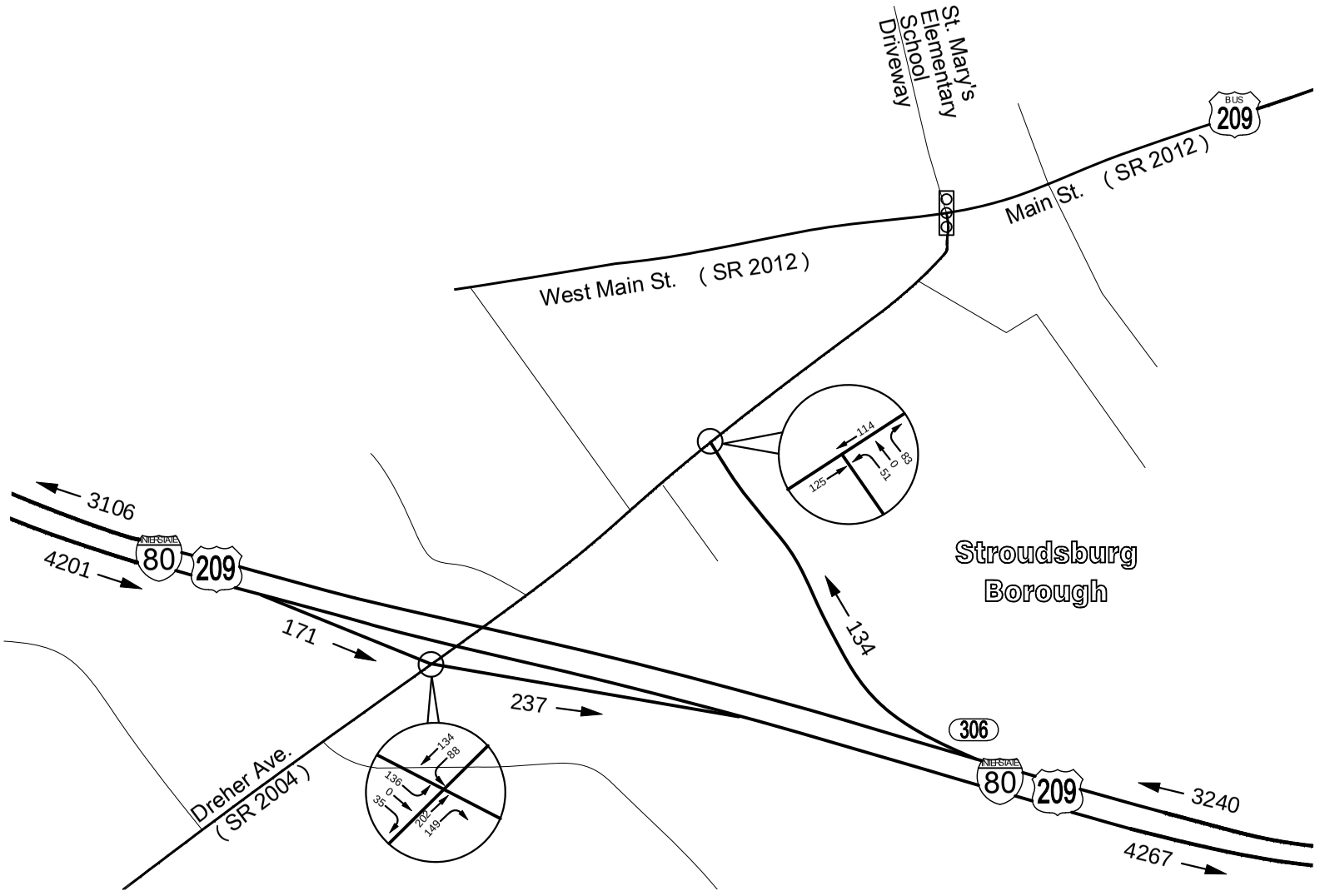
AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 2 ALTERNATIVE 1B A.M. PEAK HOUR 2045 TRAFFIC VOLUMES



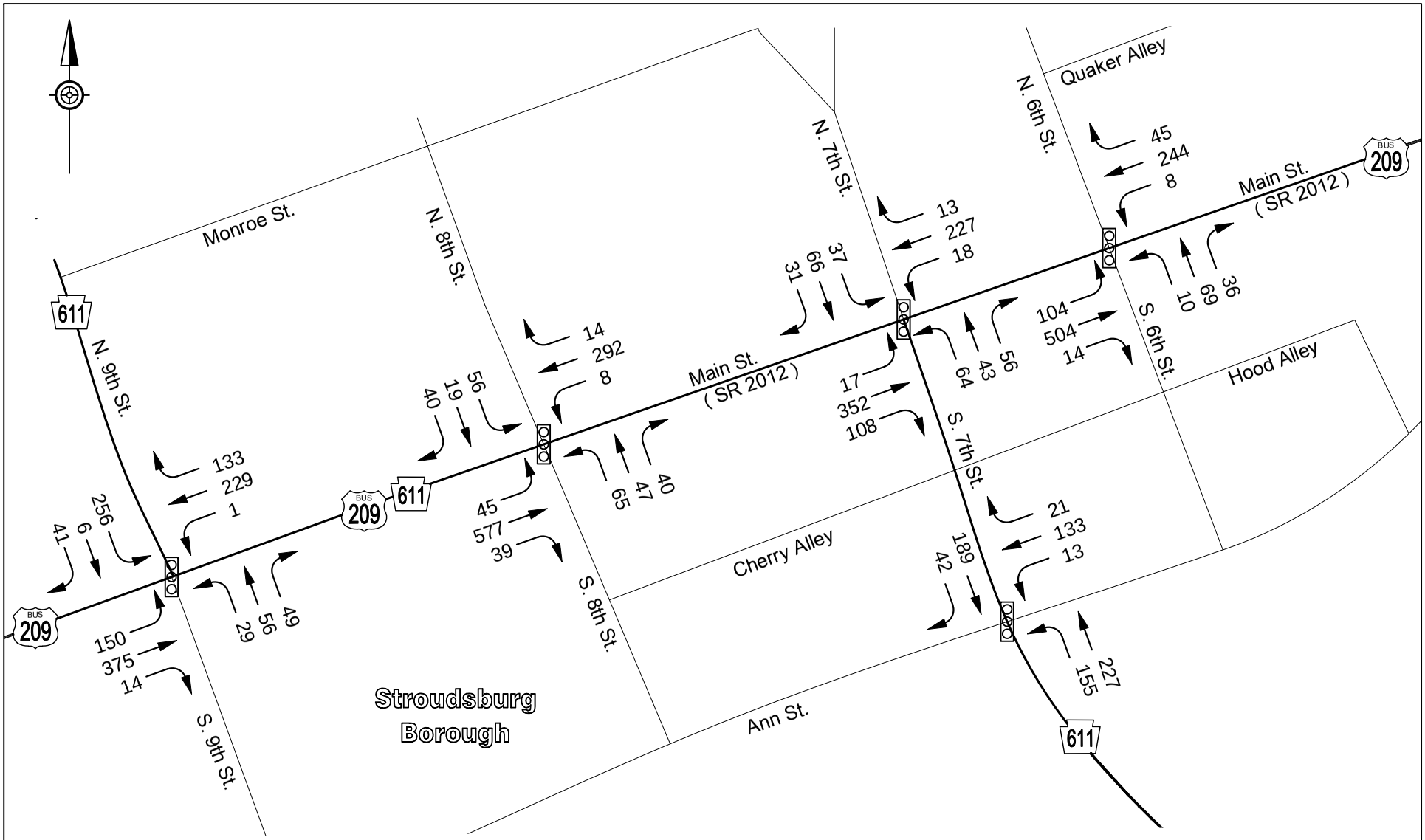
AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 3 ALTERNATIVE 1B A.M. PEAK HOUR 2045 TRAFFIC VOLUMES



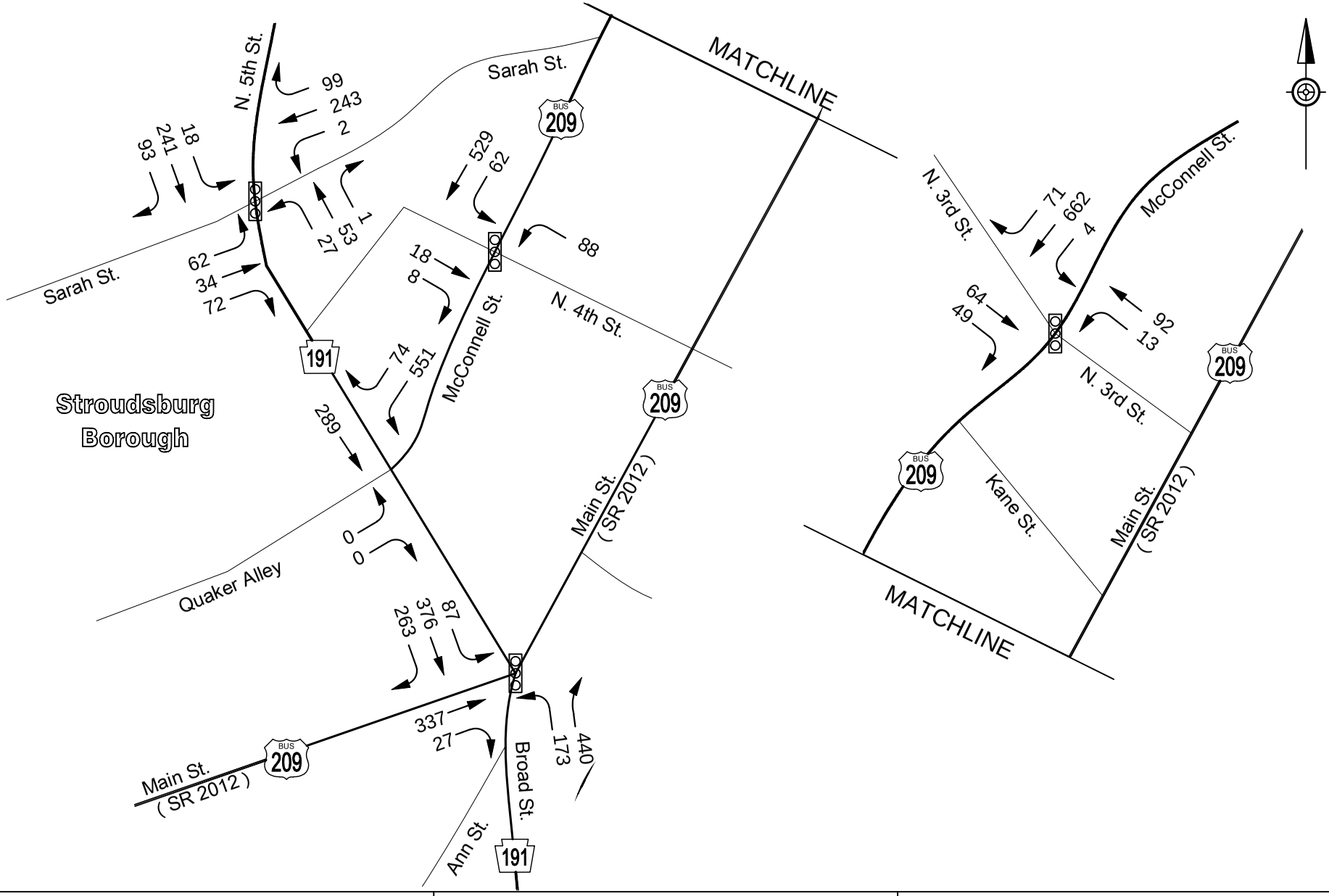
AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 4 ALTERNATIVE 1B A.M. PEAK HOUR 2045 TRAFFIC VOLUMES



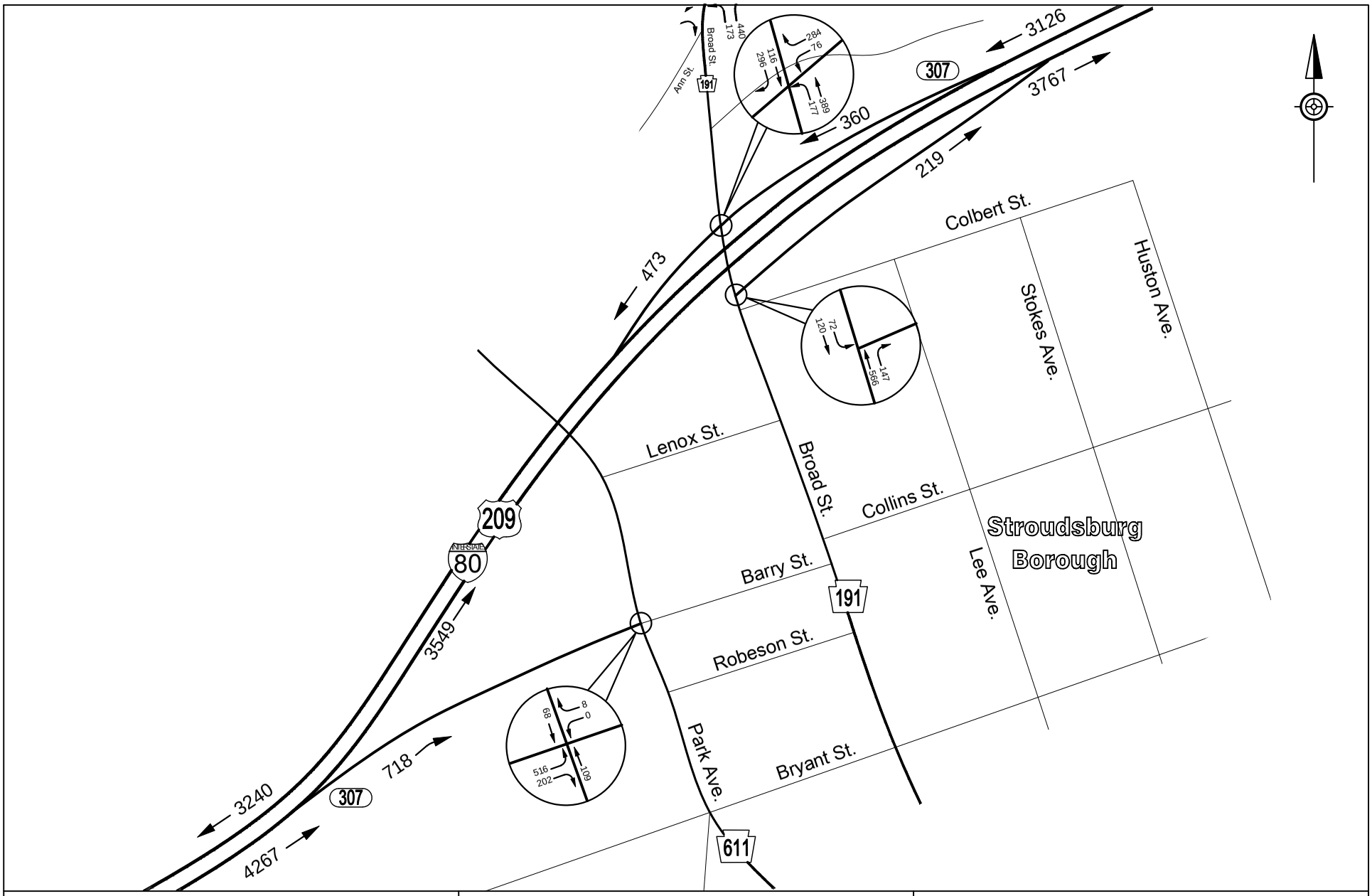
AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 5 ALTERNATIVE 1B A.M. PEAK HOUR 2045 TRAFFIC VOLUMES



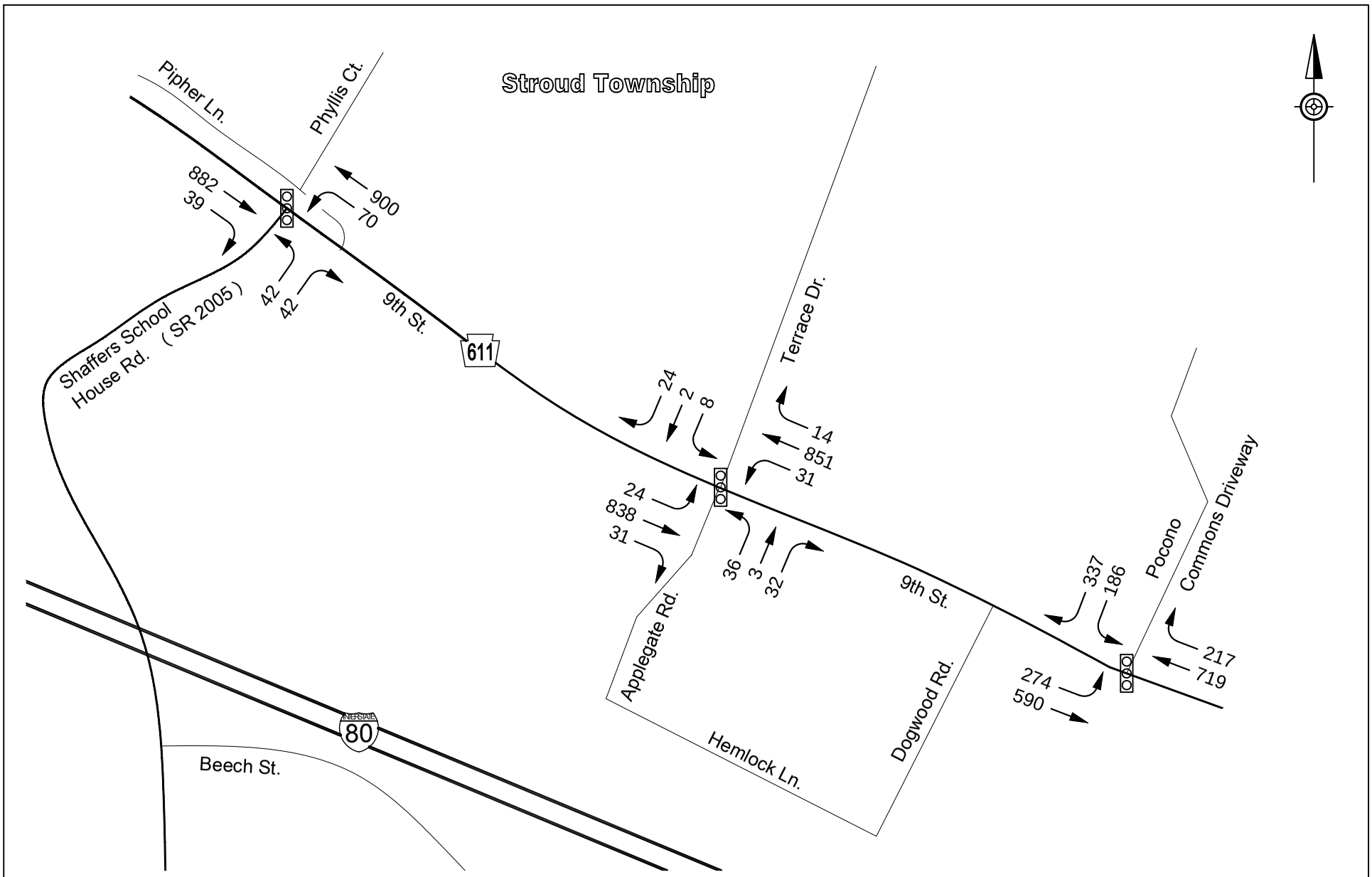
AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 6 ALTERNATIVE 1B A.M. PEAK HOUR 2045 TRAFFIC VOLUMES



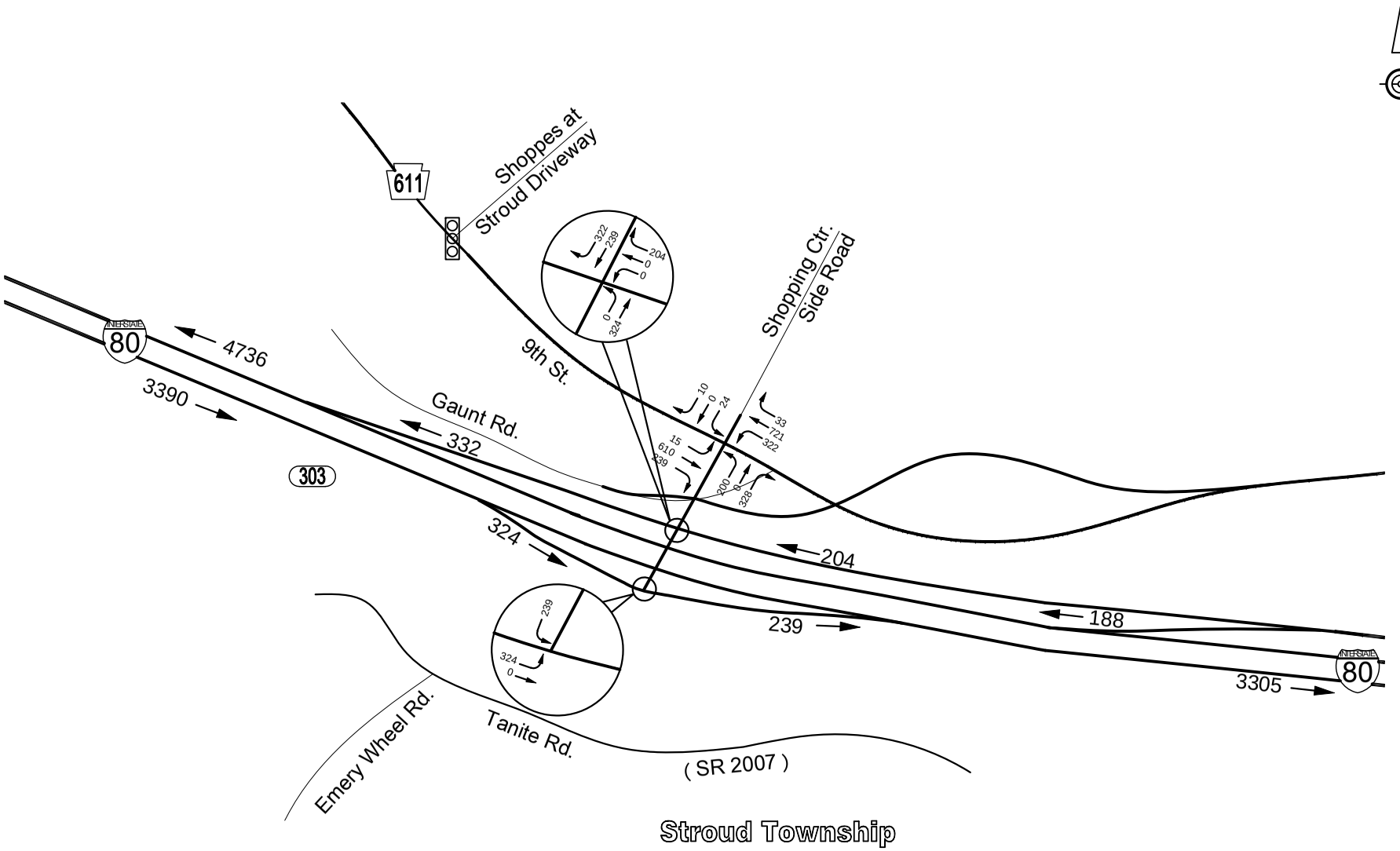
AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 7 ALTERNATIVE 1B A.M. PEAK HOUR 2045 TRAFFIC VOLUMES



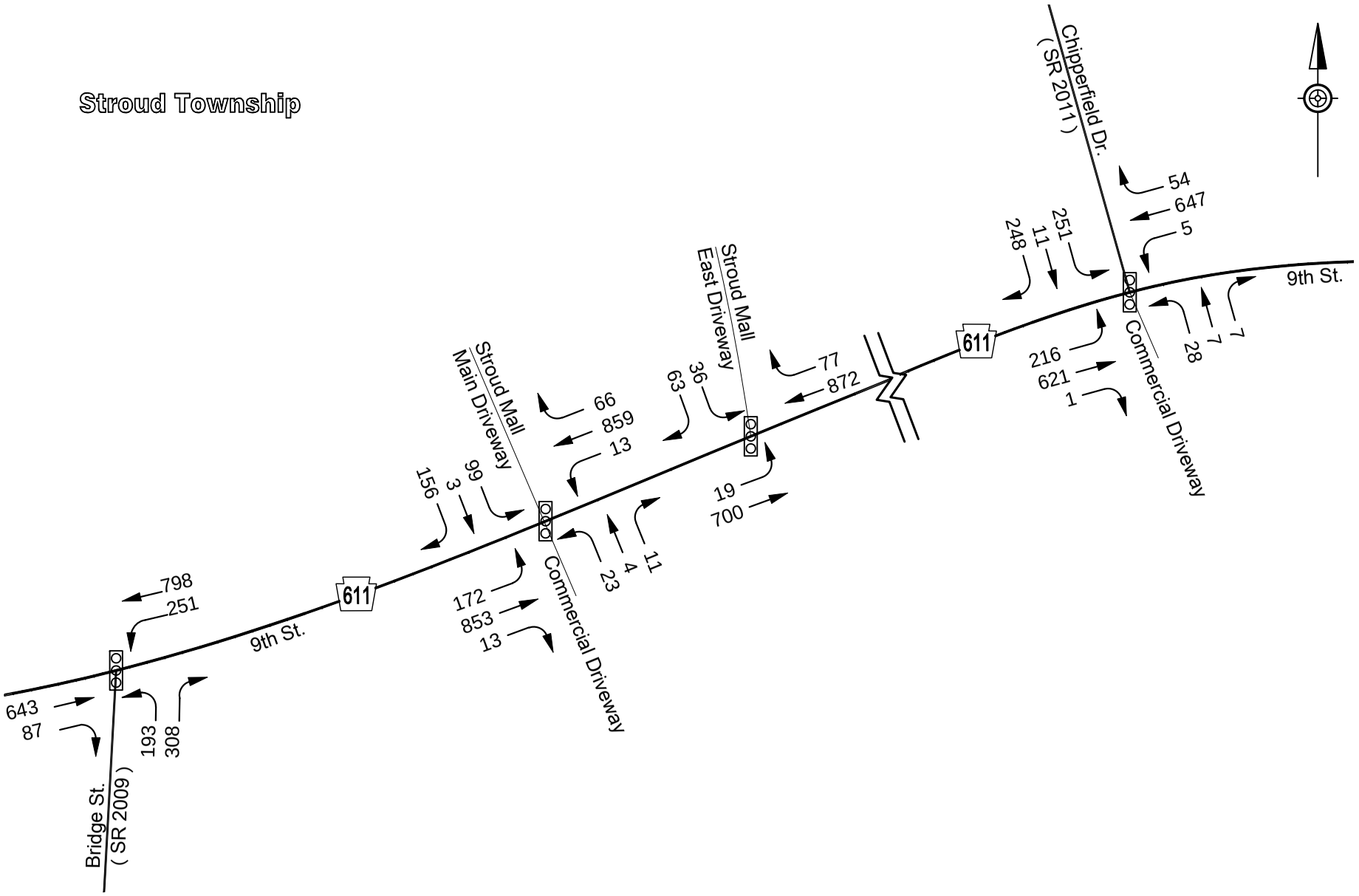
AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 8 ALTERNATIVE 1B A.M. PEAK HOUR 2045 TRAFFIC VOLUMES



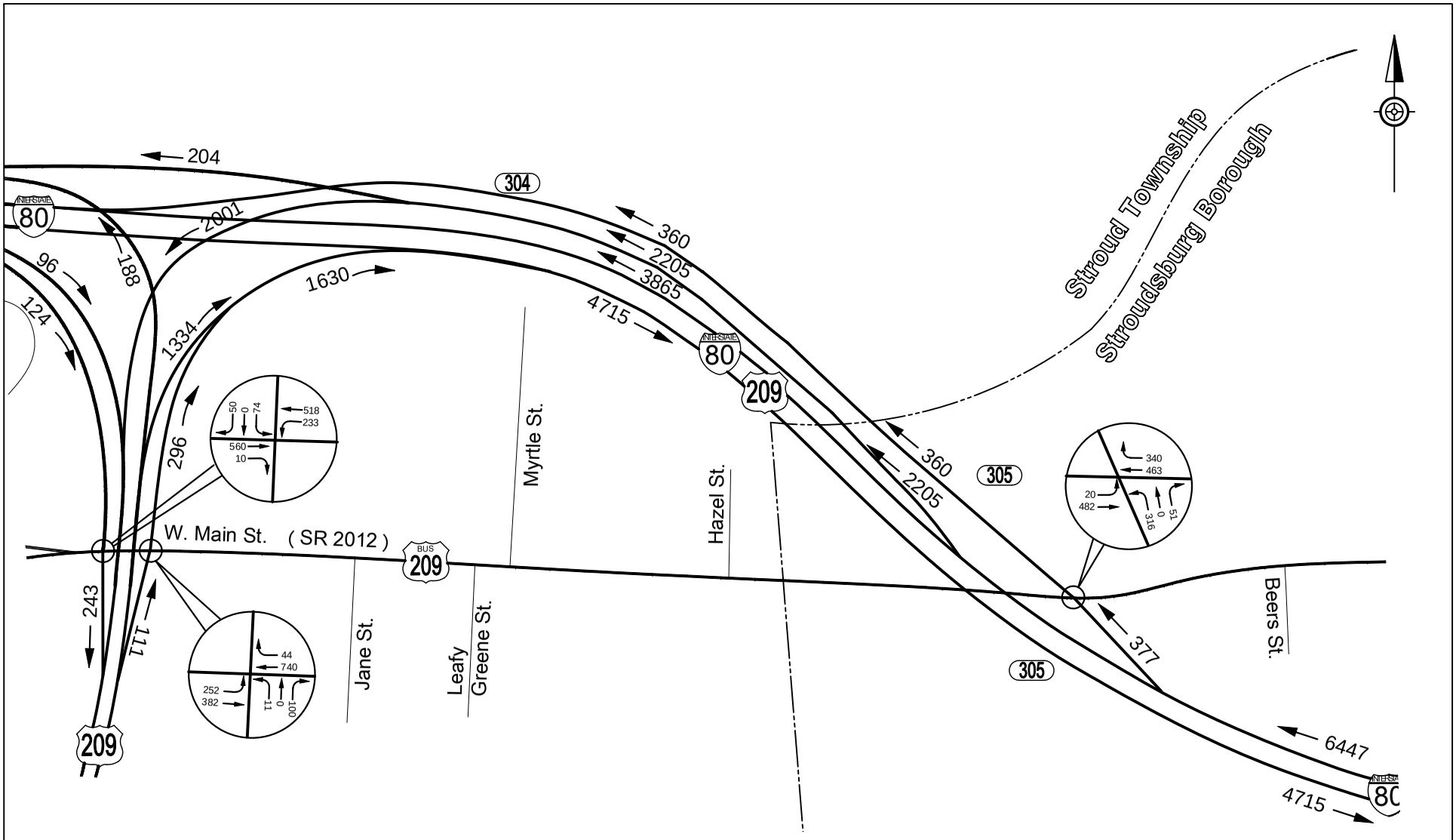
AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 9 ALTERNATIVE 1B P.M. PEAK HOUR 2045 TRAFFIC VOLUMES



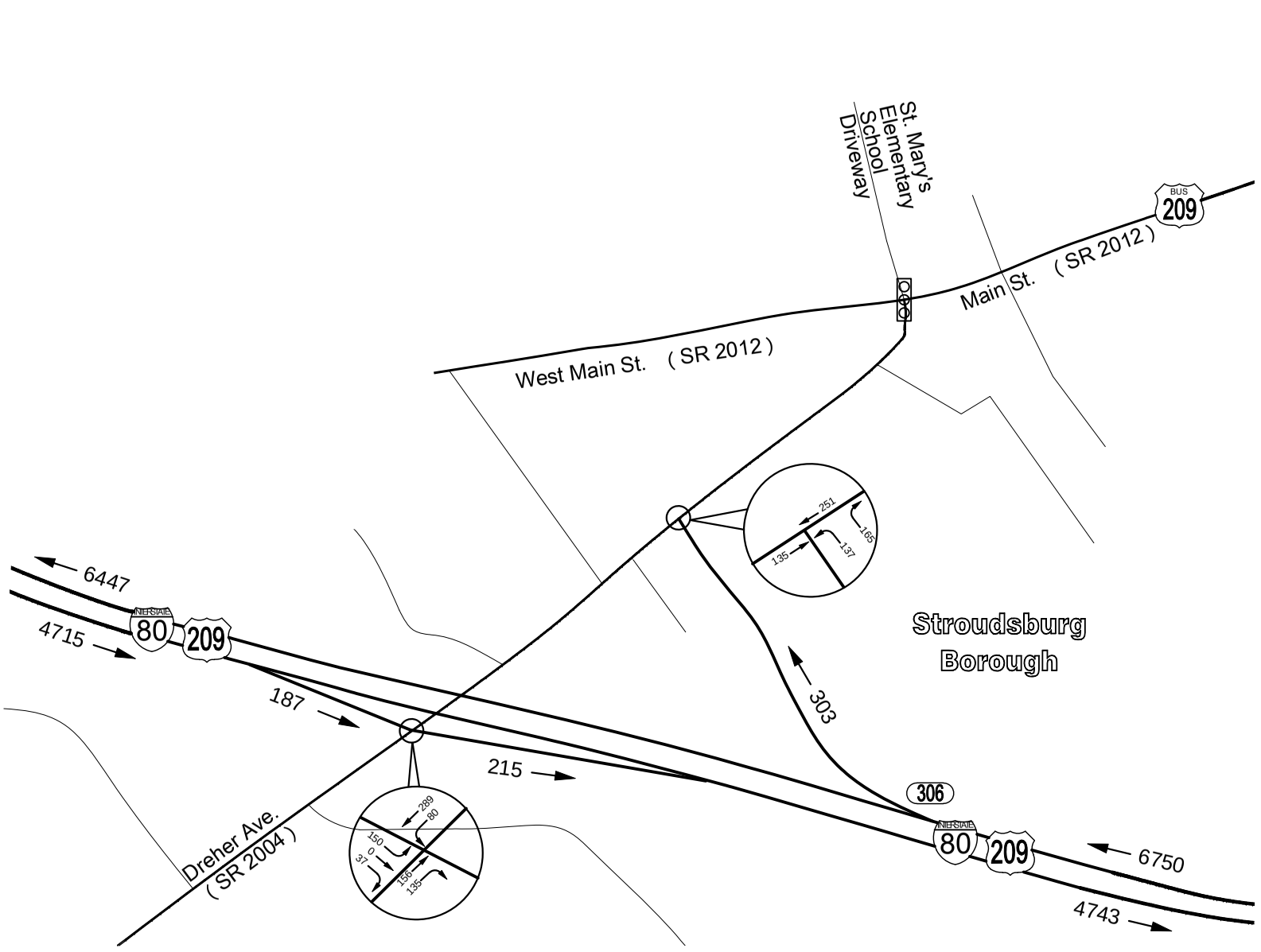
AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 10 ALTERNATIVE 1B P.M. PEAK HOUR 2045 TRAFFIC VOLUMES



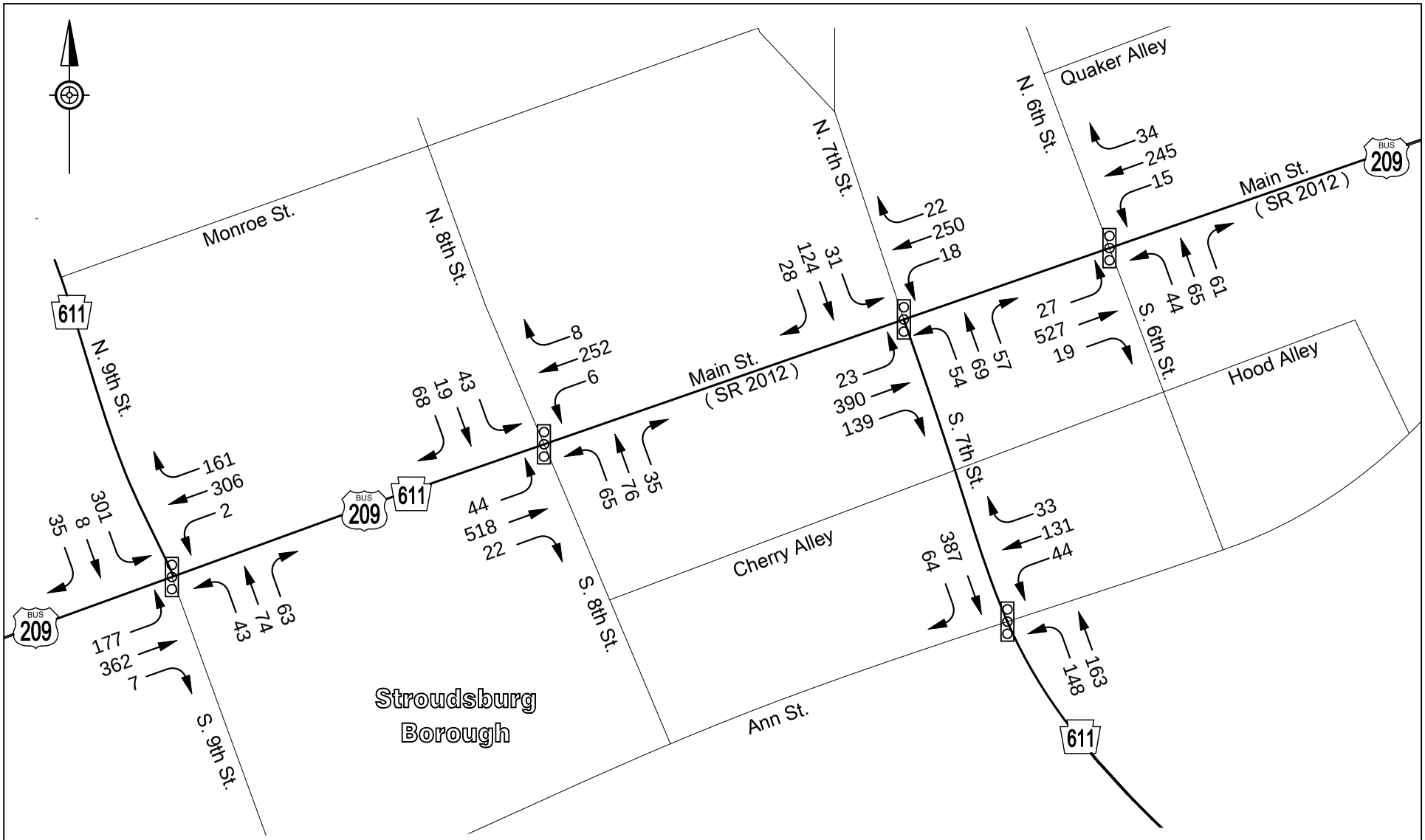
AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 11 ALTERNATIVE 1B P.M. PEAK HOUR 2045 TRAFFIC VOLUMES



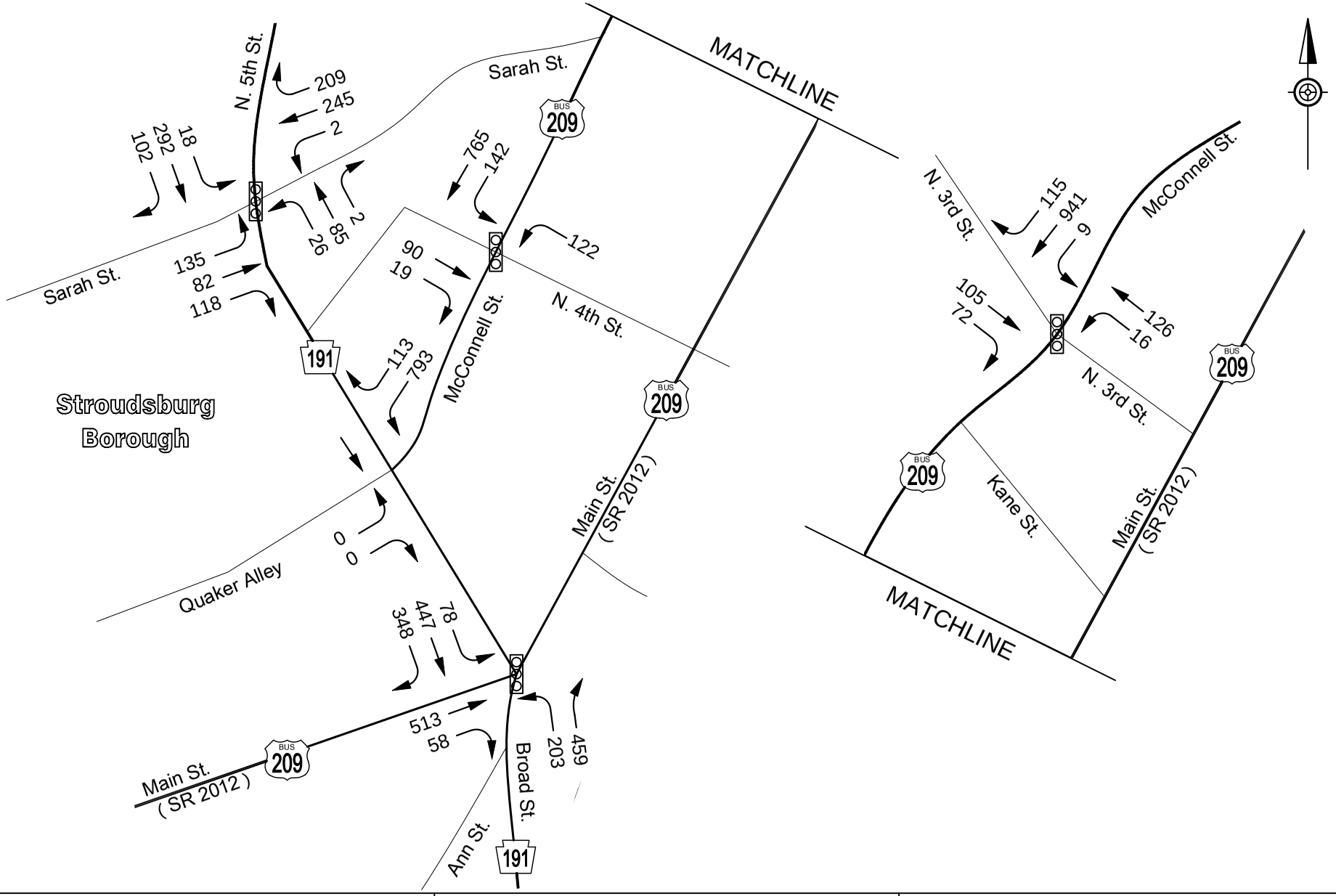
AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 12 ALTERNATIVE 1B P.M. PEAK HOUR 2045 TRAFFIC VOLUMES



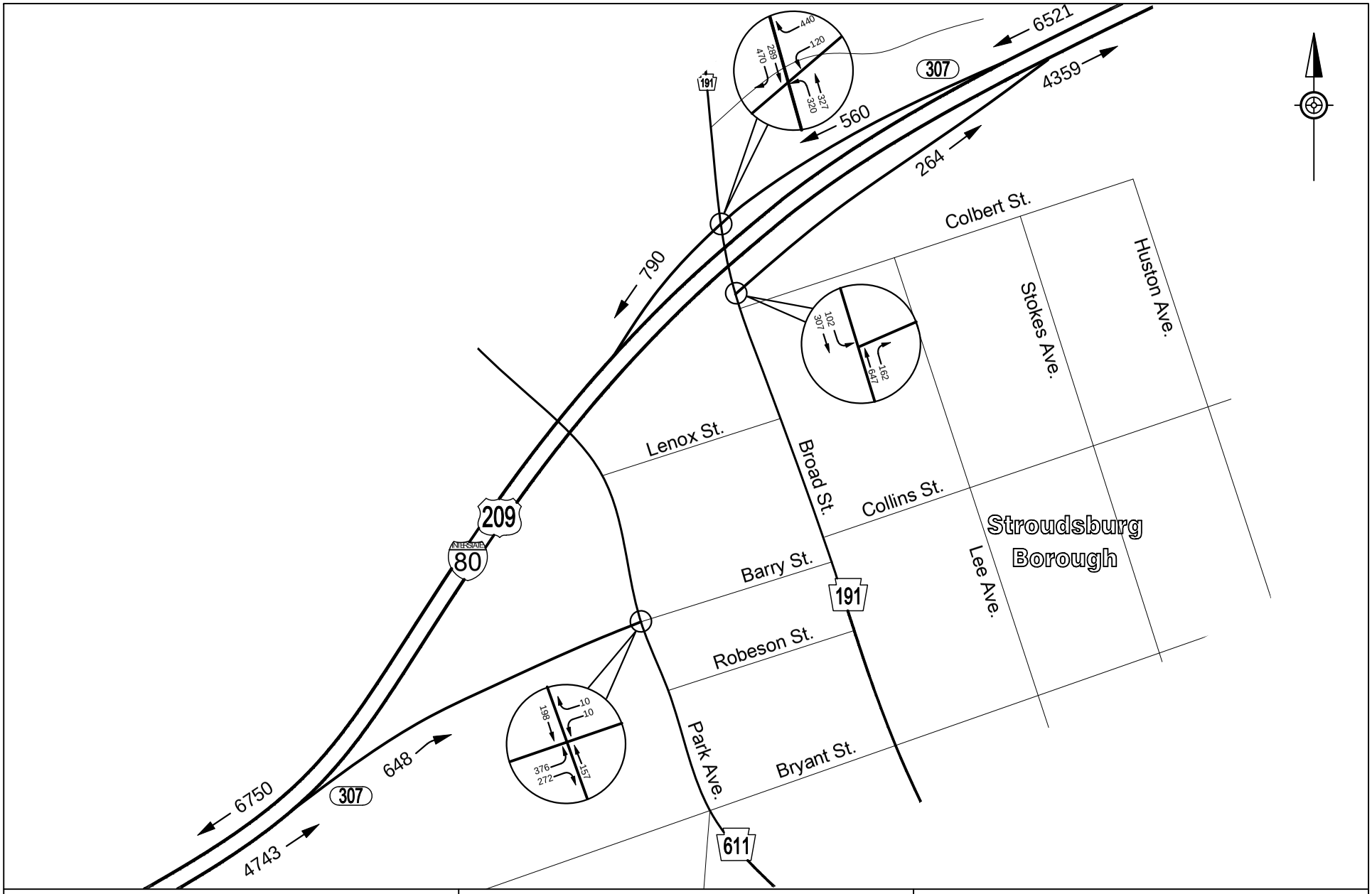
AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 13 ALTERNATIVE 1B P.M. PEAK HOUR 2045 TRAFFIC VOLUMES



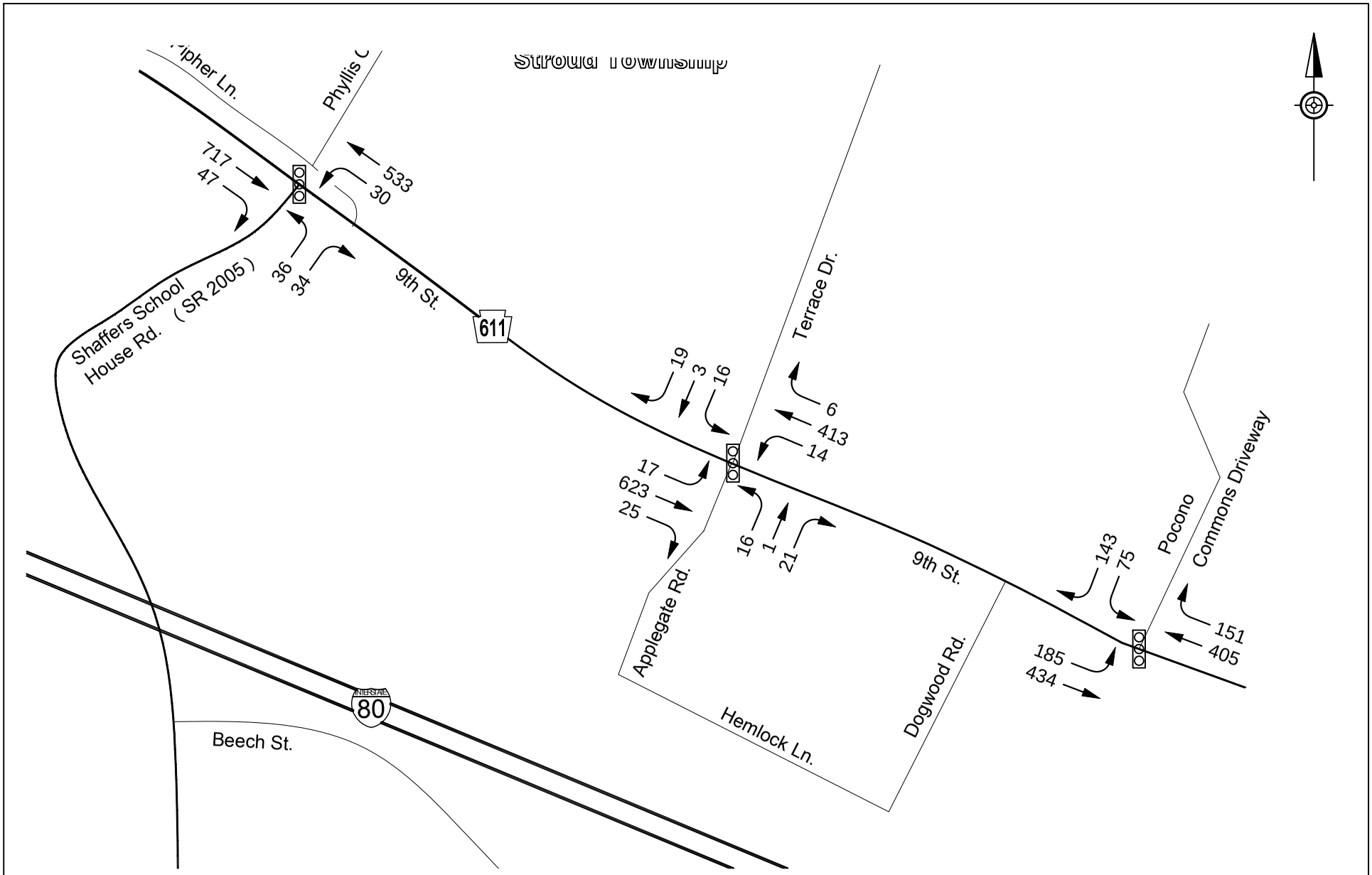
AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 14 ALTERNATIVE 1B P.M. PEAK HOUR 2045 TRAFFIC VOLUMES



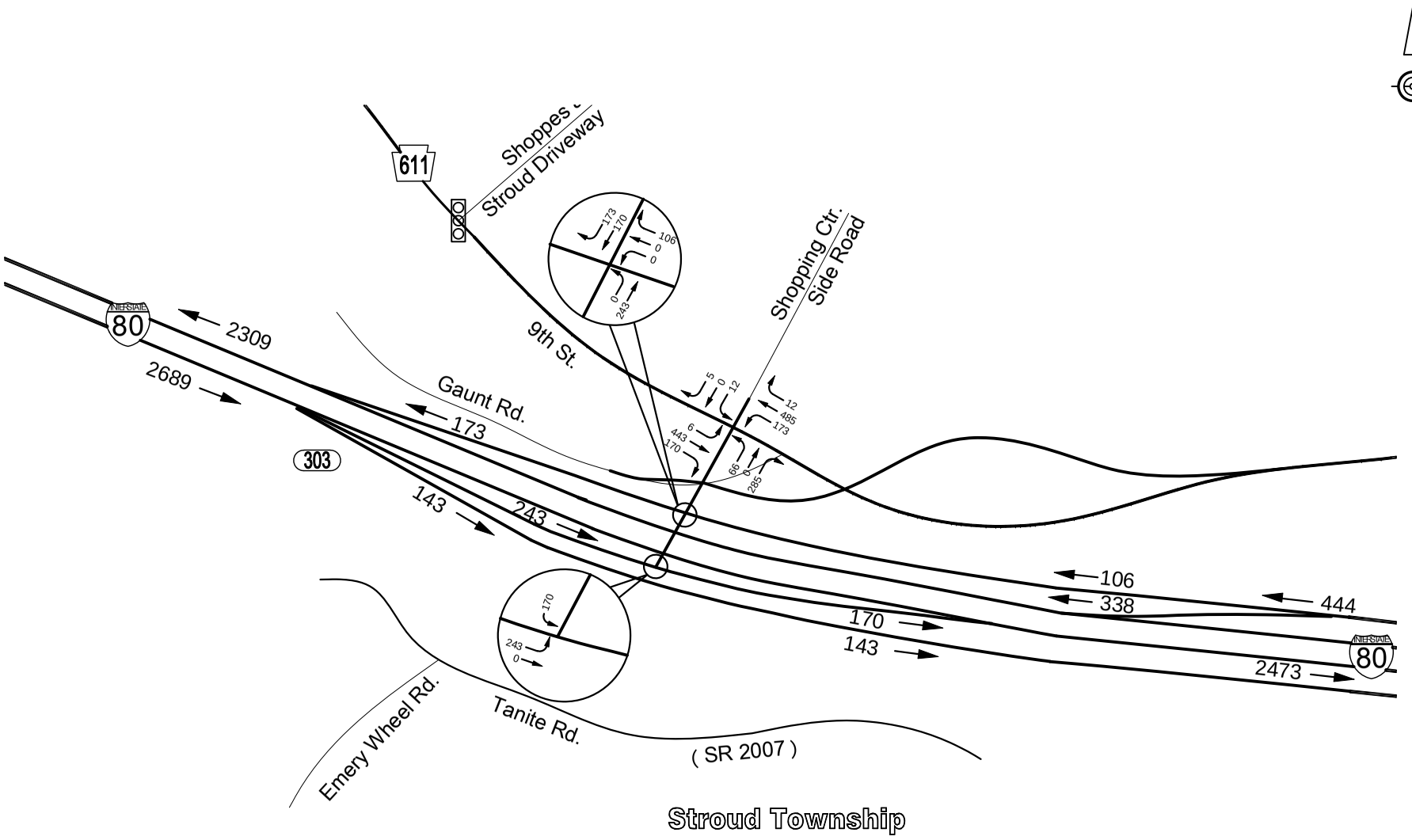
AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 15 ALTERNATIVE 1B P.M. PEAK HOUR 2045 TRAFFIC VOLUMES



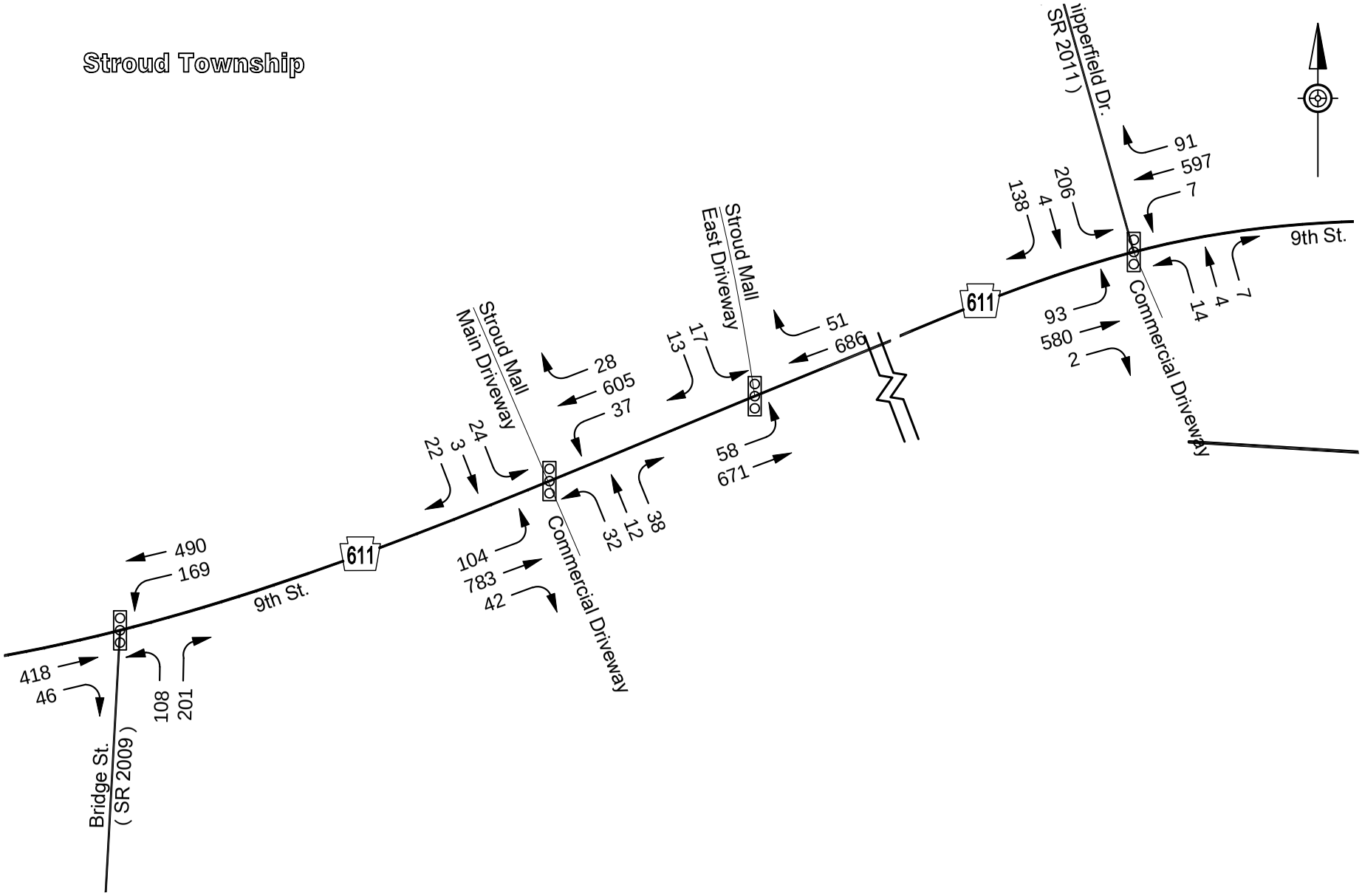
AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 16 ALTERNATIVE 1B P.M. PEAK HOUR 2045 TRAFFIC VOLUMES



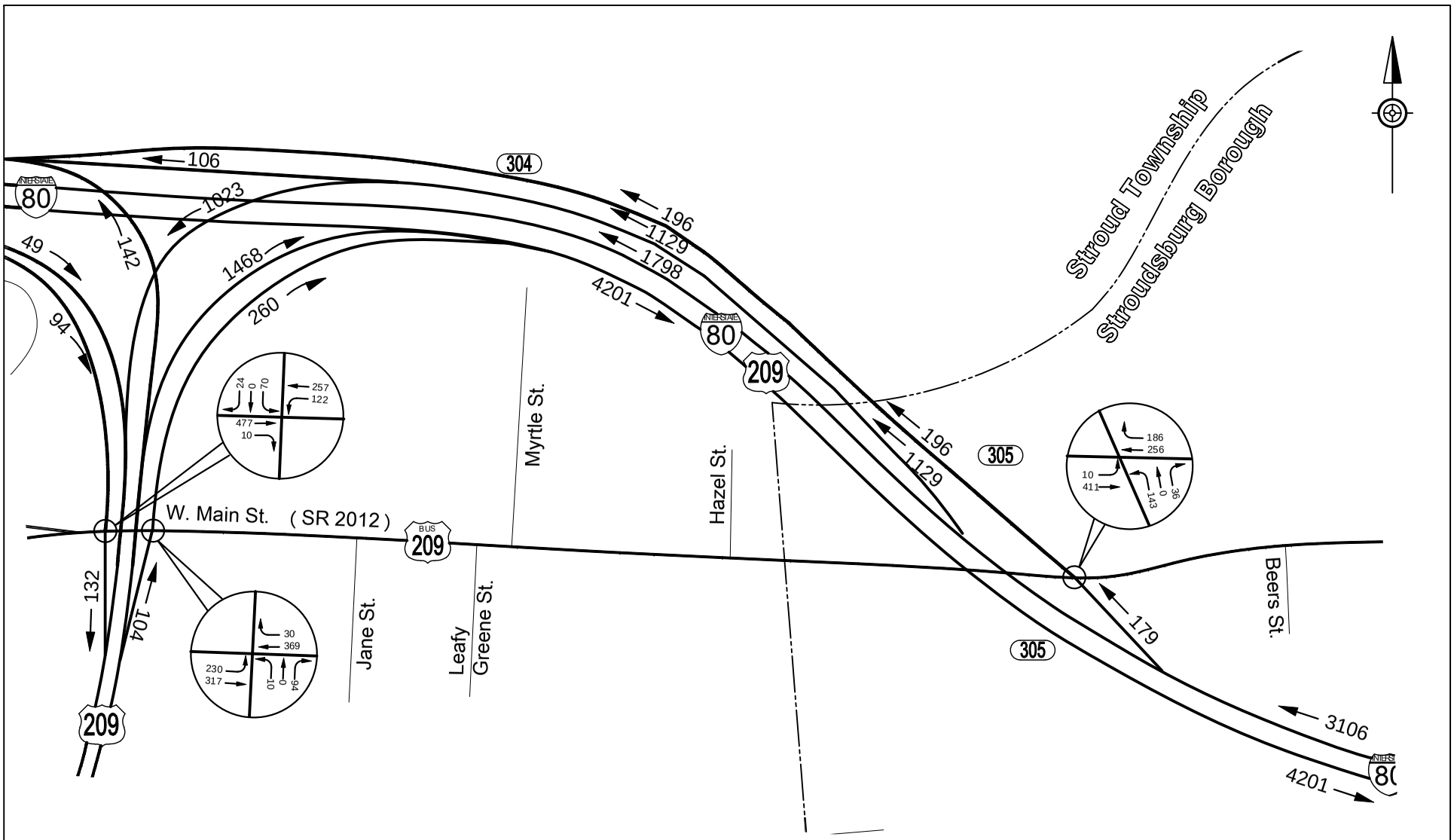
AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 1 ALTERNATIVE 1C A.M. PEAK HOUR 2045 TRAFFIC VOLUMES



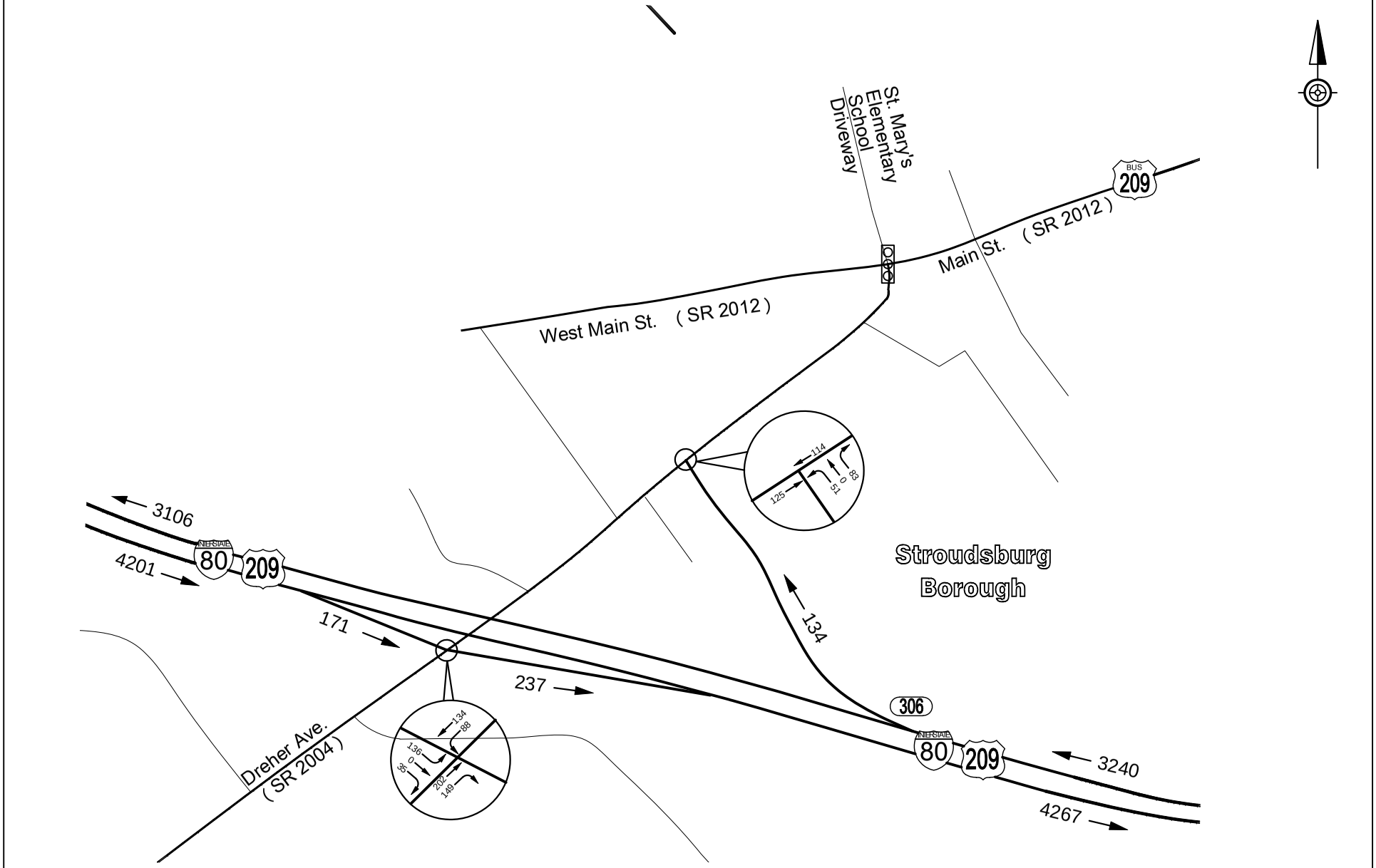
AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 2 ALTERNATIVE 1C A.M. PEAK HOUR 2045 TRAFFIC VOLUMES



AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 3 ALTERNATIVE 1C A.M. PEAK HOUR 2045 TRAFFIC VOLUMES



AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 4 ALTERNATIVE 1C A.M. PEAK HOUR 2045 TRAFFIC VOLUMES



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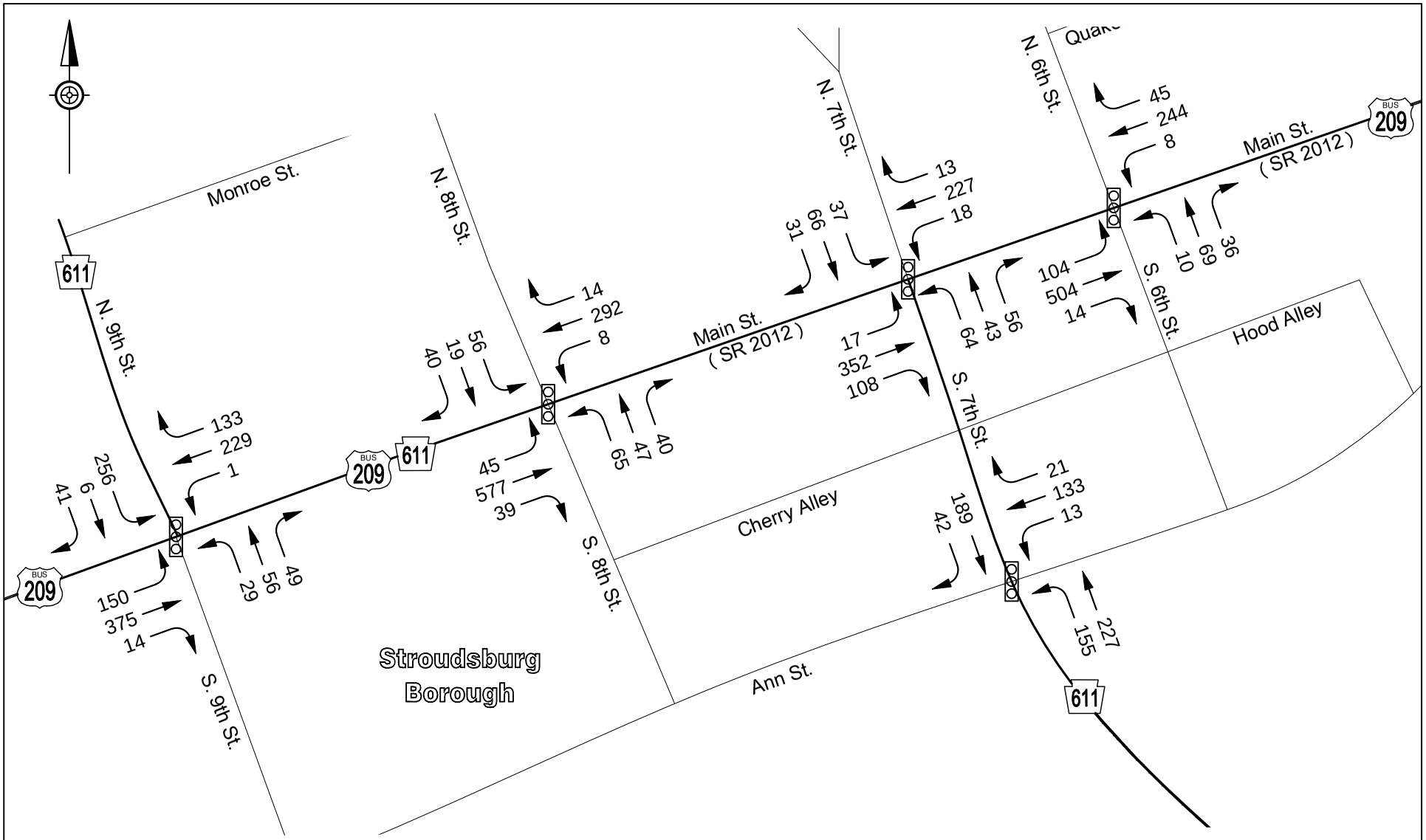
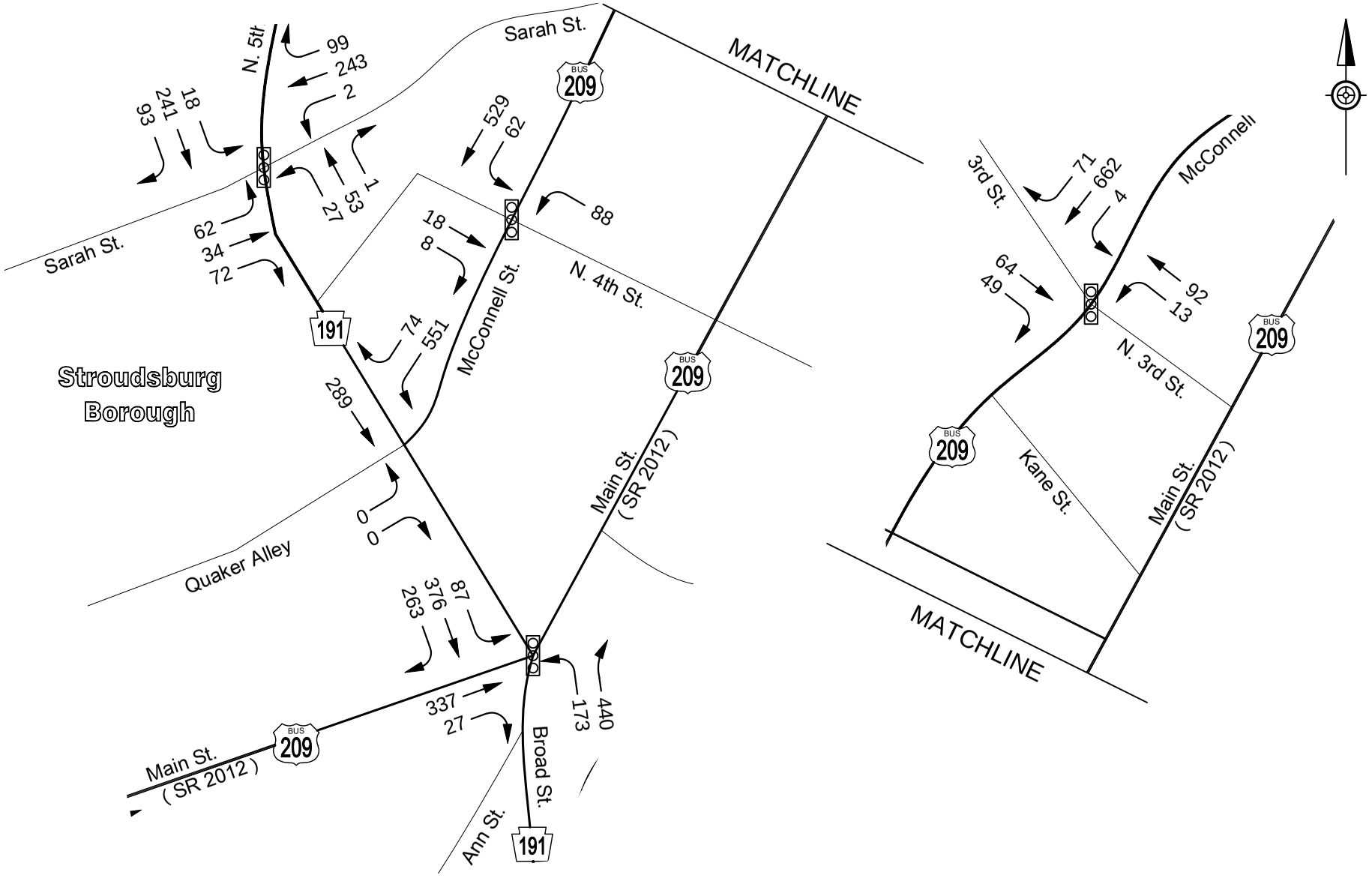
Monroe County

FIGURE 5
ALTERNATIVE 1C
A.M. PEAK HOUR
2045 TRAFFIC VOLUMES



AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 6 ALTERNATIVE 1C A.M. PEAK HOUR 2045 TRAFFIC VOLUMES



AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 7 ALTERNATIVE 1C A.M. PEAK HOUR 2045 TRAFFIC VOLUMES

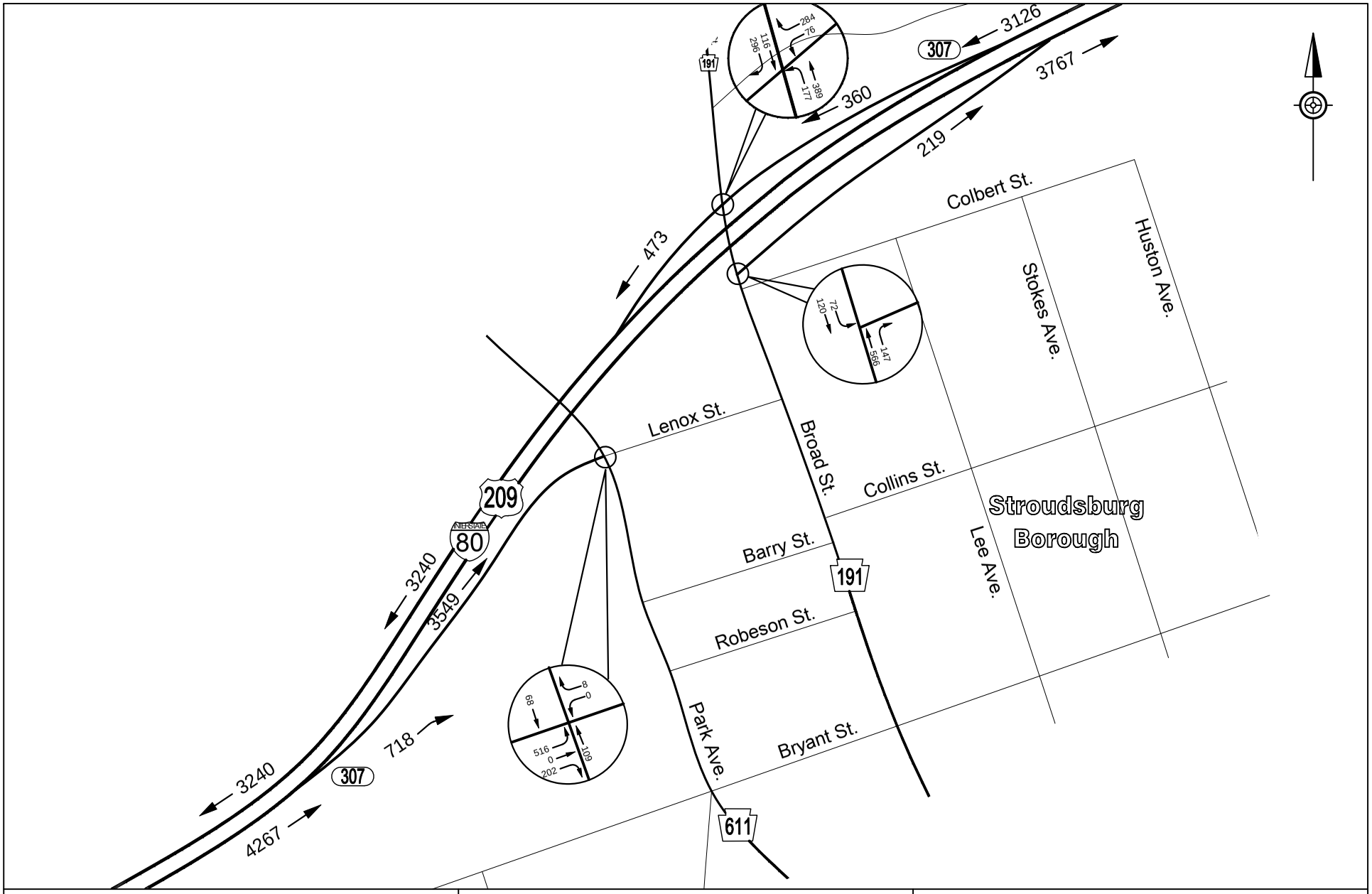


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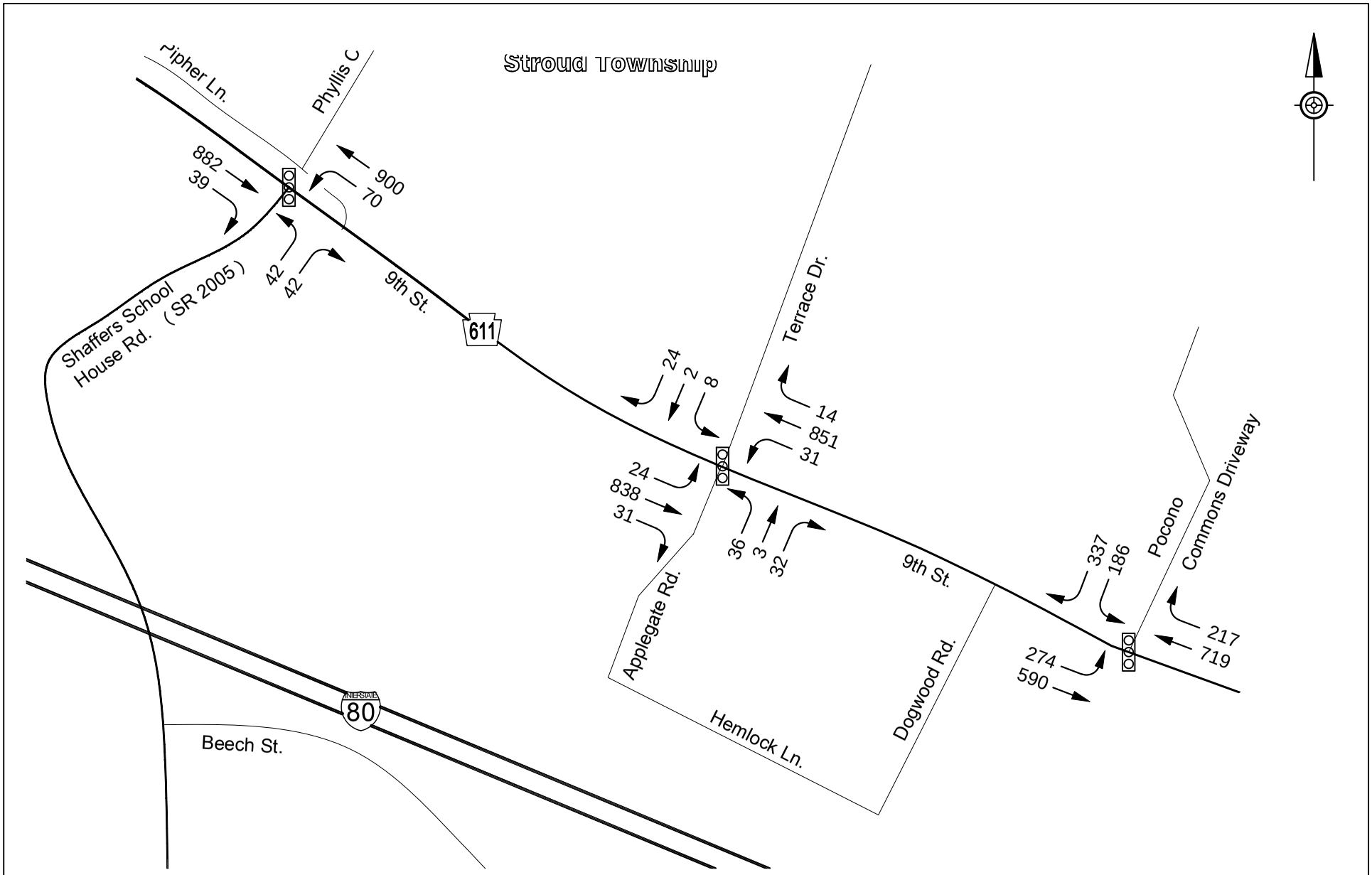
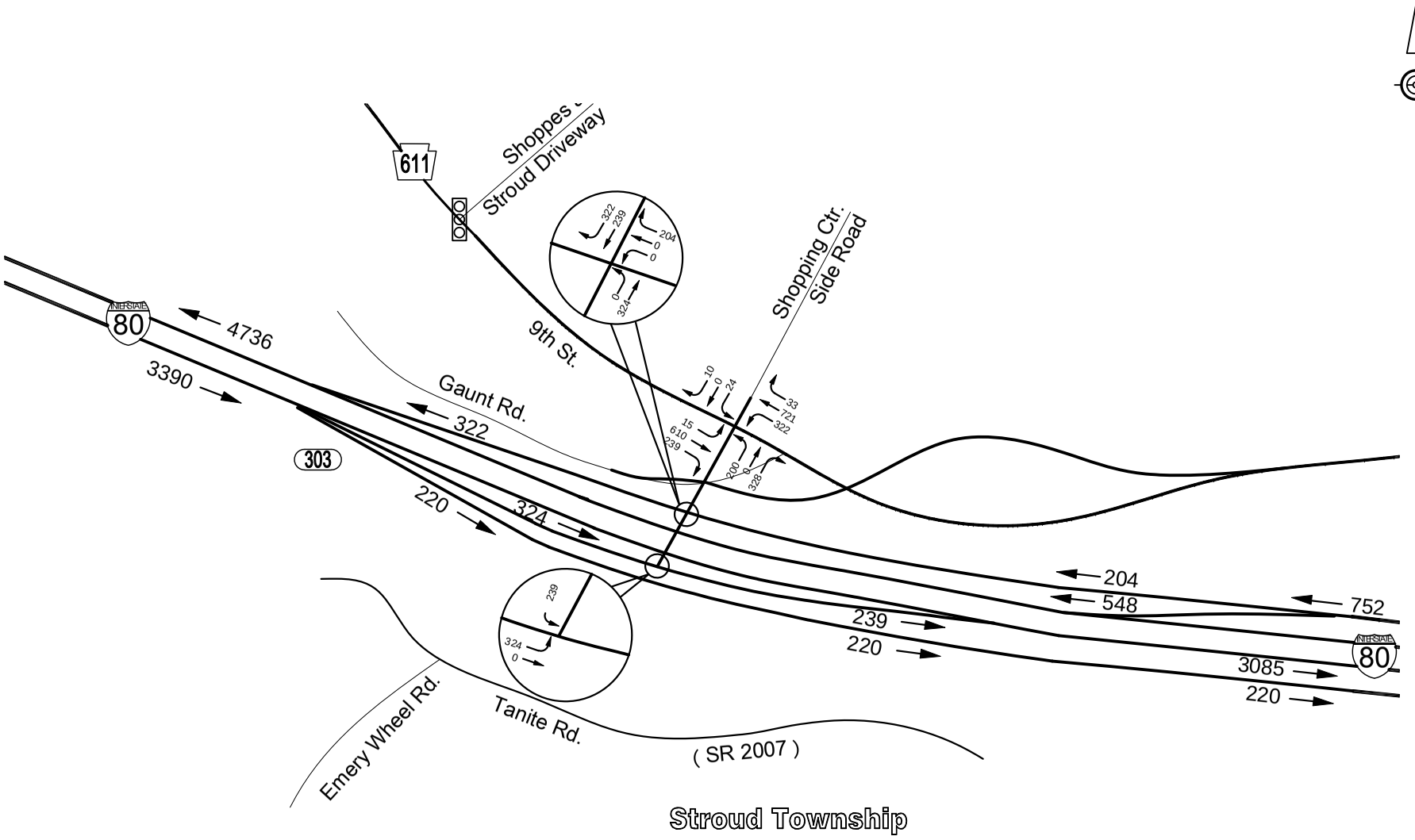
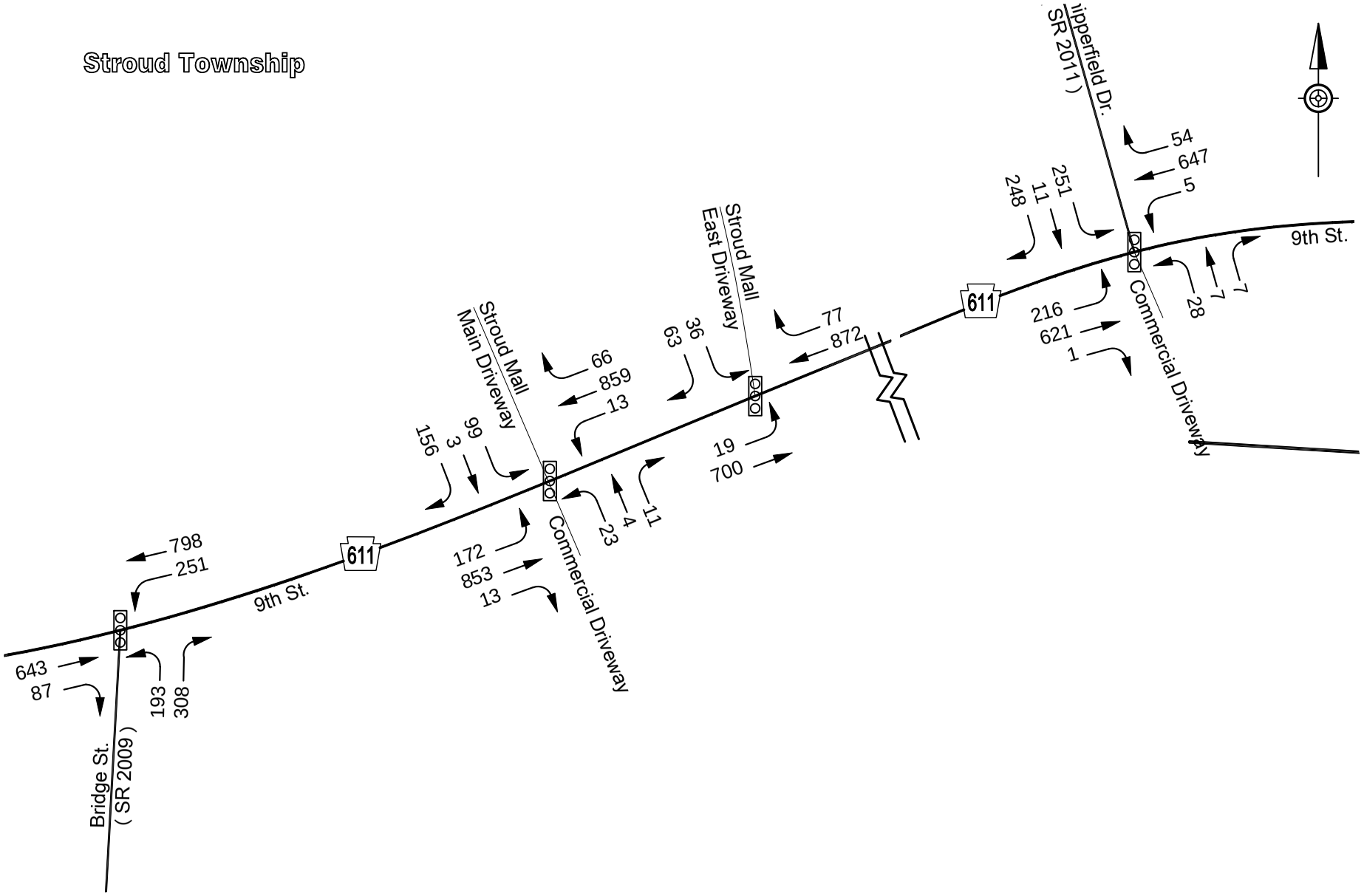
FIGURE 8
ALTERNATIVE 1C
A.M. PEAK HOUR
2045 TRAFFIC VOLUMES



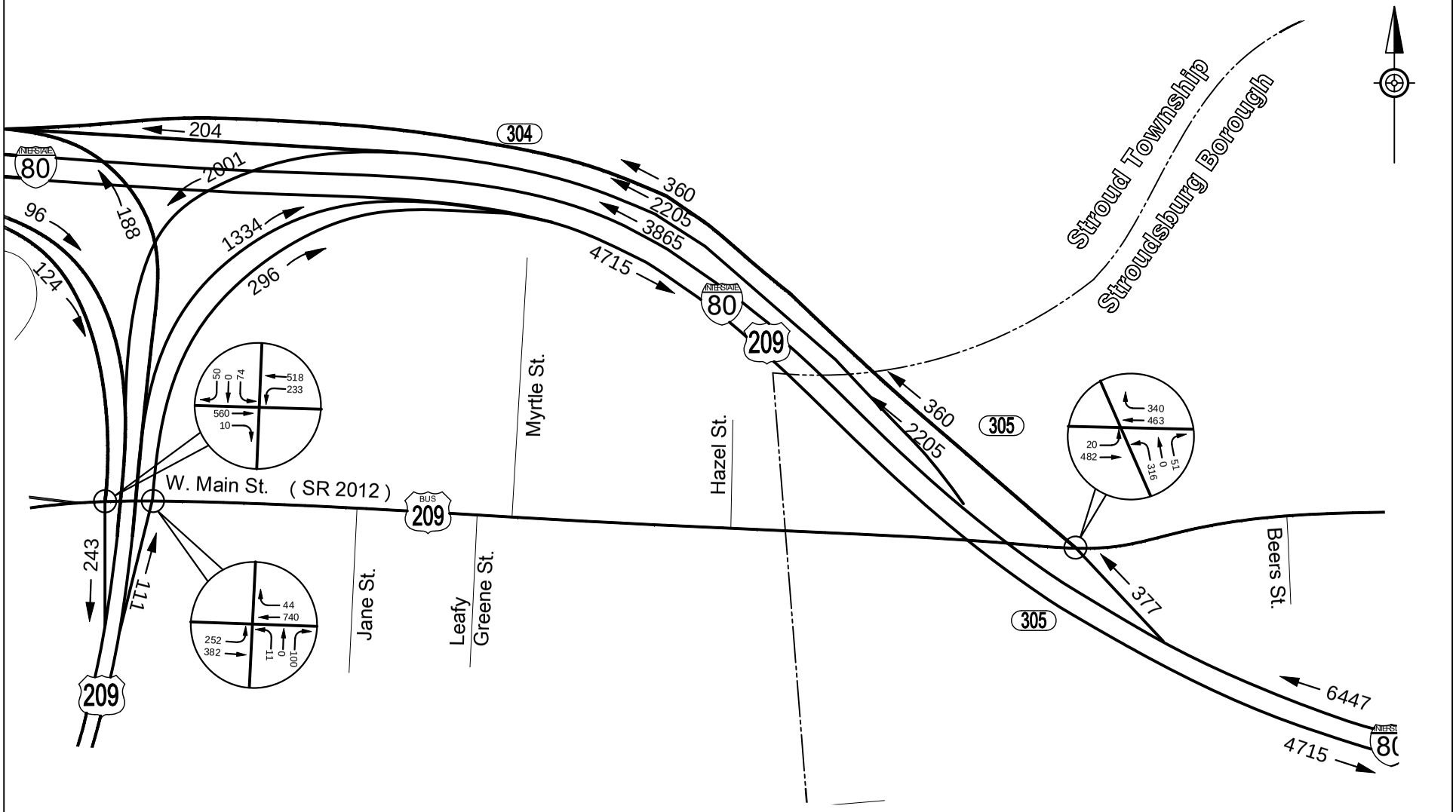
AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 9 ALTERNATIVE 1C P.M. PEAK HOUR 2045 TRAFFIC VOLUMES



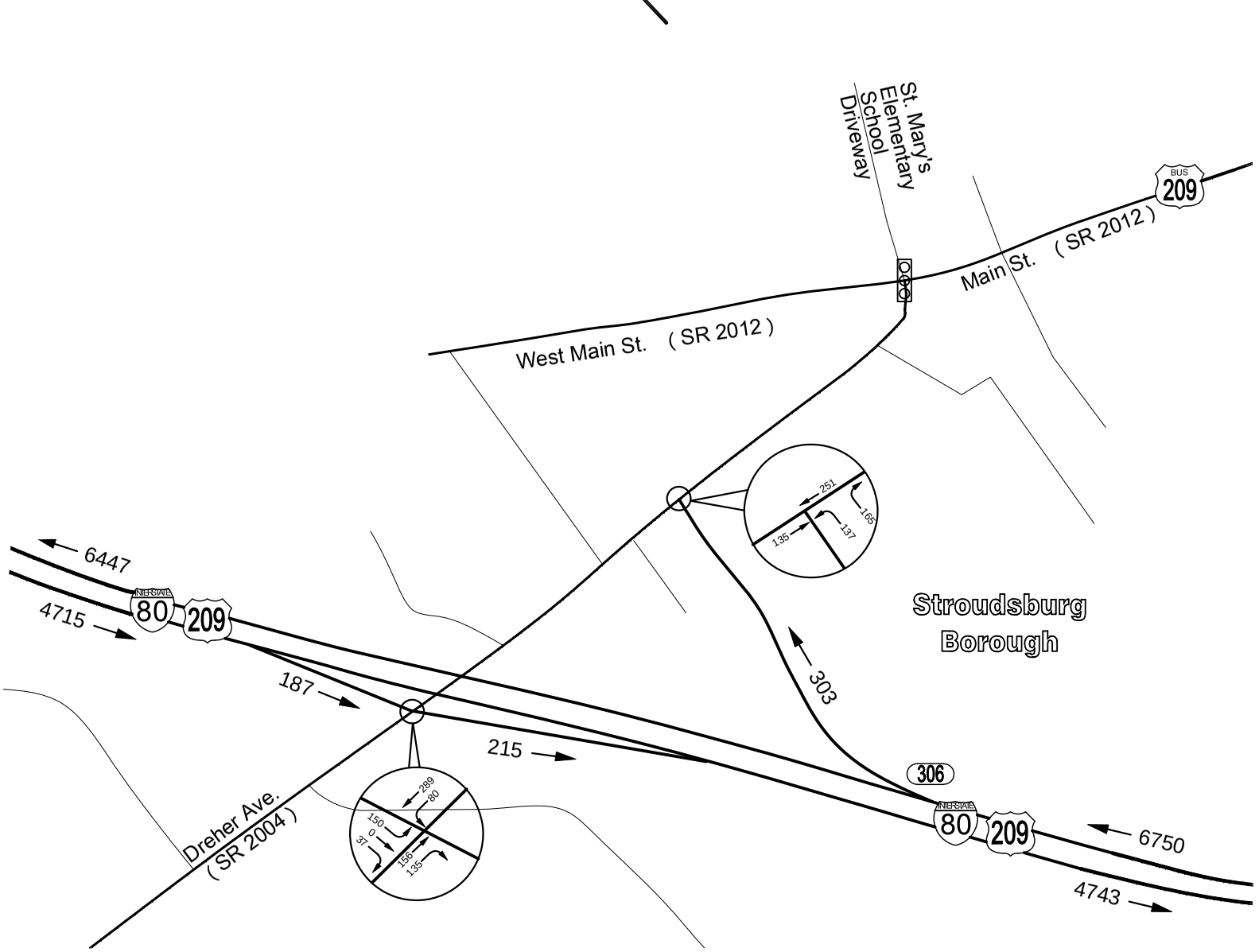
AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 10 ALTERNATIVE 1C P.M. PEAK HOUR 2045 TRAFFIC VOLUMES



AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 11 ALTERNATIVE 1C P.M. PEAK HOUR 2045 TRAFFIC VOLUMES



AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 12 ALTERNATIVE 1C P.M. PEAK HOUR 2045 TRAFFIC VOLUMES



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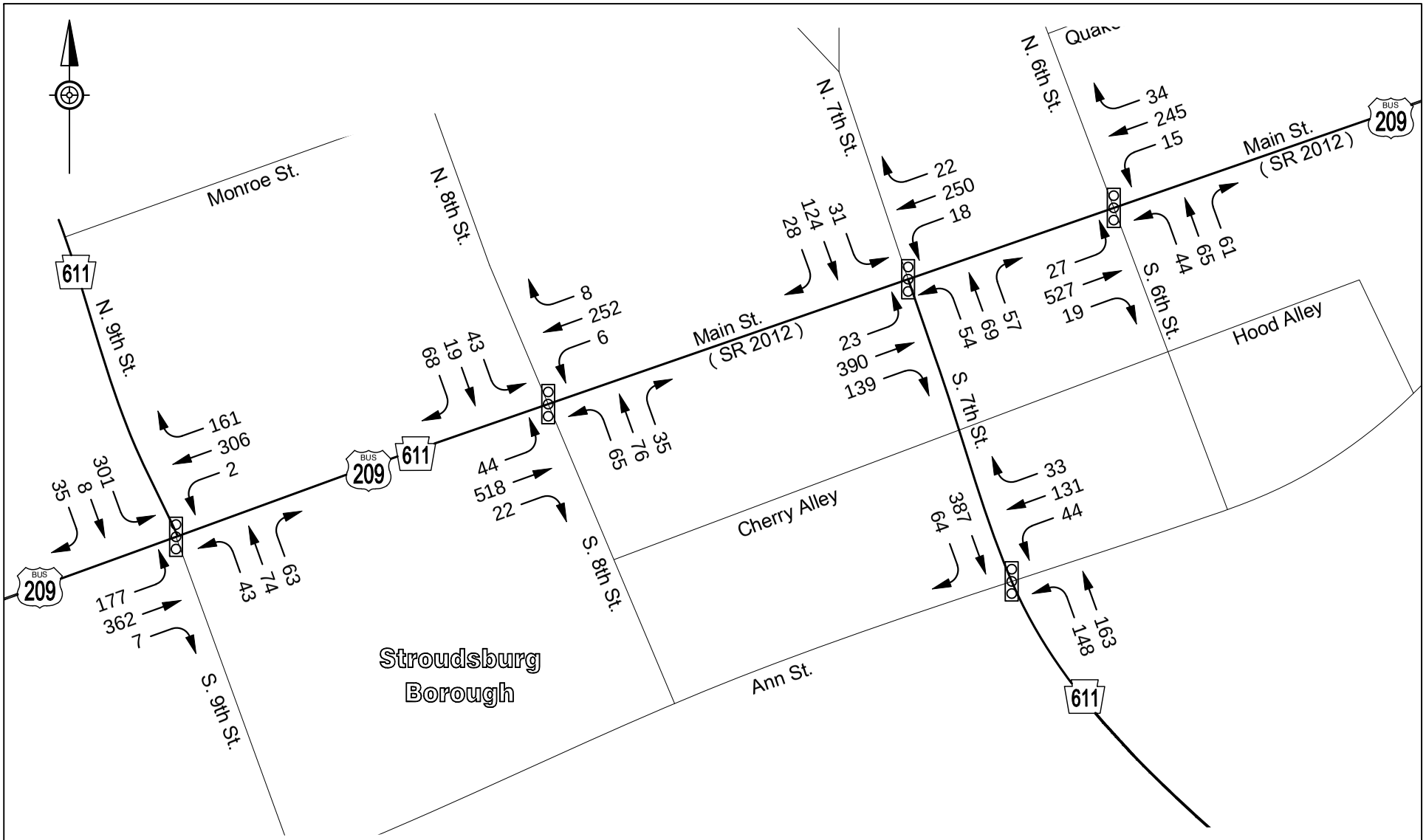
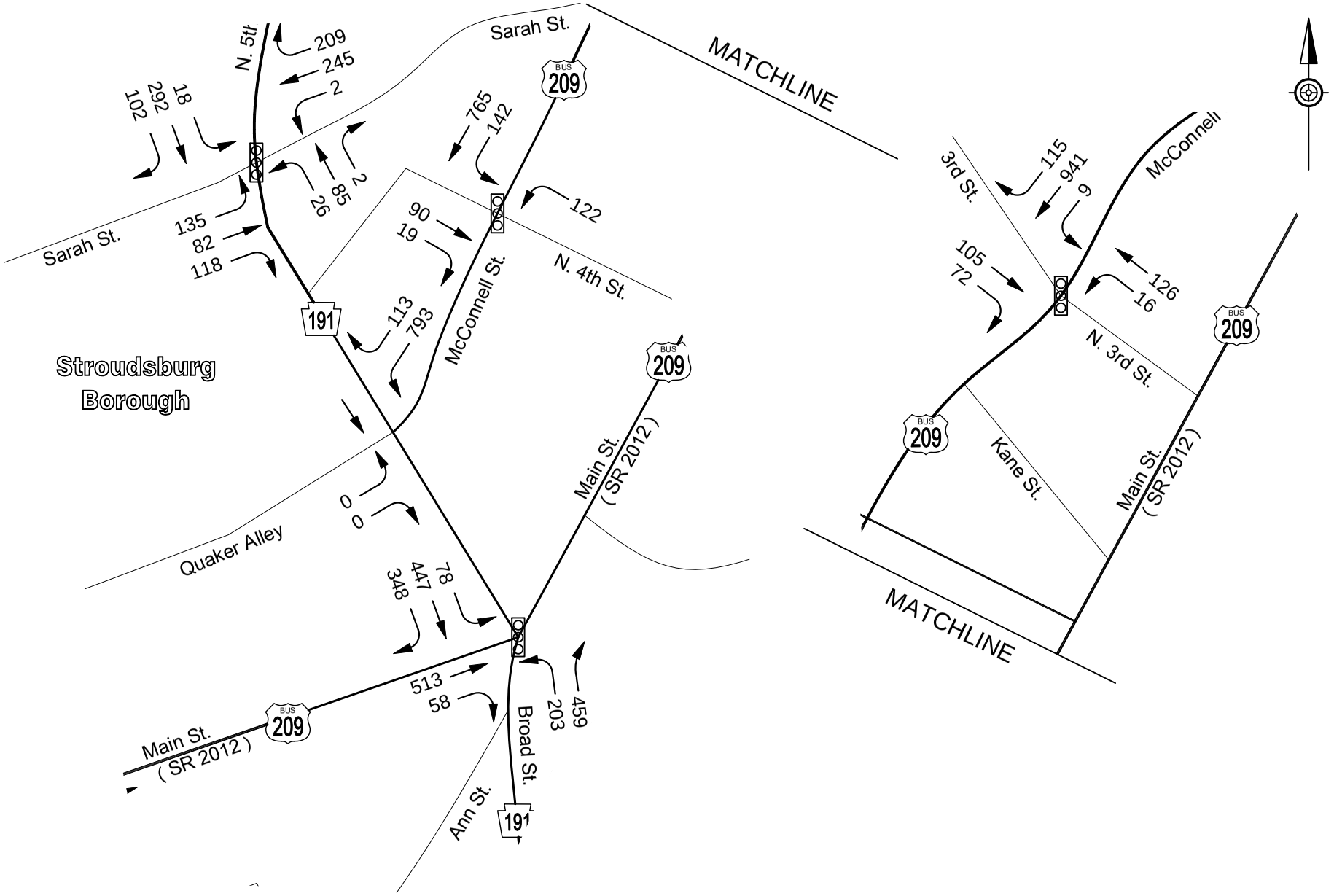
Monroe County

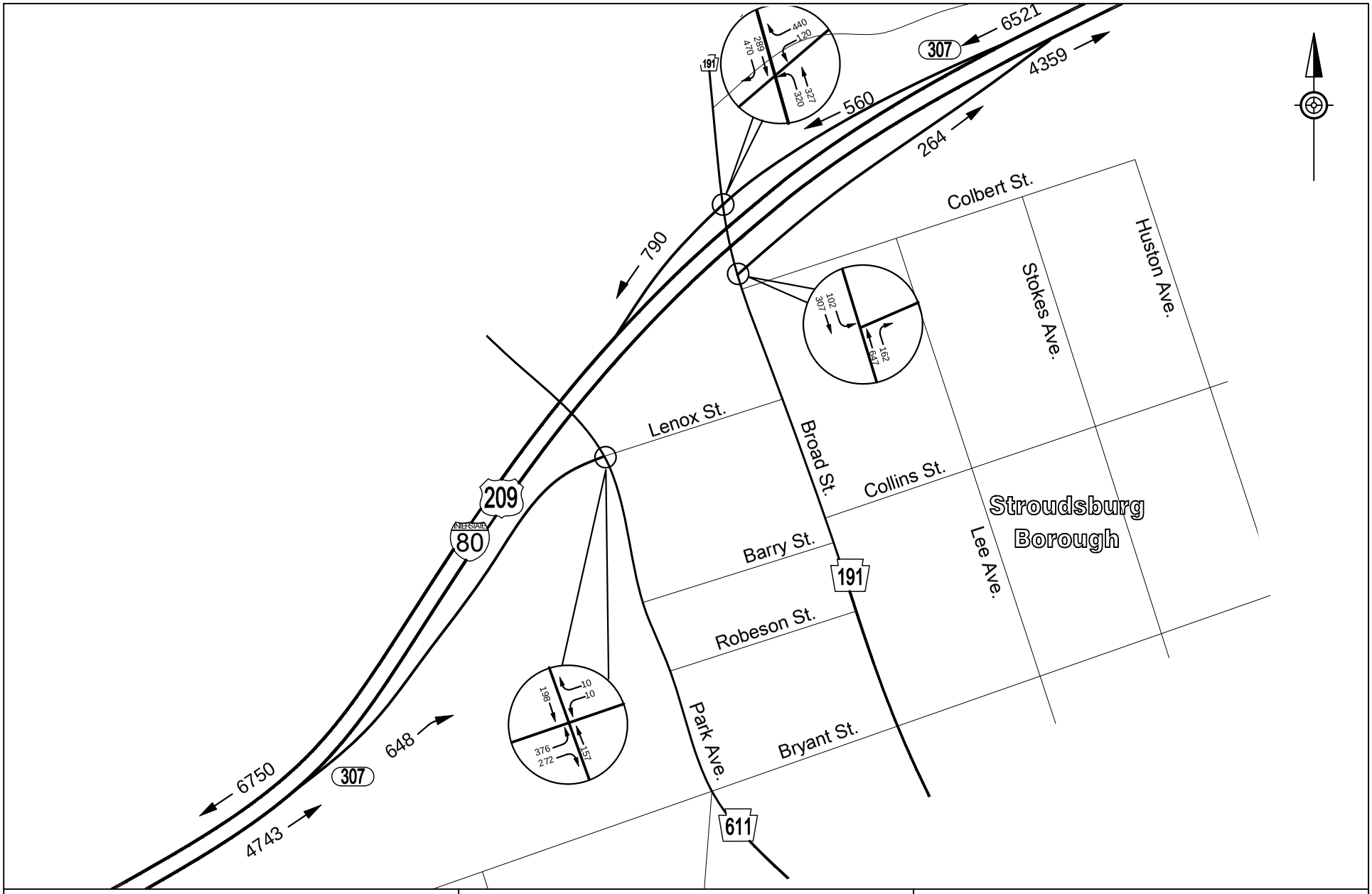
FIGURE 13
ALTERNATIVE 1C
P.M. PEAK HOUR
2045 TRAFFIC VOLUMES



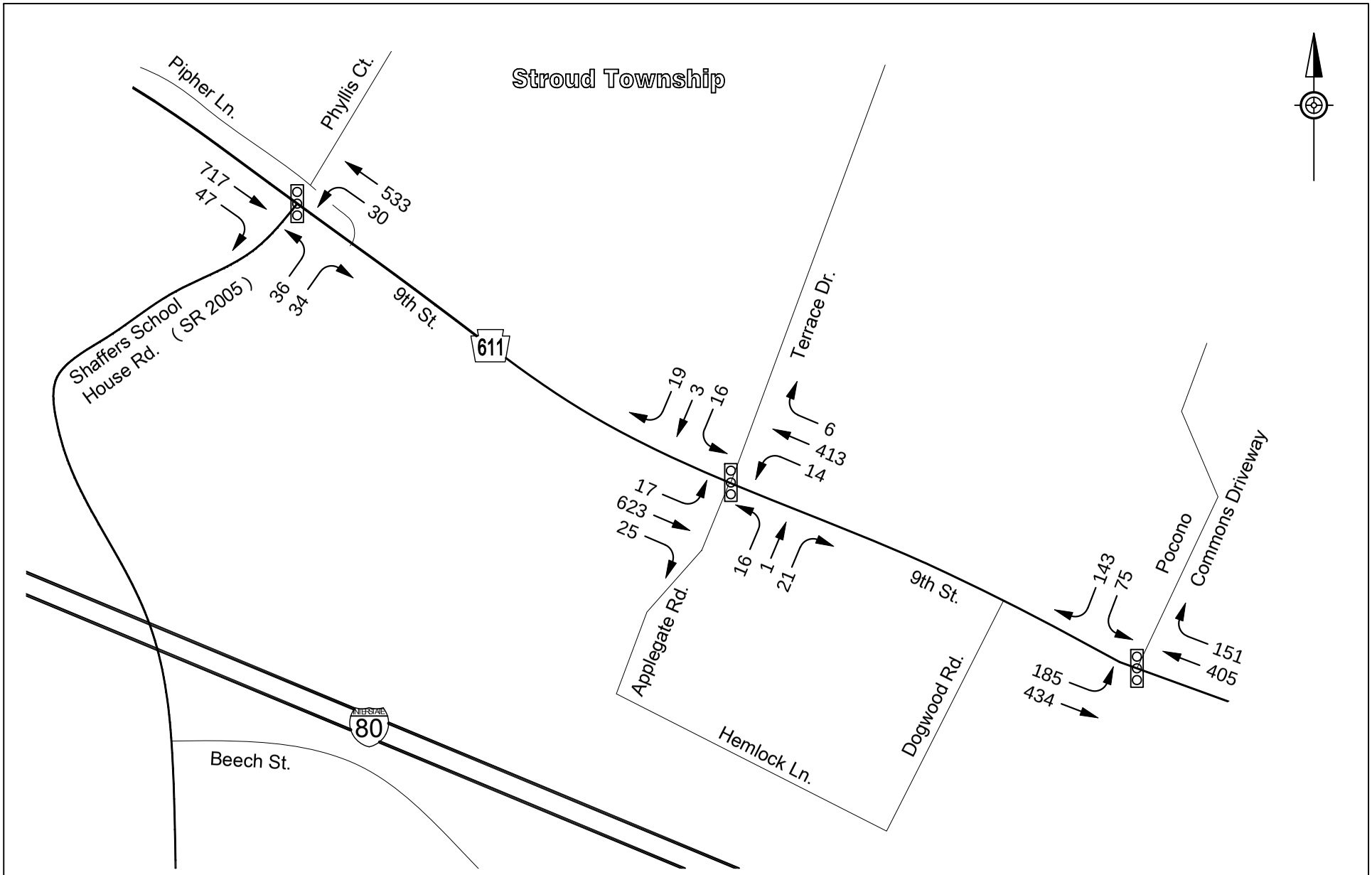
AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 14 ALTERNATIVE 1C P.M. PEAK HOUR 2045 TRAFFIC VOLUMES



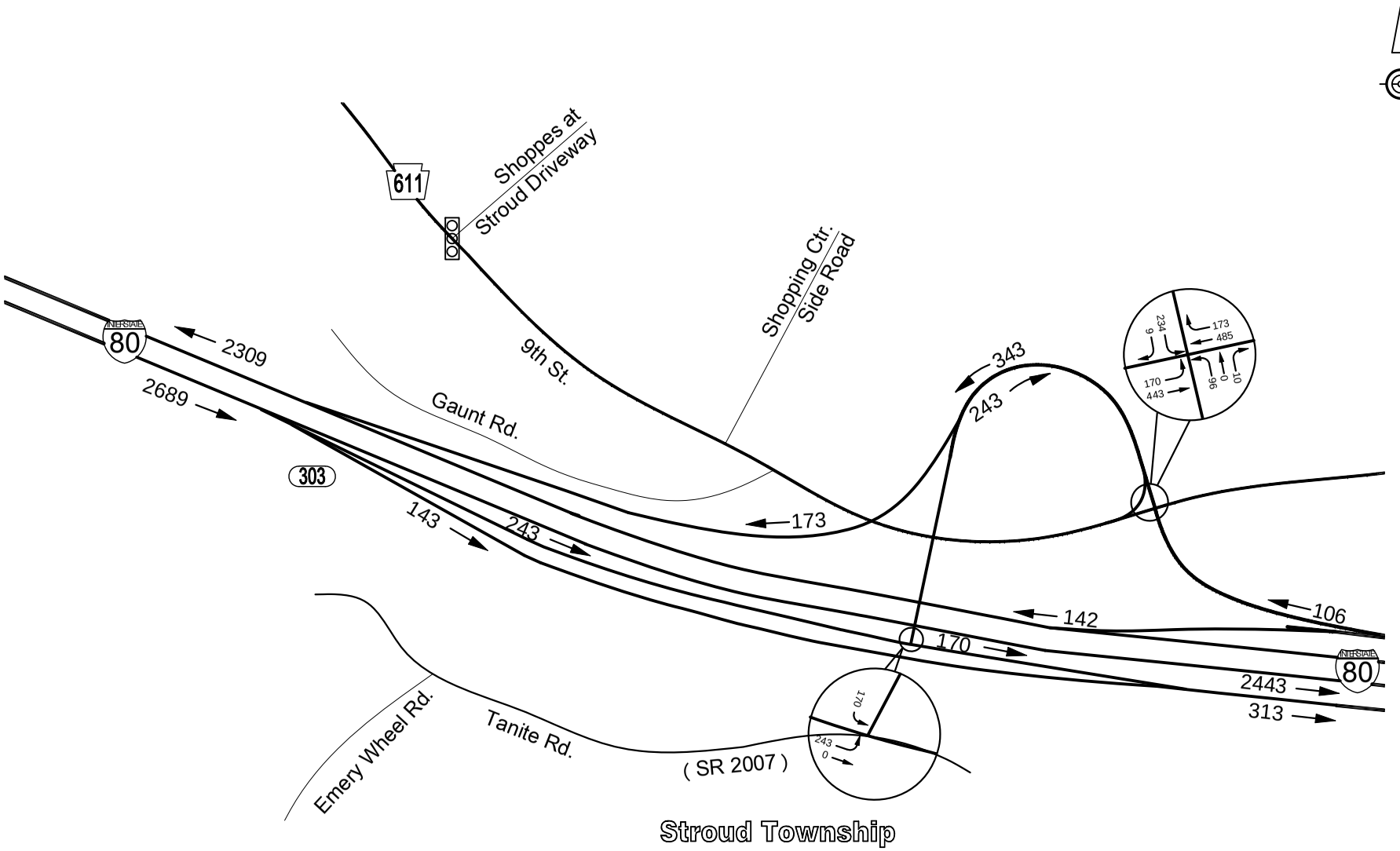
AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 15 ALTERNATIVE 1C P.M. PEAK HOUR 2045 TRAFFIC VOLUMES



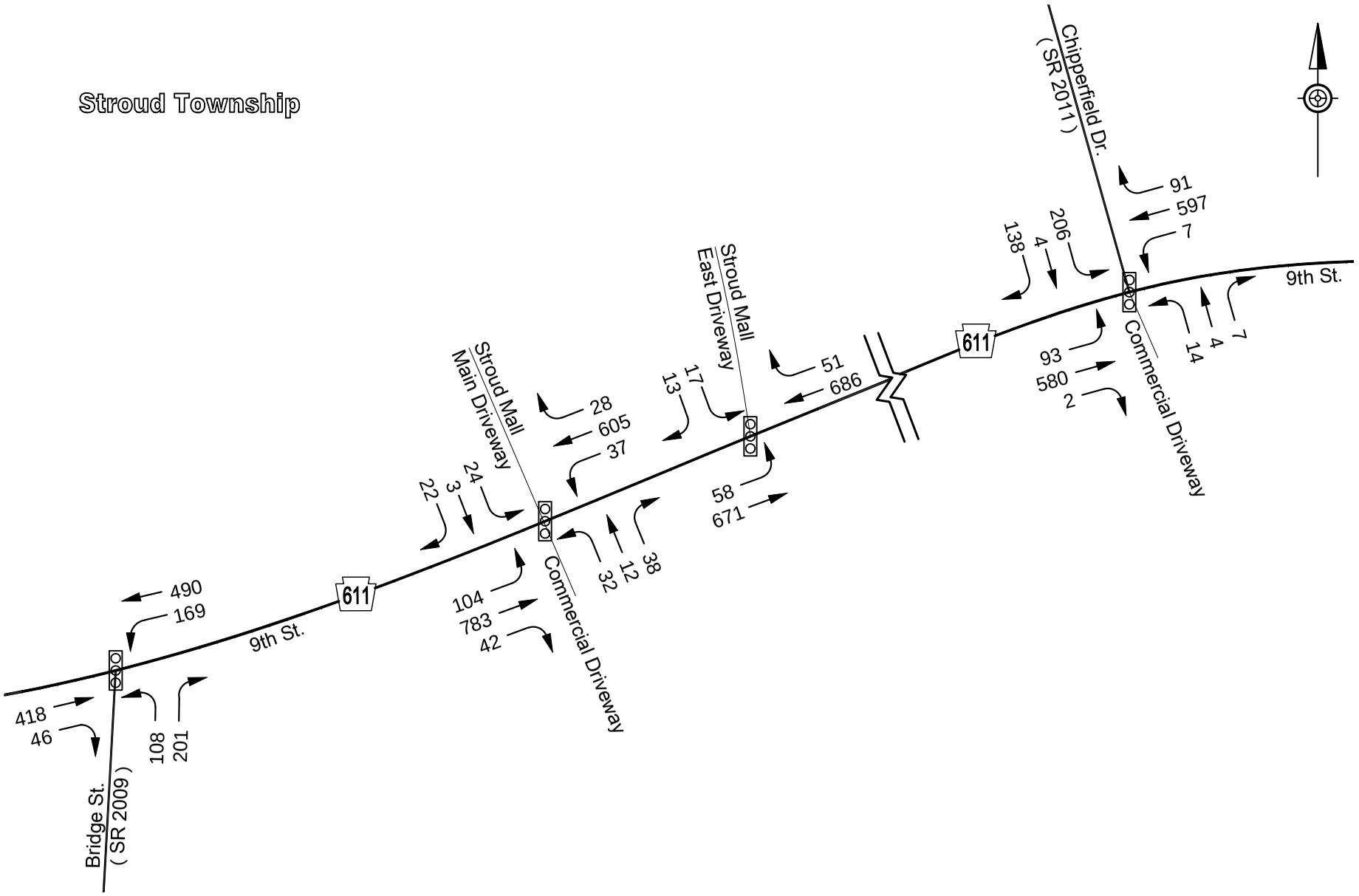
AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 16 ALTERNATIVE 1C P.M. PEAK HOUR 2045 TRAFFIC VOLUMES



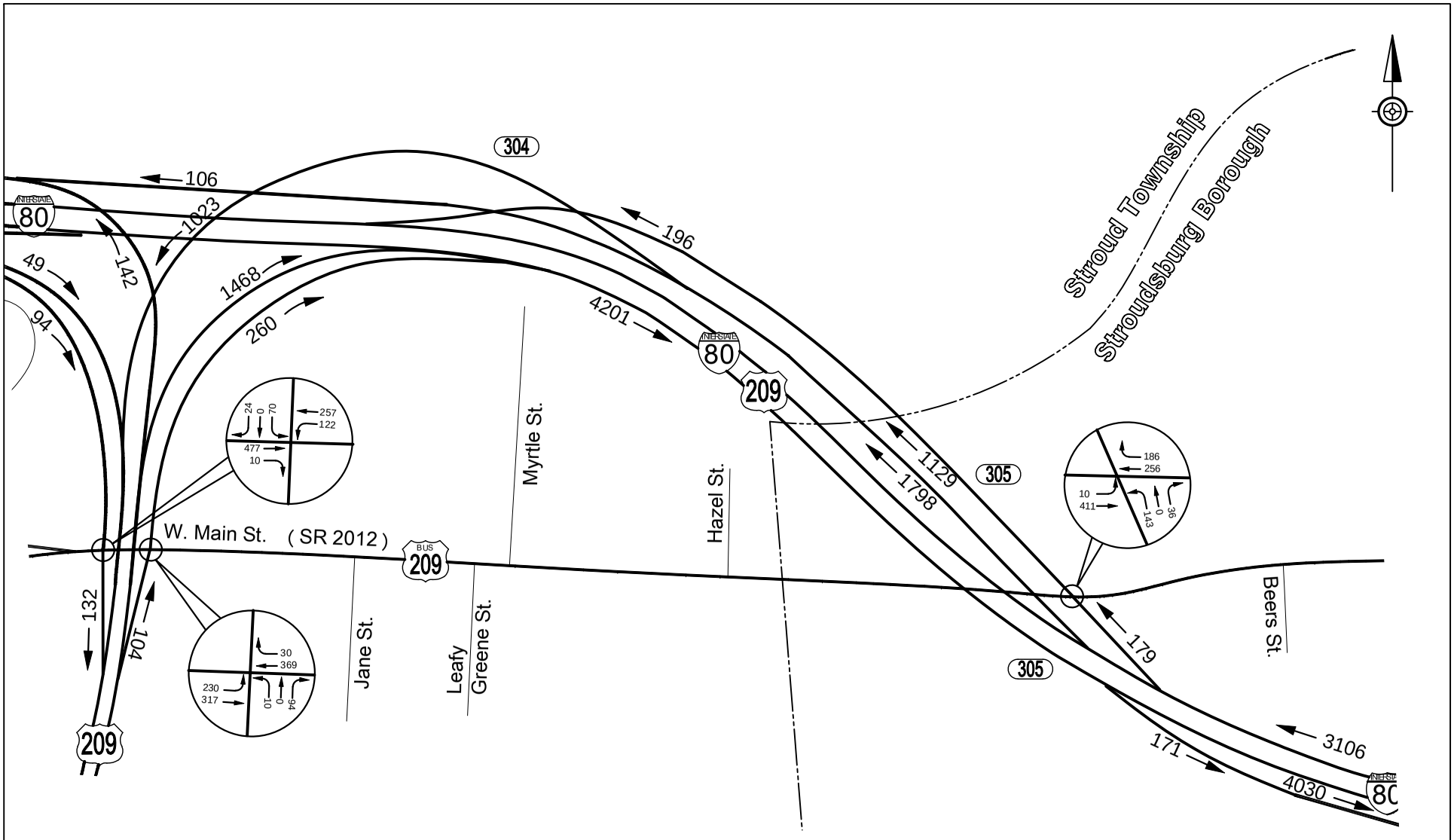
AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 1 ALTERNATIVE 1F A.M. PEAK HOUR 2045 TRAFFIC VOLUMES



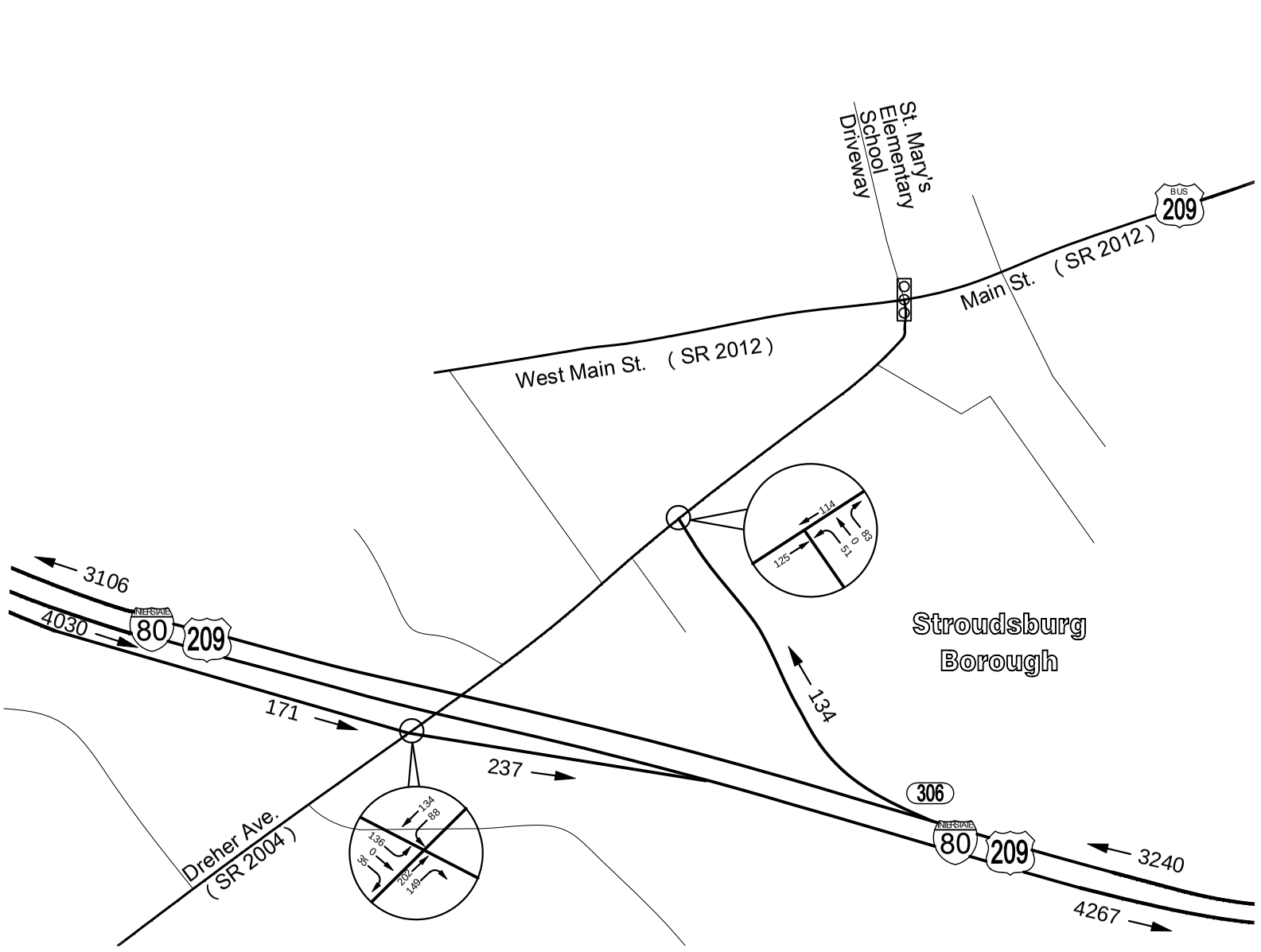
AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 2 ALTERNATIVE 1F A.M. PEAK HOUR 2045 TRAFFIC VOLUMES



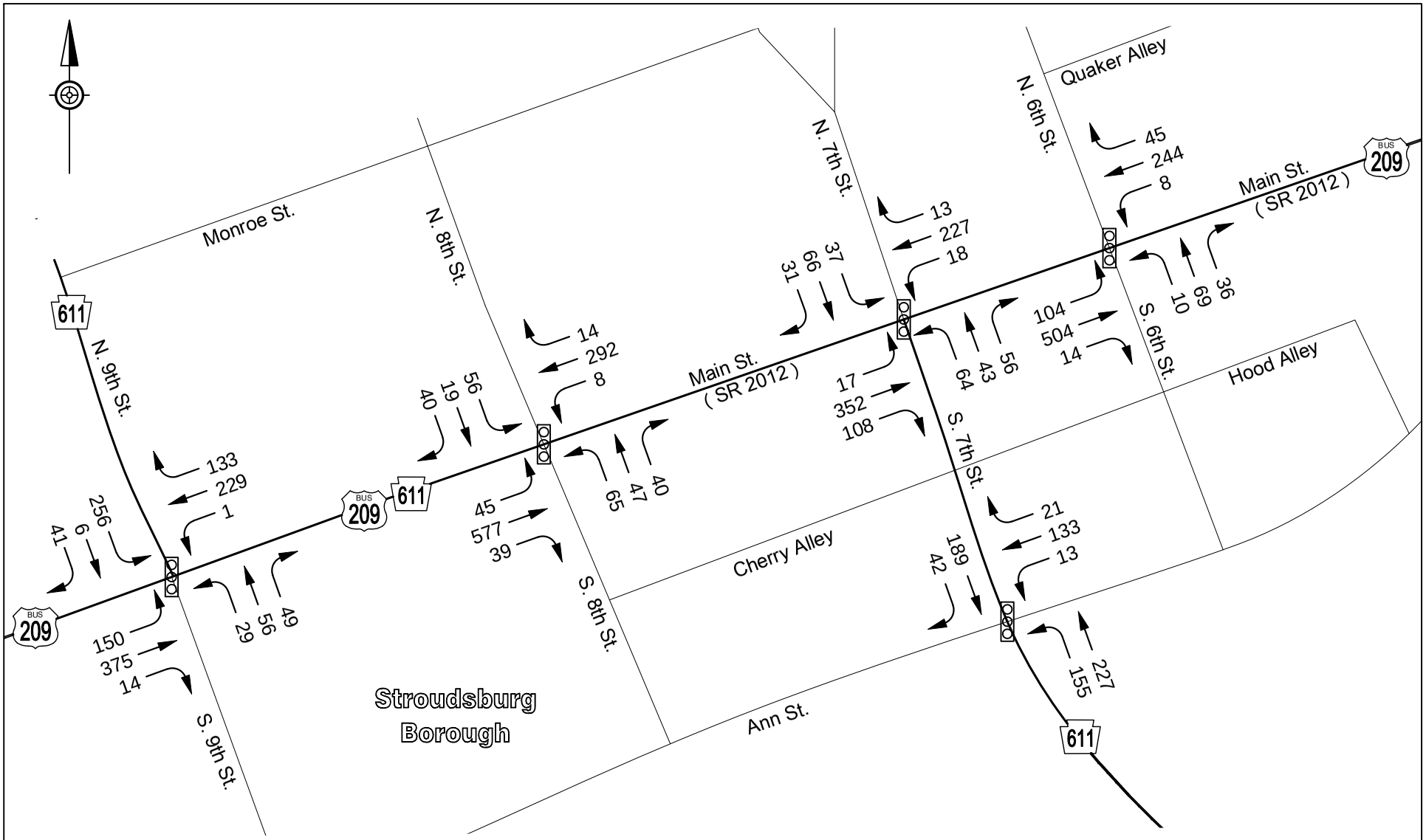
AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 3 ALTERNATIVE 1F A.M. PEAK HOUR 2045 TRAFFIC VOLUMES



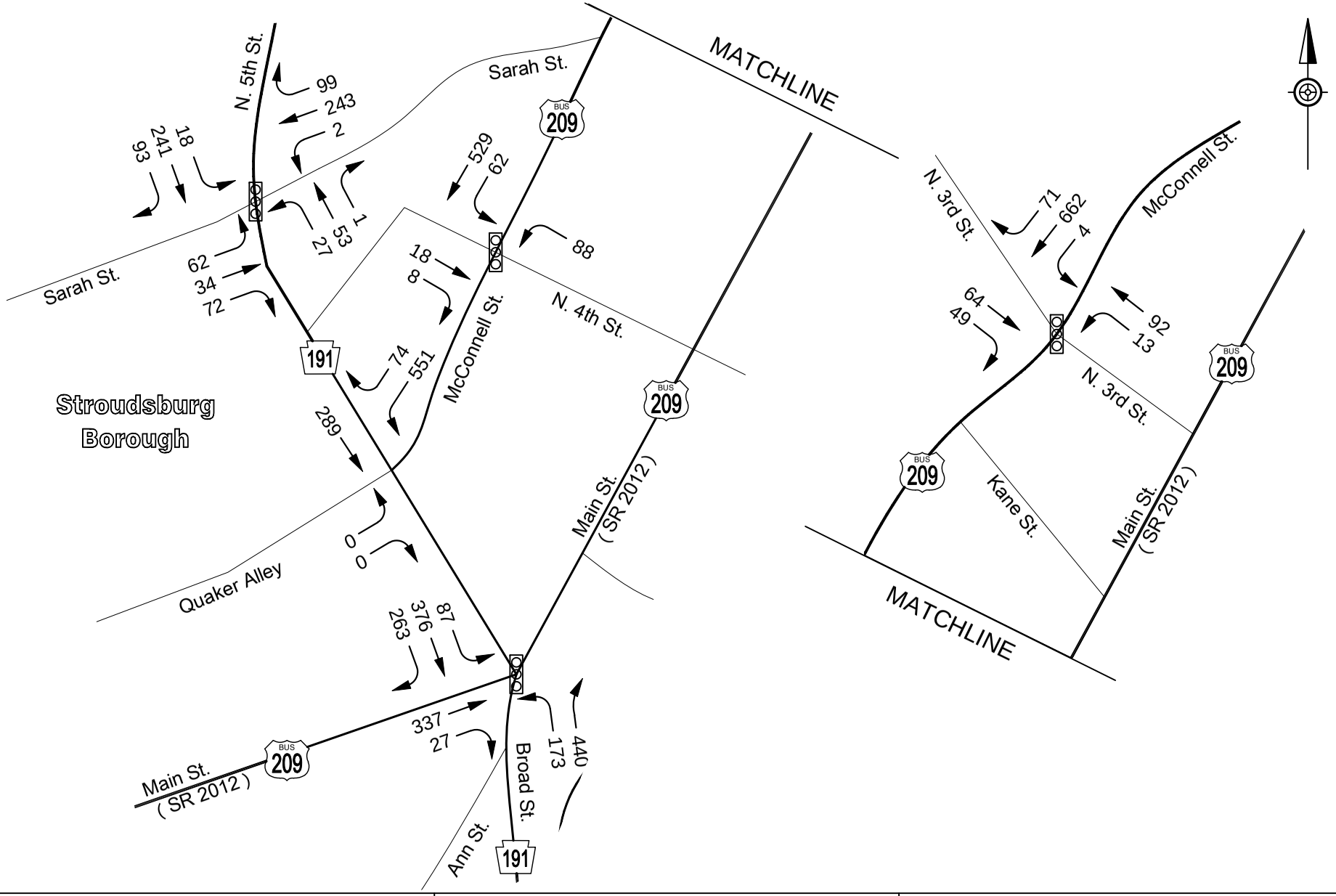
AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 4 ALTERNATIVE 1F A.M. PEAK HOUR 2045 TRAFFIC VOLUMES



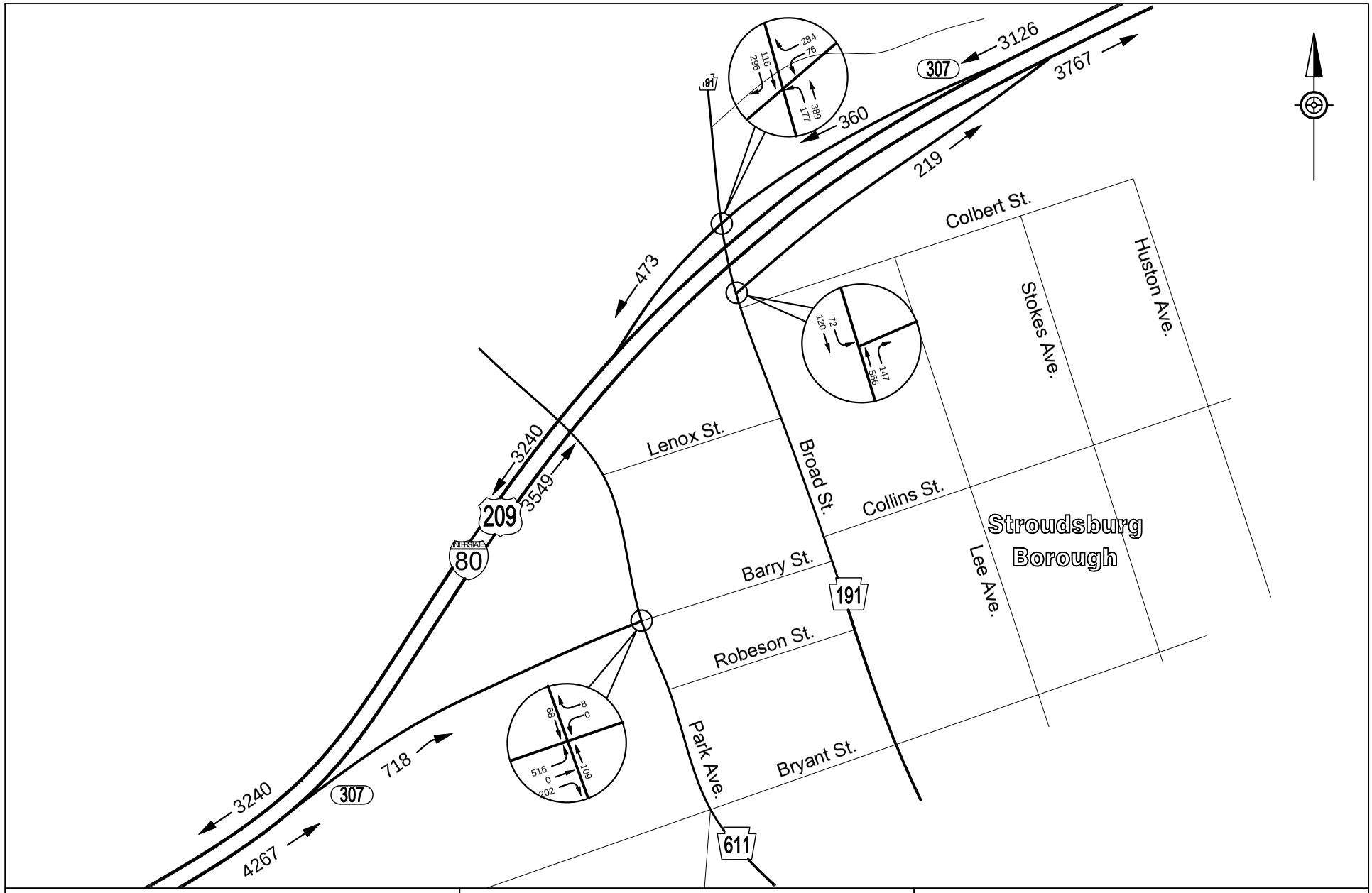
AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 5 ALTERNATIVE 1F A.M. PEAK HOUR 2045 TRAFFIC VOLUMES



AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 6 ALTERNATIVE 1F A.M. PEAK HOUR 2045 TRAFFIC VOLUMES



AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 7 ALTERNATIVE 1F A.M. PEAK HOUR 2045 TRAFFIC VOLUMES



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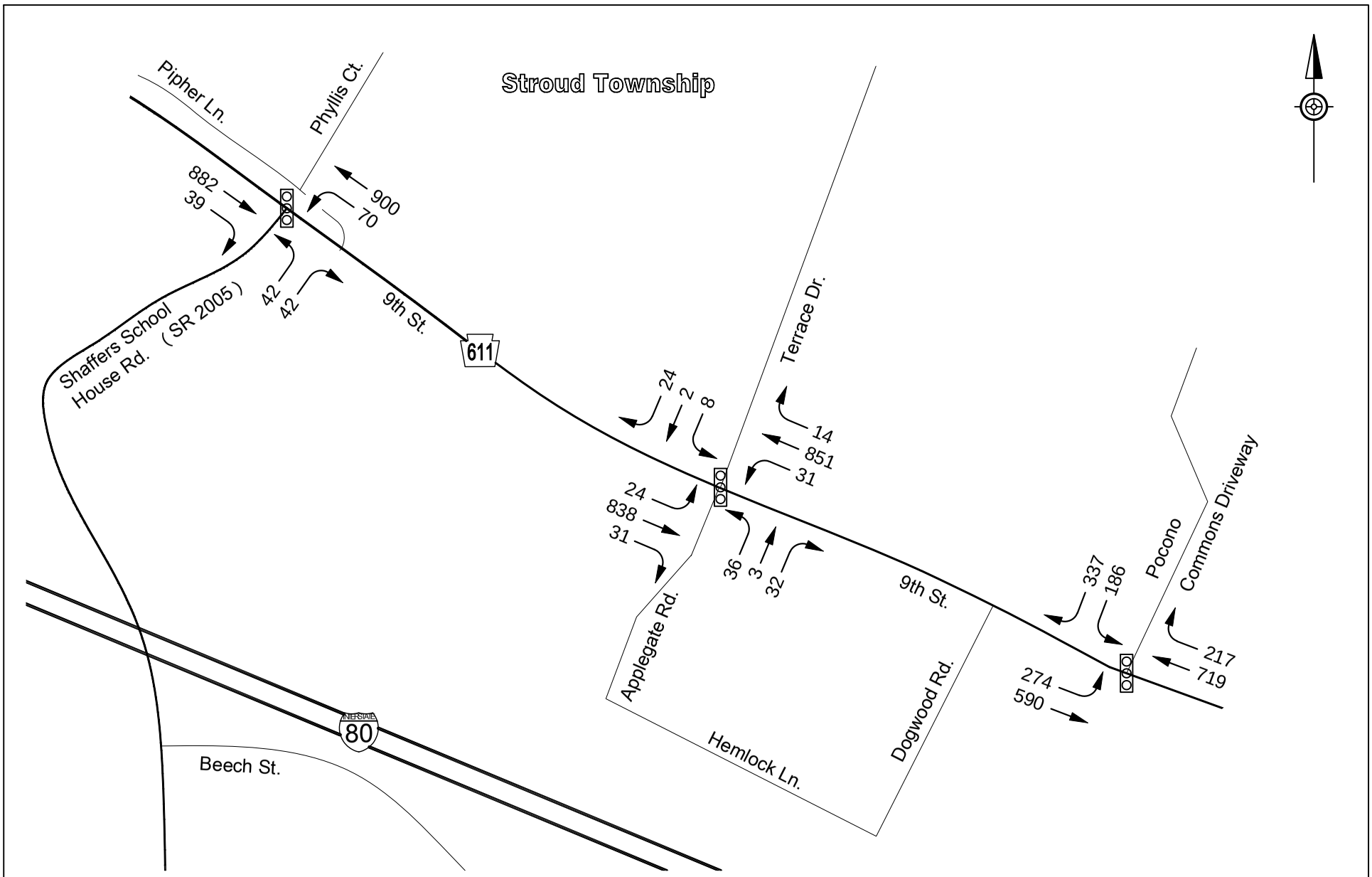
I-80 Reconstruction

Monroe County

FIGURE 8
ALTERNATIVE 1F
A.M. PEAK HOUR
2045 TRAFFIC VOLUMES



AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 9 ALTERNATIVE 1F P.M. PEAK HOUR 2045 TRAFFIC VOLUMES

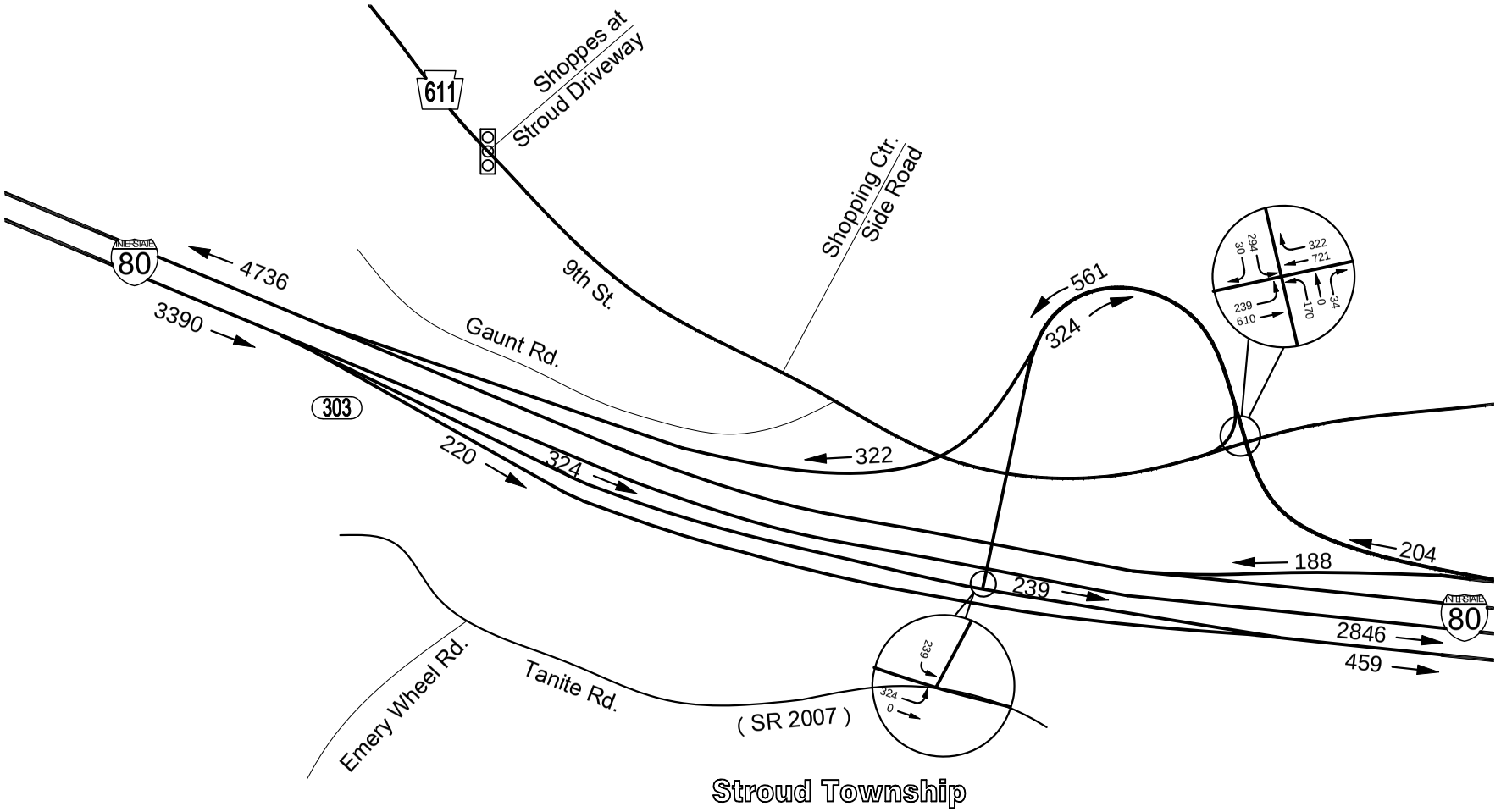


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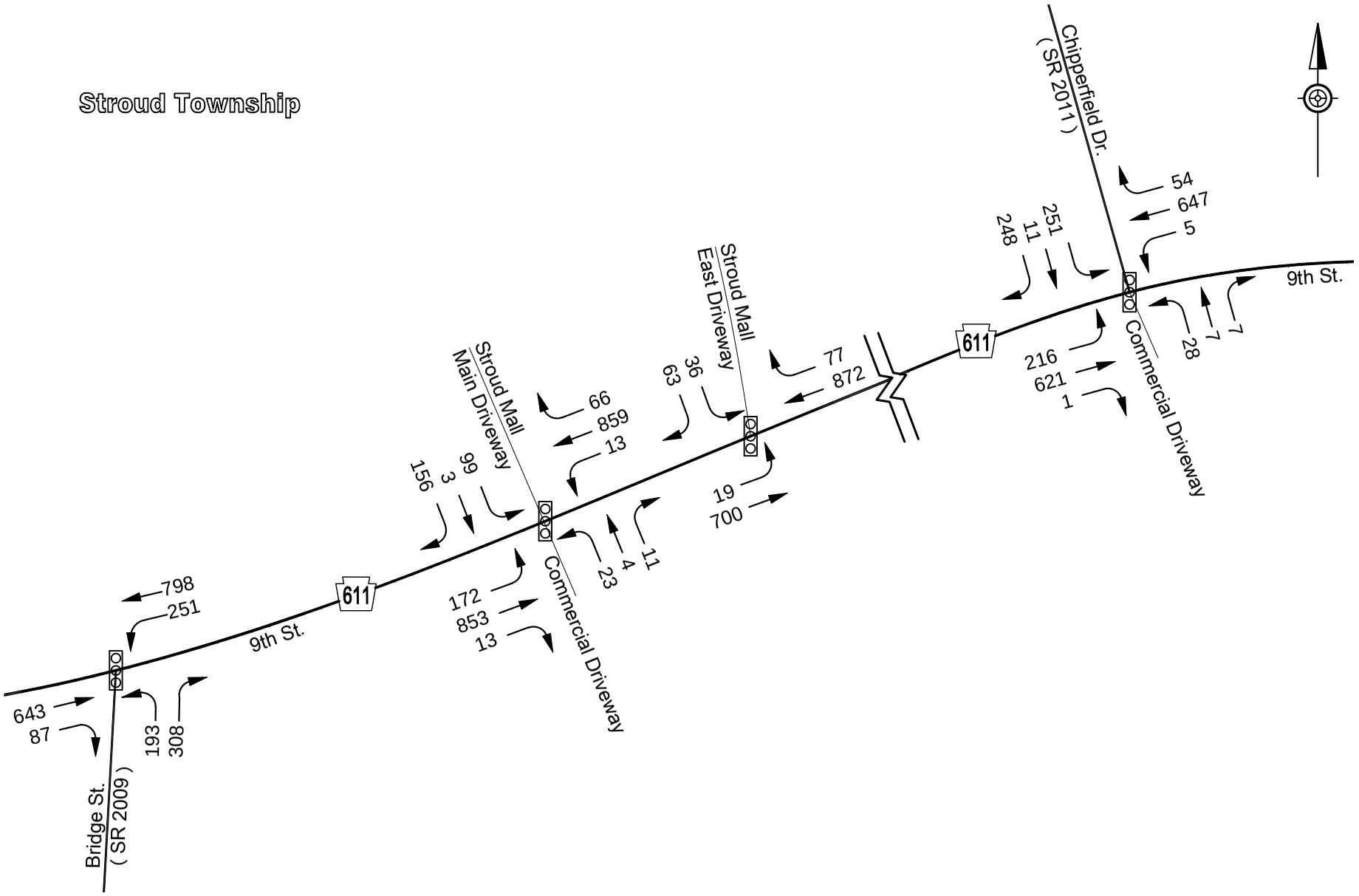
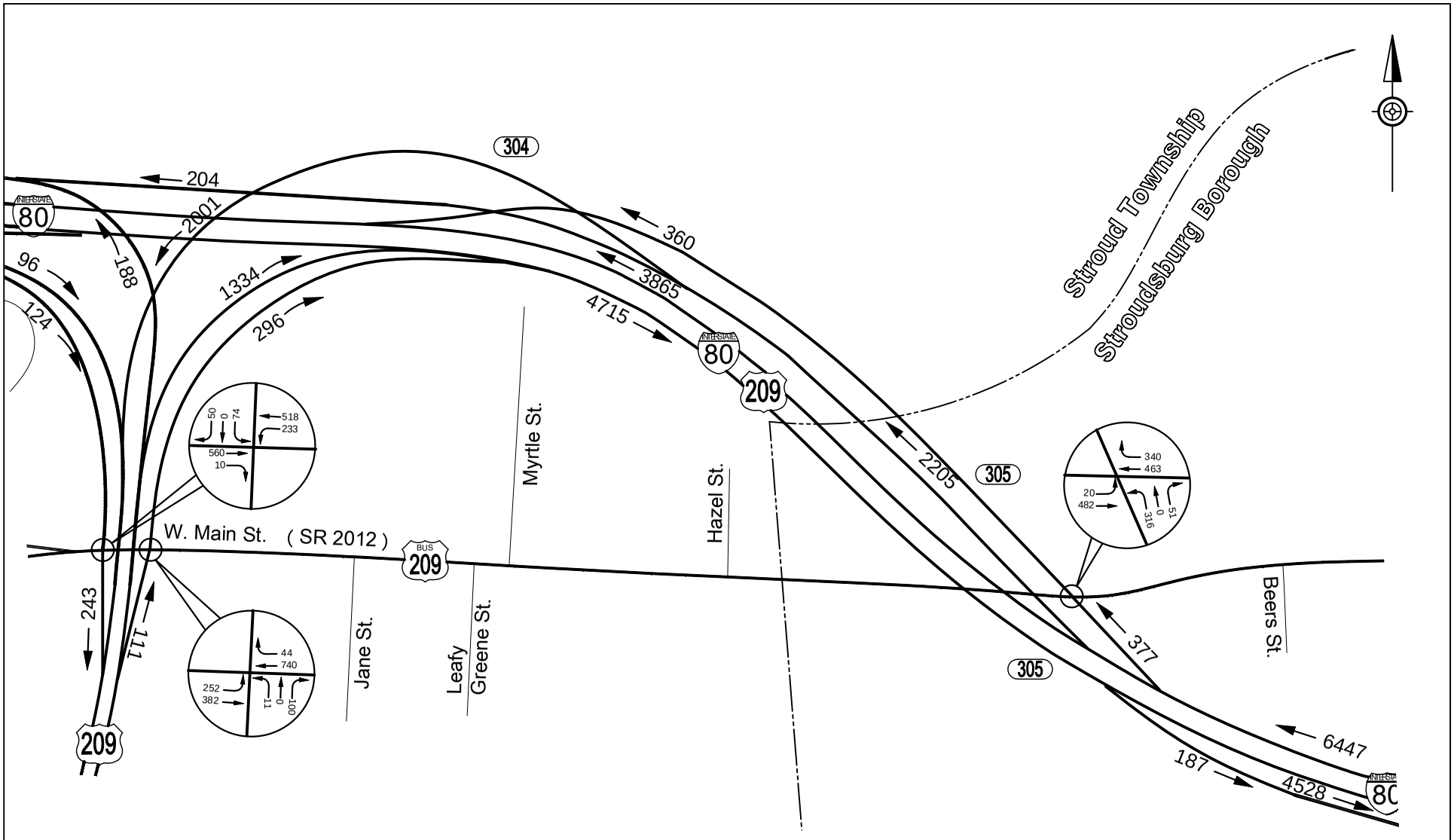
FIGURE 10
ALTERNATIVE 1F
P.M. PEAK HOUR
2045 TRAFFIC VOLUMES



AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 11 ALTERNATIVE 1F P.M. PEAK HOUR 2045 TRAFFIC VOLUMES



AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 12 ALTERNATIVE 1F P.M. PEAK HOUR 2045 TRAFFIC VOLUMES

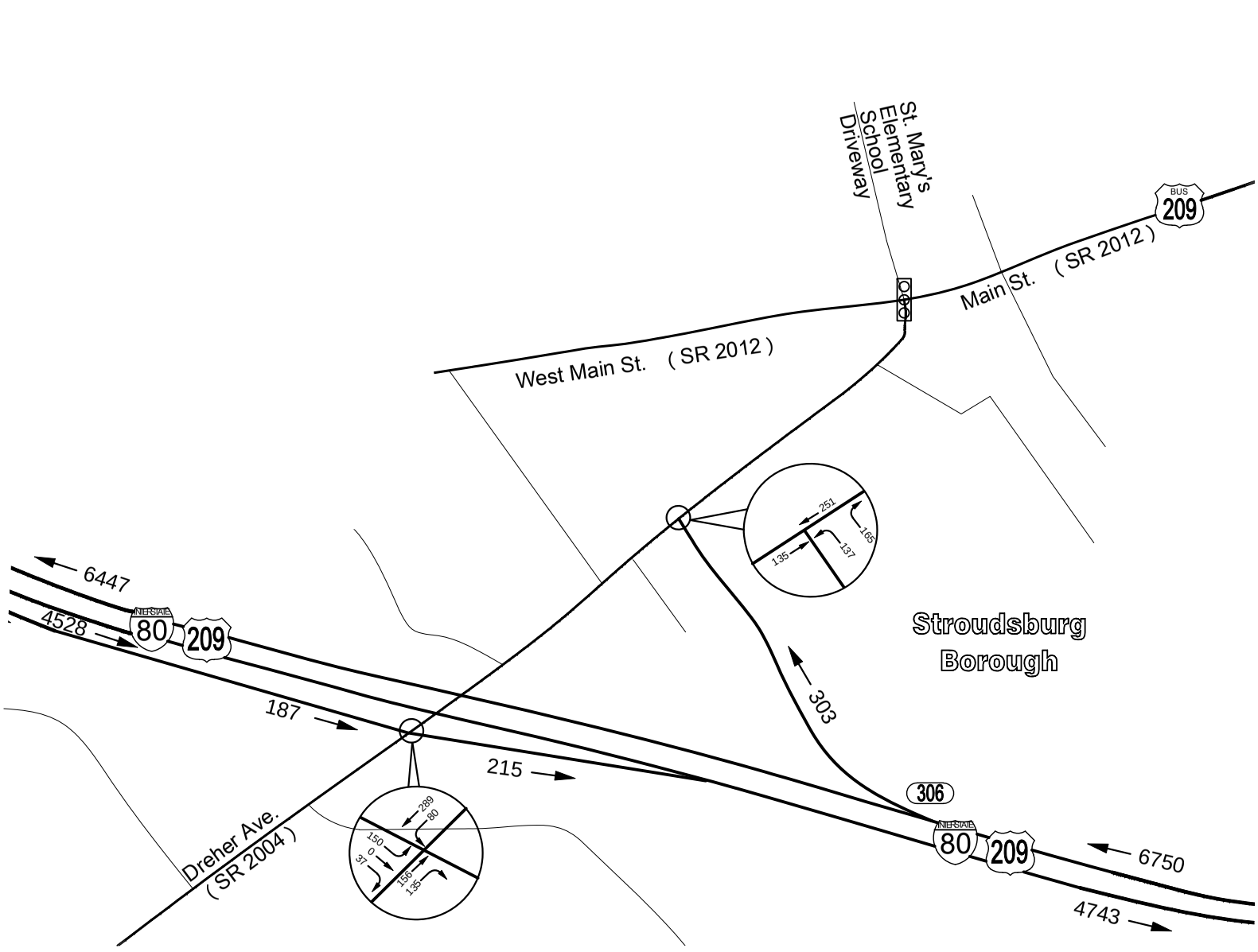


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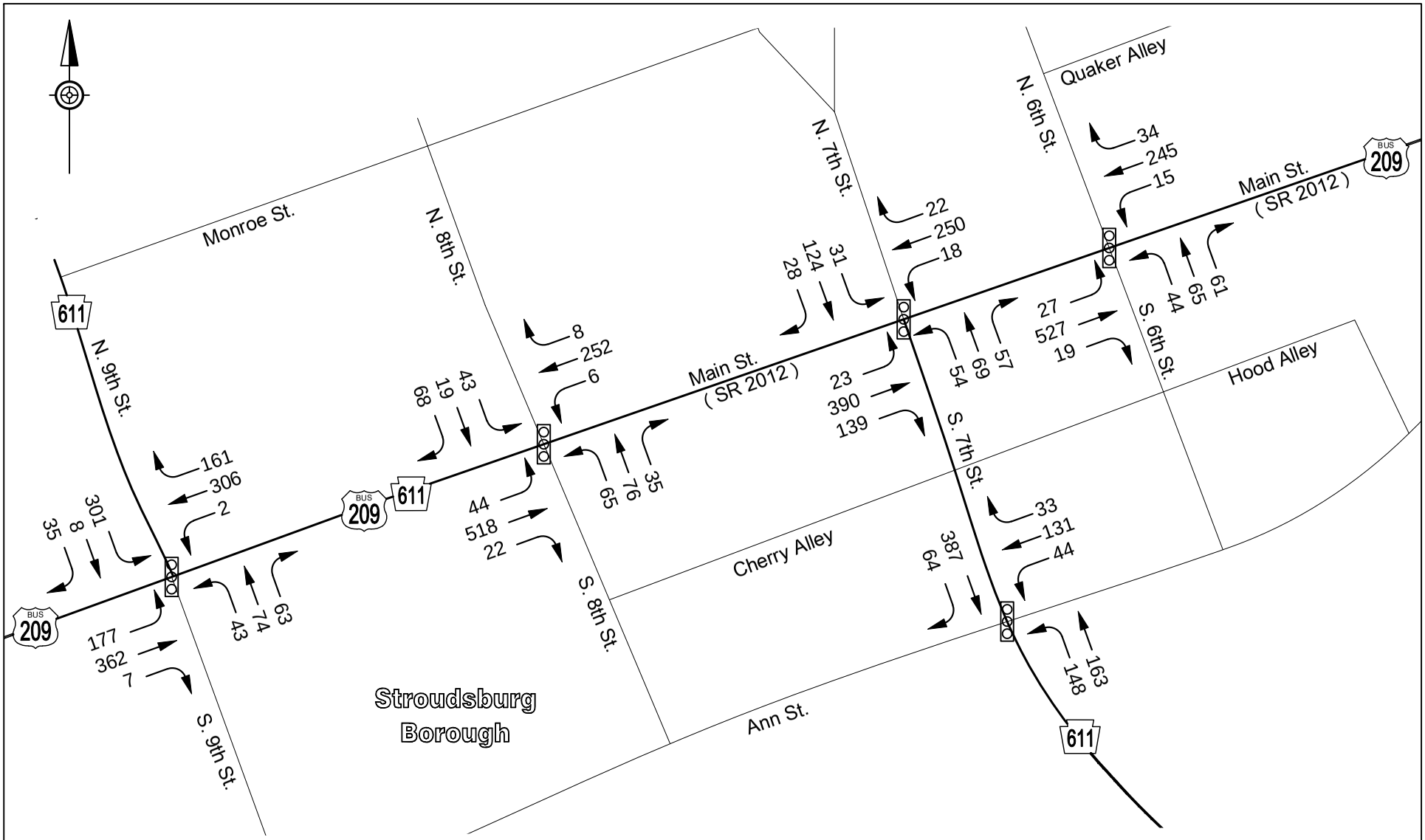
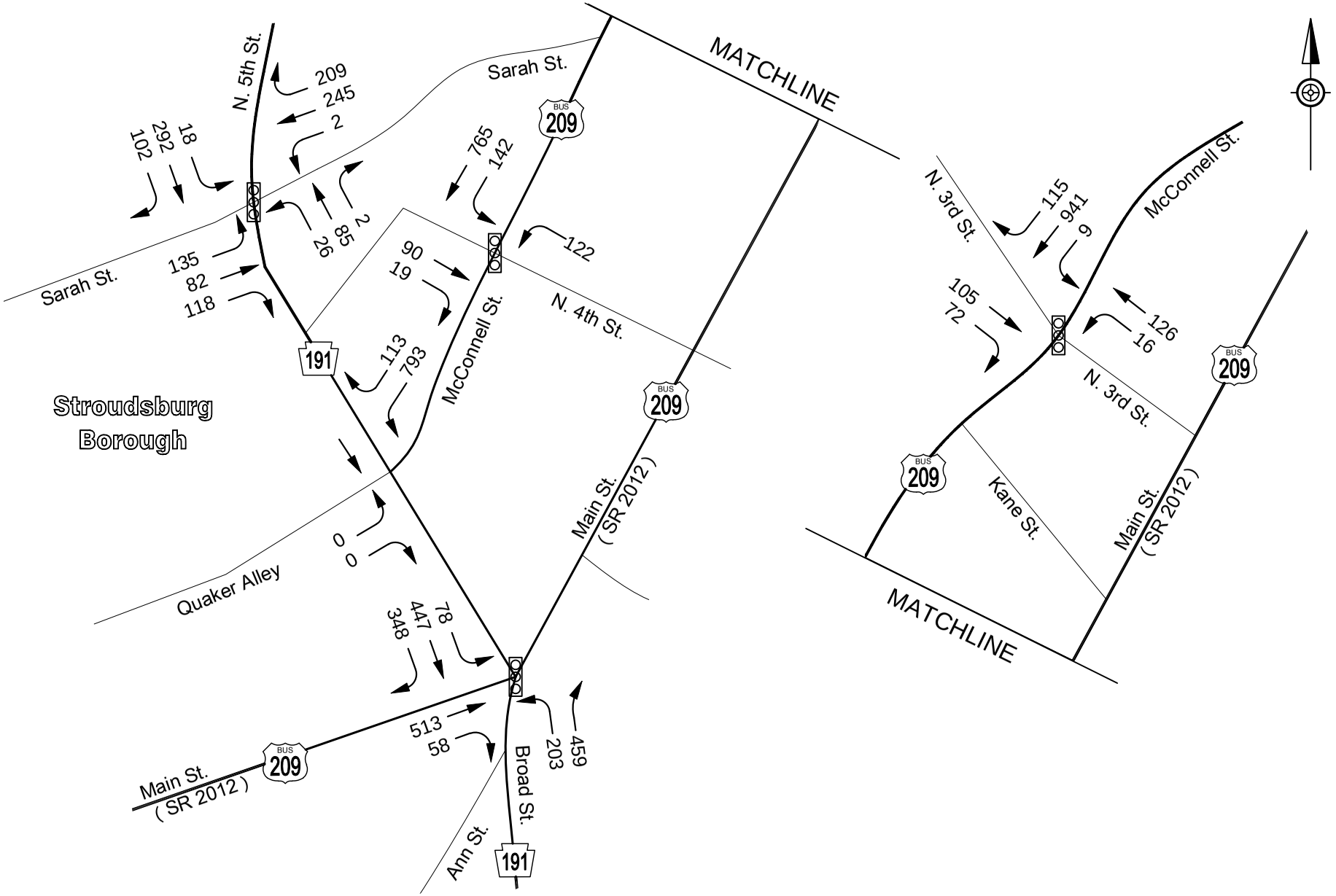
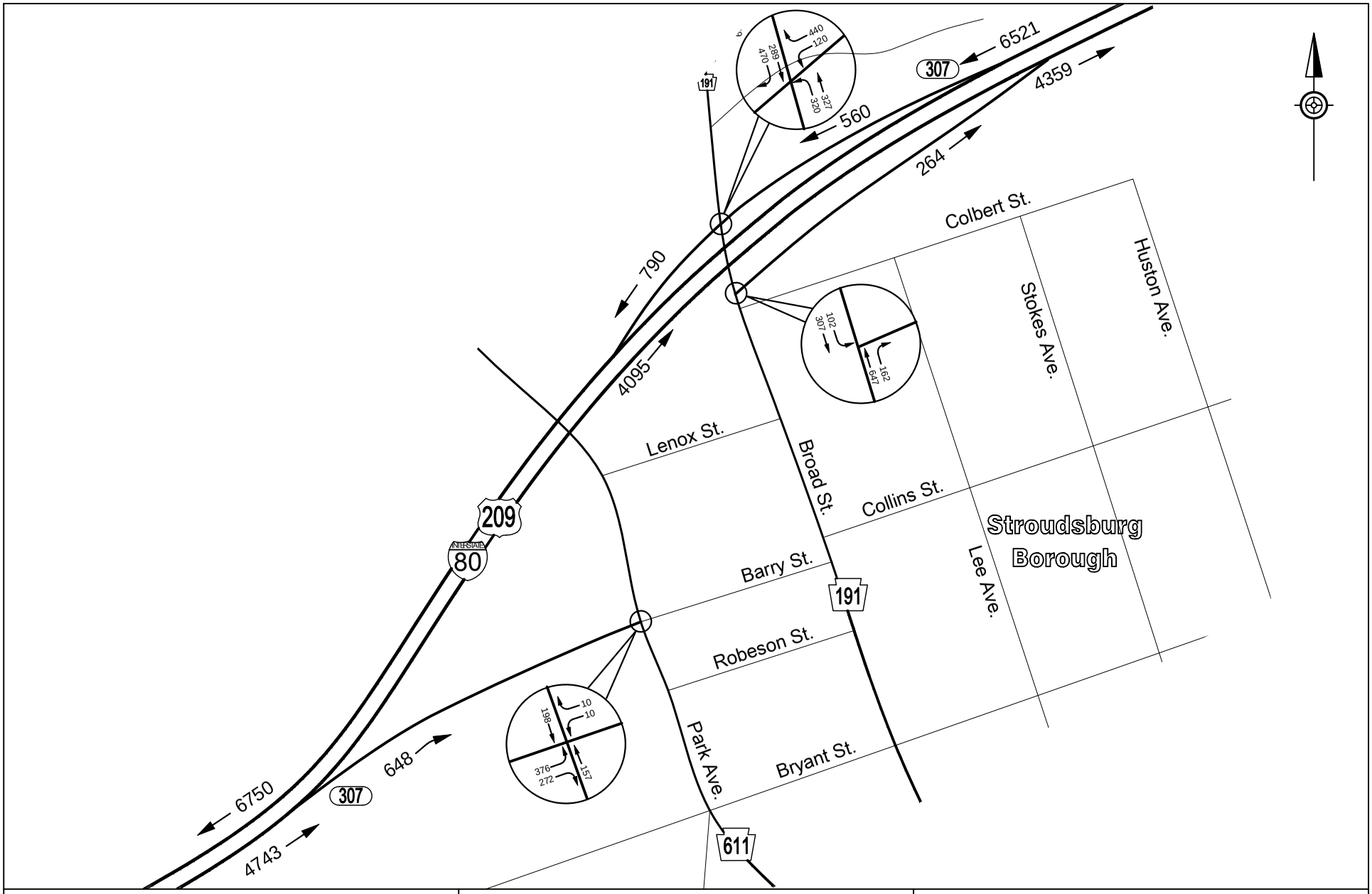
FIGURE 13
ALTERNATIVE 1F
P.M. PEAK HOUR
2045 TRAFFIC VOLUMES



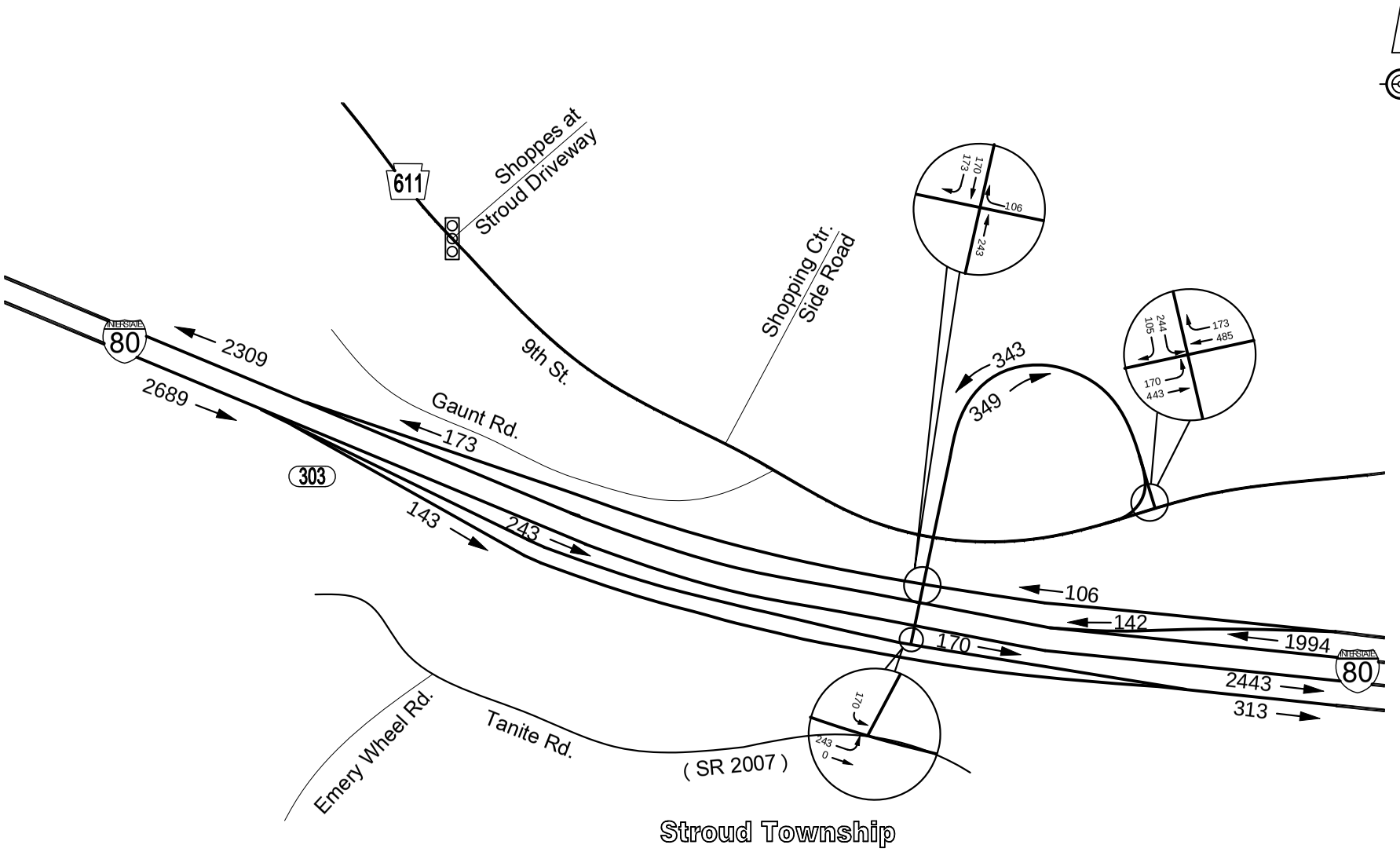
AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 14 ALTERNATIVE 1F P.M. PEAK HOUR 2045 TRAFFIC VOLUMES



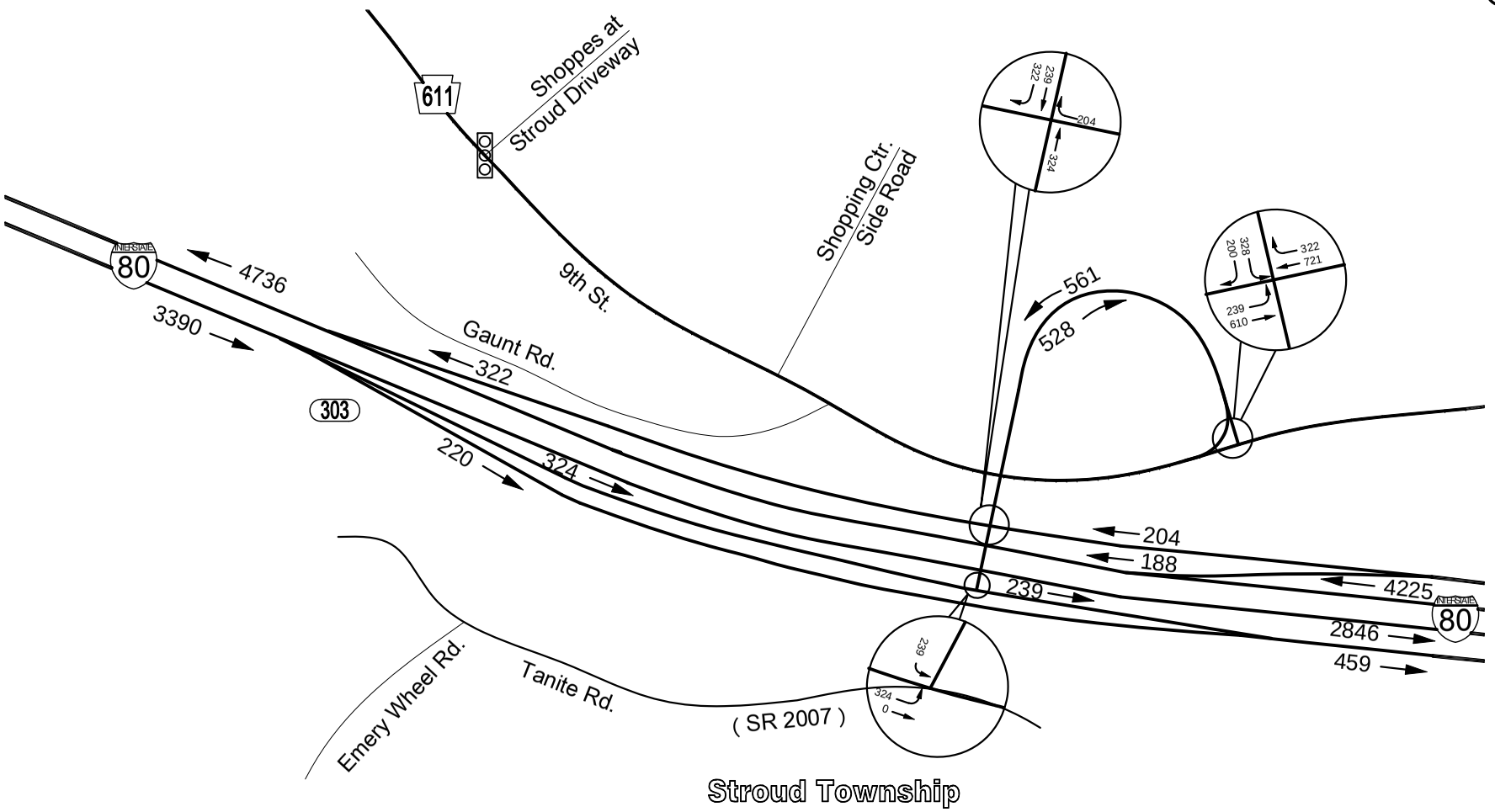
AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 15 ALTERNATIVE 1F P.M. PEAK HOUR 2045 TRAFFIC VOLUMES



AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 16 ALTERNATIVE 1F P.M. PEAK HOUR 2045 TRAFFIC VOLUMES



AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 1 ALTERNATIVE 1G A.M. PEAK HOUR 2045 TRAFFIC VOLUMES



AECOM 1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 2 ALTERNATIVE 1G P.M. PEAK HOUR 2045 TRAFFIC VOLUMES

BUILD ALTERNATIVE ANALYSIS (ALTERNATIVES A, B, C, F, & G)

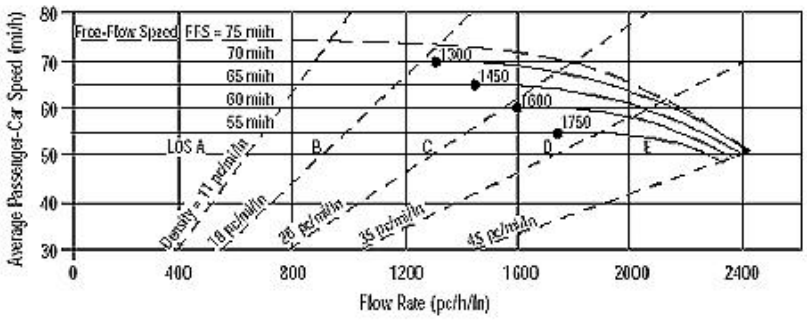
Build Alternatives Analysis Notes:

Alternative A analysis performed as baseline alternatives analysis for all build alternatives.

For Alternatives B, C, F, & G, analysis uses Alternative A as baseline, incorporating any modified ramp junction, weave section, or intersection analysis as applicable.

FREEWAY SEGMENT
HCS ANALYSIS

BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		***Site Information***	
Analyst	*AJM*	Highway/Direction of Travel	*I-80 Eastbound*
Agency or Company	*AECOM*	From/To	*Between Ints. 302 and 303*
Date Performed	*7/31/2013*	Jurisdiction	
Analysis Time Period	*A.M. Peak Hour*	Analysis Year	*Alt1A 2045*

Project Description Interstate 80 Reconstruction

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs				
Volume, V	*2689*	veh/h	Peak-Hour Factor, PHF	*0.94*
AADT		veh/day	%Trucks and Buses, P_T	*10*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*0.95*		Up/Down %	

Calculate Flow Adjustments			
f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.862*

Speed Inputs			**Calc Speed Adj and FFS**		
Lane Width	*12.0*	ft	f_{LW}	*0.0*	mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}	*0.0*	mi/h
Interchange Density	*1.67*	l/mi	f_{ID}	*5.9*	mi/h
Number of Lanes, N	*2*		f_N	*4.5*	mi/h
FFS (measured)		mi/h	FFS	*59.6*	mi/h
Base free-flow Speed, BFFS	*70.0*	mi/h			

LOS and Performance Measures			**Design (N)**	
Operational (LOS)			Design (N)	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1746*	pc/h/ln	Design LOS	
			v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	*59.5*	mi/h	S	mi/h
D = v_p / S	*29.3*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*D*		Required Number of Lanes, N	

Glossary		**Factor Location**	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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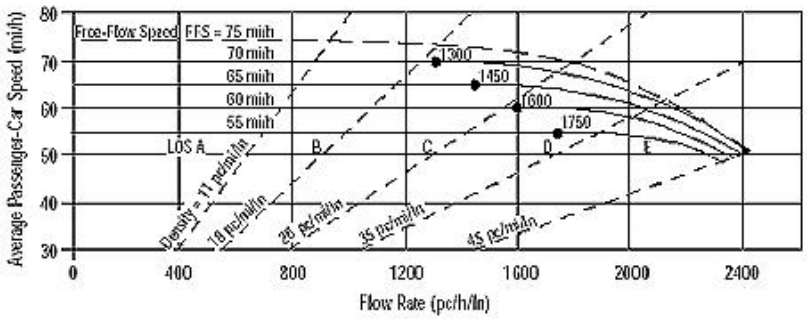
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		***Site Information***	
Analyst	*AJM*	Highway/Direction of Travel	*I-80 Eastbound*
Agency or Company	*AECOM*	From/To	*Between Ints. 302 and 303*
Date Performed	*7/31/2013*	Jurisdiction	
Analysis Time Period	*P.M. Peak Hour*	Analysis Year	*Alt1A 2045*

Project Description Interstate 80 Reconstruction

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs				
Volume, V	*3390*	veh/h	Peak-Hour Factor, PHF	*0.94*
AADT		veh/day	%Trucks and Buses, P_T	*12*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*0.95*		Up/Down %	

Calculate Flow Adjustments			
f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.840*

Speed Inputs			**Calc Speed Adj and FFS**		
Lane Width	*12.0*	ft	f_{LW}	*0.0*	mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}	*0.0*	mi/h
Interchange Density	*1.67*	l/mi	f_{ID}	*5.9*	mi/h
Number of Lanes, N	*2*		f_N	*4.5*	mi/h
FFS (measured)		mi/h	FFS	*59.6*	mi/h
Base free-flow Speed, BFFS	*70.0*	mi/h			

LOS and Performance Measures			**Design (N)**	
Operational (LOS)			Design (N)	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2259*	pc/h/ln	Design LOS	
			v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	*52.2*	mi/h	S	mi/h
D = v_p / S	*43.3*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*E*		Required Number of Lanes, N	

Glossary		**Factor Location**	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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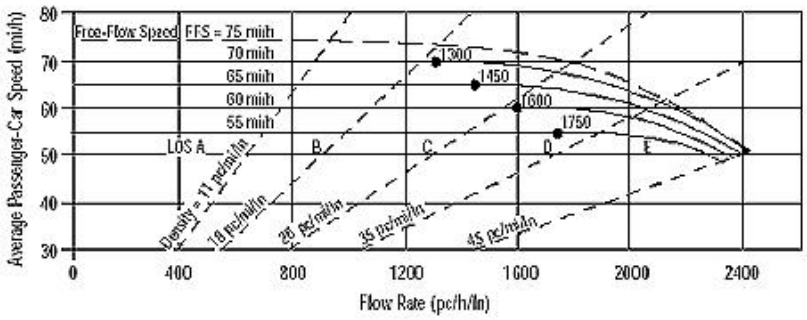

Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		***Site Information***	
Analyst	*AJM*	Highway/Direction of Travel	*I-80 Eastbound*
Agency or Company	*AECOM*	From/To	*Between Ints. 303 and 304*
Date Performed	*7/31/2013*	Jurisdiction	
Analysis Time Period	*A.M. Peak Hour*	Analysis Year	*Alt1A 2045*

Project Description Interstate 80 Reconstruction

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs				
Volume, V	*2473*	veh/h	Peak-Hour Factor, PHF	*0.94*
AADT		veh/day	%Trucks and Buses, P_T	*10*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*0.95*		Up/Down %	

Calculate Flow Adjustments			
f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.862*

Speed Inputs			**Calc Speed Adj and FFS**		
Lane Width	*12.0*	ft	f_{LW}	*0.0*	mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}	*0.0*	mi/h
Interchange Density	*1.67*	l/mi	f_{ID}	*5.9*	mi/h
Number of Lanes, N	*3*		f_N	*3.0*	mi/h
FFS (measured)		mi/h	FFS	*61.1*	mi/h
Base free-flow Speed, BFFS	*70.0*	mi/h			

LOS and Performance Measures			**Design (N)**	
Operational (LOS)			Design (N)	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1071*	pc/h/ln	Design LOS	
			v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	*61.1*	mi/h	S	mi/h
D = v_p / S	*17.5*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*B*		Required Number of Lanes, N	

Glossary		**Factor Location**	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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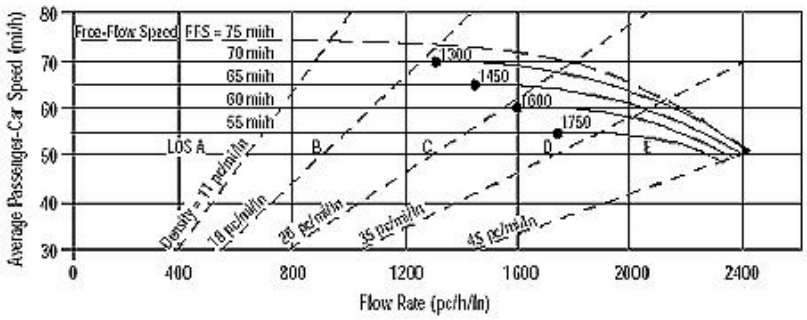

Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		***Site Information***	
Analyst	*AJM*	Highway/Direction of Travel	*I-80 Eastbound*
Agency or Company	*AECOM*	From/To	*Between Ints. 303 and 304*
Date Performed	*7/31/2013*	Jurisdiction	
Analysis Time Period	*P.M. Peak Hour*	Analysis Year	*Alt1A 2045*

Project Description Interstate 80 Reconstruction

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs				
Volume, V	*3305*	veh/h	Peak-Hour Factor, PHF	*0.94*
AADT		veh/day	%Trucks and Buses, P_T	*12*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*0.95*		Up/Down %	

Calculate Flow Adjustments			
f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.840*

Speed Inputs			**Calc Speed Adj and FFS**		
Lane Width	*12.0*	ft	f_{LW}	*0.0*	mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}	*0.0*	mi/h
Interchange Density	*1.67*	l/mi	f_{ID}	*5.9*	mi/h
Number of Lanes, N	*3*		f_N	*3.0*	mi/h
FFS (measured)		mi/h	FFS	*61.1*	mi/h
Base free-flow Speed, BFFS	*70.0*	mi/h			

LOS and Performance Measures			**Design (N)**	
Operational (LOS)			Design (N)	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1468*	pc/h/ln	Design LOS v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	*61.1*	mi/h	S	mi/h
D = v_p / S	*24.0*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*C*		Required Number of Lanes, N	

Glossary		**Factor Location**	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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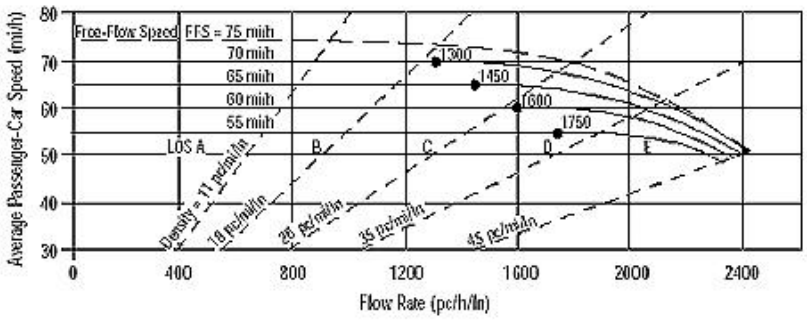

Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		***Site Information***	
Analyst	*AJM*	Highway/Direction of Travel	*I-80 Westbound*
Agency or Company	*AECOM*	From/To	*Between Ints. 302 and 303*
Date Performed	*7/31/2013*	Jurisdiction	
Analysis Time Period	*A.M. Peak Hour*	Analysis Year	*Alt1A 2045*

Project Description Interstate 80 Reconstruction

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs				
Volume, V	*2309*	veh/h	Peak-Hour Factor, PHF	*0.97*
AADT		veh/day	%Trucks and Buses, P_T	*12*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*0.95*		Up/Down %	

Calculate Flow Adjustments			
f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.840*

Speed Inputs			**Calc Speed Adj and FFS**		
Lane Width	*12.0*	ft	f_{LW}	*0.0*	mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}	*0.0*	mi/h
Interchange Density	*1.67*	l/mi	f_{ID}	*5.9*	mi/h
Number of Lanes, N	*2*		f_N	*4.5*	mi/h
FFS (measured)		mi/h	FFS	*59.6*	mi/h
Base free-flow Speed, BFFS	*70.0*	mi/h			

LOS and Performance Measures			**Design (N)**	
Operational (LOS)			Design (N)	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1491*	pc/h/ln	Design LOS	
			v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	*59.6*	mi/h	S	mi/h
D = v_p / S	*25.0*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*C*		Required Number of Lanes, N	

Glossary		**Factor Location**	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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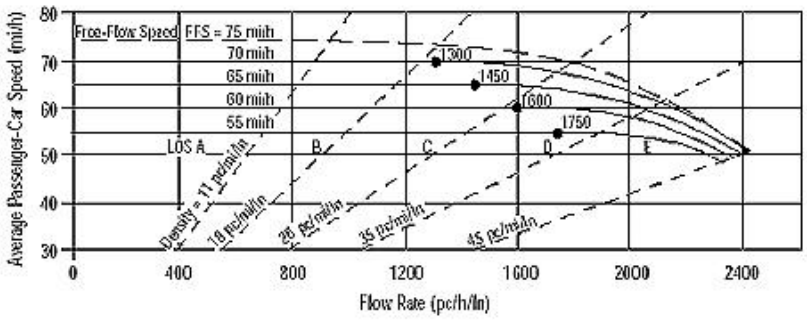

Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	*AJM*
Agency or Company	*AECOM*
Date Performed	*7/31/2013*
Analysis Time Period	*P.M. Peak Hour*

Site Information

Highway/Direction of Travel	*I-80 Westbound*
From/To	*Between Ints. 302 and 303*
Jurisdiction	
Analysis Year	*Alt1A 2045*

Project Description Interstate 80 Reconstruction

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4736*	veh/h	Peak-Hour Factor, PHF	*0.97*
AADT		veh/day	%Trucks and Buses, P_T	*13*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*0.95*		Up/Down %	

Calculate Flow Adjustments

f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.830*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Shoulder Lat. Clearance	*6.0*	ft
Interchange Density	*1.67*	l/mi
Number of Lanes, N	*2*	
FFS (measured)		mi/h
Base free-flow Speed, BFFS	*70.0*	mi/h

Calc Speed Adj and FFS

f_{LW}	*0.0*	mi/h
f_{LC}	*0.0*	mi/h
f_{ID}	*5.9*	mi/h
f_N	*4.5*	mi/h
FFS	*59.6*	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*3097*	pc/h/ln
S		mi/h
D = v_p / S		pc/mi/ln
LOS	*F*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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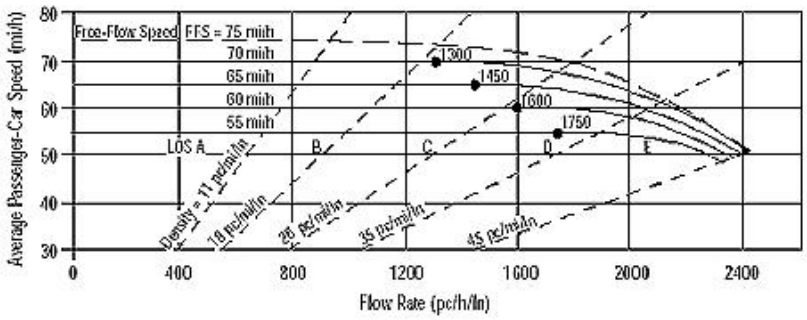

Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		***Site Information***	
Analyst	*AJM*	Highway/Direction of Travel	*I-80 Westbound*
Agency or Company	*AECOM*	From/To	*Between Ints. 303 and 304*
Date Performed	*8/1/2013*	Jurisdiction	
Analysis Time Period	*A.M. Peak Hour*	Analysis Year	*Alt1A 2045*

Project Description Interstate 80 Reconstruction

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs				
Volume, V	*2136*	veh/h	Peak-Hour Factor, PHF	*0.97*
AADT		veh/day	%Trucks and Buses, P_T	*12*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*0.95*		Up/Down %	

Calculate Flow Adjustments			
f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.840*

Speed Inputs			**Calc Speed Adj and FFS**		
Lane Width	*12.0*	ft	f_{LW}	*0.0*	mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}	*0.0*	mi/h
Interchange Density	*1.67*	I/mi	f_{ID}	*5.9*	mi/h
Number of Lanes, N	*3*		f_N	*3.0*	mi/h
FFS (measured)		mi/h	FFS	*61.1*	mi/h
Base free-flow Speed, BFFS	*70.0*	mi/h			

LOS and Performance Measures			**Design (N)**	
Operational (LOS)			Design (N)	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*919*	pc/h/ln	Design LOS	
			v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	*61.1*	mi/h	S	mi/h
D = v_p / S	*15.0*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*B*		Required Number of Lanes, N	

Glossary		**Factor Location**	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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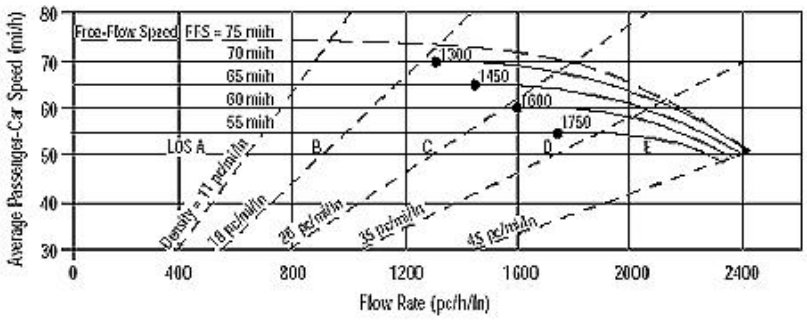

Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		***Site Information***	
Analyst	*AJM*	Highway/Direction of Travel	*I-80 Westbound*
Agency or Company	*AECOM*	From/To	*Between Ints. 303 and 304*
Date Performed	*8/1/2013*	Jurisdiction	
Analysis Time Period	*P.M. Peak Hour*	Analysis Year	*Alt1A 2045*

Project Description Interstate 80 Reconstruction

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs				
Volume, V	*4414*	veh/h	Peak-Hour Factor, PHF	*0.97*
AADT		veh/day	%Trucks and Buses, P_T	*13*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*0.95*		Up/Down %	

Calculate Flow Adjustments			
f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.830*

Speed Inputs			**Calc Speed Adj and FFS**		
Lane Width	*12.0*	ft	f_{LW}	*0.0*	mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}	*0.0*	mi/h
Interchange Density	*1.67*	l/mi	f_{ID}	*5.9*	mi/h
Number of Lanes, N	*3*		f_N	*3.0*	mi/h
FFS (measured)		mi/h	FFS	*61.1*	mi/h
Base free-flow Speed, BFFS	*70.0*	mi/h			

LOS and Performance Measures			**Design (N)**	
Operational (LOS)			Design (N)	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1924*	pc/h/ln	Design LOS v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	*59.7*	mi/h	S	mi/h
D = v_p / S	*32.2*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*D*		Required Number of Lanes, N	

Glossary		**Factor Location**	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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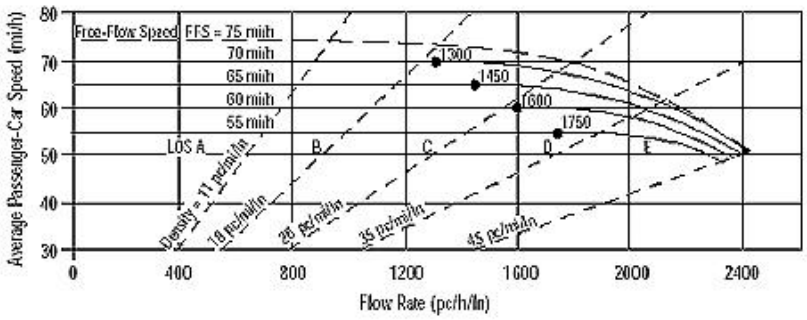
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		***Site Information***	
Analyst	*AJM*	Highway/Direction of Travel	*I-80 Westbound*
Agency or Company	*AECOM*	From/To	*Between Ints. 304 and 305*
Date Performed	*8/1/2013*	Jurisdiction	
Analysis Time Period	*A.M. Peak Hour*	Analysis Year	*Alt1A 2045*

Project Description Interstate 80 Reconstruction

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs				
Volume, V	*1798*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*12*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*0.95*		Up/Down %	

Calculate Flow Adjustments			
f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.840*

Speed Inputs			**Calc Speed Adj and FFS**		
Lane Width	*12.0*	ft	f_{LW}	*0.0*	mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}	*0.0*	mi/h
Interchange Density	*1.67*	I/mi	f_{ID}	*5.9*	mi/h
Number of Lanes, N	*3*		f_N	*3.0*	mi/h
FFS (measured)		mi/h	FFS	*61.1*	mi/h
Base free-flow Speed, BFFS	*70.0*	mi/h			

LOS and Performance Measures			**Design (N)**	
Operational (LOS)			Design (N)	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*790*	pc/h/ln	Design LOS	
			v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	*61.1*	mi/h	S	mi/h
D = v_p / S	*12.9*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*B*		Required Number of Lanes, N	

Glossary		**Factor Location**	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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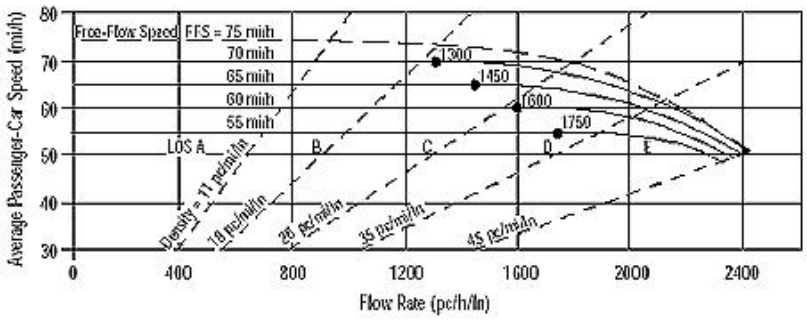

Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		***Site Information***	
Analyst	*AJM*	Highway/Direction of Travel	*I-80 Westbound*
Agency or Company	*AECOM*	From/To	*Between Ints. 304 and 305*
Date Performed	*8/1/2013*	Jurisdiction	
Analysis Time Period	*P.M. Peak Hour*	Analysis Year	*Alt1A 2045*

Project Description Interstate 80 Reconstruction

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs				
Volume, V	*3865*	veh/h	Peak-Hour Factor, PHF	*0.97*
AADT		veh/day	%Trucks and Buses, P_T	*13*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*0.95*		Up/Down %	

Calculate Flow Adjustments			
f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.830*

Speed Inputs			**Calc Speed Adj and FFS**		
Lane Width	*12.0*	ft	f_{LW}	*0.0*	mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}	*0.0*	mi/h
Interchange Density	*1.67*	l/mi	f_{ID}	*5.9*	mi/h
Number of Lanes, N	*3*		f_N	*3.0*	mi/h
FFS (measured)		mi/h	FFS	*61.1*	mi/h
Base free-flow Speed, BFFS	*70.0*	mi/h			

LOS and Performance Measures			**Design (N)**	
Operational (LOS)			Design (N)	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1685*	pc/h/ln	Design LOS	
			v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	*61.0*	mi/h	S	mi/h
D = v_p / S	*27.6*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*D*		Required Number of Lanes, N	

Glossary		**Factor Location**	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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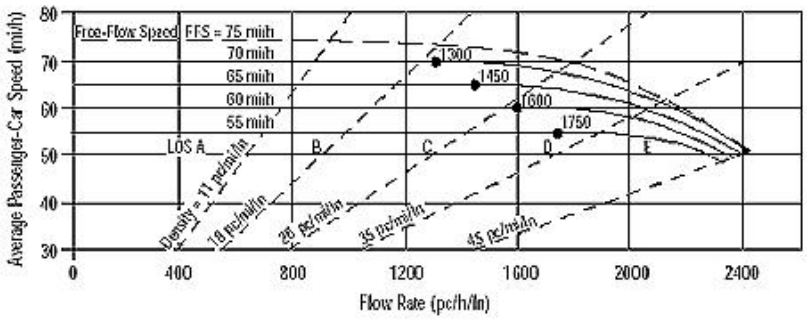

Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		***Site Information***	
Analyst	*AJM*	Highway/Direction of Travel	*I-80 Westbound*
Agency or Company	*AECOM*	From/To	*Between Ints. 305 and 306*
Date Performed	*8/1/2013*	Jurisdiction	
Analysis Time Period	*A.M. Peak Hour*	Analysis Year	*Alt1A 2045*

Project Description Interstate 80 Reconstruction

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs				
Volume, V	*3106*	veh/h	Peak-Hour Factor, PHF	*0.93*
AADT		veh/day	%Trucks and Buses, P_T	*12*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*0.95*		Up/Down %	

Calculate Flow Adjustments			
f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.840*

Speed Inputs			**Calc Speed Adj and FFS**		
Lane Width	*12.0*	ft	f_{LW}	*0.0*	mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}	*0.0*	mi/h
Interchange Density	*1.50*	I/mi	f_{ID}	*5.0*	mi/h
Number of Lanes, N	*4*		f_N	*1.5*	mi/h
FFS (measured)		mi/h	FFS	*63.5*	mi/h
Base free-flow Speed, BFFS	*70.0*	mi/h			

LOS and Performance Measures			**Design (N)**	
Operational (LOS)			Design (N)	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1046*	pc/h/ln	Design LOS	
			v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	*63.5*	mi/h	S	mi/h
D = v_p / S	*16.5*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*B*		Required Number of Lanes, N	

Glossary		**Factor Location**	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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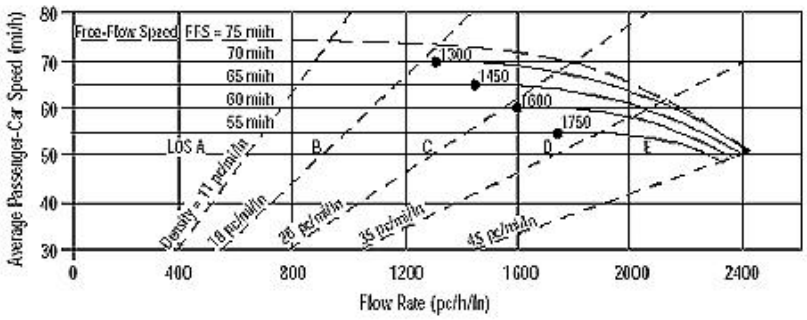

Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		***Site Information***	
Analyst	*AJM*	Highway/Direction of Travel	*I-80 Westbound*
Agency or Company	*AECOM*	From/To	*Between Ints. 305 and 306*
Date Performed	*8/1/2013*	Jurisdiction	
Analysis Time Period	*P.M. Peak Hour*	Analysis Year	*Alt1A 2045*

Project Description Interstate 80 Reconstruction

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs				
Volume, V	*6447*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*13*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*0.95*		Up/Down %	

Calculate Flow Adjustments			
f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.830*

Speed Inputs			**Calc Speed Adj and FFS**		
Lane Width	*12.0*	ft	f_{LW}	*0.0*	mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}	*0.0*	mi/h
Interchange Density	*1.50*	I/mi	f_{ID}	*5.0*	mi/h
Number of Lanes, N	*4*		f_N	*1.5*	mi/h
FFS (measured)		mi/h	FFS	*63.5*	mi/h
Base free-flow Speed, BFFS	*70.0*	mi/h			

LOS and Performance Measures			**Design (N)**	
Operational (LOS)			Design (N)	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2130*	pc/h/ln	Design LOS	
			v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	*57.9*	mi/h	S	mi/h
D = v_p / S	*36.8*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*E*		Required Number of Lanes, N	

Glossary		**Factor Location**	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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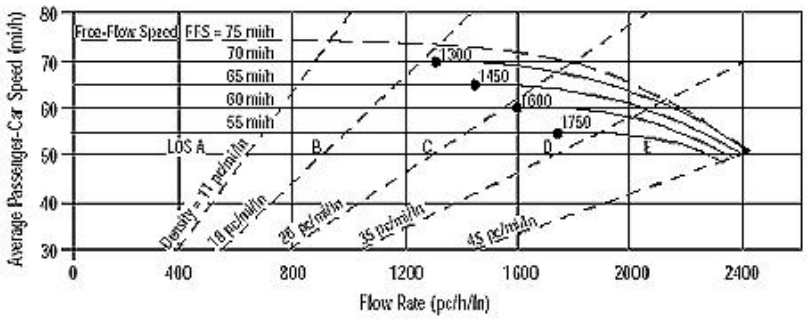

Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		***Site Information***	
Analyst	*AJM*	Highway/Direction of Travel	*I-80 Westbound*
Agency or Company	*AECOM*	From/To	*Between Ints. 306 and 307*
Date Performed	*8/1/2013*	Jurisdiction	
Analysis Time Period	*A.M. Peak Hour*	Analysis Year	*Alt1A 2045*

Project Description Interstate 80 Reconstruction

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs				
Volume, V	*3240*	veh/h	Peak-Hour Factor, PHF	*0.91*
AADT		veh/day	%Trucks and Buses, P_T	*12*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*0.95*		Up/Down %	

Calculate Flow Adjustments			
f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.840*

Speed Inputs			**Calc Speed Adj and FFS**		
Lane Width	*12.0*	ft	f_{LW}	*0.0*	mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}	*0.0*	mi/h
Interchange Density	*1.83*	I/mi	f_{ID}	*6.7*	mi/h
Number of Lanes, N	*4*		f_N	*1.5*	mi/h
FFS (measured)		mi/h	FFS	*61.8*	mi/h
Base free-flow Speed, BFFS	*70.0*	mi/h			

LOS and Performance Measures			**Design (N)**	
Operational (LOS)			Design (N)	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1115*	pc/h/ln	Design LOS v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	*61.8*	mi/h	S	mi/h
D = v_p / S	*18.0*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*C*		Required Number of Lanes, N	

Glossary		**Factor Location**	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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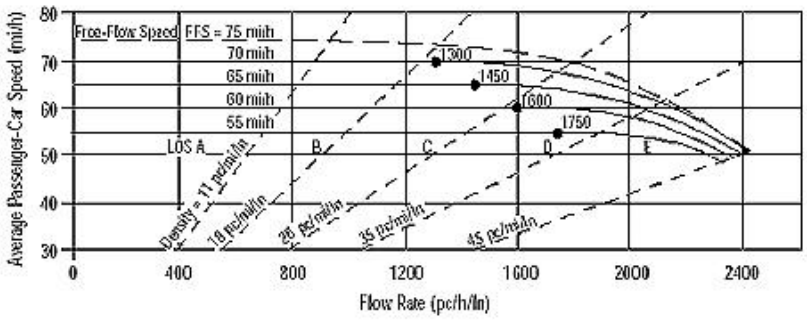

Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		***Site Information***	
Analyst	*AJM*	Highway/Direction of Travel	*I-80 Westbound*
Agency or Company	*AECOM*	From/To	*Between Ints. 306 and 307*
Date Performed	*8/1/2013*	Jurisdiction	
Analysis Time Period	*P.M. Peak Hour*	Analysis Year	*Alt1A 2045*

Project Description Interstate 80 Reconstruction

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*6750*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*12*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*0.95*		Up/Down %	

Calculate Flow Adjustments

f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.840*

Speed Inputs			**Calc Speed Adj and FFS**		
Lane Width	*12.0*	ft	f_{LW}	*0.0*	mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}	*0.0*	mi/h
Interchange Density	*1.83*	I/mi	f_{ID}	*6.7*	mi/h
Number of Lanes, N	*4*		f_N	*1.5*	mi/h
FFS (measured)		mi/h	FFS	*61.8*	mi/h
Base free-flow Speed, BFFS	*70.0*	mi/h			

LOS and Performance Measures			**Design (N)**	
Operational (LOS)			Design (N)	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2202*	pc/h/ln	Design LOS	
			v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	*55.1*	mi/h	S	mi/h
D = v_p / S	*40.0*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*E*		Required Number of Lanes, N	

Glossary		**Factor Location**	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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RAMP JUNCTION
HCS ANALYSIS

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	AJM	Freeway/Dir of Travel	I-80 Eastbound
Agency or Company	AECOM	Junction	Int. 303 from Route 611
Date Performed	7/31/2013	Jurisdiction	
Analysis Time Period	A.M. Peak Hour	Analysis Year	Alt1A 2045

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp: ☑ Yes ☐ On ☐ No ☑ Off

L_{up} = 1750 ft

V_u = 386 veh/h

Terrain: Rolling

S_{FF} = 70.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2446	0.94	Rolling	10	1	0.862	0.95	3177
Ramp	170	0.94	Rolling	5	1	0.922	0.95	207
UpStream	386	0.82	Rolling	2	0	0.971	0.95	510
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 485.38 (Equation 25-2 or 25-3)

P_{FM} = 0.599 using Equation (Exhibit 25-5)

V_{12} = 1901 pc/h

V_3 or V_{av34} 1276 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3384	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2108	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 17.1 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Determination

M_S = 0.301 (Exibit 25-19)

S_R = 61.6 mph (Exhibit 25-19)

S_0 = 67.2 mph (Exhibit 25-19)

S = 63.6 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_S = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	AJM	Freeway/Dir of Travel	I-80 Eastbound
Agency or Company	AECOM	Junction	Int. 303 from Route 611
Date Performed	7/31/2013	Jurisdiction	
Analysis Time Period	P.M. Peak Hour	Analysis Year	Alt1A 2045

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp: ☑ Yes ☐ On ☐ No ☑ Off

L_{up} = 1750 ft

V_u = 544 veh/h

Terrain: Rolling

S_{FF} = 70.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3066	0.94	Rolling	12	1	0.840	0.95	4086
Ramp	239	0.94	Rolling	2	1	0.962	0.95	278
UpStream	544	0.86	Rolling	3	0	0.957	0.95	696
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 695.10 (Equation 25-2 or 25-3)

P_{FM} = 0.599 using Equation (Exhibit 25-5)

V_{12} = 2445 pc/h

V_3 or V_{av34} = 1641 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4364	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2723	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 21.9 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Determination

M_S = 0.328 (Exibit 25-19)

S_R = 60.8 mph (Exhibit 25-19)

S_0 = 65.9 mph (Exhibit 25-19)

S = 62.6 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} = pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_S = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	AJM	Freeway/Dir of Travel	I-80 Westbound
Agency or Company	AECOM	Junction	Int. 303 from Route 611
Date Performed	8/1/2013	Jurisdiction	
Analysis Time Period	A.M. Peak Hour	Analysis Year	Alt1A 2045

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp
- ☑ Yes ☑ On
- ☐ No ☐ Off
- L_{up} = 2200 ft
- V_u = 338 veh/h

Terrain: Rolling

S_{FF} = 70.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp
- ☐ Yes ☐ On
- ☑ No ☐ Off
- L_{down} = ft
- V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2136	0.97	Rolling	12	1	0.840	0.95	2758
Ramp	173	0.74	Rolling	2	0	0.971	0.95	253
UpStream	338	0.94	Rolling	8	1	0.885	0.95	428
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 using Equation (Exhibit 25-5)

V_{12} = 2758 pc/h

V_3 or V_{av34} = 0 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3011	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3011	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 25.1 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Determination

M_S = 0.358 (Exibit 25-19)

S_R = 60.0 mph (Exhibit 25-19)

S_0 = N/A mph (Exhibit 25-19)

S = 60.0 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	AJM	Freeway/Dir of Travel	I-80 Westbound
Agency or Company	AECOM	Junction	Int. 304 from Rt 209 & Main St
Date Performed	8/1/2013	Jurisdiction	
Analysis Time Period	A.M. Peak Hour	Analysis Year	Alt1A 2045

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp	Terrain: Rolling	Downstream Adj Ramp
☐ Yes ☐ On		☑ Yes ☑ On
☑ No ☐ Off		☐ No ☐ Off
L_{up} = ft		L_{down} = 2200 ft
V_u = veh/h	S_{FF} = 70.0 mph S_{FR} = 35.0 mph Sketch (show lanes, L_A, L_D,V_R,V_f)	V_D = 173 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	1798	0.97	Rolling	12	1	0.840	0.95	2322
Ramp	338	0.94	Rolling	8	1	0.885	0.95	428
UpStream								
DownStream	173	0.74	Rolling	2	0	0.971	0.95	253

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.591 using Equation (Exhibit 25-5)

V_{12} = 1373 pc/h

V_3 or V_{av34} = 949 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	2750	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	1801	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 16.2 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Determination

M_S = 0.310 (Exibit 25-19)

S_R = 61.3 mph (Exhibit 25-19)

S_0 = 68.4 mph (Exhibit 25-19)

S = 63.6 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	AJM	Freeway/Dir of Travel	I-80 Westbound
Agency or Company	AECOM	Junction	Int. 304 from Rt 209 & Main St
Date Performed	8/1/2013	Jurisdiction	
Analysis Time Period	P.M. Peak Hour	Analysis Year	Alt1A 2045

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{up} = ft
V_u = veh/h

Terrain: Rolling

S_{FF} = 70.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp
☑ Yes ☑ On
☐ No ☐ Off
L_{down} = 2200 ft
V_D = 322 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3865	0.97	Rolling	13	1	0.830	0.95	5054
Ramp	548	0.94	Rolling	2	1	0.962	0.95	638
UpStream								
DownStream	322	0.87	Rolling	1	0	0.985	0.95	395

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.591 using Equation (Exhibit 25-5)

V_{12} = 2989 pc/h

V_3 or V_{av34} 2065 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	5692	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3627	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 30.3 (pc/mi/ln)

LOS = D (Exhibit 25-4)

Speed Determination

M_S = 0.433 (Exibit 25-19)

S_R = 57.9 mph (Exhibit 25-19)

S_0 = 64.4 mph (Exhibit 25-19)

S = 60.1 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_S = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	AJM	Freeway/Dir of Travel	I-80 Westbound
Agency or Company	AECOM	Junction	Int. 303 from Route 611
Date Performed	8/1/2013	Jurisdiction	
Analysis Time Period	P.M. Peak Hour	Analysis Year	Alt1A 2045

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp
- ☑ Yes ☑ On
- ☐ No ☐ Off
- L_{up} = 2200 ft
- V_u = 548 veh/h

Terrain: Rolling

S_{FF} = 70.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp
- ☐ Yes ☐ On
- ☑ No ☐ Off
- L_{down} = ft
- V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4414	0.97	Rolling	13	1	0.830	0.95	5772
Ramp	322	0.87	Rolling	1	0	0.985	0.95	395
UpStream	548	0.94	Rolling	2	1	0.962	0.95	638
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 using Equation (Exhibit 25-5)

V_{12} = 5772 pc/h

V_3 or V_{av34} = 0 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	6167	Exhibit 25-7		Yes

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	6167	Exhibit 25-7	4600:All	Yes

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 49.6 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Determination

M_S = 2.138 (Exibit 25-19)

S_R = 10.1 mph (Exhibit 25-19)

S_0 = N/A mph (Exhibit 25-19)

S = 10.1 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	AJM	Freeway/Dir of Travel	I-80 Westbound
Agency or Company	AECOM	Junction	Int. 307 from Broad Street
Date Performed	8/1/2013	Jurisdiction	
Analysis Time Period	A.M. Peak Hour	Analysis Year	Alt1A 2045

Project Description Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp
☑ Yes ☐ On
☐ No ☑ Off
L_{up} = 1600 ft
V_u = 360 veh/h

Terrain: Rolling
S_{FF} = 70.0 mph S_{FR} = 35.0 mph
Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{down} = ft
V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2767	0.91	Rolling	12	1	0.840	0.95	3809
Ramp	473	0.91	Rolling	6	0	0.917	0.95	596
UpStream	360	0.90	Rolling	3	0	0.957	0.95	440
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 1036.87 (Equation 25-2 or 25-3)
P_{FM} = 0.619 using Equation (Exhibit 25-5)
V_{12} = 2360 pc/h
V_3 or V_{av34} 1449 pc/h (Equation 25-4 or 25-5)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No
If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4405	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2956	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 18.9 (pc/mi/ln)
LOS = B (Exhibit 25-4)

Speed Determination

M_S = 0.291 (Exibit 25-19)
S_R = 61.9 mph (Exhibit 25-19)
S_0 = 66.6 mph (Exhibit 25-19)
S = 63.3 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)
P_{FD} = using Equation (Exhibit 25-12)
V_{12} = pc/h
V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)
LOS = (Exhibit 25-4)

Speed Determination

D_S = (Exhibit 25-19)
S_R = mph (Exhibit 25-19)
S_0 = mph (Exhibit 25-19)
S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	AJM	Freeway/Dir of Travel	I-80 Westbound
Agency or Company	AECOM	Junction	Int. 307 from Broad Street
Date Performed	8/1/2013	Jurisdiction	
Analysis Time Period	P.M. Peak Hour	Analysis Year	Alt1A 2045

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp
☑ Yes ☐ On
☐ No ☑ Off
L_{up} = 1600 ft
V_u = 560 veh/h

Terrain: Rolling
S_{FF} = 70.0 mph S_{FR} = 35.0 mph
Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{down} = ft
V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	5961	0.96	Rolling	12	1	0.840	0.95	7778
Ramp	790	0.89	Rolling	1	0	0.985	0.95	948
UpStream	560	0.88	Rolling	1	0	0.985	0.95	680
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 1961.56 (Equation 25-2 or 25-3)
P_{FM} = 0.597 using Equation (Exhibit 25-5)
V_{12} = 4640 pc/h
V_3 or V_{av34} 3138 pc/h (Equation 25-4 or 25-5)
Is V_3 or V_{av34} > 2,700 pc/h? ☑ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No
If Yes, V_{12a} = 5078 pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	8726	Exhibit 25-7		Yes

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	6026	Exhibit 25-7	4600:All	Yes

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 42.6 (pc/mi/ln)
LOS = F (Exhibit 25-4)

Speed Determination

M_S = 1.831 (Exibit 25-19)
S_R = 18.7 mph (Exhibit 25-19)
S_0 = 61.1 mph (Exhibit 25-19)
S = 23.9 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)
P_{FD} = using Equation (Exhibit 25-12)
V_{12} = pc/h
V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)
LOS = (Exhibit 25-4)

Speed Determination

D_S = (Exhibit 25-19)
S_R = mph (Exhibit 25-19)
S_0 = mph (Exhibit 25-19)
S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	AJM	Freeway/Dir of Travel	I-80 Eastbound
Agency or Company	AECOM	Junction	Int. 303 to Rt 611, 209 & Main
Date Performed	7/31/2013	Jurisdiction	
Analysis Time Period	A.M. Peak Hour	Analysis Year	Alt1A 2045

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{up} = ft
V_u = veh/h

Terrain: Rolling

S_{FF} = 70.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp
☑ Yes ☑ On
☐ No ☐ Off
L_{down} = 1750 ft
V_D = 170 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2689	0.94	Rolling	10	1	0.862	0.95	3493
Ramp	386	0.72	Rolling	1	0	0.985	0.95	573
UpStream								
DownStream	170	0.72	Rolling	1	0	0.985	0.95	252

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)
P_{FM} = using Equation (Exhibit 25-5)
V_{12} = pc/h
V_3 or V_{av34} pc/h (Equation 25-4 or 25-5)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 25-7		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 25-7		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)
LOS = (Exhibit 25-4)

Speed Determination

M_S = (Exibit 25-19)
S_R = mph (Exhibit 25-19)
S_0 = mph (Exhibit 25-19)
S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)
P_{FD} = 1.000 using Equation (Exhibit 25-12)
V_{12} = 3493 pc/h
V_3 or V_{av34} 0 pc/h (Equation 25-15 or 25-16)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No
If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	3493	Exhibit 25-14	4800	No
$V_{FO} = V_F - V_R$	2920	Exhibit 25-14	4800	No
V_R	573	Exhibit 25-3	3800	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3493	Exhibit 25-14	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 2.8 (pc/mi/ln)
LOS = A (Exhibit 25-4)

Speed Determination

D_s = 0.480 (Exhibit 25-19)
S_R = 56.6 mph (Exhibit 25-19)
S_0 = N/A mph (Exhibit 25-19)
S = 56.6 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	AJM	Freeway/Dir of Travel	I-80 Eastbound
Agency or Company	AECOM	Junction	Int. 303 to Rt 611, 209 & Main
Date Performed	7/31/2013	Jurisdiction	
Analysis Time Period	P.M. Peak Hour	Analysis Year	Alt1A 2045

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp	Terrain: Rolling	Downstream Adj Ramp
☐ Yes ☐ On		☑ Yes ☑ On
☑ No ☐ Off		☐ No ☐ Off
L_{up} = ft		L_{down} = 1750 ft
V_u = veh/h	S_{FF} = 70.0 mph S_{FR} = 35.0 mph Sketch (show lanes, L_A, L_D, V_R, V_f)	V_D = 239 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3390	0.94	Rolling	12	1	0.840	0.95	4517
Ramp	544	0.97	Rolling	1	0	0.985	0.95	599
UpStream								
DownStream	239	0.97	Rolling	1	0	0.985	0.95	263

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 25-7		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 25-7		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 using Equation (Exhibit 25-12)

V_{12} = 4517 pc/h

V_3 or V_{av34} 0 pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	4517	Exhibit 25-14	4800	No
$V_{FO} = V_F - V_R$	3918	Exhibit 25-14	4800	No
V_R	599	Exhibit 25-3	3800	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	4517	Exhibit 25-14	4400:All	Yes

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 11.6 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Determination

D_s = 0.482 (Exhibit 25-19)

S_R = 56.5 mph (Exhibit 25-19)

S_0 = N/A mph (Exhibit 25-19)

S = 56.5 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	AJM	Freeway/Dir of Travel	I-80 Westbound
Agency or Company	AECOM	Junction	Int. 305 to Main St & Rt 209
Date Performed	8/2/2013	Jurisdiction	
Analysis Time Period	A.M. Peak Hour	Analysis Year	Alt1A 2045

Project Description Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp	Terrain: Rolling	Downstream Adj Ramp
☑ Yes ☐ On		☐ Yes ☐ On
☐ No ☑ Off		☑ No ☐ Off
L_{up} = 500 ft		L_{down} = ft
V_u = 134 veh/h	S_{FF} = 70.0 mph S_{FR} = 35.0 mph Sketch (show lanes, L_A, L_D,V_R,V_f)	V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3106	0.93	Rolling	12	1	0.840	0.95	4184
Ramp	1308	0.84	Rolling	1	0	0.985	0.95	1664
UpStream	134	0.84	Rolling	1	0	0.985	0.95	170
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 25-7		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 25-7		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.450 using Equation (Exhibit 25-12)

V_{12} = 2798 pc/h

V_3 or V_{av34} 1386 pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	4184	Exhibit 25-14	7200	No
$V_{FO} = V_F - V_R$	2520	Exhibit 25-14	7200	No
V_R	1664	Exhibit 25-3	3800	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	2798	Exhibit 25-14	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 10.3 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Determination

D_s = 0.578 (Exhibit 25-19)

S_R= 53.8 mph (Exhibit 25-19)

S_0= 75.3 mph (Exhibit 25-19)

S = 59.4 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	AJM	Freeway/Dir of Travel	I-80 Westbound
Agency or Company	AECOM	Junction	Int. 305 to Main St & Rt 209
Date Performed	8/2/2013	Jurisdiction	
Analysis Time Period	P.M. Peak Hour	Analysis Year	Alt1A 2045

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp	Terrain: Rolling	Downstream Adj Ramp
☑ Yes ☐ On		☐ Yes ☐ On
☐ No ☑ Off		☑ No ☐ Off
L_{up} = 500 ft	S_{FF} = 70.0 mph S_{FR} = 35.0 mph	L_{down} = ft
V_u = 303 veh/h	Sketch (show lanes, L_A, L_D, V_R, V_f)	V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	6447	0.96	Rolling	13	1	0.830	0.95	8518
Ramp	2582	0.90	Rolling	1	0	0.985	0.95	3065
UpStream	303	0.90	Rolling	1	0	0.985	0.95	360
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 25-7		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 25-7		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.450 using Equation (Exhibit 25-12)

V_{12} = 5519 pc/h

V_3 or V_{av34} 2999 pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☑ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = 5818 pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	8518	Exhibit 25-14	7200	Yes
$V_{FO} = V_F - V_R$	5453	Exhibit 25-14	7200	No
V_R	3065	Exhibit 25-3	3800	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	5519	Exhibit 25-14	4400:All	Yes

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 36.3 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Determination

D_s = 0.704 (Exhibit 25-19)

S_R = 50.3 mph (Exhibit 25-19)

S_0 = 70.2 mph (Exhibit 25-19)

S = 55.3 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	AJM	Freeway/Dir of Travel	I-80 Westbound
Agency or Company	AECOM	Junction	Int. 306 to Dreher Avenue
Date Performed	8/1/2013	Jurisdiction	
Analysis Time Period	A.M. Peak Hour	Analysis Year	Alt1A 2045

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp: ☑ Yes ☑ On ☐ No ☐ Off

L_{up} = 3680 ft

V_u = 473 veh/h

Terrain: Rolling

S_{FF} = 70.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3240	0.91	Rolling	12	1	0.840	0.95	4460
Ramp	134	0.66	Rolling	3	0	0.957	0.95	223
UpStream	473	0.91	Rolling	6	0	0.917	0.95	596
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 25-7		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 25-7		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.436 using Equation (Exhibit 25-12)

V_{12} = 2070 pc/h

V_3 or V_{av34} 1195 pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	4460	Exhibit 25-14	9600	No
$V_{FO} = V_F - V_R$	4237	Exhibit 25-14	9600	No
V_R	223	Exhibit 25-3	2000	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	2070	Exhibit 25-14	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 17.6 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Determination

D_s = 0.448 (Exhibit 25-19)

S_R = 57.5 mph (Exhibit 25-19)

S_0 = 76.0 mph (Exhibit 25-19)

S = 66.1 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	AJM	Freeway/Dir of Travel	I-80 Westbound
Agency or Company	AECOM	Junction	Int. 306 to Dreher Avenue
Date Performed	8/1/2013	Jurisdiction	
Analysis Time Period	P.M. Peak Hour	Analysis Year	Alt1A 2045

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp: ☑ Yes ☑ On ☐ No ☐ Off

L_{up} = 3680 ft

V_u = 790 veh/h

Terrain: Rolling

S_{FF} = 70.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	6750	0.96	Rolling	12	1	0.840	0.95	8808
Ramp	303	0.82	Rolling	3	0	0.957	0.95	406
UpStream	790	0.89	Rolling	1	0	0.985	0.95	948
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 25-7		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 25-7		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = 3905.61 (Equation 25-8 or 25-9)

P_{FD} = 0.436 using Equation (Exhibit 25-12)

V_{12} = 4069 pc/h

V_3 or V_{av34} 2369 pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	8808	Exhibit 25-14	9600	No
$V_{FO} = V_F - V_R$	8402	Exhibit 25-14	9600	No
V_R	406	Exhibit 25-3	2000	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	4069	Exhibit 25-14	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 34.7 (pc/mi/ln)

LOS = D (Exhibit 25-4)

Speed Determination

D_s = 0.465 (Exhibit 25-19)

S_R = 57.0 mph (Exhibit 25-19)

S_0 = 71.5 mph (Exhibit 25-19)

S = 64.0 mph (Exhibit 25-15)

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WEAVE HCS ANALYSIS

Interstate 80 Reconstruction

FREEWAY WEAVING WORKSHEET

General Information

Analyst	JRE
Agency/Company	AECOM
Date Performed	8/1/2013
Analysis Time Period	A.M. Peak Hour

Site Information

Freeway/Dir of Travel	Int. 304 to 306 EB
Weaving Segment Location	
Analysis Year	Alt1A 2045 All Alternatives

Project Description *Interstate 80 Reconstruction*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	4	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_s	1950ft	Freeway maximum capacity, C_{IFL}	2400
Freeway free-flow speed, FFS	70 mph	Terrain type	Rolling

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	2302	0.97	13	0	2.5	2.0	0.837	0.95	2985
V_{RF}	1728	0.97	10	0	2.5	2.0	0.870	0.95	2156
V_{FR}	171	0.97	2	0	2.5	2.0	0.971	0.95	191
V_{RR}	0	0.97	2	0	2.5	2.0	0.971	0.95	0
V_{NW}	2985							V =	5332
V_W	2347								
VR	0.440								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	2347 lc/h
Interchange density, ID	1.7 int/mi	Weaving lane changes, LC_W	2908 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	901 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	3809 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	990

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	5332 pc/h	Weaving intensity factor, W	0.383
Weaving segment capacity, c_w	4335 veh/h	Weaving segment speed, S	49.9 mph
Weaving segment v/c ratio	0.978	Average weaving speed, S_W	54.8 mph
Weaving segment density, D	26.7 pc/mi/ln	Average non-weaving speed, S_{NW}	46.7 mph
Level of Service, LOS	C	Maximum weaving length, L_{MAX}	7136 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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Interstate 80 Reconstruction

FREEWAY WEAVING WORKSHEET

General Information

Analyst	JRE
Agency/Company	AECOM
Date Performed	8/1/2013
Analysis Time Period	P.M. Peak Hour

Site Information

Freeway/Dir of Travel	Int. 304 to 306 EB
Weaving Segment Location	
Analysis Year	Alt~~A~~ 2045 All Alternatives

Project Description *Interstate 80 Reconstruction*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	4	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_s	975ft	Freeway maximum capacity, C_{IFL}	2400
Freeway free-flow speed, FFS	70 mph	Terrain type	Rolling

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	fp	v (pc/h)
V_{FF}	2898	0.97	13	0	2.5	2.0	0.837	0.95	3758
V_{RF}	1630	0.97	10	0	2.5	2.0	0.870	0.95	2034
V_{FR}	187	0.97	2	0	2.5	2.0	0.971	0.95	209
V_{RR}	0	0.97	2	0	2.5	2.0	0.971	0.95	0
V_{NW}	3758							V =	6001
V_W	2243								
VR	0.374								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	2243 lc/h
Interchange density, ID	1.7 int/mi	Weaving lane changes, LC_W	2602 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	532 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	3134 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	623

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	6001 pc/h	Weaving intensity factor, W	0.568
Weaving segment capacity, c_w	5105 veh/h	Weaving segment speed, S	47.9 mph
Weaving segment v/c ratio	0.935	Average weaving speed, S_w	50.1 mph
Weaving segment density, D	31.3 pc/mi/ln	Average non-weaving speed, S_{NW}	46.6 mph
Level of Service, LOS	D	Maximum weaving length, L_{MAX}	6389 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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Interstate 80 Reconstruction

FREEWAY WEAVING WORKSHEET

General Information

Analyst	JRE
Agency/Company	AECOM
Date Performed	8/1/2013
Analysis Time Period	A.M. Peak Hour

Site Information

Freeway/Dir of Travel	Int. 303 to 304 EB Alt 1B
Weaving Segment Location	
Analysis Year	Alt1B 2045

Project Description *Interstate 80 Reconstruction*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	4	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_s	2200ft	Freeway maximum capacity, C_{IFL}	2400
Freeway free-flow speed, FFS	70 mph	Terrain type	Rolling

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	fp	v (pc/h)
V_{FF}	2303	0.97	13	0	2.5	2.0	0.837	0.95	2987
V_{RF}	170	0.97	10	0	2.5	2.0	0.870	0.95	212
V_{FR}	143	0.97	2	0	2.5	2.0	0.971	0.95	160
V_{RR}	0	0.97	2	0	2.5	2.0	0.971	0.95	0
V_{NW}	2987							V =	3359
V_W	372								
VR	0.111								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	372 lc/h
Interchange density, ID	1.7 int/mi	Weaving lane changes, LC_W	974 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	1037 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	2011 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	1117

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	3359 pc/h	Weaving intensity factor, W	0.211
Weaving segment capacity, c_w	7282 veh/h	Weaving segment speed, S	63.0 mph
Weaving segment v/c ratio	0.367	Average weaving speed, S_W	60.4 mph
Weaving segment density, D	13.3 pc/mi/ln	Average non-weaving speed, S_{NW}	63.3 mph
Level of Service, LOS	B	Maximum weaving length, L_{MAX}	3644 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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Interstate 80 Reconstruction

FREEWAY WEAVING WORKSHEET

General Information

Analyst	JRE
Agency/Company	AECOM
Date Performed	8/1/2013
Analysis Time Period	A.M. Peak Hour

Site Information

Freeway/Dir of Travel	Int. 307 to 308 EB
Weaving Segment Location	
Analysis Year	All Alternatives 2045

Project Description *Interstate 80 Reconstruction*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	4	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_s	2800ft	Freeway maximum capacity, C_{IFL}	2400
Freeway free-flow speed, FFS	70 mph	Terrain type	Rolling

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	fp	v (pc/h)
V_{FF}	2559	0.97	13	0	2.5	2.0	0.837	0.95	3319
V_{RF}	128	0.97	2	0	2.5	2.0	0.971	0.95	143
V_{FR}	989	0.97	10	0	2.5	2.0	0.870	0.95	1234
V_{RR}	91	0.97	2	0	2.5	2.0	0.971	0.95	102
V_{NW}	3421							V =	4798
V_W	1377								
VR	0.287								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	1377 lc/h
Interchange density, ID	1.7 int/mi	Weaving lane changes, LC_W	2068 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	1957 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	4025 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	1628

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	4798 pc/h	Weaving intensity factor, W	0.301
Weaving segment capacity, c_w	6648 veh/h	Weaving segment speed, S	55.1 mph
Weaving segment v/c ratio	0.574	Average weaving speed, S_W	57.3 mph
Weaving segment density, D	21.8 pc/mi/ln	Average non-weaving speed, S_{NW}	54.3 mph
Level of Service, LOS	C	Maximum weaving length, L_{MAX}	5445 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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Interstate 80 Reconstruction

FREEWAY WEAVING WORKSHEET

General Information

Analyst	JRE
Agency/Company	AECOM
Date Performed	8/1/2013
Analysis Time Period	P.M. Peak Hour

Site Information

Freeway/Dir of Travel	Int. 307 to 308 EB
Weaving Segment Location	
Analysis Year	All Alternatives 2045

Project Description *Interstate 80 Reconstruction*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	4	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_s	2800ft	Freeway maximum capacity, C_{IFL}	2400
Freeway free-flow speed, FFS	70 mph	Terrain type	Rolling

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	3370	0.97	13	0	2.5	2.0	0.837	0.95	4370
V_{RF}	154	0.97	2	0	2.5	2.0	0.971	0.95	172
V_{FR}	725	0.97	10	0	2.5	2.0	0.870	0.95	905
V_{RR}	110	0.97	2	0	2.5	2.0	0.971	0.95	123
V_{NW}	4493							V =	5570
V_W	1077								
VR	0.193								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	1077 lc/h
Interchange density, ID	1.7 int/mi	Weaving lane changes, LC_W	1768 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	2691 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	4459 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	2139

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	5570 pc/h	Weaving intensity factor, W	0.326
Weaving segment capacity, c_w	7225 veh/h	Weaving segment speed, S	55.7 mph
Weaving segment v/c ratio	0.613	Average weaving speed, S_W	56.5 mph
Weaving segment density, D	25.0 pc/mi/ln	Average non-weaving speed, S_{NW}	55.6 mph
Level of Service, LOS	C	Maximum weaving length, L_{MAX}	4468 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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Interstate 80 Reconstruction

FREEWAY WEAVING WORKSHEET

General Information

Analyst	JRE
Agency/Company	AECOM
Date Performed	8/1/2013
Analysis Time Period	A.M. Peak Hour

Site Information

Freeway/Dir of Travel	Int. 306 to 307 EB
Weaving Segment Location	
Analysis Year	Alt1A 2045

Project Description *Interstate 80 Reconstruction*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	4	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_s	2400ft	Freeway maximum capacity, C_{IFL}	2400
Freeway free-flow speed, FFS	70 mph	Terrain type	Rolling

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	3377	0.97	13	0	2.5	2.0	0.837	0.95	4379
V_{RF}	172	0.97	2	0	2.5	2.0	0.971	0.95	192
V_{FR}	653	0.97	10	0	2.5	2.0	0.870	0.95	815
V_{RR}	65	0.97	2	0	2.5	2.0	0.971	0.95	73
V_{NW}	4452							V =	5459
V_W	1007								
VR	0.184								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	1007 lc/h
Interchange density, ID	1.7 int/mi	Weaving lane changes, LC_W	1640 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	2428 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	4068 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	1816

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	5459 pc/h	Weaving intensity factor, W	0.343
Weaving segment capacity, c_w	7152 veh/h	Weaving segment speed, S	56.2 mph
Weaving segment v/c ratio	0.607	Average weaving speed, S_W	56.0 mph
Weaving segment density, D	24.3 pc/mi/ln	Average non-weaving speed, S_{NW}	56.2 mph
Level of Service, LOS	C	Maximum weaving length, L_{MAX}	4378 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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Interstate 80 Reconstruction

FREEWAY WEAVING WORKSHEET

General Information

Analyst	JRE
Agency/Company	AECOM
Date Performed	8/1/2013
Analysis Time Period	P.M. Peak Hour

Site Information

Freeway/Dir of Travel	Int. 306 to 307 EB
Weaving Segment Location	
Analysis Year	Alt1A 2045

Project Description *Interstate 80 Reconstruction*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	4	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_s	2400ft	Freeway maximum capacity, C_{IFL}	2400
Freeway free-flow speed, FFS	70 mph	Terrain type	Rolling

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	3938	0.97	13	0	2.5	2.0	0.837	0.95	5107
V_{RF}	157	0.97	2	0	2.5	2.0	0.971	0.95	175
V_{FR}	590	0.97	10	0	2.5	2.0	0.870	0.95	736
V_{RR}	58	0.97	2	0	2.5	2.0	0.971	0.95	65
V_{NW}	5172							V =	6083
V_W	911								
VR	0.150								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	911 lc/h
Interchange density, ID	1.7 int/mi	Weaving lane changes, LC_W	1544 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	2842 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	4386 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	2110

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	6083 pc/h	Weaving intensity factor, W	0.364
Weaving segment capacity, c_w	7234 veh/h	Weaving segment speed, S	56.0 mph
Weaving segment v/c ratio	0.668	Average weaving speed, S_w	55.3 mph
Weaving segment density, D	27.1 pc/mi/ln	Average non-weaving speed, S_{NW}	56.1 mph
Level of Service, LOS	C	Maximum weaving length, L_{MAX}	4029 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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Interstate 80 Reconstruction

FREEWAY WEAVING WORKSHEET

General Information

Analyst	JRE
Agency/Company	AECOM
Date Performed	8/1/2013
Analysis Time Period	A.M. Peak Hour

Site Information

Freeway/Dir of Travel	Int. 304 to 303 WB
Weaving Segment Location	
Analysis Year	Alt1A 2045

Project Description *Interstate 80 Reconstruction*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	2	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_s	1000ft	Freeway maximum capacity, C_{IFL}	2400
Freeway free-flow speed, FFS	70 mph	Terrain type	Rolling

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	fp	v (pc/h)
V_{FF}	96	0.97	13	0	2.5	2.0	0.837	0.95	124
V_{RF}	10	0.97	2	0	2.5	2.0	0.971	0.95	11
V_{FR}	206	0.97	2	0	2.5	2.0	0.971	0.95	230
V_{RR}	132	0.97	2	0	2.5	2.0	0.971	0.95	148
V_{NW}	272							V =	513
V_W	241								
VR	0.470								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	241 lc/h
Interchange density, ID	1.7 int/mi	Weaving lane changes, LC_W	332 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	213 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	545 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	46

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	513 pc/h	Weaving intensity factor, W	0.140
Weaving segment capacity, c_w	3029 veh/h	Weaving segment speed, S	65.2 mph
Weaving segment v/c ratio	0.135	Average weaving speed, S_w	63.2 mph
Weaving segment density, D	3.9 pc/mi/ln	Average non-weaving speed, S_{NW}	67.0 mph
Level of Service, LOS	A	Maximum weaving length, L_{MAX}	7475 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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Interstate 80 Reconstruction

FREEWAY WEAVING WORKSHEET

General Information

Analyst	JRE
Agency/Company	AECOM
Date Performed	8/1/2013
Analysis Time Period	P.M. Peak Hour

Site Information

Freeway/Dir of Travel	Int. 304 to 303 WB
Weaving Segment Location	
Analysis Year	Alt1A 2045

Project Description *Interstate 80 Reconstruction*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	2	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_s	1000ft	Freeway maximum capacity, C_{IFL}	2400
Freeway free-flow speed, FFS	70 mph	Terrain type	Rolling

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	fp	v (pc/h)
V_{FF}	184	0.97	13	0	2.5	2.0	0.837	0.95	239
V_{RF}	20	0.97	2	0	2.5	2.0	0.971	0.95	22
V_{FR}	380	0.97	2	0	2.5	2.0	0.971	0.95	425
V_{RR}	168	0.97	2	0	2.5	2.0	0.971	0.95	188
V_{NW}	427							V =	874
V_W	447								
VR	0.511								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	447 lc/h
Interchange density, ID	1.7 int/mi	Weaving lane changes, LC_W	538 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	245 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	783 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	73

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	874 pc/h	Weaving intensity factor, W	0.186
Weaving segment capacity, c_w	2970 veh/h	Weaving segment speed, S	62.9 mph
Weaving segment v/c ratio	0.234	Average weaving speed, S_W	61.4 mph
Weaving segment density, D	6.9 pc/mi/ln	Average non-weaving speed, S_{NW}	64.7 mph
Level of Service, LOS	A	Maximum weaving length, L_{MAX}	7960 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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Interstate 80 Reconstruction

FREEWAY WEAVING WORKSHEET

General Information

Analyst	JRE
Agency/Company	AECOM
Date Performed	8/1/2013
Analysis Time Period	A.M. Peak Hour

Site Information

Freeway/Dir of Travel	Int. 305 to 304 WB
Weaving Segment Location	
Analysis Year	Alt1A 2045

Project Description *Interstate 80 Reconstruction*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	2	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_s	1100ft	Freeway maximum capacity, C_{IFL}	2400
Freeway free-flow speed, FFS	70 mph	Terrain type	Rolling

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	fp	v (pc/h)
V_{FF}	1023	0.97	13	0	2.5	2.0	0.837	0.95	1327
V_{RF}	196	0.97	10	0	2.5	2.0	0.870	0.95	245
V_{FR}	106	0.97	2	0	2.5	2.0	0.971	0.95	118
V_{RR}	0	0.97	2	0	2.5	2.0	0.971	0.95	0
V_{NW}	1327							V =	1690
V_W	363								
VR	0.215								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	363 lc/h
Interchange density, ID	1.7 int/mi	Weaving lane changes, LC_W	461 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	484 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	945 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	248

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	1690 pc/h	Weaving intensity factor, W	0.200
Weaving segment capacity, c_w	3380 veh/h	Weaving segment speed, S	62.8 mph
Weaving segment v/c ratio	0.397	Average weaving speed, S_w	60.8 mph
Weaving segment density, D	13.5 pc/mi/ln	Average non-weaving speed, S_{NW}	63.3 mph
Level of Service, LOS	B	Maximum weaving length, L_{MAX}	4688 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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Interstate 80 Reconstruction

FREEWAY WEAVING WORKSHEET

General Information

Analyst	JRE
Agency/Company	AECOM
Date Performed	8/1/2013
Analysis Time Period	A.M. Peak Hour

Site Information

Freeway/Dir of Travel	Int. 305 to 304 WB
Weaving Segment Location	
Analysis Year	Alt1A 2045

Project Description *Interstate 80 Reconstruction*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	2	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_s	1100ft	Freeway maximum capacity, C_{IFL}	2400
Freeway free-flow speed, FFS	70 mph	Terrain type	Rolling

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	fp	v (pc/h)
V_{FF}	2001	0.97	13	0	2.5	2.0	0.837	0.95	2595
V_{RF}	360	0.97	10	0	2.5	2.0	0.870	0.95	449
V_{FR}	204	0.97	2	0	2.5	2.0	0.971	0.95	228
V_{RR}	0	0.97	2	0	2.5	2.0	0.971	0.95	0
V_{NW}	2595							V =	3272
V_W	677								
VR	0.207								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	677 lc/h
Interchange density, ID	1.7 int/mi	Weaving lane changes, LC_W	775 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	746 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	1521 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	485

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	3272 pc/h	Weaving intensity factor, W	0.292
Weaving segment capacity, c_w	3390 veh/h	Weaving segment speed, S	57.3 mph
Weaving segment v/c ratio	0.767	Average weaving speed, S_W	57.6 mph
Weaving segment density, D	28.5 pc/mi/ln	Average non-weaving speed, S_{NW}	57.3 mph
Level of Service, LOS	D	Maximum weaving length, L_{MAX}	4607 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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Interstate 80 Reconstruction

FREEWAY WEAVING WORKSHEET

General Information

Analyst	JRE
Agency/Company	AECOM
Date Performed	8/1/2013
Analysis Time Period	A.M. Peak Hour

Site Information

Freeway/Dir of Travel	Int. 308 to 307 WB
Weaving Segment Location	
Analysis Year	All Alternatives 2045

Project Description *Interstate 80 Reconstruction*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	4	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_s	2500ft	Freeway maximum capacity, C_{IFL}	2400
Freeway free-flow speed, FFS	70 mph	Terrain type	Rolling

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	fp	v (pc/h)
V_{FF}	2198	0.97	13	0	2.5	2.0	0.837	0.95	2850
V_{RF}	569	0.97	2	0	2.5	2.0	0.971	0.95	636
V_{FR}	295	0.97	10	0	2.5	2.0	0.870	0.95	368
V_{RR}	65	0.97	2	0	2.5	2.0	0.971	0.95	73
V_{NW}	2923							V =	3927
V_W	1004								
VR	0.256								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	1004 lc/h
Interchange density, ID	1.7 int/mi	Weaving lane changes, LC_W	1652 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	1187 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	2839 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	1242

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	3927 pc/h	Weaving intensity factor, W	0.250
Weaving segment capacity, c_w	6996 veh/h	Weaving segment speed, S	58.3 mph
Weaving segment v/c ratio	0.446	Average weaving speed, S_W	59.0 mph
Weaving segment density, D	16.8 pc/mi/ln	Average non-weaving speed, S_{NW}	58.1 mph
Level of Service, LOS	B	Maximum weaving length, L_{MAX}	5113 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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Interstate 80 Reconstruction

FREEWAY WEAVING WORKSHEET

General Information

Analyst	JRE
Agency/Company	AECOM
Date Performed	8/1/2013
Analysis Time Period	P.M. Peak Hour

Site Information

Freeway/Dir of Travel	Int. 308 to 307 WB
Weaving Segment Location	
Analysis Year	All Alternatives 2045

Project Description *Interstate 80 Reconstruction*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	4	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_s	2500ft	Freeway maximum capacity, C_{IFL}	2400
Freeway free-flow speed, FFS	70 mph	Terrain type	Rolling

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	fp	v (pc/h)
V_{FF}	4803	0.97	13	0	2.5	2.0	0.837	0.95	6229
V_{RF}	1157	0.97	10	0	2.5	2.0	0.870	0.95	1444
V_{FR}	295	0.97	2	0	2.5	2.0	0.971	0.95	330
V_{RR}	132	0.97	2	0	2.5	2.0	0.971	0.95	148
V_{NW}	6377							V =	8151
V_W	1774								
VR	0.218								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	1774 lc/h
Interchange density, ID	1.7 int/mi	Weaving lane changes, LC_W	2422 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	3111 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	5533 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	2710

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	8151 pc/h	Weaving intensity factor, W	0.423
Weaving segment capacity, c_w	7091 veh/h	Weaving segment speed, S	48.7 mph
Weaving segment v/c ratio	0.914	Average weaving speed, S_W	53.7 mph
Weaving segment density, D	41.9 pc/mi/ln	Average non-weaving speed, S_{NW}	47.4 mph
Level of Service, LOS	E	Maximum weaving length, L_{MAX}	4717 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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UNSIGNALIZED INTERSECTION HCS ANALYSIS

Interstate 80 Reconstruction

FREEWAY WEAVING WORKSHEET

General Information

Analyst	JRE
Agency/Company	AECOM
Date Performed	8/1/2013
Analysis Time Period	A.M. Peak Hour

Site Information

Freeway/Dir of Travel	Int. 304 to 306 EB
Weaving Segment Location	
Analysis Year	Alt1A 2045 All Alternatives

Project Description *Interstate 80 Reconstruction*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	4	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_s	1950ft	Freeway maximum capacity, C_{IFL}	2400
Freeway free-flow speed, FFS	70 mph	Terrain type	Rolling

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	2302	0.97	13	0	2.5	2.0	0.837	0.95	2985
V_{RF}	1728	0.97	10	0	2.5	2.0	0.870	0.95	2156
V_{FR}	171	0.97	2	0	2.5	2.0	0.971	0.95	191
V_{RR}	0	0.97	2	0	2.5	2.0	0.971	0.95	0
V_{NW}	2985							V =	5332
V_W	2347								
VR	0.440								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	2347 lc/h
Interchange density, ID	1.7 int/mi	Weaving lane changes, LC_W	2908 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	901 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	3809 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	990

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	5332 pc/h	Weaving intensity factor, W	0.383
Weaving segment capacity, c_w	4335 veh/h	Weaving segment speed, S	49.9 mph
Weaving segment v/c ratio	0.978	Average weaving speed, S_W	54.8 mph
Weaving segment density, D	26.7 pc/mi/ln	Average non-weaving speed, S_{NW}	46.7 mph
Level of Service, LOS	C	Maximum weaving length, L_{MAX}	7136 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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Interstate 80 Reconstruction

FREEWAY WEAVING WORKSHEET

General Information

Analyst	JRE
Agency/Company	AECOM
Date Performed	8/1/2013
Analysis Time Period	P.M. Peak Hour

Site Information

Freeway/Dir of Travel	Int. 304 to 306 EB
Weaving Segment Location	
Analysis Year	Alt~~A~~ 2045 All Alternatives

Project Description *Interstate 80 Reconstruction*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	4	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_s	975ft	Freeway maximum capacity, C_{IFL}	2400
Freeway free-flow speed, FFS	70 mph	Terrain type	Rolling

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	fp	v (pc/h)
V_{FF}	2898	0.97	13	0	2.5	2.0	0.837	0.95	3758
V_{RF}	1630	0.97	10	0	2.5	2.0	0.870	0.95	2034
V_{FR}	187	0.97	2	0	2.5	2.0	0.971	0.95	209
V_{RR}	0	0.97	2	0	2.5	2.0	0.971	0.95	0
V_{NW}	3758							V =	6001
V_W	2243								
VR	0.374								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	2243 lc/h
Interchange density, ID	1.7 int/mi	Weaving lane changes, LC_W	2602 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	532 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	3134 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	623

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	6001 pc/h	Weaving intensity factor, W	0.568
Weaving segment capacity, c_w	5105 veh/h	Weaving segment speed, S	47.9 mph
Weaving segment v/c ratio	0.935	Average weaving speed, S_w	50.1 mph
Weaving segment density, D	31.3 pc/mi/ln	Average non-weaving speed, S_{NW}	46.6 mph
Level of Service, LOS	D	Maximum weaving length, L_{MAX}	6389 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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Interstate 80 Reconstruction

FREEWAY WEAVING WORKSHEET

General Information

Analyst	JRE
Agency/Company	AECOM
Date Performed	8/1/2013
Analysis Time Period	A.M. Peak Hour

Site Information

Freeway/Dir of Travel	Int. 303 to 304 EB Alt 1B
Weaving Segment Location	
Analysis Year	Alt1B 2045

Project Description *Interstate 80 Reconstruction*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	4	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_s	2200ft	Freeway maximum capacity, C_{IFL}	2400
Freeway free-flow speed, FFS	70 mph	Terrain type	Rolling

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	fp	v (pc/h)
V_{FF}	2303	0.97	13	0	2.5	2.0	0.837	0.95	2987
V_{RF}	170	0.97	10	0	2.5	2.0	0.870	0.95	212
V_{FR}	143	0.97	2	0	2.5	2.0	0.971	0.95	160
V_{RR}	0	0.97	2	0	2.5	2.0	0.971	0.95	0
V_{NW}	2987							V =	3359
V_W	372								
VR	0.111								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	372 lc/h
Interchange density, ID	1.7 int/mi	Weaving lane changes, LC_W	974 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	1037 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	2011 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	1117

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	3359 pc/h	Weaving intensity factor, W	0.211
Weaving segment capacity, c_w	7282 veh/h	Weaving segment speed, S	63.0 mph
Weaving segment v/c ratio	0.367	Average weaving speed, S_W	60.4 mph
Weaving segment density, D	13.3 pc/mi/ln	Average non-weaving speed, S_{NW}	63.3 mph
Level of Service, LOS	B	Maximum weaving length, L_{MAX}	3644 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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Interstate 80 Reconstruction

FREEWAY WEAVING WORKSHEET

General Information

Analyst	JRE
Agency/Company	AECOM
Date Performed	8/1/2013
Analysis Time Period	A.M. Peak Hour

Site Information

Freeway/Dir of Travel	Int. 307 to 308 EB
Weaving Segment Location	
Analysis Year	All Alternatives 2045

Project Description *Interstate 80 Reconstruction*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	4	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_s	2800ft	Freeway maximum capacity, C_{IFL}	2400
Freeway free-flow speed, FFS	70 mph	Terrain type	Rolling

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	fp	v (pc/h)
V_{FF}	2559	0.97	13	0	2.5	2.0	0.837	0.95	3319
V_{RF}	128	0.97	2	0	2.5	2.0	0.971	0.95	143
V_{FR}	989	0.97	10	0	2.5	2.0	0.870	0.95	1234
V_{RR}	91	0.97	2	0	2.5	2.0	0.971	0.95	102
V_{NW}	3421							V =	4798
V_W	1377								
VR	0.287								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	1377 lc/h
Interchange density, ID	1.7 int/mi	Weaving lane changes, LC_W	2068 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	1957 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	4025 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	1628

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	4798 pc/h	Weaving intensity factor, W	0.301
Weaving segment capacity, c_w	6648 veh/h	Weaving segment speed, S	55.1 mph
Weaving segment v/c ratio	0.574	Average weaving speed, S_W	57.3 mph
Weaving segment density, D	21.8 pc/mi/ln	Average non-weaving speed, S_{NW}	54.3 mph
Level of Service, LOS	C	Maximum weaving length, L_{MAX}	5445 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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Interstate 80 Reconstruction

FREEWAY WEAVING WORKSHEET

General Information

Analyst	JRE
Agency/Company	AECOM
Date Performed	8/1/2013
Analysis Time Period	P.M. Peak Hour

Site Information

Freeway/Dir of Travel	Int. 307 to 308 EB
Weaving Segment Location	
Analysis Year	All Alternatives 2045

Project Description *Interstate 80 Reconstruction*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	4	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_s	2800ft	Freeway maximum capacity, C_{IFL}	2400
Freeway free-flow speed, FFS	70 mph	Terrain type	Rolling

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	3370	0.97	13	0	2.5	2.0	0.837	0.95	4370
V_{RF}	154	0.97	2	0	2.5	2.0	0.971	0.95	172
V_{FR}	725	0.97	10	0	2.5	2.0	0.870	0.95	905
V_{RR}	110	0.97	2	0	2.5	2.0	0.971	0.95	123
V_{NW}	4493							V =	5570
V_W	1077								
VR	0.193								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	1077 lc/h
Interchange density, ID	1.7 int/mi	Weaving lane changes, LC_W	1768 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	2691 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	4459 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	2139

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	5570 pc/h	Weaving intensity factor, W	0.326
Weaving segment capacity, c_w	7225 veh/h	Weaving segment speed, S	55.7 mph
Weaving segment v/c ratio	0.613	Average weaving speed, S_W	56.5 mph
Weaving segment density, D	25.0 pc/mi/ln	Average non-weaving speed, S_{NW}	55.6 mph
Level of Service, LOS	C	Maximum weaving length, L_{MAX}	4468 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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Interstate 80 Reconstruction

FREEWAY WEAVING WORKSHEET

General Information

Analyst	JRE
Agency/Company	AECOM
Date Performed	8/1/2013
Analysis Time Period	A.M. Peak Hour

Site Information

Freeway/Dir of Travel	Int. 306 to 307 EB
Weaving Segment Location	
Analysis Year	Alt1A 2045

Project Description *Interstate 80 Reconstruction*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	4	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_s	2400ft	Freeway maximum capacity, C_{IFL}	2400
Freeway free-flow speed, FFS	70 mph	Terrain type	Rolling

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	3377	0.97	13	0	2.5	2.0	0.837	0.95	4379
V_{RF}	172	0.97	2	0	2.5	2.0	0.971	0.95	192
V_{FR}	653	0.97	10	0	2.5	2.0	0.870	0.95	815
V_{RR}	65	0.97	2	0	2.5	2.0	0.971	0.95	73
V_{NW}	4452							V =	5459
V_W	1007								
VR	0.184								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	1007 lc/h
Interchange density, ID	1.7 int/mi	Weaving lane changes, LC_W	1640 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	2428 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	4068 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	1816

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	5459 pc/h	Weaving intensity factor, W	0.343
Weaving segment capacity, c_w	7152 veh/h	Weaving segment speed, S	56.2 mph
Weaving segment v/c ratio	0.607	Average weaving speed, S_W	56.0 mph
Weaving segment density, D	24.3 pc/mi/ln	Average non-weaving speed, S_{NW}	56.2 mph
Level of Service, LOS	C	Maximum weaving length, L_{MAX}	4378 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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Interstate 80 Reconstruction

FREEWAY WEAVING WORKSHEET

General Information

Analyst	JRE
Agency/Company	AECOM
Date Performed	8/1/2013
Analysis Time Period	P.M. Peak Hour

Site Information

Freeway/Dir of Travel	Int. 306 to 307 EB
Weaving Segment Location	
Analysis Year	Alt1A 2045

Project Description *Interstate 80 Reconstruction*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	4	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_s	2400ft	Freeway maximum capacity, C_{IFL}	2400
Freeway free-flow speed, FFS	70 mph	Terrain type	Rolling

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	3938	0.97	13	0	2.5	2.0	0.837	0.95	5107
V_{RF}	157	0.97	2	0	2.5	2.0	0.971	0.95	175
V_{FR}	590	0.97	10	0	2.5	2.0	0.870	0.95	736
V_{RR}	58	0.97	2	0	2.5	2.0	0.971	0.95	65
V_{NW}	5172							V =	6083
V_W	911								
VR	0.150								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	911 lc/h
Interchange density, ID	1.7 int/mi	Weaving lane changes, LC_W	1544 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	2842 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	4386 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	2110

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	6083 pc/h	Weaving intensity factor, W	0.364
Weaving segment capacity, c_w	7234 veh/h	Weaving segment speed, S	56.0 mph
Weaving segment v/c ratio	0.668	Average weaving speed, S_w	55.3 mph
Weaving segment density, D	27.1 pc/mi/ln	Average non-weaving speed, S_{NW}	56.1 mph
Level of Service, LOS	C	Maximum weaving length, L_{MAX}	4029 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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Interstate 80 Reconstruction

FREEWAY WEAVING WORKSHEET

General Information

Analyst	JRE
Agency/Company	AECOM
Date Performed	8/1/2013
Analysis Time Period	A.M. Peak Hour

Site Information

Freeway/Dir of Travel	Int. 304 to 303 WB
Weaving Segment Location	
Analysis Year	Alt1A 2045

Project Description *Interstate 80 Reconstruction*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	2	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_s	1000ft	Freeway maximum capacity, C_{IFL}	2400
Freeway free-flow speed, FFS	70 mph	Terrain type	Rolling

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	fp	v (pc/h)
V_{FF}	96	0.97	13	0	2.5	2.0	0.837	0.95	124
V_{RF}	10	0.97	2	0	2.5	2.0	0.971	0.95	11
V_{FR}	206	0.97	2	0	2.5	2.0	0.971	0.95	230
V_{RR}	132	0.97	2	0	2.5	2.0	0.971	0.95	148
V_{NW}	272							V =	513
V_W	241								
VR	0.470								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	241 lc/h
Interchange density, ID	1.7 int/mi	Weaving lane changes, LC_W	332 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	213 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	545 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	46

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	513 pc/h	Weaving intensity factor, W	0.140
Weaving segment capacity, c_w	3029 veh/h	Weaving segment speed, S	65.2 mph
Weaving segment v/c ratio	0.135	Average weaving speed, S_w	63.2 mph
Weaving segment density, D	3.9 pc/mi/ln	Average non-weaving speed, S_{NW}	67.0 mph
Level of Service, LOS	A	Maximum weaving length, L_{MAX}	7475 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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Interstate 80 Reconstruction

FREEWAY WEAVING WORKSHEET

General Information

Analyst	JRE
Agency/Company	AECOM
Date Performed	8/1/2013
Analysis Time Period	P.M. Peak Hour

Site Information

Freeway/Dir of Travel	Int. 304 to 303 WB
Weaving Segment Location	
Analysis Year	Alt1A 2045

Project Description *Interstate 80 Reconstruction*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	2	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_s	1000ft	Freeway maximum capacity, C_{IFL}	2400
Freeway free-flow speed, FFS	70 mph	Terrain type	Rolling

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	fp	v (pc/h)
V_{FF}	184	0.97	13	0	2.5	2.0	0.837	0.95	239
V_{RF}	20	0.97	2	0	2.5	2.0	0.971	0.95	22
V_{FR}	380	0.97	2	0	2.5	2.0	0.971	0.95	425
V_{RR}	168	0.97	2	0	2.5	2.0	0.971	0.95	188
V_{NW}	427							V =	874
V_W	447								
VR	0.511								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	447 lc/h
Interchange density, ID	1.7 int/mi	Weaving lane changes, LC_W	538 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	245 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	783 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	73

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	874 pc/h	Weaving intensity factor, W	0.186
Weaving segment capacity, c_w	2970 veh/h	Weaving segment speed, S	62.9 mph
Weaving segment v/c ratio	0.234	Average weaving speed, S_W	61.4 mph
Weaving segment density, D	6.9 pc/mi/ln	Average non-weaving speed, S_{NW}	64.7 mph
Level of Service, LOS	A	Maximum weaving length, L_{MAX}	7960 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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Interstate 80 Reconstruction

FREEWAY WEAVING WORKSHEET

General Information

Analyst	JRE
Agency/Company	AECOM
Date Performed	8/1/2013
Analysis Time Period	A.M. Peak Hour

Site Information

Freeway/Dir of Travel	Int. 305 to 304 WB
Weaving Segment Location	
Analysis Year	Alt1A 2045

Project Description *Interstate 80 Reconstruction*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	2	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_s	1100ft	Freeway maximum capacity, C_{IFL}	2400
Freeway free-flow speed, FFS	70 mph	Terrain type	Rolling

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	fp	v (pc/h)
V_{FF}	1023	0.97	13	0	2.5	2.0	0.837	0.95	1327
V_{RF}	196	0.97	10	0	2.5	2.0	0.870	0.95	245
V_{FR}	106	0.97	2	0	2.5	2.0	0.971	0.95	118
V_{RR}	0	0.97	2	0	2.5	2.0	0.971	0.95	0
V_{NW}	1327							V =	1690
V_W	363								
VR	0.215								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	363 lc/h
Interchange density, ID	1.7 int/mi	Weaving lane changes, LC_W	461 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	484 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	945 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	248

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	1690 pc/h	Weaving intensity factor, W	0.200
Weaving segment capacity, c_w	3380 veh/h	Weaving segment speed, S	62.8 mph
Weaving segment v/c ratio	0.397	Average weaving speed, S_w	60.8 mph
Weaving segment density, D	13.5 pc/mi/ln	Average non-weaving speed, S_{NW}	63.3 mph
Level of Service, LOS	B	Maximum weaving length, L_{MAX}	4688 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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Interstate 80 Reconstruction

FREEWAY WEAVING WORKSHEET

General Information

Analyst	JRE
Agency/Company	AECOM
Date Performed	8/1/2013
Analysis Time Period	A.M. Peak Hour

Site Information

Freeway/Dir of Travel	Int. 305 to 304 WB
Weaving Segment Location	
Analysis Year	Alt1A 2045

Project Description *Interstate 80 Reconstruction*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	2	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_s	1100ft	Freeway maximum capacity, C_{IFL}	2400
Freeway free-flow speed, FFS	70 mph	Terrain type	Rolling

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	fp	v (pc/h)
V_{FF}	2001	0.97	13	0	2.5	2.0	0.837	0.95	2595
V_{RF}	360	0.97	10	0	2.5	2.0	0.870	0.95	449
V_{FR}	204	0.97	2	0	2.5	2.0	0.971	0.95	228
V_{RR}	0	0.97	2	0	2.5	2.0	0.971	0.95	0
V_{NW}	2595							V =	3272
V_W	677								
VR	0.207								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	677 lc/h
Interchange density, ID	1.7 int/mi	Weaving lane changes, LC_W	775 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	746 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	1521 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	485

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	3272 pc/h	Weaving intensity factor, W	0.292
Weaving segment capacity, c_w	3390 veh/h	Weaving segment speed, S	57.3 mph
Weaving segment v/c ratio	0.767	Average weaving speed, S_W	57.6 mph
Weaving segment density, D	28.5 pc/mi/ln	Average non-weaving speed, S_{NW}	57.3 mph
Level of Service, LOS	D	Maximum weaving length, L_{MAX}	4607 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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Interstate 80 Reconstruction

FREEWAY WEAVING WORKSHEET

General Information

Analyst	JRE
Agency/Company	AECOM
Date Performed	8/1/2013
Analysis Time Period	A.M. Peak Hour

Site Information

Freeway/Dir of Travel	Int. 308 to 307 WB
Weaving Segment Location	
Analysis Year	All Alternatives 2045

Project Description *Interstate 80 Reconstruction*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	4	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_s	2500ft	Freeway maximum capacity, C_{IFL}	2400
Freeway free-flow speed, FFS	70 mph	Terrain type	Rolling

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	fp	v (pc/h)
V_{FF}	2198	0.97	13	0	2.5	2.0	0.837	0.95	2850
V_{RF}	569	0.97	2	0	2.5	2.0	0.971	0.95	636
V_{FR}	295	0.97	10	0	2.5	2.0	0.870	0.95	368
V_{RR}	65	0.97	2	0	2.5	2.0	0.971	0.95	73
V_{NW}	2923							V =	3927
V_W	1004								
VR	0.256								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	1004 lc/h
Interchange density, ID	1.7 int/mi	Weaving lane changes, LC_W	1652 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	1187 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	2839 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	1242

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	3927 pc/h	Weaving intensity factor, W	0.250
Weaving segment capacity, c_w	6996 veh/h	Weaving segment speed, S	58.3 mph
Weaving segment v/c ratio	0.446	Average weaving speed, S_W	59.0 mph
Weaving segment density, D	16.8 pc/mi/ln	Average non-weaving speed, S_{NW}	58.1 mph
Level of Service, LOS	B	Maximum weaving length, L_{MAX}	5113 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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Interstate 80 Reconstruction

FREEWAY WEAVING WORKSHEET

General Information

Analyst	JRE
Agency/Company	AECOM
Date Performed	8/1/2013
Analysis Time Period	P.M. Peak Hour

Site Information

Freeway/Dir of Travel	Int. 308 to 307 WB
Weaving Segment Location	
Analysis Year	All Alternatives 2045

Project Description *Interstate 80 Reconstruction*

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	4	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_s	2500ft	Freeway maximum capacity, C_{IFL}	2400
Freeway free-flow speed, FFS	70 mph	Terrain type	Rolling

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	fp	v (pc/h)
V_{FF}	4803	0.97	13	0	2.5	2.0	0.837	0.95	6229
V_{RF}	1157	0.97	10	0	2.5	2.0	0.870	0.95	1444
V_{FR}	295	0.97	2	0	2.5	2.0	0.971	0.95	330
V_{RR}	132	0.97	2	0	2.5	2.0	0.971	0.95	148
V_{NW}	6377							V =	8151
V_W	1774								
VR	0.218								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	1774 lc/h
Interchange density, ID	1.7 int/mi	Weaving lane changes, LC_W	2422 lc/h
Minimum RF lane changes, LC_{RF}	1 lc/pc	Non-weaving lane changes, LC_{NW}	3111 lc/h
Minimum FR lane changes, LC_{FR}	1 lc/pc	Total lane changes, LC_{ALL}	5533 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	2710

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	8151 pc/h	Weaving intensity factor, W	0.423
Weaving segment capacity, c_w	7091 veh/h	Weaving segment speed, S	48.7 mph
Weaving segment v/c ratio	0.914	Average weaving speed, S_W	53.7 mph
Weaving segment density, D	41.9 pc/mi/ln	Average non-weaving speed, S_{NW}	47.4 mph
Level of Service, LOS	E	Maximum weaving length, L_{MAX}	4717 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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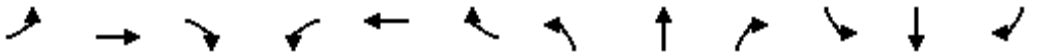
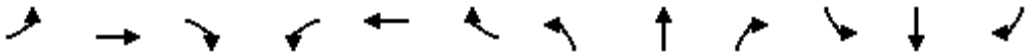
SIGNALIZED INTERSECTION HCS ANALYSIS



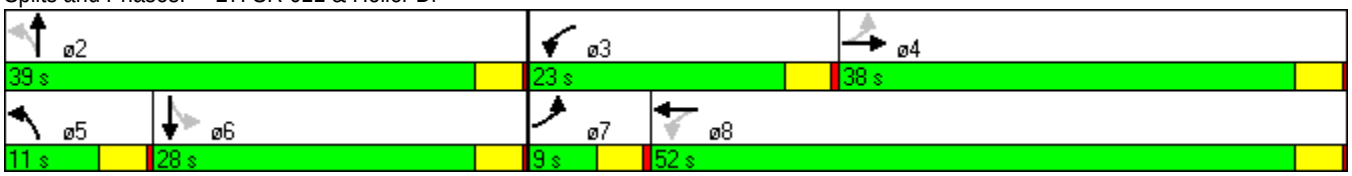
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	6	443	170	173	485	12	66	1	285	12	1	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		-3%			0%			0%			0%	
Storage Length (ft)	150		0	400		0	0		0	50		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.958			0.996			0.850			0.871	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1832	3510	0	1805	3596	0	1805	1615	0	1805	1655	0
Flt Permitted	0.446			0.169			0.680			0.568		
Satd. Flow (perm)	860	3510	0	321	3596	0	1292	1615	0	1079	1655	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		61			3			317			6	
Link Speed (mph)		35			35			30			30	
Link Distance (ft)		557			1414			347			353	
Travel Time (s)		10.9			27.5			7.9			8.0	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	7	492	189	192	539	13	73	1	317	13	1	6
Shared Lane Traffic (%)												
Lane Group Flow (vph)	7	681	0	192	552	0	73	318	0	13	7	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		Yes										
Headway Factor	0.98	0.98	0.98	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		Perm	NA	
Protected Phases	7	4		3	8		5	2			6	
Permitted Phases	4			8			2			6		

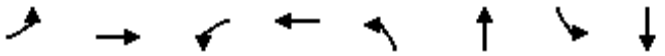


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	7	4		3	8		5	2		6	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	8.0	20.0		8.0	20.0		8.0	20.0		20.0	20.0	
Total Split (s)	9.0	38.0		23.0	52.0		11.0	39.0		28.0	28.0	
Total Split (%)	9.0%	38.0%		23.0%	52.0%		11.0%	39.0%		28.0%	28.0%	
Maximum Green (s)	5.0	34.0		19.0	48.0		7.0	35.0		24.0	24.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5		0.5	0.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead			Lag	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		None	C-Max		C-Max	C-Max	
Walk Time (s)		5.0			5.0			5.0		5.0	5.0	
Flash Dont Walk (s)		11.0			11.0			11.0		11.0	11.0	
Pedestrian Calls (#/hr)		0			0			0		0	0	
Act Effct Green (s)	29.4	24.4		41.2	39.4		50.8	50.8		41.0	41.0	
Actuated g/C Ratio	0.29	0.24		0.41	0.39		0.51	0.51		0.41	0.41	
v/c Ratio	0.02	0.75		0.60	0.39		0.10	0.33		0.03	0.01	
Control Delay	14.8	36.9		26.0	21.9		15.7	3.1		24.6	16.2	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	14.8	36.9		26.0	21.9		15.7	3.1		24.6	16.2	
LOS	B	D		C	C		B	A		C	B	
Approach Delay		36.7			23.0			5.5			21.6	
Approach LOS		D			C			A			C	
Queue Length 50th (ft)	3	194		79	124		23	0		5	0	
Queue Length 95th (ft)	9	235		106	166		56	51		21	11	
Internal Link Dist (ft)		477			1334			267			273	
Turn Bay Length (ft)	150			400						50		
Base Capacity (vph)	302	1234		414	1728		698	976		442	682	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.02	0.55		0.46	0.32		0.10	0.33		0.03	0.01	

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 100			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 60			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.75			
Intersection Signal Delay: 24.4		Intersection LOS: C	
Intersection Capacity Utilization 55.0%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 27: SR 611 & Heller Dr





Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	7	681	192	552	73	318	13	7
v/c Ratio	0.02	0.75	0.60	0.39	0.10	0.33	0.03	0.01
Control Delay	14.8	36.9	26.0	21.9	15.7	3.1	24.6	16.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	14.8	36.9	26.0	21.9	15.7	3.1	24.6	16.2
Queue Length 50th (ft)	3	194	79	124	23	0	5	0
Queue Length 95th (ft)	9	235	106	166	56	51	21	11
Internal Link Dist (ft)		477		1334		267		273
Turn Bay Length (ft)	150		400				50	
Base Capacity (vph)	302	1234	414	1728	698	976	442	682
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.55	0.46	0.32	0.10	0.33	0.03	0.01

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	6	443	170	173	485	12	66	1	285	12	1	5
Movement Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Queue, veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj. Factor (A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking, Bus Adj. Factors	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Sat. Flow Rate, veh/h/ln	1928	1928	1928	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lanes	1	2	0	1	2	0	1	1	0	1	1	0
Lane Assignment												
Capacity, veh/h	303	914	348	255	1303	32	0	3	832	503	143	713
Proportion Arriving On Green	0.01	0.34	0.34	0.02	0.35	0.35	0.00	0.52	0.52	0.52	0.52	0.52
Movement Delay, s/veh	21.3	26.9	27.1	47.6	24.5	24.5	0.0	0.0	15.6	18.1	0.0	11.6
Movement LOS	C	C	C	D	C	C			B	B		B
Approach Volume, veh/h		688			744			318			20	
Approach Delay, s/veh		26.9			30.5			15.6			15.9	
Approach LOS		C			C			B			B	

Timer:	1	2	3	4	5	6	7	8
Assigned Phase		2	3	4		6	7	8
Case No		4.0	1.1	4.0		6.3	1.1	4.0
Phase Duration (G+Y+Rc), s		54.80	5.80	37.75		54.80	4.83	38.72
Change Period (Y+Rc), s		4.00	4.00	4.00		4.00	4.00	4.00
Max. Allowable Headway (MAH), s		5.53	3.76	5.16		5.53	3.76	5.16
Maximum Green Setting (Gmax), s		50.80	1.80	24.40		41.00	5.00	39.40
Max. Queue Clearance Time (g_c+I1), s		13.64	3.80	16.76		14.38	2.23	12.88
Green Extension Time (g_e), s		2.47	0.00	4.22		2.32	0.00	3.74
Probability of Phase Call (p_c)		1.000	0.995	1.000		1.000	0.167	1.000
Probability of Max Out (p_x)		0.000	1.000	0.806		0.001	1.000	0.155

Left-Turn Movement Data								
Assigned Movement			3			1	7	
Mvmt. Sat Flow, veh/h			1809.52			1078.67	1836.67	

Through Movement Data								
Assigned Movement		2		4		6		8
Mvmt. Sat Flow, veh/h		5.65		2662.32		276.07		3692.60

Right-Turn Movement Data								
Assigned Movement		12		14		16		18
Mvmt. Sat Flow, veh/h		1610.20		1015.47		1380.34		91.29

Left Lane Group Data								
Assigned Movement	0	0	3	0	0	1	7	0
Lane Assignment			L (Pr/Pm)			LL (Pr/Pm)		
Lanes in Group	0	0	1	0	0	1	1	0
Group Volume (v), veh/h	0.0	0.0	192.2	0.0	0.0	13.3	6.7	0.0
Group Sat. Flow (s), veh/h/ln	0.0	0.0	1809.5	0.0	0.0	1078.7	1836.7	0.0
Queue Serve Time (g_s), s	0.0	0.0	1.8	0.0	0.0	0.7	0.2	0.0
Cycle Queue Clear Time (g_c), s	0.0	0.0	1.8	0.0	0.0	12.4	0.2	0.0

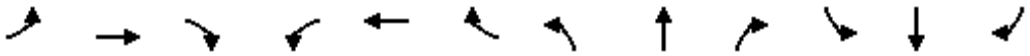
Perm LT Sat Flow Rate (s_l), veh/h/ln	0.0	0.0	771.4	0.0	0.0	1078.7	882.4	0.0
Shared LT Sat Flow (s_sh), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Eff. Green (g_p), s	0.0	0.0	34.7	0.0	0.0	50.8	33.7	0.0
Perm LT Serve Time (g_u), s	0.0	0.0	19.0	0.0	0.0	39.2	23.8	0.0
Perm LT Que Serve Time (g_ps), s	0.0	0.0	19.0	0.0	0.0	0.7	0.1	0.0
Time to First Blk (g_f), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Proportion LT Inside Lane (P_L)	0.000	0.000	1.000	0.000	0.000	1.000	1.000	0.000
Lane Group Capacity (c), veh/h	0.0	0.0	255.3	0.0	0.0	502.7	302.6	0.0
Volume-to-Capacity Ratio (X)	0.000	0.000	0.753	0.000	0.000	0.027	0.022	0.000
Available Capacity (c_a), veh/h	0.0	0.0	255.3	0.0	0.0	502.7	380.4	0.0
Upstream Filter Factor (I)	0.000	0.000	1.000	0.000	0.000	1.000	1.000	0.000
Uniform Delay (d1), s/veh	0.0	0.0	35.7	0.0	0.0	18.0	21.3	0.0
Incremental Delay (d2), s/veh	0.0	0.0	11.9	0.0	0.0	0.1	0.0	0.0
Initial Queue Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	0.0	47.6	0.0	0.0	18.1	21.3	0.0
First-Term Queue (Q1), veh/ln	0.0	0.0	4.5	0.0	0.0	0.2	0.1	0.0
Second-Term Queue (Q2), veh/ln	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0
Third-Term Queue (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentile bk-of-que factor (f_B%)	0.000	0.000	1.000	0.000	0.000	1.000	1.000	0.000
Percentile Back of Queue (Q%), veh/ln	0.0	0.0	5.4	0.0	0.0	0.2	0.1	0.0
Percentile Storage Ratio (RQ%)	0.00	0.00	0.34	0.00	0.00	0.10	0.02	0.00
Initial Queue (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Queue (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Queue (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Capacity (cs), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Initial Queue Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Middle Lane Group Data								
Assigned Movement	0	2	0	4	0	6	0	8
Lane Assignment				T				T
Lanes in Group	0	0	0	1	0	0	0	1
Group Volume (v), veh/h	0.0	0.0	0.0	355.7	0.0	0.0	0.0	277.1
Group Sat. Flow (s), veh/h/ln	0.0	0.0	0.0	1928.5	0.0	0.0	0.0	1900.0
Queue Serve Time (g_s), s	0.0	0.0	0.0	14.6	0.0	0.0	0.0	10.9
Cycle Queue Clear Time (g_c), s	0.0	0.0	0.0	14.6	0.0	0.0	0.0	10.9
Lane Group Capacity (c), veh/h	0.0	0.0	0.0	661.8	0.0	0.0	0.0	670.7
Volume-to-Capacity Ratio (X)	0.000	0.000	0.000	0.538	0.000	0.000	0.000	0.413
Available Capacity (c_a), veh/h	0.0	0.0	0.0	661.8	0.0	0.0	0.0	761.2
Upstream Filter Factor (I)	0.000	0.000	0.000	1.000	0.000	0.000	0.000	1.000
Uniform Delay (d1), s/veh	0.0	0.0	0.0	26.0	0.0	0.0	0.0	24.1
Incremental Delay (d2), s/veh	0.0	0.0	0.0	0.9	0.0	0.0	0.0	0.4
Initial Queue Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	0.0	0.0	26.9	0.0	0.0	0.0	24.5
First-Term Queue (Q1), veh/ln	0.0	0.0	0.0	6.5	0.0	0.0	0.0	4.7
Second-Term Queue (Q2), veh/ln	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.1
Third-Term Queue (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentile bk-of-que factor (f_B%)	0.000	1.000	0.000	1.000	0.000	1.000	0.000	1.000
Percentile Back of Queue (Q%), veh/ln	0.0	0.0	0.0	6.6	0.0	0.0	0.0	4.8
Percentile Storage Ratio (RQ%)	0.00	0.00	0.00	0.32	0.00	0.00	0.00	0.09

Initial Queue (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Queue (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Queue (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Capacity (cs), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Initial Queue Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

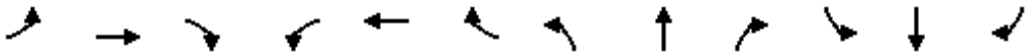
Right Lane Group Data								
Assigned Movement	0	12	0	14	0	16	0	18
Lane Assignment		T+R		T+R		T+R		T+R
Lanes in Group	0	1	0	1	0	1	0	1
Group Volume (v), veh/h	0.0	317.8	0.0	325.4	0.0	6.7	0.0	275.2
Group Sat. Flow (s), veh/h/ln	0.0	1615.8	0.0	1749.3	0.0	1656.4	0.0	1883.9
Queue Serve Time (g_s), s	0.0	11.6	0.0	14.8	0.0	0.2	0.0	10.9
Cycle Queue Clear Time (g_c), s	0.0	11.6	0.0	14.8	0.0	0.2	0.0	10.9
Prot RT Sat Flow Rate (s_R), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prot RT Eff. Green (g_R), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Proportion RT Outside Lane (P_R)	0.000	0.997	0.000	0.581	0.000	0.833	0.000	0.048
Lane Group Capacity (c), veh/h	0.0	834.6	0.0	600.3	0.0	855.6	0.0	665.0
Volume-to-Capacity Ratio (X)	0.000	0.381	0.000	0.542	0.000	0.008	0.000	0.414
Available Capacity (c_a), veh/h	0.0	834.6	0.0	600.3	0.0	855.6	0.0	754.7
Upstream Filter Factor (I)	0.000	1.000	0.000	1.000	0.000	1.000	0.000	1.000
Uniform Delay (d1), s/veh	0.0	14.3	0.0	26.1	0.0	11.5	0.0	24.1
Incremental Delay (d2), s/veh	0.0	1.3	0.0	1.0	0.0	0.0	0.0	0.4
Initial Queue Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	15.6	0.0	27.1	0.0	11.6	0.0	24.5
First-Term Queue (Q1), veh/ln	0.0	4.1	0.0	5.9	0.0	0.1	0.0	4.7
Second-Term Queue (Q2), veh/ln	0.0	0.3	0.0	0.2	0.0	0.0	0.0	0.1
Third-Term Queue (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentile bk-of-que factor (f_B%)	0.000	1.000	0.000	1.000	0.000	1.000	0.000	1.000
Percentile Back of Queue (Q%), veh/ln	0.0	4.4	0.0	6.1	0.0	0.1	0.0	4.8
Percentile Storage Ratio (RQ%)	0.00	0.42	0.00	0.30	0.00	0.01	0.00	0.09
Initial Queue (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Queue (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Queue (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Capacity (cs), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Initial Queue Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Intersection Summary	
HCM Average Control Delay	26.3
HCM Level of Service	C



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	477	10	122	257	0	0	0	0	70	1	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		0	0		50
Storage Lanes	0		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.997									0.966	
Flt Protected				0.950							0.965	
Satd. Flow (prot)	0	3599	0	1805	1900	0	0	0	0	0	1771	0
Flt Permitted				0.415							0.965	
Satd. Flow (perm)	0	3599	0	788	1900	0	0	0	0	0	1771	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		4									27	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		320			197			717			667	
Travel Time (s)		7.3			4.5			16.3			15.2	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	530	11	136	286	0	0	0	0	78	1	27
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	541	0	136	286	0	0	0	0	0	106	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		2		1	2					1	2	
Detector Template		Thru		Left	Thru					Left	Thru	
Leading Detector (ft)		100		20	100					20	100	
Trailing Detector (ft)		0		0	0					0	0	
Detector 1 Position(ft)		0		0	0					0	0	
Detector 1 Size(ft)		6		20	6					20	6	
Detector 1 Type		Cl+Ex		Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)		0.0		0.0	0.0					0.0	0.0	
Detector 1 Queue (s)		0.0		0.0	0.0					0.0	0.0	
Detector 1 Delay (s)		0.0		0.0	0.0					0.0	0.0	
Detector 2 Position(ft)		94			94						94	
Detector 2 Size(ft)		6			6						6	
Detector 2 Type		Cl+Ex			Cl+Ex						Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0						0.0	
Turn Type		NA		pm+pt	NA					Split	NA	
Protected Phases		4		3	8					6	6	
Permitted Phases				8								
Detector Phase		4		3	8					6	6	

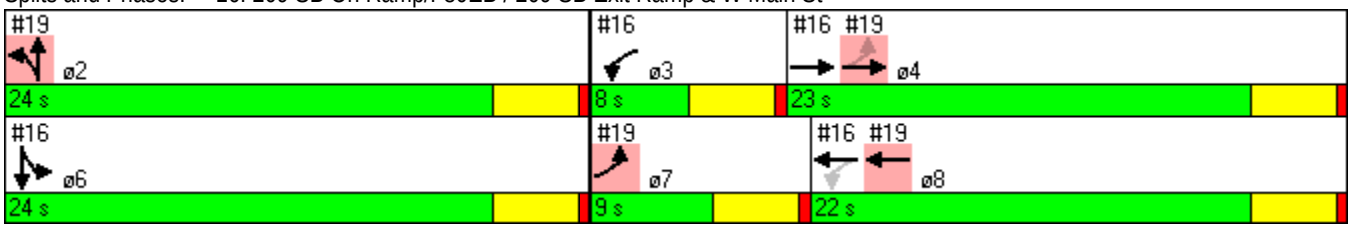
Lane Group	ø2	ø7
Lane Configurations		
Volume (vph)		
Ideal Flow (vphpl)		
Storage Length (ft)		
Storage Lanes		
Taper Length (ft)		
Lane Util. Factor		
Frt		
Flt Protected		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Right Turn on Red		
Satd. Flow (RTOR)		
Link Speed (mph)		
Link Distance (ft)		
Travel Time (s)		
Peak Hour Factor		
Adj. Flow (vph)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)		
Enter Blocked Intersection		
Lane Alignment		
Median Width(ft)		
Link Offset(ft)		
Crosswalk Width(ft)		
Two way Left Turn Lane		
Headway Factor		
Turning Speed (mph)		
Number of Detectors		
Detector Template		
Leading Detector (ft)		
Trailing Detector (ft)		
Detector 1 Position(ft)		
Detector 1 Size(ft)		
Detector 1 Type		
Detector 1 Channel		
Detector 1 Extend (s)		
Detector 1 Queue (s)		
Detector 1 Delay (s)		
Detector 2 Position(ft)		
Detector 2 Size(ft)		
Detector 2 Type		
Detector 2 Channel		
Detector 2 Extend (s)		
Turn Type		
Protected Phases	2	7
Permitted Phases		
Detector Phase		



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)		4.0		4.0	4.0					4.0	4.0	
Minimum Split (s)		22.0		8.0	22.0					22.0	22.0	
Total Split (s)		23.0		8.0	22.0					24.0	24.0	
Total Split (%)		41.8%		14.5%	40.0%					43.6%	43.6%	
Maximum Green (s)		19.0		4.0	18.0					20.0	20.0	
Yellow Time (s)		3.5		3.5	3.5					3.5	3.5	
All-Red Time (s)		0.5		0.5	0.5					0.5	0.5	
Lost Time Adjust (s)		0.0		0.0	0.0						0.0	
Total Lost Time (s)		4.0		4.0	4.0						4.0	
Lead/Lag		Lag		Lead	Lag							
Lead-Lag Optimize?												
Vehicle Extension (s)		3.0		3.0	3.0					3.0	3.0	
Recall Mode		None		None	None					C-Max	C-Max	
Walk Time (s)		5.0			5.0					5.0	5.0	
Flash Dont Walk (s)		13.0			13.0					13.0	13.0	
Pedestrian Calls (#/hr)		0			0					0	0	
Act Effct Green (s)		17.6		19.0	15.0						23.0	
Actuated g/C Ratio		0.32		0.35	0.27						0.42	
v/c Ratio		0.47		0.39	0.55						0.14	
Control Delay		16.3		9.4	8.5						9.7	
Queue Delay		0.0		0.0	0.0						0.0	
Total Delay		16.3		9.4	8.5						9.7	
LOS		B		A	A						A	
Approach Delay		16.3			8.8						9.7	
Approach LOS		B			A						A	
Queue Length 50th (ft)		72		4	9						16	
Queue Length 95th (ft)		105		25	16						43	
Internal Link Dist (ft)		240			117			637			587	
Turn Bay Length (ft)												
Base Capacity (vph)		1246		346	622						758	
Starvation Cap Reductn		0		0	13						0	
Spillback Cap Reductn		0		0	0						0	
Storage Cap Reductn		0		0	0						0	
Reduced v/c Ratio		0.43		0.39	0.47						0.14	

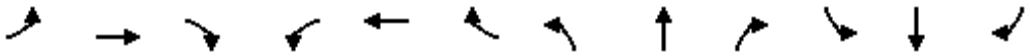
Intersection Summary			
Area Type:	Other		
Cycle Length: 55			
Actuated Cycle Length: 55			
Offset: 0 (0%), Referenced to phase 6:SBTL, Start of Green			
Natural Cycle: 55			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.66			
Intersection Signal Delay: 12.7		Intersection LOS: B	
Intersection Capacity Utilization 40.3%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 16: 209 SB On Ramp/I-80EB / 209 SB Exit Ramp & W Main St



Lane Group	ø2	ø7
Switch Phase		
Minimum Initial (s)	4.0	4.0
Minimum Split (s)	24.0	8.0
Total Split (s)	24.0	9.0
Total Split (%)	44%	16%
Maximum Green (s)	20.0	5.0
Yellow Time (s)	3.5	3.5
All-Red Time (s)	0.5	0.5
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag		Lead
Lead-Lag Optimize?		
Vehicle Extension (s)	3.0	3.0
Recall Mode	Max	None
Walk Time (s)	7.0	
Flash Dont Walk (s)	13.0	
Pedestrian Calls (#/hr)	0	
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		
LOS		
Approach Delay		
Approach LOS		
Queue Length 50th (ft)		
Queue Length 95th (ft)		
Internal Link Dist (ft)		
Turn Bay Length (ft)		
Base Capacity (vph)		
Starvation Cap Reductn		
Spillback Cap Reductn		
Storage Cap Reductn		
Reduced v/c Ratio		

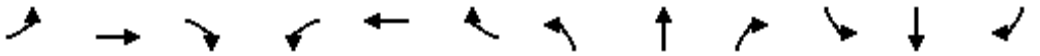
Intersection Summary



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	230	317	0	0	369	30	10	1	94	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.989			0.879				
Flt Protected	0.950							0.995				
Satd. Flow (prot)	1805	1900	0	0	3570	0	0	1662	0	0	0	0
Flt Permitted	0.393							0.995				
Satd. Flow (perm)	747	1900	0	0	3570	0	0	1662	0	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					16			104				
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		197			335			726			669	
Travel Time (s)		4.5			7.6			16.5			15.2	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	256	352	0	0	410	33	11	1	104	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	256	352	0	0	443	0	0	116	0	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2			2		1	2				
Detector Template	Left	Thru			Thru		Left	Thru				
Leading Detector (ft)	20	100			100		20	100				
Trailing Detector (ft)	0	0			0		0	0				
Detector 1 Position(ft)	0	0			0		0	0				
Detector 1 Size(ft)	20	6			6		20	6				
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex		Cl+Ex	Cl+Ex				
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0		0.0	0.0				
Detector 1 Queue (s)	0.0	0.0			0.0		0.0	0.0				
Detector 1 Delay (s)	0.0	0.0			0.0		0.0	0.0				
Detector 2 Position(ft)		94			94			94				
Detector 2 Size(ft)		6			6			6				
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex				
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0				
Turn Type	pm+pt	NA			NA		Split	NA				
Protected Phases	7	4			8		2	2				
Permitted Phases	4											
Detector Phase	7	4			8		2	2				
Switch Phase												
Minimum Initial (s)	4.0	4.0			4.0		4.0	4.0				
Minimum Split (s)	8.0	22.0			22.0		24.0	24.0				

Lane Group	ø3	ø6
Lane Configurations		
Volume (vph)		
Ideal Flow (vphpl)		
Lane Util. Factor		
Frt		
Flt Protected		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Right Turn on Red		
Satd. Flow (RTOR)		
Link Speed (mph)		
Link Distance (ft)		
Travel Time (s)		
Peak Hour Factor		
Adj. Flow (vph)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)		
Enter Blocked Intersection		
Lane Alignment		
Median Width(ft)		
Link Offset(ft)		
Crosswalk Width(ft)		
Two way Left Turn Lane		
Headway Factor		
Turning Speed (mph)		
Number of Detectors		
Detector Template		
Leading Detector (ft)		
Trailing Detector (ft)		
Detector 1 Position(ft)		
Detector 1 Size(ft)		
Detector 1 Type		
Detector 1 Channel		
Detector 1 Extend (s)		
Detector 1 Queue (s)		
Detector 1 Delay (s)		
Detector 2 Position(ft)		
Detector 2 Size(ft)		
Detector 2 Type		
Detector 2 Channel		
Detector 2 Extend (s)		
Turn Type		
Protected Phases	3	6
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	4.0	4.0
Minimum Split (s)	8.0	22.0

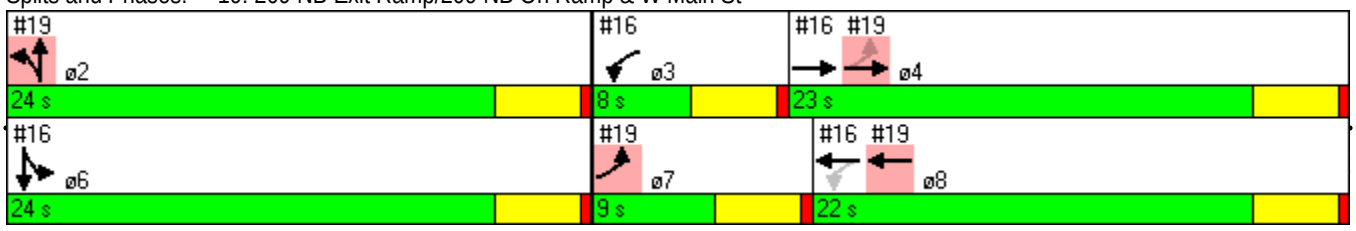
Lanes, Volumes, Timings
19: 209 NB Exit Ramp/209 NB On Ramp & W Main St 8/22/2013



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	9.0	23.0			22.0		24.0	24.0				
Total Split (%)	16.4%	41.8%			40.0%		43.6%	43.6%				
Maximum Green (s)	5.0	19.0			18.0		20.0	20.0				
Yellow Time (s)	3.5	3.5			3.5		3.5	3.5				
All-Red Time (s)	0.5	0.5			0.5		0.5	0.5				
Lost Time Adjust (s)	0.0	0.0			0.0			0.0				
Total Lost Time (s)	4.0	4.0			4.0			4.0				
Lead/Lag	Lead	Lag			Lag							
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0				
Recall Mode	None	None			None		Max	Max				
Walk Time (s)		5.0			5.0		7.0	7.0				
Flash Dont Walk (s)		13.0			13.0		13.0	13.0				
Pedestrian Calls (#/hr)		0			0		0	0				
Act Effct Green (s)	21.6	17.6			15.0			23.0				
Actuated g/C Ratio	0.39	0.32			0.27			0.42				
v/c Ratio	0.66	0.58			0.45			0.15				
Control Delay	21.1	9.5			16.3			4.4				
Queue Delay	0.0	0.0			0.0			0.0				
Total Delay	21.1	9.5			16.3			4.4				
LOS	C	A			B			A				
Approach Delay		14.4			16.3			4.4				
Approach LOS		B			B			A				
Queue Length 50th (ft)	28	26			54			2				
Queue Length 95th (ft)	85	40			100			28				
Internal Link Dist (ft)		117			255			646			589	
Turn Bay Length (ft)												
Base Capacity (vph)	389	656			1179			757				
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	0.66	0.54			0.38			0.15				

Intersection Summary			
Area Type:	Other		
Cycle Length: 55			
Actuated Cycle Length: 55			
Offset: 0 (0%), Referenced to phase 6:SBTL, Start of Green			
Natural Cycle: 55			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.66			
Intersection Signal Delay: 14.1		Intersection LOS: B	
Intersection Capacity Utilization 40.3%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 19: 209 NB Exit Ramp/209 NB On Ramp & W Main St



Lane Group	ø3	ø6
Total Split (s)	8.0	24.0
Total Split (%)	15%	44%
Maximum Green (s)	4.0	20.0
Yellow Time (s)	3.5	3.5
All-Red Time (s)	0.5	0.5
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag	Lead	
Lead-Lag Optimize?		
Vehicle Extension (s)	3.0	3.0
Recall Mode	None	C-Max
Walk Time (s)		5.0
Flash Dont Walk (s)		13.0
Pedestrian Calls (#/hr)		0
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		
LOS		
Approach Delay		
Approach LOS		
Queue Length 50th (ft)		
Queue Length 95th (ft)		
Internal Link Dist (ft)		
Turn Bay Length (ft)		
Base Capacity (vph)		
Starvation Cap Reductn		
Spillback Cap Reductn		
Storage Cap Reductn		
Reduced v/c Ratio		

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	230	317	0	0	369	30	10	1	94	0	0	0
Movement Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Queue, veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj. Factor (A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking, Bus Adj. Factors	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Sat. Flow Rate, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lanes	1	1	0	0	2	0	0	1	0	0	0	0
Lane Assignment												
Capacity, veh/h	428	782	0	0	901	73	68	7	639	0	0	0
Proportion Arriving On Green	0.08	0.14	0.00	0.00	0.26	0.26	0.44	0.44	0.44	0.00	0.00	0.00
Movement Delay, s/veh	16.4	17.6	0.0	0.0	17.0	17.1	9.5	0.0	0.0	0.0	0.0	0.0
Movement LOS	B	B			B	B	A					
Approach Volume, veh/h		608			443			117			0	
Approach Delay, s/veh		17.1			17.0			9.5			0.0	
Approach LOS		B			B			A				

Timer:	1	2	3	4	5	6	7	8
Assigned Phase		2		4			7	8
Case No		12.0		4.0			1.2	8.0
Phase Duration (G+Y+Rc), s		27.00		25.68			8.00	17.68
Change Period (Y+Rc), s		4.00		4.00			4.00	4.00
Max. Allowable Headway (MAH), s		5.54		5.25			3.80	5.25
Maximum Green Setting (Gmax), s		23.00		17.60			4.00	15.00
Max. Queue Clearance Time (g_c+I1), s		4.28		10.98			6.00	7.25
Green Extension Time (g_e), s		0.56		2.62			0.00	1.61
Probability of Phase Call (p_c)		1.000		1.000			0.976	1.000
Probability of Max Out (p_x)		0.000		0.806			1.000	0.675

Left-Turn Movement Data								
Assigned Movement		5					7	
Mvmt. Sat Flow, veh/h		155.63					1809.52	

Through Movement Data								
Assigned Movement		2		4				8
Mvmt. Sat Flow, veh/h		15.56		1900.00				3469.55

Right-Turn Movement Data								
Assigned Movement		12		14				18
Mvmt. Sat Flow, veh/h		1462.88		0.00				280.88

Left Lane Group Data								
Assigned Movement	0	5	0	0	0	0	7	0
Lane Assignment		L+T+R					L (Pr/Pm)	
Lanes in Group	0	1	0	0	0	0	1	0
Group Volume (v), veh/h	0.0	116.7	0.0	0.0	0.0	0.0	255.6	0.0
Group Sat. Flow (s), veh/h/ln	0.0	1634.1	0.0	0.0	0.0	0.0	1809.5	0.0
Queue Serve Time (g_s), s	0.0	2.3	0.0	0.0	0.0	0.0	4.0	0.0
Cycle Queue Clear Time (g_c), s	0.0	2.3	0.0	0.0	0.0	0.0	4.0	0.0

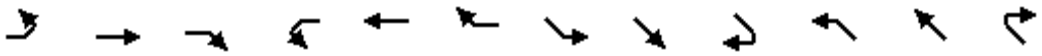
Perm LT Sat Flow Rate (s_l), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	961.2	0.0
Shared LT Sat Flow (s_sh), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Eff. Green (g_p), s	0.0	0.0	0.0	0.0	0.0	0.0	15.7	0.0
Perm LT Serve Time (g_u), s	0.0	0.0	0.0	0.0	0.0	0.0	8.4	0.0
Perm LT Que Serve Time (g_ps), s	0.0	0.0	0.0	0.0	0.0	0.0	5.8	0.0
Time to First Blk (g_f), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.7
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Proportion LT Inside Lane (P_L)	0.000	0.095	0.000	0.000	0.000	0.000	1.000	0.000
Lane Group Capacity (c), veh/h	0.0	713.4	0.0	0.0	0.0	0.0	427.9	0.0
Volume-to-Capacity Ratio (X)	0.000	0.164	0.000	0.000	0.000	0.000	0.597	0.000
Available Capacity (c_a), veh/h	0.0	713.4	0.0	0.0	0.0	0.0	427.9	0.0
Upstream Filter Factor (I)	0.000	1.000	0.000	0.000	0.000	0.000	0.880	0.000
Uniform Delay (d1), s/veh	0.0	9.0	0.0	0.0	0.0	0.0	14.4	0.0
Incremental Delay (d2), s/veh	0.0	0.5	0.0	0.0	0.0	0.0	2.0	0.0
Initial Queue Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	9.5	0.0	0.0	0.0	0.0	16.4	0.0
First-Term Queue (Q1), veh/ln	0.0	0.7	0.0	0.0	0.0	0.0	1.9	0.0
Second-Term Queue (Q2), veh/ln	0.0	0.1	0.0	0.0	0.0	0.0	0.2	0.0
Third-Term Queue (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentile bk-of-que factor (f_B%)	0.000	1.000	0.000	0.000	0.000	0.000	1.000	0.000
Percentile Back of Queue (Q%), veh/ln	0.0	0.8	0.0	0.0	0.0	0.0	2.1	0.0
Percentile Storage Ratio (RQ%)	0.00	0.03	0.00	0.00	0.00	0.00	0.33	0.00
Initial Queue (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Queue (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Queue (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Capacity (cs), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Initial Queue Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Middle Lane Group Data								
Assigned Movement	0	2	0	4	0	0	0	8
Lane Assignment				T				T
Lanes in Group	0	0	0	1	0	0	0	1
Group Volume (v), veh/h	0.0	0.0	0.0	352.2	0.0	0.0	0.0	223.7
Group Sat. Flow (s), veh/h/ln	0.0	0.0	0.0	1900.0	0.0	0.0	0.0	1900.0
Queue Serve Time (g_s), s	0.0	0.0	0.0	9.0	0.0	0.0	0.0	5.2
Cycle Queue Clear Time (g_c), s	0.0	0.0	0.0	9.0	0.0	0.0	0.0	5.2
Lane Group Capacity (c), veh/h	0.0	0.0	0.0	781.9	0.0	0.0	0.0	493.4
Volume-to-Capacity Ratio (X)	0.000	0.000	0.000	0.450	0.000	0.000	0.000	0.453
Available Capacity (c_a), veh/h	0.0	0.0	0.0	781.9	0.0	0.0	0.0	541.0
Upstream Filter Factor (I)	0.000	0.000	0.000	0.880	0.000	0.000	0.000	1.000
Uniform Delay (d1), s/veh	0.0	0.0	0.0	17.2	0.0	0.0	0.0	16.4
Incremental Delay (d2), s/veh	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.7
Initial Queue Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	0.0	0.0	17.6	0.0	0.0	0.0	17.0
First-Term Queue (Q1), veh/ln	0.0	0.0	0.0	4.1	0.0	0.0	0.0	2.0
Second-Term Queue (Q2), veh/ln	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1
Third-Term Queue (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentile bk-of-que factor (f_B%)	0.000	1.000	0.000	1.000	0.000	0.000	0.000	1.000
Percentile Back of Queue (Q%), veh/ln	0.0	0.0	0.0	4.1	0.0	0.0	0.0	2.1
Percentile Storage Ratio (RQ%)	0.00	0.00	0.00	0.64	0.00	0.00	0.00	0.19

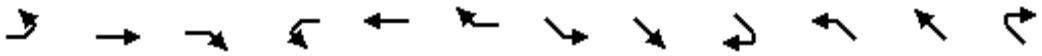
Initial Queue (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Queue (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Queue (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Capacity (cs), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Initial Queue Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Right Lane Group Data								
Assigned Movement	0	12	0	14	0	0	0	18
Lane Assignment								T+R
Lanes in Group	0	0	0	0	0	0	0	1
Group Volume (v), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	219.6
Group Sat. Flow (s), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1850.4
Queue Serve Time (g_s), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.3
Cycle Queue Clear Time (g_c), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.3
Prot RT Sat Flow Rate (s_R), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prot RT Eff. Green (g_R), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Proportion RT Outside Lane (P_R)	0.000	0.895	0.000	0.000	0.000	0.000	0.000	0.152
Lane Group Capacity (c), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	480.5
Volume-to-Capacity Ratio (X)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.457
Available Capacity (c_a), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	526.9
Upstream Filter Factor (I)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000
Uniform Delay (d1), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.4
Incremental Delay (d2), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7
Initial Queue Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.1
First-Term Queue (Q1), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0
Second-Term Queue (Q2), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Third-Term Queue (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentile bk-of-que factor (f_B%)	0.000	1.000	0.000	1.000	0.000	0.000	0.000	1.000
Percentile Back of Queue (Q%), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.1
Percentile Storage Ratio (RQ%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.19
Initial Queue (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Queue (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Queue (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Capacity (cs), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Initial Queue Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Intersection Summary	
HCM Average Control Delay	16.3
HCM Level of Service	B



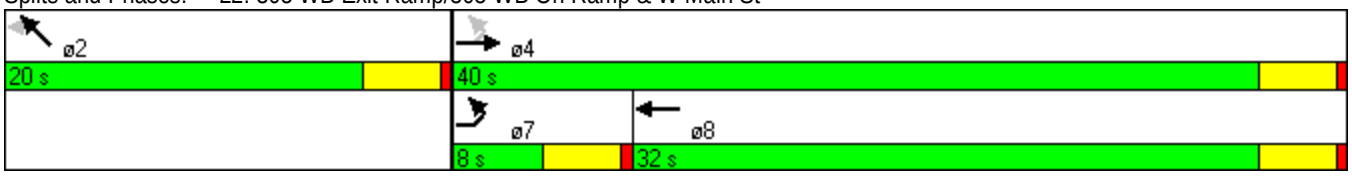
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	10	411	0	0	256	411	0	0	0	143	1	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	50		0	0		0	0		0	150		150
Storage Lanes	1		0	0		0	0		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00
Frt					0.917						0.939	
Flt Protected	0.950									0.950	0.972	
Satd. Flow (prot)	1805	1900	0	0	1742	0	0	0	0	1715	1647	0
Flt Permitted	0.133									0.950	0.972	
Satd. Flow (perm)	253	1900	0	0	1742	0	0	0	0	1715	1647	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					181						40	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1936			227			367			472	
Travel Time (s)		44.0			5.2			8.3			10.7	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	11	457	0	0	284	457	0	0	0	159	1	40
Shared Lane Traffic (%)										36%		
Lane Group Flow (vph)	11	457	0	0	741	0	0	0	0	102	98	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2			2					1	2	
Detector Template	Left	Thru			Thru					Left	Thru	
Leading Detector (ft)	20	100			100					20	100	
Trailing Detector (ft)	0	0			0					0	0	
Detector 1 Position(ft)	0	0			0					0	0	
Detector 1 Size(ft)	20	6			6					20	6	
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex					Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0					0.0	0.0	
Detector 1 Queue (s)	0.0	0.0			0.0					0.0	0.0	
Detector 1 Delay (s)	0.0	0.0			0.0					0.0	0.0	
Detector 2 Position(ft)		94			94						94	
Detector 2 Size(ft)		6			6						6	
Detector 2 Type		Cl+Ex			Cl+Ex						Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0						0.0	
Turn Type	pm+pt	NA			NA					Perm	NA	
Protected Phases	7	4			8						2	
Permitted Phases	4									2		
Detector Phase	7	4			8					2	2	



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Switch Phase												
Minimum Initial (s)	4.0	4.0			4.0					4.0	4.0	
Minimum Split (s)	8.0	28.0			28.0					20.0	20.0	
Total Split (s)	8.0	40.0	0.0	0.0	32.0	0.0	0.0	0.0	0.0	20.0	20.0	0.0
Total Split (%)	13.3%	66.7%	0.0%	0.0%	53.3%	0.0%	0.0%	0.0%	0.0%	33.3%	33.3%	0.0%
Maximum Green (s)	4.0	36.0			28.0					16.0	16.0	
Yellow Time (s)	3.5	3.5			3.5					3.5	3.5	
All-Red Time (s)	0.5	0.5			0.5					0.5	0.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead				Lag							
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0			3.0					3.0	3.0	
Recall Mode	None	None			None					C-Min	C-Min	
Walk Time (s)		7.0			7.0							
Flash Dont Walk (s)		17.0			17.0							
Pedestrian Calls (#/hr)		0			0							
Act Effct Green (s)	28.1	28.1			26.0					23.9	23.9	
Actuated g/C Ratio	0.47	0.47			0.43					0.40	0.40	
v/c Ratio	0.04	0.51			0.86					0.15	0.14	
Control Delay	5.7	12.3			23.1					16.1	11.4	
Queue Delay	0.0	0.0			0.0					0.0	0.0	
Total Delay	5.7	12.3			23.1					16.1	11.4	
LOS	A	B			C					B	B	
Approach Delay		12.1			23.1						13.8	
Approach LOS		B			C						B	
Queue Length 50th (ft)	2	108			162					24	13	
Queue Length 95th (ft)	5	99			#357					72	54	
Internal Link Dist (ft)		1856			147			287			392	
Turn Bay Length (ft)	50									150		
Base Capacity (vph)	270	1164			927					704	700	
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	0.04	0.39			0.80					0.14	0.14	

Intersection Summary			
Area Type:	Other		
Cycle Length: 60			
Actuated Cycle Length: 60			
Offset: 0 (0%), Referenced to phase 2:NWTL and 6:, Start of Green			
Natural Cycle: 60			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.86			
Intersection Signal Delay: 18.1		Intersection LOS: B	
Intersection Capacity Utilization 50.4%		ICU Level of Service A	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 22: 305 WB Exit Ramp/305 WB On Ramp & W Main St



Lane Group	EBL	EBT	WBT	NWL	NWT
Lane Group Flow (vph)	11	457	741	102	98
v/c Ratio	0.04	0.51	0.86	0.15	0.14
Control Delay	5.7	12.3	23.1	16.1	11.4
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	5.7	12.3	23.1	16.1	11.4
Queue Length 50th (ft)	2	108	162	24	13
Queue Length 95th (ft)	5	99	#357	72	54
Internal Link Dist (ft)		1856	147		392
Turn Bay Length (ft)	50			150	
Base Capacity (vph)	270	1164	927	704	700
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	0.04	0.39	0.80	0.14	0.14

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	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	10	411	0	0	256	411	0	0	0	143	1	36
Movement Number	7	4	14	3	8	18	1	6	16	5	2	12
Initial Queue, veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj. Factor (A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking, Bus Adj. Factors	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Sat. Flow Rate, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lanes	1	1	0	0	1	0	0	0	0	1	1	0
Lane Assignment												
Capacity, veh/h	0	867	0	0	300	482	0	0	0	123	18	643
Proportion Arriving On Green	0.00	0.46	0.00	0.00	0.46	0.46	0.00	0.00	0.00	0.41	0.41	0.41
Movement Delay, s/veh	0.0	11.9	0.0	0.0	0.0	35.8	0.0	0.0	0.0	209.3	0.0	10.6
Movement LOS		B				D				F		B
Approach Volume, veh/h		457			741			0			200	
Approach Delay, s/veh		11.9			35.8			0.0			168.5	
Approach LOS		B			D						F	

Timer:	1	2	3	4	5	6	7	8
Assigned Phase		2		4				8
Case No		6.0		4.0				8.0
Phase Duration (G+Y+Rc), s		27.90		30.76				30.76
Change Period (Y+Rc), s		4.00		4.00				4.00
Max. Allowable Headway (MAH), s		4.08		5.36				5.36
Maximum Green Setting (Gmax), s		23.90		28.10				26.00
Max. Queue Clearance Time (g_c+I1), s		25.90		12.09				26.31
Green Extension Time (g_e), s		0.00		6.46				0.00
Probability of Phase Call (p_c)		1.000		1.000				1.000
Probability of Max Out (p_x)		1.000		0.463				1.000

Left-Turn Movement Data		
Assigned Movement		5
Mvmt. Sat Flow, veh/h		1809.52

Through Movement Data				
Assigned Movement		2	4	8
Mvmt. Sat Flow, veh/h		43.83	1900.00	657.72

Right-Turn Movement Data				
Assigned Movement		12	14	18
Mvmt. Sat Flow, veh/h		1577.75	0.00	1055.94

Left Lane Group Data								
Assigned Movement	0	5	0	0	0	0	0	0
Lane Assignment		L						
Lanes in Group	0	1	0	0	0	0	0	0
Group Volume (v), veh/h	0.0	158.9	0.0	0.0	0.0	0.0	0.0	0.0
Group Sat. Flow (s), veh/h/ln	0.0	1809.5	0.0	0.0	0.0	0.0	0.0	0.0
Queue Serve Time (g_s), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Queue Clear Time (g_c), s	0.0	23.9	0.0	0.0	0.0	0.0	0.0	0.0

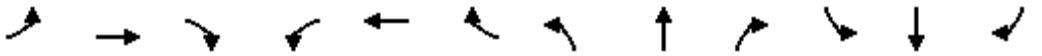
Perm LT Sat Flow Rate (s_l), veh/h/ln	0.0	1809.5	0.0	0.0	0.0	0.0	0.0	0.0
Shared LT Sat Flow (s_sh), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Eff. Green (g_p), s	0.0	23.9	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Serve Time (g_u), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Que Serve Time (g_ps), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Time to First Blk (g_f), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	26.8
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Proportion LT Inside Lane (P_L)	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
Lane Group Capacity (c), veh/h	0.0	122.7	0.0	0.0	0.0	0.0	0.0	0.0
Volume-to-Capacity Ratio (X)	0.000	1.294	0.000	0.000	0.000	0.000	0.000	0.000
Available Capacity (c_a), veh/h	0.0	122.7	0.0	0.0	0.0	0.0	0.0	0.0
Upstream Filter Factor (I)	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
Uniform Delay (d1), s/veh	0.0	29.3	0.0	0.0	0.0	0.0	0.0	0.0
Incremental Delay (d2), s/veh	0.0	180.0	0.0	0.0	0.0	0.0	0.0	0.0
Initial Queue Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	209.3	0.0	0.0	0.0	0.0	0.0	0.0
First-Term Queue (Q1), veh/ln	0.0	1.6	0.0	0.0	0.0	0.0	0.0	0.0
Second-Term Queue (Q2), veh/ln	0.0	6.1	0.0	0.0	0.0	0.0	0.0	0.0
Third-Term Queue (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentile bk-of-que factor (f_B%)	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
Percentile Back of Queue (Q%), veh/ln	0.0	7.8	0.0	0.0	0.0	0.0	0.0	0.0
Percentile Storage Ratio (RQ%)	0.00	1.30	0.00	0.00	0.00	0.00	0.00	0.00
Initial Queue (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Queue (Qe), veh	0.0	9.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Queue (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Capacity (cs), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Initial Queue Clear Time (tc), h	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0

Middle Lane Group Data								
Assigned Movement	0	2	0	4	0	0	0	8
Lane Assignment				T				
Lanes in Group	0	0	0	1	0	0	0	0
Group Volume (v), veh/h	0.0	0.0	0.0	456.7	0.0	0.0	0.0	0.0
Group Sat. Flow (s), veh/h/ln	0.0	0.0	0.0	1900.0	0.0	0.0	0.0	0.0
Queue Serve Time (g_s), s	0.0	0.0	0.0	10.1	0.0	0.0	0.0	0.0
Cycle Queue Clear Time (g_c), s	0.0	0.0	0.0	10.1	0.0	0.0	0.0	0.0
Lane Group Capacity (c), veh/h	0.0	0.0	0.0	866.7	0.0	0.0	0.0	0.0
Volume-to-Capacity Ratio (X)	0.000	0.000	0.000	0.527	0.000	0.000	0.000	0.000
Available Capacity (c_a), veh/h	0.0	0.0	0.0	910.2	0.0	0.0	0.0	0.0
Upstream Filter Factor (I)	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
Uniform Delay (d1), s/veh	0.0	0.0	0.0	11.4	0.0	0.0	0.0	0.0
Incremental Delay (d2), s/veh	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0
Initial Queue Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	0.0	0.0	11.9	0.0	0.0	0.0	0.0
First-Term Queue (Q1), veh/ln	0.0	0.0	0.0	3.6	0.0	0.0	0.0	0.0
Second-Term Queue (Q2), veh/ln	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Third-Term Queue (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentile bk-of-que factor (f_B%)	0.000	1.000	0.000	1.000	0.000	0.000	0.000	1.000
Percentile Back of Queue (Q%), veh/ln	0.0	0.0	0.0	3.7	0.0	0.0	0.0	0.0
Percentile Storage Ratio (RQ%)	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00

Initial Queue (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Queue (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Queue (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Capacity (cs), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Initial Queue Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

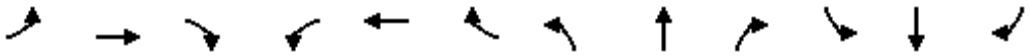
Right Lane Group Data								
Assigned Movement	0	12	0	14	0	0	0	18
Lane Assignment		T+R						T+R
Lanes in Group	0	1	0	0	0	0	0	1
Group Volume (v), veh/h	0.0	41.1	0.0	0.0	0.0	0.0	0.0	741.1
Group Sat. Flow (s), veh/h/ln	0.0	1621.6	0.0	0.0	0.0	0.0	0.0	1713.7
Queue Serve Time (g_s), s	0.0	0.9	0.0	0.0	0.0	0.0	0.0	24.3
Cycle Queue Clear Time (g_c), s	0.0	0.9	0.0	0.0	0.0	0.0	0.0	24.3
Prot RT Sat Flow Rate (s_R), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prot RT Eff. Green (g_R), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Proportion RT Outside Lane (P_R)	0.000	0.973	0.000	0.000	0.000	0.000	0.000	0.616
Lane Group Capacity (c), veh/h	0.0	660.7	0.0	0.0	0.0	0.0	0.0	781.7
Volume-to-Capacity Ratio (X)	0.000	0.062	0.000	0.000	0.000	0.000	0.000	0.948
Available Capacity (c_a), veh/h	0.0	660.7	0.0	0.0	0.0	0.0	0.0	781.7
Upstream Filter Factor (I)	0.000	1.000	0.000	0.000	0.000	0.000	0.000	1.000
Uniform Delay (d1), s/veh	0.0	10.6	0.0	0.0	0.0	0.0	0.0	15.3
Incremental Delay (d2), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.5
Initial Queue Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	10.6	0.0	0.0	0.0	0.0	0.0	35.8
First-Term Queue (Q1), veh/ln	0.0	0.3	0.0	0.0	0.0	0.0	0.0	7.8
Second-Term Queue (Q2), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.5
Third-Term Queue (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentile bk-of-que factor (f_B%)	0.000	1.000	0.000	1.000	0.000	0.000	0.000	1.000
Percentile Back of Queue (Q%), veh/ln	0.0	0.3	0.0	0.0	0.0	0.0	0.0	12.3
Percentile Storage Ratio (RQ%)	0.00	0.02	0.00	0.00	0.00	0.00	0.00	1.78
Initial Queue (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Queue (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Queue (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Capacity (cs), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Initial Queue Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Intersection Summary	
HCM Average Control Delay	47.0
HCM Level of Service	D



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	516	0	202	10	0	10	0	109	0	0	68	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		0%			0%			-5%			0%	
Storage Length (ft)	0		50	20		0	0		0	0		0
Storage Lanes	1		1	1		1	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850						
Flt Protected	0.950			0.950								
Satd. Flow (prot)	1770	0	1583	1770	0	1583	0	1909	0	0	1863	0
Flt Permitted	0.950			0.950								
Satd. Flow (perm)	1770	0	1583	1770	0	1583	0	1909	0	0	1863	0
Link Speed (mph)		30			30			35			25	
Link Distance (ft)		266			202			321			201	
Travel Time (s)		6.0			4.6			6.3			5.5	
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
Adj. Flow (vph)	561	0	220	11	0	11	0	118	0	0	74	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	561	0	220	11	0	11	0	118	0	0	74	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.97	0.97	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Free			Free	

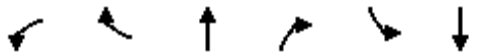
Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 47.7%		ICU Level of Service A	
Analysis Period (min) 15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	516	0	202	10	0	10	0	109	0	0	68	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			-5%			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
Hourly flow rate (vph)	561	0	220	11	0	11	0	118	0	0	74	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)			2									
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											716	
pX, platoon unblocked												
vC, conflicting volume	203	192	74	192	192	118	74			118		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	203	192	74	192	192	118	74			118		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	25	100	78	98	100	99	100			100		
cM capacity (veh/h)	746	703	988	597	703	933	1526			1470		

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1
Volume Total	780	11	11	118	74
Volume Left	561	11	0	0	0
Volume Right	220	0	11	0	0
cSH	896	597	933	1700	1700
Volume to Capacity	0.87	0.02	0.01	0.07	0.04
Queue Length 95th (ft)	284	1	1	0	0
Control Delay (s)	29.2	11.1	8.9	0.0	0.0
Lane LOS	D	B	A		
Approach Delay (s)	29.2	10.0		0.0	0.0
Approach LOS	D	B			

Intersection Summary				
Average Delay	23.1			
Intersection Capacity Utilization	47.7%	ICU Level of Service		A
Analysis Period (min)	15			



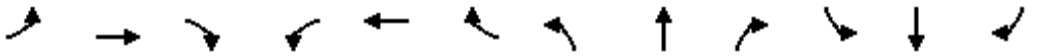
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	0	0	566	147	72	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	0%		-1%			0%
Storage Length (ft)	0	0		0	75	
Storage Lanes	0	0		0	1	
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.972			
Flt Protected					0.950	
Satd. Flow (prot)	0	0	1820	0	1770	1863
Flt Permitted					0.950	
Satd. Flow (perm)	0	0	1820	0	1770	1863
Link Speed (mph)	30		35			35
Link Distance (ft)	392		180			238
Travel Time (s)	8.9		3.5			4.6
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	615	160	78	130
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	775	0	78	130
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	0		12			12
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	1.00	1.00	0.99	0.99	1.00	1.00
Turning Speed (mph)	15	9		9	15	
Sign Control	Stop		Free			Free

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 49.4%		ICU Level of Service A	
Analysis Period (min) 15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	0	0	566	147	72	120
Sign Control	Stop		Free			Free
Grade	0%		-1%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	615	160	78	130
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						238
pX, platoon unblocked						
vC, conflicting volume	982	695			775	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	982	695			775	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			91	
cM capacity (veh/h)	251	442			841	

Direction, Lane #	NB 1	SB 1	SB 2
Volume Total	775	78	130
Volume Left	0	78	0
Volume Right	160	0	0
cSH	1700	841	1700
Volume to Capacity	0.46	0.09	0.08
Queue Length 95th (ft)	0	8	0
Control Delay (s)	0.0	9.7	0.0
Lane LOS		A	
Approach Delay (s)	0.0	3.6	
Approach LOS			

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	49.4%	ICU Level of Service	A
Analysis Period (min)	15		

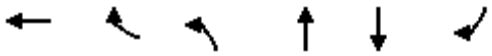


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	76	1	284	177	389	0	0	116	296
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		0%			0%			-1%			0%	
Storage Length (ft)	0		0	0		50	75		0	0		50
Storage Lanes	0		0	0		1	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.850						0.850
Flt Protected					0.953		0.950					
Satd. Flow (prot)	0	0	0	0	1775	1583	1778	1872	0	0	1863	1583
Flt Permitted					0.953		0.577					
Satd. Flow (perm)	0	0	0	0	1775	1583	1080	1872	0	0	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						309						322
Link Speed (mph)		30			30			35			35	
Link Distance (ft)		283			303			238			203	
Travel Time (s)		6.4			6.9			4.6			4.0	
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
Adj. Flow (vph)	0	0	0	83	1	309	192	423	0	0	126	322
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	84	309	192	423	0	0	126	322
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.99	0.99	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1	2	1	1	2			2	1
Detector Template				Left	Thru	Right	Left	Thru			Thru	Right
Leading Detector (ft)				20	100	20	20	100			100	20
Trailing Detector (ft)				0	0	0	0	0			0	0
Detector 1 Position(ft)				0	0	0	0	0			0	0
Detector 1 Size(ft)				20	6	20	20	6			6	20
Detector 1 Type				Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Queue (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Delay (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 2 Position(ft)					94			94			94	
Detector 2 Size(ft)					6			6			6	
Detector 2 Type					Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)					0.0			0.0			0.0	
Turn Type				Split	NA	Perm	pm+pt	NA			NA	Free
Protected Phases				8	8		5	2			6	
Permitted Phases						8	2					Free

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase				8	8	8	5	2			6	
Switch Phase												
Minimum Initial (s)				4.0	4.0	4.0	4.0	4.0			4.0	
Minimum Split (s)				20.0	20.0	20.0	8.0	20.0			20.0	
Total Split (s)				20.0	20.0	20.0	10.0	30.0			20.0	
Total Split (%)				40.0%	40.0%	40.0%	20.0%	60.0%			40.0%	
Maximum Green (s)				16.0	16.0	16.0	6.0	26.0			16.0	
Yellow Time (s)				3.5	3.5	3.5	3.5	3.5			3.5	
All-Red Time (s)				0.5	0.5	0.5	0.5	0.5			0.5	
Lost Time Adjust (s)					0.0	0.0	0.0	0.0			0.0	
Total Lost Time (s)					4.0	4.0	4.0	4.0			4.0	
Lead/Lag							Lead				Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)				3.0	3.0	3.0	3.0	3.0			3.0	
Recall Mode				None	None	None	None	C-Max			C-Max	
Act Effct Green (s)					8.8	8.8	33.2	33.2			24.0	50.0
Actuated g/C Ratio					0.18	0.18	0.66	0.66			0.48	1.00
v/c Ratio					0.27	0.58	0.23	0.34			0.14	0.20
Control Delay					18.6	7.3	4.8	5.3			10.8	0.3
Queue Delay					0.0	0.0	0.0	0.0			0.0	0.0
Total Delay					18.6	7.3	4.8	5.3			10.8	0.3
LOS					B	A	A	A			B	A
Approach Delay					9.7			5.2			3.2	
Approach LOS					A			A			A	

Intersection Summary			
Area Type:	Other		
Cycle Length: 50			
Actuated Cycle Length: 50			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Yellow			
Natural Cycle: 50			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.58			
Intersection Signal Delay: 5.8		Intersection LOS: A	
Intersection Capacity Utilization 49.4%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 3: Broad St & 307 WB On Ramp/307 WB Exit Ramp



Lane Group	WBT	WBR	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	84	309	192	423	126	322
v/c Ratio	0.27	0.58	0.23	0.34	0.14	0.20
Control Delay	18.6	7.3	4.8	5.3	10.8	0.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.6	7.3	4.8	5.3	10.8	0.3
Queue Length 50th (ft)	22	0	15	37	20	0
Queue Length 95th (ft)	44	45	49	110	58	0
Internal Link Dist (ft)	223			158	123	
Turn Bay Length (ft)		50	75			50
Base Capacity (vph)	568	717	819	1244	895	1583
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.15	0.43	0.23	0.34	0.14	0.20

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	76	1	284	177	389	0	0	116	296
Movement Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Queue, veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj. Factor (A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking, Bus Adj. Factors	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Sat. Flow Rate, veh/h/ln	1900	1900	1900	1863	1863	1863	1872	1872	1900	1900	1863	1863
Lanes	0	0	0	0	1	1	1	1	0	0	1	1
Lane Assignment												
Capacity, veh/h	0	0	0	308	4	279	0	1243	0	0	1237	1051
Proportion Arriving On Green	0.00	0.00	0.00	0.18	0.18	0.18	0.00	0.66	0.00	0.00	0.66	0.66
Movement Delay, s/veh	0.0	0.0	0.0	18.3	0.0	106.6	0.0	4.4	0.0	0.0	3.2	4.3
Movement LOS				B		F		A			A	A
Approach Volume, veh/h		0			392			423			448	
Approach Delay, s/veh		0.0			87.7			4.4			4.0	
Approach LOS					F			A			A	

Timer:	1	2	3	4	5	6	7	8
Assigned Phase		2	8			6		
Case No		4.0	11.0			7.0		
Phase Duration (G+Y+Rc), s		37.20	12.80			37.20		
Change Period (Y+Rc), s		4.00	4.00			4.00		
Max. Allowable Headway (MAH), s		4.71	4.31			4.71		
Maximum Green Setting (Gmax), s		33.20	8.80			24.00		
Max. Queue Clearance Time (g_c+I1), s		6.90	10.80			6.28		
Green Extension Time (g_e), s		4.67	0.00			4.20		
Probability of Phase Call (p_c)		1.000	0.996			1.000		
Probability of Max Out (p_x)		0.023	1.000			0.103		

Left-Turn Movement Data								
Assigned Movement			3					
Mvmt. Sat Flow, veh/h			1752.09					

Through Movement Data								
Assigned Movement		2	8			6		
Mvmt. Sat Flow, veh/h		1872.06	23.06			1862.75		

Right-Turn Movement Data								
Assigned Movement		12	18			16		
Mvmt. Sat Flow, veh/h		0.00	1583.33			1583.33		

Left Lane Group Data								
Assigned Movement	0	0	3	0	0	0	0	0
Lane Assignment			L+T					
Lanes in Group	0	0	1	0	0	0	0	0
Group Volume (v), veh/h	0.0	0.0	83.7	0.0	0.0	0.0	0.0	0.0
Group Sat. Flow (s), veh/h/ln	0.0	0.0	1775.1	0.0	0.0	0.0	0.0	0.0
Queue Serve Time (g_s), s	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0
Cycle Queue Clear Time (g_c), s	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0

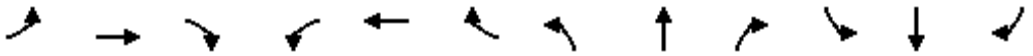
Perm LT Sat Flow Rate (s_l), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shared LT Sat Flow (s_sh), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Eff. Green (g_p), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Serve Time (g_u), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Que Serve Time (g_ps), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Time to First Blk (g_f), s	0.0	0.0	0.0	0.0	0.0	33.2	0.0	0.0
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Proportion LT Inside Lane (P_L)	0.000	0.000	0.987	0.000	0.000	0.000	0.000	0.000
Lane Group Capacity (c), veh/h	0.0	0.0	312.4	0.0	0.0	0.0	0.0	0.0
Volume-to-Capacity Ratio (X)	0.000	0.000	0.268	0.000	0.000	0.000	0.000	0.000
Available Capacity (c_a), veh/h	0.0	0.0	312.4	0.0	0.0	0.0	0.0	0.0
Upstream Filter Factor (I)	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000
Uniform Delay (d1), s/veh	0.0	0.0	17.8	0.0	0.0	0.0	0.0	0.0
Incremental Delay (d2), s/veh	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0
Initial Queue Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	0.0	18.3	0.0	0.0	0.0	0.0	0.0
First-Term Queue (Q1), veh/ln	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0
Second-Term Queue (Q2), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Third-Term Queue (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentile bk-of-que factor (f_B%)	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000
Percentile Back of Queue (Q%), veh/ln	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0
Percentile Storage Ratio (RQ%)	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.00
Initial Queue (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Queue (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Queue (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Capacity (cs), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Initial Queue Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Middle Lane Group Data								
Assigned Movement	0	2	8	0	0	6	0	0
Lane Assignment		T				T		
Lanes in Group	0	1	0	0	0	1	0	0
Group Volume (v), veh/h	0.0	422.8	0.0	0.0	0.0	126.1	0.0	0.0
Group Sat. Flow (s), veh/h/ln	0.0	1872.1	0.0	0.0	0.0	1862.7	0.0	0.0
Queue Serve Time (g_s), s	0.0	4.9	0.0	0.0	0.0	1.2	0.0	0.0
Cycle Queue Clear Time (g_c), s	0.0	4.9	0.0	0.0	0.0	1.2	0.0	0.0
Lane Group Capacity (c), veh/h	0.0	1243.0	0.0	0.0	0.0	1236.9	0.0	0.0
Volume-to-Capacity Ratio (X)	0.000	0.340	0.000	0.000	0.000	0.102	0.000	0.000
Available Capacity (c_a), veh/h	0.0	1243.0	0.0	0.0	0.0	1236.9	0.0	0.0
Upstream Filter Factor (I)	0.000	1.000	0.000	0.000	0.000	1.000	0.000	0.000
Uniform Delay (d1), s/veh	0.0	3.6	0.0	0.0	0.0	3.0	0.0	0.0
Incremental Delay (d2), s/veh	0.0	0.7	0.0	0.0	0.0	0.2	0.0	0.0
Initial Queue Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	4.4	0.0	0.0	0.0	3.2	0.0	0.0
First-Term Queue (Q1), veh/ln	0.0	0.8	0.0	0.0	0.0	0.2	0.0	0.0
Second-Term Queue (Q2), veh/ln	0.0	0.3	0.0	0.0	0.0	0.1	0.0	0.0
Third-Term Queue (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentile bk-of-que factor (f_B%)	0.000	1.000	1.000	0.000	0.000	1.000	0.000	0.000
Percentile Back of Queue (Q%), veh/ln	0.0	1.1	0.0	0.0	0.0	0.3	0.0	0.0
Percentile Storage Ratio (RQ%)	0.00	0.15	0.00	0.00	0.00	0.05	0.00	0.00

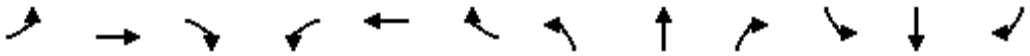
Initial Queue (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Queue (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Queue (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Capacity (cs), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Initial Queue Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Right Lane Group Data								
Assigned Movement	0	12	18	0	0	16	0	0
Lane Assignment			R			R		
Lanes in Group	0	0	1	0	0	1	0	0
Group Volume (v), veh/h	0.0	0.0	308.7	0.0	0.0	321.7	0.0	0.0
Group Sat. Flow (s), veh/h/ln	0.0	0.0	1583.3	0.0	0.0	1583.3	0.0	0.0
Queue Serve Time (g_s), s	0.0	0.0	8.8	0.0	0.0	4.3	0.0	0.0
Cycle Queue Clear Time (g_c), s	0.0	0.0	8.8	0.0	0.0	4.3	0.0	0.0
Prot RT Sat Flow Rate (s_R), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prot RT Eff. Green (g_R), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Proportion RT Outside Lane (P_R)	0.000	0.000	1.000	0.000	0.000	1.000	0.000	0.000
Lane Group Capacity (c), veh/h	0.0	0.0	278.7	0.0	0.0	1051.3	0.0	0.0
Volume-to-Capacity Ratio (X)	0.000	0.000	1.108	0.000	0.000	0.306	0.000	0.000
Available Capacity (c_a), veh/h	0.0	0.0	278.7	0.0	0.0	1051.3	0.0	0.0
Upstream Filter Factor (I)	0.000	0.000	1.000	0.000	0.000	1.000	0.000	0.000
Uniform Delay (d1), s/veh	0.0	0.0	20.6	0.0	0.0	3.5	0.0	0.0
Incremental Delay (d2), s/veh	0.0	0.0	86.0	0.0	0.0	0.8	0.0	0.0
Initial Queue Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	0.0	106.6	0.0	0.0	4.3	0.0	0.0
First-Term Queue (Q1), veh/ln	0.0	0.0	2.9	0.0	0.0	0.6	0.0	0.0
Second-Term Queue (Q2), veh/ln	0.0	0.0	6.7	0.0	0.0	0.2	0.0	0.0
Third-Term Queue (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentile bk-of-que factor (f_B%)	0.000	1.000	1.000	0.000	0.000	1.000	0.000	0.000
Percentile Back of Queue (Q%), veh/ln	0.0	0.0	9.5	0.0	0.0	0.8	0.0	0.0
Percentile Storage Ratio (RQ%)	0.00	0.00	4.85	0.00	0.00	0.43	0.00	0.00
Initial Queue (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Queue (Qe), veh	0.0	0.0	7.5	0.0	0.0	0.0	0.0	0.0
Saturated Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Queue (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Capacity (cs), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Initial Queue Clear Time (tc), h	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0

Intersection Summary	
HCM Average Control Delay	30.1
HCM Level of Service	C



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	15	610	239	322	721	33	200	1	328	24	1	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		-3%			0%			0%			0%	
Storage Length (ft)	150		0	400		0	0		0	50		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.958			0.993			0.850			0.862	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1832	3510	0	1805	3585	0	1805	1615	0	1805	1638	0
Flt Permitted	0.337			0.120			0.624			0.544		
Satd. Flow (perm)	650	3510	0	228	3585	0	1186	1615	0	1034	1638	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		78			8			353			11	
Link Speed (mph)		35			35			30			30	
Link Distance (ft)		557			1414			347			353	
Travel Time (s)		10.9			27.5			7.9			8.0	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	17	678	266	358	801	37	222	1	364	27	1	11
Shared Lane Traffic (%)												
Lane Group Flow (vph)	17	944	0	358	838	0	222	365	0	27	12	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		Yes										
Headway Factor	0.98	0.98	0.98	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		Perm	NA	
Protected Phases	7	4		3	8		5	2			6	
Permitted Phases	4			8			2			6		



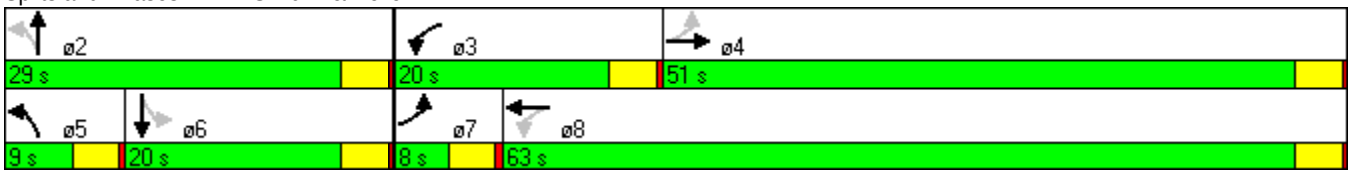
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	7	4		3	8		5	2		6	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	8.0	20.0		8.0	20.0		8.0	20.0		20.0	20.0	
Total Split (s)	8.0	51.0		20.0	63.0		9.0	29.0		20.0	20.0	
Total Split (%)	8.0%	51.0%		20.0%	63.0%		9.0%	29.0%		20.0%	20.0%	
Maximum Green (s)	4.0	47.0		16.0	59.0		5.0	25.0		16.0	16.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5		0.5	0.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead			Lag	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		None	C-Max		C-Max	C-Max	
Walk Time (s)		5.0			5.0			5.0		5.0	5.0	
Flash Dont Walk (s)		11.0			11.0			11.0		11.0	11.0	
Pedestrian Calls (#/hr)		0			0			0		0	0	
Act Effct Green (s)	38.0	34.0		53.7	50.5		38.3	38.3		22.1	22.1	
Actuated g/C Ratio	0.38	0.34		0.54	0.50		0.38	0.38		0.22	0.22	
v/c Ratio	0.06	0.76		0.96	0.46		0.42	0.44		0.12	0.03	
Control Delay	10.5	30.7		64.2	16.5		26.5	5.1		37.0	19.6	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	10.5	30.7		64.2	16.5		26.5	5.1		37.0	19.6	
LOS	B	C		E	B		C	A		D	B	
Approach Delay		30.3			30.8			13.2			31.6	
Approach LOS		C			C			B			C	
Queue Length 50th (ft)	5	257		167	158		98	5		14	1	
Queue Length 95th (ft)	12	291		#324	206		180	72		41	17	
Internal Link Dist (ft)		477			1334			267			273	
Turn Bay Length (ft)	150			400						50		
Base Capacity (vph)	294	1691		375	2118		529	836		229	371	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.06	0.56		0.95	0.40		0.42	0.44		0.12	0.03	

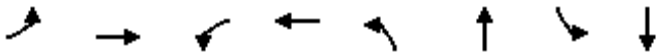
Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 91 (91%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.96
Intersection Signal Delay: 26.9 Intersection LOS: C
Intersection Capacity Utilization 72.7% ICU Level of Service C
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 27: SR 611 & Heller Dr





Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	17	944	358	838	222	365	27	12
v/c Ratio	0.06	0.76	0.96	0.46	0.42	0.44	0.12	0.03
Control Delay	10.5	30.7	64.2	16.5	26.5	5.1	37.0	19.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	10.5	30.7	64.2	16.5	26.5	5.1	37.0	19.6
Queue Length 50th (ft)	5	257	167	158	98	5	14	1
Queue Length 95th (ft)	12	291	#324	206	180	72	41	17
Internal Link Dist (ft)		477		1334		267		273
Turn Bay Length (ft)	150		400				50	
Base Capacity (vph)	294	1691	375	2118	529	836	229	371
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.06	0.56	0.95	0.40	0.42	0.44	0.12	0.03

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												
Volume (vph)	15	610	239	322	721	33	200	1	328	24	1	10
Movement Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Queue, veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj. Factor (A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking, Bus Adj. Factors	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Sat. Flow Rate, veh/h/ln	1928	1928	1928	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lanes	1	2	0	1	2	0	1	1	0	1	1	0
Lane Assignment												
Capacity, veh/h	304	1143	448	281	1630	75	0	2	654	316	60	604
Proportion Arriving On Green	0.02	0.43	0.43	0.03	0.45	0.45	0.00	0.41	0.41	0.41	0.41	0.41
Movement Delay, s/veh	15.5	21.5	21.6	179.8	18.7	18.7	0.0	0.0	24.9	29.1	0.0	16.8
Movement LOS	B	C	C	F	B	B			C	C		B
Approach Volume, veh/h		960			1196			366			39	
Approach Delay, s/veh		21.5			66.9			24.9			25.2	
Approach LOS		C			E			C			C	

Timer:	1	2	3	4	5	6	7	8
Assigned Phase		2	3	4		6	7	8
Case No		4.0	1.1	4.0		6.3	1.1	4.0
Phase Duration (G+Y+Rc), s		42.30	7.20	44.87		42.30	5.42	46.65
Change Period (Y+Rc), s		4.00	4.00	4.00		4.00	4.00	4.00
Max. Allowable Headway (MAH), s		5.51	3.76	5.16		5.51	3.76	5.16
Maximum Green Setting (Gmax), s		38.30	3.20	34.00		22.10	4.00	50.50
Max. Queue Clearance Time (g_c+I1), s		18.39	5.20	20.48		20.32	2.48	16.77
Green Extension Time (g_e), s		2.61	0.00	8.82		0.47	0.00	7.24
Probability of Phase Call (p_c)		1.000	1.000	1.000		1.000	0.354	1.000
Probability of Max Out (p_x)		0.018	1.000	0.714		1.000	1.000	0.316

Left-Turn Movement Data								
Assigned Movement			3			1	7	
Mvmt. Sat Flow, veh/h			1809.52			1032.46	1836.67	

Through Movement Data								
Assigned Movement		2		4		6		8
Mvmt. Sat Flow, veh/h		4.91		2640.12		148.85		3605.87

Right-Turn Movement Data								
Assigned Movement		12		14		16		18
Mvmt. Sat Flow, veh/h		1610.83		1034.35		1488.48		165.01

Left Lane Group Data								
Assigned Movement	0	0	3	0	0	1	7	0
Lane Assignment			L (Pr/Pm)			LL (Pr/Pm)		
Lanes in Group	0	0	1	0	0	1	1	0
Group Volume (v), veh/h	0.0	0.0	357.8	0.0	0.0	26.7	16.7	0.0
Group Sat. Flow (s), veh/h/ln	0.0	0.0	1809.5	0.0	0.0	1032.5	1836.7	0.0
Queue Serve Time (g_s), s	0.0	0.0	3.2	0.0	0.0	1.9	0.5	0.0
Cycle Queue Clear Time (g_c), s	0.0	0.0	3.2	0.0	0.0	18.3	0.5	0.0

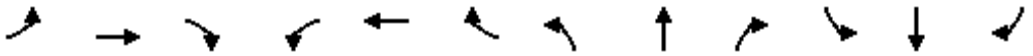
Perm LT Sat Flow Rate (s_l), veh/h/ln	0.0	0.0	603.6	0.0	0.0	1032.5	676.5	0.0
Shared LT Sat Flow (s_sh), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Eff. Green (g_p), s	0.0	0.0	42.7	0.0	0.0	38.3	40.9	0.0
Perm LT Serve Time (g_u), s	0.0	0.0	22.4	0.0	0.0	21.9	27.9	0.0
Perm LT Que Serve Time (g_ps), s	0.0	0.0	22.4	0.0	0.0	1.9	0.3	0.0
Time to First Blk (g_f), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Proportion LT Inside Lane (P_L)	0.000	0.000	1.000	0.000	0.000	1.000	1.000	0.000
Lane Group Capacity (c), veh/h	0.0	0.0	280.9	0.0	0.0	315.9	303.7	0.0
Volume-to-Capacity Ratio (X)	0.000	0.000	1.274	0.000	0.000	0.084	0.055	0.000
Available Capacity (c_a), veh/h	0.0	0.0	280.9	0.0	0.0	315.9	354.0	0.0
Upstream Filter Factor (I)	0.000	0.000	1.000	0.000	0.000	1.000	1.000	0.000
Uniform Delay (d1), s/veh	0.0	0.0	31.8	0.0	0.0	28.6	15.4	0.0
Incremental Delay (d2), s/veh	0.0	0.0	148.0	0.0	0.0	0.5	0.1	0.0
Initial Queue Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	0.0	179.8	0.0	0.0	29.1	15.5	0.0
First-Term Queue (Q1), veh/ln	0.0	0.0	6.5	0.0	0.0	0.5	0.2	0.0
Second-Term Queue (Q2), veh/ln	0.0	0.0	11.5	0.0	0.0	0.0	0.0	0.0
Third-Term Queue (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentile bk-of-que factor (f_B%)	0.000	0.000	1.000	0.000	0.000	1.000	1.000	0.000
Percentile Back of Queue (Q%), veh/ln	0.0	0.0	18.0	0.0	0.0	0.5	0.2	0.0
Percentile Storage Ratio (RQ%)	0.00	0.00	1.13	0.00	0.00	0.26	0.03	0.00
Initial Queue (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Queue (Qe), veh	0.0	0.0	19.2	0.0	0.0	0.0	0.0	0.0
Saturated Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Queue (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Capacity (cs), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Initial Queue Clear Time (tc), h	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0

Middle Lane Group Data								
Assigned Movement	0	2	0	4	0	6	0	8
Lane Assignment				T				T
Lanes in Group	0	0	0	1	0	0	0	1
Group Volume (v), veh/h	0.0	0.0	0.0	495.1	0.0	0.0	0.0	422.1
Group Sat. Flow (s), veh/h/ln	0.0	0.0	0.0	1928.5	0.0	0.0	0.0	1900.0
Queue Serve Time (g_s), s	0.0	0.0	0.0	18.5	0.0	0.0	0.0	14.8
Cycle Queue Clear Time (g_c), s	0.0	0.0	0.0	18.5	0.0	0.0	0.0	14.8
Lane Group Capacity (c), veh/h	0.0	0.0	0.0	835.2	0.0	0.0	0.0	858.8
Volume-to-Capacity Ratio (X)	0.000	0.000	0.000	0.593	0.000	0.000	0.000	0.491
Available Capacity (c_a), veh/h	0.0	0.0	0.0	835.2	0.0	0.0	0.0	1016.7
Upstream Filter Factor (I)	0.000	0.000	0.000	1.000	0.000	0.000	0.000	1.000
Uniform Delay (d1), s/veh	0.0	0.0	0.0	20.4	0.0	0.0	0.0	18.2
Incremental Delay (d2), s/veh	0.0	0.0	0.0	1.1	0.0	0.0	0.0	0.4
Initial Queue Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	0.0	0.0	21.5	0.0	0.0	0.0	18.7
First-Term Queue (Q1), veh/ln	0.0	0.0	0.0	7.8	0.0	0.0	0.0	6.1
Second-Term Queue (Q2), veh/ln	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.1
Third-Term Queue (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentile bk-of-que factor (f_B%)	0.000	1.000	0.000	1.000	0.000	1.000	0.000	1.000
Percentile Back of Queue (Q%), veh/ln	0.0	0.0	0.0	8.1	0.0	0.0	0.0	6.2
Percentile Storage Ratio (RQ%)	0.00	0.00	0.00	0.39	0.00	0.00	0.00	0.11

Initial Queue (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Queue (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Queue (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Capacity (cs), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Initial Queue Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

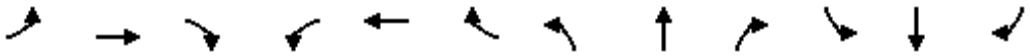
Right Lane Group Data								
Assigned Movement	0	12	0	14	0	16	0	18
Lane Assignment		T+R		T+R		T+R		T+R
Lanes in Group	0	1	0	1	0	1	0	1
Group Volume (v), veh/h	0.0	365.6	0.0	448.3	0.0	12.2	0.0	415.7
Group Sat. Flow (s), veh/h/ln	0.0	1615.7	0.0	1746.0	0.0	1637.3	0.0	1870.9
Queue Serve Time (g_s), s	0.0	16.4	0.0	18.5	0.0	0.4	0.0	14.8
Cycle Queue Clear Time (g_c), s	0.0	16.4	0.0	18.5	0.0	0.4	0.0	14.8
Prot RT Sat Flow Rate (s_R), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prot RT Eff. Green (g_R), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Proportion RT Outside Lane (P_R)	0.000	0.997	0.000	0.592	0.000	0.909	0.000	0.088
Lane Group Capacity (c), veh/h	0.0	655.7	0.0	756.1	0.0	664.5	0.0	845.6
Volume-to-Capacity Ratio (X)	0.000	0.557	0.000	0.593	0.000	0.018	0.000	0.492
Available Capacity (c_a), veh/h	0.0	655.7	0.0	756.1	0.0	664.5	0.0	1001.2
Upstream Filter Factor (I)	0.000	1.000	0.000	1.000	0.000	1.000	0.000	1.000
Uniform Delay (d1), s/veh	0.0	21.5	0.0	20.4	0.0	16.8	0.0	18.2
Incremental Delay (d2), s/veh	0.0	3.4	0.0	1.2	0.0	0.1	0.0	0.4
Initial Queue Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	24.9	0.0	21.6	0.0	16.8	0.0	18.7
First-Term Queue (Q1), veh/ln	0.0	6.0	0.0	7.1	0.0	0.2	0.0	6.0
Second-Term Queue (Q2), veh/ln	0.0	0.6	0.0	0.3	0.0	0.0	0.0	0.1
Third-Term Queue (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentile bk-of-que factor (f_B%)	0.000	1.000	0.000	1.000	0.000	1.000	0.000	1.000
Percentile Back of Queue (Q%), veh/ln	0.0	6.6	0.0	7.3	0.0	0.2	0.0	6.1
Percentile Storage Ratio (RQ%)	0.00	0.63	0.00	0.36	0.00	0.01	0.00	0.11
Initial Queue (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Queue (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Queue (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Capacity (cs), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Initial Queue Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Intersection Summary	
HCM Average Control Delay	43.2
HCM Level of Service	D



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	560	10	233	518	0	0	0	0	74	1	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		0	0		50
Storage Lanes	0		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.997									0.946	
Flt Protected				0.950							0.971	
Satd. Flow (prot)	0	3599	0	1805	1900	0	0	0	0	0	1745	0
Flt Permitted				0.380							0.971	
Satd. Flow (perm)	0	3599	0	722	1900	0	0	0	0	0	1745	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		3									41	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		320			197			717			667	
Travel Time (s)		7.3			4.5			16.3			15.2	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	622	11	259	576	0	0	0	0	82	1	56
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	633	0	259	576	0	0	0	0	0	139	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		2		1	2					1	2	
Detector Template		Thru		Left	Thru					Left	Thru	
Leading Detector (ft)		100		20	100					20	100	
Trailing Detector (ft)		0		0	0					0	0	
Detector 1 Position(ft)		0		0	0					0	0	
Detector 1 Size(ft)		6		20	6					20	6	
Detector 1 Type		Cl+Ex		Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)		0.0		0.0	0.0					0.0	0.0	
Detector 1 Queue (s)		0.0		0.0	0.0					0.0	0.0	
Detector 1 Delay (s)		0.0		0.0	0.0					0.0	0.0	
Detector 2 Position(ft)		94			94						94	
Detector 2 Size(ft)		6			6						6	
Detector 2 Type		Cl+Ex			Cl+Ex						Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0						0.0	
Turn Type		NA		pm+pt	NA					Split	NA	
Protected Phases		4		3	8					6	6	
Permitted Phases				8								
Detector Phase		4		3	8					6	6	

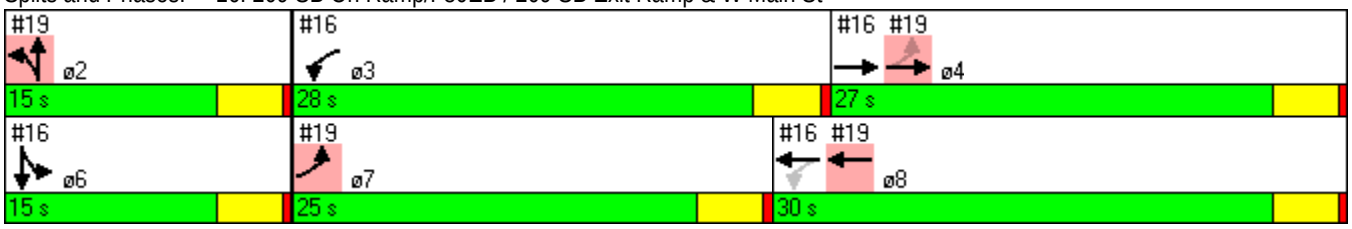
Lane Group	ø2	ø7
Lane Configurations		
Volume (vph)		
Ideal Flow (vphpl)		
Storage Length (ft)		
Storage Lanes		
Taper Length (ft)		
Lane Util. Factor		
Frt		
Flt Protected		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Right Turn on Red		
Satd. Flow (RTOR)		
Link Speed (mph)		
Link Distance (ft)		
Travel Time (s)		
Peak Hour Factor		
Adj. Flow (vph)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)		
Enter Blocked Intersection		
Lane Alignment		
Median Width(ft)		
Link Offset(ft)		
Crosswalk Width(ft)		
Two way Left Turn Lane		
Headway Factor		
Turning Speed (mph)		
Number of Detectors		
Detector Template		
Leading Detector (ft)		
Trailing Detector (ft)		
Detector 1 Position(ft)		
Detector 1 Size(ft)		
Detector 1 Type		
Detector 1 Channel		
Detector 1 Extend (s)		
Detector 1 Queue (s)		
Detector 1 Delay (s)		
Detector 2 Position(ft)		
Detector 2 Size(ft)		
Detector 2 Type		
Detector 2 Channel		
Detector 2 Extend (s)		
Turn Type		
Protected Phases	2	7
Permitted Phases		
Detector Phase		



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)		4.0		4.0	4.0					4.0	4.0	
Minimum Split (s)		22.0		20.0	22.0					22.0	22.0	
Total Split (s)		27.0		28.0	30.0					15.0	15.0	
Total Split (%)		38.6%		40.0%	42.9%					21.4%	21.4%	
Maximum Green (s)		23.0		24.0	26.0					11.0	11.0	
Yellow Time (s)		3.5		3.5	3.5					3.5	3.5	
All-Red Time (s)		0.5		0.5	0.5					0.5	0.5	
Lost Time Adjust (s)		0.0		0.0	0.0						0.0	
Total Lost Time (s)		4.0		4.0	4.0						4.0	
Lead/Lag		Lag		Lead	Lag							
Lead-Lag Optimize?												
Vehicle Extension (s)		3.0		3.0	3.0					3.0	3.0	
Recall Mode		None		None	None					C-Max	C-Max	
Walk Time (s)		5.0			5.0					5.0	5.0	
Flash Dont Walk (s)		13.0			13.0					13.0	13.0	
Pedestrian Calls (#/hr)		0			0					0	0	
Act Effct Green (s)		32.5		39.7	30.3						16.1	
Actuated g/C Ratio		0.46		0.57	0.43						0.23	
v/c Ratio		0.38		0.47	0.70						0.32	
Control Delay		12.3		8.3	8.2						20.9	
Queue Delay		0.0		0.0	0.0						0.2	
Total Delay		12.3		8.4	8.2						21.1	
LOS		B		A	A						C	
Approach Delay		12.3			8.3						21.1	
Approach LOS		B			A						C	
Queue Length 50th (ft)		77		16	24						37	
Queue Length 95th (ft)		115		57	51						88	
Internal Link Dist (ft)		240			117			637			587	
Turn Bay Length (ft)												
Base Capacity (vph)		1675		845	844						432	
Starvation Cap Reductn		0		47	0						0	
Spillback Cap Reductn		46		0	0						47	
Storage Cap Reductn		0		0	0						0	
Reduced v/c Ratio		0.39		0.32	0.68						0.36	

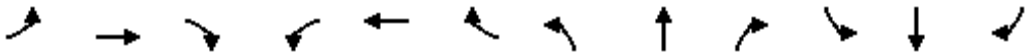
Intersection Summary			
Area Type:	Other		
Cycle Length: 70			
Actuated Cycle Length: 70			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:, Start of Green			
Natural Cycle: 70			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.70			
Intersection Signal Delay: 11.0		Intersection LOS: B	
Intersection Capacity Utilization 52.7%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 16: 209 SB On Ramp/I-80EB / 209 SB Exit Ramp & W Main St



Lane Group	ø2	ø7
Switch Phase		
Minimum Initial (s)	4.0	4.0
Minimum Split (s)	24.0	8.0
Total Split (s)	15.0	25.0
Total Split (%)	21%	36%
Maximum Green (s)	11.0	21.0
Yellow Time (s)	3.5	3.5
All-Red Time (s)	0.5	0.5
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag		Lead
Lead-Lag Optimize?		
Vehicle Extension (s)	3.0	3.0
Recall Mode	C-Max	None
Walk Time (s)	7.0	
Flash Dont Walk (s)	13.0	
Pedestrian Calls (#/hr)	0	
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		
LOS		
Approach Delay		
Approach LOS		
Queue Length 50th (ft)		
Queue Length 95th (ft)		
Internal Link Dist (ft)		
Turn Bay Length (ft)		
Base Capacity (vph)		
Starvation Cap Reductn		
Spillback Cap Reductn		
Storage Cap Reductn		
Reduced v/c Ratio		

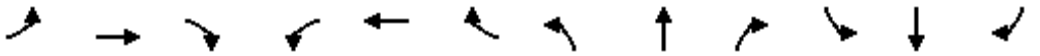
Intersection Summary



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	252	382	0	0	740	44	11	1	100	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.992			0.879				
Flt Protected	0.950							0.995				
Satd. Flow (prot)	1805	1900	0	0	3581	0	0	1662	0	0	0	0
Flt Permitted	0.208							0.995				
Satd. Flow (perm)	395	1900	0	0	3581	0	0	1662	0	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					10			111				
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		197			335			726			669	
Travel Time (s)		4.5			7.6			16.5			15.2	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	280	424	0	0	822	49	12	1	111	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	280	424	0	0	871	0	0	124	0	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2			2		1	2				
Detector Template	Left	Thru			Thru		Left	Thru				
Leading Detector (ft)	20	100			100		20	100				
Trailing Detector (ft)	0	0			0		0	0				
Detector 1 Position(ft)	0	0			0		0	0				
Detector 1 Size(ft)	20	6			6		20	6				
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex		Cl+Ex	Cl+Ex				
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0		0.0	0.0				
Detector 1 Queue (s)	0.0	0.0			0.0		0.0	0.0				
Detector 1 Delay (s)	0.0	0.0			0.0		0.0	0.0				
Detector 2 Position(ft)		94			94			94				
Detector 2 Size(ft)		6			6			6				
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex				
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0				
Turn Type	pm+pt	NA			NA		Split	NA				
Protected Phases	7	4			8		2	2				
Permitted Phases	4											
Detector Phase	7	4			8		2	2				
Switch Phase												
Minimum Initial (s)	4.0	4.0			4.0		4.0	4.0				
Minimum Split (s)	8.0	22.0			22.0		24.0	24.0				

Lane Group	ø3	ø6
Lane Configurations		
Volume (vph)		
Ideal Flow (vphpl)		
Lane Util. Factor		
Frt		
Flt Protected		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Right Turn on Red		
Satd. Flow (RTOR)		
Link Speed (mph)		
Link Distance (ft)		
Travel Time (s)		
Peak Hour Factor		
Adj. Flow (vph)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)		
Enter Blocked Intersection		
Lane Alignment		
Median Width(ft)		
Link Offset(ft)		
Crosswalk Width(ft)		
Two way Left Turn Lane		
Headway Factor		
Turning Speed (mph)		
Number of Detectors		
Detector Template		
Leading Detector (ft)		
Trailing Detector (ft)		
Detector 1 Position(ft)		
Detector 1 Size(ft)		
Detector 1 Type		
Detector 1 Channel		
Detector 1 Extend (s)		
Detector 1 Queue (s)		
Detector 1 Delay (s)		
Detector 2 Position(ft)		
Detector 2 Size(ft)		
Detector 2 Type		
Detector 2 Channel		
Detector 2 Extend (s)		
Turn Type		
Protected Phases	3	6
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	4.0	4.0
Minimum Split (s)	20.0	22.0

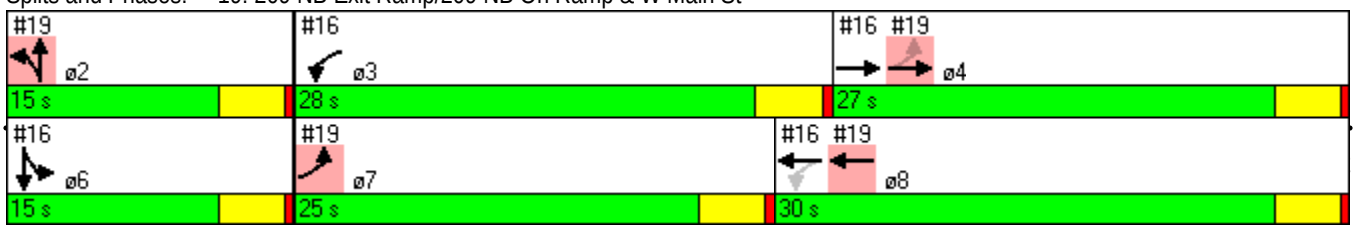
Lanes, Volumes, Timings
19: 209 NB Exit Ramp/209 NB On Ramp & W Main St 8/22/2013



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	25.0	27.0			30.0		15.0	15.0				
Total Split (%)	35.7%	38.6%			42.9%		21.4%	21.4%				
Maximum Green (s)	21.0	23.0			26.0		11.0	11.0				
Yellow Time (s)	3.5	3.5			3.5		3.5	3.5				
All-Red Time (s)	0.5	0.5			0.5		0.5	0.5				
Lost Time Adjust (s)	0.0	0.0			0.0			0.0				
Total Lost Time (s)	4.0	4.0			4.0			4.0				
Lead/Lag	Lead	Lag			Lag							
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0				
Recall Mode	None	None			None		C-Max	C-Max				
Walk Time (s)		5.0			5.0		7.0	7.0				
Flash Dont Walk (s)		13.0			13.0		13.0	13.0				
Pedestrian Calls (#/hr)		0			0		0	0				
Act Effct Green (s)	44.1	32.5			30.3			16.1				
Actuated g/C Ratio	0.63	0.46			0.43			0.23				
v/c Ratio	0.58	0.48			0.56			0.27				
Control Delay	22.6	6.5			15.7			9.1				
Queue Delay	0.4	0.5			0.0			0.0				
Total Delay	23.0	7.0			15.7			9.1				
LOS	C	A			B			A				
Approach Delay		13.3			15.7			9.1				
Approach LOS		B			B			A				
Queue Length 50th (ft)	47	32			130			5				
Queue Length 95th (ft)	124	48			174			47				
Internal Link Dist (ft)		117			255			646			589	
Turn Bay Length (ft)												
Base Capacity (vph)	682	883			1595			467				
Starvation Cap Reductn	117	159			0			0				
Spillback Cap Reductn	0	0			13			0				
Storage Cap Reductn	0	0			0			0				
Reduced v/c Ratio	0.50	0.59			0.55			0.27				

Intersection Summary			
Area Type:	Other		
Cycle Length: 70			
Actuated Cycle Length: 70			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:, Start of Green			
Natural Cycle: 70			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.70			
Intersection Signal Delay: 14.3		Intersection LOS: B	
Intersection Capacity Utilization 52.7%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 19: 209 NB Exit Ramp/209 NB On Ramp & W Main St



Lane Group	ø3	ø6
Total Split (s)	28.0	15.0
Total Split (%)	40%	21%
Maximum Green (s)	24.0	11.0
Yellow Time (s)	3.5	3.5
All-Red Time (s)	0.5	0.5
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag	Lead	
Lead-Lag Optimize?		
Vehicle Extension (s)	3.0	3.0
Recall Mode	None	C-Max
Walk Time (s)		5.0
Flash Dont Walk (s)		13.0
Pedestrian Calls (#/hr)		0
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		
LOS		
Approach Delay		
Approach LOS		
Queue Length 50th (ft)		
Queue Length 95th (ft)		
Internal Link Dist (ft)		
Turn Bay Length (ft)		
Base Capacity (vph)		
Starvation Cap Reductn		
Spillback Cap Reductn		
Storage Cap Reductn		
Reduced v/c Ratio		

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	252	382	0	0	740	44	11	1	100	0	0	0
Movement Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Queue, veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj. Factor (A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking, Bus Adj. Factors	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Sat. Flow Rate, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lanes	1	1	0	0	2	0	0	1	0	0	0	0
Lane Assignment												
Capacity, veh/h	568	1221	0	0	1464	87	38	3	348	0	0	0
Proportion Arriving On Green	0.46	0.22	0.00	0.00	0.41	0.41	0.24	0.24	0.24	0.00	0.00	0.00
Movement Delay, s/veh	5.7	14.5	0.0	0.0	15.9	15.9	23.3	0.0	0.0	0.0	0.0	0.0
Movement LOS	A	B			B	B	C					
Approach Volume, veh/h		704			871			124			0	
Approach Delay, s/veh		11.0			15.9			23.3			0.0	
Approach LOS		B			B			C				

Timer:	1	2	3	4	5	6	7	8
Assigned Phase		2		4			7	8
Case No		12.0		4.0			1.2	8.0
Phase Duration (G+Y+Rc), s		20.10		47.33			15.54	31.79
Change Period (Y+Rc), s		4.00		4.00			4.00	4.00
Max. Allowable Headway (MAH), s		5.54		5.25			3.80	5.25
Maximum Green Setting (Gmax), s		16.10		32.50			11.60	30.30
Max. Queue Clearance Time (g_c+I1), s		6.23		14.71			6.50	13.94
Green Extension Time (g_e), s		0.41		8.03			0.38	5.16
Probability of Phase Call (p_c)		1.000		1.000			0.995	1.000
Probability of Max Out (p_x)		0.077		0.397			0.431	0.441

Left-Turn Movement Data								
Assigned Movement		5					7	
Mvmt. Sat Flow, veh/h		160.53					1809.52	

Through Movement Data								
Assigned Movement		2		4				8
Mvmt. Sat Flow, veh/h		14.59		1900.00				3551.59

Right-Turn Movement Data								
Assigned Movement		12		14				18
Mvmt. Sat Flow, veh/h		1459.33		0.00				211.15

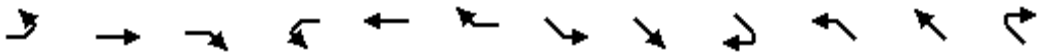
Left Lane Group Data								
Assigned Movement	0	5	0	0	0	0	7	0
Lane Assignment		L+T+R					L (Pr/Pm)	
Lanes in Group	0	1	0	0	0	0	1	0
Group Volume (v), veh/h	0.0	124.4	0.0	0.0	0.0	0.0	280.0	0.0
Group Sat. Flow (s), veh/h/ln	0.0	1634.4	0.0	0.0	0.0	0.0	1809.5	0.0
Queue Serve Time (g_s), s	0.0	4.2	0.0	0.0	0.0	0.0	4.5	0.0
Cycle Queue Clear Time (g_c), s	0.0	4.2	0.0	0.0	0.0	0.0	4.5	0.0

Perm LT Sat Flow Rate (s_l), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	646.0	0.0
Shared LT Sat Flow (s_sh), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Eff. Green (g_p), s	0.0	0.0	0.0	0.0	0.0	0.0	29.8	0.0
Perm LT Serve Time (g_u), s	0.0	0.0	0.0	0.0	0.0	0.0	15.9	0.0
Perm LT Que Serve Time (g_ps), s	0.0	0.0	0.0	0.0	0.0	0.0	5.4	0.0
Time to First Blk (g_f), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	27.8
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Proportion LT Inside Lane (P_L)	0.000	0.098	0.000	0.000	0.000	0.000	1.000	0.000
Lane Group Capacity (c), veh/h	0.0	390.2	0.0	0.0	0.0	0.0	568.3	0.0
Volume-to-Capacity Ratio (X)	0.000	0.319	0.000	0.000	0.000	0.000	0.493	0.000
Available Capacity (c_a), veh/h	0.0	390.2	0.0	0.0	0.0	0.0	569.9	0.0
Upstream Filter Factor (I)	0.000	1.000	0.000	0.000	0.000	0.000	0.933	0.000
Uniform Delay (d1), s/veh	0.0	21.1	0.0	0.0	0.0	0.0	5.1	0.0
Incremental Delay (d2), s/veh	0.0	2.1	0.0	0.0	0.0	0.0	0.6	0.0
Initial Queue Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	23.3	0.0	0.0	0.0	0.0	5.7	0.0
First-Term Queue (Q1), veh/ln	0.0	1.5	0.0	0.0	0.0	0.0	0.9	0.0
Second-Term Queue (Q2), veh/ln	0.0	0.2	0.0	0.0	0.0	0.0	0.1	0.0
Third-Term Queue (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentile bk-of-que factor (f_B%)	0.000	1.000	0.000	0.000	0.000	0.000	1.000	0.000
Percentile Back of Queue (Q%), veh/ln	0.0	1.8	0.0	0.0	0.0	0.0	1.0	0.0
Percentile Storage Ratio (RQ%)	0.00	0.06	0.00	0.00	0.00	0.00	0.15	0.00
Initial Queue (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Queue (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Queue (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Capacity (cs), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Initial Queue Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Middle Lane Group Data								
Assigned Movement	0	2	0	4	0	0	0	8
Lane Assignment				T				T
Lanes in Group	0	0	0	1	0	0	0	1
Group Volume (v), veh/h	0.0	0.0	0.0	424.4	0.0	0.0	0.0	439.8
Group Sat. Flow (s), veh/h/ln	0.0	0.0	0.0	1900.0	0.0	0.0	0.0	1900.0
Queue Serve Time (g_s), s	0.0	0.0	0.0	12.7	0.0	0.0	0.0	11.9
Cycle Queue Clear Time (g_c), s	0.0	0.0	0.0	12.7	0.0	0.0	0.0	11.9
Lane Group Capacity (c), veh/h	0.0	0.0	0.0	1221.0	0.0	0.0	0.0	783.1
Volume-to-Capacity Ratio (X)	0.000	0.000	0.000	0.348	0.000	0.000	0.000	0.562
Available Capacity (c_a), veh/h	0.0	0.0	0.0	1221.0	0.0	0.0	0.0	853.7
Upstream Filter Factor (I)	0.000	0.000	0.000	0.933	0.000	0.000	0.000	1.000
Uniform Delay (d1), s/veh	0.0	0.0	0.0	14.3	0.0	0.0	0.0	15.2
Incremental Delay (d2), s/veh	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.7
Initial Queue Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	0.0	0.0	14.5	0.0	0.0	0.0	15.9
First-Term Queue (Q1), veh/ln	0.0	0.0	0.0	6.2	0.0	0.0	0.0	4.7
Second-Term Queue (Q2), veh/ln	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.2
Third-Term Queue (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentile bk-of-que factor (f_B%)	0.000	1.000	0.000	1.000	0.000	0.000	0.000	1.000
Percentile Back of Queue (Q%), veh/ln	0.0	0.0	0.0	6.3	0.0	0.0	0.0	4.8
Percentile Storage Ratio (RQ%)	0.00	0.00	0.00	0.98	0.00	0.00	0.00	0.43

Initial Queue (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Queue (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Queue (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Capacity (cs), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Initial Queue Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Right Lane Group Data								
Assigned Movement	0	12	0	14	0	0	0	18
Lane Assignment								T+R
Lanes in Group	0	0	0	0	0	0	0	1
Group Volume (v), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	431.3
Group Sat. Flow (s), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1862.7
Queue Serve Time (g_s), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.9
Cycle Queue Clear Time (g_c), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.9
Prot RT Sat Flow Rate (s_R), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prot RT Eff. Green (g_R), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Proportion RT Outside Lane (P_R)	0.000	0.893	0.000	0.000	0.000	0.000	0.000	0.113
Lane Group Capacity (c), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	767.8
Volume-to-Capacity Ratio (X)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.562
Available Capacity (c_a), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	837.0
Upstream Filter Factor (I)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000
Uniform Delay (d1), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.2
Incremental Delay (d2), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7
Initial Queue Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.9
First-Term Queue (Q1), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.6
Second-Term Queue (Q2), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Third-Term Queue (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentile bk-of-que factor (f_B%)	0.000	1.000	0.000	1.000	0.000	0.000	0.000	1.000
Percentile Back of Queue (Q%), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.7
Percentile Storage Ratio (RQ%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.42
Initial Queue (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Queue (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Queue (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Capacity (cs), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Initial Queue Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Intersection Summary	
HCM Average Control Delay	14.4
HCM Level of Service	B

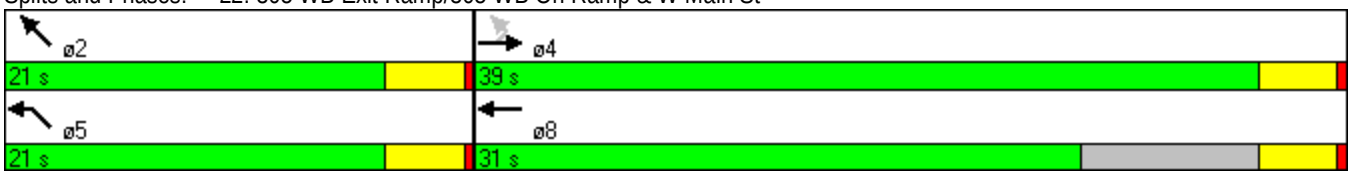


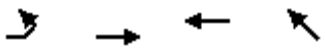
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	20	482	0	0	468	340	0	0	0	316	1	51
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	50		0	0		150	0		0	0		150
Storage Lanes	1		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.943						0.981	
Flt Protected	0.950										0.959	
Satd. Flow (prot)	1805	1900	0	0	1792	0	0	0	0	0	1787	0
Flt Permitted	0.126										0.959	
Satd. Flow (perm)	239	1900	0	0	1792	0	0	0	0	0	1787	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					105						14	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1936			227			367			472	
Travel Time (s)		44.0			5.2			8.3			10.7	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	22	536	0	0	520	378	0	0	0	351	1	57
Shared Lane Traffic (%)												
Lane Group Flow (vph)	22	536	0	0	898	0	0	0	0	0	409	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2			2					1	2	
Detector Template	Left	Thru			Thru					Left	Thru	
Leading Detector (ft)	20	100			100					20	100	
Trailing Detector (ft)	0	0			0					0	0	
Detector 1 Position(ft)	0	0			0					0	0	
Detector 1 Size(ft)	20	6			6					20	6	
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex					Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0					0.0	0.0	
Detector 1 Queue (s)	0.0	0.0			0.0					0.0	0.0	
Detector 1 Delay (s)	0.0	0.0			0.0					0.0	0.0	
Detector 2 Position(ft)		94			94						94	
Detector 2 Size(ft)		6			6						6	
Detector 2 Type		Cl+Ex			Cl+Ex						Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0						0.0	
Turn Type	Perm	NA			NA					Prot	NA	
Protected Phases		4			8					5	2	
Permitted Phases	4											
Detector Phase	4	4			8					5	2	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Switch Phase												
Minimum Initial (s)	4.0	4.0			4.0					4.0	4.0	
Minimum Split (s)	28.0	28.0			28.0					20.0	20.0	
Total Split (s)	39.0	39.0	0.0	0.0	31.0	0.0	0.0	0.0	0.0	21.0	21.0	0.0
Total Split (%)	65.0%	65.0%	0.0%	0.0%	51.7%	0.0%	0.0%	0.0%	0.0%	35.0%	35.0%	0.0%
Maximum Green (s)	35.0	35.0			27.0					17.0	17.0	
Yellow Time (s)	3.5	3.5			3.5					3.5	3.5	
All-Red Time (s)	0.5	0.5			0.5					0.5	0.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0			3.0					3.0	3.0	
Recall Mode	None	None			None					Min	C-Min	
Walk Time (s)	7.0	7.0			7.0							
Flash Dont Walk (s)	17.0	17.0			17.0							
Pedestrian Calls (#/hr)	0	0			0							
Act Effct Green (s)	31.7	31.7			31.7						20.3	
Actuated g/C Ratio	0.53	0.53			0.53						0.34	
v/c Ratio	0.17	0.53			0.90						0.67	
Control Delay	9.8	10.9			24.6						25.5	
Queue Delay	0.0	0.0			0.0						0.0	
Total Delay	9.8	10.9			24.6						25.5	
LOS	A	B			C						C	
Approach Delay		10.9			24.6						25.5	
Approach LOS		B			C						C	
Queue Length 50th (ft)	3	99			202						131	
Queue Length 95th (ft)	14	163			#456						#264	
Internal Link Dist (ft)		1856			147			287			392	
Turn Bay Length (ft)	50											
Base Capacity (vph)	139	1108			1089						613	
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	0.16	0.48			0.82						0.67	

Intersection Summary			
Area Type:	Other		
Cycle Length: 60			
Actuated Cycle Length: 60			
Offset: 0 (0%), Referenced to phase 2:NWT and 6:, Start of Green			
Natural Cycle: 60			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.90			
Intersection Signal Delay: 20.7		Intersection LOS: C	
Intersection Capacity Utilization 72.7%		ICU Level of Service C	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 22: 305 WB Exit Ramp/305 WB On Ramp & W Main St





Lane Group	EBL	EBT	WBT	NWT
Lane Group Flow (vph)	22	536	898	409
v/c Ratio	0.17	0.53	0.90	0.67
Control Delay	9.8	10.9	24.6	25.5
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	9.8	10.9	24.6	25.5
Queue Length 50th (ft)	3	99	202	131
Queue Length 95th (ft)	14	163	#456	#264
Internal Link Dist (ft)		1856	147	392
Turn Bay Length (ft)	50			
Base Capacity (vph)	139	1108	1089	613
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	0.16	0.48	0.82	0.67

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	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	20	482	0	0	468	340	0	0	0	316	1	51
Movement Number	7	4	14	3	8	18	1	6	16	5	2	12
Initial Queue, veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj. Factor (A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking, Bus Adj. Factors	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Sat. Flow Rate, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lanes	1	1	0	0	1	0	0	0	0	0	1	0
Lane Assignment												
Capacity, veh/h	147	1004	0	0	541	393	0	0	0	0	11	537
Proportion Arriving On Green	0.53	0.53	0.00	0.00	0.53	0.53	0.00	0.00	0.00	0.00	0.34	0.34
Movement Delay, s/veh	29.0	9.8	0.0	0.0	0.0	34.0	0.0	0.0	0.0	0.0	0.0	13.7
Movement LOS	C	A				C						B
Approach Volume, veh/h		558			898			0			58	
Approach Delay, s/veh		10.6			34.0			0.0			13.7	
Approach LOS		B			C						B	

Timer:	1	2	3	4	5	6	7	8
Assigned Phase		2		4				8
Case No		4.0		6.0				8.0
Phase Duration (G+Y+Rc), s		24.30		35.70				35.70
Change Period (Y+Rc), s		4.00		4.00				4.00
Max. Allowable Headway (MAH), s		5.56		5.34				5.34
Maximum Green Setting (Gmax), s		20.30		31.70				31.70
Max. Queue Clearance Time (g_c+I1), s		3.47		33.28				31.17
Green Extension Time (g_e), s		0.20		0.00				0.44
Probability of Phase Call (p_c)		1.000		1.000				1.000
Probability of Max Out (p_x)		0.000		1.000				1.000

Left-Turn Movement Data												
Assigned Movement					7							
Mvmt. Sat Flow, veh/h					630.03							

Through Movement Data												
Assigned Movement			2		4				8			
Mvmt. Sat Flow, veh/h			31.15		1900.00				1024.42			

Right-Turn Movement Data												
Assigned Movement			12		14				18			
Mvmt. Sat Flow, veh/h			1588.52		0.00				744.24			

Left Lane Group Data												
Assigned Movement	0	0	0	7	0	0	0	0				
Lane Assignment				L								
Lanes in Group	0	0	0	1	0	0	0	0				
Group Volume (v), veh/h	0.0	0.0	0.0	22.2	0.0	0.0	0.0	0.0				
Group Sat. Flow (s), veh/h/ln	0.0	0.0	0.0	630.0	0.0	0.0	0.0	0.0				
Queue Serve Time (g_s), s	0.0	0.0	0.0	2.1	0.0	0.0	0.0	0.0				
Cycle Queue Clear Time (g_c), s	0.0	0.0	0.0	31.3	0.0	0.0	0.0	0.0				

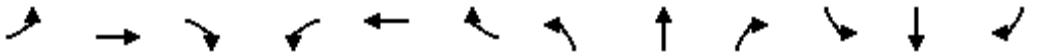
Perm LT Sat Flow Rate (s_l), veh/h/ln	0.0	0.0	0.0	630.0	0.0	0.0	0.0	0.0
Shared LT Sat Flow (s_sh), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Eff. Green (g_p), s	0.0	0.0	0.0	31.7	0.0	0.0	0.0	0.0
Perm LT Serve Time (g_u), s	0.0	0.0	0.0	2.5	0.0	0.0	0.0	0.0
Perm LT Que Serve Time (g_ps), s	0.0	0.0	0.0	2.1	0.0	0.0	0.0	0.0
Time to First Blk (g_f), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	31.7
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Proportion LT Inside Lane (P_L)	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
Lane Group Capacity (c), veh/h	0.0	0.0	0.0	146.5	0.0	0.0	0.0	0.0
Volume-to-Capacity Ratio (X)	0.000	0.000	0.000	0.152	0.000	0.000	0.000	0.000
Available Capacity (c_a), veh/h	0.0	0.0	0.0	146.5	0.0	0.0	0.0	0.0
Upstream Filter Factor (I)	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
Uniform Delay (d1), s/veh	0.0	0.0	0.0	28.5	0.0	0.0	0.0	0.0
Incremental Delay (d2), s/veh	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0
Initial Queue Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	0.0	0.0	29.0	0.0	0.0	0.0	0.0
First-Term Queue (Q1), veh/ln	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0
Second-Term Queue (Q2), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Third-Term Queue (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentile bk-of-que factor (f_B%)	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
Percentile Back of Queue (Q%), veh/ln	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0
Percentile Storage Ratio (RQ%)	0.00	0.00	0.00	0.16	0.00	0.00	0.00	0.00
Initial Queue (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Queue (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Queue (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Capacity (cs), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Initial Queue Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Middle Lane Group Data								
Assigned Movement	0	2	0	4	0	0	0	8
Lane Assignment				T				
Lanes in Group	0	0	0	1	0	0	0	0
Group Volume (v), veh/h	0.0	0.0	0.0	535.6	0.0	0.0	0.0	0.0
Group Sat. Flow (s), veh/h/ln	0.0	0.0	0.0	1900.0	0.0	0.0	0.0	0.0
Queue Serve Time (g_s), s	0.0	0.0	0.0	11.1	0.0	0.0	0.0	0.0
Cycle Queue Clear Time (g_c), s	0.0	0.0	0.0	11.1	0.0	0.0	0.0	0.0
Lane Group Capacity (c), veh/h	0.0	0.0	0.0	1003.8	0.0	0.0	0.0	0.0
Volume-to-Capacity Ratio (X)	0.000	0.000	0.000	0.534	0.000	0.000	0.000	0.000
Available Capacity (c_a), veh/h	0.0	0.0	0.0	1003.8	0.0	0.0	0.0	0.0
Upstream Filter Factor (I)	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
Uniform Delay (d1), s/veh	0.0	0.0	0.0	9.3	0.0	0.0	0.0	0.0
Incremental Delay (d2), s/veh	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0
Initial Queue Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	0.0	0.0	9.8	0.0	0.0	0.0	0.0
First-Term Queue (Q1), veh/ln	0.0	0.0	0.0	3.7	0.0	0.0	0.0	0.0
Second-Term Queue (Q2), veh/ln	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0
Third-Term Queue (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentile bk-of-que factor (f_B%)	0.000	1.000	0.000	1.000	0.000	0.000	0.000	1.000
Percentile Back of Queue (Q%), veh/ln	0.0	0.0	0.0	3.9	0.0	0.0	0.0	0.0
Percentile Storage Ratio (RQ%)	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00

Initial Queue (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Queue (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Queue (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Capacity (cs), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Initial Queue Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

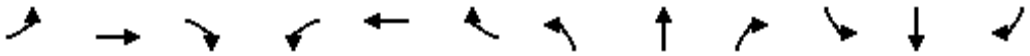
Right Lane Group Data								
Assigned Movement	0	12	0	14	0	0	0	18
Lane Assignment		T+R						T+R
Lanes in Group	0	1	0	0	0	0	0	1
Group Volume (v), veh/h	0.0	57.8	0.0	0.0	0.0	0.0	0.0	897.8
Group Sat. Flow (s), veh/h/ln	0.0	1619.7	0.0	0.0	0.0	0.0	0.0	1768.7
Queue Serve Time (g_s), s	0.0	1.5	0.0	0.0	0.0	0.0	0.0	29.2
Cycle Queue Clear Time (g_c), s	0.0	1.5	0.0	0.0	0.0	0.0	0.0	29.2
Prot RT Sat Flow Rate (s_R), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prot RT Eff. Green (g_R), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Proportion RT Outside Lane (P_R)	0.000	0.981	0.000	0.000	0.000	0.000	0.000	0.421
Lane Group Capacity (c), veh/h	0.0	548.0	0.0	0.0	0.0	0.0	0.0	934.4
Volume-to-Capacity Ratio (X)	0.000	0.105	0.000	0.000	0.000	0.000	0.000	0.961
Available Capacity (c_a), veh/h	0.0	548.0	0.0	0.0	0.0	0.0	0.0	934.4
Upstream Filter Factor (I)	0.000	1.000	0.000	0.000	0.000	0.000	0.000	1.000
Uniform Delay (d1), s/veh	0.0	13.6	0.0	0.0	0.0	0.0	0.0	13.6
Incremental Delay (d2), s/veh	0.0	0.1	0.0	0.0	0.0	0.0	0.0	20.5
Initial Queue Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	13.7	0.0	0.0	0.0	0.0	0.0	34.0
First-Term Queue (Q1), veh/ln	0.0	0.5	0.0	0.0	0.0	0.0	0.0	9.1
Second-Term Queue (Q2), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.3
Third-Term Queue (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentile bk-of-que factor (f_B%)	0.000	1.000	0.000	1.000	0.000	0.000	0.000	1.000
Percentile Back of Queue (Q%), veh/ln	0.0	0.5	0.0	0.0	0.0	0.0	0.0	14.4
Percentile Storage Ratio (RQ%)	0.00	0.03	0.00	0.00	0.00	0.00	0.00	2.01
Initial Queue (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Queue (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Queue (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Capacity (cs), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Initial Queue Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Intersection Summary	
HCM Average Control Delay	24.6
HCM Level of Service	C



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	376	0	272	10	0	10	0	157	0	0	198	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		0%			0%			-5%			0%	
Storage Length (ft)	0		50	20		0	0		0	0		0
Storage Lanes	1		1	1		1	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850						
Flt Protected	0.950			0.950								
Satd. Flow (prot)	1770	0	1583	1770	0	1583	0	1909	0	0	1863	0
Flt Permitted	0.950			0.950								
Satd. Flow (perm)	1770	0	1583	1770	0	1583	0	1909	0	0	1863	0
Link Speed (mph)		30			30			35			25	
Link Distance (ft)		266			202			321			201	
Travel Time (s)		6.0			4.6			6.3			5.5	
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
Adj. Flow (vph)	409	0	296	11	0	11	0	171	0	0	215	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	409	0	296	11	0	11	0	171	0	0	215	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.97	0.97	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Free			Free	

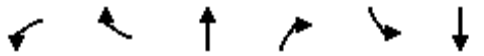
Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 42.4%		ICU Level of Service A	
Analysis Period (min) 15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	376	0	272	10	0	10	0	157	0	0	198	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			-5%			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
Hourly flow rate (vph)	409	0	296	11	0	11	0	171	0	0	215	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)			2									
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											716	
pX, platoon unblocked												
vC, conflicting volume	397	386	215	386	386	171	215			171		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	397	386	215	386	386	171	215			171		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	27	100	64	97	100	99	100			100		
cM capacity (veh/h)	556	548	825	367	548	873	1355			1407		

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1
Volume Total	704	11	11	171	215
Volume Left	409	11	0	0	0
Volume Right	296	0	11	0	0
cSH	801	367	873	1700	1700
Volume to Capacity	0.88	0.03	0.01	0.10	0.13
Queue Length 95th (ft)	282	2	1	0	0
Control Delay (s)	32.4	15.1	9.2	0.0	0.0
Lane LOS	D	C	A		
Approach Delay (s)	32.4	12.1		0.0	0.0
Approach LOS	D	B			

Intersection Summary				
Average Delay	20.8			
Intersection Capacity Utilization	42.4%	ICU Level of Service	A	
Analysis Period (min)	15			



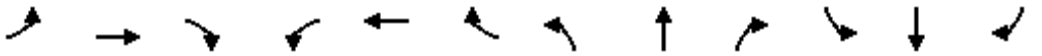
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	0	0	647	162	102	300
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	0%		-1%			0%
Storage Length (ft)	0	0		0	75	
Storage Lanes	0	0		0	1	
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.973			
Flt Protected					0.950	
Satd. Flow (prot)	0	0	1822	0	1770	1863
Flt Permitted					0.950	
Satd. Flow (perm)	0	0	1822	0	1770	1863
Link Speed (mph)	30		35			35
Link Distance (ft)	392		180			238
Travel Time (s)	8.9		3.5			4.6
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	703	176	111	326
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	879	0	111	326
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	0		12			12
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	1.00	1.00	0.99	0.99	1.00	1.00
Turning Speed (mph)	15	9		9	15	
Sign Control	Stop		Free			Free

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 102.9%		ICU Level of Service G	
Analysis Period (min) 15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	0	0	647	162	102	300
Sign Control	Stop		Free			Free
Grade	0%		-1%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	703	176	111	326
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						238
pX, platoon unblocked	0.92					
vC, conflicting volume	1339	791			879	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1326	791			879	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			86	
cM capacity (veh/h)	136	389			768	

Direction, Lane #	NB 1	SB 1	SB 2
Volume Total	879	111	326
Volume Left	0	111	0
Volume Right	176	0	0
cSH	1700	768	1700
Volume to Capacity	0.52	0.14	0.19
Queue Length 95th (ft)	0	13	0
Control Delay (s)	0.0	10.5	0.0
Lane LOS		B	
Approach Delay (s)	0.0	2.7	
Approach LOS			

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	102.9%	ICU Level of Service	G
Analysis Period (min)	15		

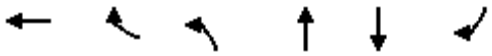


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	120	1	440	320	327	0	0	289	470
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		0%			0%			-1%			0%	
Storage Length (ft)	0		0	50		50	75		0	0		50
Storage Lanes	0		0	0		1	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.850						0.850
Flt Protected					0.953		0.950					
Satd. Flow (prot)	0	0	0	0	1775	1583	1778	1872	0	0	1863	1583
Flt Permitted					0.953		0.411					
Satd. Flow (perm)	0	0	0	0	1775	1583	769	1872	0	0	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						453						352
Link Speed (mph)		30			30			35			35	
Link Distance (ft)		283			303			238			203	
Travel Time (s)		6.4			6.9			4.6			4.0	
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
Adj. Flow (vph)	0	0	0	130	1	478	348	355	0	0	314	511
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	131	478	348	355	0	0	314	511
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.99	0.99	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1	2	1	1	2			2	1
Detector Template				Left	Thru	Right	Left	Thru			Thru	Right
Leading Detector (ft)				20	100	20	20	100			100	20
Trailing Detector (ft)				0	0	0	0	0			0	0
Detector 1 Position(ft)				0	0	0	0	0			0	0
Detector 1 Size(ft)				20	6	20	20	6			6	20
Detector 1 Type				Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Queue (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Delay (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 2 Position(ft)					94			94			94	
Detector 2 Size(ft)					6			6			6	
Detector 2 Type					Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)					0.0			0.0			0.0	
Turn Type				Split	NA	Perm	pm+pt	NA			NA	Free
Protected Phases				8	8		5	2			6	
Permitted Phases						8	2					Free

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase				8	8	8	5	2			6	
Switch Phase												
Minimum Initial (s)				4.0	4.0	4.0	4.0	4.0			4.0	
Minimum Split (s)				20.0	20.0	20.0	8.0	20.0			20.0	
Total Split (s)				20.0	20.0	20.0	10.0	30.0			20.0	
Total Split (%)				40.0%	40.0%	40.0%	20.0%	60.0%			40.0%	
Maximum Green (s)				16.0	16.0	16.0	6.0	26.0			16.0	
Yellow Time (s)				3.5	3.5	3.5	3.5	3.5			3.5	
All-Red Time (s)				0.5	0.5	0.5	0.5	0.5			0.5	
Lost Time Adjust (s)					0.0	0.0	0.0	0.0			0.0	
Total Lost Time (s)					4.0	4.0	4.0	4.0			4.0	
Lead/Lag							Lead				Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)				3.0	3.0	3.0	3.0	3.0			3.0	
Recall Mode				None	None	None	None	C-Max			C-Max	
Act Effct Green (s)					10.3	10.3	31.7	31.7			19.3	50.0
Actuated g/C Ratio					0.21	0.21	0.63	0.63			0.39	1.00
v/c Ratio					0.36	0.70	0.53	0.30			0.44	0.32
Control Delay					18.3	8.4	9.7	6.0			15.1	0.5
Queue Delay					0.0	0.0	0.0	0.0			0.0	0.0
Total Delay					18.3	8.4	9.7	6.0			15.1	0.5
LOS					B	A	A	A			B	A
Approach Delay					10.5			7.8			6.1	
Approach LOS					B			A			A	

Intersection Summary			
Area Type:	Other		
Cycle Length: 50			
Actuated Cycle Length: 50			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Yellow			
Natural Cycle: 55			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.70			
Intersection Signal Delay: 7.9		Intersection LOS: A	
Intersection Capacity Utilization 96.4%		ICU Level of Service F	
Analysis Period (min) 15			

Splits and Phases: 3: Broad St & 307 WB On Ramp/307 WB Exit Ramp



Lane Group	WBT	WBR	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	131	478	348	355	314	511
v/c Ratio	0.36	0.70	0.53	0.30	0.44	0.32
Control Delay	18.3	8.4	9.7	6.0	15.1	0.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.3	8.4	9.7	6.0	15.1	0.5
Queue Length 50th (ft)	33	6	36	36	69	0
Queue Length 95th (ft)	60	58	#109	99	135	0
Internal Link Dist (ft)	223			158	123	
Turn Bay Length (ft)		50	75			50
Base Capacity (vph)	568	815	656	1187	721	1583
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.23	0.59	0.53	0.30	0.44	0.32

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												
Volume (vph)	0	0	0	120	1	440	320	327	0	0	289	470
Movement Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Queue, veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj. Factor (A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking, Bus Adj. Factors	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Sat. Flow Rate, veh/h/ln	1900	1900	1900	1863	1863	1863	1872	1872	1900	1900	1863	1863
Lanes	0	0	0	0	1	1	1	1	0	0	1	1
Lane Assignment												
Capacity, veh/h	0	0	0	363	3	326	0	1187	0	0	1181	1004
Proportion Arriving On Green	0.00	0.00	0.00	0.21	0.21	0.21	0.00	0.63	0.00	0.00	0.63	0.63
Movement Delay, s/veh	0.0	0.0	0.0	17.6	0.0	245.8	0.0	4.8	0.0	0.0	4.6	6.8
Movement LOS				B		F		A			A	A
Approach Volume, veh/h		0			610			355			825	
Approach Delay, s/veh		0.0			196.6			4.8			5.9	
Approach LOS					F			A			A	

Timer:	1	2	3	4	5	6	7	8
Assigned Phase		2	8			6		
Case No		4.0	11.0			7.0		
Phase Duration (G+Y+Rc), s		35.70	14.30			35.70		
Change Period (Y+Rc), s		4.00	4.00			4.00		
Max. Allowable Headway (MAH), s		4.62	4.31			4.62		
Maximum Green Setting (Gmax), s		31.70	10.30			19.30		
Max. Queue Clearance Time (g_c+I1), s		6.29	12.30			10.72		
Green Extension Time (g_e), s		6.46	0.00			3.90		
Probability of Phase Call (p_c)		1.000	1.000			1.000		
Probability of Max Out (p_x)		0.084	1.000			0.624		

Left-Turn Movement Data								
Assigned Movement			3					
Mvmt. Sat Flow, veh/h			1760.07					

Through Movement Data								
Assigned Movement		2	8			6		
Mvmt. Sat Flow, veh/h		1872.06	14.67			1862.75		

Right-Turn Movement Data								
Assigned Movement		12	18			16		
Mvmt. Sat Flow, veh/h		0.00	1583.33			1583.33		

Left Lane Group Data								
Assigned Movement	0	0	3	0	0	0	0	0
Lane Assignment			L+T					
Lanes in Group	0	0	1	0	0	0	0	0
Group Volume (v), veh/h	0.0	0.0	131.5	0.0	0.0	0.0	0.0	0.0
Group Sat. Flow (s), veh/h/ln	0.0	0.0	1774.7	0.0	0.0	0.0	0.0	0.0
Queue Serve Time (g_s), s	0.0	0.0	3.2	0.0	0.0	0.0	0.0	0.0
Cycle Queue Clear Time (g_c), s	0.0	0.0	3.2	0.0	0.0	0.0	0.0	0.0

Perm LT Sat Flow Rate (s_l), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shared LT Sat Flow (s_sh), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Eff. Green (g_p), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Serve Time (g_u), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Que Serve Time (g_ps), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Time to First Blk (g_f), s	0.0	0.0	0.0	0.0	0.0	31.7	0.0	0.0
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Proportion LT Inside Lane (P_L)	0.000	0.000	0.992	0.000	0.000	0.000	0.000	0.000
Lane Group Capacity (c), veh/h	0.0	0.0	365.6	0.0	0.0	0.0	0.0	0.0
Volume-to-Capacity Ratio (X)	0.000	0.000	0.360	0.000	0.000	0.000	0.000	0.000
Available Capacity (c_a), veh/h	0.0	0.0	365.6	0.0	0.0	0.0	0.0	0.0
Upstream Filter Factor (I)	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000
Uniform Delay (d1), s/veh	0.0	0.0	17.0	0.0	0.0	0.0	0.0	0.0
Incremental Delay (d2), s/veh	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0
Initial Queue Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	0.0	17.6	0.0	0.0	0.0	0.0	0.0
First-Term Queue (Q1), veh/ln	0.0	0.0	1.2	0.0	0.0	0.0	0.0	0.0
Second-Term Queue (Q2), veh/ln	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
Third-Term Queue (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentile bk-of-que factor (f_B%)	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000
Percentile Back of Queue (Q%), veh/ln	0.0	0.0	1.2	0.0	0.0	0.0	0.0	0.0
Percentile Storage Ratio (RQ%)	0.00	0.00	0.12	0.00	0.00	0.00	0.00	0.00
Initial Queue (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Queue (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Queue (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Capacity (cs), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Initial Queue Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Middle Lane Group Data								
Assigned Movement	0	2	8	0	0	6	0	0
Lane Assignment		T				T		
Lanes in Group	0	1	0	0	0	1	0	0
Group Volume (v), veh/h	0.0	355.4	0.0	0.0	0.0	314.1	0.0	0.0
Group Sat. Flow (s), veh/h/ln	0.0	1872.1	0.0	0.0	0.0	1862.7	0.0	0.0
Queue Serve Time (g_s), s	0.0	4.3	0.0	0.0	0.0	3.7	0.0	0.0
Cycle Queue Clear Time (g_c), s	0.0	4.3	0.0	0.0	0.0	3.7	0.0	0.0
Lane Group Capacity (c), veh/h	0.0	1186.9	0.0	0.0	0.0	1181.0	0.0	0.0
Volume-to-Capacity Ratio (X)	0.000	0.299	0.000	0.000	0.000	0.266	0.000	0.000
Available Capacity (c_a), veh/h	0.0	1186.9	0.0	0.0	0.0	1181.0	0.0	0.0
Upstream Filter Factor (I)	0.000	1.000	0.000	0.000	0.000	1.000	0.000	0.000
Uniform Delay (d1), s/veh	0.0	4.1	0.0	0.0	0.0	4.0	0.0	0.0
Incremental Delay (d2), s/veh	0.0	0.6	0.0	0.0	0.0	0.6	0.0	0.0
Initial Queue Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	4.8	0.0	0.0	0.0	4.6	0.0	0.0
First-Term Queue (Q1), veh/ln	0.0	0.9	0.0	0.0	0.0	0.7	0.0	0.0
Second-Term Queue (Q2), veh/ln	0.0	0.2	0.0	0.0	0.0	0.2	0.0	0.0
Third-Term Queue (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentile bk-of-que factor (f_B%)	0.000	1.000	1.000	0.000	0.000	1.000	0.000	0.000
Percentile Back of Queue (Q%), veh/ln	0.0	1.1	0.0	0.0	0.0	0.9	0.0	0.0
Percentile Storage Ratio (RQ%)	0.00	0.14	0.00	0.00	0.00	0.17	0.00	0.00

Initial Queue (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Queue (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Queue (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Capacity (cs), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Initial Queue Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Right Lane Group Data								
Assigned Movement	0	12	18	0	0	16	0	0
Lane Assignment			R			R		
Lanes in Group	0	0	1	0	0	1	0	0
Group Volume (v), veh/h	0.0	0.0	478.3	0.0	0.0	510.9	0.0	0.0
Group Sat. Flow (s), veh/h/ln	0.0	0.0	1583.3	0.0	0.0	1583.3	0.0	0.0
Queue Serve Time (g_s), s	0.0	0.0	10.3	0.0	0.0	8.7	0.0	0.0
Cycle Queue Clear Time (g_c), s	0.0	0.0	10.3	0.0	0.0	8.7	0.0	0.0
Prot RT Sat Flow Rate (s_R), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prot RT Eff. Green (g_R), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Proportion RT Outside Lane (P_R)	0.000	0.000	1.000	0.000	0.000	1.000	0.000	0.000
Lane Group Capacity (c), veh/h	0.0	0.0	326.2	0.0	0.0	1003.8	0.0	0.0
Volume-to-Capacity Ratio (X)	0.000	0.000	1.466	0.000	0.000	0.509	0.000	0.000
Available Capacity (c_a), veh/h	0.0	0.0	326.2	0.0	0.0	1003.8	0.0	0.0
Upstream Filter Factor (I)	0.000	0.000	1.000	0.000	0.000	1.000	0.000	0.000
Uniform Delay (d1), s/veh	0.0	0.0	19.9	0.0	0.0	4.9	0.0	0.0
Incremental Delay (d2), s/veh	0.0	0.0	226.0	0.0	0.0	1.8	0.0	0.0
Initial Queue Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	0.0	245.8	0.0	0.0	6.8	0.0	0.0
First-Term Queue (Q1), veh/ln	0.0	0.0	3.3	0.0	0.0	1.5	0.0	0.0
Second-Term Queue (Q2), veh/ln	0.0	0.0	20.5	0.0	0.0	0.5	0.0	0.0
Third-Term Queue (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentile bk-of-que factor (f_B%)	0.000	1.000	1.000	0.000	0.000	1.000	0.000	0.000
Percentile Back of Queue (Q%), veh/ln	0.0	0.0	23.8	0.0	0.0	2.0	0.0	0.0
Percentile Storage Ratio (RQ%)	0.00	0.00	12.10	0.00	0.00	1.02	0.00	0.00
Initial Queue (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Queue (Qe), veh	0.0	0.0	38.0	0.0	0.0	0.0	0.0	0.0
Saturated Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Queue (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Capacity (cs), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Initial Queue Clear Time (tc), h	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0

Intersection Summary	
HCM Average Control Delay	70.7
HCM Level of Service	E

BUILD ALTERNATIVE ‘B’ ANALYSIS (MODIFIED CONFIGURATIONS)

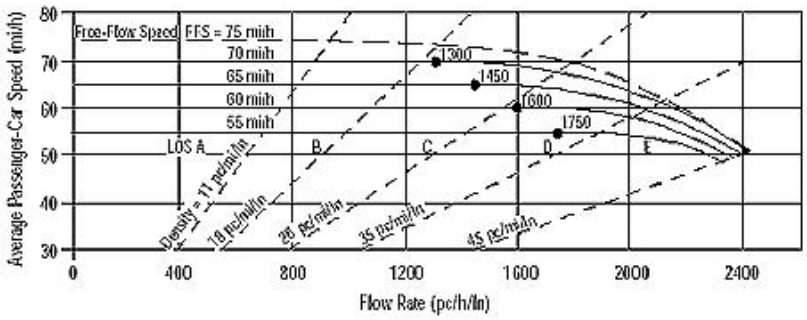
Build Alternatives Analysis Notes:

Alternative A analysis performed as baseline alternatives analysis for all build alternatives.

The following Alternative B analysis incorporates modified ramp junction, weave section, or intersection analysis specific to the alternative.

FREEWAY SEGMENT
HCS ANALYSIS

BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		***Site Information***	
Analyst	*AJM*	Highway/Direction of Travel	*I-80 Westbound*
Agency or Company	*AECOM*	From/To	*Between 304 and 305 Merges*
Date Performed	*8/1/2013*	Jurisdiction	
Analysis Time Period	*A.M. Peak Hour*	Analysis Year	*Alt1B 2045*

Project Description Interstate 80 Reconstruction

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs				
Volume, V	*1994*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*12*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*0.95*		Up/Down %	

Calculate Flow Adjustments			
f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.840*

Speed Inputs			**Calc Speed Adj and FFS**		
Lane Width	*12.0*	ft	f_{LW}	*0.0*	mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}	*0.0*	mi/h
Interchange Density	*1.67*	l/mi	f_{ID}	*5.9*	mi/h
Number of Lanes, N	*3*		f_N	*3.0*	mi/h
FFS (measured)		mi/h	FFS	*61.1*	mi/h
Base free-flow Speed, BFFS	*70.0*	mi/h			

LOS and Performance Measures			**Design (N)**	
Operational (LOS)			Design (N)	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*876*	pc/h/ln	Design LOS v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	*61.1*	mi/h	S	mi/h
D = v_p / S	*14.3*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*B*		Required Number of Lanes, N	

Glossary		**Factor Location**	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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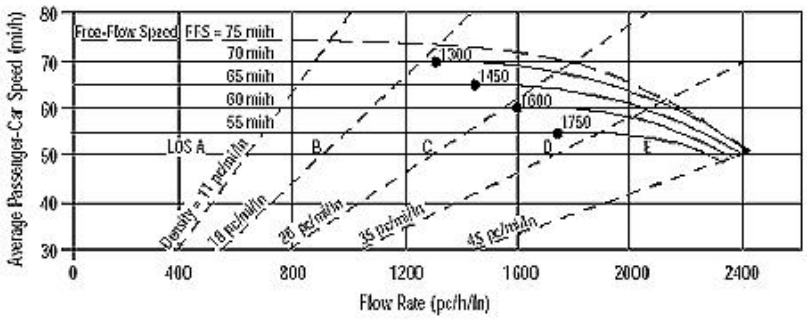
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		***Site Information***	
Analyst	*AJM*	Highway/Direction of Travel	*I-80 Westbound*
Agency or Company	*AECOM*	From/To	*Between 304 and 305 Diverges*
Date Performed	*8/1/2013*	Jurisdiction	
Analysis Time Period	*A.M. Peak Hour*	Analysis Year	*Alt1B 2045*

Project Description Interstate 80 Reconstruction

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs				
Volume, V	*2927*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*12*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*0.95*		Up/Down %	

Calculate Flow Adjustments			
f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.840*

Speed Inputs			**Calc Speed Adj and FFS**		
Lane Width	*12.0*	ft	f_{LW}	*0.0*	mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}	*0.0*	mi/h
Interchange Density	*1.67*	I/mi	f_{ID}	*5.9*	mi/h
Number of Lanes, N	*4*		f_N	*1.5*	mi/h
FFS (measured)		mi/h	FFS	*62.6*	mi/h
Base free-flow Speed, BFFS	*70.0*	mi/h			

LOS and Performance Measures			**Design (N)**		
Operational (LOS)			Design (N)		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*965*	pc/h/ln	Design LOS v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S	*62.6*	mi/h	S		mi/h
D = v_p / S	*15.4*	pc/mi/ln	D = v_p / S		pc/mi/ln
LOS	*B*		Required Number of Lanes, N		

Glossary		**Factor Location**	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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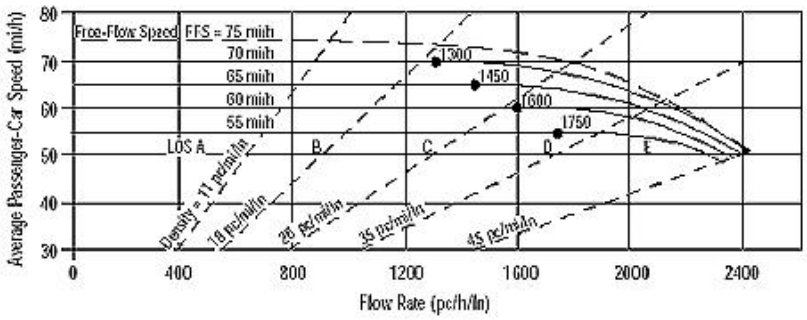
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		***Site Information***	
Analyst	*AJM*	Highway/Direction of Travel	*I-80 Westbound*
Agency or Company	*AECOM*	From/To	*Between 304 and 305 Merges*
Date Performed	*8/1/2013*	Jurisdiction	
Analysis Time Period	*P.M. Peak Hour*	Analysis Year	*Alt1B 2045*

Project Description Interstate 80 Reconstruction

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs				
Volume, V	*4225*	veh/h	Peak-Hour Factor, PHF	*0.97*
AADT		veh/day	%Trucks and Buses, P_T	*13*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*0.95*		Up/Down %	

Calculate Flow Adjustments			
f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.830*

Speed Inputs			**Calc Speed Adj and FFS**		
Lane Width	*12.0*	ft	f_{LW}	*0.0*	mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}	*0.0*	mi/h
Interchange Density	*1.67*	I/mi	f_{ID}	*5.9*	mi/h
Number of Lanes, N	*3*		f_N	*3.0*	mi/h
FFS (measured)		mi/h	FFS	*61.1*	mi/h
Base free-flow Speed, BFFS	*70.0*	mi/h			

LOS and Performance Measures			**Design (N)**	
Operational (LOS)			Design (N)	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1842*	pc/h/ln	Design LOS	
			v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	*60.4*	mi/h	S	mi/h
D = v_p / S	*30.5*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*D*		Required Number of Lanes, N	

Glossary		**Factor Location**	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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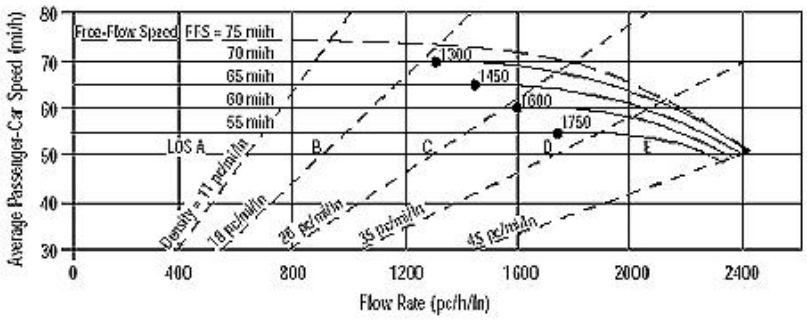
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		***Site Information***	
Analyst	*AJM*	Highway/Direction of Travel	*I-80 Westbound*
Agency or Company	*AECOM*	From/To	*Between 304 and 305 Diverges*
Date Performed	*8/1/2013*	Jurisdiction	
Analysis Time Period	*P.M. Peak Hour*	Analysis Year	*Alt1B 2045*

Project Description Interstate 80 Reconstruction

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs				
Volume, V	*6070*	veh/h	Peak-Hour Factor, PHF	*0.97*
AADT		veh/day	%Trucks and Buses, P_T	*13*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
Driver type adjustment	*0.95*		Up/Down %	

Calculate Flow Adjustments			
f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.830*

Speed Inputs			**Calc Speed Adj and FFS**		
Lane Width	*12.0*	ft	f_{LW}	*0.0*	mi/h
Rt-Shoulder Lat. Clearance	*6.0*	ft	f_{LC}	*0.0*	mi/h
Interchange Density	*1.67*	I/mi	f_{ID}	*5.9*	mi/h
Number of Lanes, N	*4*		f_N	*1.5*	mi/h
FFS (measured)		mi/h	FFS	*62.6*	mi/h
Base free-flow Speed, BFFS	*70.0*	mi/h			

LOS and Performance Measures			**Design (N)**	
Operational (LOS)			Design (N)	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1984*	pc/h/ln	Design LOS	
			v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	*60.0*	mi/h	S	mi/h
D = v_p / S	*33.1*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*D*		Required Number of Lanes, N	

Glossary		**Factor Location**	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

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RAMP JUNCTION
HCS ANALYSIS

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	AJM	Freeway/Dir of Travel	I-80 Westbound
Agency or Company	AECOM	Junction	Int. 304 from Route 209
Date Performed	8/1/2013	Jurisdiction	
Analysis Time Period	A.M. Peak Hour	Analysis Year	Alt1B 2045

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{up} = ft
V_u = veh/h

Terrain: Rolling

S_{FF} = 70.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp
☑ Yes ☑ On
☐ No ☐ Off
L_{down} = 2200 ft
V_D = 173 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	1994	0.97	Rolling	12	1	0.840	0.95	2575
Ramp	142	0.94	Rolling	8	1	0.885	0.95	180
UpStream								
DownStream	173	0.74	Rolling	2	0	0.971	0.95	253

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.605 using Equation (Exhibit 25-5)

V_{12} = 1559 pc/h

V_3 or V_{av34} 1016 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	2755	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	1739	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 12.7 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Determination

M_S = 0.273 (Exibit 25-19)

S_R = 62.4 mph (Exhibit 25-19)

S_0 = 68.1 mph (Exhibit 25-19)

S = 64.4 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_S = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	AJM	Freeway/Dir of Travel	I-80 Westbound
Agency or Company	AECOM	Junction	Int. 304 from Main St
Date Performed	8/1/2013	Jurisdiction	
Analysis Time Period	A.M. Peak Hour	Analysis Year	Alt1B 2045

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp	Terrain: Rolling	Downstream Adj Ramp
☐ Yes ☐ On		☑ Yes ☑ On
☑ No ☐ Off		☐ No ☐ Off
L_{up} = ft		L_{down} = 750 ft
V_u = veh/h	S_{FF} = 70.0 mph S_{FR} = 35.0 mph Sketch (show lanes, L_A, L_D, V_R, V_f)	V_D = 142 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	1798	0.97	Rolling	12	1	0.840	0.95	2322
Ramp	196	0.94	Rolling	8	1	0.885	0.95	248
UpStream								
DownStream	142	0.94	Rolling	8	1	0.885	0.95	180

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.614 using Equation (Exhibit 25-5)

V_{12} = 1425 pc/h

V_3 or V_{av34} = 897 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	2570	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	1673	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 10.3 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Determination

M_S = 0.251 (Exibit 25-19)

S_R = 63.0 mph (Exhibit 25-19)

S_0 = 68.6 mph (Exhibit 25-19)

S = 64.8 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	AJM	Freeway/Dir of Travel	I-80 Westbound
Agency or Company	AECOM	Junction	Int. 304 from Route 209
Date Performed	8/1/2013	Jurisdiction	
Analysis Time Period	P.M. Peak Hour	Analysis Year	Alt1B 2045

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{up} = ft
V_u = veh/h

Terrain: Rolling

S_{FF} = 70.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp
☑ Yes ☑ On
☐ No ☐ Off
L_{down} = 2200 ft
V_D = 322 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4225	0.97	Rolling	13	1	0.830	0.95	5525
Ramp	188	0.94	Rolling	2	1	0.962	0.95	219
UpStream								
DownStream	322	0.87	Rolling	1	0	0.985	0.95	395

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.605 using Equation (Exhibit 25-5)

V_{12} = 3345 pc/h

V_3 or V_{av34} 2180 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	5744	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3564	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 26.9 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Determination

M_S = 0.389 (Exibit 25-19)

S_R = 59.1 mph (Exhibit 25-19)

S_0 = 64.0 mph (Exhibit 25-19)

S = 60.9 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_S = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	AJM	Freeway/Dir of Travel	I-80 Westbound
Agency or Company	AECOM	Junction	Int. 304 from Main St
Date Performed	8/1/2013	Jurisdiction	
Analysis Time Period	P.M. Peak Hour	Analysis Year	Alt1B 2045

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{up} = ft
V_u = veh/h

Terrain: Rolling

S_{FF} = 70.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp
☑ Yes ☑ On
☐ No ☐ Off
L_{down} = 750 ft
V_D = 188 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3865	0.97	Rolling	13	1	0.830	0.95	5054
Ramp	360	0.94	Rolling	2	1	0.962	0.95	419
UpStream								
DownStream	188	0.94	Rolling	2	1	0.962	0.95	219

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.614 using Equation (Exhibit 25-5)

V_{12} = 3103 pc/h

V_3 or V_{av34} 1951 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	5473	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3522	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 24.6 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Determination

M_S = 0.362 (Exibit 25-19)

S_R = 59.9 mph (Exhibit 25-19)

S_0 = 64.8 mph (Exhibit 25-19)

S = 61.5 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_S = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	AJM	Freeway/Dir of Travel	I-80 Eastbound
Agency or Company	AECOM	Junction	Int. 303 to Route 611
Date Performed	8/1/2013	Jurisdiction	
Analysis Time Period	A.M. Peak Hour	Analysis Year	Alt1B 2045

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Rolling

S_{FF} = 70.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☑ Yes ☑ On ☐ No ☐ Off

L_{down} = 1500 ft

V_D = 170 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2689	0.94	Rolling	10	1	0.862	0.95	3493
Ramp	243	0.72	Rolling	1	0	0.985	0.95	361
UpStream								
DownStream	170	0.72	Rolling	1	0	0.985	0.95	252

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 25-7		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 25-7		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.656 using Equation (Exhibit 25-12)

V_{12} = 2416 pc/h

V_3 or V_{av34} 1077 pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	3493	Exhibit 25-14	7200	No
$V_{FO} = V_F - V_R$	3132	Exhibit 25-14	7200	No
V_R	361	Exhibit 25-3	2000	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	2416	Exhibit 25-14	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 18.3 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Determination

D_s = 0.460 (Exhibit 25-19)

S_R = 57.1 mph (Exhibit 25-19)

S_0 = 76.5 mph (Exhibit 25-19)

S = 61.9 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	AJM	Freeway/Dir of Travel	I-80 Westbound
Agency or Company	AECOM	Junction	Int. 304 to Rt 209
Date Performed	8/1/2013	Jurisdiction	
Analysis Time Period	A.M. Peak Hour	Analysis Year	Alt1B 2045

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp: ☑ Yes ☐ On ☐ No ☑ Off

L_{up} = 1200 ft

V_u = 179 veh/h

Terrain: Rolling

S_{FF} = 70.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2927	0.93	Rolling	12	1	0.840	0.95	3942
Ramp	1129	0.84	Rolling	1	0	0.985	0.95	1436
UpStream	179	0.84	Rolling	1	0	0.985	0.95	228
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 25-7		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 25-7		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.450 using Equation (Exhibit 25-12)

V_{12} = 2564 pc/h

V_3 or V_{av34} 1378 pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	3942	Exhibit 25-14	7200	No
$V_{FO} = V_F - V_R$	2506	Exhibit 25-14	7200	No
V_R	1436	Exhibit 25-3	3800	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	2564	Exhibit 25-14	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 8.3 (pc/mi/ln)

LOS = A (Exhibit 25-4)

Speed Determination

D_s = 0.557 (Exhibit 25-19)

S_R = 54.4 mph (Exhibit 25-19)

S_0 = 75.3 mph (Exhibit 25-19)

S = 60.2 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	AJM	Freeway/Dir of Travel	I-80 Westbound
Agency or Company	AECOM	Junction	Int. 305 to Main St
Date Performed	8/1/2013	Jurisdiction	
Analysis Time Period	A.M. Peak Hour	Analysis Year	Alt1B 2045

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp: ☑ Yes ☐ On ☐ No ☑ Off

L_{up} = 1500 ft

V_u = 134 veh/h

Terrain: Rolling

S_{FF} = 70.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3106	0.93	Rolling	12	1	0.840	0.95	4184
Ramp	179	0.84	Rolling	1	0	0.985	0.95	228
UpStream	134	0.84	Rolling	1	0	0.985	0.95	170
DownStream								

Estimation of v_{12}

Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Estimation of v_{12}

Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.436 using Equation (Exhibit 25-12)

V_{12} = 1953 pc/h

V_3 or V_{av34} 1115 pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 25-7		

Capacity Checks

	Actual	Capacity		LOS F?
V_F	4184	Exhibit 25-14	9600	No
$V_{FO} = V_F - V_R$	3956	Exhibit 25-14	9600	No
V_R	228	Exhibit 25-3	2000	No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 25-7		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	1953	Exhibit 25-14	4400:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 14.3 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Determination

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Speed Determination

D_s = 0.449 (Exhibit 25-19)

S_R = 57.4 mph (Exhibit 25-19)

S_0 = 76.3 mph (Exhibit 25-19)

S = 66.2 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	AJM	Freeway/Dir of Travel	I-80 Eastbound
Agency or Company	AECOM	Junction	Int. 303 to Route 611
Date Performed	8/1/2013	Jurisdiction	
Analysis Time Period	P.M. Peak Hour	Analysis Year	Alt1B 2045

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Rolling

S_{FF} = 70.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☑ Yes ☑ On ☐ No ☐ Off

L_{down} = 1500 ft

V_D = 239 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3390	0.94	Rolling	12	1	0.840	0.95	4517
Ramp	324	0.97	Rolling	1	0	0.985	0.95	357
UpStream								
DownStream	239	0.97	Rolling	1	0	0.985	0.95	263

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 25-7		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 25-7		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.631 using Equation (Exhibit 25-12)

V_{12} = 2981 pc/h

V_3 or V_{av34} 1536 pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	4517	Exhibit 25-14	7200	No
$V_{FO} = V_F - V_R$	4160	Exhibit 25-14	7200	No
V_R	357	Exhibit 25-3	2000	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	2981	Exhibit 25-14	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 23.1 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Determination

D_s = 0.460 (Exhibit 25-19)

S_R = 57.1 mph (Exhibit 25-19)

S_0 = 74.7 mph (Exhibit 25-19)

S = 62.1 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	AJM	Freeway/Dir of Travel	I-80 Westbound
Agency or Company	AECOM	Junction	Int. 304 to Rt 209
Date Performed	8/1/2013	Jurisdiction	
Analysis Time Period	P.M. Peak Hour	Analysis Year	Alt1B 2045

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp: ☑ Yes ☐ On ☐ No ☑ Off

L_{up} = 1200 ft

V_u = 377 veh/h

Terrain: Rolling

S_{FF} = 70.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	6070	0.96	Rolling	13	1	0.830	0.95	8020
Ramp	2205	0.90	Rolling	1	0	0.985	0.95	2618
UpStream	377	0.90	Rolling	1	0	0.985	0.95	448
DownStream								

Estimation of v_{12} — Merge Areas

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Estimation of v_{12} — Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.450 using Equation (Exhibit 25-12)

V_{12} = 5049 pc/h

V_3 or V_{av34} 2971 pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☑ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = 5320 pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 25-7		

Capacity Checks

	Actual	Capacity		LOS F?
V_F	8020	Exhibit 25-14	7200	Yes
$V_{FO} = V_F - V_R$	5402	Exhibit 25-14	7200	No
V_R	2618	Exhibit 25-3	3800	No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 25-7		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	5049	Exhibit 25-14	4400:All	Yes

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 32.0 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Determination

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Speed Determination

D_s = 0.664 (Exhibit 25-19)

S_R = 51.4 mph (Exhibit 25-19)

S_0 = 70.2 mph (Exhibit 25-19)

S = 56.5 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	AJM	Freeway/Dir of Travel	I-80 Westbound
Agency or Company	AECOM	Junction	Int. 305 to Main St
Date Performed	8/1/2013	Jurisdiction	
Analysis Time Period	P.M. Peak Hour	Analysis Year	Alt1B 2045

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp: ☑ Yes ☐ On ☐ No ☑ Off

L_{up} = 1500 ft

V_u = 303 veh/h

Terrain: Rolling

S_{FF} = 70.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	6447	0.96	Rolling	13	1	0.830	0.95	8518
Ramp	377	0.90	Rolling	1	0	0.985	0.95	448
UpStream	303	0.90	Rolling	1	0	0.985	0.95	360
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 25-7		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 25-7		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.436 using Equation (Exhibit 25-12)

V_{12} = 3967 pc/h

V_3 or V_{av34} 2275 pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	8518	Exhibit 25-14	9600	No
$V_{FO} = V_F - V_R$	8070	Exhibit 25-14	9600	No
V_R	448	Exhibit 25-3	2000	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3967	Exhibit 25-14	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 31.6 (pc/mi/ln)

LOS = D (Exhibit 25-4)

Speed Determination

D_s = 0.468 (Exhibit 25-19)

S_R = 56.9 mph (Exhibit 25-19)

S_0 = 71.8 mph (Exhibit 25-19)

S = 64.0 mph (Exhibit 25-15)

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BUILD ALTERNATIVE ‘F’ ANALYSIS (MODIFIED CONFIGURATIONS)

Build Alternatives Analysis Notes:

Alternative A analysis performed as baseline alternatives analysis for all build alternatives.

The following Alternative F analysis incorporates modified ramp junction, weave section, or intersection analysis specific to the alternative.

RAMP JUNCTION
HCS ANALYSIS

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	AJM	Freeway/Dir of Travel	I-80 Westbound
Agency or Company	AECOM	Junction	Int. 303 from Route 611
Date Performed	8/2/2013	Jurisdiction	
Analysis Time Period	A.M. Peak Hour	Analysis Year	Alt1F 2045

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp
- ☑ Yes ☑ On
- ☐ No ☐ Off
- L_{up} = 700 ft
- V_u = 142 veh/h

Terrain: Rolling

S_{FF} = 70.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp
- ☐ Yes ☐ On
- ☑ No ☐ Off
- L_{down} = ft
- V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2136	0.97	Rolling	12	1	0.840	0.95	2758
Ramp	173	0.74	Rolling	2	0	0.971	0.95	253
UpStream	142	0.94	Rolling	8	1	0.885	0.95	180
DownStream								

Merge Areas | Diverge Areas

Estimation of v_{12} (Merge Areas)

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.617 using Equation (Exhibit 25-5)

V_{12} = 1701 pc/h

V_3 or V_{av34} = 1057 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Estimation of v_{12} (Diverge Areas)

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} = pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks (Merge Areas)

	Actual	Capacity		LOS F?
V_{FO}	3011	Exhibit 25-7		No

Capacity Checks (Diverge Areas)

	Actual	Capacity		
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	1954	Exhibit 25-7	4600:All	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F) (Merge Areas)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 11.8 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Level of Service Determination (if not F) (Diverge Areas)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination (Merge Areas)

M_S = 0.251 (Exibit 25-19)

S_R = 63.0 mph (Exhibit 25-19)

S_0 = 68.0 mph (Exhibit 25-19)

S = 64.7 mph (Exhibit 25-14)

Speed Determination (Diverge Areas)

D_S = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	AJM	Freeway/Dir of Travel	I-80 Westbound
Agency or Company	AECOM	Junction	Int. 304 from Route 209
Date Performed	8/2/2013	Jurisdiction	
Analysis Time Period	A.M. Peak Hour	Analysis Year	Alt1F 2045

Project Description Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{up} = ft
V_u = veh/h

Terrain: Rolling

S_{FF} = 70.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp
☑ Yes ☑ On
☐ No ☐ Off
L_{down} = 700 ft
V_D = 173 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	1994	0.97	Rolling	12	1	0.840	0.95	2575
Ramp	142	0.94	Rolling	8	1	0.885	0.95	180
UpStream								
DownStream	173	0.74	Rolling	2	0	0.971	0.95	253

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.608 using Equation (Exhibit 25-5)

V_{12} = 1566 pc/h

V_3 or V_{av34} 1009 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	2755	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	1746	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 12.1 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Determination

M_S = 0.266 (Exibit 25-19)

S_R = 62.5 mph (Exhibit 25-19)

S_0 = 68.2 mph (Exhibit 25-19)

S = 64.5 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_S = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	AJM	Freeway/Dir of Travel	I-80 Westbound
Agency or Company	AECOM	Junction	Int. 304 from Main St
Date Performed	8/2/2013	Jurisdiction	
Analysis Time Period	A.M. Peak Hour	Analysis Year	Alt1F 2045

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp	Terrain: Rolling	Downstream Adj Ramp
☐ Yes ☐ On		☑ Yes ☑ On
☑ No ☐ Off		☐ No ☐ Off
L_{up} = ft	S_{FF} = 70.0 mph S_{FR} = 35.0 mph	L_{down} = 1500 ft
V_u = veh/h	Sketch (show lanes, L_A, L_D, V_R, V_f)	V_D = 142 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	1798	0.97	Rolling	12	1	0.840	0.95	2322
Ramp	196	0.94	Rolling	8	1	0.885	0.95	248
UpStream								
DownStream	142	0.94	Rolling	8	1	0.885	0.95	180

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.611 using Equation (Exhibit 25-5)

V_{12} = 1419 pc/h

V_3 or V_{av34} 903 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	2570	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	1667	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 10.8 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Determination

M_S = 0.258 (Exibit 25-19)

S_R = 62.8 mph (Exhibit 25-19)

S_0 = 68.5 mph (Exhibit 25-19)

S = 64.7 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	AJM	Freeway/Dir of Travel	I-80 Westbound
Agency or Company	AECOM	Junction	Int. 303 from Route 611
Date Performed	8/2/2013	Jurisdiction	
Analysis Time Period	P.M. Peak Hour	Analysis Year	Alt1F 2045

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp: ☑ Yes ☑ On ☐ No ☐ Off

L_{up} = 700 ft

V_u = 188 veh/h

Terrain: Rolling

S_{FF} = 70.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4414	0.97	Rolling	13	1	0.830	0.95	5772
Ramp	322	0.87	Rolling	1	0	0.985	0.95	395
UpStream	188	0.94	Rolling	2	1	0.962	0.95	219
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.617 using Equation (Exhibit 25-5)

V_{12} = 3560 pc/h

V_3 or V_{av34} = 2212 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	6167	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3955	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 27.4 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Determination

M_S = 0.427 (Exibit 25-19)

S_R = 58.1 mph (Exhibit 25-19)

S_0 = 63.8 mph (Exhibit 25-19)

S = 60.0 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} = pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_S = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	AJM	Freeway/Dir of Travel	I-80 Westbound
Agency or Company	AECOM	Junction	Int. 304 from Route 209
Date Performed	8/2/2013	Jurisdiction	
Analysis Time Period	P.M. Peak Hour	Analysis Year	Alt1F 2045

Project Description Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{up} = ft
V_u = veh/h

Terrain: Rolling

S_{FF} = 70.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp
☑ Yes ☑ On
☐ No ☐ Off
L_{down} = 700 ft
V_D = 322 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4225	0.97	Rolling	13	1	0.830	0.95	5525
Ramp	188	0.94	Rolling	2	1	0.962	0.95	219
UpStream								
DownStream	322	0.87	Rolling	1	0	0.985	0.95	395

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.608 using Equation (Exhibit 25-5)

V_{12} = 3361 pc/h

V_3 or V_{av34} 2164 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	5744	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3580	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 26.4 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Determination

M_S = 0.384 (Exibit 25-19)

S_R = 59.3 mph (Exhibit 25-19)

S_0 = 64.0 mph (Exhibit 25-19)

S = 61.0 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_S = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	AJM	Freeway/Dir of Travel	I-80 Westbound
Agency or Company	AECOM	Junction	Int. 304 from Main St
Date Performed	8/2/2013	Jurisdiction	
Analysis Time Period	P.M. Peak Hour	Analysis Year	Alt1F 2045

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Terrain: Rolling

S_{FF} = 70.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☑ Yes ☑ On ☐ No ☐ Off

L_{down} = 1500 ft

V_D = 188 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3865	0.97	Rolling	13	1	0.830	0.95	5054
Ramp	360	0.94	Rolling	2	1	0.962	0.95	419
UpStream								
DownStream	188	0.94	Rolling	2	1	0.962	0.95	219

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.611 using Equation (Exhibit 25-5)

V_{12} = 3088 pc/h

V_3 or V_{av34} = 1966 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	5473	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3507	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 25.1 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Determination

M_S = 0.367 (Exibit 25-19)

S_R = 59.7 mph (Exhibit 25-19)

S_0 = 64.7 mph (Exhibit 25-19)

S = 61.4 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} = pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_S = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	AJM	Freeway/Dir of Travel	I-80 Westbound
Agency or Company	AECOM	Junction	Int. 305 to Main St & Rt 209
Date Performed	8/2/2013	Jurisdiction	
Analysis Time Period	A.M. Peak Hour	Analysis Year	Alt1F 2045

Project Description: Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp	Terrain: Rolling	Downstream Adj Ramp
☑ Yes ☐ On		☐ Yes ☐ On
☐ No ☑ Off		☑ No ☐ Off
L_{up} = 500 ft	S_{FF} = 70.0 mph S_{FR} = 35.0 mph	L_{down} = ft
V_u = 134 veh/h	Sketch (show lanes, L_A, L_D, V_R, V_f)	V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3106	0.93	Rolling	12	1	0.840	0.95	4184
Ramp	1308	0.84	Rolling	1	0	0.985	0.95	1664
UpStream	134	0.84	Rolling	1	0	0.985	0.95	170
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 25-7		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 25-7		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.450 using Equation (Exhibit 25-12)

V_{12} = 2798 pc/h

V_3 or V_{av34} 1386 pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	4184	Exhibit 25-14	7200	No
$V_{FO} = V_F - V_R$	2520	Exhibit 25-14	7200	No
V_R	1664	Exhibit 25-3	3800	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	2798	Exhibit 25-14	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 10.3 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Determination

D_s = 0.578 (Exhibit 25-19)

S_R = 53.8 mph (Exhibit 25-19)

S_0 = 75.3 mph (Exhibit 25-19)

S = 59.4 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	AJM	Freeway/Dir of Travel	I-80 Westbound
Agency or Company	AECOM	Junction	Int. 305 to Main St & Rt 209
Date Performed	8/2/2013	Jurisdiction	
Analysis Time Period	P.M. Peak Hour	Analysis Year	Alt1F 2045

Project Description Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp
☑ Yes ☐ On
☐ No ☑ Off
L_{up} = 500 ft
V_u = 303 veh/h

Terrain: Rolling
S_{FF} = 70.0 mph S_{FR} = 35.0 mph
Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{down} = ft
V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	6447	0.96	Rolling	13	1	0.830	0.95	8518
Ramp	2582	0.90	Rolling	1	0	0.985	0.95	3065
UpStream	303	0.90	Rolling	1	0	0.985	0.95	360
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$
L_{EQ} = (Equation 25-2 or 25-3)
P_{FM} = using Equation (Exhibit 25-5)
V_{12} = pc/h
V_3 or V_{av34} pc/h (Equation 25-4 or 25-5)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 25-7		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 25-7		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$
D_R = (pc/mi/ln)
LOS = (Exhibit 25-4)

Speed Determination

M_S = (Exibit 25-19)
S_R = mph (Exhibit 25-19)
S_0 = mph (Exhibit 25-19)
S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$
L_{EQ} = (Equation 25-8 or 25-9)
P_{FD} = 0.450 using Equation (Exhibit 25-12)
V_{12} = 5519 pc/h
V_3 or V_{av34} 2999 pc/h (Equation 25-15 or 25-16)
Is V_3 or V_{av34} > 2,700 pc/h? ☑ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No
If Yes, V_{12a} = 5818 pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	8518	Exhibit 25-14	7200	Yes
$V_{FO} = V_F - V_R$	5453	Exhibit 25-14	7200	No
V_R	3065	Exhibit 25-3	3800	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	5519	Exhibit 25-14	4400:All	Yes

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$
D_R = 36.3 (pc/mi/ln)
LOS = F (Exhibit 25-4)

Speed Determination

D_s = 0.704 (Exhibit 25-19)
S_R = 50.3 mph (Exhibit 25-19)
S_0 = 70.2 mph (Exhibit 25-19)
S = 55.3 mph (Exhibit 25-15)

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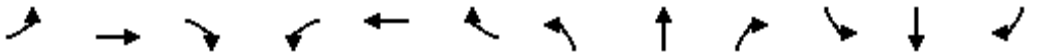
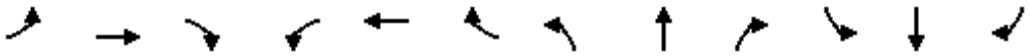
SIGNALIZED INTERSECTION HCS ANALYSIS



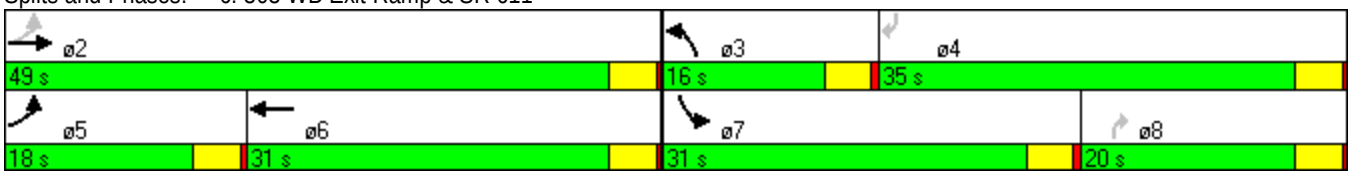
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	170	443	0	0	485	173	96	0	10	234	0	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	150		0	0		75	150		0	0		0
Storage Lanes	1		0	0		0	1		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.961				0.850			0.850
Flt Protected	0.950						0.950			0.950		
Satd. Flow (prot)	1805	3610	0	0	3469	0	1805	0	1615	1805	0	1615
Flt Permitted	0.159						0.950			0.950		
Satd. Flow (perm)	302	3610	0	0	3469	0	1805	0	1615	1805	0	1615
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					49				11			10
Link Speed (mph)		30			35			30			30	
Link Distance (ft)		1150			796			577			1035	
Travel Time (s)		26.1			15.5			13.1			23.5	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	189	492	0	0	539	192	107	0	11	260	0	10
Shared Lane Traffic (%)												
Lane Group Flow (vph)	189	492	0	0	731	0	107	0	11	260	0	10
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2			2		1		1	1		1
Detector Template	Left	Thru			Thru		Left		Right	Left		Right
Leading Detector (ft)	20	100			100		20		20	20		20
Trailing Detector (ft)	0	0			0		0		0	0		0
Detector 1 Position(ft)	0	0			0		0		0	0		0
Detector 1 Size(ft)	20	6			6		20		20	20		20
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex		Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0		0.0		0.0	0.0		0.0
Detector 1 Queue (s)	0.0	0.0			0.0		0.0		0.0	0.0		0.0
Detector 1 Delay (s)	0.0	0.0			0.0		0.0		0.0	0.0		0.0
Detector 2 Position(ft)		94			94							
Detector 2 Size(ft)		6			6							
Detector 2 Type		Cl+Ex			Cl+Ex							
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0							
Turn Type	pm+pt	NA			NA		Prot		custom	Prot		custom
Protected Phases	5	2			6		3			7		
Permitted Phases	2								8			4
Detector Phase	5	2			6		3		8	7		4



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	4.0	4.0			4.0		4.0		4.0	4.0		4.0
Minimum Split (s)	8.0	28.0			28.0		8.0		20.0	20.0		20.0
Total Split (s)	18.0	49.0	0.0	0.0	31.0	0.0	16.0	0.0	20.0	31.0	0.0	35.0
Total Split (%)	18.0%	49.0%	0.0%	0.0%	31.0%	0.0%	16.0%	0.0%	20.0%	31.0%	0.0%	35.0%
Maximum Green (s)	14.0	45.0			27.0		12.0		16.0	27.0		31.0
Yellow Time (s)	3.5	3.5			3.5		3.5		3.5	3.5		3.5
All-Red Time (s)	0.5	0.5			0.5		0.5		0.5	0.5		0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead				Lag		Lead		Lag	Lead		Lag
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0			3.0		3.0		3.0	3.0		3.0
Recall Mode	None	C-Max			C-Max		None		Max	Max		Max
Walk Time (s)		7.0			7.0							
Flash Dont Walk (s)		17.0			17.0							
Pedestrian Calls (#/hr)		0			0							
Act Effct Green (s)	45.0	45.0			29.4		10.3		16.0	27.0		32.7
Actuated g/C Ratio	0.45	0.45			0.29		0.10		0.16	0.27		0.33
v/c Ratio	0.61	0.30			0.69		0.58		0.04	0.53		0.02
Control Delay	25.9	18.2			33.6		54.8		18.7	35.9		12.9
Queue Delay	0.0	0.0			0.0		0.0		0.0	0.0		0.0
Total Delay	25.9	18.2			33.6		54.8		18.7	35.9		12.9
LOS	C	B			C		D		B	D		B
Approach Delay		20.3			33.6							
Approach LOS		C			C							
Queue Length 50th (ft)	72	102			203		65		0	141		0
Queue Length 95th (ft)	119	139			279		120		16	222		12
Internal Link Dist (ft)		1070			716			497			955	
Turn Bay Length (ft)	150						150					
Base Capacity (vph)	346	1625			1055		217		268	487		535
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	0.55	0.30			0.69		0.49		0.04	0.53		0.02

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 100			
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBT, Start of Green			
Natural Cycle: 80			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.69			
Intersection Signal Delay: 30.0		Intersection LOS: C	
Intersection Capacity Utilization 51.3%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 6: 303 WB Exit Ramp & SR 611



Lane Group	EBL	EBT	WBT	NBL	NBR	SBL	SBR
Lane Group Flow (vph)	189	492	731	107	11	260	10
v/c Ratio	0.61	0.30	0.69	0.58	0.04	0.53	0.02
Control Delay	25.9	18.2	33.6	54.8	18.7	35.9	12.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.9	18.2	33.6	54.8	18.7	35.9	12.9
Queue Length 50th (ft)	72	102	203	65	0	141	0
Queue Length 95th (ft)	119	139	279	120	16	222	12
Internal Link Dist (ft)		1070	716				
Turn Bay Length (ft)	150			150			
Base Capacity (vph)	346	1625	1055	217	268	487	535
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	0.55	0.30	0.69	0.49	0.04	0.53	0.02

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	170	443	0	0	485	173	96	0	10	234	0	9
Movement Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Queue, veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj. Factor (A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking, Bus Adj. Factors	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Sat. Flow Rate, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lanes	1	2	0	0	2	0	1	0	1	1	0	1
Lane Assignment												
Capacity, veh/h	0	1903	0	0	1412	502	224	0	0	660	0	0
Proportion Arriving On Green	0.00	0.53	0.00	0.00	0.53	0.53	0.12	0.00	0.00	0.36	0.00	0.00
Movement Delay, s/veh	0.0	9.7	0.0	0.0	10.6	10.6	31.8	0.0	0.0	19.2	0.0	0.0
Movement LOS		A			B	B	C			B		
Approach Volume, veh/h		492			731			107			260	
Approach Delay, s/veh		9.7			10.6			31.8			19.2	
Approach LOS		A			B			C			B	

Timer:	1	2	3	4	5	6	7	8
Assigned Phase		2	3			6	7	
Case No		4.0	2.0			8.0	2.0	
Phase Duration (G+Y+Rc), s		43.00	13.15			43.00	31.00	
Change Period (Y+Rc), s		4.00	4.00			4.00	4.00	
Max. Allowable Headway (MAH), s		5.21	3.80			5.21	3.80	
Maximum Green Setting (Gmax), s		45.00	10.30			29.40	27.00	
Max. Queue Clearance Time (g_c+I1), s		7.53	6.06			10.85	9.89	
Green Extension Time (g_e), s		3.89	0.08			7.72	0.68	
Probability of Phase Call (p_c)		1.000	0.888			1.000	1.000	
Probability of Max Out (p_x)		0.058	0.636			0.308	0.000	

Left-Turn Movement Data								
Assigned Movement			3				7	
Mvmt. Sat Flow, veh/h			1809.52				1809.52	

Through Movement Data								
Assigned Movement		2				6		
Mvmt. Sat Flow, veh/h		3705.00				2679.79		

Right-Turn Movement Data								
Assigned Movement		12				16		
Mvmt. Sat Flow, veh/h		0.00				952.18		

Left Lane Group Data								
Assigned Movement	0	0	3	0	0	0	7	0
Lane Assignment			L (Prot)				L (Prot)	
Lanes in Group	0	0	1	0	0	0	1	0
Group Volume (v), veh/h	0.0	0.0	106.7	0.0	0.0	0.0	260.0	0.0
Group Sat. Flow (s), veh/h/ln	0.0	0.0	1809.5	0.0	0.0	0.0	1809.5	0.0
Queue Serve Time (g_s), s	0.0	0.0	4.1	0.0	0.0	0.0	7.9	0.0
Cycle Queue Clear Time (g_c), s	0.0	0.0	4.1	0.0	0.0	0.0	7.9	0.0

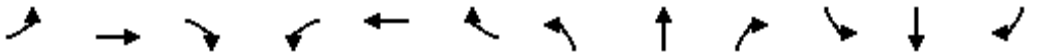
Perm LT Sat Flow Rate (s_l), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shared LT Sat Flow (s_sh), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Eff. Green (g_p), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Serve Time (g_u), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Que Serve Time (g_ps), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Time to First Blk (g_f), s	0.0	0.0	0.0	0.0	0.0	39.0	0.0	0.0
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Proportion LT Inside Lane (P_L)	0.000	0.000	1.000	0.000	0.000	0.000	1.000	0.000
Lane Group Capacity (c), veh/h	0.0	0.0	223.8	0.0	0.0	0.0	660.2	0.0
Volume-to-Capacity Ratio (X)	0.000	0.000	0.477	0.000	0.000	0.000	0.394	0.000
Available Capacity (c_a), veh/h	0.0	0.0	251.9	0.0	0.0	0.0	660.2	0.0
Upstream Filter Factor (I)	0.000	0.000	1.000	0.000	0.000	0.000	1.000	0.000
Uniform Delay (d1), s/veh	0.0	0.0	30.2	0.0	0.0	0.0	17.4	0.0
Incremental Delay (d2), s/veh	0.0	0.0	1.6	0.0	0.0	0.0	1.8	0.0
Initial Queue Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	0.0	31.8	0.0	0.0	0.0	19.2	0.0
First-Term Queue (Q1), veh/ln	0.0	0.0	1.7	0.0	0.0	0.0	3.1	0.0
Second-Term Queue (Q2), veh/ln	0.0	0.0	0.1	0.0	0.0	0.0	0.3	0.0
Third-Term Queue (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentile bk-of-que factor (f_B%)	0.000	0.000	1.000	0.000	0.000	0.000	1.000	0.000
Percentile Back of Queue (Q%), veh/ln	0.0	0.0	1.8	0.0	0.0	0.0	3.4	0.0
Percentile Storage Ratio (RQ%)	0.00	0.00	0.30	0.00	0.00	0.00	0.09	0.00
Initial Queue (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Queue (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Queue (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Capacity (cs), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Initial Queue Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Middle Lane Group Data								
Assigned Movement	0	2	0	0	0	6	0	0
Lane Assignment		T				T		
Lanes in Group	0	2	0	0	0	1	0	0
Group Volume (v), veh/h	0.0	492.2	0.0	0.0	0.0	381.5	0.0	0.0
Group Sat. Flow (s), veh/h/ln	0.0	1805.0	0.0	0.0	0.0	1900.0	0.0	0.0
Queue Serve Time (g_s), s	0.0	5.5	0.0	0.0	0.0	8.8	0.0	0.0
Cycle Queue Clear Time (g_c), s	0.0	5.5	0.0	0.0	0.0	8.8	0.0	0.0
Lane Group Capacity (c), veh/h	0.0	1902.5	0.0	0.0	0.0	1001.3	0.0	0.0
Volume-to-Capacity Ratio (X)	0.000	0.259	0.000	0.000	0.000	0.381	0.000	0.000
Available Capacity (c_a), veh/h	0.0	2195.3	0.0	0.0	0.0	1001.3	0.0	0.0
Upstream Filter Factor (I)	0.000	1.000	0.000	0.000	0.000	1.000	0.000	0.000
Uniform Delay (d1), s/veh	0.0	9.6	0.0	0.0	0.0	10.4	0.0	0.0
Incremental Delay (d2), s/veh	0.0	0.1	0.0	0.0	0.0	0.2	0.0	0.0
Initial Queue Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	9.7	0.0	0.0	0.0	10.6	0.0	0.0
First-Term Queue (Q1), veh/ln	0.0	1.9	0.0	0.0	0.0	3.2	0.0	0.0
Second-Term Queue (Q2), veh/ln	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Third-Term Queue (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentile bk-of-que factor (f_B%)	0.000	1.000	0.000	0.000	0.000	1.000	0.000	0.000
Percentile Back of Queue (Q%), veh/ln	0.0	2.0	0.0	0.0	0.0	3.2	0.0	0.0
Percentile Storage Ratio (RQ%)	0.00	0.04	0.00	0.00	0.00	0.11	0.00	0.00

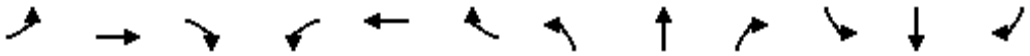
Initial Queue (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Queue (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Queue (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Capacity (cs), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Initial Queue Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Right Lane Group Data								
Assigned Movement	0	12	0	0	0	16	0	0
Lane Assignment						T+R		
Lanes in Group	0	0	0	0	0	1	0	0
Group Volume (v), veh/h	0.0	0.0	0.0	0.0	0.0	349.6	0.0	0.0
Group Sat. Flow (s), veh/h/ln	0.0	0.0	0.0	0.0	0.0	1732.0	0.0	0.0
Queue Serve Time (g_s), s	0.0	0.0	0.0	0.0	0.0	8.9	0.0	0.0
Cycle Queue Clear Time (g_c), s	0.0	0.0	0.0	0.0	0.0	8.9	0.0	0.0
Prot RT Sat Flow Rate (s_R), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prot RT Eff. Green (g_R), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Proportion RT Outside Lane (P_R)	0.000	0.000	0.000	0.000	0.000	0.550	0.000	0.000
Lane Group Capacity (c), veh/h	0.0	0.0	0.0	0.0	0.0	912.8	0.0	0.0
Volume-to-Capacity Ratio (X)	0.000	0.000	0.000	0.000	0.000	0.383	0.000	0.000
Available Capacity (c_a), veh/h	0.0	0.0	0.0	0.0	0.0	912.8	0.0	0.0
Upstream Filter Factor (I)	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000
Uniform Delay (d1), s/veh	0.0	0.0	0.0	0.0	0.0	10.4	0.0	0.0
Incremental Delay (d2), s/veh	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0
Initial Queue Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	0.0	0.0	0.0	0.0	10.6	0.0	0.0
First-Term Queue (Q1), veh/ln	0.0	0.0	0.0	0.0	0.0	2.9	0.0	0.0
Second-Term Queue (Q2), veh/ln	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Third-Term Queue (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentile bk-of-que factor (f_B%)	0.000	1.000	0.000	0.000	0.000	1.000	0.000	0.000
Percentile Back of Queue (Q%), veh/ln	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0
Percentile Storage Ratio (RQ%)	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00
Initial Queue (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Queue (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Queue (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Capacity (cs), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Initial Queue Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Intersection Summary	
HCM Average Control Delay	13.1
HCM Level of Service	B



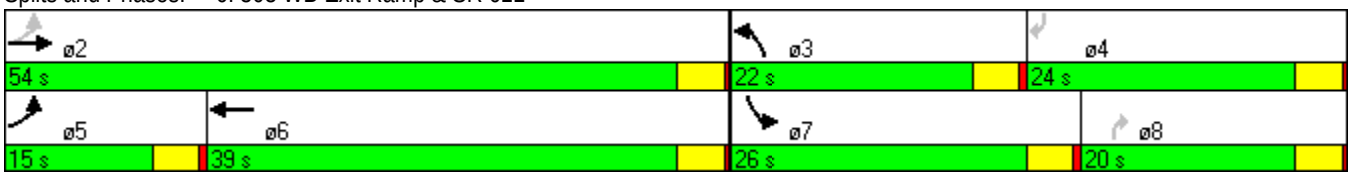
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	170	610	0	0	721	173	170	0	34	294	0	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	150		0	0		75	150		0	0		0
Storage Lanes	1		0	0		0	1		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.971				0.850			0.850
Flt Protected	0.950						0.950			0.950		
Satd. Flow (prot)	1805	3610	0	0	3505	0	1805	0	1615	1805	0	1615
Flt Permitted	0.101						0.950			0.950		
Satd. Flow (perm)	192	3610	0	0	3505	0	1805	0	1615	1805	0	1615
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					32				38			33
Link Speed (mph)		30			35			30			30	
Link Distance (ft)		1150			796			577			1035	
Travel Time (s)		26.1			15.5			13.1			23.5	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	189	678	0	0	801	192	189	0	38	327	0	33
Shared Lane Traffic (%)												
Lane Group Flow (vph)	189	678	0	0	993	0	189	0	38	327	0	33
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2			2		1		1	1		1
Detector Template	Left	Thru			Thru		Left		Right	Left		Right
Leading Detector (ft)	20	100			100		20		20	20		20
Trailing Detector (ft)	0	0			0		0		0	0		0
Detector 1 Position(ft)	0	0			0		0		0	0		0
Detector 1 Size(ft)	20	6			6		20		20	20		20
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex		Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0		0.0		0.0	0.0		0.0
Detector 1 Queue (s)	0.0	0.0			0.0		0.0		0.0	0.0		0.0
Detector 1 Delay (s)	0.0	0.0			0.0		0.0		0.0	0.0		0.0
Detector 2 Position(ft)		94			94							
Detector 2 Size(ft)		6			6							
Detector 2 Type		Cl+Ex			Cl+Ex							
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0							
Turn Type	pm+pt	NA			NA		Prot		custom	Prot		custom
Protected Phases	5	2			6		3			7		
Permitted Phases	2								8			4
Detector Phase	5	2			6		3		8	7		4



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	4.0	4.0			4.0		4.0		4.0	4.0		4.0
Minimum Split (s)	8.0	28.0			28.0		8.0		20.0	20.0		20.0
Total Split (s)	15.0	54.0			39.0		22.0		20.0	26.0		24.0
Total Split (%)	15.0%	54.0%			39.0%		22.0%		20.0%	26.0%		24.0%
Maximum Green (s)	11.0	50.0			35.0		18.0		16.0	22.0		20.0
Yellow Time (s)	3.5	3.5			3.5		3.5		3.5	3.5		3.5
All-Red Time (s)	0.5	0.5			0.5		0.5		0.5	0.5		0.5
Lost Time Adjust (s)	0.0	0.0			0.0		0.0		0.0	0.0		0.0
Total Lost Time (s)	4.0	4.0			4.0		4.0		4.0	4.0		4.0
Lead/Lag	Lead				Lag		Lead		Lag	Lead		Lag
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0			3.0		3.0		3.0	3.0		3.0
Recall Mode	None	C-Max			C-Max		None		Max	Max		Max
Walk Time (s)		7.0			7.0							
Flash Dont Walk (s)		17.0			17.0							
Pedestrian Calls (#/hr)		0			0							
Act Effct Green (s)	50.0	50.0			35.7		14.9		16.0	22.0		23.1
Actuated g/C Ratio	0.50	0.50			0.36		0.15		0.16	0.22		0.23
v/c Ratio	0.72	0.38			0.78		0.70		0.13	0.82		0.08
Control Delay	35.0	16.2			33.0		54.2		12.9	55.7		11.9
Queue Delay	0.0	0.0			0.0		0.0		0.0	0.0		0.0
Total Delay	35.0	16.2			33.0		54.2		12.9	55.7		11.9
LOS	D	B			C		D		B	E		B
Approach Delay		20.3			33.0							
Approach LOS		C			C							
Queue Length 50th (ft)	65	134			288		115		0	200		0
Queue Length 95th (ft)	#157	176			369		185		29	#342		26
Internal Link Dist (ft)		1070			716			497			955	
Turn Bay Length (ft)	150						150					
Base Capacity (vph)	273	1805			1273		325		290	397		398
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	0.69	0.38			0.78		0.58		0.13	0.82		0.08

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 100			
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBT, Start of Green			
Natural Cycle: 80			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.82			
Intersection Signal Delay: 32.6		Intersection LOS: C	
Intersection Capacity Utilization 61.2%		ICU Level of Service B	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 6: 303 WB Exit Ramp & SR 611



Lane Group	EBL	EBT	WBT	NBL	NBR	SBL	SBR
Lane Group Flow (vph)	189	678	993	189	38	327	33
v/c Ratio	0.72	0.38	0.78	0.70	0.13	0.82	0.08
Control Delay	35.0	16.2	33.0	54.2	12.9	55.7	11.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	35.0	16.2	33.0	54.2	12.9	55.7	11.9
Queue Length 50th (ft)	65	134	288	115	0	200	0
Queue Length 95th (ft)	#157	176	369	185	29	#342	26
Internal Link Dist (ft)		1070	716				
Turn Bay Length (ft)	150			150			
Base Capacity (vph)	273	1805	1273	325	290	397	398
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	0.69	0.38	0.78	0.58	0.13	0.82	0.08

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												
Volume (vph)	170	610	0	0	721	173	170	0	34	294	0	30
Movement Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Queue, veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj. Factor (A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking, Bus Adj. Factors	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Sat. Flow Rate, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lanes	1	2	0	0	2	0	1	0	1	1	0	1
Lane Assignment												
Capacity, veh/h	0	2091	0	0	1717	412	369	0	0	558	0	0
Proportion Arriving On Green	0.00	0.58	0.00	0.00	0.58	0.58	0.20	0.00	0.00	0.31	0.00	0.00
Movement Delay, s/veh	0.0	7.9	0.0	0.0	9.0	9.0	26.3	0.0	0.0	25.2	0.0	0.0
Movement LOS		A			A	A	C			C		
Approach Volume, veh/h		678			993			189			327	
Approach Delay, s/veh		7.9			9.0			26.3			25.2	
Approach LOS		A			A			C			C	

Timer:	1	2	3	4	5	6	7	8
Assigned Phase		2	3			6	7	
Case No		4.0	2.0			8.0	2.0	
Phase Duration (G+Y+Rc), s		45.31	18.55			45.31	26.00	
Change Period (Y+Rc), s		4.00	4.00			4.00	4.00	
Max. Allowable Headway (MAH), s		5.20	3.80			5.20	3.80	
Maximum Green Setting (Gmax), s		50.00	14.90			35.70	22.00	
Max. Queue Clearance Time (g_c+I1), s		8.93	8.62			13.11	12.86	
Green Extension Time (g_e), s		7.23	0.26			12.11	0.69	
Probability of Phase Call (p_c)		1.000	0.976			1.000	1.000	
Probability of Max Out (p_x)		0.185	0.136			0.441	0.043	

Left-Turn Movement Data								
Assigned Movement			3				7	
Mvmt. Sat Flow, veh/h			1809.52				1809.52	

Through Movement Data								
Assigned Movement		2				6		
Mvmt. Sat Flow, veh/h		3705.00				2963.47		

Right-Turn Movement Data								
Assigned Movement		12				16		
Mvmt. Sat Flow, veh/h		0.00				711.05		

Left Lane Group Data								
Assigned Movement	0	0	3	0	0	0	7	0
Lane Assignment			L (Prot)				L (Prot)	
Lanes in Group	0	0	1	0	0	0	1	0
Group Volume (v), veh/h	0.0	0.0	188.9	0.0	0.0	0.0	326.7	0.0
Group Sat. Flow (s), veh/h/ln	0.0	0.0	1809.5	0.0	0.0	0.0	1809.5	0.0
Queue Serve Time (g_s), s	0.0	0.0	6.6	0.0	0.0	0.0	10.9	0.0
Cycle Queue Clear Time (g_c), s	0.0	0.0	6.6	0.0	0.0	0.0	10.9	0.0

Perm LT Sat Flow Rate (s_l), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shared LT Sat Flow (s_sh), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Eff. Green (g_p), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Serve Time (g_u), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Que Serve Time (g_ps), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Time to First Blk (g_f), s	0.0	0.0	0.0	0.0	0.0	41.3	0.0	0.0
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Proportion LT Inside Lane (P_L)	0.000	0.000	1.000	0.000	0.000	0.000	1.000	0.000
Lane Group Capacity (c), veh/h	0.0	0.0	369.1	0.0	0.0	0.0	558.3	0.0
Volume-to-Capacity Ratio (X)	0.000	0.000	0.512	0.000	0.000	0.000	0.585	0.000
Available Capacity (c_a), veh/h	0.0	0.0	378.1	0.0	0.0	0.0	558.3	0.0
Upstream Filter Factor (I)	0.000	0.000	1.000	0.000	0.000	0.000	1.000	0.000
Uniform Delay (d1), s/veh	0.0	0.0	25.2	0.0	0.0	0.0	20.8	0.0
Incremental Delay (d2), s/veh	0.0	0.0	1.1	0.0	0.0	0.0	4.4	0.0
Initial Queue Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	0.0	26.3	0.0	0.0	0.0	25.2	0.0
First-Term Queue (Q1), veh/ln	0.0	0.0	2.7	0.0	0.0	0.0	4.3	0.0
Second-Term Queue (Q2), veh/ln	0.0	0.0	0.1	0.0	0.0	0.0	0.7	0.0
Third-Term Queue (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentile bk-of-que factor (f_B%)	0.000	0.000	1.000	0.000	0.000	0.000	1.000	0.000
Percentile Back of Queue (Q%), veh/ln	0.0	0.0	2.8	0.0	0.0	0.0	5.0	0.0
Percentile Storage Ratio (RQ%)	0.00	0.00	0.47	0.00	0.00	0.00	0.13	0.00
Initial Queue (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Queue (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Queue (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Capacity (cs), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Initial Queue Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Middle Lane Group Data								
Assigned Movement	0	2	0	0	0	6	0	0
Lane Assignment		T				T		
Lanes in Group	0	2	0	0	0	1	0	0
Group Volume (v), veh/h	0.0	677.8	0.0	0.0	0.0	513.6	0.0	0.0
Group Sat. Flow (s), veh/h/ln	0.0	1805.0	0.0	0.0	0.0	1900.0	0.0	0.0
Queue Serve Time (g_s), s	0.0	6.9	0.0	0.0	0.0	11.1	0.0	0.0
Cycle Queue Clear Time (g_c), s	0.0	6.9	0.0	0.0	0.0	11.1	0.0	0.0
Lane Group Capacity (c), veh/h	0.0	2091.2	0.0	0.0	0.0	1100.6	0.0	0.0
Volume-to-Capacity Ratio (X)	0.000	0.324	0.000	0.000	0.000	0.467	0.000	0.000
Available Capacity (c_a), veh/h	0.0	2531.3	0.0	0.0	0.0	1100.6	0.0	0.0
Upstream Filter Factor (I)	0.000	1.000	0.000	0.000	0.000	1.000	0.000	0.000
Uniform Delay (d1), s/veh	0.0	7.8	0.0	0.0	0.0	8.6	0.0	0.0
Incremental Delay (d2), s/veh	0.0	0.1	0.0	0.0	0.0	0.3	0.0	0.0
Initial Queue Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	7.9	0.0	0.0	0.0	9.0	0.0	0.0
First-Term Queue (Q1), veh/ln	0.0	2.3	0.0	0.0	0.0	3.7	0.0	0.0
Second-Term Queue (Q2), veh/ln	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Third-Term Queue (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentile bk-of-que factor (f_B%)	0.000	1.000	0.000	0.000	0.000	1.000	0.000	0.000
Percentile Back of Queue (Q%), veh/ln	0.0	2.3	0.0	0.0	0.0	3.8	0.0	0.0
Percentile Storage Ratio (RQ%)	0.00	0.05	0.00	0.00	0.00	0.13	0.00	0.00

Initial Queue (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Queue (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Queue (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Capacity (cs), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Initial Queue Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Right Lane Group Data								
Assigned Movement	0	12	0	0	0	16	0	0
Lane Assignment						T+R		
Lanes in Group	0	0	0	0	0	1	0	0
Group Volume (v), veh/h	0.0	0.0	0.0	0.0	0.0	479.7	0.0	0.0
Group Sat. Flow (s), veh/h/ln	0.0	0.0	0.0	0.0	0.0	1774.5	0.0	0.0
Queue Serve Time (g_s), s	0.0	0.0	0.0	0.0	0.0	11.1	0.0	0.0
Cycle Queue Clear Time (g_c), s	0.0	0.0	0.0	0.0	0.0	11.1	0.0	0.0
Prot RT Sat Flow Rate (s_R), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prot RT Eff. Green (g_R), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Proportion RT Outside Lane (P_R)	0.000	0.000	0.000	0.000	0.000	0.401	0.000	0.000
Lane Group Capacity (c), veh/h	0.0	0.0	0.0	0.0	0.0	1028.0	0.0	0.0
Volume-to-Capacity Ratio (X)	0.000	0.000	0.000	0.000	0.000	0.467	0.000	0.000
Available Capacity (c_a), veh/h	0.0	0.0	0.0	0.0	0.0	1028.0	0.0	0.0
Upstream Filter Factor (I)	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000
Uniform Delay (d1), s/veh	0.0	0.0	0.0	0.0	0.0	8.6	0.0	0.0
Incremental Delay (d2), s/veh	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0
Initial Queue Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	0.0	0.0	0.0	0.0	9.0	0.0	0.0
First-Term Queue (Q1), veh/ln	0.0	0.0	0.0	0.0	0.0	3.4	0.0	0.0
Second-Term Queue (Q2), veh/ln	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Third-Term Queue (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentile bk-of-que factor (f_B%)	0.000	1.000	0.000	0.000	0.000	1.000	0.000	0.000
Percentile Back of Queue (Q%), veh/ln	0.0	0.0	0.0	0.0	0.0	3.5	0.0	0.0
Percentile Storage Ratio (RQ%)	0.00	0.00	0.00	0.00	0.00	0.12	0.00	0.00
Initial Queue (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Queue (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Queue (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Capacity (cs), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Initial Queue Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Intersection Summary	
HCM Average Control Delay	12.6
HCM Level of Service	B

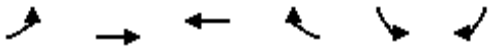
BUILD ALTERNATIVE ‘G’ ANALYSIS (MODIFIED CONFIGURATIONS)

Build Alternatives Analysis Notes:

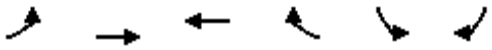
Alternative A analysis performed as baseline alternatives analysis for all build alternatives.

The following Alternative F analysis incorporates modified ramp junction, weave section, or intersection analysis specific to the alternative.

SIGNALIZED INTERSECTION HCS ANALYSIS



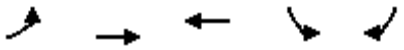
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	170	443	485	173	244	105
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	150			75	0	0
Storage Lanes	1			0	1	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	0.95	0.95	0.95	1.00	1.00
Frt			0.961			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1805	3610	3469	0	1805	1615
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1805	3610	3469	0	1805	1615
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			56			117
Link Speed (mph)		30	35		30	
Link Distance (ft)		1150	796		1035	
Travel Time (s)		26.1	15.5		23.5	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	189	492	539	192	271	117
Shared Lane Traffic (%)						
Lane Group Flow (vph)	189	492	731	0	271	117
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Number of Detectors	1	2	2		1	1
Detector Template	Left	Thru	Thru		Left	Right
Leading Detector (ft)	20	100	100		20	20
Trailing Detector (ft)	0	0	0		0	0
Detector 1 Position(ft)	0	0	0		0	0
Detector 1 Size(ft)	20	6	6		20	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0
Detector 2 Position(ft)		94	94			
Detector 2 Size(ft)		6	6			
Detector 2 Type		Cl+Ex	Cl+Ex			
Detector 2 Channel						
Detector 2 Extend (s)		0.0	0.0			
Turn Type	Prot	NA	NA		NA	Free
Protected Phases	5	2	6		4	
Permitted Phases						Free
Detector Phase	5	2	6		4	



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0		4.0	
Minimum Split (s)	8.0	28.0	20.0		20.0	
Total Split (s)	26.0	66.0	40.0	0.0	34.0	0.0
Total Split (%)	26.0%	66.0%	40.0%	0.0%	34.0%	0.0%
Maximum Green (s)	22.0	62.0	36.0		30.0	
Yellow Time (s)	3.5	3.5	3.5		3.5	
All-Red Time (s)	0.5	0.5	0.5		0.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead		Lag			
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0		3.0	
Recall Mode	None	C-Max	Max		None	
Walk Time (s)		7.0	5.0			
Flash Dont Walk (s)		17.0	11.0			
Pedestrian Calls (#/hr)		0	0			
Act Effct Green (s)	15.7	71.7	52.1		20.3	100.0
Actuated g/C Ratio	0.16	0.72	0.52		0.20	1.00
v/c Ratio	0.67	0.19	0.40		0.74	0.07
Control Delay	50.9	5.4	15.7		49.4	0.1
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	50.9	5.4	15.7		49.4	0.1
LOS	D	A	B		D	A
Approach Delay		18.0	15.7		34.5	
Approach LOS		B	B		C	
Queue Length 50th (ft)	115	46	130		163	0
Queue Length 95th (ft)	177	82	224		231	0
Internal Link Dist (ft)		1070	716		955	
Turn Bay Length (ft)	150					
Base Capacity (vph)	397	2590	1834		542	1615
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	0.48	0.19	0.40		0.50	0.07

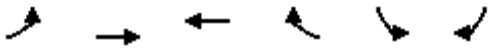
Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 100			
Offset: 0 (0%), Referenced to phase 2:EBT, Start of Green			
Natural Cycle: 50			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.74			
Intersection Signal Delay: 20.6		Intersection LOS: C	
Intersection Capacity Utilization 51.9%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 6: SR 611 & Connector Rd

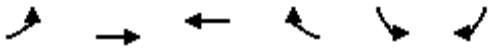


Lane Group	EBL	EBT	WBT	SBL	SBR
Lane Group Flow (vph)	189	492	731	271	117
v/c Ratio	0.67	0.19	0.40	0.74	0.07
Control Delay	50.9	5.4	15.7	49.4	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	50.9	5.4	15.7	49.4	0.1
Queue Length 50th (ft)	115	46	130	163	0
Queue Length 95th (ft)	177	82	224	231	0
Internal Link Dist (ft)		1070	716	955	
Turn Bay Length (ft)	150				
Base Capacity (vph)	397	2590	1834	542	1615
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	0.48	0.19	0.40	0.50	0.07

Intersection Summary



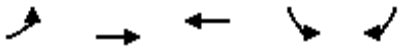
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	170	610	721	173	328	200
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	150			75	0	0
Storage Lanes	1			0	1	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	0.95	0.95	0.95	1.00	1.00
Frt			0.971			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1805	3610	3505	0	1805	1615
Flt Permitted	0.153				0.950	
Satd. Flow (perm)	291	3610	3505	0	1805	1615
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			35			222
Link Speed (mph)		30	35		30	
Link Distance (ft)		1150	796		1035	
Travel Time (s)		26.1	15.5		23.5	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	189	678	801	192	364	222
Shared Lane Traffic (%)						
Lane Group Flow (vph)	189	678	993	0	364	222
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Number of Detectors	1	2	2		1	1
Detector Template	Left	Thru	Thru		Left	Right
Leading Detector (ft)	20	100	100		20	20
Trailing Detector (ft)	0	0	0		0	0
Detector 1 Position(ft)	0	0	0		0	0
Detector 1 Size(ft)	20	6	6		20	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0
Detector 2 Position(ft)		94	94			
Detector 2 Size(ft)		6	6			
Detector 2 Type		Cl+Ex	Cl+Ex			
Detector 2 Channel						
Detector 2 Extend (s)		0.0	0.0			
Turn Type	pm+pt	NA	NA		NA	Perm
Protected Phases	5	2	6		4	
Permitted Phases	2					4
Detector Phase	5	2	6		4	4



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0		4.0	4.0
Minimum Split (s)	8.0	28.0	28.0		20.0	20.0
Total Split (s)	19.0	63.0	44.0		37.0	37.0
Total Split (%)	19.0%	63.0%	44.0%		37.0%	37.0%
Maximum Green (s)	15.0	59.0	40.0		33.0	33.0
Yellow Time (s)	3.5	3.5	3.5		3.5	3.5
All-Red Time (s)	0.5	0.5	0.5		0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0		4.0	4.0
Lead/Lag	Lead		Lag			
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	C-Max	C-Max		Max	Max
Walk Time (s)		7.0	7.0			
Flash Dont Walk (s)		17.0	17.0			
Pedestrian Calls (#/hr)		0	0			
Act Effct Green (s)	59.0	59.0	44.4		33.0	33.0
Actuated g/C Ratio	0.59	0.59	0.44		0.33	0.33
v/c Ratio	0.57	0.32	0.63		0.61	0.33
Control Delay	16.6	10.9	23.4		33.4	4.8
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	16.6	10.9	23.4		33.4	4.8
LOS	B	B	C		C	A
Approach Delay		12.1	23.4		22.6	
Approach LOS		B	C		C	
Queue Length 50th (ft)	51	106	239		193	0
Queue Length 95th (ft)	86	140	337		290	50
Internal Link Dist (ft)		1070	716		955	
Turn Bay Length (ft)	150					
Base Capacity (vph)	399	2130	1574		596	682
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	0.47	0.32	0.63		0.61	0.33

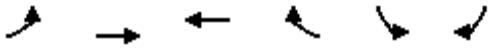
Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 100			
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBT, Start of Green			
Natural Cycle: 60			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.63			
Intersection Signal Delay: 19.2		Intersection LOS: B	
Intersection Capacity Utilization 63.0%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 6: SR 611 & Connector Rd



Lane Group	EBL	EBT	WBT	SBL	SBR
Lane Group Flow (vph)	189	678	993	364	222
v/c Ratio	0.57	0.32	0.63	0.61	0.33
Control Delay	16.6	10.9	23.4	33.4	4.8
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	16.6	10.9	23.4	33.4	4.8
Queue Length 50th (ft)	51	106	239	193	0
Queue Length 95th (ft)	86	140	337	290	50
Internal Link Dist (ft)		1070	716	955	
Turn Bay Length (ft)	150				
Base Capacity (vph)	399	2130	1574	596	682
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	0.47	0.32	0.63	0.61	0.33

Intersection Summary



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	170	610	721	173	328	200
Movement Number	5	2	6	16	7	14
Initial Queue, veh	0	0	0	0	0	0
Ped-Bike Adj. Factor (A_pbT)	1.00			1.00	1.00	1.00
Parking, Bus Adj. Factors	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Sat. Flow Rate, veh/h/ln	1900	1900	1900	1900	1900	1900
Lanes	1	2	2	0	1	1
Lane Assignment						
Capacity, veh/h	0	1986	1630	391	655	585
Proportion Arriving On Green	0.00	0.55	0.55	0.55	0.36	0.36
Movement Delay, s/veh	0.0	11.5	13.0	13.0	26.6	23.4
Movement LOS		B	B	B	C	C
Approach Volume, veh/h		678	993		587	
Approach Delay, s/veh		11.5	13.0		25.4	
Approach LOS		B	B		C	

Timer:	1	2	3	4	5	6	7	8
Assigned Phase		2		4		6		
Case No		4.0		9.0		8.0		
Phase Duration (G+Y+Rc), s		54.13		37.00		54.13		
Change Period (Y+Rc), s		4.00		4.00		4.00		
Max. Allowable Headway (MAH), s		5.20		3.89		5.20		
Maximum Green Setting (Gmax), s		59.00		33.00		44.40		
Max. Queue Clearance Time (g_c+I1), s		11.48		16.66		17.19		
Green Extension Time (g_e), s		7.78		1.77		13.39		
Probability of Phase Call (p_c)		1.000		1.000		1.000		
Probability of Max Out (p_x)		0.136		0.009		0.355		

Left-Turn Movement Data								
Assigned Movement				7				
Mvmt. Sat Flow, veh/h				1809.52				

Through Movement Data								
Assigned Movement		2				6		
Mvmt. Sat Flow, veh/h		3705.00				2963.47		

Right-Turn Movement Data								
Assigned Movement		12		14		16		
Mvmt. Sat Flow, veh/h		0.00		1615.00		711.05		

Left Lane Group Data								
Assigned Movement	0	0	0	7	0	0	0	0
Lane Assignment				L				
Lanes in Group	0	0	0	1	0	0	0	0
Group Volume (v), veh/h	0.0	0.0	0.0	364.4	0.0	0.0	0.0	0.0
Group Sat. Flow (s), veh/h/ln	0.0	0.0	0.0	1809.5	0.0	0.0	0.0	0.0
Queue Serve Time (g_s), s	0.0	0.0	0.0	14.7	0.0	0.0	0.0	0.0
Cycle Queue Clear Time (g_c), s	0.0	0.0	0.0	14.7	0.0	0.0	0.0	0.0

Perm LT Sat Flow Rate (s_l), veh/h/ln	0.0	0.0	0.0	1809.5	0.0	0.0	0.0	0.0
Shared LT Sat Flow (s_sh), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Eff. Green (g_p), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Serve Time (g_u), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Que Serve Time (g_ps), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Time to First Blk (g_f), s	0.0	0.0	0.0	0.0	0.0	50.1	0.0	0.0
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Proportion LT Inside Lane (P_L)	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
Lane Group Capacity (c), veh/h	0.0	0.0	0.0	655.3	0.0	0.0	0.0	0.0
Volume-to-Capacity Ratio (X)	0.000	0.000	0.000	0.556	0.000	0.000	0.000	0.000
Available Capacity (c_a), veh/h	0.0	0.0	0.0	655.3	0.0	0.0	0.0	0.0
Upstream Filter Factor (I)	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
Uniform Delay (d1), s/veh	0.0	0.0	0.0	23.2	0.0	0.0	0.0	0.0
Incremental Delay (d2), s/veh	0.0	0.0	0.0	3.4	0.0	0.0	0.0	0.0
Initial Queue Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	0.0	0.0	26.6	0.0	0.0	0.0	0.0
First-Term Queue (Q1), veh/ln	0.0	0.0	0.0	6.1	0.0	0.0	0.0	0.0
Second-Term Queue (Q2), veh/ln	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0
Third-Term Queue (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentile bk-of-que factor (f_B%)	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000
Percentile Back of Queue (Q%), veh/ln	0.0	0.0	0.0	6.7	0.0	0.0	0.0	0.0
Percentile Storage Ratio (RQ%)	0.00	0.00	0.00	0.18	0.00	0.00	0.00	0.00
Initial Queue (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Queue (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Queue (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Capacity (cs), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Initial Queue Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Middle Lane Group Data								
Assigned Movement	0	2	0	0	0	6	0	0
Lane Assignment		T				T		
Lanes in Group	0	2	0	0	0	1	0	0
Group Volume (v), veh/h	0.0	677.8	0.0	0.0	0.0	513.6	0.0	0.0
Group Sat. Flow (s), veh/h/ln	0.0	1805.0	0.0	0.0	0.0	1900.0	0.0	0.0
Queue Serve Time (g_s), s	0.0	9.5	0.0	0.0	0.0	15.2	0.0	0.0
Cycle Queue Clear Time (g_c), s	0.0	9.5	0.0	0.0	0.0	15.2	0.0	0.0
Lane Group Capacity (c), veh/h	0.0	1985.8	0.0	0.0	0.0	1045.1	0.0	0.0
Volume-to-Capacity Ratio (X)	0.000	0.341	0.000	0.000	0.000	0.491	0.000	0.000
Available Capacity (c_a), veh/h	0.0	2337.3	0.0	0.0	0.0	1045.1	0.0	0.0
Upstream Filter Factor (I)	0.000	1.000	0.000	0.000	0.000	1.000	0.000	0.000
Uniform Delay (d1), s/veh	0.0	11.4	0.0	0.0	0.0	12.6	0.0	0.0
Incremental Delay (d2), s/veh	0.0	0.1	0.0	0.0	0.0	0.4	0.0	0.0
Initial Queue Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	11.5	0.0	0.0	0.0	13.0	0.0	0.0
First-Term Queue (Q1), veh/ln	0.0	3.5	0.0	0.0	0.0	5.8	0.0	0.0
Second-Term Queue (Q2), veh/ln	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Third-Term Queue (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentile bk-of-que factor (f_B%)	0.000	1.000	0.000	0.000	0.000	1.000	0.000	0.000
Percentile Back of Queue (Q%), veh/ln	0.0	3.6	0.0	0.0	0.0	5.9	0.0	0.0
Percentile Storage Ratio (RQ%)	0.00	0.08	0.00	0.00	0.00	0.20	0.00	0.00

Initial Queue (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Queue (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Queue (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Capacity (cs), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Initial Queue Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Right Lane Group Data								
Assigned Movement	0	12	0	14	0	16	0	0
Lane Assignment				R		T+R		
Lanes in Group	0	0	0	1	0	1	0	0
Group Volume (v), veh/h	0.0	0.0	0.0	222.2	0.0	479.7	0.0	0.0
Group Sat. Flow (s), veh/h/ln	0.0	0.0	0.0	1615.0	0.0	1774.5	0.0	0.0
Queue Serve Time (g_s), s	0.0	0.0	0.0	9.3	0.0	15.2	0.0	0.0
Cycle Queue Clear Time (g_c), s	0.0	0.0	0.0	9.3	0.0	15.2	0.0	0.0
Prot RT Sat Flow Rate (s_R), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prot RT Eff. Green (g_R), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Proportion RT Outside Lane (P_R)	0.000	0.000	0.000	1.000	0.000	0.401	0.000	0.000
Lane Group Capacity (c), veh/h	0.0	0.0	0.0	584.9	0.0	976.1	0.0	0.0
Volume-to-Capacity Ratio (X)	0.000	0.000	0.000	0.380	0.000	0.491	0.000	0.000
Available Capacity (c_a), veh/h	0.0	0.0	0.0	584.9	0.0	976.1	0.0	0.0
Upstream Filter Factor (I)	0.000	0.000	0.000	1.000	0.000	1.000	0.000	0.000
Uniform Delay (d1), s/veh	0.0	0.0	0.0	21.5	0.0	12.6	0.0	0.0
Incremental Delay (d2), s/veh	0.0	0.0	0.0	1.9	0.0	0.4	0.0	0.0
Initial Queue Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	0.0	0.0	23.4	0.0	13.0	0.0	0.0
First-Term Queue (Q1), veh/ln	0.0	0.0	0.0	4.2	0.0	5.4	0.0	0.0
Second-Term Queue (Q2), veh/ln	0.0	0.0	0.0	0.3	0.0	0.1	0.0	0.0
Third-Term Queue (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Percentile bk-of-que factor (f_B%)	0.000	1.000	0.000	1.000	0.000	1.000	0.000	0.000
Percentile Back of Queue (Q%), veh/ln	0.0	0.0	0.0	4.5	0.0	5.5	0.0	0.0
Percentile Storage Ratio (RQ%)	0.00	0.00	0.00	0.12	0.00	0.19	0.00	0.00
Initial Queue (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Queue (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Queue (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saturated Capacity (cs), veh/h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Initial Queue Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Intersection Summary	
HCM Average Control Delay	15.8
HCM Level of Service	B

I-80 Design Criteria

Pennsylvania Department of Transportation, District 5-0
Agreement No. E02656, Monroe County
SR 0080, Section 17M

Design Element	Criteria Source	Standard Criteria	Applied Criteria	Comments
Functional Classification	Functional Classification Map	Urban Interstate	Urban Interstate	iTMS Data Attached
Terrain	AASHTO Greenbook pg 231	Rolling	Rolling	
Lane Widths	DM2 pg 1-32	4 or More 12'-0" Lanes	4-6 12'-0" lanes	
Shoulder Width	DM2 pg 1-32	10'-0" Right Shoulder 8'-0" Graded, 4'-0" Paved Left Shoulder (Medians Only)	12'-0" Right Shoulder 10'-0" Median Shoulder	12' used because truck traffic > 250 DDHV, shoulder widths provided in scope (attached)
Median Width	DM2 pg 1-32	2 Lane Directional: 10'-0" Min		Two 12'-0" Shoulders and a 2'-0" Median Barrier, Truck Traffic > 250
		3+ Lane Directional: 22'-0" Min	26'-0" Min	
Cross Slope / Superelevation	DM2 pg 1-32	Max = 6.0%	Max = 6.0%	
		Min = 2.0%	Min = 2.0%	
Bridge Width	DM2 pg 1-32	Lane Widths + Right Shoulder + 6'-0" Left Shoulder	Lane Widths + Right Shoulder + 6'-0" Left Shoulder	
Vertical Grades	2005 AASHTO Publication pg. 3	Max = 4%	Max. = 4%	
	DM2 pg 1-32	Min = 0.5%	Min = 0.5%	
Lateral Clearance to Structures	DM2 pg 4-3	14' Lateral Clearance to front face of barrier protectings walls or piers	14' Min	
Vertical Clearance	AASHTO Green Book pg 506 & DM2 Sect. 2.20 pg 2-47	16'-0" Min. + 6" for resurfacing	16'-6"	
Horizontal Curvature	AASHTO Green Book, Exhibit 3-15 pg 147	Min Radius = 1,330'	Min Radius = 1,330'	
Compound Curve Ratio	AASHTO Green Book, pg 201	1.5:1	1.5:1	
Clear Zone Widths	DM2 Chapter 12	See Table 12.1	See Table 12.1	See attached table
Guide Rail and Median Barrier	DM2 Chapter 12	See Table 12.3	See Table 12.3	See attached table
Design Speed	DM2 Chapter 12	50 - 70 MPH	60 MPH	Posted at 50MPH
Vertical Sight Distance	AASHTO Green Book, Exhibit 3-72, pg 272	Stopping Sight Distance = 570'	Stopping Sight Distance = 570'	

NOTES:
1) The design criteria for this project are taken from PENNDOT Publication 13M, *Design Manual Part 2 (Aug 2009 ED); 2005 AASHTO Publication, A Policy on Design Standards - Interstate System; and the AASHTO Greenbook, 2004 Edition*

Interchange 303 - PA611 Design Criteria

Pennsylvania Department of Transportation, District 5-0
Agreement No. E02656, Monroe County
SR 0080, Section 17M

Design Element	Criteria Source	Standard Criteria	Applied Criteria	Comments
Functional Classification	Functional Class Map	Urban Minor Arterial	Urban Minor Arterial	iTMS Data Attached
Roadway Typology	DM2 pg 1-7	Regional Suburban Corridor	Regional Suburban Corridor	
Terrain	DM2, pg 2-11 AASHTO Greenbook pg 231	Rolling	Rolling	
Lane Widths	DM2 pg 1-12	11' - 12'	11'-12'	
Shoulder Width	DM2 pg 1-12	8'-12'	8'-12'	
Bike Lane	DM2 pg 1-12	6' (if no shoulder)	NA	Match existing section
Median Width (if needed)	DM2 pg 1-12	16' - 18' For Left Turn; 6' to 8' for Peds	16' - 18' For Left Turn; 6' to 8' for Peds	
Curb Return	DM2 pg 1-12	30' - 50'	NA	No curbs on existing roadway
Travel Lanes	DM2 pg 1-12	4 - 6	4	
Cross Slope / Superelevation	DM2 pg 1-12	Max = 6.0%	Max = 6.0%	
		Min = 2.0%	Min = 2.0%	
Bridge Width	DM2 pg 1-12	Lane Width + Shoulder each side	Lane Width + Shoulder each side	
Vertical Grades	AASHTO Greenbook, pg 472	Max. = 7%	Max. = 7%	
	DM2 pg 1-12	Min = 0.5%	Min = 0.5%	
Vertical Clearance	DM2 pg 2-50	16' 0" MIN + 6" for resurfacing	16'-6" Min	
Lateral Clearance to Structures	DM2 pg 4-3	14' Lateral Clearance to front face of barrier protectings walls or piers	14'-0"	
Horizontal Curvature	AASHTO Green Book, pg 147	Min Radius = 643'	Min Radius =643'	
Compound Curve Ratio	AASHTO Green Book, pg 201	1.5:1	1.5:1	
Compound Curve Length	AASHTO Green Book, pg 202	60' to 200' minimum	See exhibit 3-42, pg 202	
Clear Zone Widths	DM2 Chapter 12	See Table 12.1	See Table 12.1	See attached Table
Guide Rail and Median Barrier	DM2 Chapter 12	See Table 12.3	See Table 12.3	See attached Table
Desired Operating Speed	DM2 pg 1-12 & 2-11	35 - 55 MPH	45 MPH	Posted 45MPH
Sight Distance (minimum)	AASHTO Green Book, Exhibit 7-1 pg 445	Stopping Sight Distance= 360'	Stopping Sight Distance = 360'	

NOTES:
1) The design criteria for this project are taken from PENNDOT Publication 13M, Design Manual Part 2 (Aug 2009 ED); 2005 AASHTO Publication, A Policy on Design Standards - Interstate System;

Inerchange 304 - US-209 Design Criteria

Pennsylvania Department of Transportation, District 5-0
Agreement No. E02656, Monroe County
SR 0080, Section 17M

Design Element	Criteria Source	Standard Criteria	Applied Criteria	Comments
Functional Classification	Functional Classification Map	Urban Other Principal Arterial	Urban Other Principal Arterial	iTMS Data Attached
Roadway Typology	DM2, pg 2-17	Urban Non-Interstate	Urban Non-Interstate	
Terrain	DM2, pg 2-11 AASHTO Greenbook pg 231	Rolling	Rolling	
Lane Widths	DM2 pg 1-32	4 or More 12'-0" Lanes	4 12'-0" lanes	
Shoulder Width	DM2 pg 1-32	10'-0" Right Shoulder 8'-0" Graded, 4'-0" Paved Left Shoulder (Medians Only)	12'-0" Right Shoulder 10'-0" Median Shoulder	12' used because truck traffic > 250 DDHV
Median Width	DM2 pg 1-32	2 Lane Directional: 10'-0" Min	10'-0" Min	
Cross Slope / Superelevation	DM2 pg 1-32	Max = 6.0%	Max = 6.0%	
		Min = 2.0%	Min = 2.0%	
Bridge Width	DM2 pg 1-32	Lane Widths + Right Shoulder + 6'-0" Left Shoulder	Lane Widths + Right Shoulder + 6'-0" Left Shoulder	
Vertical Grades	2005 AASHTO Publication pg. 3	Max = 4%	Max. = 4%	
	DM2 pg 1-32	Min = 0.5%	Min = 0.5%	
Lateral Clearance to Structures	DM2 pg 4-3	14' Lateral Clearance to front face of barrier protectings walls or piers	14' Min	
Vertical Clearance	AASHTO Green Book pg 506 & DM2 Sect. 2.20 pg 2-47	16'-0" Min. + 6" for resurfacing	16'-6"	
Horizontal Curvature	AASHTO Green Book, Exhibit 3-15 pg 147	Min Radius = 1,330'	Min Radius = 1,330'	
Compound Curve Ratio	AASHTO Green Book, pg 201	1.5:1	1.5:1	
Clear Zone Widths	DM2 Chapter 12	See Table 12.1	See Table 12.1	See attached table
Guide Rail and Median Barrier	DM2 Chapter 12	See Table 12.3	See Table 12.3	See attached table
Design Speed	DM2 Chapter 12	50 - 70 MPH	60 MPH	Posted at 55MPH
Vertical Sight Distance	AASHTO Green Book, Exhibit 3-72, pg 272	Stopping Sight Distance = 570'	Stopping Sight Distance = 570'	

NOTES:

1) The design criteria for this project are taken from PENNDOT Publication 13M, *Design Manual Part 2 (Aug 2009 ED) and The AASHTO Greenbook, 2004 Edition*

Interchange 305 - SR2012, West Main Street Design Criteria

Pennsylvania Department of Transportation, District 5-0
Agreement No. E02656, Monroe County
SR 0080, Section 17M

Design Element	Criteria Source	Standard Criteria	Applied Criteria	Comments
Functional Classification	Functional Class Map	Urban - Other Principal Arterial	Urban - Other Principal Arterial	iTMS Data attached
Roadway Typology	DM2 pg 1-7 & 1-16	Community Arterial Suburban Corridor	Community Arterial Suburban Corridor	
Terrain	DM2 pg 2-11, AASHTO Greenbook pg 231	Rolling	Rolling	
Lane Widths	DM2 pg 1-16	11' - 12'	11' - 12'	
Shoulder Width	DM2 pg 1-16	8' to 10'	8' - 10'	
Bike Lane	DM2 pg 1-16	5' - 6' (if no shoulder)	NA	Match existing section
Parking Lane	DM2 pg 1-16	NA	NA	Match existing section
Median Width (if needed)	DM2 pg 1-16	16' - 18' For Left Turn 12' - 18' For Left Turn; 6' to 8' for Peds	Not Needed	
Curb Return	DM2 pg 1-16	25'-50'	25'-50'	
Travel Lanes	DM2 pg 1-16	2 - 4	2	
Cross Slope / Superelevation	DM2 pg 1-16	Max = 6.0% Min = 2.0%	Max = 6.0% Min = 2.0%	
Bridge Width	DM2 pg 1-16	Lane Widths plus Shoulder each side	Lane Widths plus Shoulder each side	
Vertical Grades	AASHTO Green Book, Exhibit 7-10 pg 472	Max. = 8%	Max. = 8%	
	DM2 pg 1-16	Min = 0.5%	Min = 0.5%	
Vertical Clearance	DM2 section 2.20 pg 2-50	16' 0" MIN + 6" for resurfacing	16' 6"	
Lateral Clearance to Structures	DM2 pg 4-3	14' Lateral Clearance to front face of barrier protectings walls or piers	14'-0" Min	
Horizontal Curvature	AASHTO Green Book, pg 168	Min Radius = 485'	Min Radius = 485'	
Compound Curve Ratio	AASHTO Green Book, pg 201	1.5:1	1.5:1	
Clear Sidewalk Width	DM2 pg 1-16	5' - 6'	5' - 6'	
Buffer	DM2 pg 1-16	5' - 10'	5' - 10'	
Shy Distance	DM2 pg 1-16	NA	NA	
Total Sidewalk Width	DM2 pg 1-16	5' - 6'	5' - 6'	
Clear Zone Widths	DM2 Chapter 12	Table 12.1	Table 12.1	See attached table
Desired Operating Speed	DM2 pg 1-7 & 1-16	35 - 55 MPH	40 MPH	Posted 40MPH
Sight Distance (minimum)	AASHTO Green Book, Exhibit 7-1 pg 445	Stopping Sight Distance= 305' Passing Sight Distance= 1470'	Stopping Sight Distance = 305' Passing Sight Distance = 1470'	

NOTES:

1) The design criteria for this project are taken from PENNDOT Publication 13M, *Design Manual Part 2 (Aug 2009 ED) and The AASHTO Greenbook, 2004 Edition*

Interchange 306 - SR2004, Dreher Ave Design Criteria

Pennsylvania Department of Transportation, District 5-0
Agreement No. E02656, Monroe County
SR 0080, Section 17M

Design Element	Criteria Source	Standard Criteria	Applied Criteria	Comments
Functional Classification	Functional Class Map	Urban - Minor Arterial	Urban - Minor Arterial	iTMS Data attached
Roadway Typology	DM2 pg 1-7 & 1-16	Community Arterial Suburban Neighborhood	Community Arterial Suburban Neighborhood	
Terrain	DM2 pg 2-11, AASHTO Greenbook pg 231	Rolling	Rolling	
Lane Widths	DM2 pg 1-16	10' - 12'	10' - 12'	
Shoulder Width	DM2 pg 1-16	4' to 8' (if no parking or bike lane)	4' - 8'	
Bike Lane	DM2 pg 1-16	5' - 6' (if no shoulder)	NA	Match existing section
Parking Lane	DM2 pg 1-16	7' to 8' Parallel	NA	Match existing section
Median Width (if needed)	DM2 pg 1-16	16' - 18' For Left Turn	Not Needed	
		12' - 18' For Left Turn; 6' to 8' for Peds		
Curb Return	DM2 pg 1-16	25'-35'	25'-35'	
Travel Lanes	DM2 pg 1-16	2 - 4	2	
Cross Slope / Superelevation	DM2 pg 1-16	Max = 6.0%	Max = 6.0%	3% min Cross Slope recommended for DS < 40 MPH; 3% Cross Slope may be on Tangents if vertical grade <1%
		Min = 2.0%, 3.0% Desired	Min = 2.0%, 3.0% Desired	
Bridge Width	DM2 pg 1-16	Lane Widths plus Shoulders each side	Lane Widths plus Shoulders each side	
Vertical Grades	AASHTO Green Book, Exhibit 7-10 pg 472	Max. = 8%	Max. = 8%	
	DM2 pg 1-16	Min = 0.5%	Min = 0.5%	
Vertical Clearance	DM2 section 2.20 pg 2-50	16' 0" MIN + 6" for resurfacing	16' 6"	
Lateral Clearance to Structures	DM2 pg 4-3	14' Lateral Clearance to front face of barrier protectings walls or piers	14'-0" Min	
Horizontal Curvature	AASHTO Green Book, pg 168	Min Radius = 340'	Min Radius = 485'	
Compound Curve Ratio	AASHTO Green Book, pg 201	1.5:1	1.5:1	
Clear Sidewalk Width	DM2 pg 1-16	5'	5'	
Buffer	DM2 pg 1-16	6'+	6'+	
Total Sidewalk Width	DM2 pg 1-16	5'	5'	
Clear Zone Widths	DM2 Chapter 12	Table 12.1	Table 12.1	See attached table
Desired Operating Speed	DM2 pg 1-7 & 1-16	30-35 MPH	35 MPH	Posted 35MPH
Sight Distance (minimum)	AASHTO Green Book, Exhibit 7-1 pg 445	Stopping Sight Distance= 250'	Stopping Sight Distance = 250'	
		Passing Sight Distance= 1280'	Passing Sight Distance = 1280'	

NOTES:
1) The design criteria for this project are taken from PENNDOT Publication 13M, *Design Manual Part 2 (Aug 2009 ED) and The AASHTO Greenbook, 2004 Edition*

Interchange 307 - PA611 Design Criteria

Pennsylvania Department of Transportation, District 5-0
Agreement No. E02656, Monroe County
SR 0080, Section 17M

Design Element	Criteria Source	Standard Criteria	Applied Criteria	Comments
Functional Classification	Functional Class Map	Urban - Minor Arterial	Urban - Minor Arterial	iTMS Data attached
Roadway Typology	DM2 pg 1-7 & 1-16	Community Arterial Suburban Neighborhood	Community Arterial Suburban Neighborhood	
Terrain	DM2 pg 2-11, AASHTO Greenbook pg 231	Rolling	Rolling	
Lane Widths	DM2 pg 1-16	11' - 12'	11' - 12'	
Shoulder Width	DM2 pg 1-16	8' to 10'	8' - 10'	
Bike Lane	DM2 pg 1-16	6' (if no shoulder)	NA	Match existing section
Parking Lane	DM2 pg 1-16	7' to 8' Parallel	NA	Match existing section
Median Width (if needed)	DM2 pg 1-16	12' - 18' For Left Turn; 6' to 8' for Peds	12' - 18' For Left Turn; 6' to 8' for Peds	
Curb Return	DM2 pg 1-16	25'-50'	25'-50'	
Travel Lanes	DM2 pg 1-16	2 - 4	2	
Cross Slope / Superelevation	DM2 pg 1-16	Max = 6.0%	Max = 6.0%	
		Min = 2.0%	Min = 2.0%	
Bridge Width	DM2 pg 1-16	Lane Widths plus Shoulders each side	Lane Widths plus Shoulders each side	
Vertical Grades	AASHTO Greenbook pg 472	Max. = 8%	Max. = 8%	
	DM2 pg 1-16	Min = 0.5%	Min = 0.5%	
Vertical Clearance	DM2 pg 2-50	16' 0" MIN + 6" for resurfacing	16' 6"	
Lateral Clearance to Structures	DM2 pg 4-3	14' Lateral Clearance to front face of barrier protectings walls or piers	14'-0" Min	
Horizontal Curvature	AASHTO Green Book, pg 168	Min Radius = 340'	Min Radius = 340'	
Compound Curve Ratio	AASHTO Green Book, pg 201	1.5:1	1.5:1	
Clear Zone Widths	DM2 Chapter 12	Table 12.1	Table 12.1	See attached table
Guide Rail and Median Barrier	DM2 Chapter 12	Table 12.3	Table 12.3	See attached table
Desired Operating Speed	DM2 pg 1-16 & pg 2-11	35-50 MPH	35 MPH	Posted 35MPH
Sight Distance	DM2 pg 1-16 & AASHTO Greenbook pg 445	Stopping Sight Distance= 250'	Stopping Sight Distance = 250'	

NOTES:

1) The design criteria for this project are taken from PENNDOT Publication 13M, *Design Manual Part 2 (Aug 2009 ED) and The AASHTO Greenbook, 2004 Edition*

Interchange 307 - SR191 Design Criteria

Pennsylvania Department of Transportation, District 5-0
Agreement No. E02656, Monroe County
SR 0080, Section 17M

Design Element	Criteria Source	Standard Criteria	Applied Criteria	Comments
Functional Classification	Functional Class Map	Urban Other Principal Arterial	Urban Other Principal Arterial	iTMS Data attached
Roadway Typology	DM2 pg 1-7 & 1-16	Community Arterial Suburban Corridor	Community Arterial Suburban Corridor	
Terrain	DM2 pg 2-11, AASHTO Greenbook pg 231	Rolling	Rolling	
Lane Widths	DM2 pg 1-16	11' - 12'	11' - 12'	
Shoulder Width	DM2 pg 1-16	8' to 10'	8' - 10'	
Bike Lane	DM2 pg 1-16	5'-6' (if no shoulder)	NA	Match existing section
Median Width (if needed)	DM2 pg 1-16	12' - 18' For Left Turn; 6' to 8' for Peds	12' - 16' For Left Turn; 6' to 8' for Peds	
Curb Return	DM2 pg 1-16	25'-50'	25'-50'	
Travel Lanes	DM2 pg 1-16	2 - 4	2	
Cross Slope / Superelevation	DM2 pg 1-16	Max = 6.0%	Max = 6.0%	
		Min = 2.0%	Min = 2.0%	
Bridge Width	DM2 pg 1-16	Lane Widths plus Shoulders each side	Lane Widths plus Shoulders each side	
Vertical Grades	AASHTO Greenbook pg 472	Max. = 8%	Max. = 8%	
	DM2 pg 1-16	Min = 0.5%	Min = 0.5%	
Vertical Clearance	DM2 pg 2-50	16' 0" MIN + 6" for resurfacing	16'-6" Min	
Lateral Clearance to Structures	DM2 pg 4-3	14' Lateral Clearance to front face of barrier protectings walls or piers	14'-0" Min	
Horizontal Curvature	AASHTO Green Book, pg 168	Min Radius = 340'	Min Radius = 340'	
Compound Curve Ratio	AASHTO Green Book, pg 201	1.5:1	1.5:1	
Clear Zone Widths	DM2 Chapter 12	Table 12.1	Table 12.1	See attached table
Guide Rail and Median Barrier	DM2 Chapter 12	Table 12.3	Table 12.3	See attached table
Desired Operating Speed	DM2 pg 1-16 & pg 2-11	35-50 MPH	35 MPH	Posted 35MPH
Sight Distance	DM2 pg 1-16 & AASHTO Greenbook pg 445	Stopping Sight Distance= 250'	Stopping Sight Distance = 250'	

NOTES:

1) The design criteria for this project are taken from PENNDOT Publication 13M, *Design Manual Part 2 (Aug 2009 ED) and The AASHTO Greenbook, 2004 Edition*

I-80 Design Criteria

Pennsylvania Department of Transportation, District 5-0
Agreement No. E02656, Monroe County
SR 0080, Section 17M

Design Element	Criteria Source	Standard Criteria	Applied Criteria	Comments
Functional Classification	DM2 pg 1-7 & Functional Classification Map	Regional Arterial Surburban Corridor	Regional Arterial Surburban Corridor	
Terrain	PENNDOT	Rolling	Rolling	
Lane Widths	DM2 pg 1-12	11' - 12'	12'-0"	
Shoulder Width	DM2 pg 1-12	8' - 12'	10' RT; 4' LT	
Bike Lane	DM2 pg 1-12	6' (if No Shoulder)	NA	
Median Width (if needed)	DM2 pg 1-12	16' - 18' for LT Turn; 6' - 8' for Peds Only	10'	Min 4' - 6' OK in areas without at-grade intersections per AASHTO Green Book pg 456
Curb Return	DM2 pg 1-12	30' - 50'	NA	
Travel Lanes	DM2 pg 1-12	4-6	4	
Cross Slope / Superelevation	DM2 pg 1-12	Max = 6.0%	Max = 6.0%	
		Min = 2.0%	Min = 2.0%	
Bridge Width	DM2 pg 1-12	Pavement Width + Shoulder each side	Pavement Width + 10' RT Shld + 4' LT Shld	For bridges over 200' length shoulder may be reduced to 4' on each side (Note 16 DM-2 pg 1-13) & AASHTO Green Book pg 455
Vertical Grades	AASHTO Green Book, pg 472	Max = 7% - 5%	Max. = 7%	
	DM2 pg 1-12	Min = 0.5%	Min = 0.5%	
Vertical Clearance	DM2 pg 2-47	16'-6" (Min.)	16'-6" (Min.)	
Horizontal Clearance	DM2 pg 4-3	14' Lateral Clearance to front face of barrier protectings walls or piers	14'-0"	
Horizontal Curvature	AASHTO Green Book, pg 168	Min Radius = 340' - 1060'	Min Radius = 833'	
Compound Curve Ratio	AASHTO Green Book, pg 201	1.5:1	1.5:1	
Clear Zone Widths	DM2 pg 1-12	See DM-2, Chapter 12	See DM-2, Chapter 12	
Guide Rail and Median Barrier	DM2 pg 1-12	See DM-2, Chapter 12	See DM-2, Chapter 12	
Desired Operating Speed	DM2 pg 1-12 & pg 2-11	35 - 55 MPH	50 MPH	
Sight Distance	DM2 pg 1-12 & AASHTO Green Book pg 445	Stopping Sight Distance=250' - 495'	Stopping Sight Distance = 425'	

NOTES:

1) The design criteria for this project are taken from PENNDOT Publication 13M, *Design Manual Part 2 (Aug 2009 ED)*

I-80 Design Criteria

Pennsylvania Department of Transportation, District 5-0
Agreement No. E02656, Monroe County
SR 0080, Section 17M

Design Element	Criteria Source	Standard Criteria	Applied Criteria	Comments
Functional Classification	DM2 pg 1-7 & Functional Class Map	Community Arterial (Town/Village/Neighborhood)	Community Arterial (Town/Village/Neighborhood)	
Terrain	PENNDOT, AASHTO pg 231	Rolling	Rolling	
Lane Widths	DM2 pg 1-16	10' - 12'	12'	
Shoulder Width	DM2 pg 1-16	4' to 6' (if no parking or bike lane)	6'	
Bike Lane	DM2 pg 1-16	5' - 6'	NA	Not provided to match adjoining section
Parking Lane	DM2 pg 1-16	7' to 8' Parallel	NA	Not provided to match adjoining section
Median Width (if needed)	DM2 pg 1-16	16' - 18' For Left Turn 12' - 18' For Left Turn; 6' to 8' for Peds	NA	Not Needed
Curb Return	DM2 pg 1-16	15' - 30'	15' - 30'	Should be as small as possible
Travel Lanes	DM2 pg 1-16	2 - 4	2 - 4	
Cross Slope / Superelevation	DM2 pg 1-16	Max = 6.0% Min = 3.0%	Max = 6.0% Min = 3.0%	3% min Cross Slope recommended for DS < 40 MPH; 3% min Cross Slope recommended on Tangets if Vert. Grade < 1%
Bridge Width	DM2 pg 1-16	Lane Widths plus Shoulder each side	Lane Widths plus Shoulder each side	Bridges over 200' in length, shoulder may be 4' each side; On curbed approaches: curb to curb width = bridge width
Vertical Grades	AASHTO Green Book, Exhibit 7-10 pg 472 DM2 pg 1-16	Max. = 8% Min = 0.5% - 0.75% (if curbed)	Max. = 8% Min = 0.5% - 0.75%	0.75% Min Recommended Grade on Curbed Sections
Vertical Clearance	DM2 section 2.20 pg 2-47	16' 0" MIN + 6" for resurfacing	16' 6"	
Horizontal Clearance	DM2 pg 4-3	14' Lateral Clearance to front face of barrier protectings walls or piers	14'-0"	
Horizontal Curvature	AASHTO Green Book, pg 147	Min Radius = 144' - 231'	Min Radius = 340'	
Compound Curve Ratio	AASHTO Green Book, pg 201	1.5:1	1.5:1	(in the direction of sharper curvature)
Compound Curve Length	AASHTO Green Book, pg 202	60' to 200' minimum	See exhibit 3-42, pg 202	(min length of compound curve)
Clear Sidewalk Width	DM2 pg 1-16	6' - 8'	6'	Need to check vs future pedestrian volumes
Buffer	DM2 pg 1-16	4' - 6'	4'	(grass area between shldr & sidewalk)
Shy Distance	DM2 pg 1-16	0' - 2'	0'	
Total Sidewalk Width	DM2 pg 1-16	10' - 16'	10'-0"	
Clear Zone Widths	DM2 pg 1-16	See DM-2, Chapter 12	See DM-2, Chapter 12	
Desired Operating Speed	DM2 pg 1-7 & 1-16	25 - 55 MPH	35 MPH	
Sight Distance (minimum)	AASHTO Green Book, Exhibit 7-1 pg 445	Stopping Sight Distance= 250' Passing Sight Distance= 1280'	Stopping Sight Distance = 250' Passing Sight Distance = 1280'	

NOTES:
1) The design criteria for this project are taken from PENNDOT Publication 13M, *Design Manual Part 2 (Aug 2009 ED)*

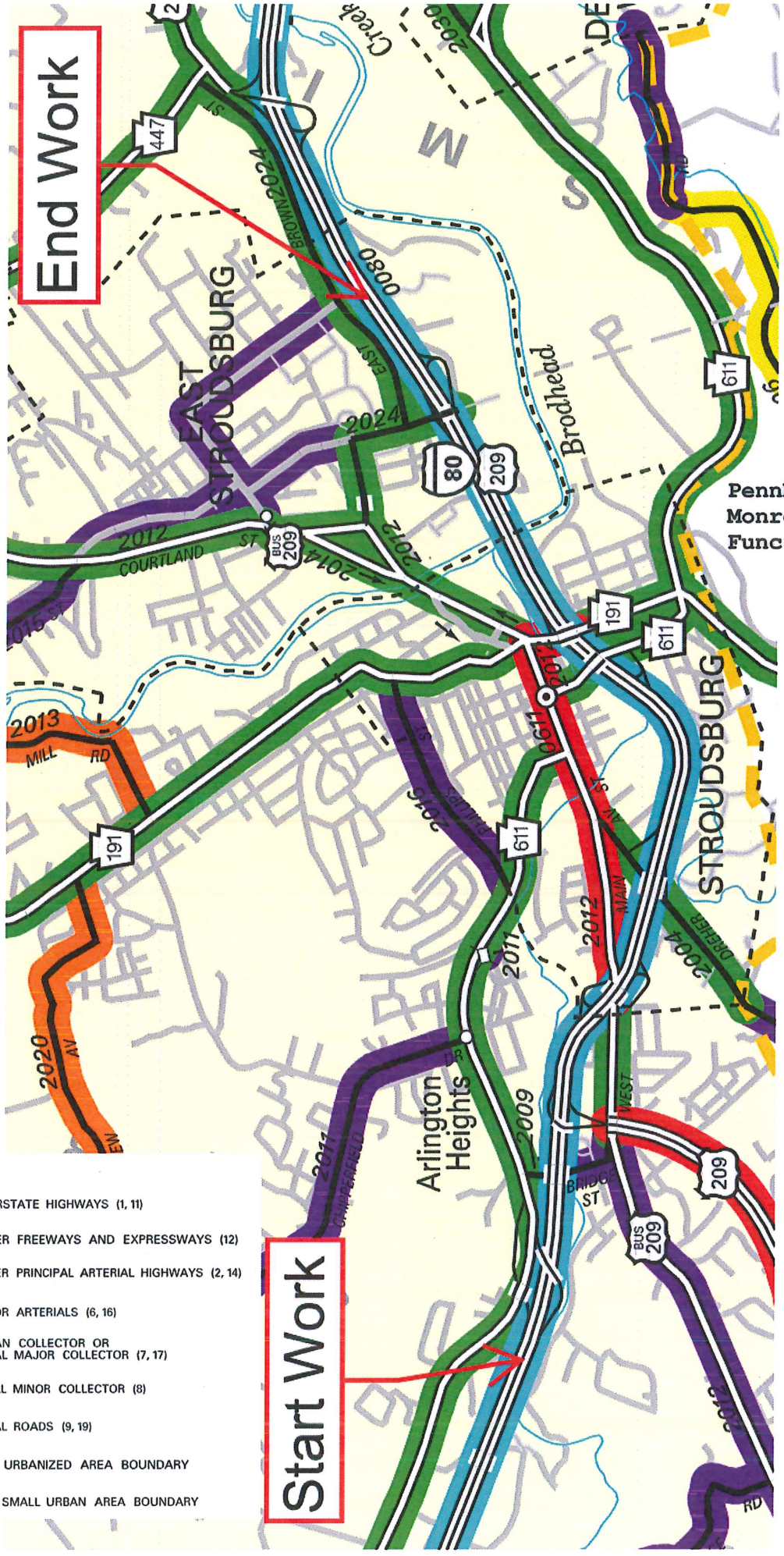
I-80 Design Criteria

Pennsylvania Department of Transportation, District 5-0
Agreement No. E02656, Monroe County
SR 0080, Section 17M

Design Element	Criteria Source	Standard Criteria	Applied Criteria	Comments
Functional Classification	DM2 pg 1-7 & Functional Class Map	Community Arterial (Town/Village/Neighborhood)	Community Arterial (Town/Village/Neighborhood)	
Terrain	PENNDOT, AASHTO pg 231	Rolling	Rolling	
Lane Widths	DM2 pg 1-16	10' - 12'	12'	
Shoulder Width	DM2 pg 1-16	4' to 6' (if no parking or bike lane)	6'	
Bike Lane	DM2 pg 1-16	5' - 6'	NA	Not provided to match adjoining section
Parking Lane	DM2 pg 1-16	7' to 8' Parallel	NA	Not provided to match adjoining section
Median Width (if needed)	DM2 pg 1-16	16' - 18' For Left Turn	NA	Not Needed
		12' - 18' For Left Turn; 6' to 8' for Peds		
Curb Return	DM2 pg 1-16	15' - 30'	15' - 30'	Should be as small as possible
Travel Lanes	DM2 pg 1-16	2 - 4	2 - 4	
Cross Slope / Superelevation	DM2 pg 1-16	Max = 6.0%	Max = 6.0%	3% min Cross Slope recommended for DS < 40 MPH; 3% min Cross Slope recommended on Tangets if Vert. Grade < 1%
		Min = 3.0%	Min = 3.0%	
Bridge Width	DM2 pg 1-16	Lane Widths plus Shoulder each side	Lane Widths plus Shoulder each side	Bridges over 200' in length, shoulder may be 4' each side; On curbed approaches: curb to curb width = bridge width
Vertical Grades	AASHTO Green Book, Exhibit 7-10 pg 472	Max. = 8%	Max. = 8%	0.75% Min Recommended Grade on Curbed Sections
	DM2 pg 1-16	Min = 0.5% - 0.75% (if curbed)	Min = 0.5% - 0.75%	
Vertical Clearance	DM2 section 2.20 pg 2-47	16' 0" MIN + 6" for resurfacing	16' 6"	
Horizontal Clearance	DM2 pg 4-3	14' Lateral Clearance to front face of barrier protectings walls or piers	14'-0"	
Horizontal Curvature	AASHTO Green Book, pg 147	Min Radius = 144' - 231'	Min Radius = 340'	
Compound Curve Ratio	AASHTO Green Book, pg 201	1.5:1	1.5:1	(in the direction of sharper curvature)
Compound Curve Length	AASHTO Green Book, pg 202	60' to 200' minimum	See exhibit 3-42, pg 202	(min length of compound curve)
Clear Sidewalk Width	DM2 pg 1-16	6' - 8'	6'	Need to check vs future pedestrian volumes
Buffer	DM2 pg 1-16	4' - 6'	4'	(grass area between shldr & sidewalk)
Shy Distance	DM2 pg 1-16	0' - 2'	0'	
Total Sidewalk Width	DM2 pg 1-16	10' - 16'	10'-0"	
Clear Zone Widths	DM2 pg 1-16	See DM-2, Chapter 12	See DM-2, Chapter 12	
Desired Operating Speed	DM2 pg 1-7 & 1-16	25 - 55 MPH	35 MPH	
Sight Distance (minimum)	AASHTO Green Book, Exhibit 7-1 pg 445	Stopping Sight Distance= 250'	Stopping Sight Distance = 250'	
		Passing Sight Distance= 1280'	Passing Sight Distance = 1280'	

NOTES:
1) The design criteria for this project are taken from PENNDOT Publication 13M, *Design Manual Part 2 (Aug 2009 ED)*

Project: I-80 Reconstruction
Originator: SMS 2/19/13
Reviewer: _____



PennDOT
Monroe County
Funct Class Map

Project: I-80 Reconstruction Job# 60284833
Originator: JNB 2/19/13 Calc# 1
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TABLE 1.2
ROADWAY TYPOLOGIES

ROADWAY CLASS	ROADWAY TYPE	DESIRED OPERATING SPEED	AVERAGE TRIP LENGTH	VOLUME	INTERSECTION SPACING	COMMENTS
Arterial	Regional	50-90 km/h (30-55 mph)	24-56 km (15-35 mi)	10,000-40,000 veh/day	200-400 m (660-1,320 ft)	Roadways in this category would be considered "Principal Arterial" in traditional functional classification.
Arterial	Community	40-90 km/h (25-55 mph)	11-40 km (7-25 mi)	5,000-25,000 veh/day	90-400 m (300-1,320 ft)	Often classified as "Minor Arterial" in traditional classification but may include road segments classified as "Principal Arterial".
Collector	Community	40-90 km/h (25-55 mph)	8-16 km (5-10 mi)	5,000-15,000 veh/day	90-200 m (300-660 ft)	Often similar in appearance to a community arterial. Typically classified as "Major Collector".
Collector	Neighborhood	40-60 km/h (25-35 mph)	< 11 km (< 7 mi)	< 6,000 veh/day	90-200 m (300-660 ft)	Similar in appearance to local roadways. Typically classified as "Minor Collector".
Local	Local	30-50 km/h (20-30 mph)	< 8 km (< 5 mi)	< 3,000 veh/day	60-200 m (200-660 ft)	

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FIGURE 1.2
ILLUSTRATED ROADWAY TYPOLOGIES

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Originator: JWC 2/13/13 Calc# 1
Reviewer: _____ Page 12

FIGURE 1.2 (CONTINUED)
ILLUSTRATED ROADWAY TYPOLOGIES

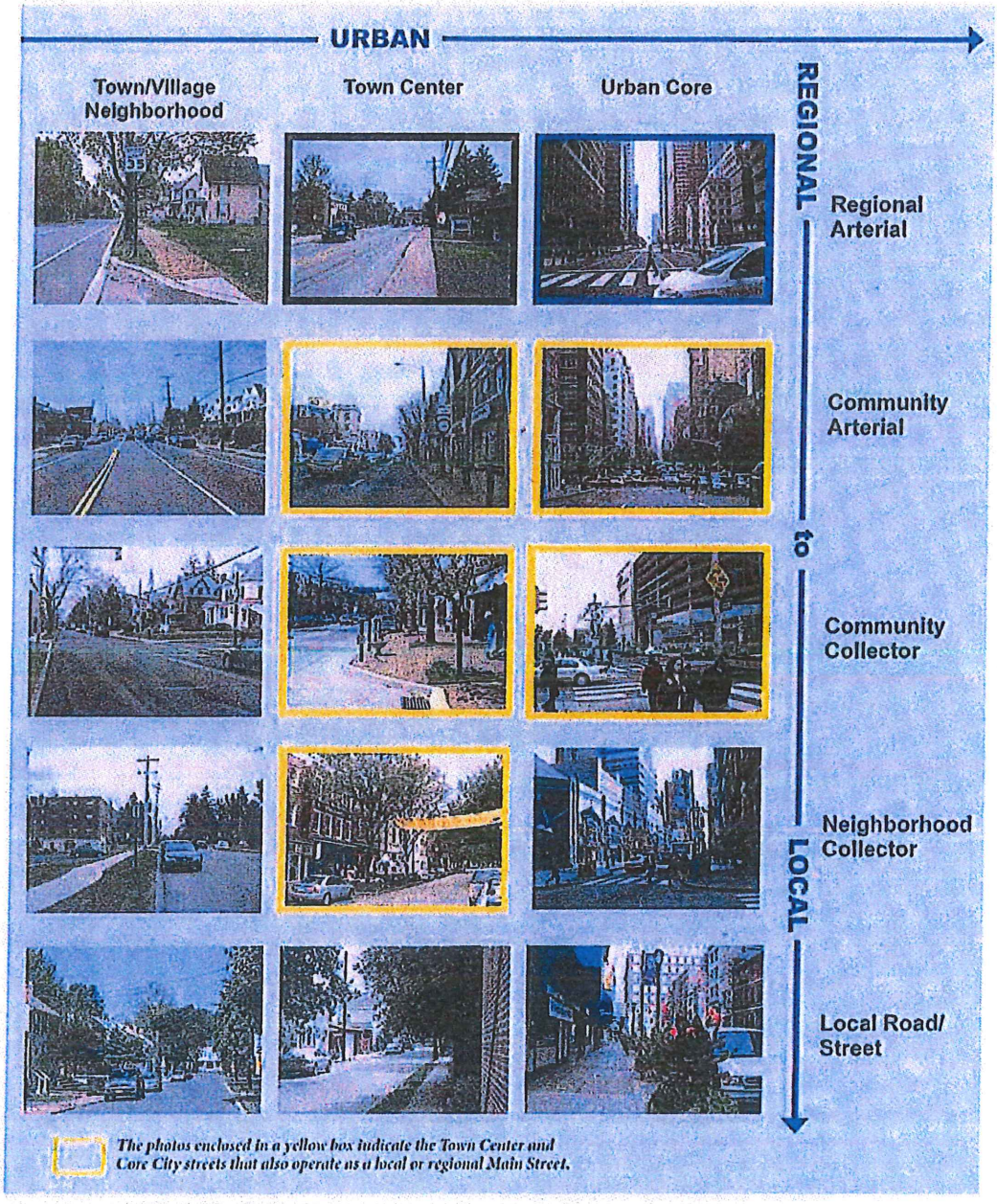

TABLE 1.4 (ENGLISH)
MATRIX OF DESIGN VALUES – COMMUNITY ARTERIAL

	Community Arterial	Rural	Suburban Neighborhood	Suburban Corridor	Suburban Center	Town/Village Neighborhood	Town/Village Center	Urban Core
Roadway	Lane Width [1]	11' to 12'	10' to 12'	11' to 12'	10' to 12'	10' to 12'	10' to 12'	10' to 12'
	Shoulder Width [2, 3]	8' to 10'	4' to 8' (if No Parking or Bike Lane)	8' to 10'	4' to 6' (if No Parking or Bike Lane)	4' to 6' (if No Parking or Bike Lane)	4' to 6' (if No Parking or Bike Lane)	4' to 6' (if No Parking or Bike Lane)
	Parking Lane [16]	NA	7' to 8' Parallel	NA	8' Parallel	7' to 8' Parallel	7' to 8' Parallel	7' to 8' Parallel
	Bike Lane [4]	NA	5' to 6' (if No Shoulder)	5' to 6' (if No Shoulder)	5' to 6'	5' to 6'	5' to 6'	5' to 6'
	Median (if needed)	4' to 6'	16' to 18' for Left Turn 12' to 18' for Left Turn; 6' to 8' for Pedestrians	16' to 18' for Left Turn 12' to 18' for Left Turn; 6' to 8' for Pedestrians	16' to 18' for Left Turn 12' to 18' for Left Turn; 6' to 8' for Pedestrians	16' to 18' for Left Turn 12' to 18' for Left Turn; 6' to 8' for Pedestrians	16' to 18' for Left Turn 12' to 18' for Left Turn; 6' to 8' for Pedestrians	16' to 18' for Left Turn 12' to 18' for Left Turn; 6' to 8' for Pedestrians
	Curb Return [5]	25' to 50'	25' to 35'	25' to 50'	20' to 40'	15' to 30'	15' to 35'	15' to 40'
	Travel Lanes	2 to 4	2 to 4	2 to 4	2 to 4	2 to 4	2 to 4	2 to 4
	Cross Slopes (Minimum) [6, 7]	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
	Cross Slopes (Maximum) [8]	8.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%
	Bridge Widths (Two-Lane Facilities) [9, 10, 17]	Lane Widths Plus Shoulders Each Side	Lane Widths Plus Shoulders Each Side	Lane Widths Plus Shoulders Each Side	Lane Widths Plus Shoulders Each Side	Lane Widths Plus Shoulders Each Side	Lane Widths Plus Shoulders Each Side	Lane Widths Plus Shoulders Each Side
	Bridge Widths (Four-Lane Facilities) [9, 10, 17]	Lane Widths Plus Shoulders Each Side	Lane Widths Plus Shoulders Each Side	Lane Widths Plus Shoulders Each Side	Lane Widths Plus Shoulders Each Side	Lane Widths Plus Shoulders Each Side	Lane Widths Plus Shoulders Each Side	Lane Widths Plus Shoulders Each Side
	Vertical Grades (Minimum) [11]	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
	Vertical Clearance (Minimum)	16'-0", See Chapter 2	16'-0", See Chapter 2	16'-0", See Chapter 2	16'-0", See Chapter 2	16'-0", See Chapter 2	16'-0", See Chapter 2	16'-0", See Chapter 2
Roadside [12]	Clear Sidewalk Width	NA	5'	5' to 6'	6'	6' to 8'	6' to 10'	8' to 14'
	Buffer [13]	NA	6'+	5' to 10'	4' to 6'	4' to 6'	4' to 6'	4' to 6'
	Shy Distance	NA	NA	NA	0' to 2'	0' to 2'	2'	2'
	Total Sidewalk Width	NA	5'	5' to 6'	10' to 14'	10' to 16'	12' to 18'	14' to 22'
	Clear Zone Widths [14]	See Chapter 12	See Chapter 12	See Chapter 12	See Chapter 12	See Chapter 12	See Chapter 12	See Chapter 12
	Right-of-Way Widths [15]	Varies	Varies	Varies	Varies	Varies	Varies	Varies
Speed	Desired Operating Speed (Design Speed)	35-55 mph	30-35 mph	35-50 mph	30 mph	25-30 mph	25-30 mph	25-30 mph
	Stopping and Passing Sight Distances (Minimum)	2004 AASHTO Green Book, Exhibit 7-1	2004 AASHTO Green Book, Exhibit 7-1	2004 AASHTO Green Book, Exhibit 7-1	2004 AASHTO Green Book, Exhibit 7-1	2004 AASHTO Green Book, Exhibit 7-1	2004 AASHTO Green Book, Exhibit 7-1	2004 AASHTO Green Book, Exhibit 7-1
	Vertical Grades (Maximum)	2004 AASHTO Green Book, Exhibit 7-2	2004 AASHTO Green Book, Exhibit 7-10	2004 AASHTO Green Book, Exhibit 7-10	2004 AASHTO Green Book, Exhibit 7-10	2004 AASHTO Green Book, Exhibit 7-10	2004 AASHTO Green Book, Exhibit 7-10	2004 AASHTO Green Book, Exhibit 7-10

TABLE 1.3 (ENGLISH)
MATRIX OF DESIGN VALUES – REGIONAL ARTERIAL

	Regional Arterial	Rural	Suburban Neighborhood	Suburban Corridor	Suburban Center	Town/Village Neighborhood	Town/Village Center	Urban Core
Roadway	Lane Width [1]	11' to 12'	11' to 12'	11' to 12'	11' to 12'	10' to 12'	10' to 12'	10' to 12'
	Shoulder Width [2, 3]	8' to 10'	8' to 10'	8' to 12'	4' to 6' (if No Parking or Bike Lane)	4' to 6' (if No Parking or Bike Lane)	4' to 6' (if No Parking or Bike Lane)	4' to 6' (if No Parking or Bike Lane)
	Parking Lane	NA	NA	NA	8' Parallel	8' Parallel	8' Parallel	8' Parallel
	Bike Lane [4]	NA	5' to 6' (if No Shoulder)	6' (if No Shoulder)	5' to 6'	5' to 6'	5' to 6'	5' to 6'
	Median (if needed)	4' to 6'	16' to 18' for Left Turn; 6' to 8' for Pedestrians Only	16' to 18' for Left Turn; 6' to 8' for Pedestrians Only	16' to 18' for Left Turn; 6' to 8' for Pedestrians Only	16' to 18' for Left Turn; 6' to 8' for Pedestrians Only	16' to 18' for Left Turn; 6' to 8' for Pedestrians Only	16' to 18' for Left Turn; 6' to 8' for Pedestrians Only
	Curb Return [5]	30' to 50'	25' to 35'	30' to 50'	25' to 50'	15' to 40'	15' to 40'	15' to 40'
	Travel Lanes	2 to 6	2 to 6	4 to 6	4 to 6	2 to 4	2 to 4	2 to 6
	Cross Slopes (Minimum) [6, 7]	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
	Cross Slopes (Maximum) [8]	8.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%
	Bridge Widths (Two-Lane Facilities) [9, 10, 16]	Lane Widths Plus Shoulders Each Side	Lane Widths Plus Shoulders Each Side	Lane Widths Plus Shoulders Each Side	Lane Widths Plus Shoulders Each Side	Lane Widths Plus Shoulders Each Side	Lane Widths Plus Shoulders Each Side	Lane Widths Plus Shoulders Each Side
	Bridge Widths (Four-Lane or More Facilities) [9, 10, 16]	Lane Widths Plus Shoulders Each Side	Lane Widths Plus Shoulders Each Side	Lane Widths Plus Shoulders Each Side	Lane Widths Plus Shoulders Each Side	Lane Widths Plus Shoulders Each Side	Lane Widths Plus Shoulders Each Side	Lane Widths Plus Shoulders Each Side
	Vertical Grades (Minimum) [11]	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
	Vertical Clearance (Minimum)	16'-0", See Chapter 2	16'-0", See Chapter 2	16'-0", See Chapter 2	16'-0", See Chapter 2	16'-0", See Chapter 2	16'-0", See Chapter 2	16'-0", See Chapter 2
Roadside [12]	Clear Sidewalk Width	NA	5'	5' to 6'	5' to 6'	6' to 8'	6' to 10'	6' to 12'
	Buffer [13]	NA	6'+	6' to 10'	4' to 6'	4' to 6'	4' to 6'	4' to 6'
	Shy Distance	NA	NA	NA	0' to 2'	0' to 2'	2'	2'
	Total Sidewalk Width	NA	5'	5' to 6'	9' to 14'	10' to 16'	12' to 18'	12' to 20'
	Clear Zone Widths [14]	See Chapter 12	See Chapter 12	See Chapter 12	See Chapter 12	See Chapter 12	See Chapter 12	See Chapter 12
	Right-of-Way Widths [15]	Varies	Varies	Varies	Varies	Varies	Varies	Varies
Speed	Desired Operating Speed (Design Speed)	45-55 mph	35-40 mph	35-55 mph	30-35 mph	30-35 mph	30-35 mph	30-35 mph
	Stopping and Passing Sight Distances (Minimum)	2004 AASHTO Green Book, Exhibit 7-1	2004 AASHTO Green Book, Exhibit 7-1	2004 AASHTO Green Book, Exhibit 7-1	2004 AASHTO Green Book, Exhibit 7-1	2004 AASHTO Green Book, Exhibit 7-1	2004 AASHTO Green Book, Exhibit 7-1	2004 AASHTO Green Book, Exhibit 7-1
	Vertical Grades (Maximum)	2004 AASHTO Green Book, Exhibit 7-2	2004 AASHTO Green Book, Exhibit 7-10	2004 AASHTO Green Book, Exhibit 7-10	2004 AASHTO Green Book, Exhibit 7-10	2004 AASHTO Green Book, Exhibit 7-10	2004 AASHTO Green Book, Exhibit 7-10	2004 AASHTO Green Book, Exhibit 7-10

Project: I-80 Reconstruction
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TABLE 1.3 (ENGLISH) (CONTINUED)
MATRIX OF DESIGN VALUES – REGIONAL ARTERIAL

Matrix of Design Values - Notes (Regional Arterial)
[1] 12' preferred for regular transit routes, and heavy truck volumes > 5%, particularly for design speeds of 35 mph or greater. A 1' to 2' offset to the curb is desirable. 14' for an outside lane with no shoulder or bike lane, if optimal accommodation for bicyclists is desired.
[2] Shoulders should only be installed in urban contexts as a retrofit of wide travel lanes to accommodate bicyclists. For rural divided arterials with three or more lanes in each direction, a 10' wide left shoulder within the median is desirable.
[3] Paving for railroad grade crossings shall extend 2' beyond the extreme rails for the full graded width of the highway.
[4] Design of bike lanes should be considered when identified as part of the Engineering & Environmental (E&E) Scoping process. For additional guidance, refer to Publication 10A, Design Manual, Part 1A, *Transportation Engineering Procedures,* Appendix J, Bicycle and Pedestrian Checklist.
[5] Curb return radius should be as small as possible. Number of lanes, on street parking, bike lanes, and shoulders should be utilized to determine effective radius.
[6] Cross slopes of 3.0% are recommended for design speeds less than 40 mph.
[7] In curbed areas with longitudinal slopes of 1% or less, 3.0% cross slopes may be used on tangents.
[8] For additional guidance, refer to Chapter 2, Sections 2.13.B, Rates of Superelevation and 2.13.C, Maximum Superelevation.
[9] On curbed approaches, the minimum bridge width may equal the curb-to-curb width. Where pedestrian traffic is anticipated, provisions for a sidewalk, preferably on the outside of the parapet, should be considered and shall meet the Department's Standards and requirements (see Chapter 6). Where paved or curbed parking lanes exist or have been approved for construction on approaches, the clear roadway width of the proposed bridge in each case shall be determined by the Central Office, Bureau of Design upon receipt of the District Executive's recommendation.
[10] For appropriate bridge widths, refer to the Minimum Width Criteria for Bridges.
[11] Recommended minimum grade of 0.75% on curbed sections.
[12] The Roadside design values should be considered and implemented as feasible and reasonable; however, Chapter 6, Pedestrian Facilities, should still be used for minimum design criteria. ADA accommodations must be addressed in accordance with ADA policy.
[13] Buffer is assumed to be planted area (grass, shrubs and/or trees) for suburban neighborhood and corridor contexts; street furniture/car door zone for other land use contexts. Minimum of 6' for transit zones.
[14] Center piers are not desirable. Increase bridge span where necessary to provide for required horizontal stopping sight distance. Provide clearance for guide rail in front of substructures if protection is required. For offset distances to substructure units, see Publication 15M, Design Manual, Part 4, *Structures*.
[15] No minimum right-of-way width is suggested. The procurement of sufficient right-of-way width should be based on the preferable dimensions for all the elements of the composite highway cross section and should be adequate to accommodate the construction and proper maintenance of the highway throughout the project. Future widening should be considered and, where needed for safety, additional right-of-way may be required for adequate sight distance. For additional information on right-of-way widths, refer to the 2004 AASHTO Green Book.
[16] For long bridges over 200' in length, the shoulder width may be 4' on each side.

Project: I-80 Reconstruction
Originator: JMG 2/19/13
Reviewer: _____

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Calc# 1
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TABLE 1.4 (ENGLISH) (CONTINUED)
MATRIX OF DESIGN VALUES – COMMUNITY ARTERIAL

Matrix of Design Values - Notes (Community Arterial)
[1] 12' preferred for regular transit routes, and heavy truck volumes > 5%, particularly for design speeds of 35 mph or greater. A 1' to 2' offset to the curb is desirable. 14' for an outside lane with no shoulder or bike lane, if optimal accommodation for bicyclists is desired.
[2] Shoulders should be installed in urban contexts only as part of a retrofit of wide travel lanes to accommodate bicyclists.
[3] Paving for railroad grade crossings shall extend 2' beyond the extreme rails for the full graded width of the highway.
[4] Design of bike lanes should be considered when identified as part of the Engineering & Environmental (E&E) Scoping process. For additional guidance, refer to Publication 10A, Design Manual, Part 1A, *Transportation Engineering Procedures,* Appendix J, Bicycle and Pedestrian Checklist.
[5] Curb Return radius should be as small as possible. Number of lanes, on street parking, bike lanes, and shoulders should be utilized to determine effective radius.
[6] Cross slopes of 3.0% are recommended for design speeds less than 40 mph.
[7] In curbed areas with longitudinal slopes of 1% or less, 3.0% cross slopes may be used on tangents.
[8] For additional guidance, refer to Chapter 2, Sections 2.13.B, Rates of Superelevation and 2.13.C, Maximum Superelevation.
[9] On curbed approaches, the minimum bridge width may equal the curb-to-curb width. Where pedestrian traffic is anticipated, provisions for a sidewalk, preferably on the outside of the parapet, should be considered and shall meet the Department's Standards and requirements (see Chapter 6). Where paved or curbed parking lanes exist or have been approved for construction on approaches, the clear roadway width of the proposed bridge in each case shall be determined by the Central Office, Bureau of Design upon receipt of the District Executive's recommendation.
[10] For appropriate bridge widths, refer to the Minimum Width Criteria for Bridges.
[11] Recommended minimum grade of 0.75% on curbed sections.
[12] The Roadside design values should be considered and implemented as feasible and reasonable; however, Chapter 6, Pedestrian Facilities, should still be used for minimum design criteria. ADA accommodations must be addressed in accordance with ADA policy.
[13] Buffer is assumed to be planted area (grass, shrubs and/or trees) for suburban neighborhood and corridor contexts; street furniture/car door zone for other land use contexts. Minimum of 6' for transit zones.
[14] Center piers are not desirable. Increase bridge span where necessary to provide for required horizontal stopping sight distance. Provide clearance for guide rail in front of substructures if protection is required. For offset distances to substructure units, see Publication 15M, Design Manual, Part 4, *Structures*.
[15] No minimum right-of-way width is suggested. The procurement of sufficient right-of-way width should be based on the preferable dimensions for all the elements of the composite highway cross section and should be adequate to accommodate the construction and proper maintenance of the highway throughout the project. Future widening should be considered and, where needed for safety, additional right-of-way may be required for adequate sight distance. For additional information on right-of-way widths, refer to the 2004 AASHTO Green Book.
[16] 7' parking lanes on this roadway type to be considered in appropriate conditions.
[17] For long bridges over 200' in length, the shoulder width may be 4' on each side.

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TABLE 1.8 (ENGLISH)
MATRIX OF DESIGN VALUES – LIMITED ACCESS FREEWAY

	Limited Access Freeway	Rural Interstate	Rural Non-Interstate	Urban Interstate	Urban Non-Interstate
Roadway	Lane Widths [1]	4 or More 12'-0" Lanes	4 or More 12'-0" Lanes [2]	4 or More 12'-0" Lanes	4 or More 12'-0" Lanes [2]
	Shoulder Widths [3, 4, 5]	10'-0" Right Shoulder 8'-0" Graded, 4'-0" Paved Left Shoulder (Medians Only)	10'-0" Right Shoulder 8'-0" Graded, 4'-0" Paved Left Shoulder (Medians Only)	10'-0" Right Shoulder 8'-0" Graded, 4'-0" Paved Left Shoulder (Medians Only)	10'-0" Right Shoulder 8'-0" Graded, 4'-0" Paved Left Shoulder (Medians Only)
	Median Widths	10'-0" to 50'-0" [6, 7] (Mountainous) 36'-0" to 100'-0" [8] (Level or Rolling)	10'-0" to 100'-0" [6, 7, 8]	10'-0" [6]	10'-0" [6]
	Cross Slopes (Minimum)	2.0%	2.0%	2.0%	2.0%
	Cross Slopes (Maximum)	8.0%	8.0%	6.0%	6.0%
	Bridge Widths [9, 10]	Lane Widths Plus Right Shoulder Plus 6'-0" Left Shoulder	Lane Widths Plus Right Shoulder Plus 6'-0" Left Shoulder	Lane Widths Plus Right Shoulder Plus 6'-0" Left Shoulder	Lane Widths Plus Right Shoulder Plus 6'-0" Left Shoulder
	Vertical Grades (Minimum)	0.5%	0.5%	0.5%	0.5%
	Vertical Clearance (Minimum)	16'-0", See Chapter 2	16'-0", See Chapter 2	16'-0", See Chapter 2	16'-0", See Chapter 2
Roadside	Clear Zone Widths [11]	See Chapter 12	See Chapter 12	See Chapter 12	See Chapter 12
	Right-of-Way Widths [12]	Varies	Varies	Varies	Varies
Speed	Design Speed [13]	70 mph	70 mph	50-70 mph	50-70 mph
	Stopping Sight Distances (Minimum)	2004 AASHTO Green Book, Exhibit 3-72	2004 AASHTO Green Book, Exhibit 3-72	2004 AASHTO Green Book, Exhibit 3-72	2004 AASHTO Green Book, Exhibit 3-72
	Vertical Grades (Maximum) [14, 15]	2004 AASHTO Green Book, Exhibit 8-1	2004 AASHTO Green Book, Exhibit 8-1	2004 AASHTO Green Book, Exhibit 8-1	2004 AASHTO Green Book, Exhibit 8-1

TABLE 1.8 (ENGLISH) (CONTINUED)
MATRIX OF DESIGN VALUES – LIMITED ACCESS FREEWAY

Matrix of Design Values - Notes (Limited Access Freeway)
[1] Number of lanes determined by lane capacity design for selected Level of Service.
[2] Paving for railroad grade crossings shall extend 2' beyond the extreme rails for the full graded width of the highway.
[3] Where truck traffic exceeds 250 DDHV, a paved width of 12' for the right shoulder should be considered.
[4] On sections with six or more lanes, a paved width of 10' for the left shoulder should be provided. Where truck traffic exceeds 250 DDHV, a paved width of 12' for the left shoulder should be considered.
[5] In mountainous terrain, a reduced paved shoulder width together with a minimal median width may be used to reduce the high costs associated with providing a full width roadway cross section. In these instances, a 8' minimum paved right shoulder and a 4' minimum paved left shoulder may be used on a traveled way consisting of four or six lanes. Where eight or more lanes are provided, a 8' minimum paved shoulder width should be used on both sides.
[6] Use a minimum width of 10' for a two-lane directional facility which provides for two 4' shoulders and a 2' median barrier. For three or more lane directional facilities, the minimum width is 22' and preferably 26' where DDHV is greater than 250 Trucks.
[7] All median widths 20' or less should be paved. When Type 1 shoulders are specified for the 4' median shoulders, Type 3 shoulders may be used for the remainder if the remaining width is 8' or greater.
[8] The 100' dimension shown in the 2004 AASHTO Green Book, Exhibit 8-3B permits the designer to use independent profiles in rolling terrain to blend the freeway more appropriately with the environment while maintaining flat slopes for vehicle recovery.
[9] Selection of single or dual structures shall be made based on an economic analysis. Such items as structure length and width, horizontal and vertical curvature and ramp geometry shall be considered.
[10] Provide 12' left shoulder for bridges carrying three or more through lanes. Auxiliary lanes shall not be counted as through lanes.
[11] Center piers are not desirable. Increase bridge span where necessary to provide for required horizontal stopping sight distance. Provide clearance for guide rail in front of substructures if protection is required. For offset distances to substructure units, see Publication 15M, Design Manual, Part 4, *Structures*.
[12] No minimum right-of-way width is suggested. The procurement of sufficient right-of-way width should be based on the preferable dimensions for all the elements of the composite highway cross section and should be adequate to accommodate the construction and proper maintenance of the highway throughout the project. Future widening should be considered and, where needed for safety, additional right-of-way may be required for adequate sight distance. For additional information on right-of-way widths, refer to the 2004 AASHTO Green Book.
[13] Where terrain is mountainous, a design speed from 50 to 60 mph may be used. In urban areas, the design speed shall be at least 50 mph.
[14] For short grades less than 500' and for one-way downgrades, maximum grades may be up to 1% steeper.
[15] Grades up to 1% steeper than the value shown in Exhibit 8-1 may be provided in urban areas with crucial right-of-way constraints or where needed in mountainous terrain.

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c. Running Speed. The speed at which an individual vehicle travels over a highway section, defined as the length of the highway section divided by the running time required for the vehicle to travel through the section.

6. Traffic Flow Relationships. Traffic flow conditions on roadways can be characterized by the volume flow rate expressed in vehicles per hour, the average speed in kilometers per hour (miles per hour) and the traffic density in vehicles per kilometer (vehicles per mile). Generalized speed-volume-density relationships are shown in the 2004 AASHTO Green Book, Chapter 2, Exhibit 2-30.

D. Safety. The section "Safety" in the 2004 AASHTO Green Book, Chapter 2 discusses how a viable safety evaluation and improvement program is a vital part of the overall highway improvement program. Areas of primary importance include the identification of potential safety problems, the evaluation of the effectiveness of alternative solutions, and the programming of available funds for the most effective improvements.

E. Environment. The section "Environment" in the 2004 AASHTO Green Book, Chapter 2 discusses how a highway should be considered as an element of the total environment. Because highway location and design decisions have an effect on the development of adjacent areas, it is important that environmental variables be given full consideration. Also, care should be exercised to ensure that applicable local, state, and federal environmental requirements are met.

F. Economic Analysis. Highway economics is concerned with the cost of a proposed improvement and the benefits resulting from it. The AASHTO publication, "User Benefit Analysis for Highways", may be used to perform economic analysis of proposed highway improvements.

2.20 VERTICAL CLEARANCE REQUIREMENTS

Vertical clearance represents one of the key highway elements or features as the controlling criteria for developing geometric design for both highway and bridge projects.

As such, the clearances presented in this Section represent the minimum acceptable criteria and shall be used as the required vertical control for all new structures, superstructure replacements and reconstructed pavements on or over the highway based on the functional classification of the facility. Vertical clearance shall apply to the required clearance over the entire roadway width and the usable width of the shoulders and shall also include auxiliary lanes, when applicable, to structures passing over the highway facility. Where a bridge deck is to be replaced or a portion of the superstructure is to be replaced, achievement of the vertical clearance requirements should be considered. The minimum vertical clearance required shall preferably be maintained within the recovery area.

All structures having a vertical clearance below the minimum acceptable criteria should ultimately be considered for improvement of clearance. When the vertical clearance requirements cannot be achieved, justification to support a design exception submission request shall be provided.

A. Strategic Highway Network (STRAHNET). The Surface Deployment and Distribution Command Transportation Engineering Agency (SDDCTEA) of the Department of Defense has developed and continues to refine the Strategic Highway Network (STRAHNET). The STRAHNET is a system of highways that provides defense access, continuity and emergency capabilities for movements of personnel and equipment in both peacetime and wartime. The STRAHNET includes all Interstate highways in Pennsylvania (including the Pennsylvania Turnpike) and has been incorporated into the National Highway System (NHS). Figure 2.10 shows the highway facilities that are designated as part of the STRAHNET, including major STRAHNET connectors to military facilities.

All highway facilities on the STRAHNET require the following vertical clearance:

THE VERTICAL CLEARANCE AT ALL UNDERPASSES SHALL BE AT LEAST 4.9 m (16 ft, 0 in) PLUS AN ALLOWANCE OF UP TO 0.15 m (6 in) TO ACCOMMODATE FUTURE RESURFACING.

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crossings, appearance, or aesthetic dimension relations; and cost factors such as lengthy depressed sections of roadway.

The lateral clearances for major roadway underpasses are illustrated in the 2004 AASHTO Green Book, Chapter 10, Exhibit 10-6. For a two-lane roadway or an undivided multilane roadway, the minimum lateral clearance from the edge of the traveled way to the face of the protective barrier should be the normal shoulder width. On divided highways, the clearances on the left side of each roadway are usually governed by the median width. A minimum median width of 3.0 m (10 ft) may be used on a four-lane roadway to provide 1.2 m (4 ft) shoulders and rigid median barrier. For a roadway with six or more lanes, the minimum median width should be 6.6 m (22 ft) to provide 3.0 m (10 ft) shoulders and a rigid median barrier. Where structural design makes it necessary to reduce their horizontal clearance through an underpass, the change in lateral width should be accomplished through gradual adjustments in the cross section of the approach roadway rather than abruptly at the structure. Such transitions in width may have a longitudinal/lateral ratio of 0.6 × design speed to 1 for a design speed in kilometers per hour (design speed to 1 for a design speed in miles per hour). For lateral width "flare" transitions, refer to Chapter 12, Table 12.7 (Flare Rates for Barrier Design).

For new or reconstruction projects, the minimum lateral clearance from the edge of the pavement to the face of the protective barrier in front of retaining walls and bridge substructures including piers, columns, and abutments shall be 4300 mm (14 ft) unless supporting documentation is provided. A design exception for lateral clearance will not be required if 4300 mm (14 ft) of lateral clearance is not provided; however, other geometric criteria such as required shoulder width and sight distance must still be met unless properly justified through the design exception process.

Sound barrier walls shall be located as far away as possible from the edge of traveled way while still providing the maximum benefit for insertion loss. Positive protection is required as per Publication 218M, *Standards for Bridge Design*, for sound barrier walls located within the clear zone. When a sound barrier wall protected by a concrete barrier is constructed along a highway or when a concrete barrier alone is constructed along a highway, the barrier shall be located no closer than the outer edge of shoulder and preferably should be located 0.6 m (2 ft) beyond the outer edge of shoulder.

Positive protection shall be provided when substructure units, retaining walls, or sound barrier walls must be placed within the clear zone width identified in Chapter 12, Table 12.1.

For the vertical clearance requirements of all structures, refer to Chapter 2, Section 2.20.

D. Overpass Roadways. The roadway dimensional design of an overpass or other bridge should be the same as that of the basic roadway in cross section dimensions unless the cost becomes prohibitive. The use of bridge railings, lateral clearances and median treatment should be as specified in Publication 15M, Design Manual, Part 4, *Structures,* and Publication 218M, *Standards for Bridge Design.*

E. Longitudinal Distance to Attain Grade Separation. The longitudinal distance needed for adequate design of a grade separation depends on the design speed, the roadway gradient and the amount of rise or fall needed to achieve the separation. To determine whether or not a grade separation is practical for given conditions, Exhibit 10-8 from Chapter 10 of the 2004 AASHTO Green Book should be used as a guide for preliminary design to determine horizontal distance in flat terrain. The figure also may serve as a general guide in other than flat terrain and adjustments can be made in the length of the terminal vertical curves.

F. Grade Separations Without Ramps. There are many situations where grade separations are constructed without the provision of ramps. In other situations, despite sufficient traffic demand, ramps may be omitted: (1) to avoid having interchanges so close to each other that signing and operation would be difficult, (2) to eliminate interference with large highway traffic volumes and (3) to increase safety and mobility by concentrating turning traffic where it is practical to provide adequate ramp systems.

For additional guidelines and criteria for the procedures, considerations and geometric design features for grade separation structures, refer to the section "Grade Separations without Ramps" in the 2004 AASHTO Green Book, Chapter 10.

METRIC						US Customary					
Design Speed (km/h)	Maximum e (%)	Maximum f	Total (e/100 + f)	Calculated Radius (m)	Rounded Radius (m)	Design Speed (mph)	Maximum e (%)	Maximum f	Total (e/100 + f)	Calculated Radius (ft)	Rounded Radius (ft)
15	4.0	0.40	0.44	4.0	4	10	4.0	0.38	0.42	15.9	16
20	4.0	0.35	0.39	8.1	8	15	4.0	0.32	0.36	41.7	42
30	4.0	0.28	0.32	22.1	22	20	4.0	0.27	0.31	86.0	86
40	4.0	0.23	0.27	46.7	47	25	4.0	0.23	0.27	154.3	154
50	4.0	0.19	0.23	85.6	86	30	4.0	0.20	0.24	250.0	250
60	4.0	0.17	0.21	135.0	135	35	4.0	0.18	0.22	371.2	371
70	4.0	0.15	0.19	203.1	203	40	4.0	0.16	0.20	533.3	533
80	4.0	0.14	0.18	280.0	280	45	4.0	0.15	0.19	710.5	711
90	4.0	0.13	0.17	375.2	375	50	4.0	0.14	0.18	925.9	926
100	4.0	0.12	0.16	492.1	492	55	4.0	0.13	0.17	1186.3	1190
						60	4.0	0.12	0.16	1500.0	1500
15	6.0	0.40	0.46	3.9	4	10	6.0	0.38	0.44	15.2	15
20	6.0	0.35	0.41	7.7	8	15	6.0	0.32	0.38	39.5	39
30	6.0	0.28	0.34	20.8	21	20	6.0	0.27	0.33	80.8	81
40	6.0	0.23	0.29	43.4	43	25	6.0	0.23	0.29	143.7	144
50	6.0	0.19	0.25	78.7	79	30	6.0	0.20	0.26	230.8	231
60	6.0	0.17	0.23	123.2	123	35	6.0	0.18	0.24	340.3	340
70	6.0	0.15	0.21	183.7	184	40	6.0	0.16	0.22	484.8	485
80	6.0	0.14	0.20	252.0	252	45	6.0	0.15	0.21	642.9	643
90	6.0	0.13	0.19	335.7	336	50	6.0	0.14	0.20	833.3	833
100	6.0	0.12	0.18	437.4	437	55	6.0	0.13	0.19	1061.4	1060
110	6.0	0.11	0.17	560.4	560	60	6.0	0.12	0.18	1333.3	1330
120	6.0	0.09	0.15	755.9	756	65	6.0	0.11	0.17	1656.9	1660
130	6.0	0.08	0.14	950.5	951	70	6.0	0.10	0.16	2041.7	2040
						75	6.0	0.09	0.15	2500.0	2500
						80	6.0	0.08	0.14	3047.6	3050
15	8.0	0.40	0.48	3.7	4	10	8.0	0.38	0.46	14.5	14
20	8.0	0.35	0.43	7.3	7	15	8.0	0.32	0.40	37.5	38
30	8.0	0.28	0.36	19.7	20	20	8.0	0.27	0.35	76.2	76
40	8.0	0.23	0.31	40.6	41	25	8.0	0.23	0.31	134.4	134
50	8.0	0.19	0.27	72.9	73	30	8.0	0.20	0.28	214.3	214
60	8.0	0.17	0.25	113.4	113	35	8.0	0.18	0.26	314.1	314
70	8.0	0.15	0.23	167.8	168	40	8.0	0.16	0.24	444.4	444
80	8.0	0.14	0.22	229.1	229	45	8.0	0.15	0.23	587.0	587
90	8.0	0.13	0.21	303.7	304	50	8.0	0.14	0.22	757.6	758
100	8.0	0.12	0.20	393.7	394	55	8.0	0.13	0.21	960.3	960
110	8.0	0.11	0.19	501.5	501	60	8.0	0.12	0.20	1200.0	1200
120	8.0	0.09	0.17	667.0	667	65	8.0	0.11	0.19	1482.5	1480
130	8.0	0.08	0.16	831.7	832	70	8.0	0.10	0.18	1814.8	1810
						75	8.0	0.09	0.17	2205.9	2210
						80	8.0	0.08	0.16	2666.7	2670
15	10.0	0.40	0.50	3.5	4	10	10.0	0.38	0.48	13.9	14
20	10.0	0.35	0.45	7.0	7	15	10.0	0.32	0.42	35.7	36
30	10.0	0.28	0.38	18.6	19	20	10.0	0.27	0.37	72.1	72
40	10.0	0.23	0.33	38.2	38	25	10.0	0.23	0.33	126.3	126
50	10.0	0.19	0.29	67.9	68	30	10.0	0.20	0.30	200.0	200
60	10.0	0.17	0.27	105.0	105	35	10.0	0.18	0.28	291.7	292
70	10.0	0.15	0.25	154.3	154	40	10.0	0.16	0.26	410.3	410
80	10.0	0.14	0.24	210.0	210	45	10.0	0.15	0.25	540.0	540
90	10.0	0.13	0.23	277.3	277	50	10.0	0.14	0.24	694.4	694
100	10.0	0.12	0.22	357.9	358	55	10.0	0.13	0.23	876.8	877
110	10.0	0.11	0.21	453.7	454	60	10.0	0.12	0.22	1090.9	1090
120	10.0	0.09	0.19	596.8	597	65	10.0	0.11	0.21	1341.3	1340
130	10.0	0.08	0.18	739.3	739	70	10.0	0.10	0.20	1633.3	1630
						75	10.0	0.09	0.19	1973.7	1970
						80	10.0	0.08	0.18	2370.4	2370
15	12.0	0.40	0.52	3.4	3	10	12.0	0.38	0.50	13.3	13
20	12.0	0.35	0.47	6.7	7	15	12.0	0.32	0.44	34.1	34
30	12.0	0.28	0.40	17.7	18	20	12.0	0.27	0.39	68.4	68
40	12.0	0.23	0.35	36.0	36	25	12.0	0.23	0.35	119.0	119
50	12.0	0.19	0.31	63.5	64	30	12.0	0.20	0.32	187.5	188
60	12.0	0.17	0.29	97.7	98	35	12.0	0.18	0.30	272.2	272
70	12.0	0.15	0.27	142.9	143	40	12.0	0.16	0.28	381.0	381
80	12.0	0.14	0.26	193.8	194	45	12.0	0.15	0.27	500.0	500
90	12.0	0.13	0.25	255.1	255	50	12.0	0.14	0.26	641.0	641
100	12.0	0.12	0.24	328.1	328	55	12.0	0.13	0.25	806.7	807
110	12.0	0.11	0.23	414.2	414	60	12.0	0.12	0.24	1000.0	1000
120	12.0	0.09	0.21	539.9	540	65	12.0	0.11	0.23	1224.6	1220
130	12.0	0.08	0.20	665.4	665	70	12.0	0.10	0.22	1484.8	1480
						75	12.0	0.09	0.21	1785.7	1790
						80	12.0	0.08	0.20	2133.3	2130

Note: In recognition of safety considerations, use of e_{max} = 4.0% should be limited to urban conditions.

Exhibit 3-15. Minimum Radius Using Limiting Values of e and f

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METRIC

e (%)	V_d = 20 km/h R (m)	V_d = 30 km/h R (m)	V_d = 40 km/h R (m)	V_d = 50 km/h R (m)	V_d = 60 km/h R (m)	V_d = 70 km/h R (m)	V_d = 80 km/h R (m)	V_d = 90 km/h R (m)	V_d = 100 km/h R (m)	V_d = 110 km/h R (m)	V_d = 120 km/h R (m)	V_d = 130 km/h R (m)
1.5	194	421	738	1050	1440	1910	2360	2880	3510	4060	4770	5240
2.0	138	299	525	750	1030	1380	1710	2090	2560	2970	3510	3880
2.2	122	265	465	668	919	1230	1530	1880	2300	2670	3160	3500
2.4	109	236	415	599	825	1110	1380	1700	2080	2420	2870	3190
2.6	97	212	372	540	746	1000	1260	1540	1890	2210	2630	2930
2.8	87	190	334	488	676	910	1150	1410	1730	2020	2420	2700
3.0	78	170	300	443	615	831	1050	1290	1590	1870	2240	2510
3.2	70	152	269	402	561	761	959	1190	1470	1730	2080	2330
3.4	61	133	239	364	511	697	882	1100	1360	1600	1940	2180
3.6	51	113	206	329	465	640	813	1020	1260	1490	1810	2050
3.8	42	96	177	294	422	586	749	939	1170	1390	1700	1930
4.0	36	82	155	261	380	535	690	870	1090	1300	1590	1820
4.2	31	72	136	234	343	488	635	806	1010	1220	1500	1720
4.4	27	63	121	210	311	446	584	746	938	1140	1410	1630
4.6	24	56	108	190	283	408	538	692	873	1070	1330	1540
4.8	21	50	97	172	258	374	496	641	812	997	1260	1470
5.0	19	45	88	156	235	343	457	594	755	933	1190	1400
5.2	17	40	79	142	214	315	421	549	701	871	1120	1330
5.4	15	36	71	128	195	287	386	506	648	810	1060	1260
5.6	13	32	63	115	176	260	351	463	594	747	980	1190
5.8	11	28	56	102	156	232	315	416	537	679	900	1110
6.0	8	21	43	79	123	184	252	336	437	560	756	951

Exhibit 3-26. Minimum Radii for Design Superelevation Rates, Design Speeds, and e_{max} = 6%

US CUSTOMARY

e (%)	V_d = 15 mph R (ft)	V_d = 20 mph R (ft)	V_d = 25 mph R (ft)	V_d = 30 mph R (ft)	V_d = 35 mph R (ft)	V_d = 40 mph R (ft)	V_d = 45 mph R (ft)	V_d = 50 mph R (ft)	V_d = 55 mph R (ft)	V_d = 60 mph R (ft)	V_d = 65 mph R (ft)	V_d = 70 mph R (ft)	V_d = 75 mph R (ft)	V_d = 80 mph R (ft)
1.5	868	1580	2290	3130	4100	5230	6460	7870	9410	11100	12600	14100	15700	17400
2.0	614	1120	1630	2240	2950	3770	4680	5700	6820	8060	9130	10300	11500	12900
2.2	543	991	1450	2000	2630	3370	4190	5100	6110	7230	8200	9240	10400	11600
2.4	482	884	1300	1790	2360	3030	3770	4600	5520	6540	7430	8380	9420	10600
2.6	430	791	1170	1610	2130	2740	3420	4170	5020	5950	6770	7660	8620	9670
2.8	384	709	1050	1460	1930	2490	3110	3800	4580	5440	6200	7030	7930	8910
3.0	341	635	944	1320	1760	2270	2840	3480	4200	4990	5710	6490	7330	8260
3.2	300	566	850	1200	1600	2080	2600	3200	3860	4600	5280	6010	6810	7680
3.4	256	498	761	1080	1450	1900	2390	2940	3560	4250	4890	5580	6340	7180
3.6	209	422	673	972	1320	1740	2190	2710	3290	3940	4540	5210	5930	6720
3.8	176	358	583	864	1190	1590	2010	2490	3040	3650	4230	4860	5560	6320
4.0	151	309	511	766	1070	1440	1840	2300	2810	3390	3950	4550	5220	5950
4.2	131	270	452	684	960	1310	1690	2110	2590	3140	3680	4270	4910	5620
4.4	116	238	402	615	868	1190	1540	1940	2400	2920	3440	4010	4630	5320
4.6	102	212	360	555	788	1090	1410	1780	2210	2710	3220	3770	4380	5040
4.8	91	189	324	502	718	995	1300	1640	2050	2510	3000	3550	4140	4790
5.0	82	169	292	456	654	911	1190	1510	1890	2330	2800	3330	3910	4550
5.2	73	152	264	413	595	833	1090	1390	1750	2160	2610	3120	3690	4320
5.4	65	136	237	373	540	759	995	1280	1610	1990	2420	2910	3460	4090
5.6	58	121	212	335	487	687	903	1160	1470	1830	2230	2700	3230	3840
5.8	51	106	186	296	431	611	806	1040	1320	1650	2020	2460	2970	3550
6.0	39	81	144	231	340	485	643	833	1060	1330	1660	2040	2500	3050

Exhibit 3-26. Minimum Radii for Design Superelevation Rates, Design Speeds, and e_{max} = 6%

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Compound curves at intersections for which the radius of one curve is more than twice the radius of the other should have either a spiral or a circular curve of intermediate radius inserted between the two. If, in such instances, the calculated length of spiral is less than 30 m [100 ft], it is suggested that a length of at least 30 m [100 ft] be used.

Compound Circular Curves

Compound circular curves are advantageous in effecting desirable shapes of turning roadways for at-grade intersections and for interchange ramps. Where circular arcs of widely different radii are joined, however, the alignment appears abrupt or forced, and the travel paths of vehicles need considerable steering effort.

On compound curves for open highways, it is generally accepted that the ratio of the flatter radius to the sharper radius should not exceed 1.5:1. For compound curves at intersections where drivers accept more rapid changes in direction and speed, the radius of the flatter arc can be as much as 100 percent greater than the radius of the sharper arc, a ratio of 2:1. The ratio of 2:1 for the sharper curves used at intersections results in approximately the same difference (about 10 km/h [6 mph]) in average running speeds for the two curves. These curves are compounded as for a ratio of 1.5:1 on the flatter curves used on the open highway. General observations on ramps having differences in radii with a ratio of 2:1 indicate that both operation and appearance normally are satisfactory.

Where practical, a smaller difference in radii should be used. A desirable maximum ratio is 1.75:1. Where the ratio is greater than 2:1, a suitable length of spiral or a circular arc of intermediate radius should be inserted between the two curves. In the case of very sharp curves designed to accommodate minimum turning paths of vehicles, it is not practical to apply this ratio control. In this case, compound curves should be developed that fit closely to the path of the design vehicle to be accommodated, for which higher ratios may be necessary needed as shown in Chapter 9.

Curves that are compounded should not be too short or their effectiveness in enabling smooth transitions from tangent or flat-curve to sharp-curve operation may be lost. In a series of curves of decreasing radii, each curve should be long enough to enable the driver to decelerate at a reasonable rate, which at intersections is assumed to be not more than 5 km/h/s [3 mph/s], although 3 km/h/s [2 mph/s] is desirable. Minimum curve lengths that meet these criteria based on the running speeds shown in Exhibit 3-14, are indicated in Exhibit 3-42. They are based on a deceleration of 5 km/h/s [3 mph/s], and a desirable minimum deceleration of 3 km/h/s [2 mph/s]. The latter deceleration rate indicates very light braking, because deceleration in gear alone generally results in overall rates between 1.5 and 2.5 km/h/s [1 and 1.5 mph/s].

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Metric				US Customary			
Design speed (km/h)	Stopping sight distance (m)	Rate of vertical curvature, K^a		Design speed (mph)	Stopping sight distance (ft)	Rate of vertical curvature, K^a	
		Calculated	Design			Calculated	Design
20	20	0.6	1	15	80	3.0	3
30	35	1.9	2	20	115	6.1	7
40	50	3.8	4	25	155	11.1	12
50	65	6.4	7	30	200	18.5	19
60	85	11.0	11	35	250	29.0	29
70	105	16.8	17	40	305	43.1	44
80	130	25.7	26	45	360	60.1	61
90	160	38.9	39	50	425	83.7	84
100	185	52.0	52	55	495	113.5	114
110	220	73.6	74	60	570	150.6	151
120	250	95.0	95	65	645	192.8	193
130	285	123.4	124	70	730	246.9	247
				75	820	311.6	312
				80	910	383.7	384

[a] Rate of vertical curvature, K, is the length of curve per percent algebraic difference in intersecting grades (A). $K = L/A$

Exhibit 3-72. Design Controls for Stopping Sight Distance and for Crest Vertical Curves

Metric			US Customary		
Design speed (km/h)	Passing sight distance (m)	Rate of vertical curvature, K^* design	Design speed (mph)	Passing sight distance (ft)	Rate of vertical curvature, K^* design
30	200	46	20	710	180
40	270	84	25	900	289
50	345	138	30	1090	424
60	410	195	35	1280	585
70	485	272	40	1470	772
80	540	338	45	1625	943
90	615	438	50	1835	1203
100	670	520	55	1985	1407
110	730	617	60	2135	1628
120	775	695	65	2285	1865
130	815	769	70	2480	2197
			75	2580	2377
			80	2680	2565

Note: *Rate of vertical curvature, K, is the length of curve per percent algebraic difference in intersecting grades (A). $K = L/A$

Exhibit 3-73. Design Controls for Crest Vertical Curves Based on Passing Sight Distance

Generally, it is impractical to design crest vertical curves to provide for passing sight distance because of high cost where crest cuts are involved and the difficulty of fitting the resulting long vertical curves to the terrain, particularly for high-speed roads. Passing sight

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Type of terrain	Metric: Design speed (km/h) for specified design volume (veh/day)			US Customary: Design speed (mph) for specified design volume (veh/day)		
	0 to 400	400 to 2000	over 2000	0 to 400	400 to 2000	over 2000
Level	60	80	100	40	50	60
Rolling	50	60	80	30	40	50
Mountainous	30	50	60	20	30	40

Note: Where practical, design speeds higher than those shown should be considered.

Exhibit 6-1. Minimum Design Speeds for Rural Collectors

Metric: Design speed (km/h)	Metric: Design stopping sight distance (m)	Metric: Rate of vertical curvature, K[a] (m/%) Crest	Metric: Rate of vertical curvature, K[a] (m/%) Sag	US Customary: Design speed (mph)	US Customary: Design stopping sight distance (ft)	US Customary: Rate of vertical curvature, K[a] (ft/%) Crest	US Customary: Rate of vertical curvature, K[a] (ft/%) Sag
20	20	1	3	15	80	3	10
30	35	2	6	20	115	7	17
40	50	4	9	25	155	12	26
50	65	7	13	30	200	19	37
60	85	11	18	35	250	29	49
70	105	17	23	40	305	44	64
80	130	26	30	45	360	61	79
90	160	39	38	50	425	84	96
100	185	52	45	55	495	114	115
				60	570	151	136

[a] Rate of vertical curvature, K, is the length of curve per percent algebraic difference in the intersecting grades (i.e., $K = L/A$). (See Chapter 3 for details.)

Exhibit 6-2. Design Controls for Stopping Sight Distance and for Crest and Sag Vertical Curves

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Metric			US Customary		
Design speed (km/h)	Design passing sight distance (m)	Rate of vertical curvature, K[a] (m/%)	Design speed (mph)	Design passing sight distance (ft)	Rate of vertical curvature, K[a] (ft/%)
30	200	46	20	710	180
40	270	84	25	900	289
50	345	138	30	1090	424
60	410	195	35	1280	585
70	485	272	40	1470	772
80	540	338	45	1625	943
90	615	438	50	1835	1203
100	670	520	55	1985	1407
			60	2135	1628

[a] Rate of vertical curvature, K, is the length of curve per percent algebraic difference in the intersecting grades (i.e., $K = L/A$). (See Chapter 3 for details.)

Exhibit 6-3. Design Controls for Crest Vertical Curves Based on Passing Sight Distance

	Metric								US Customary								
	Maximum grade (%) for specified design speed (km/h)								Maximum grade (%) for specified design speed (mph)								
Type of terrain	30	40	50	60	70	80	90	100	20	25	30	35	40	45	50	55	60
Level	7	7	7	7	7	6	6	5	7	7	7	7	7	7	6	6	5
Rolling	10	10	9	8	8	7	7	6	10	10	9	9	8	8	7	7	6
Mountainous	12	11	10	10	10	9	9	8	12	11	10	10	10	10	9	9	8

Note: Short lengths of grade in rural areas, such as grades less than 150 m [500 ft] in length, one-way downgrades, and grades on low-volume rural collectors may be up to 2 percent steeper than the grades shown above.

Exhibit 6-4. Maximum Grades for Rural Collectors

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Sight Distance

Sight distance is directly related to and varies appreciably with design speed. Stopping sight distance, a key safety-related design element, should be provided through the length of the roadway. Passing and decision sight distances influence roadway operations and should be provided wherever practical. Providing decision sight distance at locations where complex decisions are made greatly enhances the chances that drivers will be able to safely accomplish maneuvers. Examples of locations where complex decisions are required include high-volume intersections, transitions in roadway width, and transitions in the number of lanes. Provision for adequate sight distance on rural arterials, which may combine both high speeds and high traffic volumes, can be complex. Exhibit 7-1 presents the recommended minimum values of stopping and passing sight distance. Refer to Chapter 3 for a comprehensive discussion of sight distance and for tabulated values for decision sight distance.

Metric			US Customary		
Design speed (km/h)	Minimum stopping sight distance (m)	Minimum passing sight distance (m)	Design speed (mph)	Minimum stopping sight distance (ft)	Minimum passing sight distance (ft)
50	65	345	30	200	1090
60	85	410	35	250	1280
70	105	485	40	305	1470
80	130	540	45	360	1625
90	160	615	50	425	1835
100	185	670	55	495	1985
110	220	730	60	570	2135
120	250	775	65	645	2285
130	285	815	70	730	2480
			75	820	2580
			80	910	2680

Exhibit 7-1. Minimum Sight Distances for Arterials

Ideally, intersections and railroad crossings should be grade separated or provided with adequate sight distance. Intersections should be placed in sag and/or tangent locations, where practical, to allow maximum visibility of the roadway and pavement markings.

Alignment

A smooth flowing alignment is desirable on a rural arterial. Changes in alignment, both horizontal and vertical, should be so gradual that they will not surprise the driver. Roads with adequate alignment usually operate more efficiently and safely than roads with poor alignment, even where improved signing and pavement marking are provided; therefore, adequate alignment should be provided wherever practical.

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guidance applicable to both rural and urban arterials is presented in the section on "Superelevated Cross Sections" in the earlier discussion of rural arterials in this chapter.

	Metric						US Customary						
	Maximum grade (%) for specified design speed (km/h)						Maximum grade (%) for specified design speed (mph)						
Type of terrain	50	60	70	80	90	100	30	35	40	45	50	55	60
Level	8	7	6	6	5	5	8	7	7	6	6	5	5
Rolling	9	8	7	7	6	6	9	8	8	7	7	6	6
Mountainous	11	10	9	9	8	8	11	10	10	9	9	8	8

Exhibit 7-10. Maximum Grades for Urban Arterials

Cross Slope

Sufficient cross slope for adequate pavement drainage is important on urban arterials. The typical problems related to splashing and hydroplaning are compounded by heavy traffic volumes and curbed sections, especially for high speeds. Cross slopes should range from 1.5 to 3 percent; the lower portion of this range is appropriate where drainage flow is across a single lane and higher values are appropriate where flow is across several lanes. Even higher cross-slope rates may be used for parking lanes. The overall cross section should provide a smooth appearance without sharp breaks. Because urban arterials are often curbed, it is necessary to provide for longitudinal as well as cross-slope drainage. The use of higher cross-slope rates also reduces flow on the roadway and ponding of water due to pavement irregularities and rutting. The section on "Cross Slopes" in Chapter 4 provides additional guidance.

Vertical Clearances

New or reconstructed structures should provide 4.9-m [16-ft] vertical clearance over the entire roadway width. Existing structures that provide clearance of 4.3 m [14 ft], if allowed by local statute, may be retained. In highly urbanized areas, a minimum clearance of 4.3 m [14 ft] may be provided if there is an alternate route with 4.9-m [16-ft] clearance. Structures should provide additional clearance for future resurfacing of the underpassing road.

Lane Widths

Lane widths may vary from 3.0 to 3.6 m [10 to 12 ft]. Lane widths of 3.0 m [10 ft] may be used in highly restricted areas having little or no truck traffic. Lane widths of 3.3 m [11 ft] are used quite extensively for urban arterial street designs. The 3.6-m [12-ft] lane widths are most desirable and should be used, where practical, on higher speed, free-flowing, principal arterials.

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interchange facilities and the need for frequent changes in speed make it desirable to use flat grades wherever practical. On sustained upgrades, the need for climbing lanes should be investigated, as discussed in Chapter 3.

Type of Terrain	Metric						US Customary						
	Design Speeds (km/h)						Design Speeds (mph)						
	80	90	100	110	120	130	50	55	60	65	70	75	80
	Grades (%)[a]						Grades (%)[a]						
Level	4	4	3	3	3	3	4	4	3	3	3	3	3
Rolling	5	5	4	4	4	4	5	5	4	4	4	4	4
Mountainous	6	6	6	5	—	—	6	6	6	5	5	—	—

[a] Grades 1% steeper than the value shown may be provided in mountainous terrain or in urban areas with crucial right-of-way controls.

Exhibit 8-1. Maximum Grades for Rural and Urban Freeways

Structures

The design of bridges, culverts, walls, tunnels, and other structures should be in accordance with the principles of the current *Standard Specifications for Highway Bridges* (2) or with the AASHTO *LRFD Bridge Design Specifications* (3). Structures carrying freeway traffic should provide an MS 18 [HS 20–44] design loading.

The clear width on bridges carrying freeway traffic should be as wide as the approach roadway, as discussed in Chapter 10. On bridges longer than 60 m [200 ft], some economy in substructure costs may be gained by building a single structure rather than twin parallel structures. In such cases, the approach shoulder widths are provided and a median barrier is extended across the bridge.

Structures carrying ramps should provide a clear width equal to the ramp width and paved shoulders. Clear widths for structures carrying auxiliary lanes are discussed in Chapter 10.

The structure width and lateral clearance of highways and streets overpassing or underpassing the freeway are dependent on the functional classification of the highway or street as discussed in Chapters 5, 6, and 7.

Vertical Clearance

The vertical clearance to structures passing over freeways should be at least 4.9 m [16 ft] over the entire roadway width, including auxiliary lanes and the usable width of shoulders (with an allowance for future resurfacing). In highly developed urban areas, where attainment of the 4.9-m [16-ft] clearance would be unreasonably costly, a minimum clearance of 4.3 m [14 ft] may be used if there is an alternate freeway facility with the minimum 4.9-m [16-ft] clearance.

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TABLE 12.1 (ENGLISH)
CLEAR ZONE WIDTH
(in feet from edge of through traveled way)

DESIGN SPEED	DESIGN ADT	FORESLOPE			BACKSLOPE		
		1V:6H OR FLATTER	1V:5H TO 1V:4H	1V:3H	1V:3H	1V:5H TO 1V:4H	1V:6H OR FLATTER
40 mph or less	Under 750	7	7	**	7	7	7
	750 - 1500	10	12	**	10	10	10
	1500 - 6000	12	14	**	12	12	12
	Over 6000	14	16	**	14	14	14
45-50 mph	Under 750	10	12	**	8	8	10
	750 - 1500	14	16	**	10	12	14
	1500 - 6000	16	20	**	12	14	16
	Over 6000	20	24	**	14	18	20
55 mph	Under 750	12	14	**	8	10	10
	750 - 1500	16	20	**	10	14	16
	1500 - 6000	20	24	**	14	16	20
	Over 6000	22	26	**	16	20	22
60 mph	Under 750	16	20	**	10	12	14
	750 - 1500	20	26	**	12	16	20
	1500 - 6000	26	30	**	14	18	24
	Over 6000	30	30	**	20	24	26
65-70 mph	Under 750	18	20	**	10	14	14
	750 - 1500	24	28	**	12	18	20
	1500 - 6000	28	30	**	16	22	26
	Over 6000	30	30	**	22	26	28

** Since recovery is less likely on the unshielded, traversable 1V:3H slopes, consider removal of fixed objects present beyond the toe of these slopes. Determination of the width of the recovery area provided, if any, at the toe of slope should take into consideration right-of-way availability, environmental concerns, economic factors, safety needs, and crash histories. Also, the distance between the edge of the through traveled lane and the beginning of the 1V:3H slope should influence the recovery area provided at the toe of slope.

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To determine the need for guide rail, refer to Section 12.4, Barrier Placement, and the preceding sections of this Chapter. Additional selection guidelines and criteria for standard and nonstandard conditions are presented below in Sections 12.3.D and 12.3.E.

TABLE 12.3 (METRIC)
GUIDE RAIL AND MEDIAN BARRIER SYSTEMS

TYPE DESIGNATION	DESCRIPTION	MOUNTING HEIGHT	MINIMUM UNOBSTRUCTED DISTANCE	POST SPACING
2 - W	WEAK POST W-BEAM GUIDE RAIL (NORMAL POST SPACING)	815 mm TO TOP OF BEAM	2.1 m	3810 mm
2 - WC	WEAK POST W-BEAM GUIDE RAIL (CLOSE POST SPACING)	815 mm TO TOP OF BEAM	1.5 m	1905 mm
2 - WCC	WEAK POST W-BEAM GUIDE RAIL (VERY CLOSE POST SPACING)	815 mm TO TOP OF BEAM	1.2 m	952.5 mm
2 - S	STRONG POST W-BEAM GUIDE RAIL (NORMAL POST SPACING)	706 mm TO TOP OF BEAM	0.9 m	1905 mm
2 - SC	STRONG POST W-BEAM GUIDE RAIL (CLOSE POST SPACING)	706 mm TO TOP OF BEAM	0.6 m	952.5 mm
2 - SCC	STRONG POST W-BEAM GUIDE RAIL (VERY CLOSE POST SPACING)	706 mm TO TOP OF BEAM	0.3 m	476.25 mm
2 - WM	WEAK POST W-BEAM MEDIAN BARRIER	815 mm TO TOP OF BARRIER	2.1 m	3810 mm
—	CONCRETE MEDIAN BARRIER SINGLE & DOUBLE FACE	810 mm TO TOP OF BARRIER	0.0 m	—
—	CONCRETE GLARE SCREEN	1270 mm TO TOP OF BARRIER (TYP)	0.0 m	—

TABLE 12.3 (ENGLISH)
GUIDE RAIL AND MEDIAN BARRIER SYSTEMS

TYPE DESIGNATION	DESCRIPTION	MOUNTING HEIGHT	MINIMUM UNOBSTRUCTED DISTANCE	POST SPACING
2 - W	WEAK POST W-BEAM GUIDE RAIL (NORMAL POST SPACING)	32" TO TOP OF BEAM	7' - 0"	12' - 6"
2 - WC	WEAK POST W-BEAM GUIDE RAIL (CLOSE POST SPACING)	32" TO TOP OF BEAM	5' - 0"	6' - 3"
2 - WCC	WEAK POST W-BEAM GUIDE RAIL (VERY CLOSE POST SPACING)	32" TO TOP OF BEAM	4' - 0"	3' - 1 1/2"
2 - S	STRONG POST W-BEAM GUIDE RAIL (NORMAL POST SPACING)	27 3/4" TO TOP OF BEAM	3' - 0"	6' - 3"
2 - SC	STRONG POST W-BEAM GUIDE RAIL (CLOSE POST SPACING)	27 3/4" TO TOP OF BEAM	2' - 0"	3' - 1 1/2"
2 - SCC	STRONG POST W-BEAM GUIDE RAIL (VERY CLOSE POST SPACING)	27 3/4" TO TOP OF BEAM	1' - 0"	1' - 6 3/4"
2 - WM	WEAK POST W-BEAM MEDIAN BARRIER	32" TO TOP OF BARRIER	7' - 0"	12' - 6"
—	CONCRETE MEDIAN BARRIER SINGLE & DOUBLE FACE	32" TO TOP OF BARRIER	0' - 0"	—
—	CONCRETE GLARE SCREEN	50" TO TOP OF BARRIER (TYP)	0' - 0"	—

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CHAPTER 1

GENERAL DESIGN

1.0 INTRODUCTION

The purpose of this Manual is to provide its users with the current, uniform procedures and guidelines for the application and design of safe, convenient, efficient and attractive highways that are compatible with their service characteristics and that optimally satisfy the needs of highway users while maintaining the integrity of the environment.

This Manual does not attempt to encompass the total scope of important, published information and literature relative to the formulation of highway design criteria, policies and procedures. Sources of additional publications and related material which may complement the concepts contained herein include the following:

- Publication 408, *Specifications*, and associated changes, Pennsylvania Department of Transportation (PENNDOT).
- *A Policy on Geometric Design of Highways and Streets*, 2004 AASHTO Publication.*
- *Roadside Design Guide*, 2006 AASHTO Publication.**
- *Highway Capacity Manual*, Transportation Research Board, 2000 or newer edition.***
- *Manual on Uniform Traffic Control Devices*, Federal Highway Administration, 2003 or newer edition.****
- *A Policy on Design Standards---Interstate System*, 2005 AASHTO Publication.

Initiative should be exercised to utilize the most appropriate design values within the given ranges based upon the project context and roadway typology wherever practicable and within reasonable economic limitations and sound engineering judgment. When design criteria presented in this Manual differs from criteria presented in other sources, this Manual shall take precedence. However, for Federal-aid projects on the National Highway System (NHS), this Manual only takes precedence when criteria in this Manual exceed the criteria in the 2004 AASHTO Green Book and the 2005 AASHTO publication, *A Policy on Design Standards---Interstate System* (for Interstate Federal-aid projects). The design criteria and text presented herein provide guidance to the designer by referencing a range of values for critical dimensions.

Since the concepts, practices and procedures described in this Manual are subject to future change, the contents shall be updated accordingly to reflect those changes in order to retain its usefulness. The Highway Quality Assurance Division, Bureau of Design shall be responsible for keeping the Manual current by incorporating revisions, additions or deletions when required.

Whenever a District Executive determines that modifications or additions are required to improve the current design criteria in this Manual, the following procedures shall be followed:

1. The recommended modifications or additions shall be transmitted to the Director, Bureau of Design with the following information:

---

* Hereinafter referred to as the 2004 AASHTO Green Book.
** Hereinafter referred to as the AASHTO Roadside Design Guide.
*** Hereinafter referred to as the *HCM*.
**** Hereinafter referred to as the *MUTCD*.

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RIGHT-OF-WAY

Right-of-Way

The width of right-of-way shall be sufficient to accommodate the roadway cross section elements and requisite appurtenances necessary for an adequate facility in the design year and for known future improvements.

Control of Access

Access to the interstate system shall be fully controlled. The interstate highway shall be grade separated at all railroad crossings and selected public crossroads. At-grade intersections shall not be allowed. To accomplish this, the intersecting roads are to be grade separated, terminated, rerouted, and/or intercepted by frontage roads. Access is to be achieved by interchanges at selected public roads.

Access control shall extend the full length of ramps and terminals on the crossroad. Such control shall either be acquired outright prior to construction or by the construction of frontage roads or by a combination of both.

Access control beyond the ramp terminals should be affected by purchasing access rights, providing frontage roads, controlling added corner right-of-way areas, or prohibiting driveways. Such control should extend beyond the ramp terminal at least 30 m (100 ft) in urban areas and 90 m (300 ft) in rural areas. However, in areas of high traffic volume, where exists the potential for development which would create operational or safety problems, longer lengths of access control should be provided.

GEOMETRIC CONTROLS AND CRITERIA

Design Speed

A minimum design speed of 110 km/h (70 mph) should be used for rural areas. Where terrain is mountainous, a design speed from 80 to 100 km/h (50 to 60 mph) may be used. In urban areas, the design speed shall be at least 80 km/h (50 mph).

Sight Distance

The minimum stopping sight distance shall be the values established in the current edition of AASHTO's *A Policy on Geometric Design of Highways and Streets* for the appropriate design speed.

Curvature and Superelevation

Curvature, superelevation, and allied features, such as transition curves, shall be correlated with the design speed in accordance with the current edition of AASHTO's *A Policy on Geometric Design of Highways and Streets*.

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Job# 60284833
Calc# 1
Page 34
Project: I-80 Reconstruction
Originator: JMC 2/28/13
Reviewer: _____

Gradients

Maximum grades as a function of the design speed and the type of terrain are shown in the following table:

Type of Terrain	Metric						U.S. Customary						
	Design Speed (km/h)						Design Speed (mph)						
	80	90	100	110	120	130	50	55	60	65	70	75	80
	Grades (%)*						Grades (%)*						
Level	4	4	3	3	3	3	4	4	3	3	3	3	3
Rolling	5	5	4	4	4	4	5	5	4	4	4	4	4
Mountainous	6	6	6	5	–	–	6	6	6	5	5	–	–

*Grades up to one percent steeper than the value shown may be provided in urban areas with crucial right-of-way constraints or where needed in mountainous terrain.

CROSS SECTION ELEMENTS

Number of Lanes

A minimum of four traffic lanes shall be provided on the interstate system. The number of lanes shall be sufficient to accommodate the DHV at an acceptable level of service for the applicable conditions. A capacity analysis using the design year traffic should be performed to determine the number of lanes required to achieve the acceptable level of service. Refer to AASHTO's *A Policy on Geometric Design of Highways and Streets* for guidance in the selection of level of service.

On ascending grades, which exceed the critical design length, a climbing lane analysis should be performed and climbing lanes added where appropriate. Likewise, on extended lengths of maximum or near maximum descending grades, emergency escape ramps should be added where an analysis indicates they are required.

Width of Traffic Lanes

All traffic lanes shall be at least 3.6 m (12 ft) wide.

Shoulders

The paved width of the right shoulder shall not be less than 3.0 m (10 ft). Where truck traffic exceeds 250 DDHV, a paved shoulder width of 3.6 m (12 ft) should be considered. On a four-lane section, the paved width of the left shoulder shall be at least 1.2 m (4 ft). On sections with six or more lanes, a 3.0 m (10 ft) paved width for the left shoulder should be provided. Where truck traffic exceeds 250 DDHV, a paved width of 3.6 m (12 ft) should be considered.

In mountainous terrain, a reduced paved shoulder width together with a minimal median width may be used to reduce the high costs associated with providing a full width roadway cross section. In these instances, a 2.4 m (8 ft) minimum paved right shoulder and a 1.2 m (4 ft) minimum paved left shoulder may be used on a traveled way consisting of four or six lanes. Where eight or more lanes are provided, a 2.4 m (8 ft) minimum paved shoulder width should be used on both sides.

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Job# 60284833
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Project: I-80 Reconstruction
Originator: JMG 2/28/13
Reviewer: _____

Pavement and Shoulder Cross Slope

On tangent sections, the pavement cross slope shall be a minimum of 1.5 percent and desirably two percent. In areas of intense rainfall, the cross slope may be increased to 2.5 percent. Paved shoulders should have a cross slope in the range of two to six percent but not less than the cross slope of the adjacent pavement.

Sideslopes

Foreslopes within the clear zone should not be steeper than 1V:4H and desirably should be 1V:6H or flatter. Where steeper slopes are used within the clear zone, roadside barriers shall be installed where warranted by the criteria in the current edition of AASHTO's *Roadside Design Guide*.

Medians

Medians in rural areas in level or rolling topography shall be at least 11 m (36 ft) wide. Medians in urban or mountainous areas shall be at least 3.0 m (10 ft) wide. AASHTO's *Roadside Design Guide* should be consulted to determine the details and warrants, based on consideration of average daily traffic, median width, and crash history, for barrier installation in the median. When economically feasible, consideration should be given to decking over the opening between parallel structures and extending a median barrier across the deck. Where continuous decking is not feasible, median barriers or guardrails should be installed to stop or redirect an errant vehicle safely.

Horizontal Clearance to Obstructions

The width of the clear recovery area shall be commensurate with the design speed and roadside conditions, and be determined through application of the currently accepted procedures in the AASHTO *Roadside Design Guide*. To the extent practicable, the piers and abutments of overcrossing structures should be designed to provide a horizontal clearance equal to the clear recovery area.

In restricted areas, it may be necessary to construct barriers, walls, piers, abutments or other unyielding objects nearer to the traveled way than the width required for a clear recovery area. Fixed objects within the limits of the clear recovery area shall be made breakaway, made yielding, or be shielded by installation of crashworthy barriers or attenuators. The minimum horizontal clearance from the edge of the traveled way to the face of the barrier shall be consistent with the requirements for the paved shoulder width.

Curbs

Vertical curbs shall not be used. Sloping curbs, when used, should be located at the outer edge of the paved shoulder. The height of sloping curb should be limited to 100 mm (4 in).

The use of curbs in conjunction with guardrail is discouraged. When the installation of curb is necessary in conjunction with a guardrail, the face of the curb should be located behind the face of the guardrail, or at least no closer to the traveled way than the face of the guardrail. AASHTO's *Roadside Design Guide* should be consulted for detailed information concerning installation of curb in conjunction with guardrail.

INTERCHANGES

Interchanges shall be provided between all intersecting interstate routes, between other selected access-controlled highways, and at other selected public highways to facilitate the distribution of traffic. Each interchange shall provide for all traffic movements.

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Job# 60284833
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Project: I-80 Reconstruction
Originator: JMG 2/16/12
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The ramp curvature, pavement widths, and related elements, which constitute an interchange, shall be adequate to accommodate the appropriate design vehicles.

Spacing of interchanges has a significant effect on the operation of interstate highways. In areas of concentrated development, proper spacing may be difficult to obtain because of demand for frequent access. As a rule, minimum spacing should be 1.5 km (1 mi) in urban areas and 5 km (3 mi) in rural areas, based on crossroad to crossroad spacing. In urban areas, spacing of less than 1.5 km (1 mi) may be developed by grade-separated ramps or by collector-distributor roads.

BRIDGES AND OTHER STRUCTURES

General

The following standards apply to interstate highway bridges, overpasses and underpasses. Standards for crossroad overpasses and underpasses are to be those of the crossroad.

Vertical Clearance

On all rural sections, the clear height of structures shall be not less than 4.9 m (16 ft) over the entire roadway width, including the width of paved shoulder. In urban areas, the 4.9 m (16 ft) clearance shall apply at least to a single interstate routing. On other interstate urban routes, the clear height shall be not less than 4.3 m (14 ft). An allowance should be made for future resurfacing. The vertical clearance to sign trusses and pedestrian overpasses shall be 5.1 m (17 ft). On interstate urban routes with less than the 4.9 m (16 ft) clearance, the vertical clearance to sign trusses shall be 0.3 m (1 ft) greater than the minimum clearance of other structures. The vertical clearance from the deck to the cross bracing on through truss structures shall also be a minimum of 5.1 m (17 ft).

Cross Section

The width of all bridges, including grade separation structures, measured between rails, parapets, or barriers shall equal the full paved width of the approach roadways. The approach roadway includes the width of paved shoulders. Long bridges, defined as bridges having an overall length in excess of 60 m (200 ft), may have a lesser width. Such bridges shall be analyzed individually. On long bridges, offsets to parapet, rail or barrier shall be at least 1.2 m (4 ft) measured from the edge of the nearest traffic lane on both the left and the right.

Structural Capacity

All new bridges shall have at least an MS 18 (HS 20) structural capacity. A bridge can remain in place if the operating rating capacity can safely service the system for an additional 20-year service life.

Existing Bridges to Remain in Place

Mainline bridges on the interstate system and bridges on routes to be incorporated into the system may remain in place if, as a minimum, they meet the following: a) the bridge cross section consists of 3.6 m (12 ft) lanes, 3.0 m (10 ft) shoulder on the right and 1.1 m (3.5 ft) shoulder on the left; b) for long bridges, the offset to the face of parapet or bridge rail on both the left and right is 1.1 m (3.5 ft) measured from the edge of the nearest traveled lane; c) bridge railing shall meet or be upgraded to current standards.

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Reviewer:

length. Even in this case, the alignment may be unpleasant in appearance when both curves are clearly visible for some distance ahead.

- To avoid the appearance of inconsistent distortion, the horizontal alignment should be coordinated carefully with the profile design. General controls for this coordination are discussed in the section of this chapter on "Combination of Horizontal and Vertical Alignment."

VERTICAL ALIGNMENT

Terrain

The topography of the land traversed has an influence on the alignment of roads and streets. Topography affects horizontal alignment, but has an even more pronounced effect on vertical alignment. To characterize variations in topography, engineers generally separate it into three classifications according to terrain.

In level terrain, highway sight distances, as governed by both horizontal and vertical restrictions, are generally long or can be made to be so without construction difficulty or major expense.

In rolling terrain, natural slopes consistently rise above and fall below the road or street grade, and occasional steep slopes offer some restriction to normal horizontal and vertical roadway alignment.

In mountainous terrain, longitudinal and transverse changes in the elevation of the ground with respect to the road or street are abrupt, and benching and side hill excavation are frequently needed to obtain acceptable horizontal and vertical alignment.

Terrain classifications pertain to the general character of a specific route corridor. Routes in valleys, passes, or mountainous areas that have all the characteristics of roads or streets traversing level or rolling terrain should be classified as level or rolling. In general, rolling terrain generates steeper grades than level terrain, causing trucks to reduce speeds below those of passenger cars; mountainous terrain has even greater effects, causing some trucks to operate at crawl speeds.

Grades

Roads and streets should be designed to encourage uniform operation throughout. As discussed earlier in this chapter, design speeds are used as a means toward this end by correlation of various geometric features of the road or street. Design criteria have been determined for many highway features, but few conclusions have been reached on the appropriate relationship of roadway grades to design speed. Vehicle operating characteristics on grades are discussed and established relationships of grades and their lengths to design speed are developed below.

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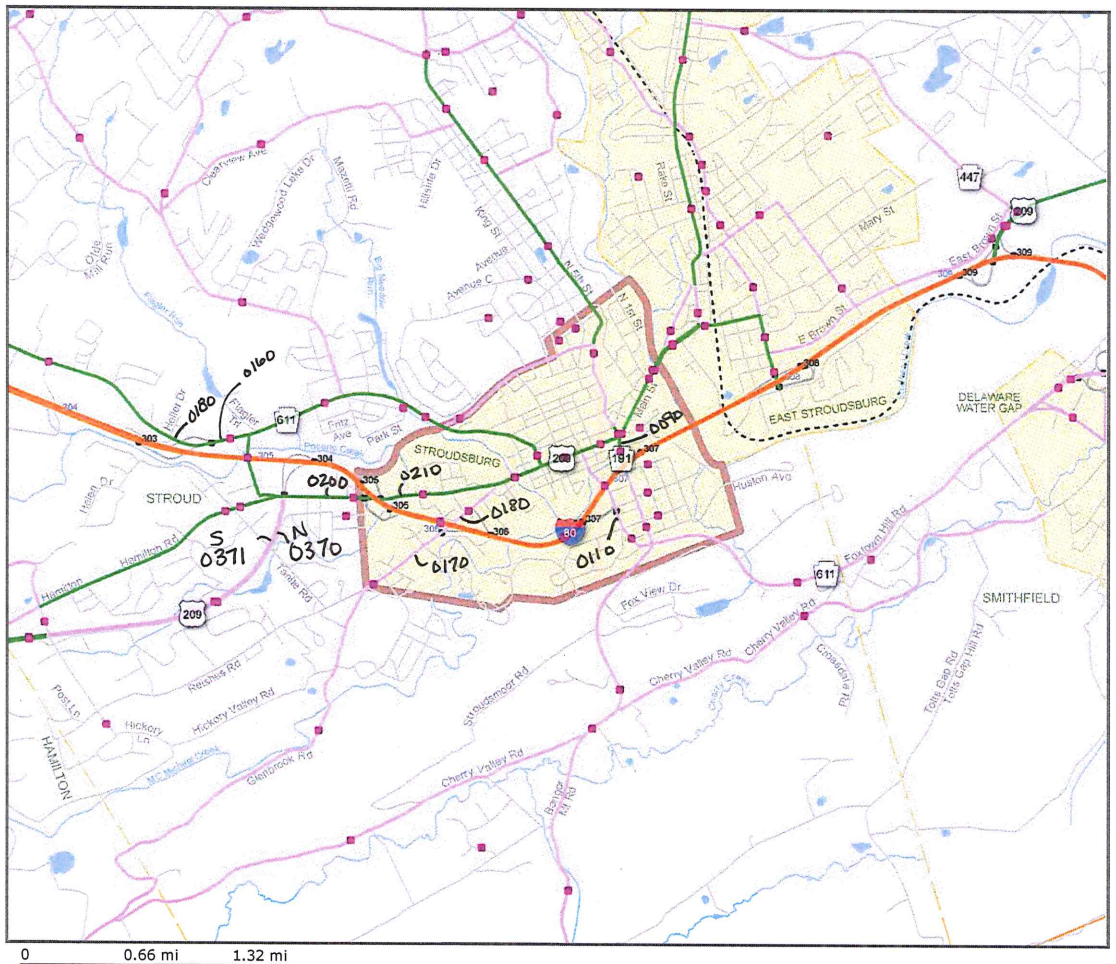
I-80 Reconstruction

Map Legend

- Traffic Sites
- AADT 20,000 - 50,000
- AADT 10,000 - 20,000
- AADT < 10,000
- Exits
- Interstates
- State Routes
- Local Roads
- Rail
- Selected Municipality
- Municipality Boundaries
- Water
- Cities / Boroughs
- District Boundary
- Route Shields
- Ab123 Text Labels



pennsylvania DEPARTMENT OF TRANSPORTATION

iTMS

Project: I-80 Reconstruction
Originator: SMG 2/28/13
Reviewer: _____

Job# 60284833
Calc# 1

SITE NO: 3784	
County	MONROE (45)
Route	0080
Segment	3064
Dir	E
Current Avg Daily Traffic	28146
Current Avg Daily Truck Volume	6192
K Factor	9
D Factor	65
T Factor	10
Truck Percent	22
Base Traffic Year	2010
Traffic Pattern Group	URBAN - INTERSTATE

Job# 40284933
Project: I-80 Reconstruction Calc# 1
Originator: JWC 2/25/13 Page 39
Reviewer: _____

SITE NO: 3779	
County	MONROE (45)
Route	0080
Segment	3011
Dir	W
Current Avg Daily Traffic	27195
Current Avg Daily Truck Volume	5581
K Factor	8
D Factor	55
T Factor	15
Truck Percent	21
Base Traffic Year	2011
Traffic Pattern Group	URBAN - INTERSTATE

Online VideoLog

Job# 402849 33
Project: I-80 Reconstruction Calc# 1
Originator: JWC 2/4/2013 Page 40
Reviewer: _____

Int. 303

SITE NO: 10792	
County	MONROE (45)
Route	0611
Segment	0180
Dir	B
Current Avg Daily Traffic	15894
Current Avg Daily Truck Volume	664
K Factor	10
D Factor	55
T Factor	4
Truck Percent	4
Base Traffic Year	2009
Traffic Pattern Group	URBAN - MINOR ARTERIALS, COLLECTORS, LOCAL ROADS

Project: I-80 Reconstruction Job# 40284333 Calc# 1
Originator: JSL 2/19/13 Page 41
Reviewer: _____

Int. 303

SITE NO: 6947	
County	MONROE (45)
Route	0611
Segment	0160
Dir	B
Current Avg Daily Traffic	18648
Current Avg Daily Truck Volume	559
K Factor	11
D Factor	55
T Factor	2
Truck Percent	3
Base Traffic Year	2008
Traffic Pattern Group	URBAN - MINOR ARTERIALS, COLLECTORS, LOCAL ROADS

Job# 60284833 Calc# 1
Project: I-80 Reconstruction Page 42
Originator: JMG 2/23/13
Reviewer: _____

Int. 304

SITE NO: 3796	
ɔunty	MONROE (45)
Route	0209
Segment	0370
Dir	N
Current Avg Daily Traffic	8959
Current Avg Daily Truck Volume	718
K Factor	9
D Factor	70
T Factor	5
Truck Percent	8
Base Traffic Year	2011
Traffic Pattern Group	URBAN - OTHER PRINCIPAL ARTERIALS

Project: I-80 Reconstruction Job# 6029833 Calc# 1
Originator: JMC 2/28/13 Page 43
Reviewer: _____

Int. 304

SITE NO: 3796	
ɔunty	MONROE (45)
Route	0209
Segment	0371
Dir	S
Current Avg Daily Traffic	8960
Current Avg Daily Truck Volume	643
K Factor	9
D Factor	70
T Factor	5
Truck Percent	7
Base Traffic Year	2011
Traffic Pattern Group	URBAN - OTHER PRINCIPAL ARTERIALS

Int. 305

SITE NO: 31422	
ɔunty	MONROE (45)
Route	2012
Segment	0200
Dir	B
Current Avg Daily Traffic	12947
Current Avg Daily Truck Volume	485
K Factor	9
D Factor	55
T Factor	3
Truck Percent	4
Base Traffic Year	2008
Traffic Pattern Group	URBAN - MINOR ARTERIALS, COLLECTORS, LOCAL ROADS

Posted 40 mph

Int. 305

SITE NO: 6908	
County	MONROE (45)
Route	2012
Segment	0210
Dir	B
Current Avg Daily Traffic	11324
Current Avg Daily Truck Volume	793
K Factor	13
D Factor	55
T Factor	4
Truck Percent	7
Base Traffic Year	2008
Traffic Pattern Group	URBAN - OTHER PRINCIPAL ARTERIALS

Online VideoLog

Project: I-80 Reconstruction Job# 60284833
Originator: JML 2/28/13 Calc# 1
Reviewer: Page 46

Int. 306

SITE NO: 17163	
County	MONROE (45)
Route	2004
Segment	0180
Dir	B
Current Avg Daily Traffic	3773
Current Avg Daily Truck Volume	134
K Factor	11
D Factor	65
T Factor	7
Truck Percent	4
Base Traffic Year	2009
Traffic Pattern Group	URBAN - MINOR ARTERIALS, COLLECTORS, LOCAL ROADS

FCMap

Online VideoLog

Posted speed = 35 mph

Project: I-80 Reconstruction Job# 60284833
Originator: JML 2/28/13 Calc# 1
Reviewer: Page 47

Int. 306

SITE NO: 6920	
County	MONROE (45)
Route	2004
Segment	0170
Dir	B
Current Avg Daily Traffic	3455
Current Avg Daily Truck Volume	100
K Factor	9
D Factor	60
T Factor	4
Truck Percent	3
Base Traffic Year	2011
Traffic Pattern Group	URBAN - MINOR ARTERIALS, COLLECTORS, LOCAL ROADS

Int 307 (WB 1-80)

SITE NO: 25156	
County	MONROE (45)
Route	0191
Segment	0090
Dir	B
Current Avg Daily Traffic	12378
Current Avg Daily Truck Volume	495
K Factor	11
D Factor	55
T Factor	2
Truck Percent	4
Base Traffic Year	2009
Traffic Pattern Group	URBAN - OTHER PRINCIPAL ARTERIALS

Online VideoLog

Posted 35 mph

Project: I-80 Reconstruction Job# 60284333
Originator: JMG 2/28/13 Calc# 1
Reviewer: Page 49

Int. 307 (EB I-80)

SITE NO: 25189	
County	MONROE (45)
Route	0611
Segment	0110
Dir	B
Current Avg Daily Traffic	8871
Current Avg Daily Truck Volume	444
K Factor	10
D Factor	55
T Factor	3
Truck Percent	5
Base Traffic Year	2006
Traffic Pattern Group	URBAN - MINOR ARTERIALS, COLLECTORS, LOCAL ROADS

Posted 35 mph

Project: I-80 Reconstruction Job# 10284933
Originator: JMS 2/24/13 Calc# 1
Reviewer: _____ Page 50

AECOM
1700 Market Street
Suite 1600
Philadelphia, PA 19103
www.aecom.com

215-735-0832 tel
215-735-0883 fax

April 17, 2013

U.S. Fish and Wildlife Service
Endangered Species Section
315 South Allen Street, Suite 322,
State College, PA.

Subject: **PNDI Search ID: 20130327397134**
PennDOT District 5-0
SR 0080, Section 17M - Interstate 80 Reconstruction Project
Monroe County, Pennsylvania

Dear Sir/Ma'am:

On behalf of the Pennsylvania Department of Transportation (PennDOT), Engineering District 5-0, we are contacting you regarding the proposed SR 0080, Section 17M Reconstruction Project within Monroe County, Pennsylvania. Project location maps are attached as well as a PNDI receipt.

I-80 Section 17M is a 3.5-mile long roadway reconstruction including five interchanges traversing through three municipalities (Stroud Township, Stroudsburg Borough & East Stroudsburg Borough). PennDOT is currently in the early stages of resource identification and alternatives development. The project purpose is to relieve congestion, alleviate safety issues, and bring the roadway and structures up to current standards. The following table provides project information.

MPMS	PNDI Search ID	SR	Municipalities	USGS Quad(s)
76357	20130327397134	0080, Sec 17M	Stroud Twp, Stroudsburg & East Stroudsburg Boroughs	Stroudsburg, PA & East Stroudsburg, PA

Based on the PNDI reviews, potential conflicts were indicated for the above referenced project. To assist us in our environmental studies, we are requesting a review to ensure that the proposed project will not adversely affect those species or critical habitats identified under your agencies.

If you have any questions, please do not hesitate to contact me at (215) 735-0832. Thank you for your assistance and attention to this matter.

Sincerely,

Christopher Salvatico, GISP
Sr. Environmental Planner
christopher.salvatico@aecom.com

Enclosures
Cc: File

AECOM
1700 Market Street
Suite 1600
Philadelphia, PA 19103
www.aecom.com

215-735-0832 tel
215-735-0883 fax

April 17, 2013

PA Game Commission
Bureau of Wildlife Habitat Management
Division of Environmental Planning and Habitat Protection
2001 Elmerton Avenue, Harrisburg, PA. 17110-9797

Subject: PNDI Search ID: 20130327397134
PennDOT District 5-0
SR 0080, Section 17M - Interstate 80 Reconstruction Project
Monroe County, Pennsylvania

Dear Sir/Ma'am:

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MPMS	PNDI Search ID	SR	Municipalities	USGS Quad(s)
76357	20130327397134	0080, Sec 17M	Stroud Twp, Stroudsburg & East Stroudsburg Boroughs	Stroudsburg, PA & East Stroudsburg, PA

Based on the PNDI reviews, potential conflicts were indicated for the above referenced project for *Myotis septentrionalis*. To assist us in our environmental studies, we are requesting a review to ensure that the proposed project will not adversely affect those species or critical habitats identified under your agencies.

If you have any questions, please do not hesitate to contact me at (215) 735-0832. Thank you for your assistance and attention to this matter.

Sincerely,

Christopher Salvatico, GISP
Sr. Environmental Planner
christopher.salvatico@aecom.com

Enclosures
Cc: File

AECOM
1700 Market Street
Suite 1600
Philadelphia, PA 19103
www.aecom.com

215-735-0832 tel
215-735-0883 fax

April 17, 2013

PA Fish and Boat Commission
Division of Environmental Services
450 Robinson Lane, Bellefonte, PA. 16823-7437

Subject: **PNDI Search ID: 20130327397134**
PennDOT District 5-0
SR 0080, Section 17M - Interstate 80 Reconstruction Project
Monroe County, Pennsylvania

Dear Sir/Ma'am:

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MPMS	PNDI Search ID	SR	Municipalities	USGS Quad(s)
76357	20130327397134	0080, Sec 17M	Stroud Twp, Stroudsburg & East Stroudsburg Boroughs	Stroudsburg, PA & East Stroudsburg, PA

Based on the PNDI reviews, potential conflicts were indicated for the above referenced project for *Stygobromus allegheniensis*. To assist us in our environmental studies, we are requesting a review to ensure that the proposed project will not adversely affect those species or critical habitats identified under your agencies.

If you have any questions, please do not hesitate to contact me at (215) 735-0832. Thank you for your assistance and attention to this matter.

Sincerely,

Christopher Salvatico, GISP
Sr. Environmental Planner
christopher.salvatico@aecom.com

Enclosures (including PAFBC SIR)
Cc: File

PFBC-DES-NDS-1 (5/2/03)

COMMONWEALTH OF PENNSYLVANIA
FISH AND BOAT COMMISSION
NATURAL DIVERSITY SECTION
SPECIES IMPACT REVIEW (SIR) REQUEST FORM

A. This form provides the site information necessary to perform a computer database search for species of special concern listed under the Endangered Species Act of 1973, the Wild Resource Conservation Act, the Pennsylvania Fish and Boat Code or the Wildlife Code.

B. Use only one form for each proposed project or location. Complete the information below and mail form to:

Natural Diversity Section Division
of Environmental Services PA Fish
and Boat Commission
450 Robinson Lane
Bellefonte, PA 16823
Fax: (814) 359-5175

C. This form, a cover letter including a project narrative, and accompanying maps should be sent to the above address for environmental reviews that only concern reptiles, amphibians, fishes and aquatic invertebrates. Reviews for other natural resources must be submitted to other appropriate agencies.

D. The absence of recorded information from our databases and files does not necessarily imply actual conditions on site. Future field investigations could alter this determination. The information contained in our files is routinely updated. A review is valid for one year.

E. Please send us only one (1) copy of your request – either by fax or by mail – not both. Mail is preferred to improve legibility of maps. Facsimile submission will not improve our response turn-around time.

F. Allow 30 days for completion of the review from the date of PFBC receipt. Large projects and workload may extend this review timeframe.

G. In any future correspondence with us following your receipt of the SIR response, please refer to the assigned SIR number at the top left of our cover letter.

H. FORMS THAT ARE NOT COMPLETED IN FULL WILL NOT BE REVIEWED.

PLEASE PRINT OR TYPE: If available, provide the potential conflict PNDI Search Number: 20130327397134

PFBC response should be sent to:

Company/Agency: AECOM Form Preparer: Christopher Salvatico, GISP

Address: 1700 Market Street, Suite 1600, Philadelphia, PA 19103

Phone (8:00 AM to 4:00 PM): (215) 735-0832

Project Description: I-80 Section 17M is a 3.5-mile long roadway reconstruction including five interchanges traversing through three municipalities (Stroud Township, Stroudsburg Borough & East Stroudsburg Borough).

Indicate if the project is: X Transportation or Non-transportation (check one)

Will the proposed project encroach directly or indirectly (e.g., runoff) upon wetlands or waterways? Circle one for each:

Wetlands: Yes No X Unknown Waterways: Yes No X Unknown

County: Monroe Township/Municipality: Stroud, Stroudsburg & East Stroudsburg

Name of the United States Geological Survey (U.S.G.S.) 7.5 Minute Quadrangle Map where project is located:

Stroudsburg, PA & East Stroudsburg, PA Project size (in acres): 417

Attach an 8.5" by 11" photocopy (DO NOT REDUCE) of the section of the U.S.G.S. Quadrangle Map which identifies the project location. On this map, indicate the location of the project center (if linear, depict both ends) and outline the approximate boundaries of the project area.

Specify latitude/longitude of the project center. Latitude: 40 ° / 58 ' / 56.09 " N

Indicate latitude/longitude in degrees-minutes-seconds format only. Longitude: 75 ° / 12 ' / 43.19 " W

Three steps are needed to convert from decimal degrees to degrees-minutes-seconds: (1) Degrees will be the whole number. (2) To get minutes, multiply the decimal degree portion by 60. (3) Multiply the decimal minute portion by 60 to get seconds.
Example: (Latitude) 40.93748 = 40°; 0.93748 x 60 = 56.2488'= 56'; 0.2488 x 60 = 14.928 = 15" = 40°56'15" N
(Longitude) 75.94740 = 75°; 0.94740 x 60 = 56.844' = 56'; 0.844 x 60 = 50.64 = 51" = 75°56'51" W

FOR PFBC USE ONLY

SIR#	Quad Name	Data Source	Search Result-Potential Species Conflict	Action

AECOM
1700 Market Street
Suite 1600
Philadelphia, PA 19103
www.aecom.com

215-735-0832 tel
215-735-0883 fax

April 17, 2013

PA Department of Conservation and Natural Resources
Bureau of Forestry, Ecological Services Section
400 Market Street
P O Box 8552
Harrisburg, PA 17105-8522

Subject: **PNDI Search ID: 20130327397134**
PennDOT District 5-0
SR 0080, Section 17M - Interstate 80 Reconstruction Project
Monroe County, Pennsylvania

Dear Sir/Ma'am:

On behalf of the Pennsylvania Department of Transportation (PennDOT), Engineering District 5-0, we are contacting you regarding the proposed SR 0080, Section 17M Reconstruction Project within Monroe County, Pennsylvania. Project location maps are attached as well as a PNDI receipt.

I-80 Section 17M is a 3.5-mile long roadway reconstruction including five interchanges traversing through three municipalities (Stroud Township, Stroudsburg Borough & East Stroudsburg Borough). PennDOT is currently in the early stages of resource identification and alternatives development. The project purpose is to relieve congestion, alleviate safety issues, and bring the roadway and structures up to current standards. The following table provides project information.

MPMS	PNDI Search ID	SR	Municipalities	USGS Quad(s)
76357	20130327397134	0080, Sec 17M	Stroud Twp, Stroudsburg & East Stroudsburg Boroughs	Stroudsburg, PA & East Stroudsburg, PA

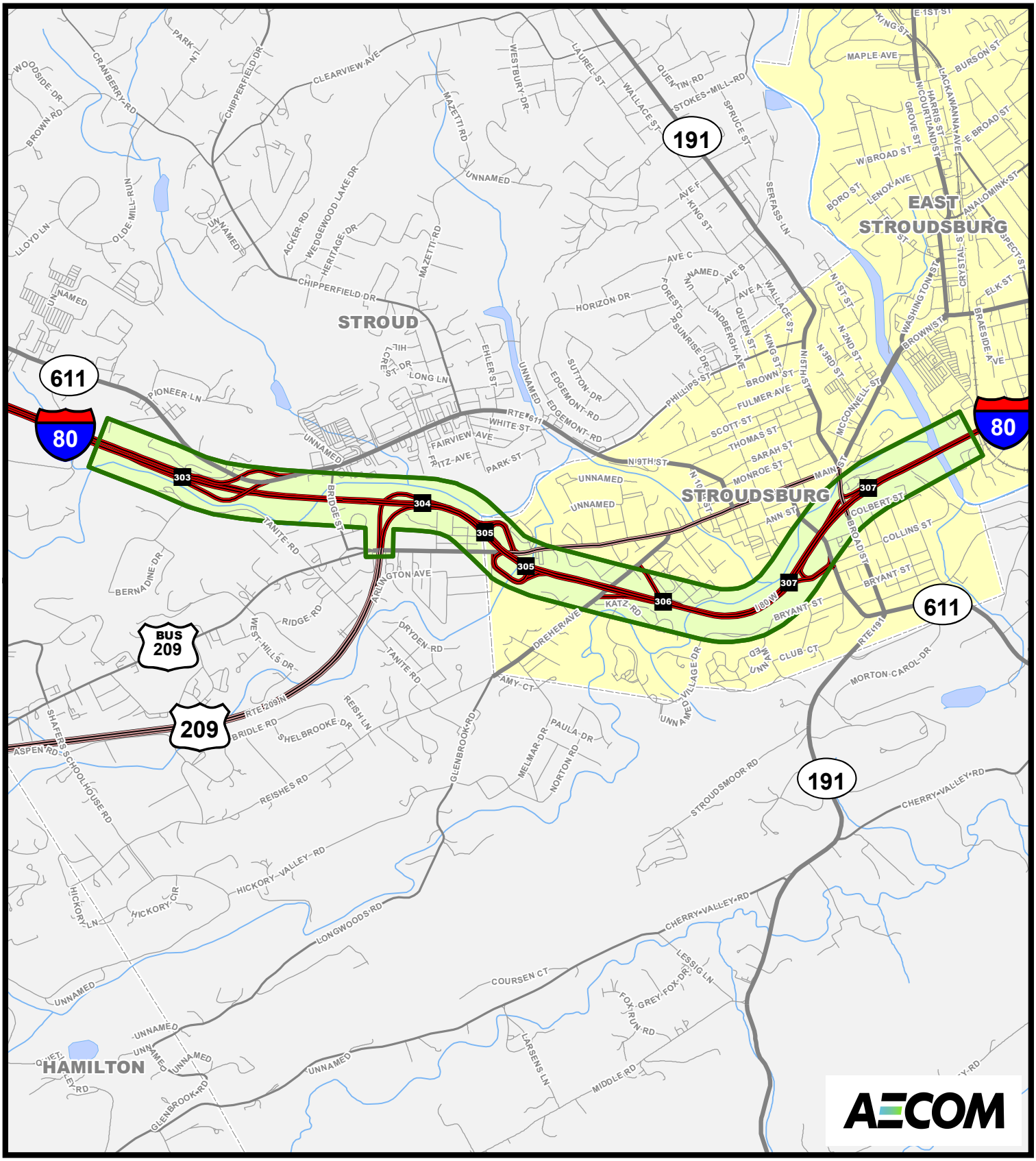
Based on the PNDI reviews, potential conflicts were indicated for the above referenced project for *Polygonum ramosissimum & Satyrodes eurydice*. To assist us in our environmental studies, we are requesting a review to ensure that the proposed project will not adversely affect those species or critical habitats identified under your agencies.

If you have any questions, please do not hesitate to contact me at (215) 735-0832. Thank you for your assistance and attention to this matter.

Sincerely,

Christopher Salvatico, GISP
Sr. Environmental Planner
christopher.salvatico@aecom.com

Enclosures
Cc: File



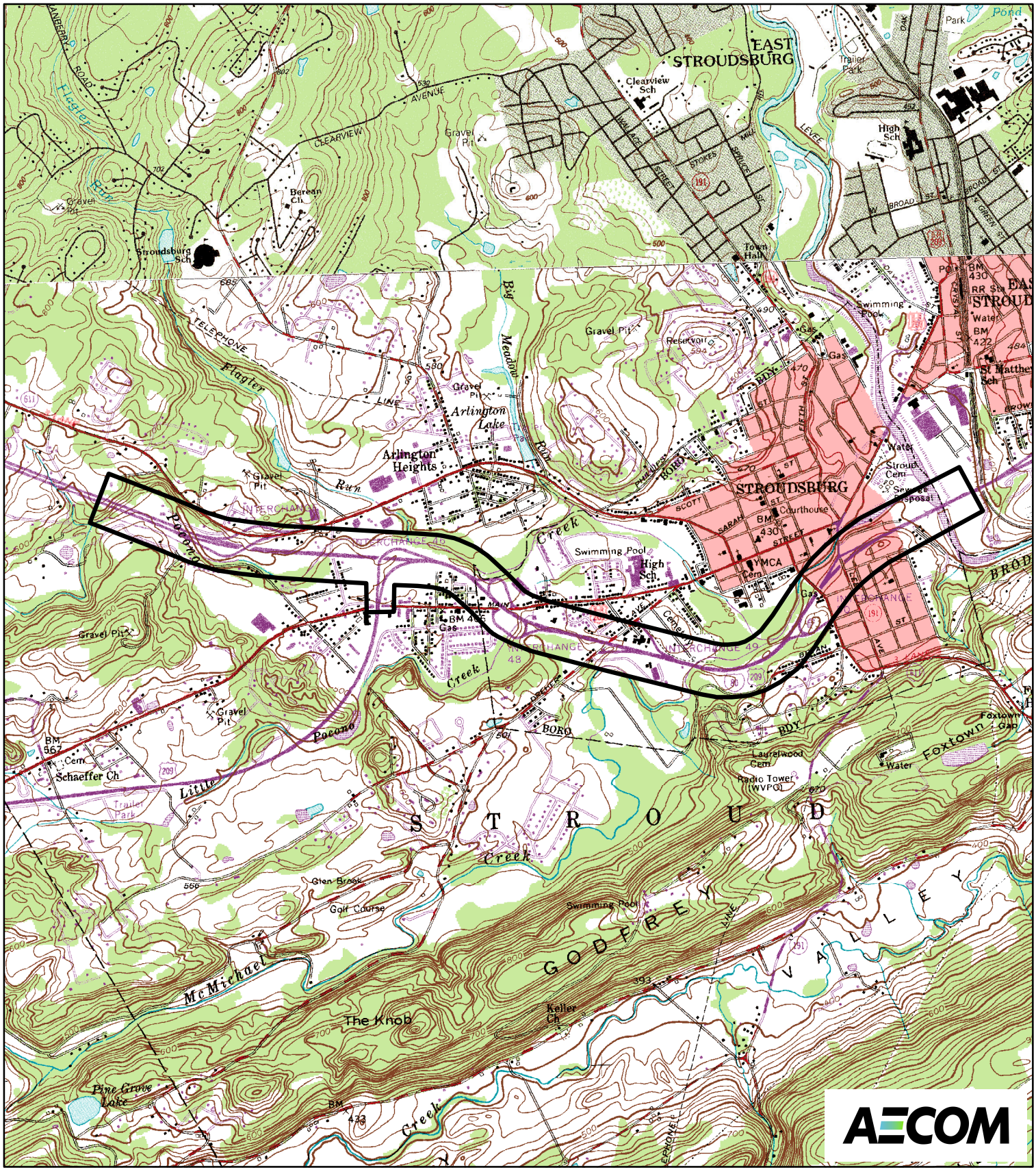
INTERSTATE 80, SECTION 17M
PROJECT LOCATION

Project Location

N

0 1,200 2,400

Feet



INTERSTATE 80, SECTION 17M
PROJECT LOCATION (USGS)

Project Location

N

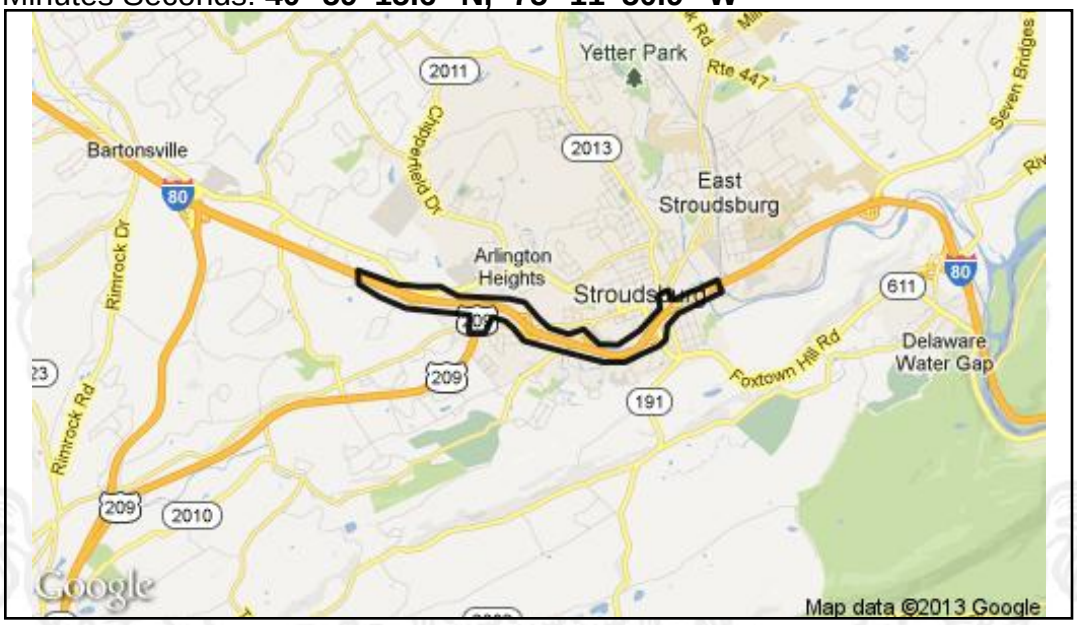
0 1,250 2,500

Feet

Source: USGS Topographic Mapping, East Stroudsburg, PA & Stroudsburg, PA Quads.

1. PROJECT INFORMATION

Project Name: **Interstate 80**
Date of review: **3/27/2013 2:10:17 PM**
Project Category: **Transportation,Road -- construction/alignment (New Roads, Interchanges(including ramps) staging areas)**
Project Area: **417.0** acres
County: **Monroe** Township/Municipality: **Stroudsburg,East Stroudsburg,Stroud**
Quadrangle Name: **STROUDSBURG** ~ ZIP Code: **18301,18360**
Decimal Degrees: **40.987673 N, -75.197467 W**
Degrees Minutes Seconds: **40° 59' 15.6" N, -75° 11' 50.9" W**



2. SEARCH RESULTS

Agency	Results	Response
PA Game Commission	**Potential Impact**	**FURTHER REVIEW IS REQUIRED, See Agency Response**
PA Department of Conservation and Natural Resources	**Potential Impact**	**FURTHER REVIEW IS REQUIRED, See Agency Response**
PA Fish and Boat Commission	**Potential Impact**	**FURTHER REVIEW IS REQUIRED, See Agency Response**
U.S. Fish and Wildlife Service	**Potential Impact**	**FURTHER REVIEW IS REQUIRED, See Agency Response**

As summarized above, Pennsylvania Natural Diversity Inventory (PNDI) records indicate there may be potential impacts to threatened and endangered and/or special concern species and resources within the project area. If the response above indicates "No Further Review Required" no additional communication with the respective agency is required. If the response is "Further Review Required" or "See Agency Response," refer to the appropriate agency comments below. Please see the DEP Information Section of this receipt if a PA Department of Environmental Protection Permit is required.

Note that regardless of PNDI search results, projects requiring a Chapter 105 DEP individual permit or GP 5, 6, 7, 8, 9 or 11 in certain counties (Adams, Berks, Bucks, Carbon, Chester, Cumberland, Delaware, Lancaster, Lebanon, Lehigh, Monroe, Montgomery, Northampton, Schuylkill and York) must comply with the bog turtle habitat screening requirements of the PASPGP.

RESPONSE TO QUESTION(S) ASKED

Q1: "Will the entire project area (including any discharge), plus a 300 feet buffer around the project area, all occur in or on an existing building, parking lot, driveway, road, road shoulder, street, runway, paved area, railroad bed, maintained (periodically mown) lawn, crop agriculture field or maintained orchard?"
Your answer is: **2. No**

Q2: Will the entire project occur within an existing building, parking lot, driveway, road, street, or maintained (periodically mowed) lawn?
Your answer is: **2. No**

3. AGENCY COMMENTS

Regardless of whether a DEP permit is necessary for this proposed project, any potential impacts to threatened and endangered species and/or special concern species and resources must be resolved with the appropriate jurisdictional agency. In some cases, a permit or authorization from the jurisdictional agency may be needed if adverse impacts to these species and habitats cannot be avoided.

These agency determinations and responses are **valid for two years** (from the date of the review), and are based on the project information that was provided, including the exact project location; the project type, description, and features; and any responses to questions that were generated during this search. If any of the following change: 1) project location, 2) project size or configuration, 3) project type, or 4) responses to the questions that were asked during the online review, the results of this review are not valid, and the review must be searched again via the PNDI Environmental Review Tool and resubmitted to the jurisdictional agencies. The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer impacts than what is listed on this PNDI receipt. The jursidictional agencies **strongly advise against** conducting surveys for the species listed on the receipt prior to consultation with the agencies.

PA Game Commission

RESPONSE: Further review of this project is necessary to resolve the potential impacts(s). Please send project information to this agency for review (see WHAT TO SEND).

PGC Species: (Note: The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer species than what is listed below.)
Scientific Name: Myotis septentrionalis
Common Name: Northern Myotis
Current Status: Special Concern Species*
Proposed Status: Special Concern Species*

PA Department of Conservation and Natural Resources

RESPONSE: Further review of this project is necessary to resolve the potential impacts(s). Please send

project information to this agency for review (see WHAT TO SEND).

DCNR Species: (Note: The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer species than what is listed below. After desktop review, if a botanical survey is required by DCNR, we recommend the DCNR Botanical Survey Protocols, available here: http://www.gis.dcnr.state.pa.us/hgis-er/PNDI_DCNR.aspx.)
Scientific Name: Polygonum ramosissimum
Common Name: Bushy Knotweed
Current Status: Special Concern Species*
Proposed Status: Special Concern Species*

Scientific Name: Satyrodes eurydice
Common Name: Eyed Brown
Current Status: Special Concern Species*
Proposed Status: Special Concern Species*

PA Fish and Boat Commission

RESPONSE: Further review of this project is necessary to resolve the potential impacts(s). Please send project information to this agency for review (see WHAT TO SEND).

PFBC Species: (Note: The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer species than what is listed below.)
Scientific Name: Stygobromus allegheniensis
Common Name: Allegheny Cave Amphipod
Current Status: Special Concern Species*
Proposed Status: Special Concern Species*

U.S. Fish and Wildlife Service

RESPONSE: Further review of this project is necessary to resolve the potential impacts(s). Please send project information to this agency for review (see WHAT TO SEND).

* Special Concern Species or Resource - Plant or animal species classified as rare, tentatively undetermined or candidate as well as other taxa of conservation concern, significant natural communities, special concern populations (plants or animals) and unique geologic features.
** Sensitive Species - Species identified by the jurisdictinal agency as collectible, having economic value, or being susceptible to decline as a result of visitation.

WHAT TO SEND TO JURISDICTIONAL AGENCIES

If project information was requested by one or more of the agencies above, send the following information to the agency(s) seeking this information (see AGENCY CONTACT INFORMATION).

Check-list of *Minimum* Materials to be submitted:

____**SIGNED** copy of this Project Environmental Review Receipt
____Project narrative with a description of the overall project, the work to be performed, current physical characteristics of the site and acreage to be impacted.
____Project location information (name of USGS Quadrangle, Township/Municipality, and County)
____USGS 7.5-minute Quadrangle with project boundary clearly indicated, and quad name on the map

The inclusion of the following information may expedite the review process.
____A basic site plan(particularly showing the relationship of the project to the physical features such as wetlands, streams, ponds, rock outcrops, etc.)
____Color photos keyed to the basic site plan (i.e. showing on the site plan where and in what direction each photo was taken and the date of the photos)
____Information about the presence and location of wetlands in the project area, and how this was determined (e.g., by a qualified wetlands biologist), if wetlands are present in the project area, provide project plans showing the location of all project features, as well as wetlands and streams

4. DEP INFORMATION

The Pa Department of Environmental Protection (DEP) requires that a signed copy of this receipt, along with any required documentation from jurisdictional agencies concerning resolution of potential impacts, be submitted with applications for permits requiring PNDI review. For cases where a "Potential Impact" to threatened and endangered species has been identified before the application has been submitted to DEP, the application should not be submitted until the impact has been resolved. For cases where "Potential Impact" to special concern species and resources has been identified before the application has been submitted, the application should be submitted to DEP along with the PNDI receipt. The PNDI Receipt should also be submitted to the appropriate agency according to directions on the PNDI Receipt. DEP and the jurisdictional agency will work together to resolve the potential impact(s). See the DEP PNDI policy at http://www.naturalheritage.state.pa.us.

5. ADDITIONAL INFORMATION

The PNDI environmental review website is a **preliminary** screening tool. There are often delays in updating species status classifications. Because the proposed status represents the best available information regarding the conservation status of the species, state jurisdictional agency staff give the proposed statuses at least the same consideration as the current legal status. If surveys or further information reveal that a threatened and endangered and/or special concern species and resources exist in your project area, contact the appropriate jurisdictional agency/agencies immediately to identify and resolve any impacts.

For a list of species known to occur in the county where your project is located, please see the species lists by county found on the PA Natural Heritage Program (PNHP) home page (www.naturalheritage.state.pa.us). Also note that the PNDI Environmental Review Tool only contains information about species occurrences that have actually been reported to the PNHP.

6. AGENCY CONTACT INFORMATION

PA Department of Conservation and Natural Resources

Bureau of Forestry, Ecological Services Section
400 Market Street, PO Box 8552, Harrisburg, PA. 17105-8552
Fax:(717) 772-0271

U.S. Fish and Wildlife Service

Endangered Species Section
315 South Allen Street, Suite 322, State College, PA. 16801-4851
NO Faxes Please.

PA Fish and Boat Commission

Division of Environmental Services
450 Robinson Lane, Bellefonte, PA. 16823-7437
NO Faxes Please

PA Game Commission

Bureau of Wildlife Habitat Management
Division of Environmental Planning and Habitat Protection
2001 Elmerton Avenue, Harrisburg, PA. 17110-9797
Fax:(717) 787-6957

7. PROJECT CONTACT INFORMATION

Name: Christopher Salvatico, GISP
Company/Business Name: AECOM
Address: 1700 Market Street, Suite 1600
City, State, Zip: Philadelphia, PA 19103
Phone:(215) 735-0832 Fax:(215) 735-0883
Email: christopher.salvatico@aecom.com

8. CERTIFICATION

I certify that ALL of the project information contained in this receipt (including project location, project size/configuration, project type, answers to questions) is true, accurate and complete. In addition, if the project type, location, size or configuration changes, or if the answers to any questions that were asked during this online review change, I agree to re-do the online environmental review.

April 17, 2013

applicant/project proponent signature date

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pennsylvania Field Office
315 South Allen Street, Suite 322
State College, Pennsylvania 16801-4850

May 3, 2013

Christopher Salvatico
AECOM
1700 Market Street
Suite 1600
Philadelphia, PA 19103

RE: USFWS Project #2013-0652
PNDI #20130327397134

Dear Mr. Salvatico:

This responds to your letter of April 17, 2013, requesting information about fish and wildlife resources within the area affected by the proposed I-80, Section 17M, reconstruction project located in Stroud Township; Stroudsburg and East Stroudsburg Boroughs, Monroe County, Pennsylvania. The Pennsylvania Department of Transportation (PennDOT) proposes to reconstruct 3.5 miles of roadway, including five interchanges to relieve congestion, alleviate safety issues, and bring the roadway up to current standards.

The following comments are provided pursuant to the Endangered Species Act of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*) to ensure the protection of endangered and threatened species and the Migratory Bird Treaty Act (MBTA, 16 U.S.C. 703-712; Ch. 128; July 13, 1918; 40 Stat. 755, as amended) to ensure the protection of migratory bird species.

Federally Listed and Proposed Species

The proposed project is within the known range of the bog turtle (*Clemmys muhlenbergii*), a species that is federally listed as threatened. Bog turtles inhabit shallow, spring-fed fens, sphagnum bogs, swamps, marshy meadows, and pastures characterized by soft, muddy bottoms; clear, cool, slow-flowing water, often forming a network of rivulets; high humidity; and an open canopy. Bog turtles usually occur in small, discrete populations occupying suitable wetland habitat dispersed along a watershed. The occupied "intermediate successional stage" wetland habitat is usually a mosaic of micro-habitats ranging from dry pockets, to areas that are saturated with water, to areas that are periodically flooded. Some wetlands occupied by bog turtles are located in agricultural areas and are subject to grazing by livestock.

Because wetlands occur within the project area, their potential suitability as bog turtle habitat should be assessed, as described under "*Bog Turtle Habitat Survey*" (Phase 1 survey) of the enclosed *Guidelines for Bog Turtle Surveys*. This Phase 1 survey should evaluate all wetlands within the project action area. The project "action area" includes all areas that will be directly or indirectly affected by the proposed project (including all phases of multi-phased projects) and all project-associated features, such as roads, water and sewer lines, utility lines, stormwater and sedimentation basins, buildings and other structures, driveways, parking lots, yards/lawns, and wells.

Due to the skill required to correctly identify potential bog turtle habitat, we recommend that the Phase 1 survey be done by a qualified surveyor (see enclosed list). Survey results should be submitted to the Service for review and concurrence. If the Phase 1 survey is done by someone who is not on this list, it is likely that a site visit by a Fish and Wildlife Service biologist will be necessary to verify their findings. Due to the limited availability of staff from this office, such a visit may not be possible for some time. Use of a qualified surveyor will expedite our review of the survey results.

If potential bog turtle habitat is found in the project action area, efforts should be made to avoid any direct or indirect impacts to those wetlands (see enclosed *Bog Turtle Conservation Zones*). Avoidance of direct and indirect effects means no disturbance to or encroachment into the wetlands (e.g., filling, ditching or draining) for any project-associated features or activities. Adverse effects may also be anticipated to occur when lot lines include portions of the wetland; when an adequate upland buffer is not designated around the wetland (see *Bog Turtle Conservation Zones*); or when roads, stormwater/sedimentation basins, impervious surfaces, or wells affect the hydrology of the wetland.

If potential habitat is found, submit (along with your Phase 1 survey results) a detailed project description and detailed project plans documenting how direct and indirect impacts to the wetlands will be avoided. If adverse effects to these wetlands cannot be avoided, a more detailed and thorough survey will be necessary, as described under "*Bog Turtle Survey*" (Phase 2 survey) of the *Guidelines*. The Phase 2 survey should be conducted by a qualified biologist with bog turtle field survey experience (see enclosed list of qualified surveyors). Submit survey results to the Service for review and concurrence.

In cases where adverse effects to federally listed species cannot be avoided, further consultation with the Service would be necessary to avoid potential violations of section 9 (prohibiting "take" of listed species) and/or section 7 (requiring federal agencies to consult) of the Endangered Species Act. Information about the section 7 and section 10 consultation processes (for federal and non-federal actions, respectively) can be obtained by contacting this office or accessing the Service's Endangered Species Home Page (http://endangered.fws.gov).

Assessment of Risks to Migratory Birds

The Service is the principal Federal agency charged with protecting and enhancing populations and habitat of migratory bird species. The Migratory Bird Treaty Act (MBTA) prohibits the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts,

and nests, except when specifically authorized by the Department of the Interior. While the MBTA has no provision for authorizing incidental take, the Service recognizes that some birds may be killed even if all reasonable measures to avoid take are implemented.

The potential exists for avian mortality from habitat destruction and alteration within the project boundaries. Site-specific factors that should be considered in project siting to avoid and minimize the risk to birds include avian abundance; the quality, quantity and type of habitat; geographic location; type and extent of bird use (*e.g.* breeding, foraging, migrating, etc.); and landscape features. Please review the enclosed information for general recommendations for avoiding and minimizing impacts to migratory birds within and around the project area. Please be aware that since these are general guidelines, some of them may not be applicable to the current project design or they may have already been included in the project design.

This response relates only to endangered and threatened species under our jurisdiction, based on an office review of the proposed project's location. No field inspection of the project area has been conducted by this office. Consequently, this letter is not to be construed as addressing other potential Service concerns under the Fish and Wildlife Coordination Act or other authorities.

To avoid potential delays in reviewing your project, please use the above-referenced USFWS project tracking number in any future correspondence regarding this project.

If you have any questions regarding this matter, please contact Jennifer Kagel of my staff at 814-234-4090.

Sincerely,

Roberta E. Hylton
Acting Field Office Supervisor

Enclosures

Federally Listed, Proposed, and Candidate Species in Pennsylvania

(revised March 13, 2012)

Common Name	Scientific Name	Status[1]	Distribution (Counties and/or Watersheds)
MAMMALS			
Indiana bat	*Myotis sodalis*	E	Hibernacula: Armstrong, Beaver, Blair, Centre, Fayette, Huntingdon, Lawrence, Luzerne, Mifflin and Somerset Co. Maternity Colonies & Male Sites : Adams, Armstrong, Bedford, Berks, Blair, Greene, Pike, Washington, and York Counties. Potential winter habitat state-wide in caves or abandoned mines. Potential summer habitat state-wide in forests or wooded areas.
BIRDS			
Piping plover	*Charadrius melodus*	E	Designated critical habitat on Presque Isle (Erie Co.). Migratory. No nesting in PA since 1950s, but recent colonization attempts at Presque Isle
REPTILES			
Bog turtle	*Clemmys (Glyptemys) muhlenbergii*	T	Adams, Berks, Bucks, Carbon, Chester, Cumberland, Delaware, Lancaster, Lebanon, Lehigh, Monroe, Montgomery, Northampton, Schuylkill and York Co. *Historically found in Crawford, Mercer and Philadelphia Co.*
Eastern massasauga rattlesnake	*Sistrurus catenatus catenatus*	C	Butler, Crawford, Mercer and Venango Co. *Historically found in Allegheny and Lawrence Co.*
MUSSELS			
Clubshell	*Pleurobema clava*	E	Allegheny River (Armstrong, Clarion, Forest, Venango, Warren); Conneaut Outlet (Crawford); Conneauttee Creek (Crawford); French Creek (Crawford, Erie, Mercer, Venango); LeBoeuf Creek (Erie); Muddy Creek (Crawford); Shenango River (Mercer) *Has not been found recently in 13 streams of historical occurrence in Butler, Beaver, Fayette, Greene, Indiana, Lawrence, and Westmoreland Co.*
Dwarf wedgemussel	*Alasmidonta heterodon*	E	Delaware River (Monroe, Northampton, Pike, Wayne Co.). *Has not been found recently in streams of historical occurrence in the Delaware River watershed (Bucks, Carbon, Chester, Philadelphia) or Susquehanna River watershed (Lancaster)*
Northern riffleshell	*Epioblasma torulosa rangiana*	E	Allegheny River (Armstrong, Clarion, Forest, Venango, Warren); Conewango Creek (Warren); French Creek (Crawford, Erie, Mercer, Venango); LeBoeuf Creek (Erie); Muddy Creek (Crawford) *Has not been found recently in streams of historical occurrence, including Shenango River (Lawrence)*

Common Name	Scientific Name	Status[1]	Distribution (Counties and/or Watersheds)
Rabbitsfoot	*Quadrula cylindrica cylindrica*	C	Allegheny River (Armstrong, Clarion, Forest, Venango, Warren); Conneauttee Creek (Venango); French Creek (Crawford, Erie, Mercer, Venango); LeBoeuf Creek (Erie); Muddy Creek (Crawford); Shenango River (Crawford, Mercer)
Rayed bean	*Villosa fabalis*	E	Allegheny River (Armstrong, Clarion, Forest, Venango, Warren); Cussewago Creek (Crawford); French Creek (Crawford, Erie, Mercer, Venango); LeBoeuf Creek (Erie); Muddy Creek (Crawford) *Potentially extant in Shenango River (Crawford, Mercer) and Woodcock Creek (Venango)* *Has not been found recently in 5 streams of historical occurrence in Armstrong, Lawrence, Mercer and Warren Co.*
Sheepnose	*Plethobasus cyphyus*	E	Allegheny River (Forest and Venango Co.). *Has not been found recently in streams of historical occurrence, including: Allegheny River (Armstrong); Beaver River (Lawrence); Monongahela River (Washington); Ohio River (Allegheny and Beaver)*
Snuffbox	*Epioblasma triquetra*	E	Allegheny River (Armstrong, Clarion, Venango), Conneaut Outlet (Crawford); Cussewago Creek (Crawford); Dunkard Creek (Greene); French Creek (Crawford, Erie, Mercer, Venango); LeBoeuf Creek (Erie); Little Mahoning Creek (Indiana); Muddy Creek (Crawford); Shenango and Little Shenango River (Mercer); West Branch French Creek (Erie)
FISH			
Atlantic sturgeon[2]	*Acipenser oxyrinchus oxyrinchus*	E	Delaware River (New York Bight Distinct Population Segment)
Shortnose sturgeon[2]	*Acipenser brevirostrum*	E	Delaware River and other Atlantic coastal waters
PLANTS			
Northeastern bulrush	*Scirpus ancistrochaetus*	E	Adams, Bedford, Blair, Cambria, Carbon, Centre, Clinton, Columbia, Cumberland, Dauphin, Franklin, Fulton, Huntingdon, Lackawanna, Lehigh, Lycoming, Mifflin, Monroe, Perry, Snyder, Tioga, and Union Co. *Historically found in Northampton Co.*
Small-whorled pogonia	*Isotria medeoloides*	T	Centre, Chester and Venango Co. *Historically found in Berks, Greene, Monroe, Montgomery and Philadelphia Co.*

[1] E = Endangered; T = Threatened; PE = Proposed for listing as Endangered; C = Candidate
[2] Atlantic sturgeon and shortnose sturgeon are under the jurisdiction of the National Marine Fisheries Service

U.S. FISH AND WILDLIFE SERVICE
& PENNSYLVANIA FISH AND BOAT COMMISSION

QUALIFIED BOG TURTLE SURVEYORS

The following list includes persons known by the U.S. Fish and Wildlife Service and the Pennsylvania Fish and Boat Commission to have the skills and experience to search for and successfully find bog turtles and their habitat. This list includes individuals who do bog turtle survey work in Pennsylvania on a contractual basis. Any individuals handling or conducting surveys for bog turtles must first obtain from the Pennsylvania Fish and Boat Commission a Scientific Collector's Permit, and a Special Permit to survey for endangered and threatened species pursuant to 58 PA Code 75.4. All permitted collector's encounters with bog turtles must be reported in writing to the Commission and Service within 48 hours.

Contracted bog turtle surveys and research will be overseen by a qualified surveyor, who will be present in the field at all times during the investigation. Qualified surveyors are the individuals who act in the capacity of Principal Investigator (PI), having in-field oversight responsibility for surveys, bog turtle captures, turtle identification and marking, telemetry studies, and safe handling procedures. They are also the individuals responsible for ensuring 1) they and their assistants have the appropriate permits to conduct bog turtle work, 2) surveys are carried out in accordance with survey protocols, and 3) reports are accurate and complete and submitted to the appropriate agencies. Phase 1 and Phase 2 surveys should be carried out in accordance with the Service's *Guidelines for Bog Turtle Surveys* (dated April 2006); exceptions should be reviewed and approved by the Service and Commission.

This information is not to be construed as an endorsement of individuals or firms by the Service, the Commission, or any of its employees. Persons not on this list, but who have documented experience in conducting scientific studies of, or successful searches for, bog turtles and their habitat may submit their qualifications to the Service and the Commission for review. Additions to and deletions from this list are at the sole discretion of the Service and Commission. This list is subject to revision at any time without prior notice.

Ben Berra Skelly and Loy, Inc. 449 Eisenhower Blvd - Suite 300 Harrisburg, PA 17111-2302 717-232-0593 or 800-892-6532 bberra@skellyloy.com	Tessa Mai Bickhart Herpetological Associates, Inc. 581 Airport Road Bethel, PA 19507 717-933-8380; 717-933-4096 (fax) TBickhart@herpetologicalassociates.com	Stan Boder Wildlife Specialists, LLC 942 Camp Trail Road Quakertown, PA 18951 office: 215-529-7280 cell: 570-952-1169 fax: 215-529-1556 stan@wildlife-specialists.com
Andrew Brookens Skelly and Loy, Inc. 449 Eisenhower Blvd - Suite 300 Harrisburg, PA 17111-2302 717-232-0593 or 800-892-6532 abrookens@skellyloy.com	Robert Bull The Wilson T. Ballard Company 28 Northbrook Drive – Suite 3 Shrewsbury, PA 17361 717-235-0770; 717-235-3149 (fax) rbull@wtbco.com	Robert Zappalorti Herpetological Associates 575 Toms River Road, Route 571 Jackson, NJ 08527 732-833-8600; Fax732-928-9257 RZappalort@aol.com
Jay Drasher Aqua-Terra Environmental Ltd. P.O. Box 4099 Reading, PA 19606 610-374-7500; 610-374-7480 (fax) JDrasher@Aqua-TerraEnv.com	Bryon DuBois Trident Environmental 521 Beaver Valley Pike Lancaster, PA 17602 908-814-1109 (cell);732-818-3744(fax) BDubois@tridentenviro.com	B. Scott Fiegel Ecological Associates, LLC 185 Long Lane, PO Box 181 Oley, PA 19547-0181 610-987-6585 Bscottfiegel@aol.com

Sean P. Gorby Clemmys Environmental Services 112 Commons Court Chadds Ford, PA 19317 610-558-1664 Sean.Gorby@Clemmysenvironmental.com	Jeremy Hite RETTEW 3020 Columbia Avenue Lancaster, PA 17603 717-394-3721; 717-394-1063 (fax) jhite@rettew.com	Kevin S. Keat ECSI 1095 Mill Road PenArgyl, PA 18072 484-515-6806 kevinkeat@ptd.net
Andrew J. Longenecker Liberty Environmental, Inc. 50 North 5th Street, 5th Floor Reading, PA 19601 610-375-9301; 610-375-9302 (fax) alongenecker@libertyenviro.com	Matthew Malhame P.O. Box 394 Henryville, PA 18332 570-872-1284 mmalhame@hotmail.com	Gian L. Rocco 322 Strawberry Hill Road Centre Hall, PA 16828 814-364-1204; 814-441-4303 (cell) gxr124@psu.edu
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BOG TURTLE CONSERVATION ZONES[1]

(revised April 18, 2001)

Projects in and adjacent to bog turtle habitat can cause habitat destruction, degradation and fragmentation. Of critical importance is evaluating the potential direct and indirect effects of activities that occur in or are proposed for upland areas adjacent to bog turtle habitat. Even if the wetland impacts from an activity are avoided (i.e., the activity does not result in encroachment into the wetland), activities in adjacent upland areas can seriously compromise wetland habitat quality, fragment travel corridors, and alter wetland hydrology, thereby adversely affecting bog turtles.

The following bog turtle conservation zones have been designated with the intent of protecting and recovering known bog turtle populations within the northern range of this species. The conservation suggestions for each zone are meant to guide the evaluation of activities that may affect high-potential bog turtle habitat, potential travel corridors, and adjacent upland habitat that may serve to buffer bog turtles from indirect effects. *Nevertheless, it is important to recognize that consultations and project reviews will continue to be conducted on a case-by-case basis, taking into account site- and project-specific characteristics.*

Zone 1

This zone includes the wetland and visible spring seeps occupied by bog turtles. Bog turtles rely upon different portions of the wetland at different times of year to fulfill various needs; therefore, this zone includes the entire wetland (the delineation of which will be scientifically based), not just those portions that have been identified as, or appear to be, optimal for nesting, basking or hibernating. In this zone, bog turtles and their habitat are most vulnerable to disturbance, therefore, the greatest degree of protection is necessary.

Within this zone, the following activities are likely to result in habitat destruction or degradation and should be avoided. These activities (not in priority order) include:

- development (e.g., roads, sewer lines, utility lines, storm water or sedimentation basins, residences, driveways, parking lots, and other structures)
- wetland draining, ditching, tiling, filling, excavation, stream diversion and construction of impoundments
- heavy grazing
- herbicide, pesticide or fertilizer application[2]
- mowing or cutting of vegetation[2]
- mining
- delineation of lot lines (e.g., for development, even if the proposed building or structure will not be in the wetland)

Some activities within this zone may be compatible with bog turtle conservation but warrant careful evaluation on a case-by-case basis:

- light to moderate grazing
- non-motorized recreational use (e.g., hiking, hunting, fishing)

Zone 2

The boundary of this zone extends *at least 300 feet* from the edge of Zone 1 and includes upland areas adjacent to Zone 1. Activities in this zone could indirectly destroy or degrade wetland habitat over the short or long-term, thereby adversely affecting bog turtles. In addition, activities in this zone have the potential to cut off travel corridors between wetlands occupied or likely to be occupied by bog turtles, thereby isolating or dividing populations and increasing the risk of turtles being killed while attempting to disperse. Some of the indirect effects to wetlands resulting from activities in the adjacent uplands include: changes in hydrology (e.g., from roads, detention basins, irrigation, increases in impervious surfaces, sand and gravel mining); degradation of water quality (e.g., due to herbicides, pesticides, oil and salt from various sources including roads, agricultural fields, parking lots and residential developments); acceleration of succession (e.g., from fertilizer runoff); and introduction of exotic plants (e.g., due to soil disturbance and roads). This zone acts as a filter and buffer, preventing or minimizing the effects of land-use activities on bog turtles and their habitat. This zone is also likely to include at least a portion of the groundwater recharge/supply area for the wetland.

Activities that should be avoided in this zone due to their potential for adverse effects to bog turtles and their habitat include:

- development (e.g., roads, sewer lines, utility lines, storm water or sedimentation basins, residences, driveways, parking lots, and other structures)
- mining
- herbicide application[2]
- pesticide or fertilizer application
- farming (with the exception of light to moderate grazing - see below)
- certain types of stream-bank stabilization techniques (e.g., rip-rapping)
- delineation of lot lines (e.g., for development, even if the proposed building or structure will not be in the wetland)

Careful evaluation of proposed activities on a case-by-case basis will reveal the manner in which, and degree to which activities in this zone would affect bog turtles and their habitat. Assuming impacts within Zone 1 have been avoided, evaluation of proposed activities within Zone 2 will often require an assessment of anticipated impacts on wetland hydrology, water quality, and habitat continuity.

Activities that are likely to be compatible with bog turtle conservation, but that should be evaluated on a case-by-case basis within this zone include:

- light to moderate grazing
- non-motorized recreational use (e.g., hiking, hunting, fishing)
- mowing or cutting of vegetation

Zone 3

This zone includes upland, wetland, and riparian areas extending either to the geomorphic edge of the drainage basin or at least one-half mile beyond the boundary of Zone 2. Despite the distance from Zone 1, activities in these areas have the potential to adversely affect bog turtles and their habitat. This particularly applies to activities affecting wetlands or streams connected to or contiguous with Zone 1, because these areas may support undocumented occurrences of bog turtles and/or provide travel corridors. In addition, some activities (e.g., roads, groundwater withdrawal, water/stream diversions, mining, impoundments, dams, "pump-and-treat" activities) far beyond Zone 1 have the potential to alter

the hydrology of bog turtle habitat, therefore, another purpose of Zone 3 is to protect the ground and surface water recharge zones for bog turtle wetlands. Where the integrity of Zone 2 has been compromised (e.g., through increases in impervious surfaces, heavy grazing, channelization of stormwater runoff), there is also a higher risk of activities in Zone 3 altering the water chemistry of bog turtle wetlands (e.g., via nutrient loading, sedimentation, and contaminants).

Activities occurring in this zone should be carefully assessed in consultation with the Fish and Wildlife Service and/or appropriate State wildlife agency to determine their potential for adverse effects to bog turtles and their habitat. Prior to conducting activities that may directly or indirectly affect wetlands, bog turtles and/or bog turtle habitat surveys should be conducted in accordance with accepted survey guidelines.

[1] These guidelines are taken directly from the final "Bog Turtle (*Clemmys muhlenbergii*), Northern Population, Recovery Plan" (dated May 15, 2001).

[2] Except when conducted as part of a bog turtle habitat management plan approved by the Fish and Wildlife Service or State wildlife agency

GUIDELINES FOR BOG TURTLE SURVEYS[1]

(revised April 2006)

RATIONALE

A bog turtle survey (when conducted according to these guidelines) is an attempt to determine presence or probable absence of the species; it does not provide sufficient data to determine population size or structure. Following these guidelines will standardize survey procedures. It will help maximize the potential for detection of bog turtles at previously undocumented sites at a minimum acceptable level of effort. Although the detection of bog turtles confirms their presence, failure to detect them does not absolutely confirm their absence (likewise, bog turtles do not occur in all appropriate habitats and many seemingly suitable sites are devoid of the species). Surveys as extensive as outlined below are usually sufficient to detect bog turtles; however, there have been instances in which additional effort was necessary to detect bog turtles, especially when habitat was less than optimum, survey conditions were less than ideal, or turtle densities were low.

PRIOR TO CONDUCTING ANY SURVEYS

If a project is proposed to occur in a county of known bog turtle occurrence (see attachment 1), contact the U.S. Fish and Wildlife Service (Service) and/or the appropriate State wildlife agency (see attachment 2). They will determine whether or not any known bog turtle sites occur in or near the project area, and will determine the need for surveys.

< If a wetland in or near the project area is *known* to support bog turtles, measures must be taken to avoid impacts to the species. The Service and State wildlife agency will work with federal, state and local regulatory agencies, permit applicants, and project proponents to ensure that adverse effects to bog turtles are avoided or minimized.

< If wetlands in or adjacent to the project area are *not* known bog turtle habitat, conduct a bog turtle habitat survey (Phase 1 survey) if:

1. The wetland(s) have an emergent and/or scrub-shrub wetland component, or are forested with suitable soils and hydrology (see below), *and*

2. Direct and indirect adverse effects to the wetland(s) cannot be avoided.

   See *Bog Turtle Conservation Zones*[2] for guidance regarding activities that may affect bog turtles and their habitat. In addition, consult with the Fish and Wildlife Service and/or appropriate State wildlife agency to definitively determine whether or not a Phase 1 survey will be necessary.

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[1] These guidelines are a modification of those found in the final "Bog Turtle (*Clemmys muhlenbergii*), Northern Population, Recovery Plan" (dated May 15, 2001). Several minor revisions were made to facilitate survey efforts and increase searcher effectiveness. As additional information becomes available regarding survey techniques and effectiveness, these survey guidelines may be updated and revised. Contact the Fish and Wildlife Service or one of the state agencies listed in Attachment 1 for the most recent version of these guidelines.

[2] See Appendix A of the "Bog Turtle (*Clemmys muhlenbergii*), Northern Population, Recovery Plan" (dated May 15, 2001).

BOG TURTLE HABITAT SURVEY (= Phase 1 survey)

The purpose of this survey is to determine whether or not the wetland(s) are *potential* bog turtle habitat. These surveys are performed by a recognized, qualified bog turtle surveyor (contact the Service or the appropriate State wildlife agency to receive a list of recognized, qualified bog turtle surveyors). The following conditions and information apply to habitat surveys.

< Surveys can be performed any month of the year (except when significant snow and/or ice cover is present). This flexibility in conducting Phase 1 surveys allows efforts during the Phase 2 survey window to be spent on wetlands most likely to support bog turtles (*i.e.*, those that meet the criteria below).

< Potential bog turtle habitat is recognized by three criteria *(not all of which may occur in the same portion of a particular wetland)*:

1. **Suitable hydrology**. Bog turtle wetlands are typically spring-fed with shallow surface water or saturated soils present year-round, although in summer the wet area(s) may be restricted to near spring head(s). Typically these wetlands are interspersed with dry and wet pockets. There is often subsurface flow. In addition, shallow rivulets (less than 4 inches deep) or pseudo-rivulets are often present.

2. **Suitable soils**. Usually a bottom substrate of permanently saturated organic or mineral soils. These are often soft, mucky-like soils (this does not refer to a technical soil type); you will usually sink to your ankles (3-5 inches) or deeper in muck, although in degraded wetlands or summers of dry years this may be limited to areas near spring heads or drainage ditches. In some portions of the species' range, the soft substrate consists of scattered pockets of peat instead of muck.

3. **Suitable vegetation**. Dominant vegetation of low grasses and sedges (in emergent wetlands), often with a scrub-shrub wetland component. Common emergent vegetation includes, but is not limited to: tussock sedge (*Carex stricta*), soft rush (*Juncus effusus*), rice cut grass (*Leersia oryzoides*), sensitive fern (*Onoclea sensibilis*), tearthumbs (*Polygonum* spp.), jewelweeds (*Impatiens* spp.), arrowheads (*Saggitaria* spp.), skunk cabbage (*Symplocarpus foetidus*), panic grasses (*Panicum* spp.), other sedges (*Carex* spp.), spike rushes (*Eleocharis* spp.), grass-of-Parnassus (*Parnassia glauca*), shrubby cinquefoil (*Dasiphora fruticosa*), sweet-flag (*Acorus calamus*), and in disturbed sites, reed canary grass (*Phalaris arundinacea*) or purple loosestrife (*Lythrum salicaria*). Common scrub-shrub species include alder (*Alnus spp.*), red maple (*Acer rubrum*), willow (*Salix spp.*), tamarack (*Larix laricina*), and in disturbed sites, multiflora rose (*Rosa multiflora*). Some forested wetland habitats are suitable given hydrology, soils and/or historic land use. These forested wetlands include red maple, tamarack, and cedar swamps.

Suitable hydrology and soils are the critical criteria (*i.e.*, the primary determinants of potentially suitable habitat).

< Suitable hydrology, soils and vegetation are necessary to provide the critical wintering sites (soft muck, peat, burrows, root systems of woody vegetation) and nesting habitats (open

areas with tussocky or hummocky vegetation) for this species. It is very important to note, however, that one or more of these criteria may be absent from portions of a wetland or wetland complex supporting bog turtles. Absence of one or more criteria does not preclude bog turtle use of these areas to meet important life functions, including foraging, shelter and dispersal.

< If these criteria (suitable soils, vegetation and hydrology) are present in the *wetland*, then the *wetland* is considered to be potential bog turtle habitat, regardless of whether or not that portion of the wetland occurring within the project boundaries contains all three criteria. If the *wetland* is determined to be potential habitat and the project will directly or indirectly impact *any portion* of the wetland (see *Bog Turtle Conservation Zones*), then either:

  < Completely avoid all direct and indirect effects to the wetland, in consultation with the Service and appropriate State wildlife agency, OR

  < Conduct a Phase 2 survey to determine the presence of bog turtles.

< The Service and appropriate State wildlife agency (see list) should be sent a copy of survey results for review and comment including: a USGS topographic map indicating location of site; project design map, including location of wetlands and stream and delineation of wetland type (PEM, PSS, PFO, POW) and "designated survey areas"[3]; color photographs of the site; surveyor's name; date of visit; opinion on potential/not potential habitat; a description of the hydrology, soils, and vegetation. A phase 1 report template and field form are available from the States and Service.

BOG TURTLE SURVEY (= Phase 2 survey)

If the wetland(s) are identified as potential bog turtle habitat (see Phase 1 survey), and direct and indirect adverse effects cannot be avoided, conduct a bog turtle survey in accordance with the specifications below. Note that this is *not* a survey to estimate population size or structure; a long-term mark/recapture study would be required for that.

Prior to conducting the survey, contact the appropriate State agency (see attached list) to determine whether or not a scientific collector's permit valid for the location and period of the survey will be required.

The Phase 2 survey will focus on the areas of the wetland that meet the soils, hydrology and vegetation criteria, as defined under the Phase 1 survey guidelines. Those areas that meet the criteria are referred to as "designated survey areas" for Phase 2 and Phase 3 survey purposes.

1. Surveys should only be performed during the period from April 15-June 15. For the Lake Plain Recovery Unit (see Recovery Plan), surveys should only be performed during the period from May 1 to June 30. This coincides with the period of greatest annual turtle activity (spring emergence and breeding) and before vegetation gets too dense to accurately survey. While turtles may be found outside of these dates, a result of no turtles would be

[3] "Designated survey areas" are those areas of the wetland that meet the soils, hydrology and vegetation criteria for potential bog turtle habitat. These areas may occur within the emergent, scrub-shrub or forested parts of the wetland.

considered inconclusive. Surveys beyond June also have a higher likelihood of disruption or destruction of nests or newly hatched young.

2. Ambient air temperature at the surface in the shade should be ≥ 55° F.

3. Surveys should be done during the day, at least one hour after sunrise and no later than one hour before sunset.

4. Surveys may be done when it is sunny or cloudy. In addition, surveys may be conducted during and after light rain, provided air temperatures are ≥ 65° F.

5. At least one surveyor must be a recognized qualified bog turtle surveyor[4], and the others should have some previous experience successfully conducting bog turtle surveys or herpetological surveys in wetlands. To maintain survey effort consistency and increase the probability of encountering turtles, the same surveyors should be used for each wetland.

6. A minimum of four (4) surveys per wetland site are needed to adequately assess the site for presence of bog turtles. At least two of these surveys must be performed in May. From April 15 to April 30, surveys should be separated by six or more days. From May 1 to June 15, surveys should be separated by three or more days. The shorter period between surveys during May and June is needed to ensure that surveys are carried out during the optimum window of time (*i.e.*, before wetland vegetation becomes too thick).

   Note that bog turtles are more likely to be encountered by spreading the surveys out over a longer period. For example, erroneous survey results could be obtained if surveys were conducted on four successive days in late April due to possible late spring emergence, or during periods of extreme weather because turtles may be buried in mud and difficult to find.

   Because this is solely a presence/absence survey, survey efforts at a particular wetland may cease once a bog turtle has been found.

7. Survey time should be at least four (4) to six (6) person-hours per acre of designated survey area per visit. Additional survey time may be warranted in wetlands that are difficult to survey or that have high quality potential habitat. The designated survey area includes all areas of the wetland where soft, mucky-like soils are present, regardless of vegetative cover type. This includes emergent, scrub-shrub, and forested areas of the wetland.

   If the cover is too thick to effectively survey using Phase 2 survey techniques alone (*e.g.*, dominated by multiflora rose, reed canary grass, *Phragmites*), contact the Service and State wildlife agency for guidance on Phase 3 survey techniques (trapping) to supplement the Phase 2 effort. In addition, Phase 3 (trapping) surveys may also be warranted if the site is in

[4] Searching for bog turtles and recognizing their habitat is a skill that can take many months or years of field work to develop. This level of expertise is necessary when conducting searches in order to ensure that surveys are effective and turtles are not harmed during the survey (*e.g.*, by stepping on nests). Many individuals that have been recognized as qualified to conduct bog turtle surveys obtained their experience through graduate degree research or employment by a state wildlife agency. Others have spent many years actively surveying for bog turtles as amateur herpetologists or consultants.

the Lake Plain-Prairie Peninsula Recovery Unit. Check with the Service or State wildlife agency for further guidance.

8. Walk quietly through the wetland. Bog turtles will bask on herbaceous vegetation and bare ground, or be half-buried in shallow water or rivulets. Walking noisily through the wetland will often cause the turtles to submerge before they can be observed. Be sure to search areas where turtles may not be visible, including under mats of dead vegetation, shallow pools, underground springs, open mud areas, vole runways and under tussocks. Do not step on the tops of tussocks or hummocks because turtle nests, eggs and nesting microhabitat may be destroyed. Both random opportunistic searching and transect surveys should be used at each wetland.

   The following survey sequence is recommended to optimize detection of bog turtles:

   - Semi-rapid walk through the designated survey area using visual encounter techniques.
   - If no bog turtles are found during visual survey, while walking through site identify highest quality habitat patches. Within these highest quality patches, begin looking under live and dead vegetation using muddling and probing techniques.
   - If still no bog turtles are found, the rest of the designated survey area should be surveyed using visual encounter surveys, muddling and probing techniques.

9. Photo-documentation of each bog turtle located will be required; a macro lens is highly recommended. The photos should be in color and of sufficient detail and clarity to identify the bog turtle to species and individual. Therefore, photographs of the carapace, plastron, and face/neck markings should be taken of each individual turtle. Do not harass the turtle in an attempt to get photos of the face/neck markings; if gently placed on the ground, most turtles will slowly extend their necks if not harassed. If shell notching is conducted, do the photo-documentation after the notching is done.

10. The following information should be collected for each bog turtle: sex, carapace length-straight line and maximum length, carapace width, weight, and details about scars/injuries. Maximum plastron length information should also be collected to differentiate juveniles from adults as well as to obtain additional information on recruitment, growth, and demography.

11. Each bog turtle should be marked (*e.g.*, notched, PIT tagged) in a manner consistent with the requirements of the appropriate State agency and/or Service. Contact the appropriate State wildlife agency prior to conducting the survey to determine what type of marking system, if any, should be used.

12. All bog turtles must be returned to the point of capture as soon as possible on the same day as capture. They should only be held long enough to identify, measure, weigh, and photograph them, during which time their exposure to high temperatures must be avoided. No bog turtles may be removed from the wetland without permission from the Service and appropriate State agency.

13. The Fish and Wildlife Service and appropriate State agency should be sent a copy of survey results for review and concurrence, including the following: dates of site visits; time spent per designated survey area per wetland per visit; names of surveyors; a site map including wetlands and delineations of designated survey areas; a table indicating the size of each wetland, the designated survey area within each wetland, and the survey effort per visit; a description of the wetlands within the project area (*e.g.*, acreage, vegetation, soils, hydrology); an explanation of which wetlands or portions of wetlands were or were not surveyed, and why; survey methodology; weather per visit at beginning and end of survey (air temperature, wind, and precipitation); presence or absence of bog turtles, including number of turtles found and date, and information and measurements specified in item 10 above; and other reptile and amphibian species found and date.

ADDITIONAL SURVEYS / STUDIES

Proper implementation of the Phase 2 survey protocol is usually adequate to determine species presence or probable absence, especially in small wetlands lacking invasive plant species. Additional surveys, however, may be necessary to determine whether or not bog turtles are using a particular wetland, especially if the Phase 2 survey results are negative but the quality and quantity of habitat are good and in a watershed of known occurrence. In this case, additional surveys (Phase 2 and/or Phase 3 (trapping) surveys), possibly extending into the following field season, may be recommended by the Service or appropriate State agency.

If bog turtles are documented to occur at a site, additional surveys/studies may be necessary to characterize the population (*e.g.*, number, density, population structure, recruitment), identify nesting and hibernating areas, and/or identify and assess adverse impacts to the species and its habitat, particularly if project activities are proposed to occur in, or within 300 feet of, wetlands occupied by the species.

Attachment 1

CONTACT AGENCIES - BY STATE

(April 2006)

STATE	FISH AND WILDLIFE SERVICE	STATE AGENCY
Connecticut	U.S. Fish and Wildlife Service New England Field Office 22 Bridge Street, Unit #1 Concord, NH 03301	Department of Environmental Protection Env. & Geographic Information Center 79 Elm Street, Store Floor, Hartford, CT 06106 *(info about presence of bog turtles in or near a project area)* Department of Environmental Protection Wildlife Division, Sixth Floor 79 Elm Street, Store Floor, Hartford, CT 06106 *(to get a Scientific Collectors Permit or determine what type of marking system to use)*
Delaware	U.S. Fish and Wildlife Service Chesapeake Bay Field Office 177 Admiral Cochrane Drive Annapolis, MD 21401	Nongame & Endangered Species Program Delaware Division of Fish and Wildlife 4876 Hay Point Landing Road Smyrna, DE 19977
Maryland	U.S. Fish and Wildlife Service Chesapeake Bay Field Office 177 Admiral Cochrane Drive Annapolis, MD 21401	Maryland Department of Natural Resources Wildlife & Heritage Division PO Box 68, Main Street Wye Mills, MD 21679
Massachusetts	U.S. Fish and Wildlife Service New England Field Office 22 Bridge Street, Unit #1 Concord, NH 03301	Division of Fisheries and Wildlife Dept. Fisheries, Wildlife and Env Law Enforcement Rt. 135 Westboro, MA 01581
New Jersey	U.S. Fish and Wildlife Service New Jersey Field Office 927 North Main Street, Bldg. D-1 Pleasantville, NJ 08232	New Jersey Division of Fish and Wildlife Endangered and Nongame Species Program 143 Van Syckels Road Hampton, NJ 08827
New York	U.S. Fish and Wildlife Service 3817 Luker Road Cortland, NY 13045	New York Natural Heritage Program 625 Broadway, 5th Floor Albany, NY 12233-4757 Phone: (518) 402-8935 *(info about presence of bog turtles in or near a project area)* NYS Department of Environmental Conservation Division of Fish, Wildlife, and Marine Resources Special Licenses Unit 600 Broadway, 5th Floor Albany, NY 12233-4752 *(for endangered species permit applications)*
Pennsylvania	U.S. Fish and Wildlife Service Pennsylvania Field Office 315 South Allen Street, Suite 322 State College, PA 16801	Natural Diversity Section Pennsylvania Fish and Boat Commission 450 Robinson Lane Bellefonte, PA 16823

Attachment 2

BOG TURTLE COUNTIES OF OCCURRENCE OR LIKELY OCCURRENCE[1]
(April 2006)

STATE	COUNTY	
Connecticut	Fairfield	Litchfield
Delaware	New Castle	
Maryland	Baltimore Carroll	Cecil Harford
Massachusetts	Berkshire	
New Jersey	Burlington Gloucester Hunterdon Middlesex Monmouth Morris	Ocean Salem Somerset Sussex Union Warren
New York	Albany Columbia Dutchess Genesee Orange Oswego Putnam	Seneca Sullivan Ulster Wayne Westchester
Pennsylvania	Adams Berks Bucks Chester Cumberland Delaware Franklin	Lancaster Lebanon Lehigh Monroe Montgomery Northampton Schuylkill York

[1] *This list is valid for one year from the date indicated. It may, however, be revised more frequently if new counties of occurrence are documented. Updates to this list are available from the Service upon request.*

Adaptive Management Practices for Conserving Migratory Birds

The Fish and Wildlife Service is the principal Federal agency charged with protecting and enhancing populations and habitat of migratory bird species. The Migratory Bird Treaty Act (MBTA, 16 U.S.C. 703-712; Ch. 128; July 13, 1918; 40 Stat. 755, as amended) prohibits the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, and nests, except when specifically authorized by the Department of the Interior. While the MBTA has no provision for authorizing incidental take, the Service recognizes that some birds may be killed even if all reasonable measures to avoid take are implemented. Unless the take is authorized, it is not possible to absolve individuals, companies or agencies from liability (even if they implement avian mortality avoidance or similar conservation measures). However, the Office of Law Enforcement focuses on those individuals, companies, or agencies that take migratory birds with disregard for their actions and the law.

The potential exists for avian mortality from habitat destruction and alteration within the project boundaries. Site-specific factors that should be considered in project siting to avoid and minimize the risk to birds include avian abundance; the quality, quantity and type of habitat; geographic location; type and extent of bird use (*e.g.* breeding, foraging, migrating, etc.); and landscape features.

We offer the following recommendations to avoid and minimize impacts to migratory birds within and around the project area:

1. Where disturbance is necessary, clear natural or semi-natural habitats (*e.g.*, forests, woodlots, reverting fields, shrubby areas) and perform maintenance activities (*e.g.*, mowing) between September 1 and March 31, which is outside the nesting season for most native bird species. Without undertaking specific analysis of breeding species and their respective nesting seasons on the project site, implementation of this seasonal restriction will avoid take of most breeding birds, their nests, and their young (*i.e.*, eggs, hatchlings, fledglings).

2. Minimize land and vegetation disturbance during project design and construction. To reduce habitat fragmentation, co-locate roads, fences, lay down areas, staging areas, and other infrastructure in or immediately adjacent to already-disturbed areas (*e.g.*, existing roads, pipelines, agricultural fields) and cluster development features (*e.g.*, buildings, roads) as opposed to distributing them throughout land parcels. Where this is not possible, minimize roads, fences, and other infrastructure.

3. Avoid permanent habitat alterations in areas where birds are highly concentrated. Examples of high concentration areas for birds are wetlands, State or Federal refuges, Audubon Important Bird Areas, private duck clubs, staging areas, rookeries, leks, roosts, and riparian areas. Avoid establishing sizable structures along known bird migration pathways or known daily movement flyways (*e.g.*, between roosting and feeding areas).

4. To conserve area-sensitive species, avoid fragmenting large, contiguous tracts of wildlife habitat, especially if habitat cannot be fully restored after construction. Maintain

contiguous habitat corridors to facilitate wildlife dispersal. Where practicable, concentrate construction activities, infrastructure, and man-made structures (*e.g.*, buildings, cell towers, roads, parking lots) on lands already altered or cultivated, and away from areas of intact and healthy native habitats. If not feasible, select fragmented or degraded habitats over relatively intact areas.

5. Develop a habitat restoration plan for the proposed site that avoids or minimizes negative impacts birds and that creates functional habitat for a variety of bird species. Use only plant species that are native to the local area for revegetation of the project area.

If you have any questions regarding these measures, please contact Jennifer Siani of the Pennsylvania Field Office located in State College, PA at 814-234-4090 ext 225 or Jennifer_Siani@fws.gov

Division of Environmental
Planning and Habitat
Protection
717-783-5957

COMMONWEALTH OF PENNSYLVANIA
Pennsylvania Game Commission

2001 ELMERTON AVENUE
HARRISBURG, PA 17110-9797

"To manage all wild birds, mammals and their habitats for current and future generations."

ADMINISTRATIVE BUREAUS:

ADMINISTRATION.....717-787-5670
HUMAN RESOURCES.....717-787-7836
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CONTRACTS AND PROCUREMENT.....717-787-6594
LICENSING.....717-787-2084
OFFICE SERVICES.....717-787-2116
WILDLIFE MANAGEMENT.....717-787-5529
INFORMATION & EDUCATION.....717-787-6286
WILDLIFE PROTECTION.....717-783-6526
WILDLIFE HABITAT MANAGEMENT.....717-787-6818
REAL ESTATE DIVISION.....717-787-6568
AUTOMATED TECHNOLOGY SERVICES.....717-787-4076

www.pgc.state.pa.us

April 23, 2013 PNDI Number: 20130327397134

Mr. Christopher Salvatico
AECOM
1700 Market Street, Suite 1600
Philadelphia, PA 19103

PNDI Number: 20130327397134
Re: SR 80, Section 17M – Interstate 80 Reconstruction
Stroud, East Stroudsburg, and Stroudsburg Borough/Townships, Monroe County, PA

Dear Mr. Salvatico,

Thank you for submitting the Pennsylvania Natural Diversity Inventory (PNDI) Environmental Review Receipt Number 20130327397134 for review. The Pennsylvania Game Commission (PGC) screened this project for potential impacts to species and resources of concern under PGC responsibility, which includes birds and mammals only.

Potential Impact Anticipated

PNDI records indicate species or resources of concern are located in the vicinity of the project. The PGC has received and thoroughly reviewed the information that you provided to this office, as well as PNDI data, and has determined that there are no known occurrences of state listed **threatened or endangered** bird or mammal species associated with your project. However, potential impacts to **species of special concern** may be associated with your project, and as a result, additional measures are recommended to avoid potential impacts to the species listed below.

Conservation Measure

The following is a mammal species of special concern, and therefore, are not a target species for a survey:

Scientific Name	Common Name
Myotis septentrionalis	Northern Long-eared Bat

However, because of their ecological significance, the following seasonal timber restriction is suggested to avoid potential impacts to roosting and foraging northern long-eared bats: *All trees or dead snags greater than 5 inches in diameter at breast height that need to be harvested to*

facilitate the project (including any access roads or off - R.O.W. work spaces) shall be cut between November 1 and March 31.

This response represents the most up-to-date summary of the PNDI data files and is valid for two (2) years from the date of this letter. An absence of recorded information does not necessarily imply actual conditions on site. Should project plans change or additional information on listed or proposed species become available, this determination may be reconsidered.

Should the proposed work continue beyond the period covered by this letter, please resubmit the project to this agency as an "Update" (including an updated PNDI receipt, project narrative and accurate map). If the proposed work has not changed and no additional information concerning listed species is found, the project will be cleared for PNDI requirements under this agency for two additional years.

This finding applies to impacts to birds and mammals only. To complete your review of state and federally-listed threatened and endangered species and species of special concern, please be sure that the U.S. Fish and Wildlife Service, the PA Department of Conservation and Natural Resources, and/or the PA Fish and Boat Commission have been contacted regarding this project as directed by the online PNDI ER Tool found at www.naturalheritage.state.pa.us.

Sincerely,

Tracey Librandi Mumma

Tracey Librandi Mumma
Division of Environmental Planning & Habitat Protection
Bureau of Wildlife Habitat Management
Phone: 717-787-4250, Extension 3614
Fax: 717-787-6957
E-mail:tlibrandi@pa.gov

A PNHP Partner

Pennsylvania Natural Heritage Program

TLM/tlm

Pennsylvania Fish & Boat Commission

established 1866

Division of Environmental Services
450 Robinson Lane
Bellefonte, PA 16823-9620

May 7, 2013

IN REPLY REFER TO
SIR # 40692

AECOM
ATTN: CHRISTOPHER SALVATICO
1700 MARKET STREET, SUITE 1600
PHILADELPHIA, PA 19103

RE: Species Impact Review (SIR) - Rare, Candidate, Threatened and Endangered Species
PNDI Search Number (if available): 20130327397134
SR 0080, SECTION 17M - INTERSTATE 80 RECONSTRUCTION PROJECT
STROUDSBURG, EAST STROUDSBURG, STROUD Townships, MONROE County, Pennsylvania

This responds to your inquiry about a Pennsylvania Natural Diversity Inventory (PNDI) Internet Database search "potential conflict" or a threatened and endangered species impact review. These projects are screened for potential conflicts with rare, candidate, threatened or endangered species under Pennsylvania Fish & Boat Commission jurisdiction (fish, reptiles, amphibians, aquatic invertebrates only) using the Pennsylvania Natural Diversity Inventory (PNDI) database and our own files. These species of special concern are listed under the Endangered Species Act of 1973, the Wild Resource Conservation Act, and the Pennsylvania Fish & Boat Code (Chapter 75), or the Wildlife Code.

__X__ ***NO ADVERSE IMPACTS EXPECTED FROM THE PROPOSED PROJECT***

____ Except for occasional transient species, rare, candidate, threatened or endangered species under our jurisdiction are not known to exist in the vicinity of the project area. Therefore, no biological assessment or further consultation regarding rare species is needed with the Commission. Should project plans change, or if additional information on listed or proposed species becomes available, this determination may be reconsidered.

__X__ An element occurrence of a rare, candidate, threatened, or endangered species under our jurisdiction is known from the vicinity of the proposed project. However, given the nature of the proposed project, the immediate location, or the current status of the nearby element occurrence(s), no adverse impacts are expected to the species of special concern.

This response represents the most up-to-date summary of the PNDI data and our files and is valid for two (2) years from the date of this letter. An absence of recorded species information does not necessarily imply species absence. Our data files and the PNDI system are continuously being updated with species occurrence information. Should project plans change or additional information on listed or proposed species become available, this determination may be reconsidered, and consultation shall be re-initiated.

If you have any questions regarding this review, please contact the biologist indicated below:

__X__	Jordan Allison	814-359-5236	____	Kathy Gipe	814-359-5186	____	Bill Savage 814-359-5145
____	Nevin Welte	412-586-2334	____	Bob Morgan	814-359-5129	____	Dave Spotts 814-359-5115

Thank you in advance for your cooperation and attention to this important matter of species conservation and habitat protection.

SIGNATURE: Jordan Allison DATE: 5-7-13

pennsylvania
DEPARTMENT OF CONSERVATION
AND NATURAL RESOURCES

BUREAU OF FORESTRY

April 23, 2013 **PNDI Number: 20130327397134**

Christopher Salvatico
AECOM, Inc.
1700 Market Street, Suite 1600
Philadelphia, PA 19103
Email: christopher.salvatico@aecom.com (Hard copy not to follow)

Re: Interstate 80 (widening and improvement project)
Borough of Stroudsburg, East Stroudsburg Township, Stroud Township, Monroe County, PA

Dear Mr. Salvatico,

Thank you for the submission of the Pennsylvania Natural Diversity Inventory (PNDI) Environmental Review Receipt Number **20130327397134** for review. PA Department of Conservation and Natural Resources screened this project for potential impacts to species and resources of concern under DCNR's responsibility, which includes plants, terrestrial invertebrates, natural communities, and geologic features only.

No Impact Anticipated

PNDI records indicate species or resources under DCNR's jurisdiction are located in the vicinity of the project. However, based on the information you submitted concerning the nature of the project, the immediate location, and our detailed resource information, DCNR has determined that no impact is likely. No further coordination with our agency is needed for this project. As a voluntary measure, please clean all construction equipment before it is brought on site; this will remove invasive plant seeds from the equipment that has been picked up from other sites and will help control invasive plant spread into adjacent riparian and woodland habitats. As a voluntary measure, if revegetating an area, please use seed mixtures that do not contain invasive species, including crown vetch.

Conservation Measure—Voluntary Action

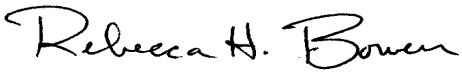
The following species of concern is known to occur in the area and potential habitat exists in the area; however, this species is not listed in PA: A conservation measure is suggested to be mindful of the potential presence of the following species that may utilize the following habitats:

- *Lethe eurydice* (eyed brown)–habitat is open sedge meadows, freshwater meadows, slow-moving streams, and cord-grass swales-for more information, please see http://www.natureserve.org/explorer/servlet/NatureServe?searchName=Satyrodes+eurydice

This response represents the most up-to-date review of the PNDI data files and is valid for **two years** only. If project plans change or more information on listed or proposed species becomes available, our determination may be reconsidered. For PNDI project updates, please see the PNHP website at www.naturalheritage.state.pa.us for guidance. As a reminder, this finding applies to potential impacts under DCNR's jurisdiction only. Visit the PNHP website for directions on contacting the Commonwealth's other resource agencies for environmental review. Should you have any questions or concerns, please don't hesitate to contact me at 717.705.2819 or c-frsechle@pa.gov.

Sincerely,

Frederick C. Sechler, Jr, Ecological Information Specialist
Pennsylvania Natural Heritage Program
Bureau of Forestry, Ecological Services Section



Rebecca H. Bowen, Section Chief
Pennsylvania Natural Heritage Program
Bureau of Forestry, Ecological Services Section

CONCEPTUAL PHASE I COST ESTIMATE

Pennsylvania Department of Transportation, District 5-0
Agreement No. E02656, Monroe County
I-80 Reconstruction

ALTERNATIVE NAME: Alternative A

APPROX. QUANTITY	UNIT	ITEM DESCRIPTION	UNIT PRICE	TOTAL ITEM COST	NOTES
		ROADWAY			
340999	CY	CLASS 1 EXCAVATION	$7.00	$2,386,993	
340999	CY	COMMON BORROW EXCAVATION	$6.00	$2,045,994	
855302	CY	FOREIGN BORROW EXCAVATION	$8.00	$6,842,416	
228143	SY	FULL DEPTH PAVEMENT CONSTRUCTION - SR 80	$74.00	$16,882,582	
152642	SY	FULL DEPTH PAVEMENT CONSTRUCTION - RAMPS	$74.00	$11,295,508	
71779	SY	FULL DEPTH PAVEMENT CONSTRUCTION - SIDE ROADS	$74.00	$5,311,646	
31679	GAL	BITUMINOUS TACK COAT - SR 80, RAMPS, & SIDE ROAD	$1.50	$47,519	
77883	LF	GUIDE RAIL	$10.00	$778,833	
21190	LF	CONCRETE GLARE SCREEN	$50.00	$1,059,490	
		ROADWAY SUBTOTAL		**$46,651,000**	
		STRUCTURES			
1	EA	BRIDGES AND RETAINING WALLS		$253,569,550	
		STRUCTURES SUBTOTAL		**$253,569,550**	
		CONCEPTUAL QUANTITY SUBTOTAL		***$300,220,550***	
		OTHER			
		DRAINAGE	5%	$2,332,550	% of Roadway
		IMPACT ATTENUATORS	1%	$466,510	% of Roadway
		MAINTENANCE AND PROTECTION OF TRAFFIC	10%	$4,665,100	% of Roadway
		EROSION AND SEDIMENT CONTROL	2%	$933,020	% of Roadway
		STORM WATER MANAGEMENT	2%	$933,020	% of Roadway
		PAVEMENT MARKINGS, SIGNS AND DELINEATORS	5%	$2,332,550	% of Roadway
		HIGHWAY LIGHTING	0%	$0	% of Roadway
		TRAFFIC SIGNALS	5%	$2,332,550	% of Roadway
		OTHER SUBTOTAL		**$314,215,850**	
		INFLATION (12 YEARS (2025) @3%)	1.426	$447,996,669	
		CONSTRUCTION SERVICES (CE&I)	10%	$44,799,667	
		CONSTRUCTION CONSULTATION	2%	$8,959,933	
		CONTINGENCY	15%	$67,199,500	
		CONSTRUCTION TOTAL		**$568,956,000**	

		RIGHT-OF-WAY TOTAL	20%	**$9,331,000**	% of Pavement
		UTILITIES TOTAL	2%	**$934,000**	% of Pavement
		DESIGN TOTAL	10%	**$56,896,000**	% of Construction

NOTE: Transportation Management Plan (MPT/ITS) includes the following:

Maintenance and Protection of Traffic
Other corridor signal enhancements
ITS relocations/system expansion
ITS for use during construction as part of TMP

CONCEPTUAL PHASE I COST ESTIMATE

Pennsylvania Department of Transportation, District 5-0
Agreement No. E02656, Monroe County
I-80 Reconstruction

ALTERNATIVE NAME: Alternative B

APPROX. QUANTITY	UNIT	ITEM DESCRIPTION	UNIT PRICE	TOTAL ITEM COST	NOTES
		ROADWAY			
372300	CY	CLASS 1 EXCAVATION	$7.00	$2,606,100	
372300	CY	COMMON BORROW EXCAVATION	$6.00	$2,233,800	
860965	CY	FOREIGN BORROW EXCAVATION	$8.00	$6,887,720	
219346	SY	FULL DEPTH PAVEMENT CONSTRUCTION - SR 80	$74.00	$16,231,604	
150333	SY	FULL DEPTH PAVEMENT CONSTRUCTION - RAMPS	$74.00	$11,124,642	
65395	SY	FULL DEPTH PAVEMENT CONSTRUCTION - SIDE ROADS	$74.00	$4,839,230	
30455	GAL	BITUMINOUS TACK COAT - SR 80, RAMPS, & SIDE ROAD	$1.50	$45,683	
67472	LF	GUIDE RAIL	$10.00	$674,718	
19664	LF	CONCRETE GLARE SCREEN	$50.00	$983,196	
		ROADWAY SUBTOTAL		**$45,627,000**	
		STRUCTURES			
1	EA	BRIDGES AND RETAINING WALLS		$263,752,250	
		STRUCTURES SUBTOTAL		**$263,752,250**	
		CONCEPTUAL QUANTITY SUBTOTAL		***$309,379,250***	
		OTHER			
		DRAINAGE	5%	$2,281,350	% of Pavement
		IMPACT ATTENUATORS	1%	$456,270	% of Pavement
		MAINTENANCE AND PROTECTION OF TRAFFIC	10%	$4,562,700	% of Pavement
		EROSION AND SEDIMENT CONTROL	2%	$912,540	% of Pavement
		STORM WATER MANAGEMENT	2%	$912,540	% of Pavement
		PAVEMENT MARKINGS, SIGNS AND DELINEATORS	5%	$2,281,350	% of Pavement
		HIGHWAY LIGHTING	0%	$0	% of Pavement
		TRAFFIC SIGNALS	5%	$2,281,350	% of Pavement
		OTHER SUBTOTAL		**$323,067,350**	
		INFLATION (12 YEARS (2025) @3%)	1.426	460,616,791	
		CONSTRUCTION SERVICES (CE&I)	10%	46,061,679	
		CONSTRUCTION CONSULTATION	2%	9,212,336	
		CONTINGENCY	15%	69,092,519	
		CONSTRUCTION TOTAL		**$584,984,000**	
		RIGHT-OF-WAY TOTAL	20%	**$9,126,000**	% of Pavement
		UTILITIES TOTAL	2%	**$913,000**	% of Pavement
		DESIGN TOTAL	10%	**$58,499,000**	% of Construction

NOTE: Transportation Management Plan (MPT/ITS) includes the following:

Maintenance and Protection of Traffic
Other corridor signal enhancements
ITS relocations/system expansion
ITS for use during construction as part of TMP

CONCEPTUAL PHASE I COST ESTIMATE

Pennsylvania Department of Transportation, District 5-0
Agreement No. E02656, Monroe County
I-80 Reconstruction

ALTERNATIVE NAME: Alternative C

APPROX. QUANTITY	UNIT	ITEM DESCRIPTION	UNIT PRICE	TOTAL ITEM COST	NOTES
		ROADWAY			
329614	CY	CLASS 1 EXCAVATION	$7.00	$2,307,298	
329614	CY	COMMON BORROW EXCAVATION	$6.00	$1,977,684	
719382	CY	FOREIGN BORROW EXCAVATION	$8.00	$5,755,056	
239083	SY	FULL DEPTH PAVEMENT CONSTRUCTION - SR 80	$74.00	$17,692,142	
170988	SY	FULL DEPTH PAVEMENT CONSTRUCTION - RAMPS	$74.00	$12,653,112	
68624	SY	FULL DEPTH PAVEMENT CONSTRUCTION - SIDE ROADS	$74.00	$5,078,176	
33509	GAL	BITUMINOUS TACK COAT - SR 80, RAMPS, & SIDE ROADS	$1.50	$50,264	
75281	LF	GUIDE RAIL	$10.00	$752,805	
21190	LF	CONCRETE GLARE SCREEN	$50.00	$1,059,490	
		ROADWAY SUBTOTAL		**$47,327,000**	
		STRUCTURES			
1	EA	BRIDGES AND RETAINING WALLS		$259,155,050	
		STRUCTURES SUBTOTAL		**$259,155,050**	
		CONCEPTUAL QUANTITY SUBTOTAL		***$306,482,050***	
		OTHER			
		DRAINAGE	5%	$2,366,350	% of Pavement
		IMPACT ATTENUATORS	1%	$473,270	% of Pavement
		MAINTENANCE AND PROTECTION OF TRAFFIC	10%	$4,732,700	% of Pavement
		EROSION AND SEDIMENT CONTROL	2%	$946,540	% of Pavement
		STORM WATER MANAGEMENT	2%	$946,540	% of Pavement
		PAVEMENT MARKINGS, SIGNS AND DELINEATORS	5%	$2,366,350	% of Pavement
		HIGHWAY LIGHTING	0%	$0	% of Pavement
		TRAFFIC SIGNALS	5%	$2,366,350	% of Pavement
		OTHER SUBTOTAL		**$320,680,150**	
		INFLATION (12 YEARS (2025) @3%)	1.426	457,213,215	
		CONSTRUCTION SERVICES (CE&I)	10%	45,721,322	
		CONSTRUCTION CONSULTATION	2%	9,144,264	
		CONTINGENCY	15%	68,581,982	
		CONSTRUCTION TOTAL		**$580,661,000**	

		RIGHT-OF-WAY TOTAL	20%	**$9,466,000**	% of Pavement
		UTILITIES TOTAL	2%	**$947,000**	% of Pavement
		DESIGN TOTAL	10%	**$58,067,000**	% of Construction

NOTE: Transportation Management Plan (MPT/ITS) includes the following:

Maintenance and Protection of Traffic
Other corridor signal enhancements
ITS relocations/system expansion
ITS for use during construction as part of TMP

CONCEPTUAL PHASE I COST ESTIMATE

Pennsylvania Department of Transportation, District 5-0
Agreement No. E02656, Monroe County
I-80 Reconstruction

ALTERNATIVE NAME: Alternative F

APPROX. QUANTITY	UNIT	ITEM DESCRIPTION	UNIT PRICE	TOTAL ITEM COST	NOTES
		ROADWAY			
1033818	CY	CLASS 1 EXCAVATION	$7.00	$7,236,726	
1033818	CY	COMMON BORROW EXCAVATION	$6.00	$6,202,908	
91461	CY	FOREIGN BORROW EXCAVATION	$8.00	$731,688	
244351	SY	FULL DEPTH PAVEMENT CONSTRUCTION - SR 80	$74.00	$18,081,974	
206132	SY	FULL DEPTH PAVEMENT CONSTRUCTION - RAMPS	$74.00	$15,253,768	
66625	SY	FULL DEPTH PAVEMENT CONSTRUCTION - SIDE ROADS	$74.00	$4,930,250	
36198	GAL	BITUMINOUS TACK COAT - SR 80, RAMPS, & SIDE ROADS	$1.50	$54,297	
82323	LF	GUIDE RAIL	$10.00	$823,233	
23730	LF	CONCRETE GLARE SCREEN	$50.00	$1,186,483	
		ROADWAY SUBTOTAL		**$54,502,000**	
		STRUCTURES			
1	EA	BRIDGES AND RETAINING WALLS		$228,898,500	
		STRUCTURES SUBTOTAL		**$228,898,500**	
		CONCEPTUAL QUANTITY SUBTOTAL		***$283,400,500***	
		OTHER			
		DRAINAGE	5%	$2,725,100	% of Pavement
		IMPACT ATTENUATORS	1%	$545,020	% of Pavement
		MAINTENANCE AND PROTECTION OF TRAFFIC	10%	$5,450,200	% of Pavement
		EROSION AND SEDIMENT CONTROL	2%	$1,090,040	% of Pavement
		STORM WATER MANAGEMENT	2%	$1,090,040	% of Pavement
		PAVEMENT MARKINGS, SIGNS AND DELINEATORS	5%	$2,725,100	% of Pavement
		HIGHWAY LIGHTING	0%	$0	% of Pavement
		TRAFFIC SIGNALS	5%	$2,725,100	% of Pavement
		OTHER SUBTOTAL		**$299,751,100**	
		INFLATION (12 YEARS (2025) @3%)	1.426	427,373,394	
		CONSTRUCTION SERVICES (CE&I)	10%	42,737,339	
		CONSTRUCTION CONSULTATION	2%	8,547,468	
		CONTINGENCY	15%	64,106,009	
		CONSTRUCTION TOTAL		**$542,765,000**	

		RIGHT-OF-WAY TOTAL	20%	**$10,901,000**	% of Pavement
		UTILITIES TOTAL	2%	**$1,091,000**	% of Pavement
		DESIGN TOTAL	10%	**$54,277,000**	% of Construction

NOTE: Transportation Management Plan (MPT/ITS) includes the following:

Maintenance and Protection of Traffic
Other corridor signal enhancements
ITS relocations/system expansion
ITS for use during construction as part of TMP

CONCEPTUAL PHASE I COST ESTIMATE

Pennsylvania Department of Transportation, District 5-0
Agreement No. E02656, Monroe County
I-80 Reconstruction

ALTERNATIVE NAME: Alternative G

APPROX. QUANTITY	UNIT	ITEM DESCRIPTION	UNIT PRICE	TOTAL ITEM COST	NOTES
		ROADWAY			
1033818	CY	CLASS 1 EXCAVATION	$7.00	$7,236,726	
1033818	CY	COMMON BORROW EXCAVATION	$6.00	$6,202,908	
91461	CY	FOREIGN BORROW EXCAVATION	$8.00	$731,688	
244351	SY	FULL DEPTH PAVEMENT CONSTRUCTION - SR 80	$74.00	$18,081,974	
203959	SY	FULL DEPTH PAVEMENT CONSTRUCTION - RAMPS	$74.00	$15,092,966	
62595	SY	FULL DEPTH PAVEMENT CONSTRUCTION - SIDE ROADS	$74.00	$4,632,030	
35763	GAL	BITUMINOUS TACK COAT - SR 80, RAMPS, & SIDE ROADS	$1.50	$53,645	
81361	LF	GUIDE RAIL	$10.00	$813,606	
23730	LF	CONCRETE GLARE SCREEN	$50.00	$1,186,483	
		ROADWAY SUBTOTAL		**$54,033,000**	
		STRUCTURES			
1	EA	BRIDGES AND RETAINING WALLS		$225,311,950	
		STRUCTURES SUBTOTAL		**$225,311,950**	
		CONCEPTUAL QUANTITY SUBTOTAL		***$279,344,950***	
		OTHER			
		DRAINAGE	5%	$2,701,650	% of Pavement
		IMPACT ATTENUATORS	1%	$540,330	% of Pavement
		MAINTENANCE AND PROTECTION OF TRAFFIC	10%	$5,403,300	% of Pavement
		EROSION AND SEDIMENT CONTROL	2%	$1,080,660	% of Pavement
		STORM WATER MANAGEMENT	2%	$1,080,660	% of Pavement
		PAVEMENT MARKINGS, SIGNS AND DELINEATORS	5%	$2,701,650	% of Pavement
		HIGHWAY LIGHTING	0%	$0	% of Pavement
		TRAFFIC SIGNALS	5%	$2,701,650	% of Pavement
		OTHER SUBTOTAL		**$295,554,850**	
		INFLATION (12 YEARS (2025) @3%)	1.426	421,390,545	
		CONSTRUCTION SERVICES (CE&I)	10%	42,139,055	
		CONSTRUCTION CONSULTATION	2%	8,427,811	
		CONTINGENCY	15%	63,208,582	
		CONSTRUCTION TOTAL		**$535,166,000**	

		RIGHT-OF-WAY TOTAL	20%	**$10,807,000**	% of Pavement
		UTILITIES TOTAL	2%	**$1,081,000**	% of Pavement
		DESIGN TOTAL	10%	**$53,517,000**	% of Construction

NOTE: Transportation Management Plan (MPT/ITS) includes the following:

Maintenance and Protection of Traffic
Other corridor signal enhancements
ITS relocations/system expansion
ITS for use during construction as part of TMP

I-80 Reconstruction

Bridge Cost Estimate Unit Cost ($/SF): 550

	Alternate 1A		Alternate 1B		Alternate 1C		Alternate 1F		Alternate 1G	
Bridge	SF	Cost	SF	Cost	SF	Cost	SF	Cost	SF	Cost
611 Connector/I-80	13285	$7,306,750	10463	$5,754,650	17506	$9,628,300	12920	$7,106,000	12920	$7,106,000
611 Connector/Access Rd	3452	$1,898,600	2710	$1,490,500	3452	$1,898,600	0	$0	0	$0
611/Access Rd	5420	$2,981,000	5420	$2,981,000	5420	$2,981,000	0	$0	0	$0
I-80/Bridge St & Pocono Crk*	100402	$55,221,100	105000	$57,750,000	100402	$55,221,100	86758	$47,716,900	86758	$47,716,900
Ramp G/I-80	14236	$7,829,800	18051	$9,928,050	14520	$7,986,000	47863	$26,324,650	47863	$26,324,650
Ramp F/I-80	24545	$13,499,750	23224	$12,773,200	29040	$15,972,000	0	$0	0	$0
209/Main St	7226	$3,974,300	9849	$5,416,950	16356	$8,995,800	8874	$4,880,700	8874	$4,880,700
I-80/Main St	25950	$14,272,500	33567	$18,461,850	37459	$20,602,450	24803	$13,641,650	24814	$13,647,700
I-80/Dreher Ave	9530	$5,241,500	8549	$4,701,950	8830	$4,856,500	9577	$5,267,350	9435	$5,189,250
I-80/McMichaels Creek	65200	$35,860,000	65200	$35,860,000	65200	$35,860,000	37994	$20,896,700	37994	$20,896,700
191/I-80	12008	$6,604,400	12008	$6,604,400	12008	$6,604,400	11673	$6,420,150	11673	$6,420,150
191/McMichaels Creek	10303	$5,666,650	10303	$5,666,650	10303	$5,666,650	9389	$5,163,950	9389	$5,163,950
I-80/Brodhead Creek	67115	$36,913,250	67115	$36,913,250	67115	$36,913,250	58740	$32,307,000	58740	$32,307,000
Ramp C/Main St On-Ramp	0	$0	30906	$16,998,300	0	$0	9643	$5,303,650	9643	$5,303,650
611/611 Connector	0	$0	0	$0	0	$0	8007	$4,403,850	8007	$4,403,850
611/I-80 On Ramp	0	$0	0	$0	0	$0	6390	$3,514,500	0	$0
I-80/Ramp F	0	$0	0	$0	0	$0	24397	$13,418,350	24397	$13,418,350
Ramp G/Ramp F	0	$0	0	$0	0	$0	3524	$1,938,200	3524	$1,938,200
Ramp L Viaduct	25179	$13,848,450								
Total Bridge Cost:		$211,118,050		$221,300,750		$213,186,050		$198,303,600		$194,717,050

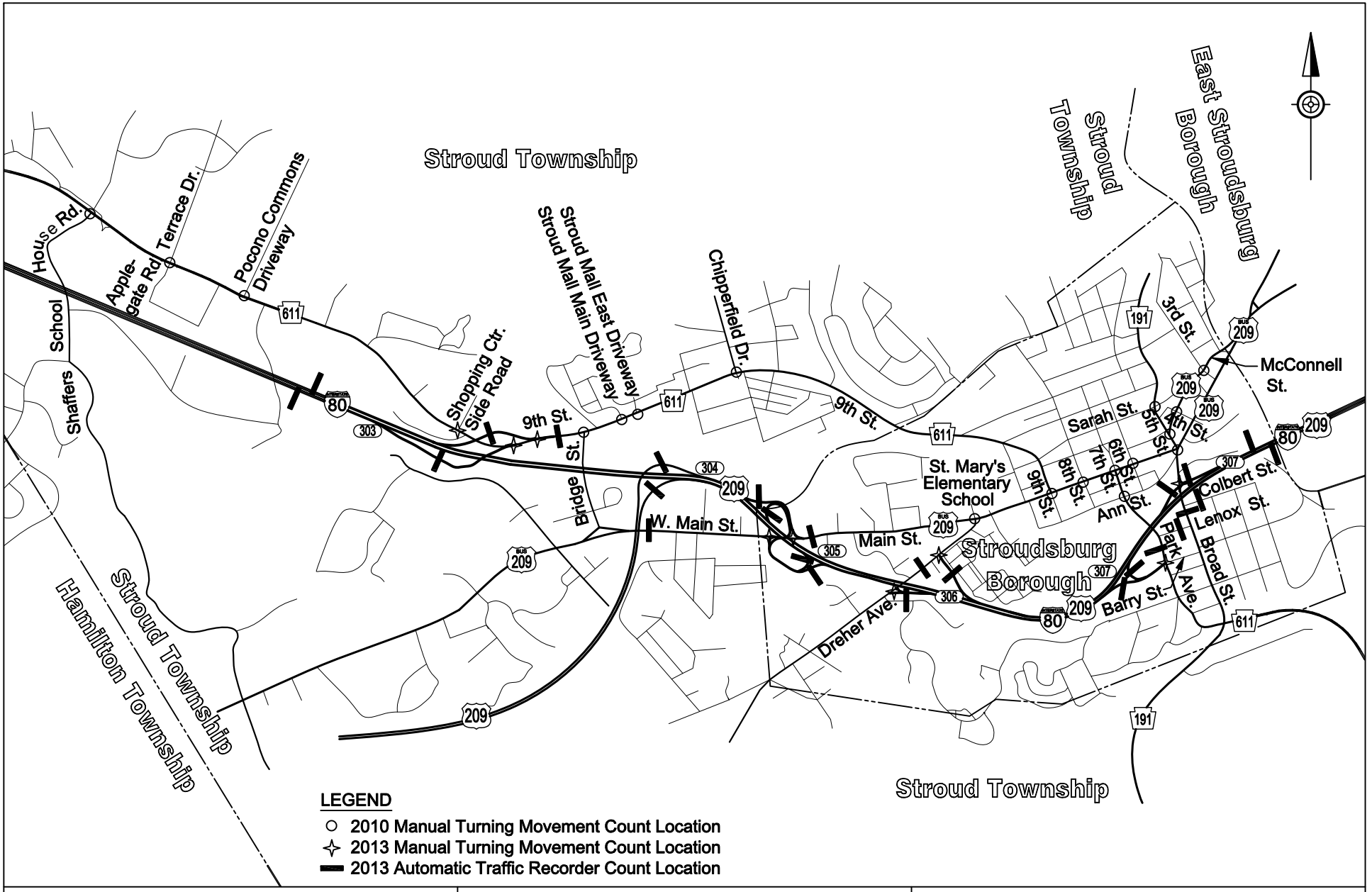
* Note: Cost represents total of three adjacent structures

Wall Height: 15 (assume 15' height throughout project)

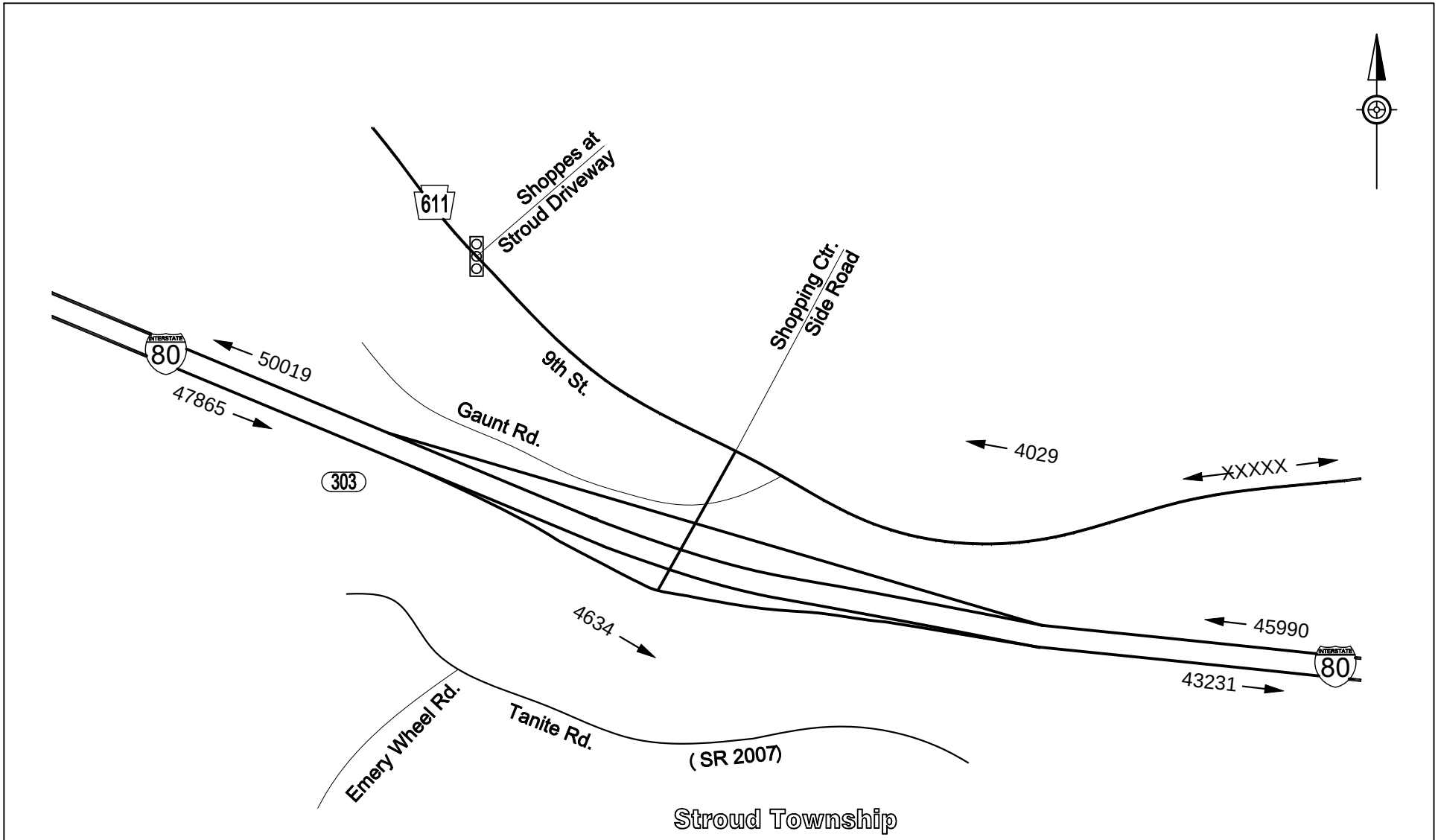
Retaining Wall Cost Estimate Unit Cost ($/SF): 140

	Alternate 1A		Alternate 1B		Alternate 1C		Alternate 1F		Alternate 1G	
Retaining Wall	LF	Cost	LF	Cost	LF	Cost	LF	Cost	LF	Cost
Western Limit to 303	2900	$6,090,000	2900	$6,090,000	2900	$6,090,000	908	$1,906,800	908	$1,906,800
303 to Bridge St	2293	$4,815,300	2293	$4,815,300	2293	$4,815,300	1220	$2,562,000	1220	$2,562,000
Bridge St to 304	2300	$4,830,000	2300	$4,830,000	2300	$4,830,000	1150	$2,415,000	1150	$2,415,000
Interchange 304 and Rt 209	4674	$9,815,400	4674	$9,815,400	6349	$13,332,900	4143	$8,700,300	4143	$8,700,300
304 to Main St	3500	$7,350,000	3500	$7,350,000	3500	$7,350,000	2600	$5,460,000	2600	$5,460,000
Main St to Dreher Ave	510	$1,071,000	510	$1,071,000	510	$1,071,000	510	$1,071,000	510	$1,071,000
Dreher Ave to McMichaels	408	$856,800	408	$856,800	408	$856,800	408	$856,800	408	$856,800
McMichaels to 191	1160	$2,436,000	1160	$2,436,000	1160	$2,436,000	1160	$2,436,000	1160	$2,436,000
191 to Brodhead	2470	$5,187,000	2470	$5,187,000	2470	$5,187,000	2470	$5,187,000	2470	$5,187,000
Total Retaining Wall Cost:		$42,451,500		$42,451,500		$45,969,000		$30,594,900		$30,594,900

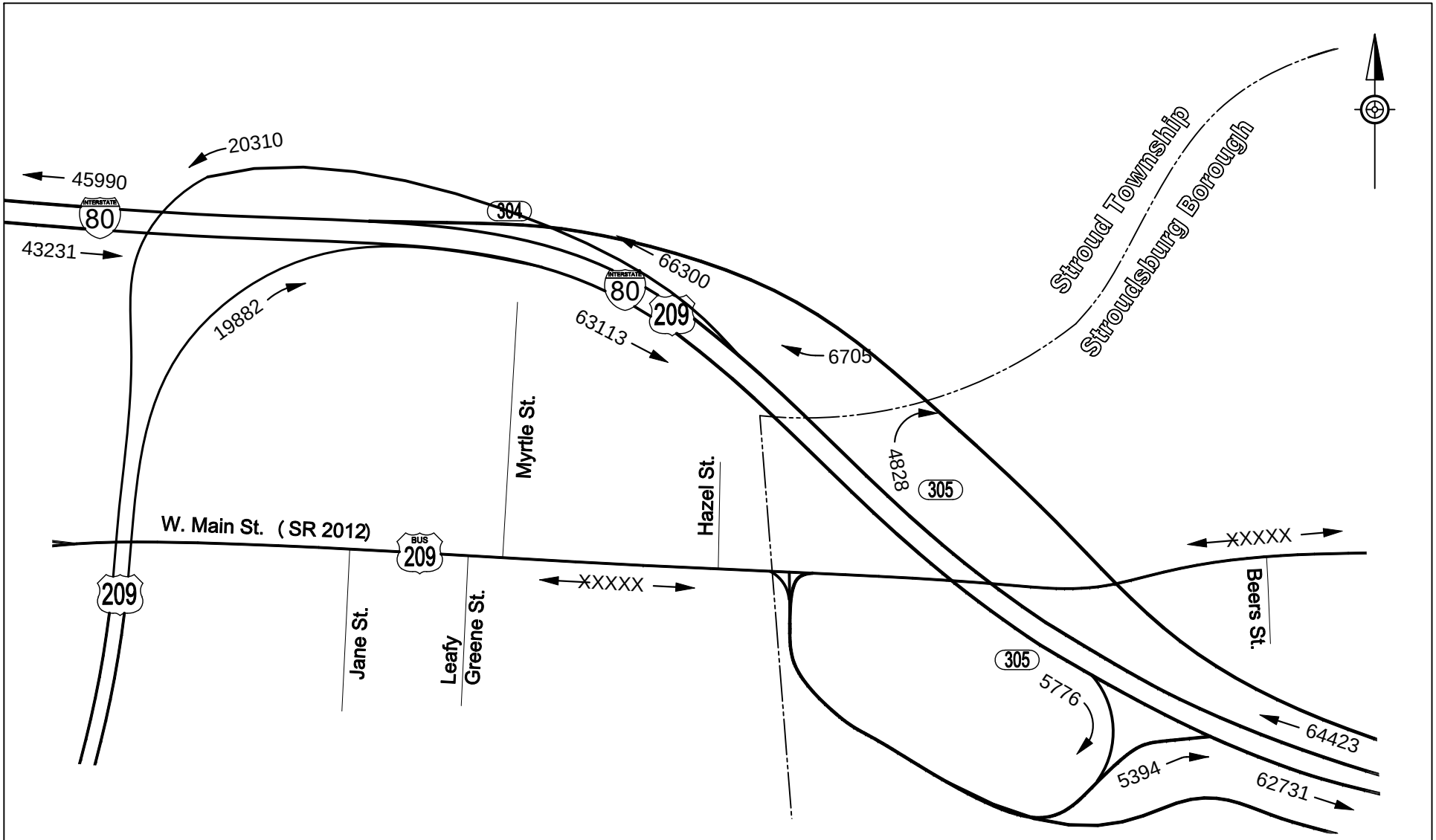
Total Cost (Bridge & Ret. Wall):	$253,569,550	$263,752,250	$259,155,050	$228,898,500	$225,311,950



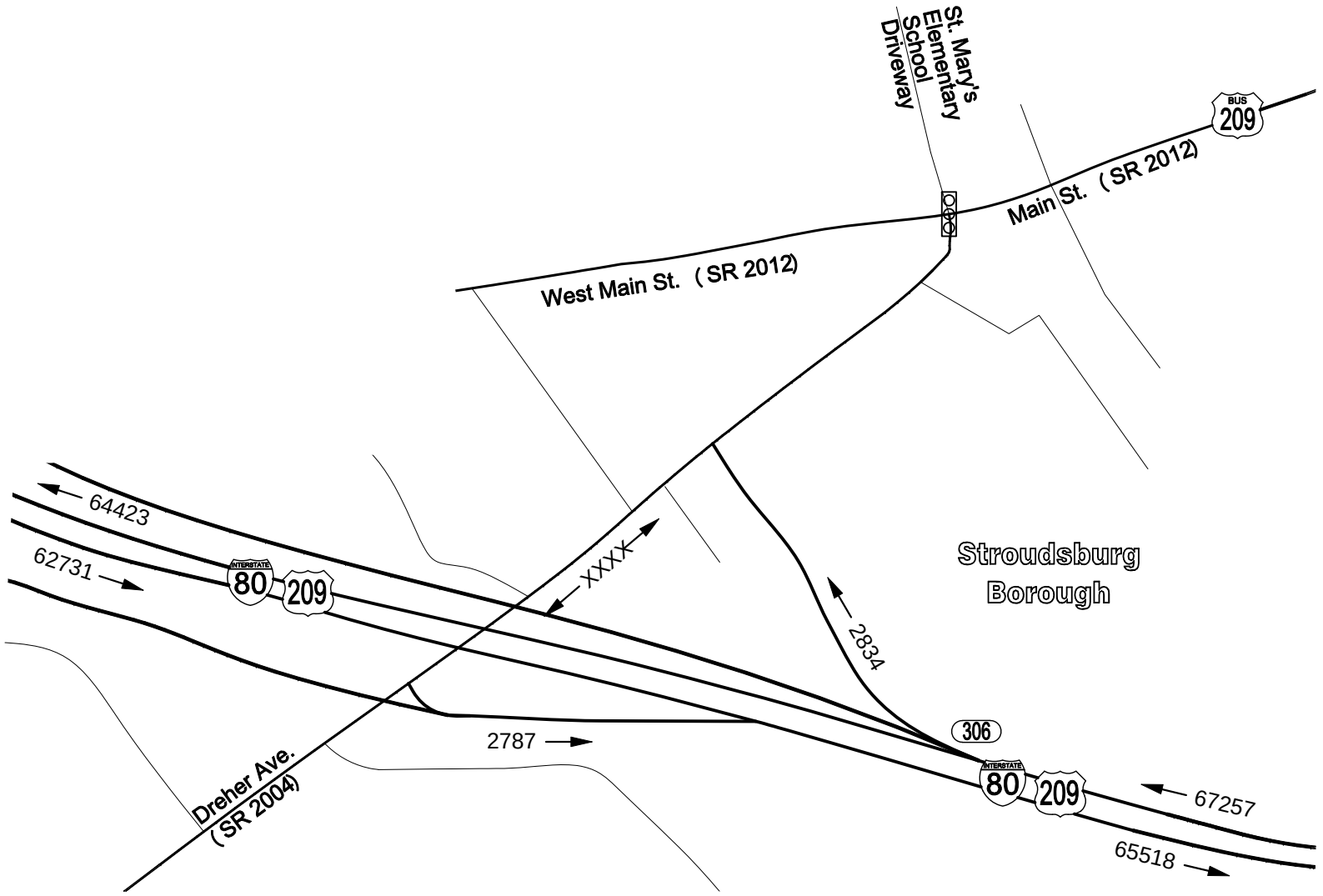
1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 1 ALTERNATIVE 1H STUDY AREA



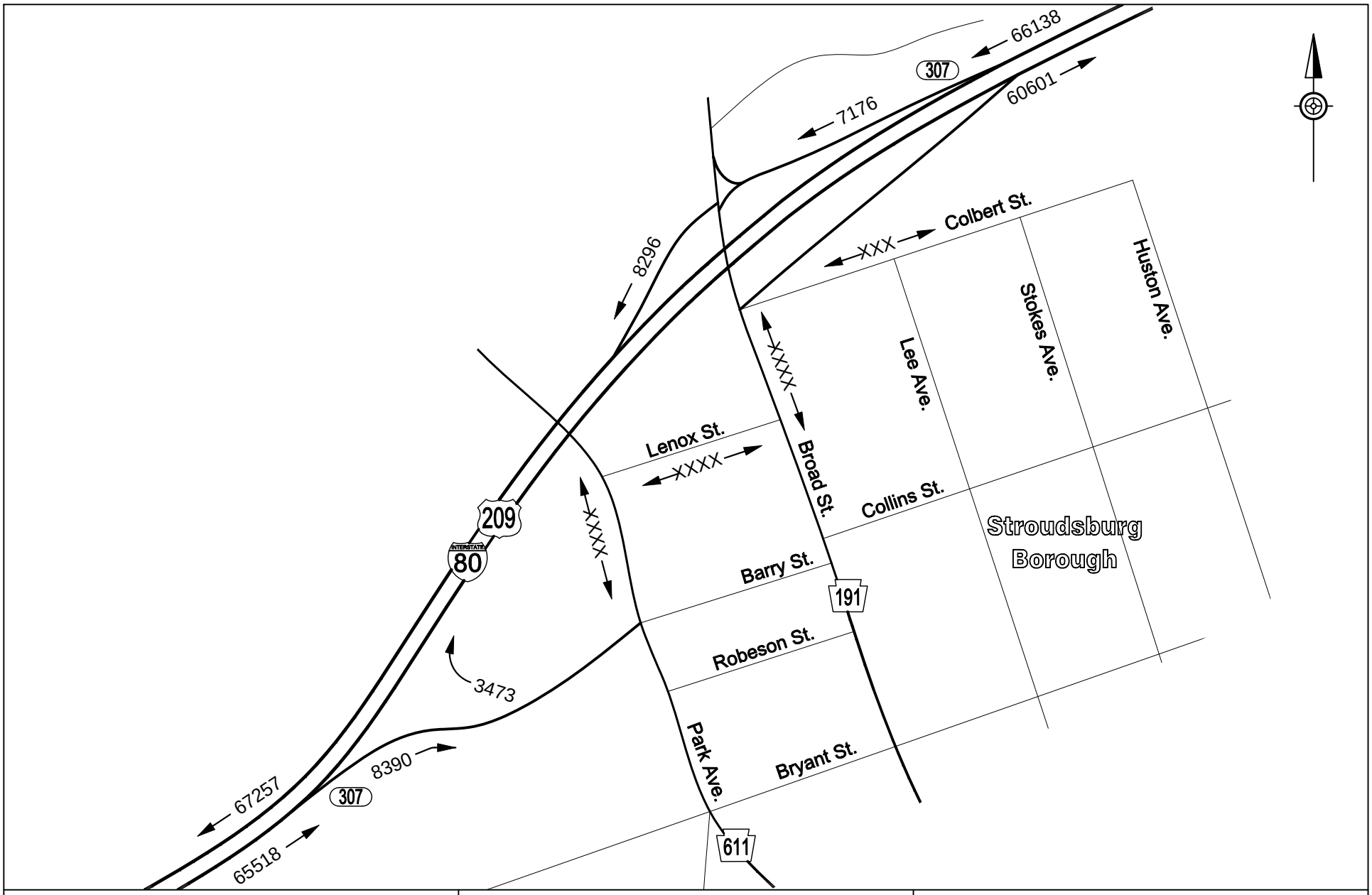
1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 2 ALTERNATIVE 1H ANNUAL AVERAGE DAILY 2045 TRAFFIC VOLUMES



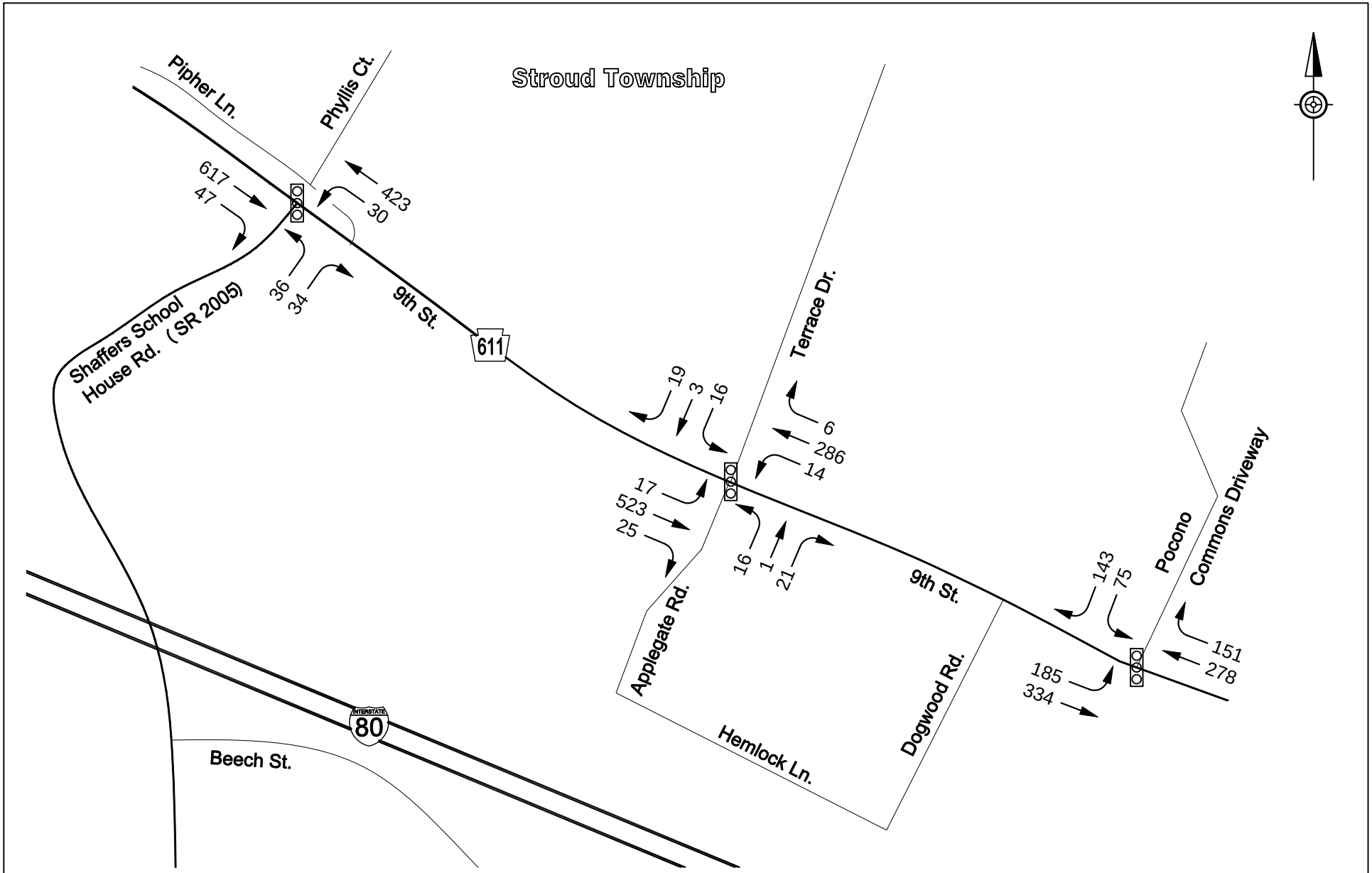
1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 3 ALTERNATIVE 1H ANNUAL AVERAGE DAILY 2045 TRAFFIC VOLUMES



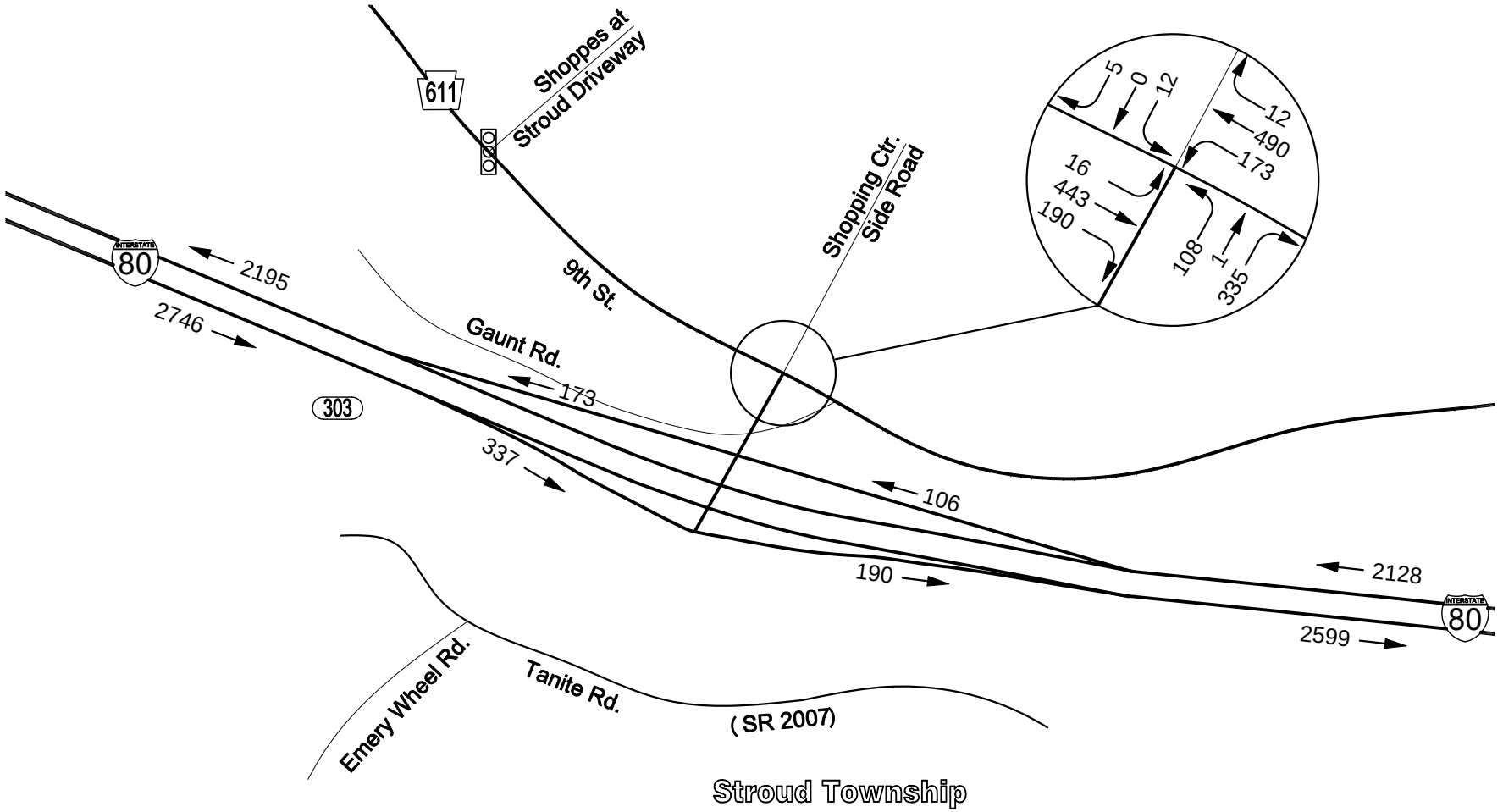
1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 4 ALTERNATIVE 1H ANNUAL AVERAGE DAILY 2045 TRAFFIC VOLUMES



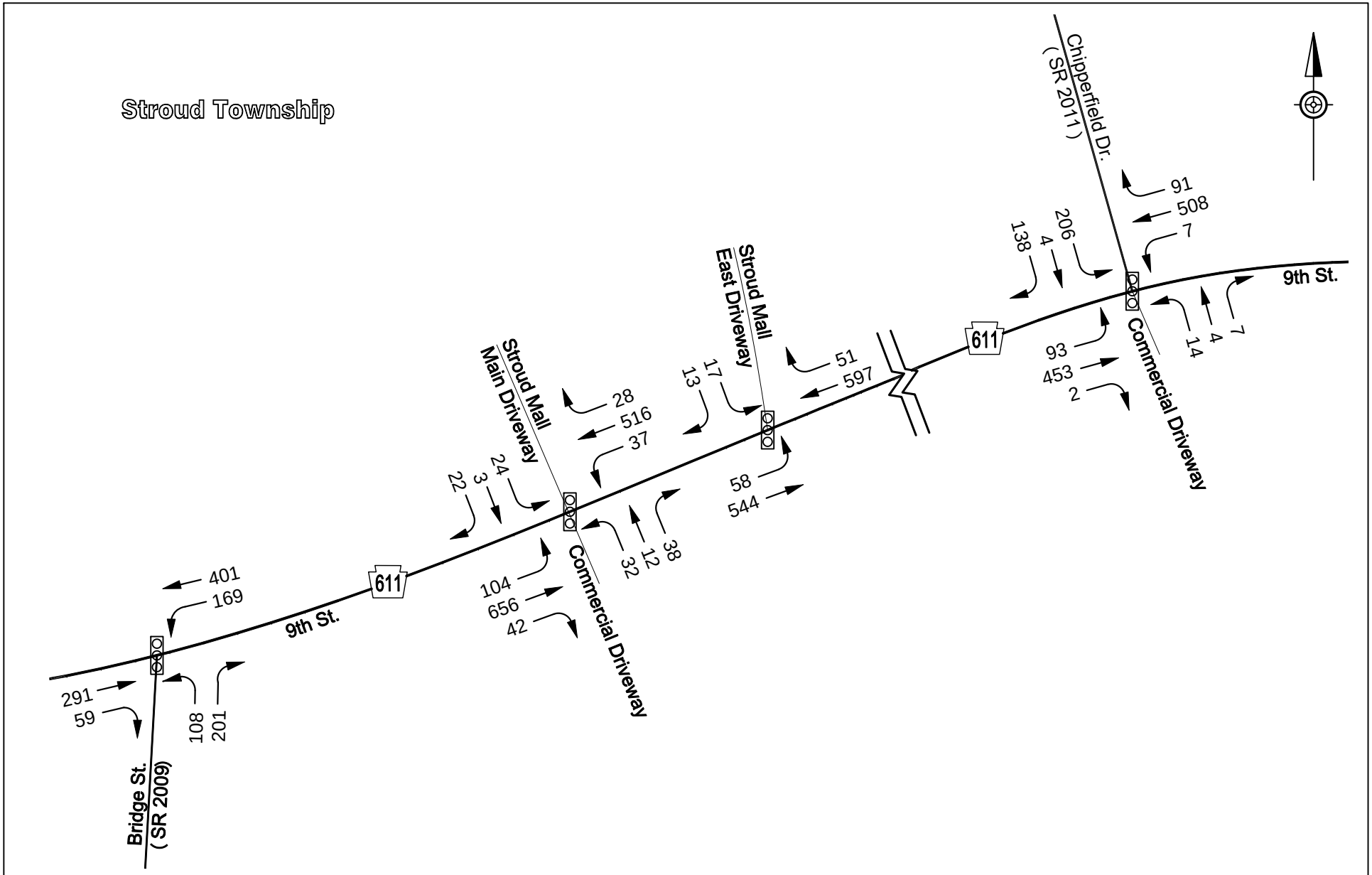
1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 5 ALTERNATIVE 1H ANNUAL AVERAGE DAILY 2045 TRAFFIC VOLUMES



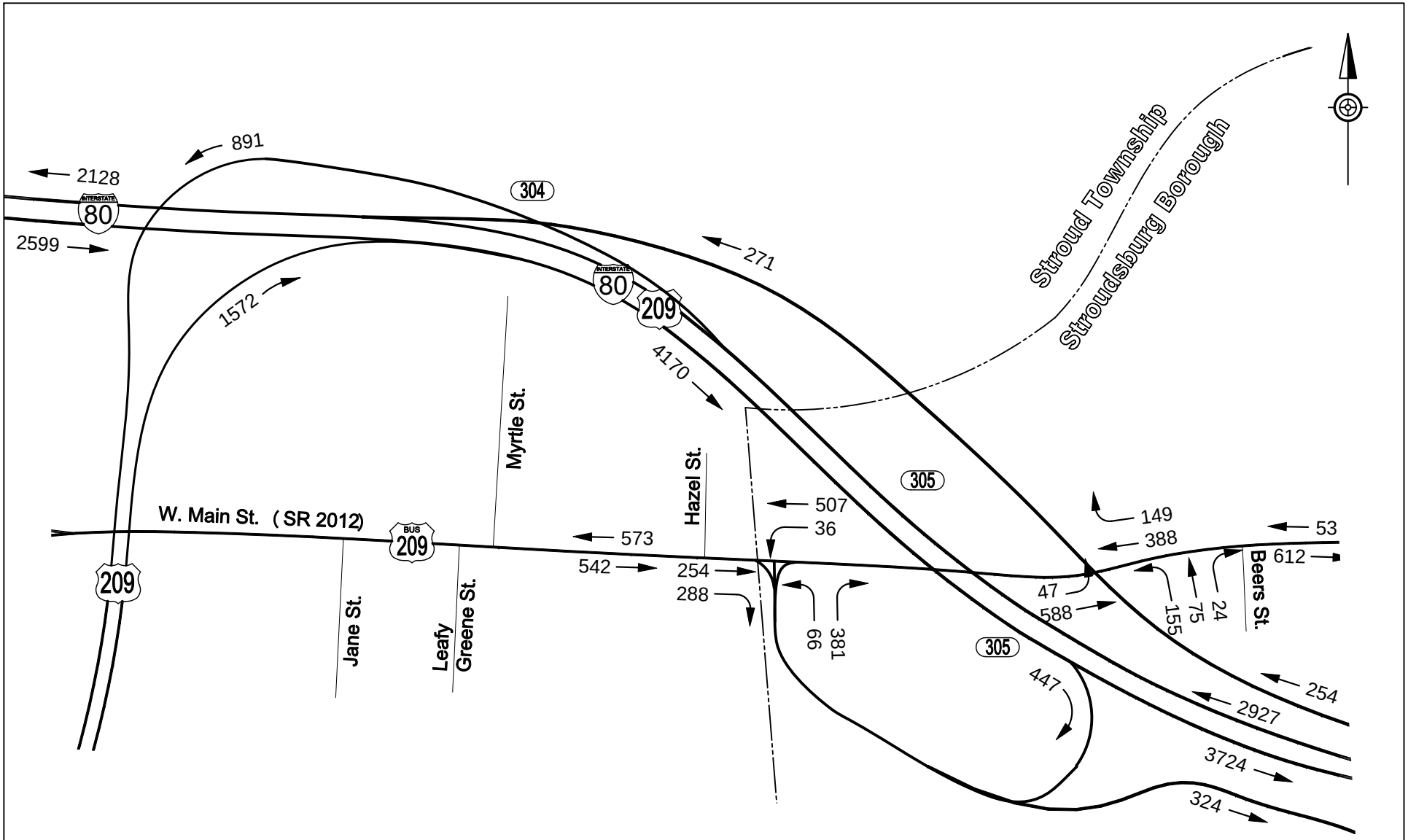
1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 1 ALTERNATIVE 1H A.M. PEAK HOUR 2045 TRAFFIC VOLUMES



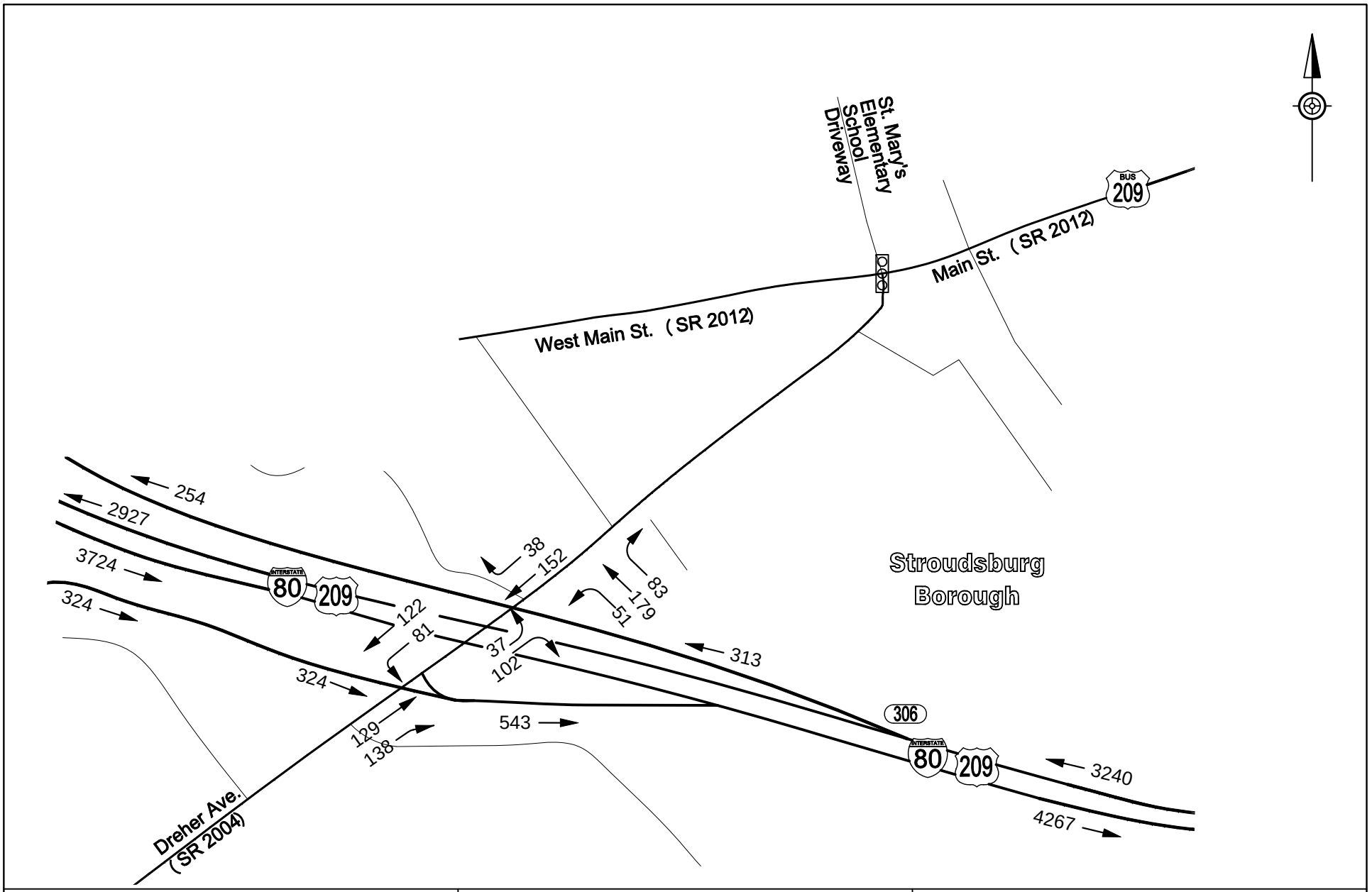
1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 2 ALTERNATIVE 1H A.M. PEAK HOUR 2045 TRAFFIC VOLUMES



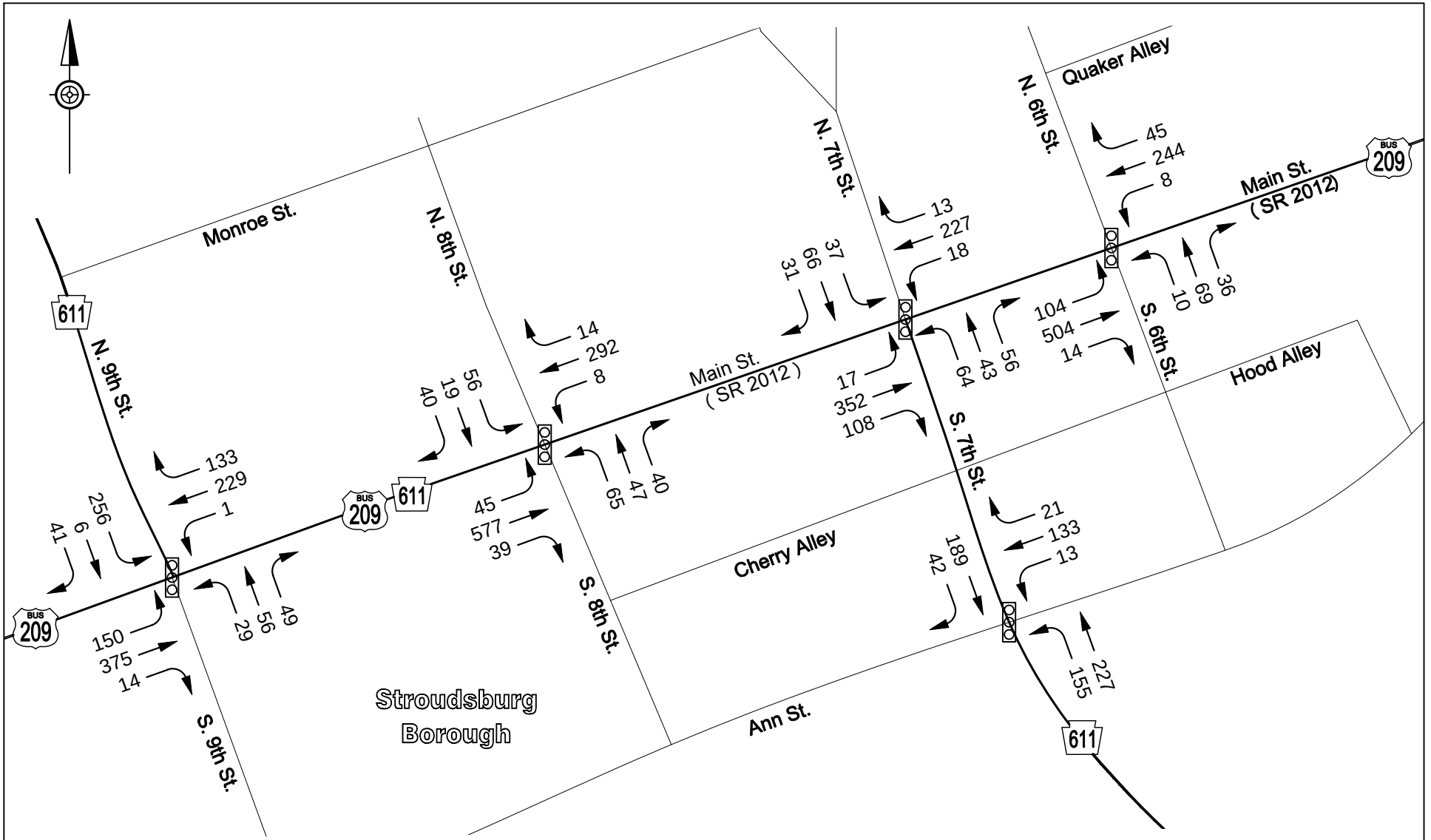
1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 3 ALTERNATIVE 1H A.M. PEAK HOUR 2045 TRAFFIC VOLUMES



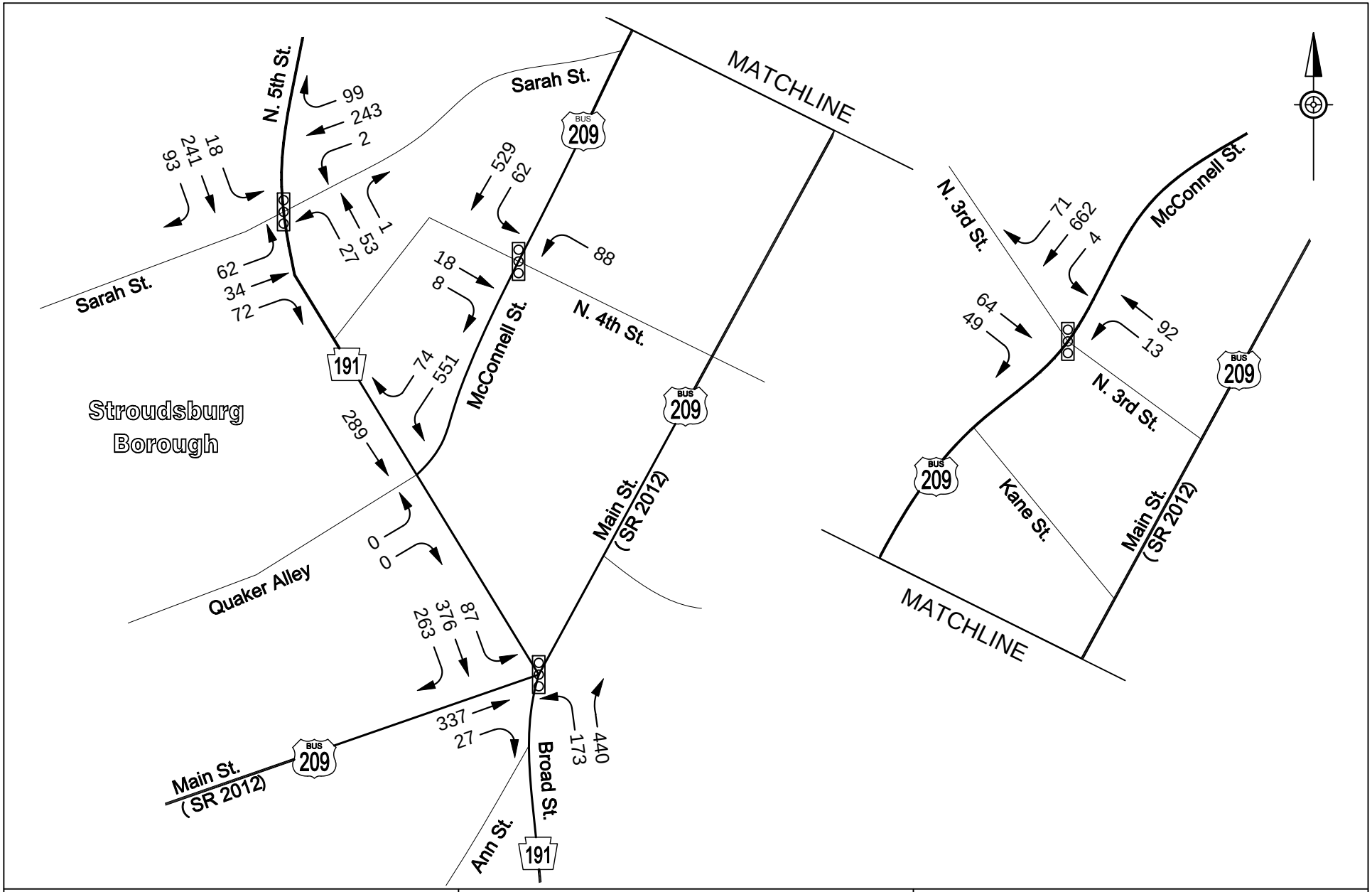
1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 4 ALTERNATIVE 1H A.M. PEAK HOUR 2045 TRAFFIC VOLUMES



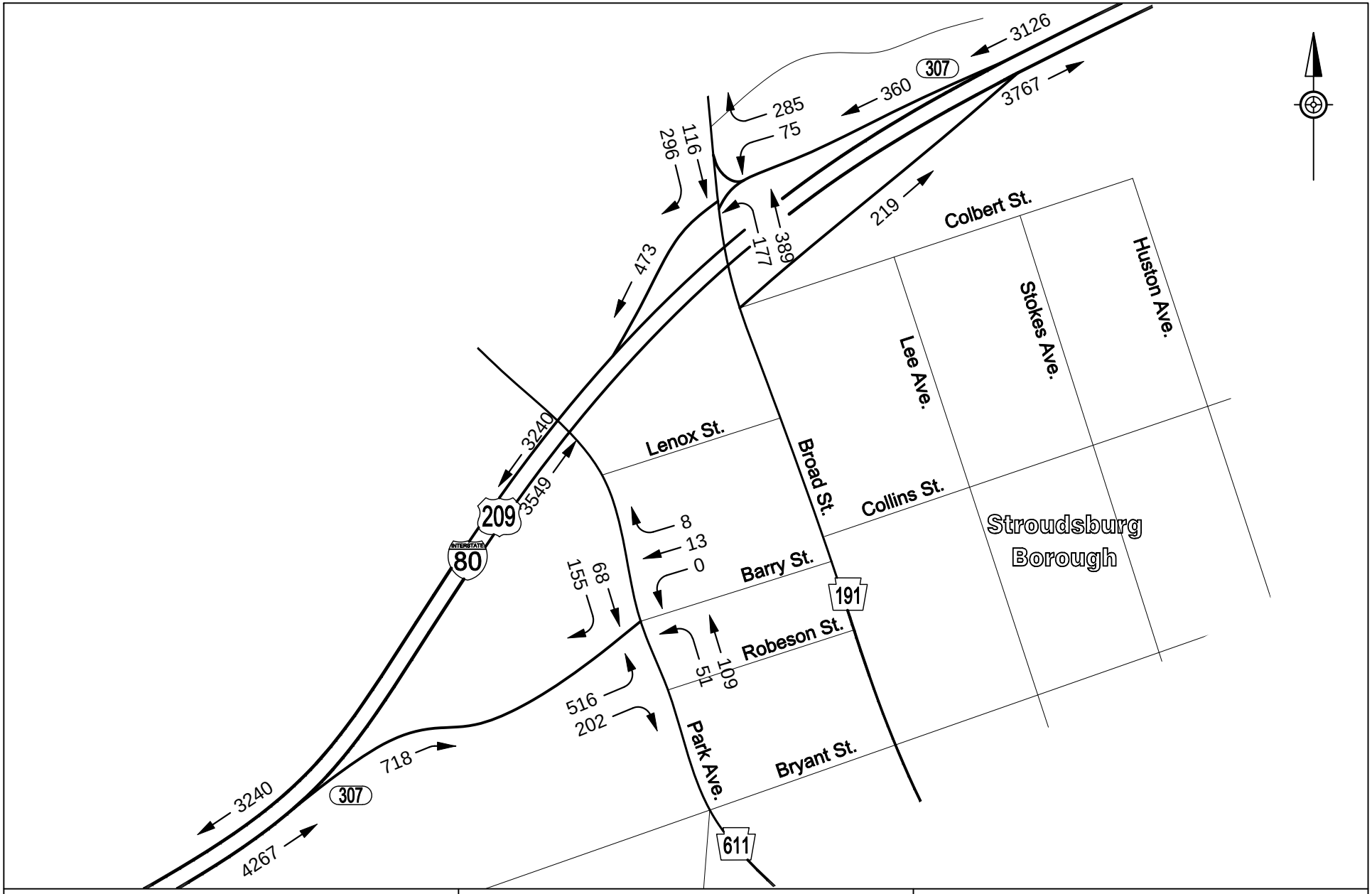
1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 5 ALTERNATIVE 1H A.M. PEAK HOUR 2045 TRAFFIC VOLUMES



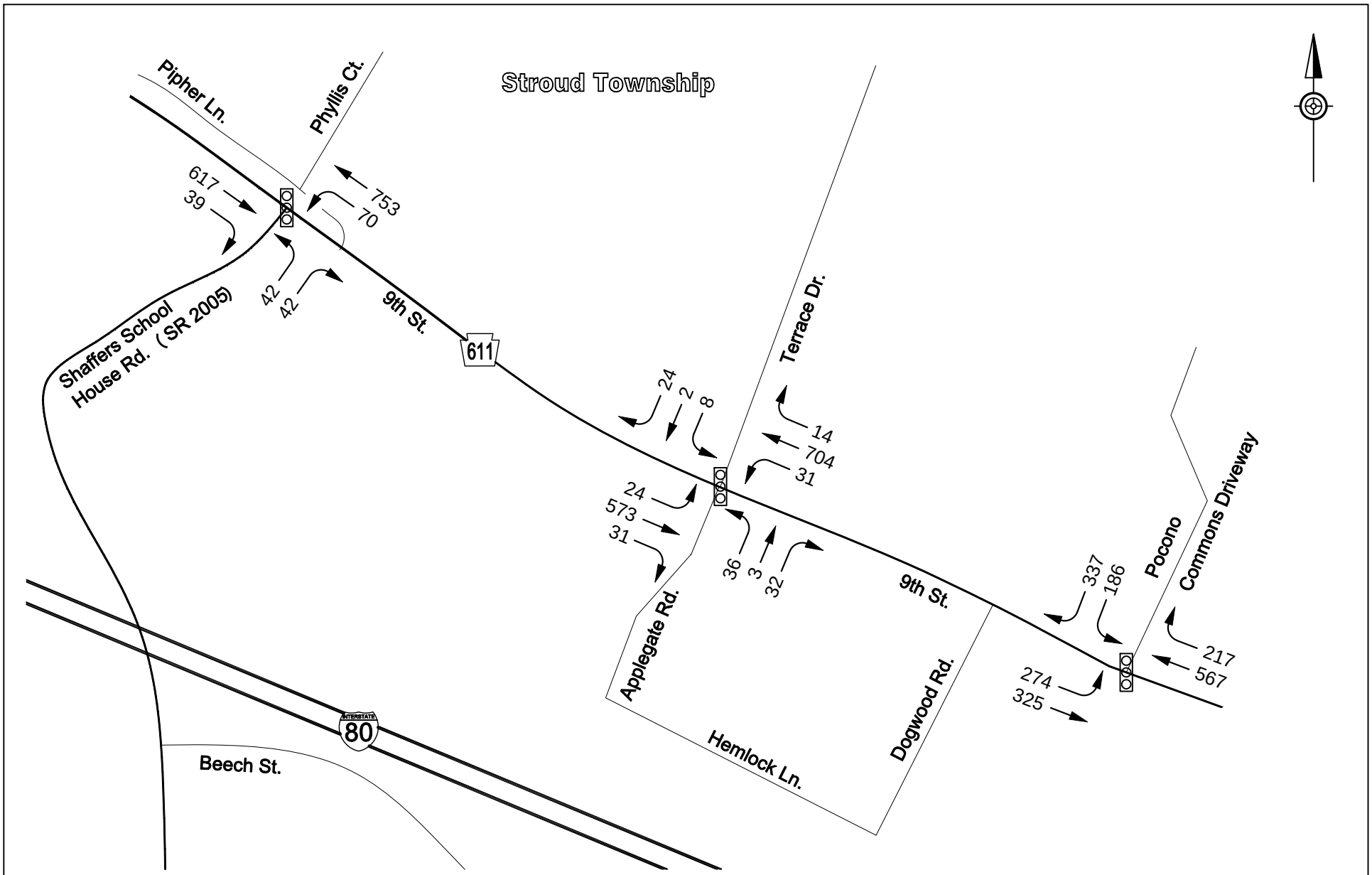
1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 6 ALTERNATIVE 1H A.M. PEAK HOUR 2045 TRAFFIC VOLUMES



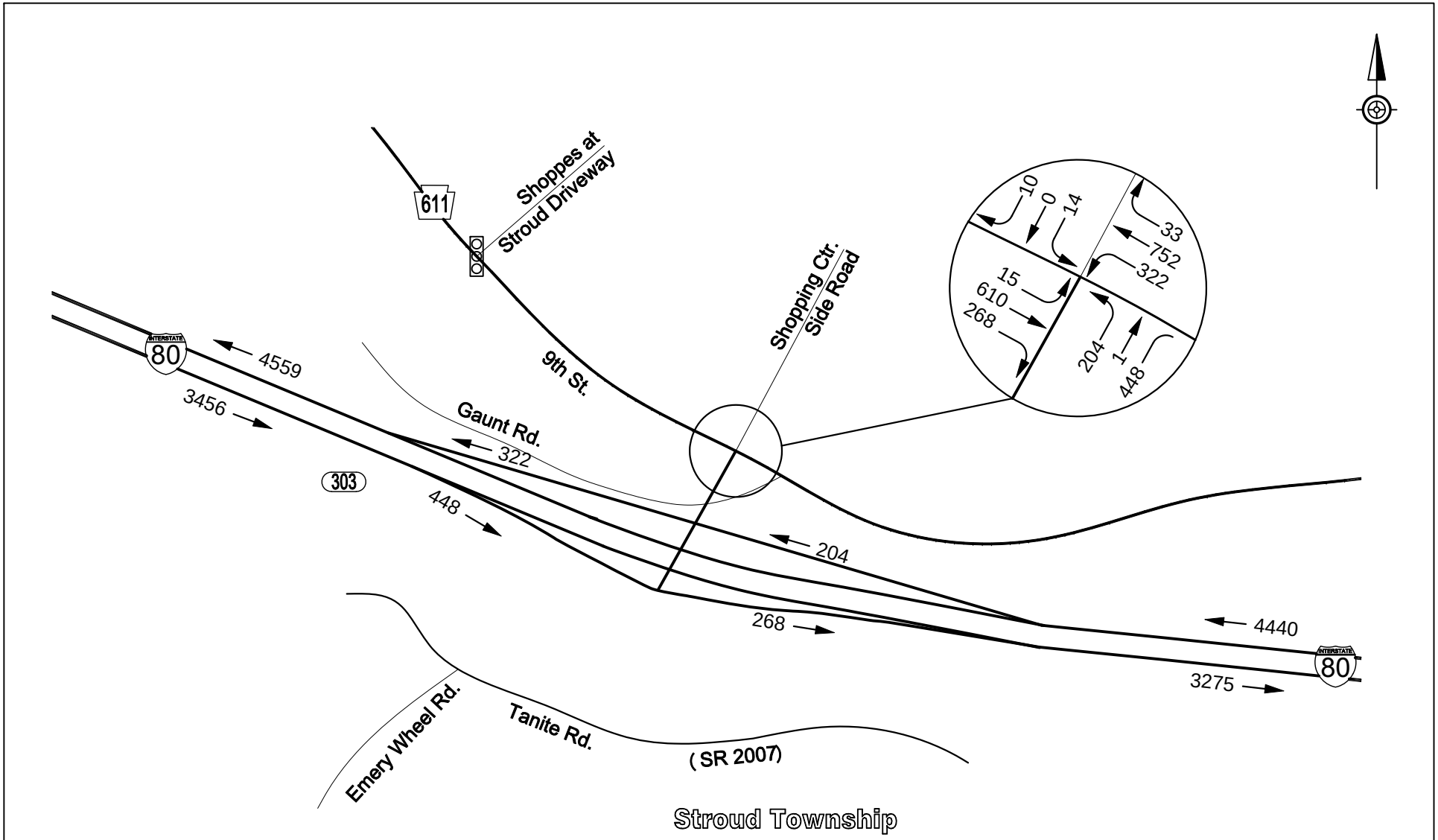
1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 7 ALTERNATIVE 1H A.M. PEAK HOUR 2045 TRAFFIC VOLUMES



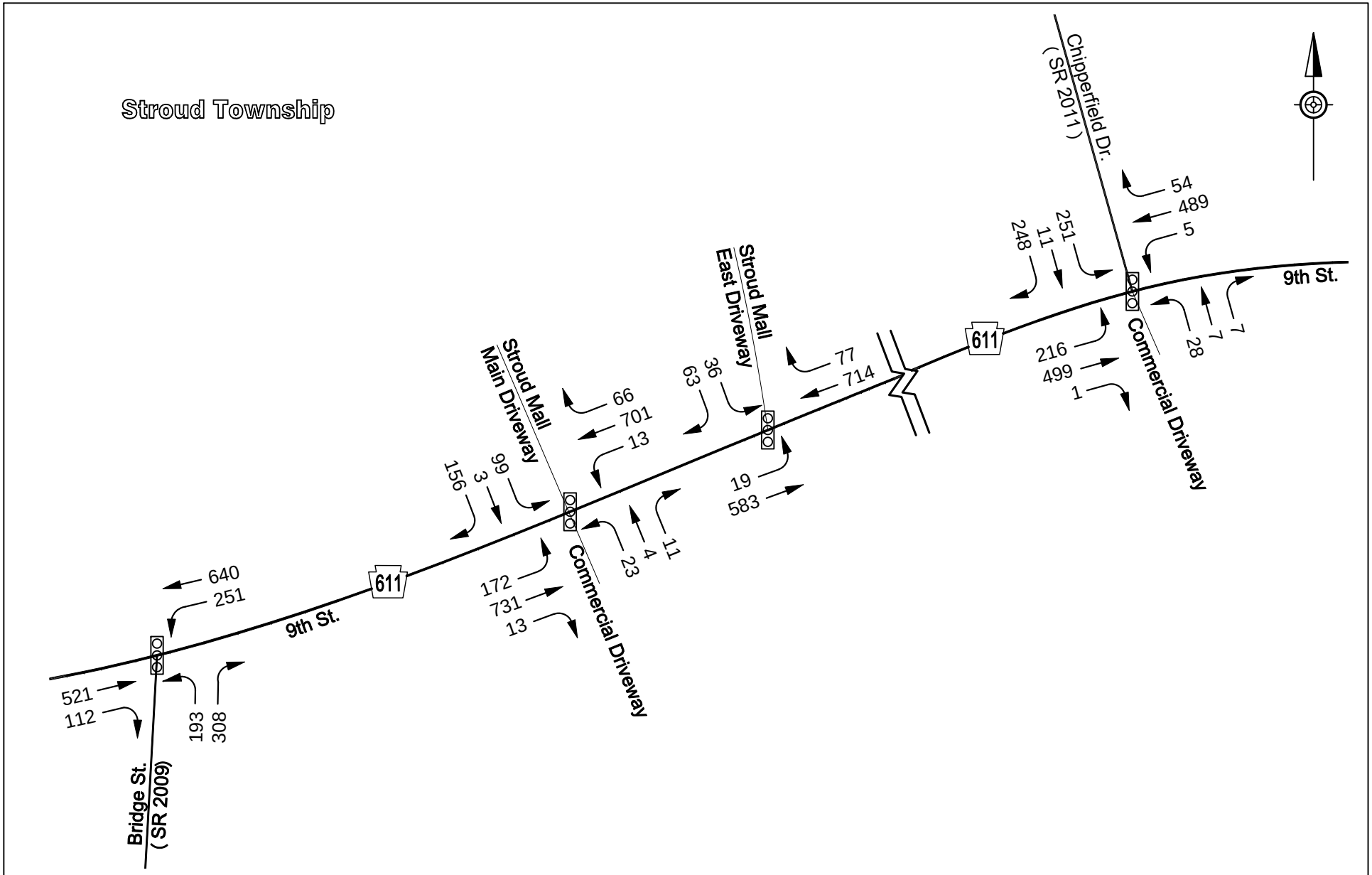
1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 8 ALTERNATIVE 1H A.M. PEAK HOUR 2045 TRAFFIC VOLUMES



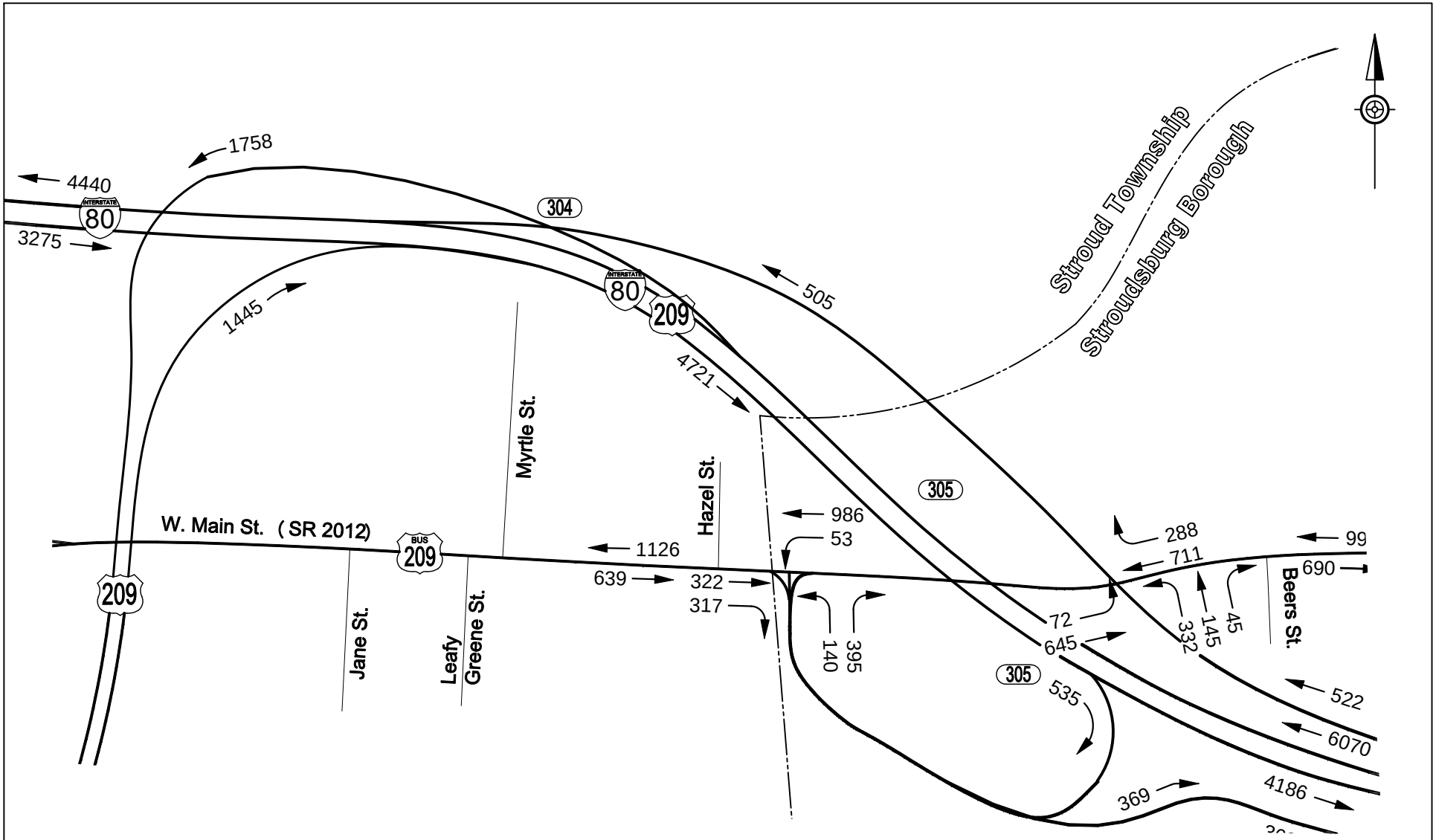
1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 9 ALTERNATIVE 1H P.M. PEAK HOUR 2045 TRAFFIC VOLUMES



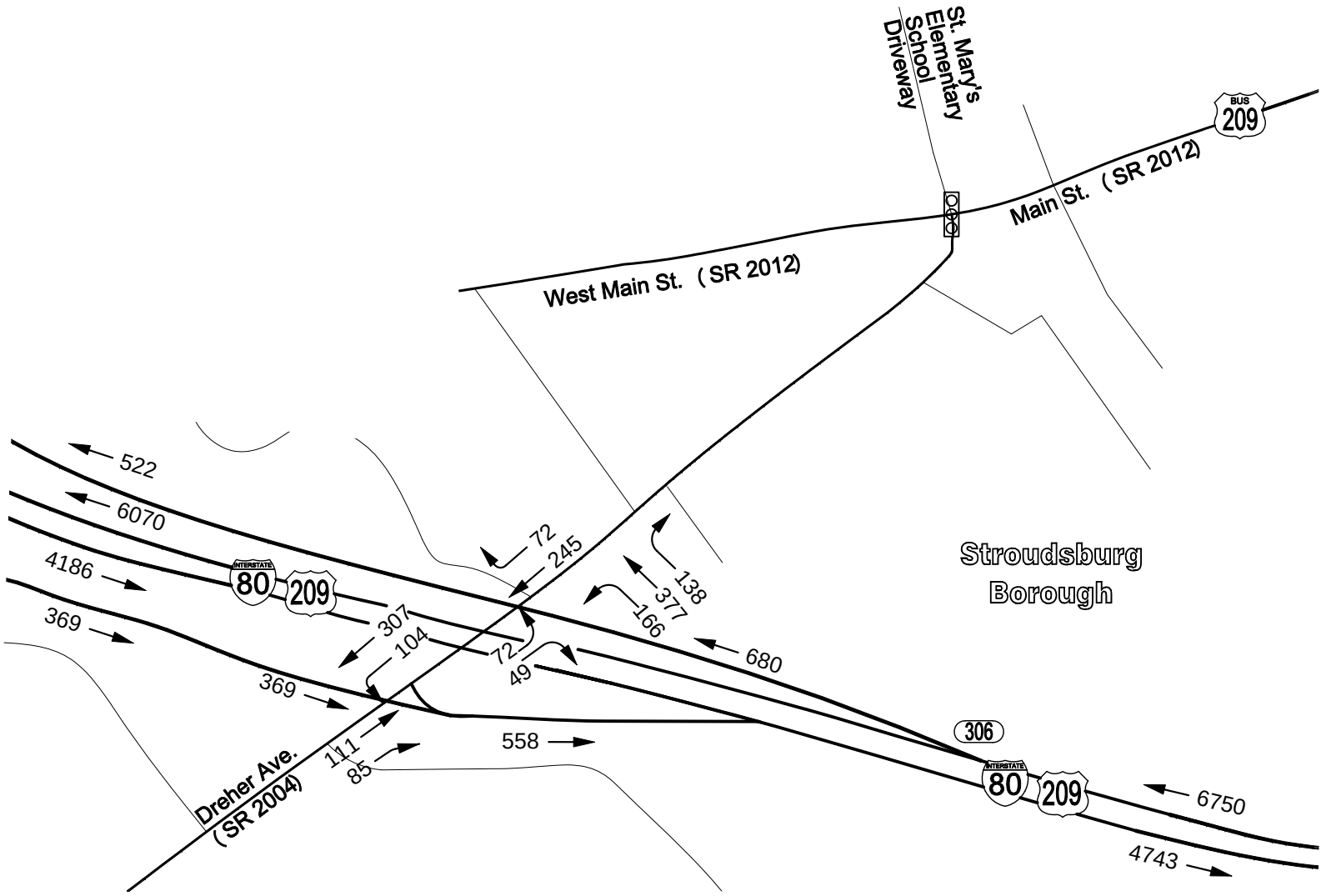
1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 10 ALTERNATIVE 1H P.M. PEAK HOUR 2045 TRAFFIC VOLUMES



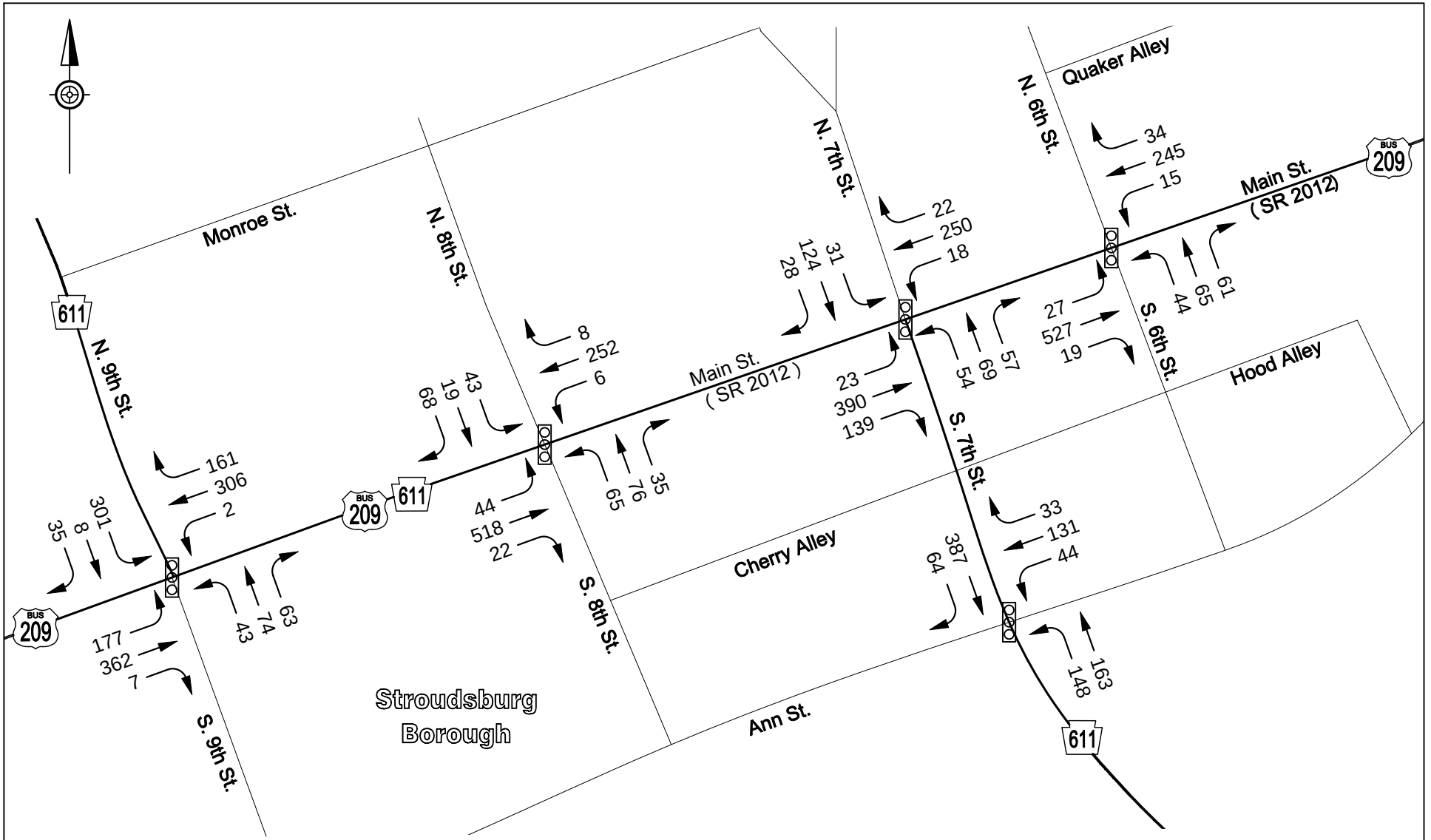
1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 11 ALTERNATIVE 1H P.M. PEAK HOUR 2045 TRAFFIC VOLUMES



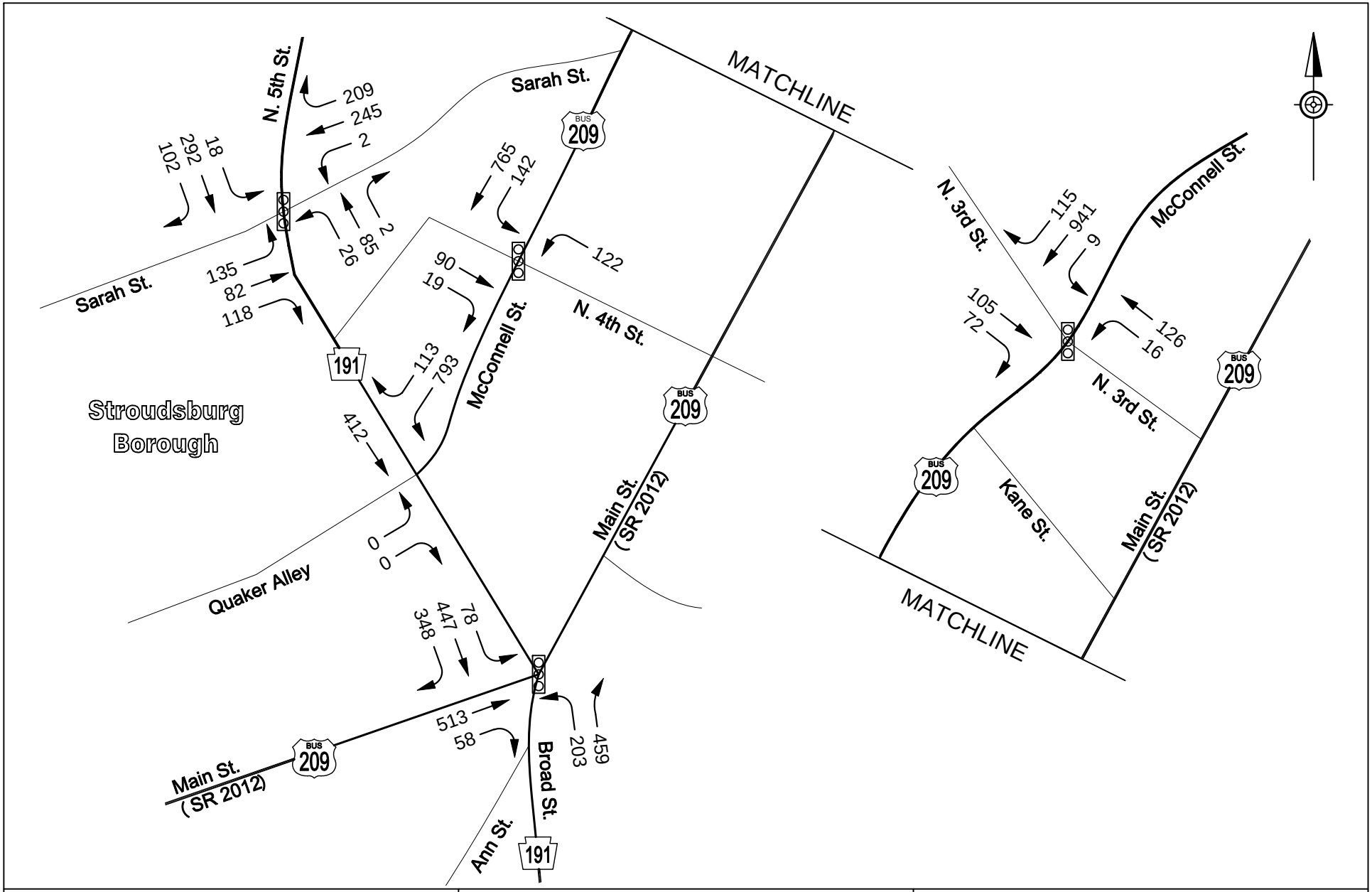
1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 12 ALTERNATIVE 1H P.M. PEAK HOUR 2045 TRAFFIC VOLUMES



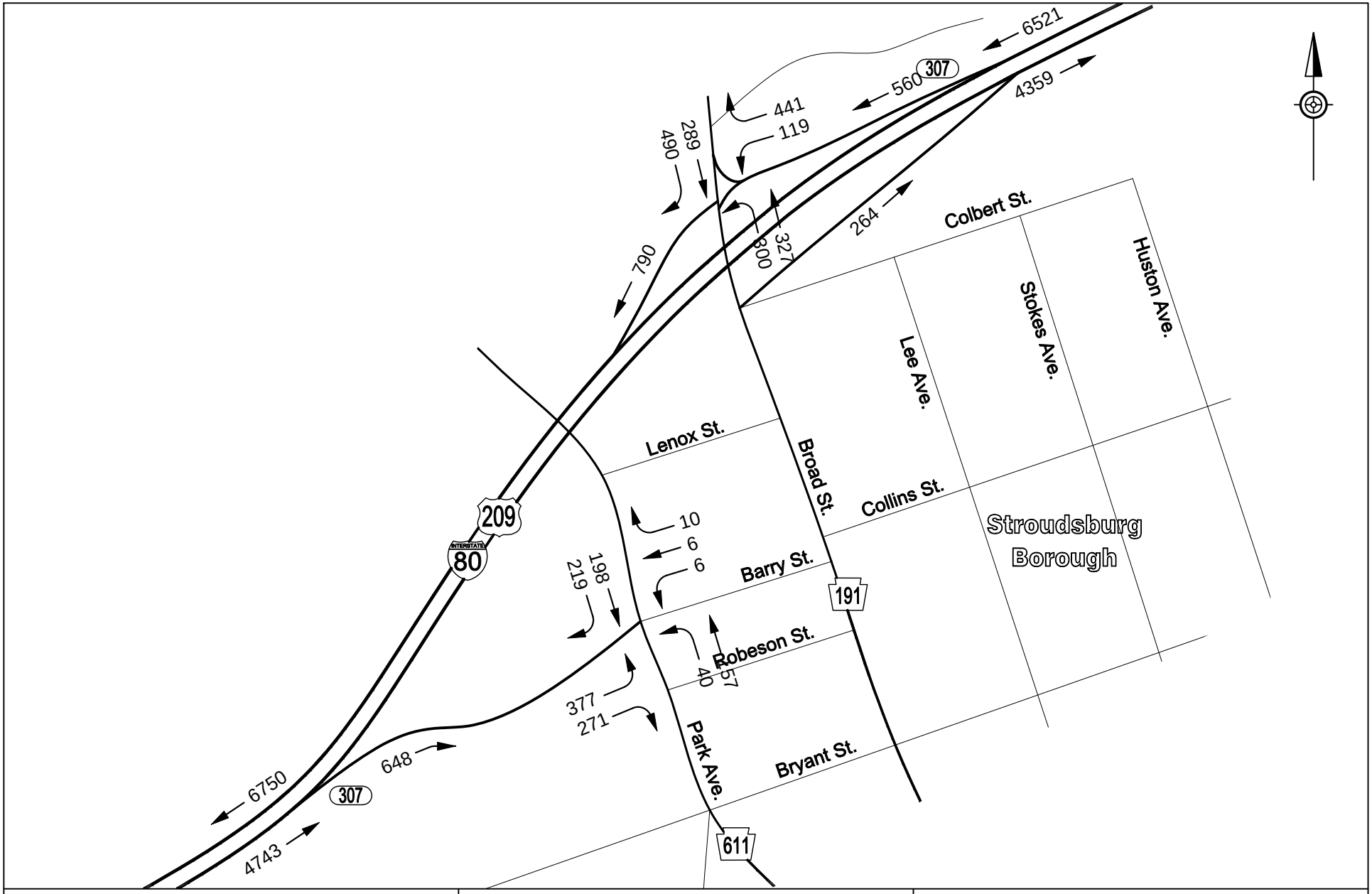
1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 13 ALTERNATIVE 1H P.M. PEAK HOUR 2045 TRAFFIC VOLUMES



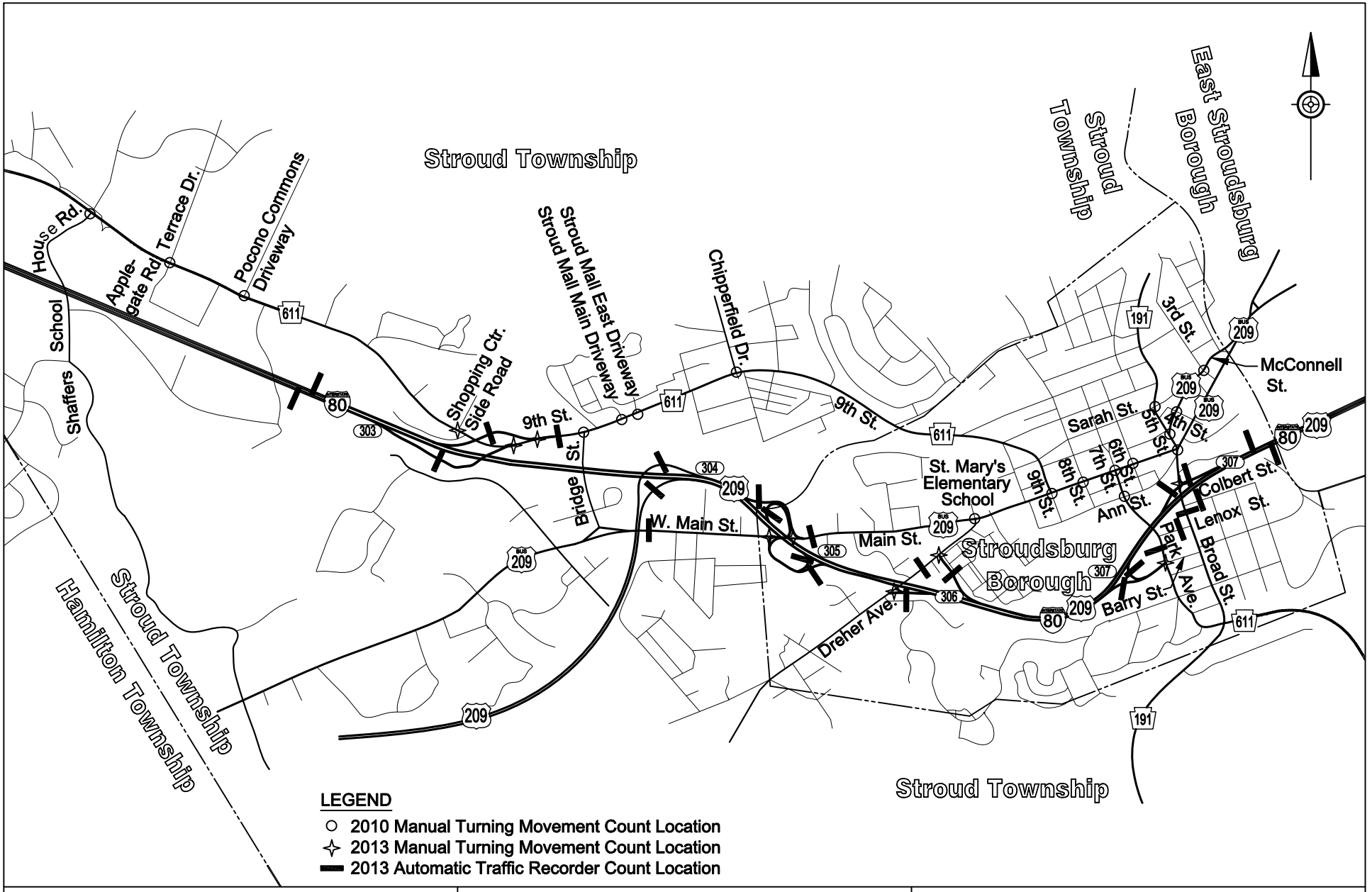
1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 14 ALTERNATIVE 1H P.M. PEAK HOUR 2045 TRAFFIC VOLUMES



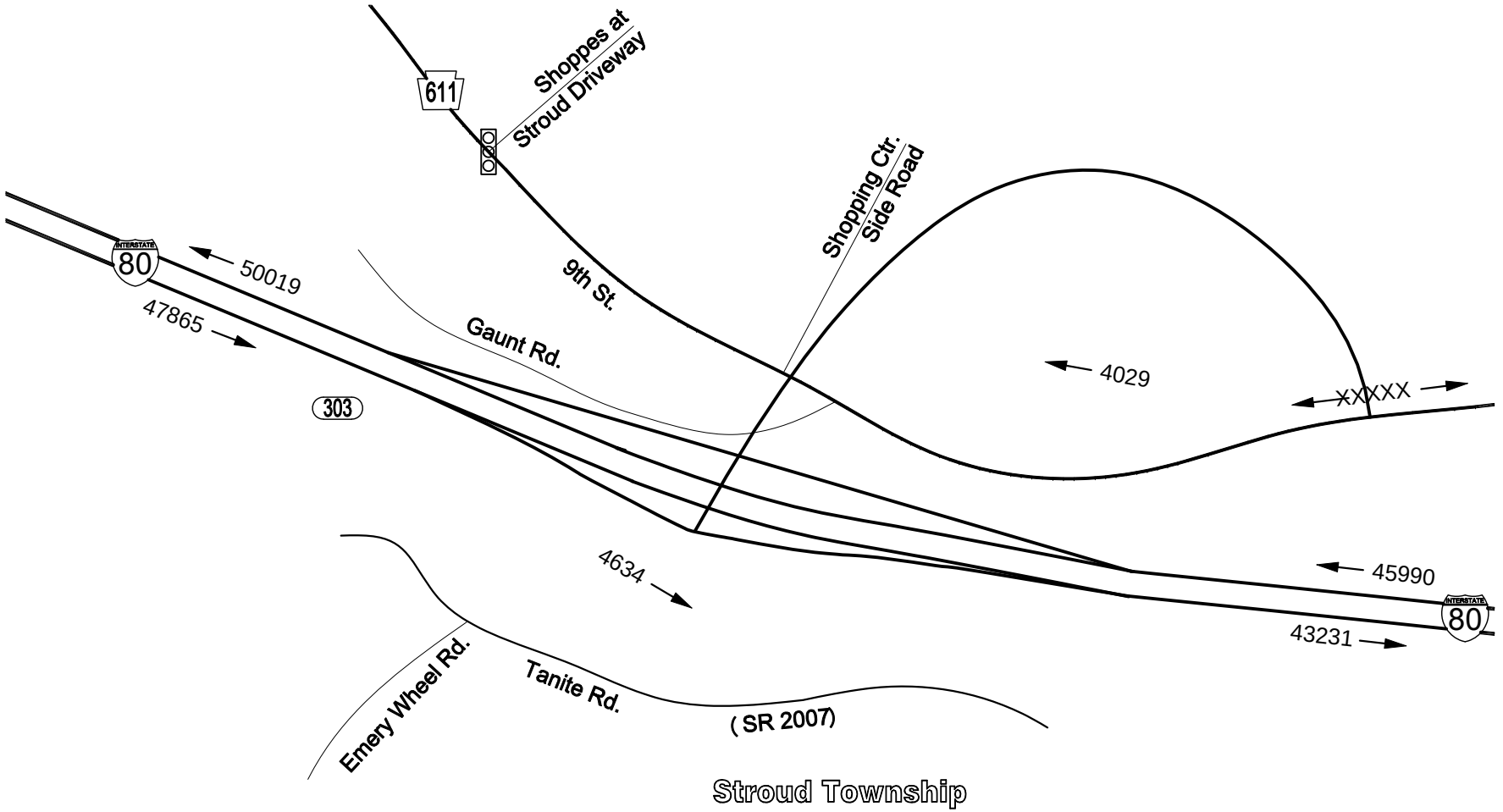
1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 15 ALTERNATIVE 1H P.M. PEAK HOUR 2045 TRAFFIC VOLUMES



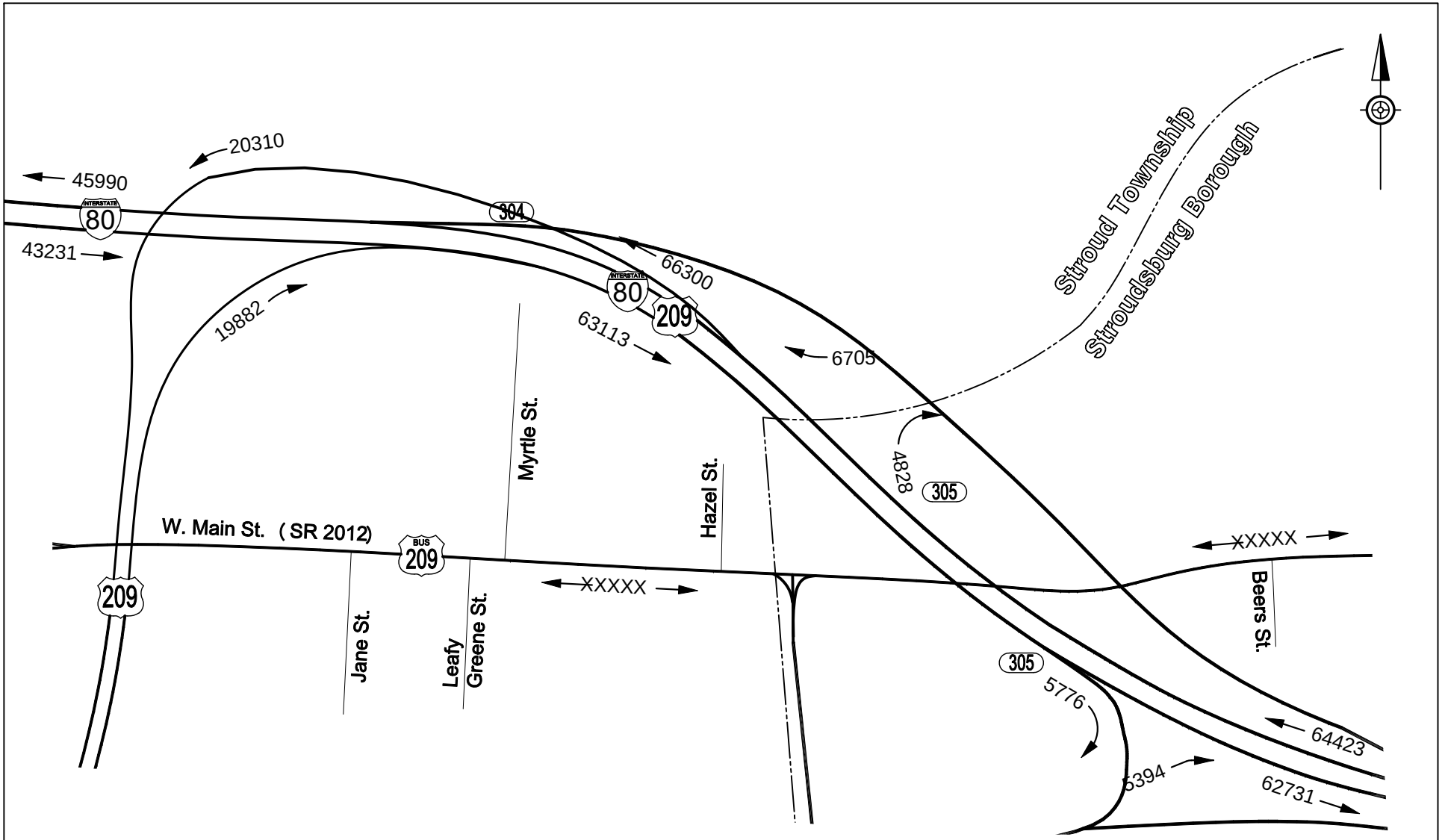
1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 16 ALTERNATIVE 1H P.M. PEAK HOUR 2045 TRAFFIC VOLUMES



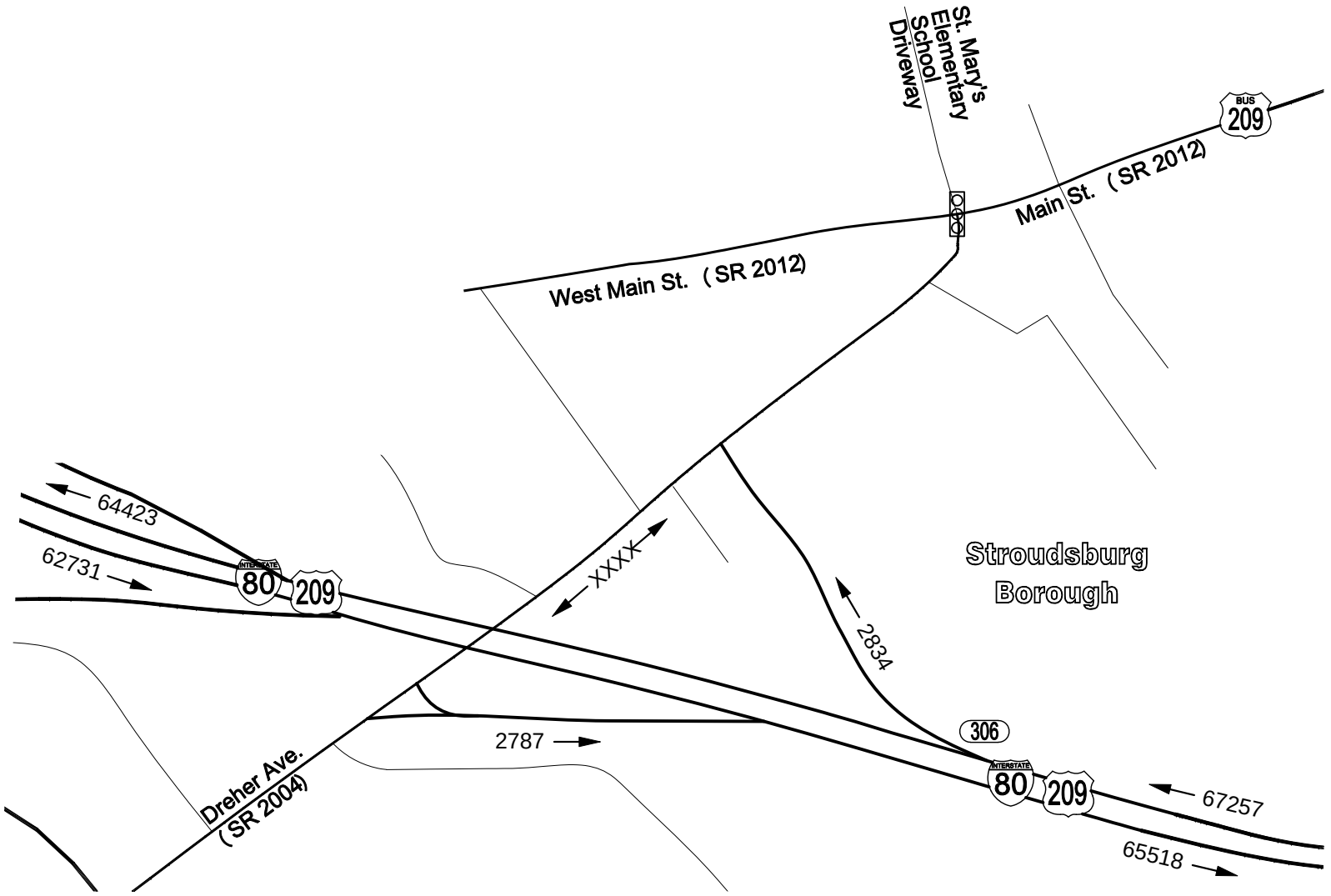
1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 1 ALTERNATIVE 1I STUDY AREA



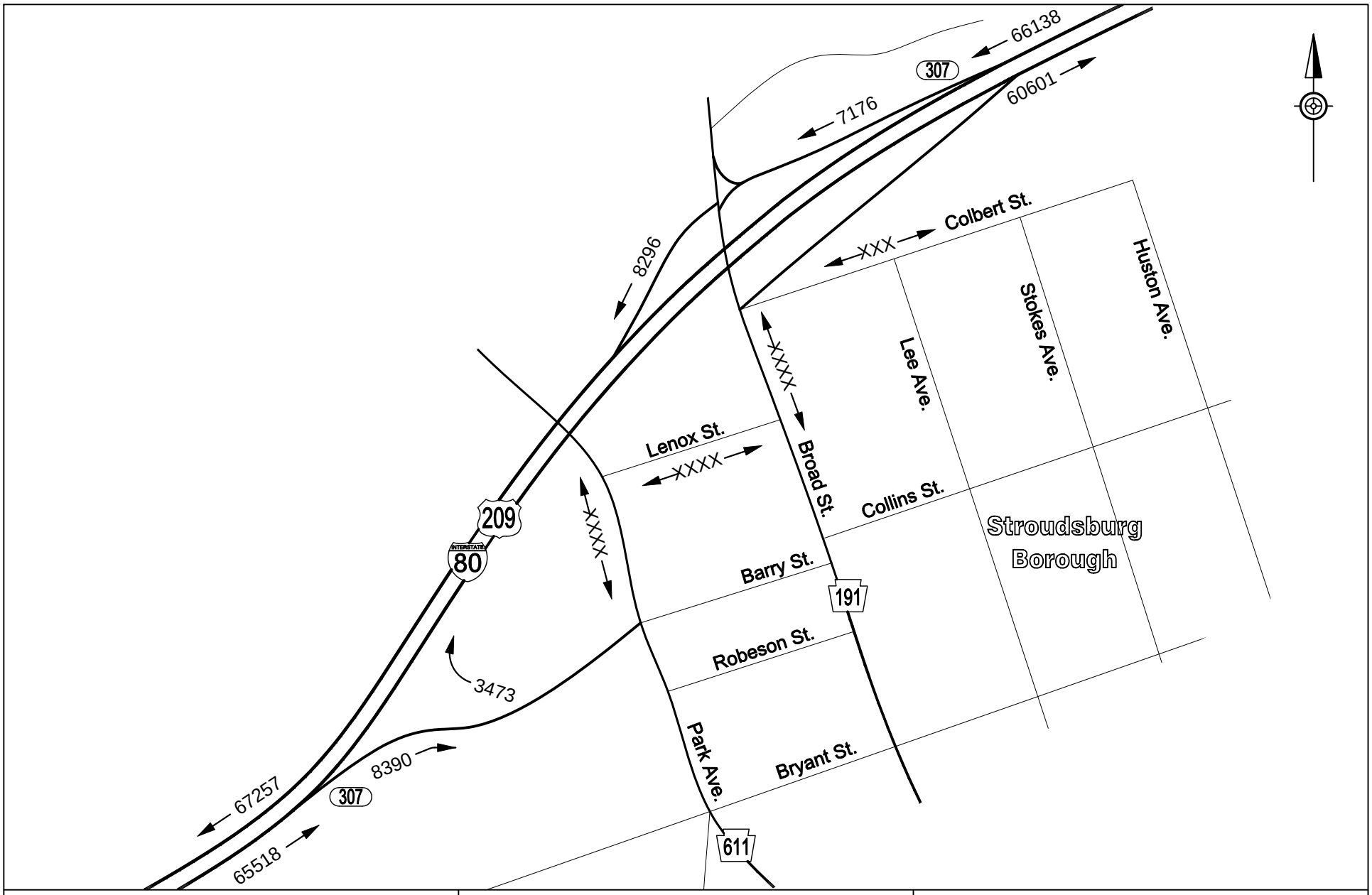
1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 2 ALTERNATIVE 1I ANNUAL AVERAGE DAILY 2045 TRAFFIC VOLUMES



1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 3 ALTERNATIVE 1I ANNUAL AVERAGE DAILY 2045 TRAFFIC VOLUMES



1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 4 ALTERNATIVE 1I ANNUAL AVERAGE DAILY 2045 TRAFFIC VOLUMES



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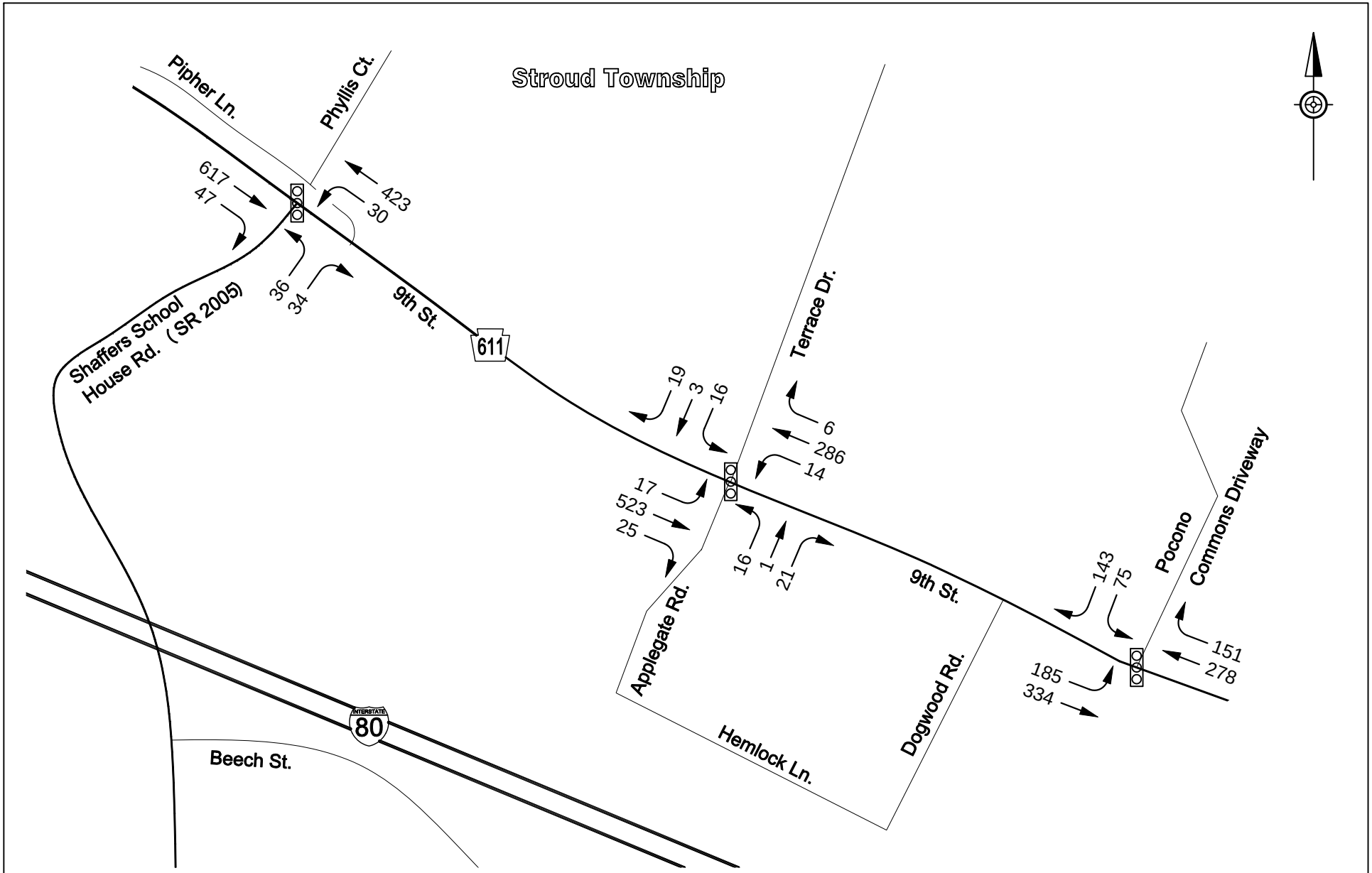
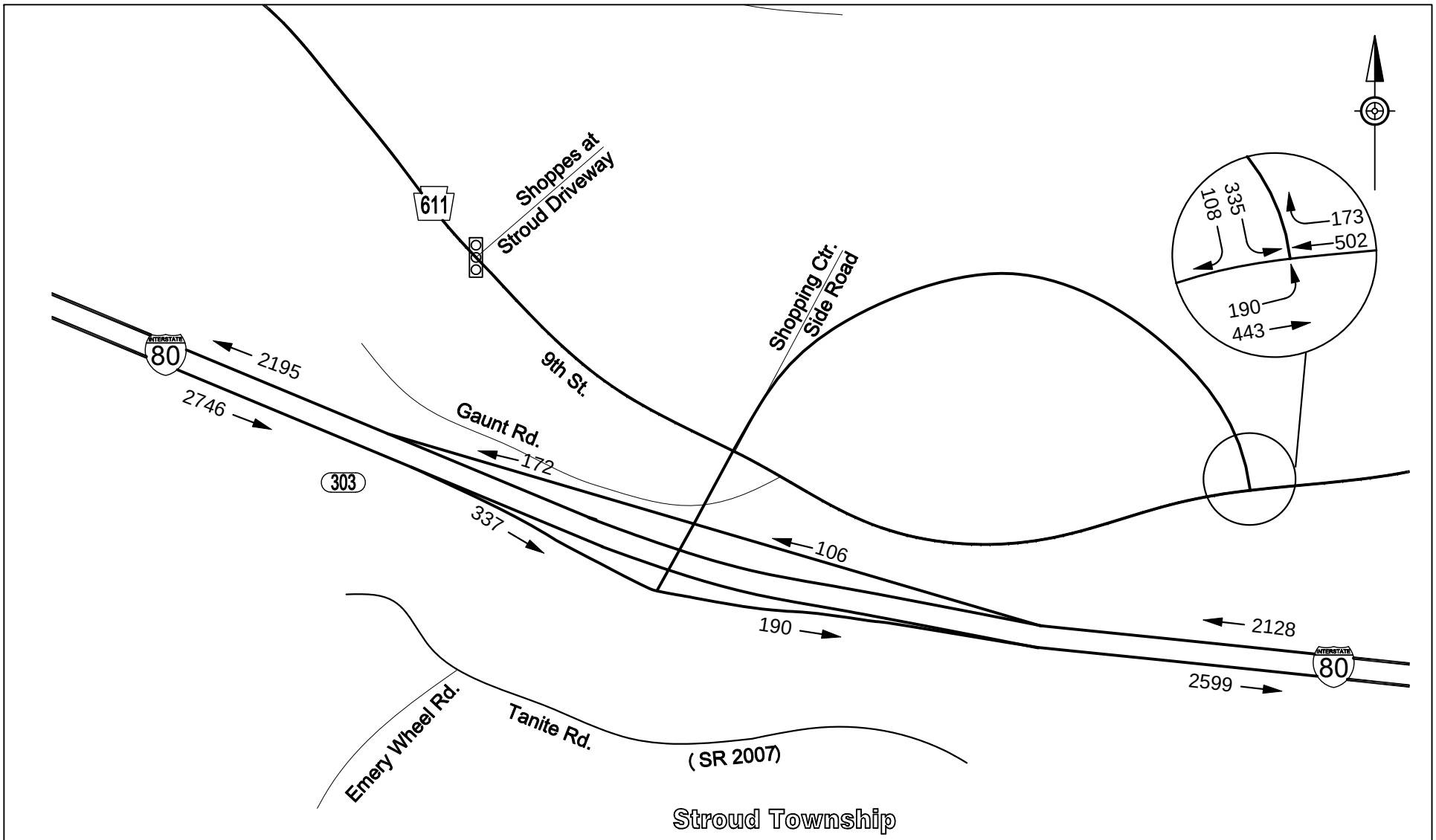


1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 1 ALTERNATIVE 1I A.M. PEAK HOUR 2045 TRAFFIC VOLUMES



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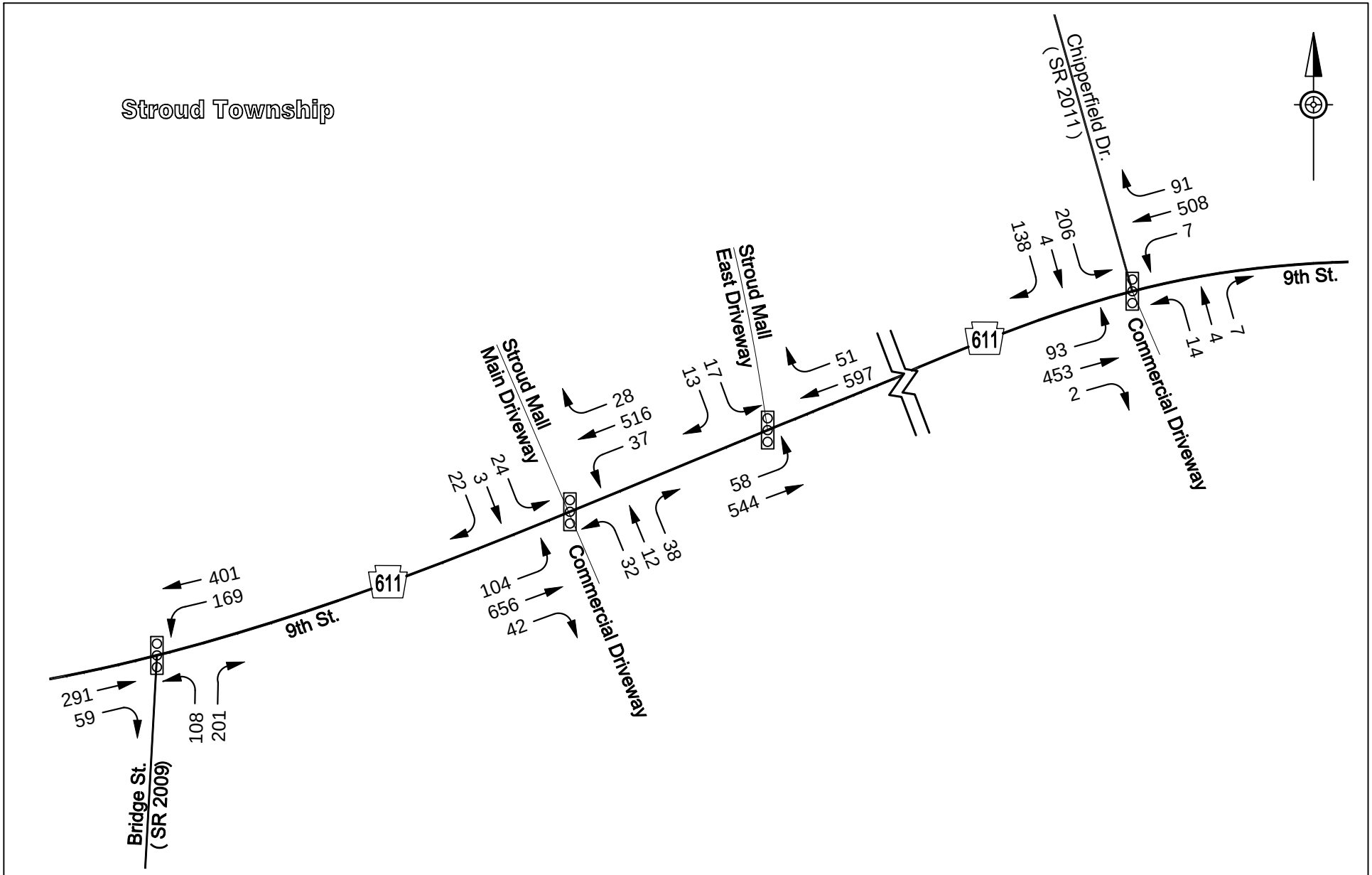
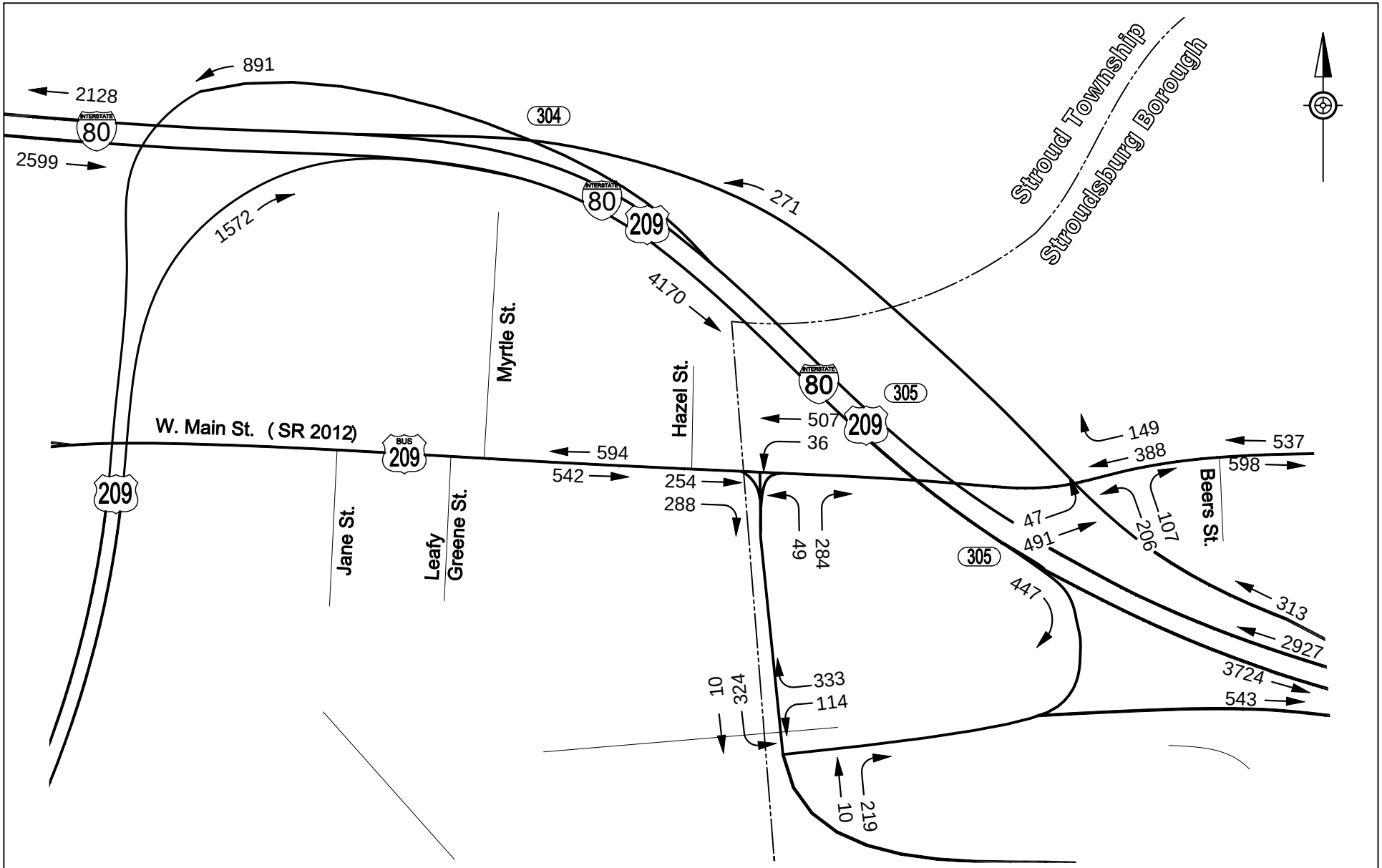


1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 3 ALTERNATIVE 1I A.M. PEAK HOUR 2045 TRAFFIC VOLUMES



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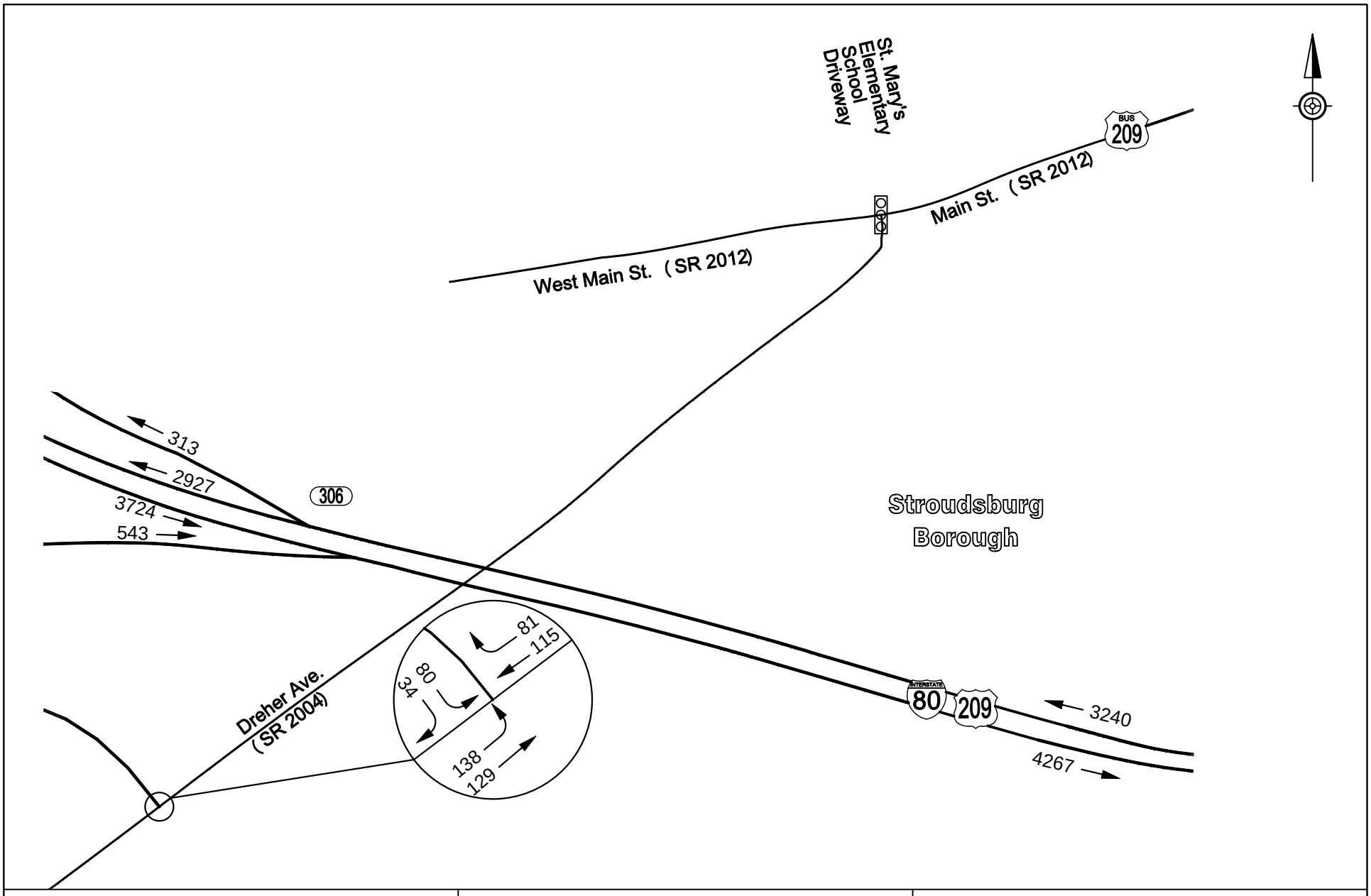

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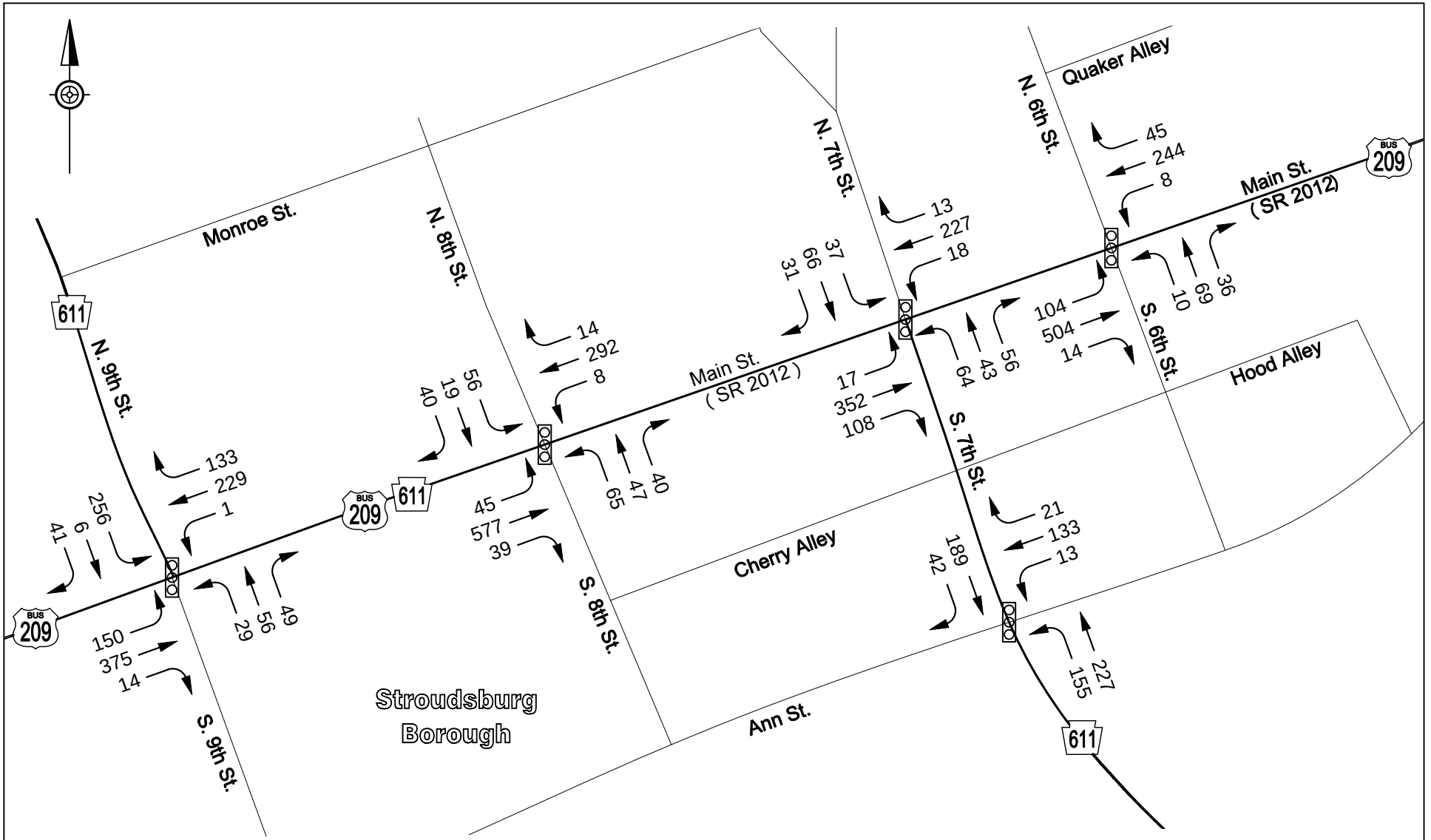
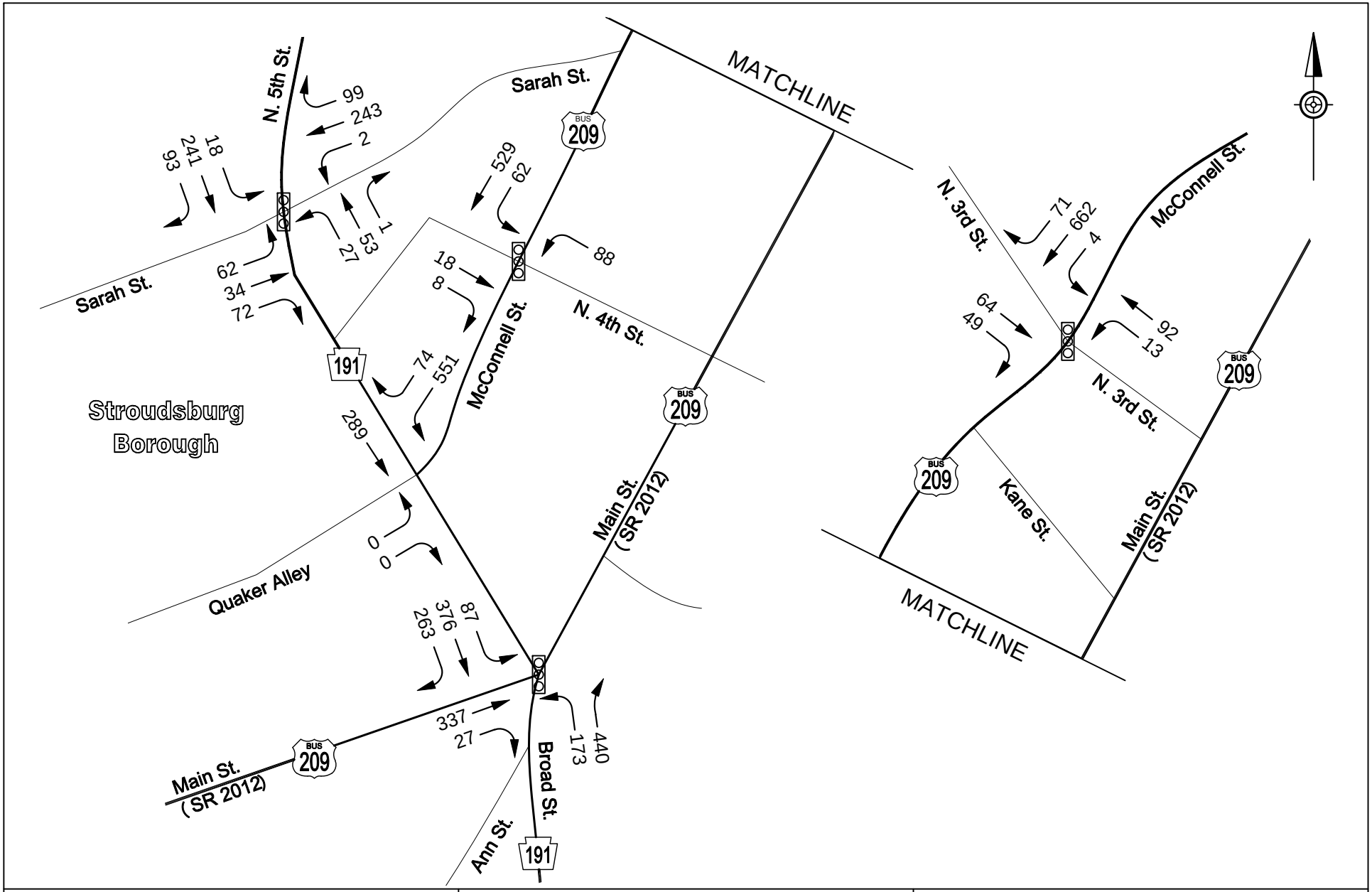
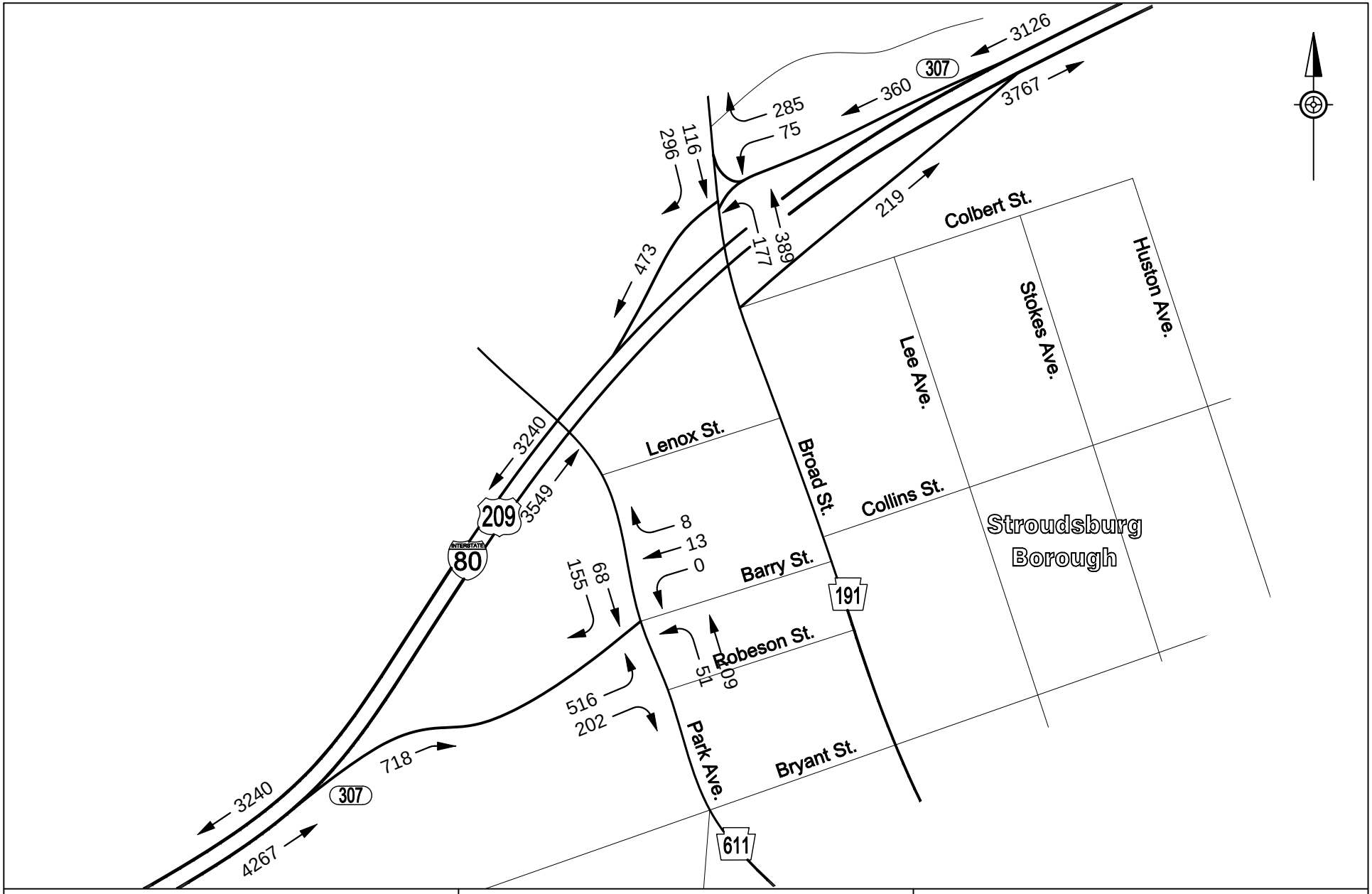


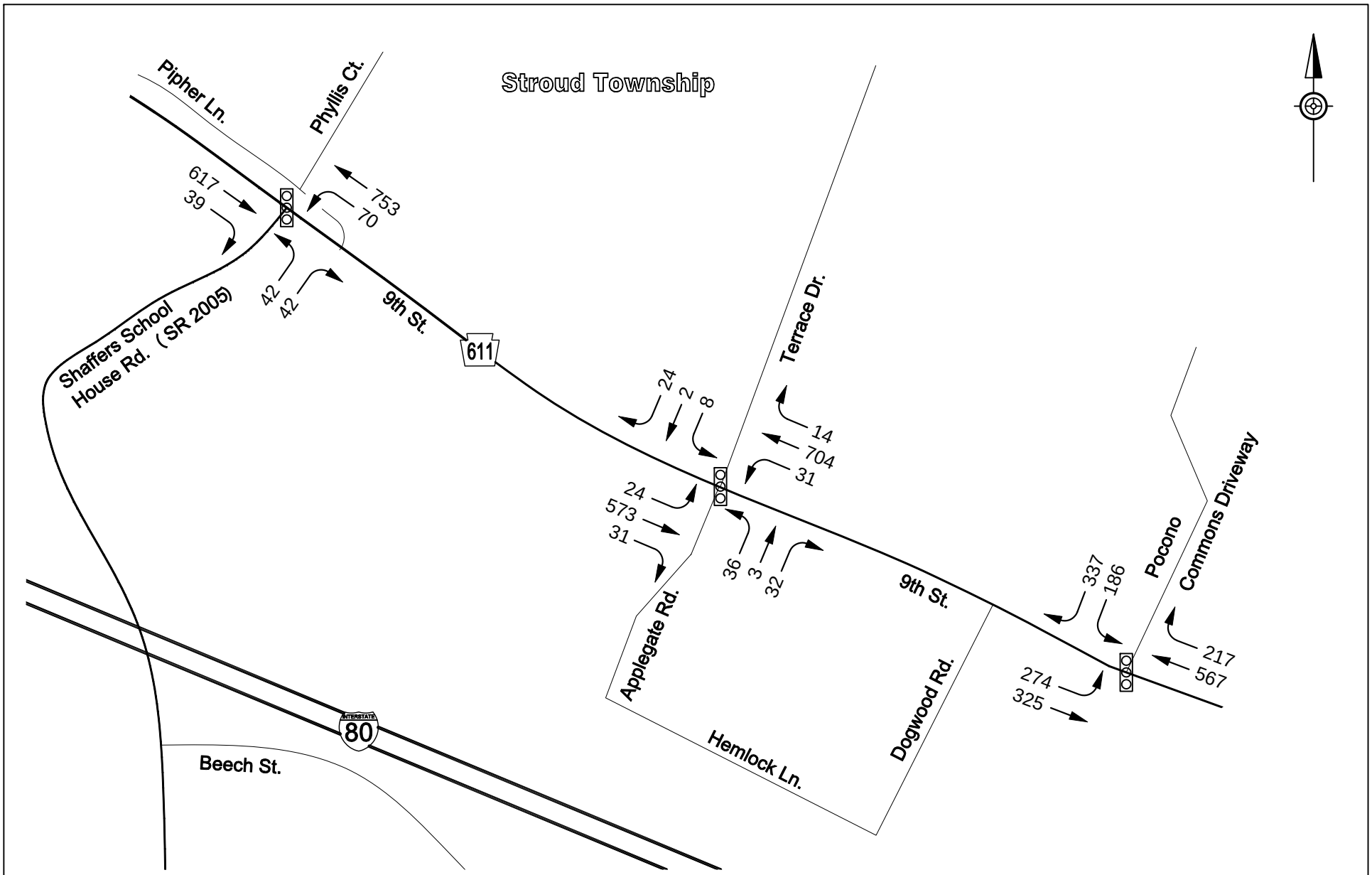
1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 6 ALTERNATIVE 1I A.M. PEAK HOUR 2045 TRAFFIC VOLUMES



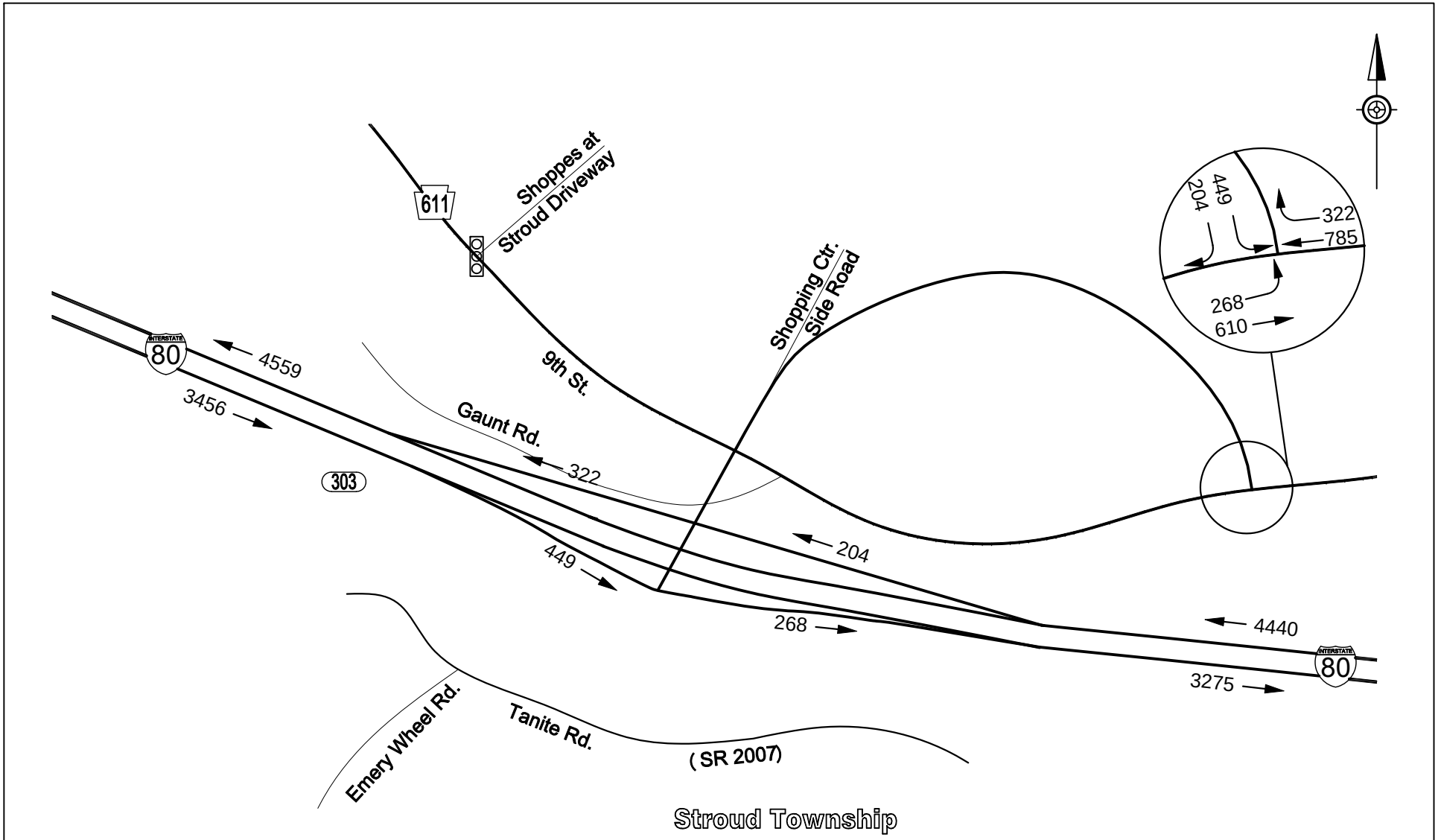
1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 7 ALTERNATIVE 1I A.M. PEAK HOUR 2045 TRAFFIC VOLUMES



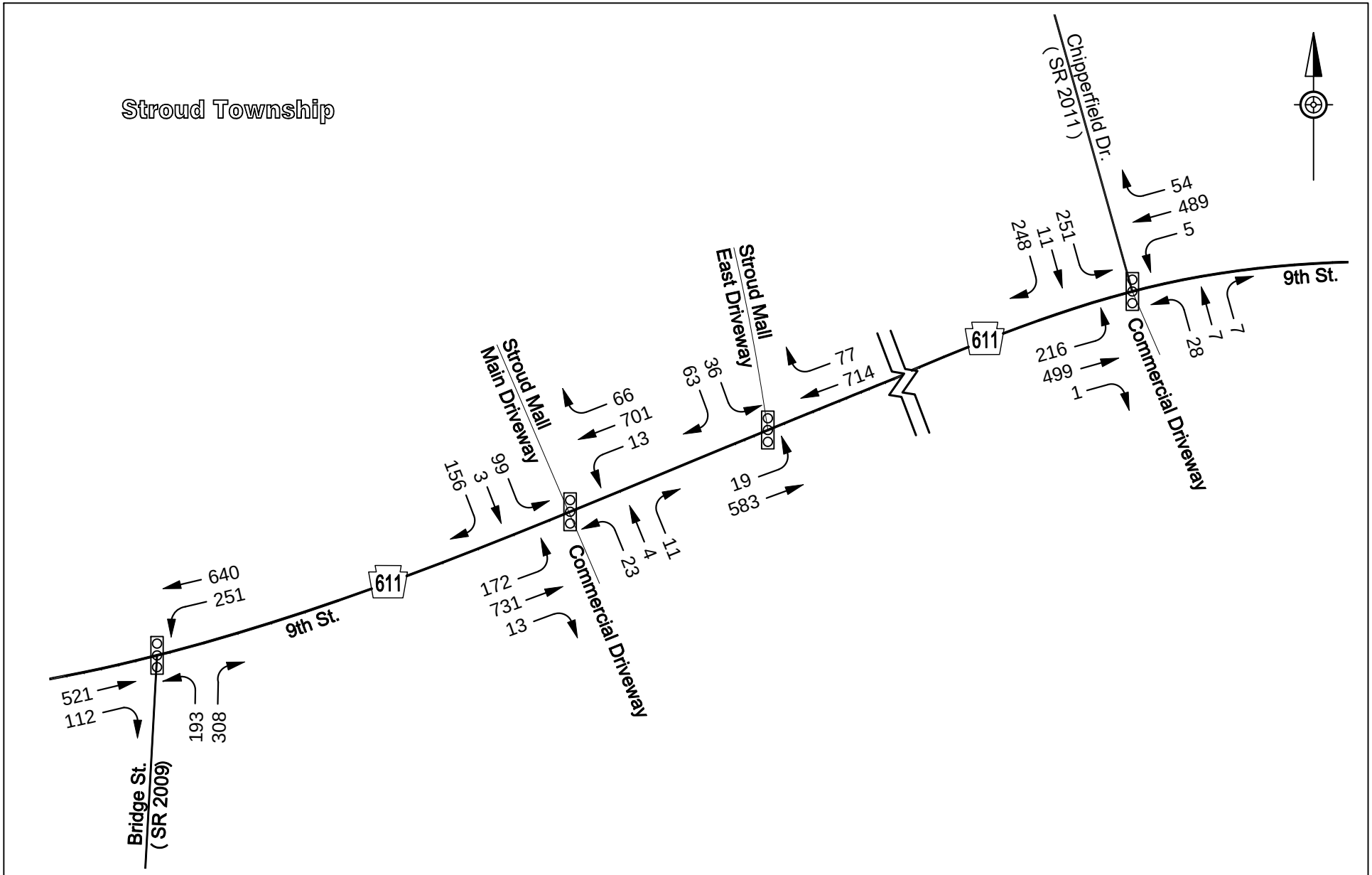
1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 8 ALTERNATIVE 1I A.M. PEAK HOUR 2045 TRAFFIC VOLUMES



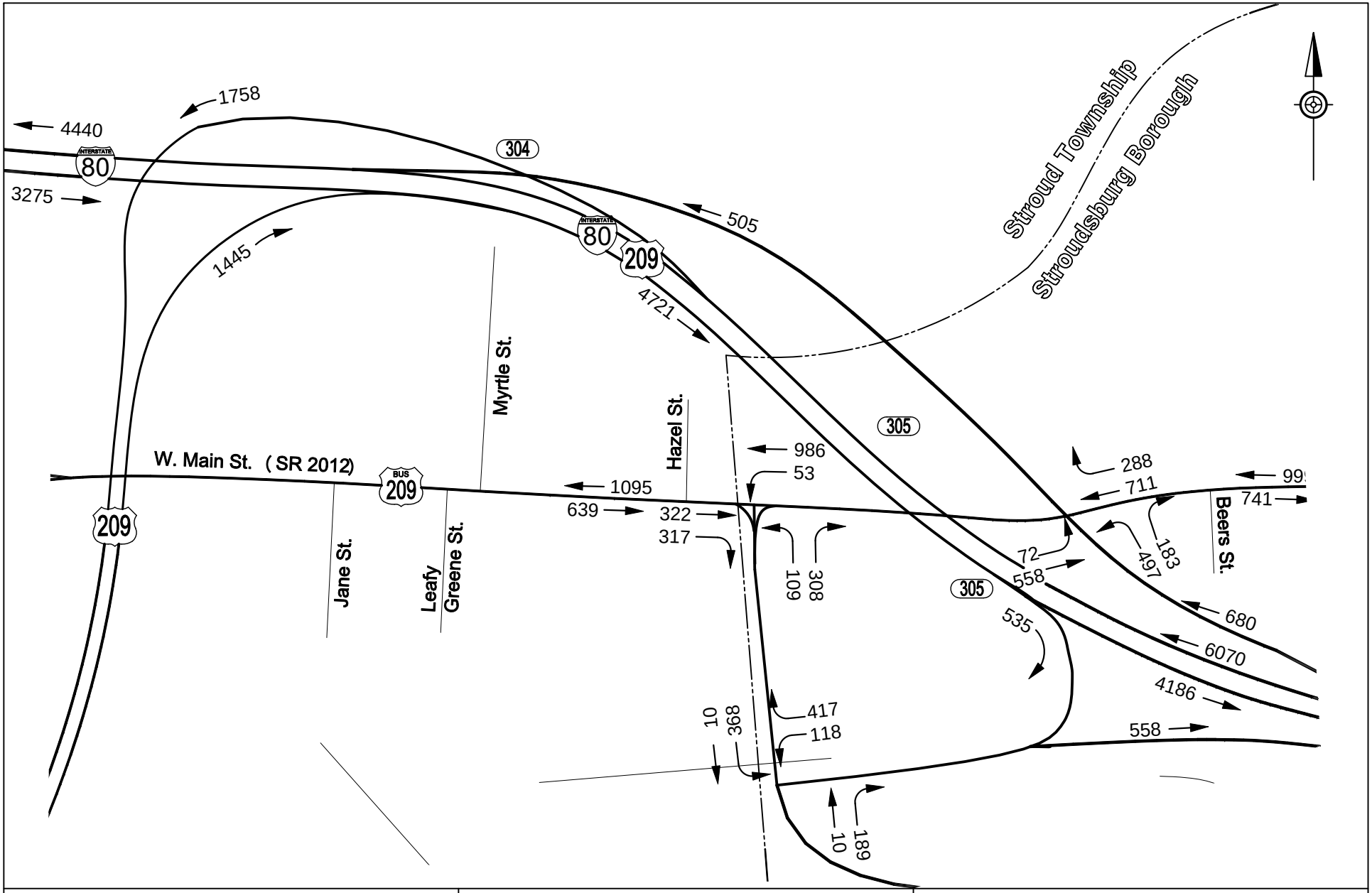
1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 9 ALTERNATIVE 1I P.M. PEAK HOUR 2045 TRAFFIC VOLUMES



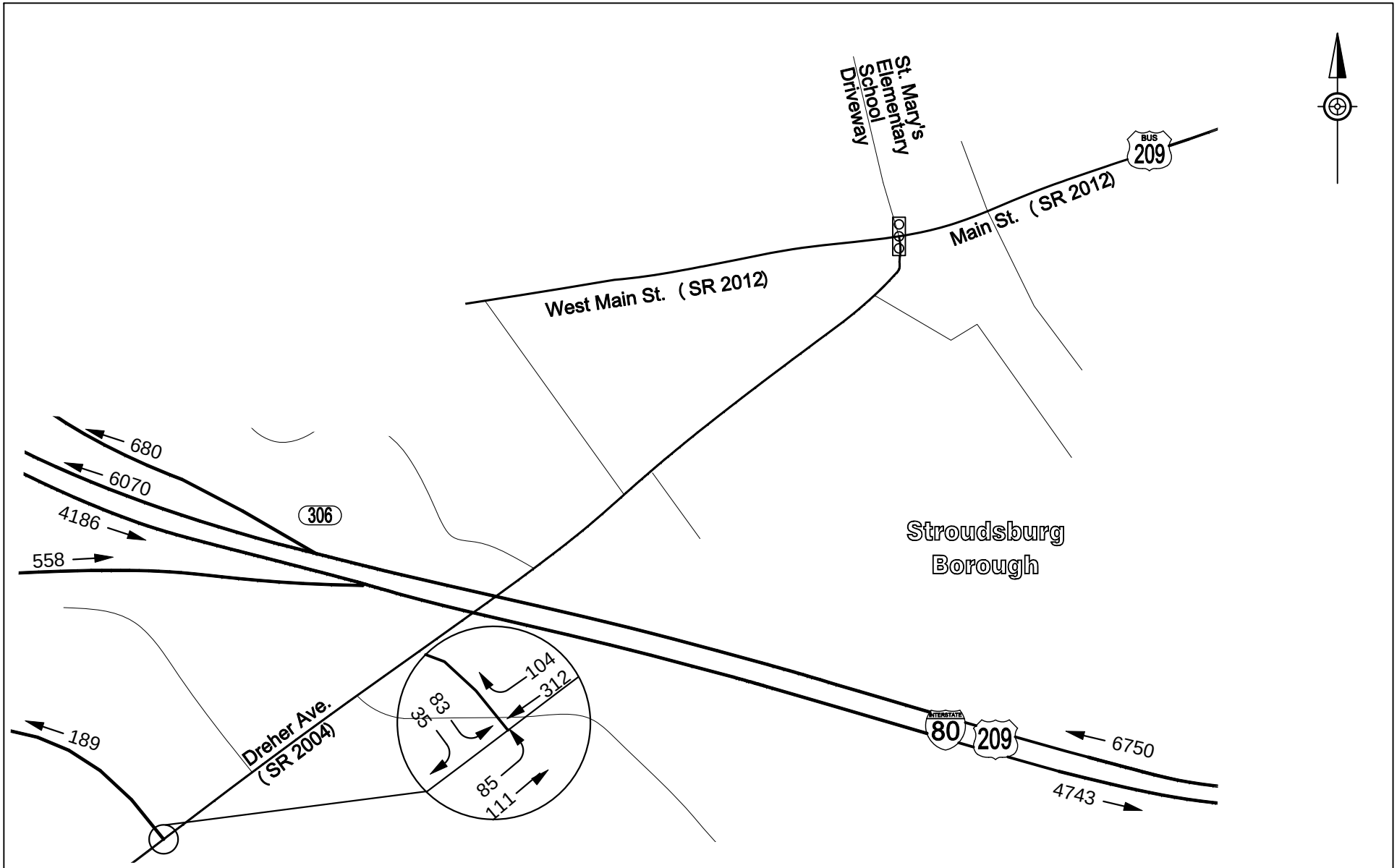
1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 10 ALTERNATIVE 1I P.M. PEAK HOUR 2045 TRAFFIC VOLUMES



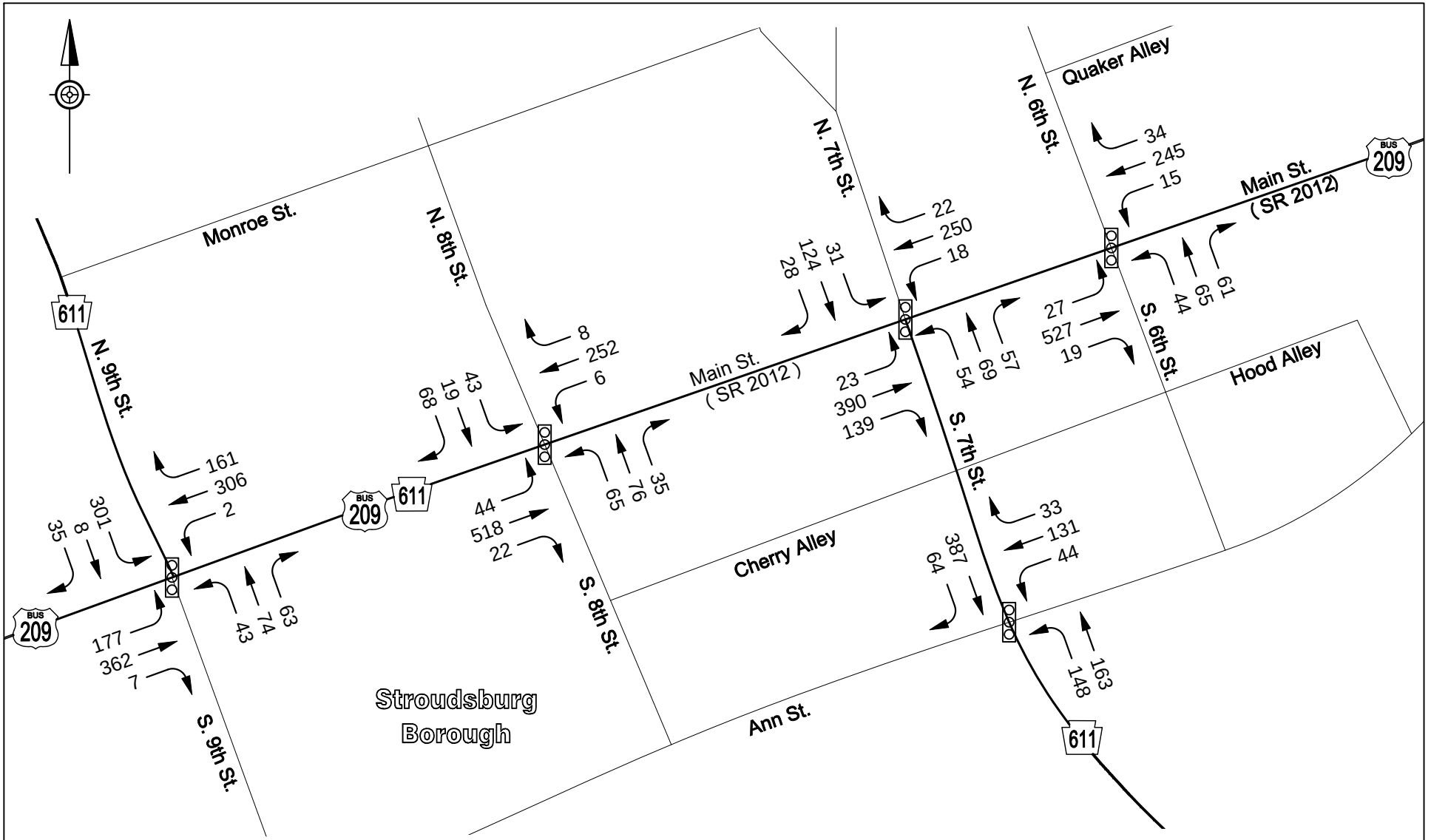
1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 11 ALTERNATIVE 1I P.M. PEAK HOUR 2045 TRAFFIC VOLUMES



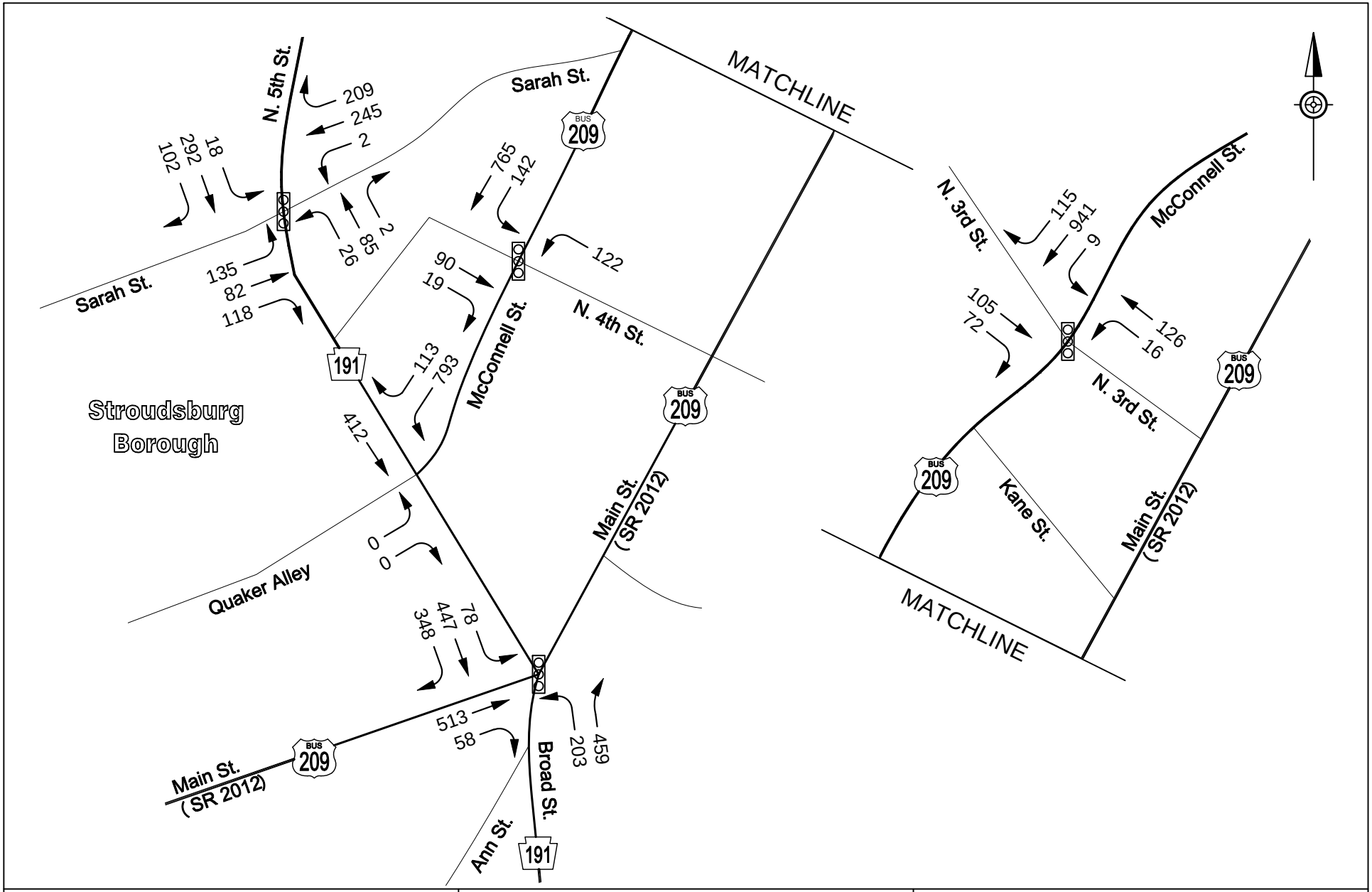
1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 12 ALTERNATIVE 1I P.M. PEAK HOUR 2045 TRAFFIC VOLUMES



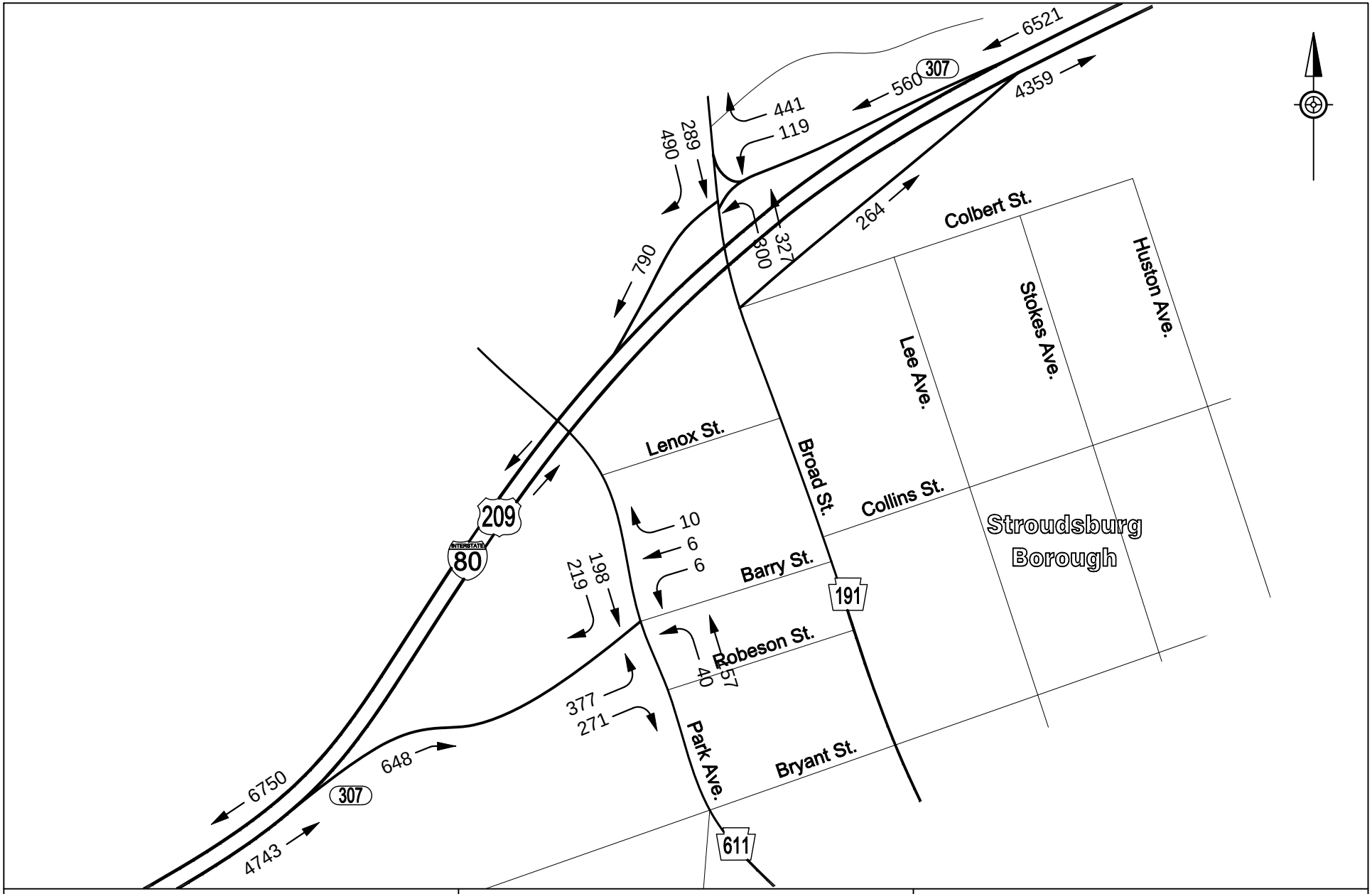
1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 13 ALTERNATIVE 1I P.M. PEAK HOUR 2045 TRAFFIC VOLUMES



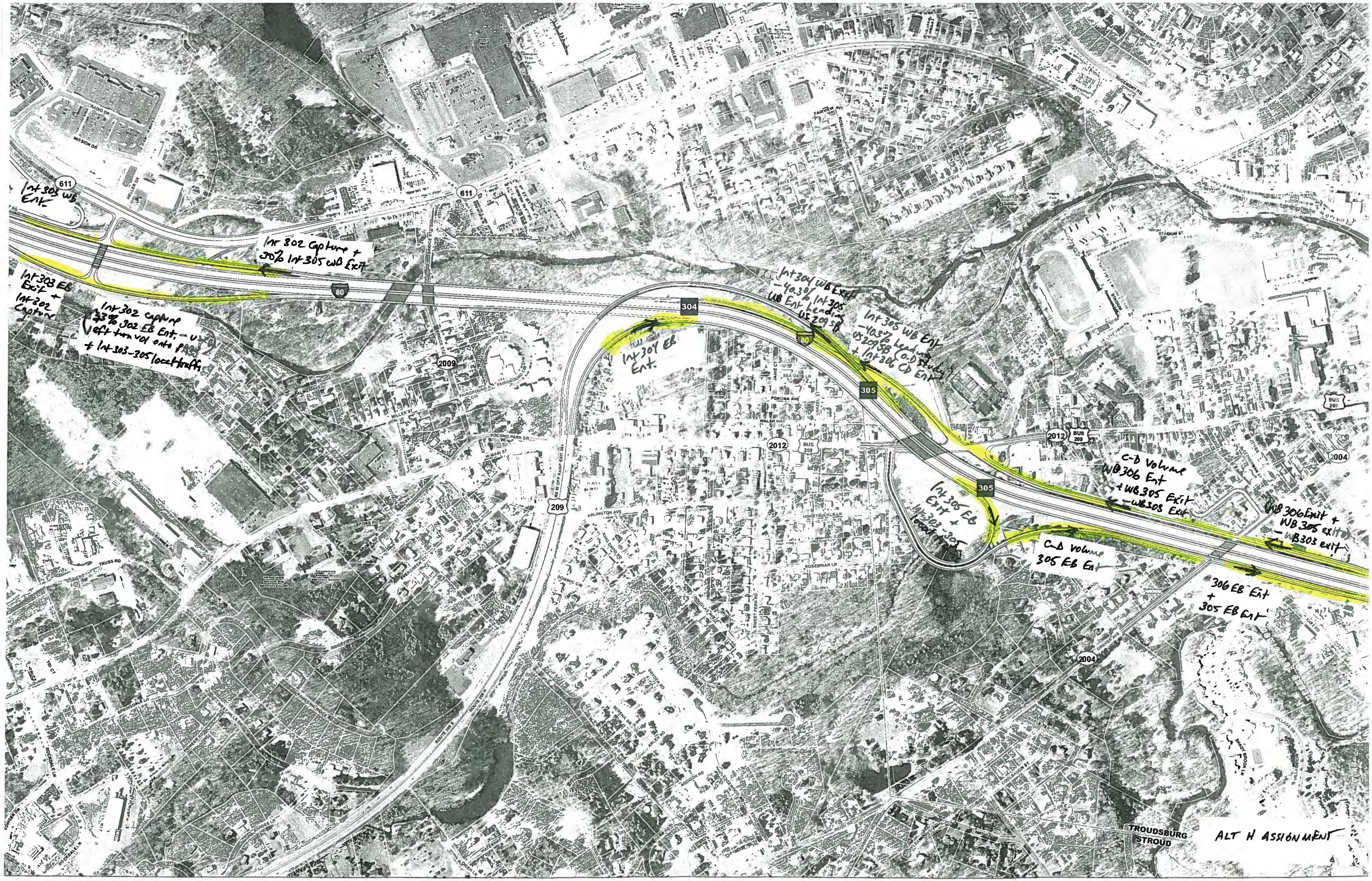
1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 14 ALTERNATIVE 1I P.M. PEAK HOUR 2045 TRAFFIC VOLUMES



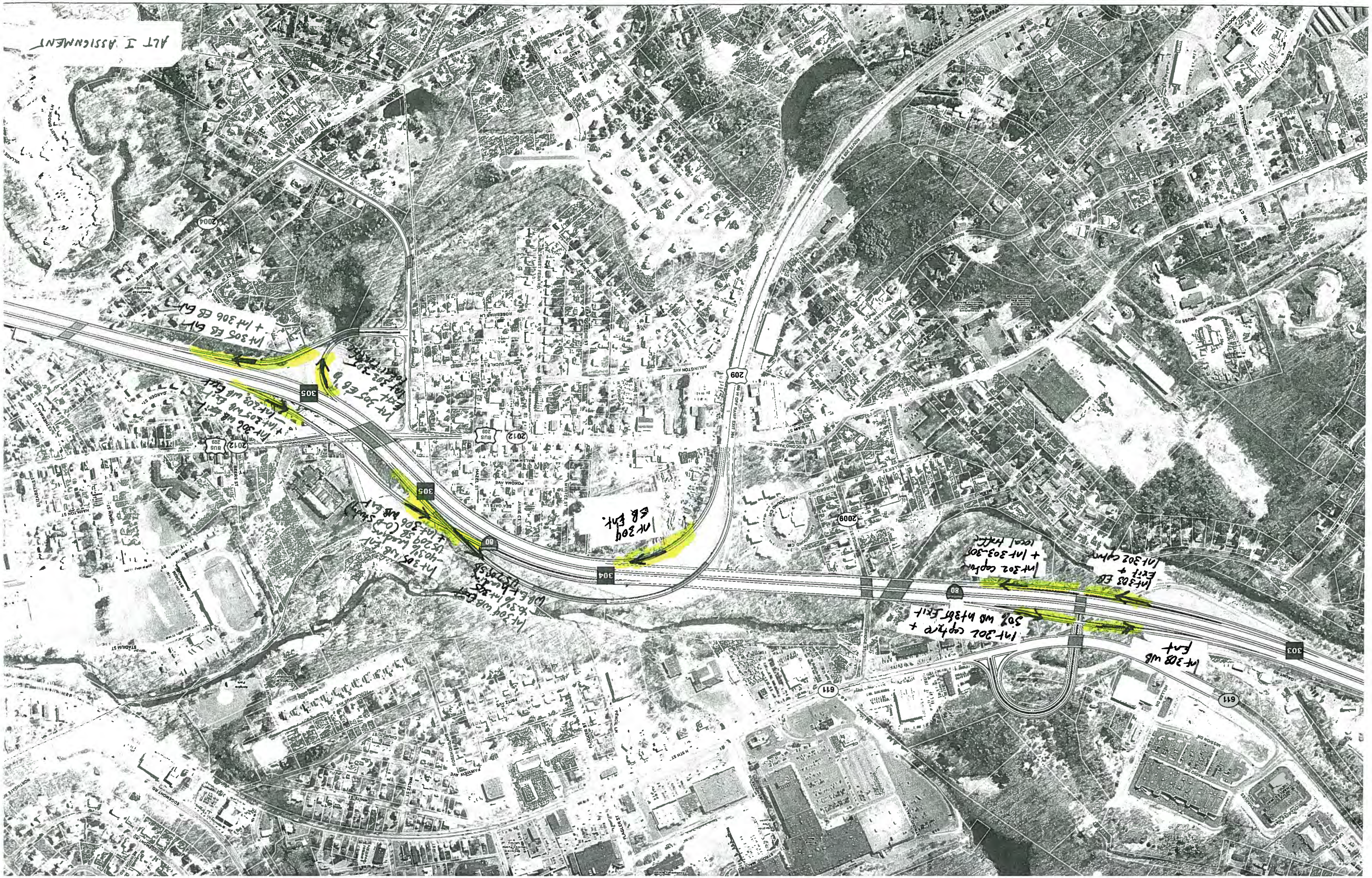
1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 15 ALTERNATIVE 1I P.M. PEAK HOUR 2045 TRAFFIC VOLUMES



1700 Market Street - Suite 1600 Philadelphia, PA 19103	I-80 Reconstruction Monroe County	FIGURE 16 ALTERNATIVE 1I P.M. PEAK HOUR 2045 TRAFFIC VOLUMES



Int 303 WB Ent.
Int 302 Capture + 30% Int 305 WB Exit
Int 303 EB Exit + Int 302 Capture
Int 302 capture 33% 302 EB Ent. - use left turn vol onto PASS + Int 303-305 local traffic
Int 304 WB Exit - 40.3% Int 305 WB Ent heading US 209 SB
Int 305 WB Ent - 40.3% heading US 209 SB (O-D Study) + Int 306 CD Ent
Int 304 EB Ent.
C-D Volume WB 306 Ent + WB 305 Exit - WB 303 Exit
(WB 306 Exit + WB 305 exit) - WB 303 exit
Int 305 EB Exit + Int 303-305 local traffic
C-D volume 305 EB Ent
306 EB Ent + 305 EB Ent
611
80
304
305
209
2009
2012
2004
BUS 209
STROUDSBURG
STROUD
ALT H ASSIGNMENT


ALT I ASSIGNMENT
Int 305 EB Ext
+ Int 306 EB Ext
Int 305 EB
Ext
+ Int 305 WB
Ext
+ Int 306 WB Ext
+ Int 305 WB Ext
Int 304 EB Ext.
Int 304 WB Ext
+ Int 305 WB Ext
+ Int 306 WB Ext
Int 302 capture
+ Int 303-305
local traffic
Int 303 EB
Ext +
Int 302 capture
Int 302 capture +
30% WB Int 305 Exit
Int 303 WB
Ext
305
304
303
80
209
2009
2012
2004
611

I-80 RECONSTRUCTION
Alt H AM Peak

I-80 SEGMENT / RAMP	DIR	ANALYSIS TYPE	EXISTING 2013 VOLUME	EXISTING ALT H VOLUME	NOTES	GROWTH RATE	ALT H 2025 VOLUME	ALT H 2045 VOLUME
Eastbound I-80 (West of Int 303)	EB	FREEWAY SEGMENT	1516	1457	Balance from West	0.02	1848	2746
Int 303 (EB Exit to PA611 Connector)	EB	DIVERGE	165	179	(Int 303 EB Exit) + (20% of 33% Int 302 EB Exit - Use Right Turn Vol onto PA611)	0.02	227	337
Int 303 (EB Entrance from PA611 Connector)	EB	MERGE	-	101	(33% Int 302 EB Entrance - Use Left Turn Vol onto PA33) + 13.6% for Int 302-305 EB traffic	0.02	128	190
Eastbound I-80 (between Int 303 - Int 304)	EB	FREEWAY SEGMENT	1351	1379	Balance from West	0.02	1749	2599
Int 304 (EB Exit to US209) (NOT IN ALT H)	EB	DIVERGE	-	-		0.02	-	-
Int 304 (EB Exit to Main St Bus 209) (NOT IN ALT H)	EB	DIVERGE	-	-		0.02	-	-
Int 304 (EB Entrance from Main St Bus 209) (NOT IN ALT H)	EB	MERGE	-	-		0.02	-	-
Int 304 (EB Entrance from US209)	EB	MERGE	834	834	(Int 304 EB Entrance)	0.02	1058	1572
Int 304 (US209SB Entrance from Main St Bus 209) (NOT IN ALT H)	SB	MERGE	-	-		0.02	-	-
Int 304 (US209NB Exit to Main St Bus 209) (NOT IN ALT H)	NB	DIVERGE	-	-		0.02	-	-
Eastbound I-80 (between Int 304 - Int 305)	EB	FREEWAY SEGMENT	2185	2213	Balance from West	0.02	2807	4170
Int 305 (EB Exit to Main St Bus 209)	EB	DIVERGE	209	237	Add 13.6% for Int 302-305 EB traffic	0.02	301	447
Int 305 Ramp (EB Entrance from Main St Bus 209) - CONNECTS TO 306	EB	MERGE	172	172		0.02	218	324
Eastbound I-80 (between Int 305 - Int 306)	EB	FREEWAY SEGMENT	2148	1976	Balance from West	0.02	2506	3724
Int 306 (EB Exit to Dreher Ave) (NOT IN ALT H)	EB	DIVERGE	-	-		0.02	-	-
Int 306 (EB Entrance from Dreher Ave)	EB	MERGE	116	288	(Int 306 EB Ent) + (Int 305 EB Entrance Ramp)	0.02	365	543
Eastbound I-80 (between Int 306 - Int 307)	EB	FREEWAY SEGMENT	2264	2264	Balance from West	0.02	2871	4267
Int 307A (EB Exit to Park Ave)	EB	DIVERGE	381	381	Constant	0.02	483	718
Int 307A (EB Entrance from Park Ave)	EB	MERGE	116	-	Reassigned to Int 307B	0.02	-	-
Eastbound I-80 (between Int 307A - Int 307B) (ALT)	EB	FREEWAY SEGMENT	-	1883	Balance from West	0.02	2388	3549
Int 307B (EB Entrance from PA191) (ALT)	EB	MERGE	-	116	Reassigned volume from eliminated Int 307A EB Entrance Ramp	0.02	147	219
Eastbound I-80 (East of Int 307)	EB	FREEWAY SEGMENT	1999	1999	Balance from West	0.02	2535	3767
Westbound I-80 (East of Int 307)	WB	FREEWAY SEGMENT	1659	1659	Balance from West	0.02	2104	3126
Int 307B (WB Exit to PA191)	WB	DIVERGE	191	191	Constant	0.02	242	360
Int 307B (WB Entrance from PA191)	WB	MERGE	251	251	Constant	0.02	318	473
Westbound I-80 (between Int 306 - Int 307)	WB	FREEWAY SEGMENT	1719	1719	Balance from West	0.02	2180	3240
Int 306 (WB Exit to Dreher Ave)	WB	DIVERGE	71	166	Combine with Int 305 WB Exit	0.02	211	313
Int 306 (WB Entrance from Dreher Ave)	WB	MERGE	-	40	(50% of Right Turns at Int 305 WB Ent)	0.02	51	75
Westbound I-80 (between Int 305 - Int 306)	WB	FREEWAY SEGMENT	1648	1553	Balance from West	0.02	1970	2927
Int 305 (WB Exit to Main St) (REMOVED IN ALT H - ALL EXIT 306)	WB	DIVERGE	151	95	(Int 305 WB Exit) - (Int 303 WB to PA611)	0.02	120	179
Int 305 (WB Entrance from Main St)	WB	MERGE	174	144	(Int 305 WB Entrance) - reduce by 40.3% heading Main209SB + Int 306 CD Entrance	0.02	183	271
Westbound I-80 (between Int 304 - Int 305)	WB	FREEWAY SEGMENT	1671	1602	Balance from West	0.02	2032	3019
Int 304 (WB Exit to US209)	WB	DIVERGE	543	473	Reduce by 305 Ent heading Main209SB	0.02	600	891
Int 304 (WB Entrance from US209) (NOT IN ALT H)	WB	MERGE	-	-		0.02	-	-
Westbound I-80 (between Int 303 - Int 304)	WB	FREEWAY SEGMENT	1128	1129	Balance from West	0.02	1432	2128
Int 303 (WB Exit to PA611) (ALT)	WB	DIVERGE	-	56	(5% Int 302 WB Exit Right Turn to PA611) + (30% Int 305 WB Exit - note 89% head west Bus209 PM Peak)	0.02	71	106
Int 303 (WB Entrance from PA611)	WB	MERGE	92	92	Constant	0.02	117	173
Westbound I-80 (West of Int 303)	WB	FREEWAY SEGMENT	1220	1165	Balance from West	0.02	1478	2195

I-80 RECONSTRUCTION
Alt 1H PM Peak

I-80 SEGMENT / RAMP	DIR	ANALYSIS TYPE	EXISTING 2013 VOLUME	EXISTING ALT H VOLUME	NOTES	GROWTH RATE	ALT H 2025 VOLUME	ALT H 2045 VOLUME
Eastbound I-80 (West of Int 303)	EB	FREEWAY SEGMENT	1922	1834	Balance from West	0.02	2326	3456
Int 303 (EB Exit to PA611 Connector)	EB	DIVERGE	218	238	(Int 303 EB Exit) + (20% of 33% Int 302 EB Exit - Use Right Turn Vol onto PA611)	0.02	302	449
Int 303 (EB Entrance from PA611 Connector)	EB	MERGE	-	142	(33% Int 302 EB Entrance - Use Left Turn Vol onto PA33) + 13.6% for Int 302-305 EB traffic	0.02	180	268
Eastbound I-80 (between Int 303 - Int 304)	EB	FREEWAY SEGMENT	1704	1738	Balance from West	0.02	2204	3275
Int 304 (EB Exit to US209) (NOT IN ALT H)	EB	DIVERGE	-	-		0.02	-	-
Int 304 (EB Exit to Main St Bus 209) (NOT IN ALT H)	EB	DIVERGE	-	-		0.02	-	-
Int 304 (EB Entrance from Main St Bus 209) (NOT IN ALT H)	EB	MERGE	-	-		0.02	-	-
Int 304 (EB Entrance from US209)	EB	MERGE	767	767	(Int 304 EB Entrance)	0.02	973	1445
Int 304 (US209SB Entrance from Main St Bus 209) (NOT IN ALT H)	SB	MERGE	-	-		0.02	-	-
Int 304 (US209NB Exit to Main St Bus 209) (NOT IN ALT H)	NB	DIVERGE		-		0.02	-	-
Eastbound I-80 (between Int 304 - Int 305)	EB	FREEWAY SEGMENT	2471	2505	Balance from West	0.02	3177	4721
Int 305 (EB Exit to Main St Bus 209)	EB	DIVERGE	250	284	Add 13.6% for Int 302-305 EB traffic	0.02	360	535
Int 305 Ramp (EB Entrance from Main St Bus 209) - CONNECTS TO 306	EB	MERGE	196	196		0.02	249	369
Eastbound I-80 (between Int 305 - Int 306)	EB	FREEWAY SEGMENT	2417	2221	Balance from West	0.02	2817	4186
Int 306 (EB Exit to Dreher Ave) (NOT IN ALT H)	EB	DIVERGE	-	-		0.02	-	-
Int 306 (EB Entrance from Dreher Ave)	EB	MERGE	100	296	(Int 306 EB Ent) + (Int 305 EB Entrance Ramp)	0.02	375	558
Eastbound I-80 (between Int 306 - Int 307)	EB	FREEWAY SEGMENT	2517	2517	Balance from West	0.02	3192	4743
Int 307A (EB Exit to Park Ave)	EB	DIVERGE	344	344	Constant	0.02	436	648
Int 307A (EB Entrance from Park Ave)	EB	MERGE	140	-	Reassigned to Int 307B	0.02	-	-
Eastbound I-80 (between Int 307A - Int 307B) (ALT)	EB	FREEWAY SEGMENT	-	2173	Balance from West	0.02	2756	4095
Int 307B (EB Entrance from PA191) (ALT)	EB	MERGE	-	140	Reassigned volume from eliminated Int 307A EB Entrance Ramp	0.02	178	264
Eastbound I-80 (East of Int 307)	EB	FREEWAY SEGMENT	2313	2313	Balance from West	0.02	2933	4359
Westbound I-80 (East of Int 307)	WB	FREEWAY SEGMENT	3460	3460	Balance from West	0.02	4388	6521
Int 307B (WB Exit to PA191)	WB	DIVERGE	297	297	Constant	0.02	377	560
Int 307B (WB Entrance from PA191)	WB	MERGE	419	419	Constant	0.02	531	790
Westbound I-80 (between Int 306 - Int 307)	WB	FREEWAY SEGMENT	3582	3582	Balance from West	0.02	4543	6750
Int 306 (WB Exit to Dreher Ave)	WB	DIVERGE	161	361	Combine with Int 305 WB Exit	0.02	458	680
Int 306 (WB Entrance from Dreher Ave) CONNECTS TO 305	WB	MERGE	-	77	(50% of Right Turns at Int 305 WB Ent)	0.02	98	145
Westbound I-80 (between Int 305 - Int 306)	WB	FREEWAY SEGMENT	3421	3221	Balance from West	0.02	4085	6070
Int 305 (WB Exit to Main St)	WB	DIVERGE	308	200	(Int 305 WB Exit) - (Int 303 WB to PA611)	0.02	254	377
Int 305 (WB Entrance from Main St)	WB	MERGE	320	268	(Int 305 WB Entrance) - reduce by 40.3% heading Main209SB + Int 306 CD Entrance	0.02	340	505
Westbound I-80 (between Int 304 - Int 305)	WB	FREEWAY SEGMENT	3433	3289	Balance from West	0.02	4171	6198
Int 304 (WB Exit to US209)	WB	DIVERGE	1062	933	Reduce by 305 Ent heading Main209SB	0.02	1183	1758
Int 304 (WB Entrance from US209) (NOT IN ALT H)	WB	MERGE	-	-		0.02	-	-
Westbound I-80 (between Int 303 - Int 304)	WB	FREEWAY SEGMENT	2371	2356	Balance from West	0.02	2988	4440
Int 303 (WB Exit to PA611) (ALT)	WB	DIVERGE	-	108	(5% Int 302 WB Exit Right Turn to PA611) + (30% Int 305 WB Exit - note 89% head west Bus209 PM Peak)	0.02	137	204
Int 303 (WB Entrance from PA611)	WB	MERGE	171	171	Constant	0.02	217	322
Westbound I-80 (West of Int 303)	WB	FREEWAY SEGMENT	2542	2419	Balance from West	0.02	3068	4559

2045 BUILD PEAK HOUR LEVELS OF SERVICE
FREEWAY SEGMENTS

AM PEAK HOUR									
Location	**Existing**	**No Build**	**Build Option A**	**Build Option B**	**Build Option C**	**Build Option F**	**Build Option G**	**Build Option H**	**Build Option I**
I-80 EB between Int. 302 and 303	-	D	D	D	D	D	D	D	D
I-80 EB between Int. 303 and 304	B	C	B	B	B	B	B	B	B
I-80 EB between Int. 304 and 305	C	F	C	C	C	C	C	C	C
I-80 EB between Int. 305 and 306	C	F							
I-80 EB between Int. 306 and 307	C	F	C	C	C	C	C	B	B
I-80 EB between Int. 307 and 308	-	F	C	C	C	C	C	C	C
I-80 WB between Int. 308 to Int. 307	-	E	B	B	B	B	B	B	B
I-80 WB between Int. 307 and 306	B	E	C	C	C	C	C	C	C
I-80 WB between Int. 306 and 305	B	D	B	B	B	B	B	B	B
I-80 WB between Int. 305 Diverge and 304 Diverge	-	-	-	B	B	-	-	-	-
I-80 WB Ramp/Auxiliary Int. 305 to Int. 304	-	-	B	-	-	-	-	-	-
I-80 WB between Int. 305 and 304	B	D	B	B	B	B	B	B	B
I-80 WB between Int. 305 Merge and 304 Merge	-	-	-	B	-	B	-	-	-
I-80 WB Ramp/Auxiliary Int. 304 to Int. 303 Exit	-	-	A	A	A	A	A	-	-
I-80 WB between Int. 304 and 303 (Mainline)	A	C	B	B	B	B	B	B	B
I-80 WB between Int. 303 and 302	-	C	C	C	C	C	C	C	C
X – LOS according to HCS+™									
X – LOS (Weave) according to HCS+™									

2045 BUILD PEAK HOUR LEVELS OF SERVICE
FREEWAY SEGMENTS

PM PEAK HOUR									
Location	**Existing**	**No Build**	**Build Option A**	**Build Option B**	**Build Option C**	**Build Option F**	**Build Option G**	**Build Option H**	**Build Option I**
I-80 EB between Int. 302 and 303	-	E	E	E	E	E	E	E	E
I-80 EB between Int. 303 and 304	B	E	C	C	C	C	C	C	C
I-80 EB between Int. 304 and 305	C	F	C	C	C	C	C	C	C
I-80 EB between Int. 305 and 306	C	F							
I-80 EB between Int. 306 and 307	C	F	C	C	C	C	C	C	C
I-80 EB between Int. 307 and 308	-	F	C	C	C	C	C	C	C
								-	-
I-80 WB between Int. 308 to Int. 307	-	F	E	E	E	E	E	E	E
I-80 WB between Int. 307 and 306	E	F	E	E	E	E	E	E	E
I-80 WB between Int. 306 and 305	E	F	E	E	E	E	E	D	D
I-80 WB between Int. 305 Diverge and 304 Diverge	-	-	-	D	D	-	-	-	-
I-80 WB Ramp/Auxiliary Int. 305 to Int. 304	-	-	D	-	-	-	-	-	-
I-80 WB between Int. 305 and 304	E	F	D	D	D	D	D	D	D
I-80 WB between Int. 305 Merge and 304 Merge	-	-	-	D	-	D	-	-	-
I-80 WB Ramp/Auxiliary Int. 304 to Int. 303 Exit	-	-	A	A	A	A	A	-	-
I-80 WB between Int. 304 and 303 (Mainline)	C	F	D	D	D	D	D	D	D
I-80 WB between Int. 303 and 302	-	F	F	F	F	F	F	F	F

X – LOS (Freeway Segment) according to HCS+™

X – LOS (Weave) according to HCS+™

2045 BUILD PEAK HOUR LEVELS OF SERVICE
RAMP MERGES

AM PEAK HOUR									
Location	**Existing**	**No Build**	**Build Option A**	**Build Option B**	**Build Option C**	**Build Option F**	**Build Option G**	**Build Option H**	**Build Option I**
I-80 EB Int. 303 from Rt. 611	-	-	B	B	B	B	B	B	B
I-80 EB Int. 304 from Rt. 209	C	F	-	-	-	-	-	-	-
I-80 EB Int. 305 from W. Main St.	C	F	-	-	-	-	-	-	-
I-80 EB Int. 306 from Dreher Ave.	D	F	-	-	-	-	-	-	-
I-80 EB Int. 307 from Park Ave.	C	F	-	-	-	-	-	-	-
I-80 WB Int. 303 from Rt. 611	B	C	C	C	C	B	B	C	-
I-80 WB Int. 304 from Rt. 209	-	-	B	B	B	B	B	-	-
I-80 WB Int. 305 from Main St	-	-	-	B	-	B	-	B	B
I-80 WB Int. 307 from Broad St.	C	E	-	-	-	-	-	-	-

PM PEAK HOUR									
Location	**Existing**	**No Build**	**Build Option A**	**Build Option B**	**Build Option C**	**Build Option F**	**Build Option G**	**Build Option H**	**Build Option I**
I-80 EB Int. 303 from Rt. 611	-	-	C	C	C	C	C	C	C
I-80 EB Int. 304 from Rt. 209	C	F	-	-	-	-	-	-	-
I-80 EB Int. 305 from W. Main St.	D	F	-	-	-	-	-	-	-
I-80 EB Int. 306 from Dreher Ave.	D	F	-	-	-	-	-	-	-
I-80 EB Int. 307 from Park Ave.	C	F	-	-	-	-	-	-	-
I-80 WB Int. 303 from Rt. 611	C	F	F	F	F	C	C	F	-
I-80 WB Int. 304 from Rt. 209	-	-	D	C	D	C	D	-	-
I-80 WB Int. 305 from Main St	-	-	-	C	-	C	-	D	D
I-80 WB Int. 307 from Broad St.	E	F	-	-	-	-	-	-	-

2045 BUILD PEAK HOUR LEVELS OF SERVICE
RAMP DIVERGES

AM PEAK HOUR									
Location	**Existing**	**No Build**	**Build Option A**	**Build Option B**	**Build Option C**	**Build Option F**	**Build Option G**	**Build Option H**	**Build Option I**
I-80 EB Int. 303 to Rt. 611	B	D	A	B	A	A	A	A	A
I-80 EB Int. 305 to W. Main St.	D	F	-	-	-	-	-	-	-
I-80 EB Int. 307 to Park Ave.	D	F	-	-	-	-	-	-	-
I-80 WB Int. 303 to Rt. 611	-	-	-	-	-	-	-	B	B
I-80 WB Int. 304 to Rt. 209	-	-	-	A	A	-	-	-	-
I-80 WB Int. 305 to W. Main St.	C	E	A	B	B	A	A	-	C
I-80 WB Int. 306 to Dreher Ave.	C	E	B	B	B	B	B	C	-
I-80 WB Int. 307 to Broad St.	C	E	-	-	-	-	-	-	-

PM PEAK HOUR									
Location	**Existing**	**No Build**	**Build Option A**	**Build Option B**	**Build Option C**	**Build Option F**	**Build Option G**	**Build Option H**	**Build Option I**
I-80 EB Int. 303 to Rt. 611	B	F	B	C	B	B	B	B	B
I-80 EB Int. 305 to W. Main St.	D	F	-	-	-	-	-	-	-
I-80 EB Int. 307 to Park Ave.	D	F	-	-	-	-	-	-	-
I-80 WB Int. 303 to Rt. 611	-	-	-	-	-	-	-	C	C
I-80 WB Int. 304 to Rt. 209	-	-	-	C	C	-	-	-	-
I-80 WB Int. 305 to W. Main St.	E	F	C	D	D	C	C	-	E
I-80 WB Int. 306 to Dreher Ave.	E	F	D	D	D	D	D	E	-
I-80 WB Int. 307 to Broad St.	E	F	-	-	-	-	-	-	-

2045 BUILD PEAK HOUR LEVELS OF SERVICE
RAMP TERMINUS INTERSECTIONS

AM PEAK HOUR								
Intersection	**No Build**	**Build Option A**	**Build Option B**	**Build Option C**	**Build Option F**	**Build Option G**	**Build Option H**	**Build Option I**
Int. 303 – Heller Dr Connector and I-80 EB Ramps (Unsignalized)	-	EB Approach C (15.3s)	EB Approach C (15.3s)	EB Approach C (15.3s)	EB Approach C (15.3s)	EB Approach C (15.3s)	EB Approach C (15.3s)	EB Approach C (15.3s)
Int. 303 – Heller Dr Connector and I-80 WB Ramps (Unsignalized)	-	WB Approach B (10.2s)	WB Approach B (10.2s)	WB Approach B (10.2s)	-	WB Approach B (10.2s)	WB Approach B (10.2s)	WB Approach B (10.2s)
Int 303 - Heller Dr Connector and PA611 (Alts 1A-1C, 1HSignalized)	-	Signalized C (26.3s)	Signalized C (26.3s)	Signalized C (26.3s)	-	-	Signalized C (23.4s)	-
Int 303 – Loop Access Rd and PA611 (Alts F, G, & I Signalized)	-	-	-	-	Signalized B (13.1s)	Signalized B (12.3s)	-	Signalized C (24.5s)
Int 304 – I-80 EB Off Ramp/US209 SB On Ramp and W. Main St	-	Unsignalized SBL Approach D (26.6s)	Unsignalized SBL Approach D (26.6s)	Unsignalized SBL Approach D (26.6s)	Unsignalized SBL Approach D (26.6s)	Unsignalized SBL Approach D (26.6s)	-	-
	-	Signalized B (16.3s)	Signalized B (16.3s)	Signalized B (16.3s)	Signalized B (16.3s)	Signalized B (16.3s)	-	-
Int 304 – I-80 EB On Ramp /US209 NB Off Ramp and W. Main St	-	Unsignalized NBL Approach D (26.6s)	Unsignalized NBL Approach D (26.6s)	Unsignalized NBL Approach D (26.6s)	Unsignalized NBL Approach D (26.6s)	Unsignalized NBL Approach D (26.6s)	-	-
	-	Signalized B (16.3s)	Signalized B (16.3s)	Signalized B (16.3s)	Signalized B (16.3s)	Signalized B (16.3s)	-	-
Int. 305 – W. Main St. and I-80 EB Ramps	NB Approach D (29.0s)	-	-	-	-	-	Unsignalized NB Approach C (21.4 s)	Unsignalized NB Approach C (20.1 s)
							Signalized B (11s)	Signalized B (11.5s)
Int. 305 – Dreher Connector Rd and I-80 EB Ramps (Unsignalized)	-	-	-	-	-	-	-	Unsignalized SB Approach D (25.2 s)

Int. 305 – W. Main St. and I-80 WB Ramps	Unsignalized SB Approach C (24.1s)	Unsignalized NBL Approach C (18.8s)	Unsignalized NBL Approach C (18.8s)	Unsignalized NBL Approach C (18.8s)	Unsignalized NBL Approach C (18.8s)	Unsignalized NBL Approach C (18.8s)	Unsignalized NBL Approach A (7s)	Unsignalized NBL Approach C (23.1s)
	Signalized D (47.0s)	Signalized D (47.0s)	Signalized D (47.0s)	Signalized D (47.0s)	Signalized D (47.0s)	Signalized D (47.0s)	Signalized B (16.1s)	Signalized B (16.0s)
Int. 306 – Dreher Ave. and I-80 EB On Ramp (+ Off Ramp, Alts A-G) (Unsignalized)	WBL Approach B (10.1s)	WBL Approach C (16.5s)	WBL Approach C (16.5s)	WBL Approach C (16.5s)	WBL Approach C (16.5s)	WBL Approach C (16.5s)	SB Approach A (7.6s)	-
Int. 306 – Dreher Ave. and I-80 WB Off Ramp and C-D Road	-	-	-	-	-	-	Unsignalized SB Approach C (15.7s)	-
							Signalized A (8.8s)	
Int. 307A – Park Ave. and I-80 EB Ramp (Unsignalized)	EB Approach D (29.2s)	EB Approach D (29.2s)	EB Approach D (29.2s)	-	EB Approach D (29.2s)	EB Approach D (29.2s)	EB Approach D (29.2s)	EB Approach D (29.2s)
Int. 307A – Lennox Ave. and I-80 EB Ramp	-	-	-	EB Approach D (35.4s)	-	-	-	-
Int. 307B – Broad St. and I-80 WB Ramps	Unsignalized WB Approach F (476s)	Unsignalized WB Approach F (476s)	Unsignalized WB Approach F (476s)	Unsignalized WB Approach F (476s)	Unsignalized WB Approach F (476s)	Unsignalized WB Approach F (476s)	Unsignalized WB Approach F (476s)	Unsignalized WB Approach F (476s)
	Signalized C (30.1s)	Signalized C (30.1s)	Signalized C (30.1s)	Signalized C (30.1s)	Signalized C (30.1s)	Signalized C (30.1s)	Signalized C (30.1s)	Signalized C (30.1s)
Int. 307B – Broad St. and I-80 EB Ramp (Unsignalized)	-	Unsignalized A (3.6s)	Unsignalized A (3.6s)	Unsignalized A (3.6s)	Unsignalized A (3.6s)	Unsignalized A (3.6s)	Unsignalized A (3.6s)	Unsignalized A (3.6s)

Note: All Signalized Intersection Level of Service results reported in accordance with HCM 2010.

2045 BUILD PEAK HOUR LEVELS OF SERVICE
RAMP TERMINUS INTERSECTIONS

PM PEAK HOUR								
Intersection	**No Build**	**Build Option A**	**Build Option B**	**Build Option C**	**Build Option F**	**Build Option G**	**Build Option H**	**Build Option I**
Int. 303 – Heller Dr Connector and I-80 EB Ramps (Unsignalized)	-	EB Approach D (27.9s)	EB Approach D (27.9s)	EB Approach D (27.9s)	EB Approach D (27.9)	EB Approach D (27.9s)	EB Approach D (27.9s)	EB Approach D (27.9s)
Int. 303 – Heller Dr Connector and I-80 WB Ramps (Unsignalized)	-	WB Approach B (12.0s)	WB Approach B (12.0s)	WB Approach B (12.0s)	-	WB Approach B (12.0s)	WB Approach B (12.0s)	WB Approach B (12.0s)
Int 303 - Heller Dr Connector and PA611	-	Signalized D (43.2s)	Signalized D (43.2s)	Signalized D (43.2s)	-	-	Signalized C (26.9s)	-
Int 303 – Loop Connector Rd and PA611 (Alts F, G, & I Signalized)	-	-	-	-	Signalized B (12.6s)	Signalized B (15.8s)	-	Signalized C (34.0s)
Int 304 – I-80 EB Off Ramp/US209 SB On Ramp and W. Main St	-	Unsignalized SBL Approach F (88.1s)	Unsignalized SBL Approach F (88.1s)	Unsignalized SBL Approach F (88.1s)	Unsignalized SBL Approach F (88.1s)	Unsignalized SBL Approach F (88.1s)	-	-
	-	Signalized B (14.4s)	Signalized B (14.4s)	Signalized B (14.4s)	Signalized B (14.4s)	Signalized B (14.4s)	-	-
Int 304 – I-80 EB On Ramp /US209 NB Off Ramp and W. Main St	-	Unsignalized SBL Approach F (63.8s)	Unsignalized SBL Approach F (63.8s)	Unsignalized SBL Approach F (63.8s)	Unsignalized SBL Approach F (63.8s)	Unsignalized SBL Approach F (63.8s)	-	-
	-	Signalized B (14.4s)	Signalized B (14.4s)	Signalized B (14.4s)	Signalized B (14.4s)	Signalized B (14.4s)	-	-
Int. 305 – W. Main St. and I-80 EB Ramps	NB Approach F (1206s)	-	-	-	-	-	NB Approach F (264s)	NB Approach F (163s)
							Signalized B (15.7s)	Signalized B (15.9s)
Int. 305 – Dreher Connector Rd and I-80 EB Ramps (Unsignalized)	-	-	-	-	-	-	-	Unsignalized SB Approach D (33.8 s)

Int. 305 – W. Main St. and I-80 WB Ramps	SB Approach F (1175s)	NBL Approach F (234.2s)	NBL Approach F (234.2s)	NBL Approach F (234.2s)	NBL Approach F (234.2s)	NBL Approach F (234.2s)	NB Approach F (1168s)	NB Approach F (2100s)
	Signalized C (24.6s)	Signalized C (24.6s)	Signalized C (24.6s)	Signalized C (24.6s)	Signalized C (24.6s)	Signalized C (24.6s)	Signalized D (45.4s)	Signalized E (74s)
Int. 306 – Dreher Ave. and I-80 EB On Ramp (+ Off Ramp, Alts A-G) (Unsignalized)	WBL Approach A (9.8s)	WBL Approach C (19.8s)	WBL Approach C (19.8s)	WBL Approach C (19.8s)	WBL Approach C (19.8s)	WBL Approach C (19.8s)	SB Approach A (5.2s)	-
Int. 306 – Dreher Ave. and I-80 WB Off Ramp and C-D Road	-	-	-	-	-	-	Unsignalized WB Approach F (181)	-
							Signalized B (13.3s)	
Int. 307A – Park Ave. and I-80 EB Ramp (Unsignalized)	EB Approach D (32.4s)	EB Approach D (32.4s)	EB Approach D (32.4s)	-	EB Approach D (32.4s)	EB Approach D (32.4s)	EB Approach D (32.4s)	EB Approach D (32.4s)
Int. 307A – Lennox Ave. and I-80 EB Ramp (Unsignalized)	-	-	-	EB Approach D (34.1s)	-	-	-	-
Int. 307B – Broad St. and I-80 WB Ramps	Unsignalized F (2775s)	Unsignalized F (2775s)	Unsignalized F (2775s)	Unsignalized F (2775s)	Unsignalized F (2775s)	Unsignalized F (2775s)	Unsignalized F (2775s)	Unsignalized F (2775s)
	Signalized E (70.7s)	Signalized E (70.7s)	Signalized E (70.7s)	Signalized E (70.7s)	Signalized E (70.7s)	Signalized E (70.7s)	Signalized E (70.7s)	Signalized E (70.7s)
Int. 307B – Broad St. and I-80 EB Ramp (Unsignalized)	-	Unsignalized B (2.7s)	Unsignalized B (2.7s)	Unsignalized B (2.7s)	Unsignalized B (2.7s)	Unsignalized B (2.7s)	Unsignalized B (2.7s)	Unsignalized B (2.7s)

Note: All Signalized Intersection Level of Service results reported in accordance with HCM 2010.

BUILD ALTERNATIVE ANALYSIS (ALTERNATIVES H, I)

Build Alternatives Analysis Notes:

Alternative H analysis performed as baseline alternatives analysis for H & I alternatives.

For Alternative I, analysis uses Alternative H as baseline, incorporating any modified ramp junction, weave section, or intersection analysis as applicable.

FREEWAY SEGMENT HCS ANALYSIS

BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*JRE*	Highway/Direction of Travel	*I-80 Eastbound*
Agency or Company	*AECOM*	From/To	*Between Ints. 302 and 303*
Date Performed		Jurisdiction	
Analysis Time Period	*A.M. Peak Hour*	Analysis Year	*Alt1H 2045*

Project Description *Interstate 80 Reconstruction*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*2746*	veh/h	Peak-Hour Factor, PHF	*0.94*
AADT		veh/day	%Trucks and Buses, P_T	*10*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.862*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD	*1.67*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*5.0*	mph
FFS	*70.4*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1784*	pc/h/ln
S	*66.0*	mph
D = v_p / S	*27.0*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 10-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*JRE*	Highway/Direction of Travel	*I-80 Eastbound*
Agency or Company	*AECOM*	From/To	*Between Ints. 302 and 303*
Date Performed	*1/3/2014*	Jurisdiction	
Analysis Time Period	*P.M. Peak Hour*	Analysis Year	*Alt1H 2045*

Project Description *Interstate 80 Reconstruction*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3456*	veh/h	Peak-Hour Factor, PHF	*0.94*
AADT		veh/day	%Trucks and Buses, P_T	*12*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.840*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD	*1.67*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*5.0*	mph
FFS	*70.4*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2303*	pc/h/ln
S	*55.9*	mph
D = v_p / S	*41.2*	pc/mi/ln
LOS	*E*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*JRE*
Agency or Company	*AECOM*
Date Performed	*1/3/2014*
Analysis Time Period	*A.M. Peak Hour*

Site Information

Highway/Direction of Travel	*I-80 Eastbound*
From/To	*Between Ints. 303 and 304*
Jurisdiction	
Analysis Year	*Alt1H 2045*

Project Description *Interstate 80 Reconstruction*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*2599*	veh/h	Peak-Hour Factor, PHF	*0.94*
AADT		veh/day	%Trucks and Buses, P_T	*10*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.862*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD	*1.67*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*5.0*	mph
FFS	*70.4*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1125*	pc/h/ln
S	*70.0*	mph
D = v_p / S	*16.1*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 10-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*JRE*	Highway/Direction of Travel	*I-80 Eastbound*
Agency or Company	*AECOM*	From/To	*Between Ints. 303 and 304*
Date Performed	*1/3/2014*	Jurisdiction	
Analysis Time Period	*P.M. Peak Hour*	Analysis Year	*Alt1H 2045*

Project Description *Interstate 80 Reconstruction*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*3275*	veh/h	Peak-Hour Factor, PHF	*0.94*
AADT		veh/day	%Trucks and Buses, P_T	*12*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.840*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD	*1.67*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*5.0*	mph
FFS	*70.4*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1455*	pc/h/ln
S	*69.2*	mph
D = v_p / S	*21.0*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 10-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*JRE*	Highway/Direction of Travel	*I-80 Westbound*
Agency or Company	*AECOM*	From/To	*Between Ints. 302 and 303*
Date Performed	*1/3/2014*	Jurisdiction	
Analysis Time Period	*A.M. Peak Hour*	Analysis Year	*Alt1H 2045*

Project Description *Interstate 80 Reconstruction*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*2195*	veh/h	Peak-Hour Factor, PHF	*0.97*
AADT		veh/day	%Trucks and Buses, P_T	*12*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.840*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD	*1.67*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*5.0*	mph
FFS	*70.4*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1417*	pc/h/ln
S	*69.5*	mph
D = v_p / S	*20.4*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*JRE*
Agency or Company	*AECOM*
Date Performed	*1/3/2014*
Analysis Time Period	*P.M. Peak Hour*

Site Information

Highway/Direction of Travel	*I-80 Westbound*
From/To	*Between Ints. 302 and 303*
Jurisdiction	
Analysis Year	*Alt1H 2045*

Project Description *Interstate 80 Reconstruction*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4559*	veh/h	Peak-Hour Factor, PHF	*0.97*
AADT		veh/day	%Trucks and Buses, P_T	*13*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.830*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD	*1.67*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*5.0*	mph
FFS	*70.4*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2981*	pc/h/ln
S	*33.2*	mph
D = v_p / S	*89.8*	pc/mi/ln
LOS	*F*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 10-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*JRE*	Highway/Direction of Travel	*I-80 Westbound*
Agency or Company	*AECOM*	From/To	*Between Ints. 303 and 304*
Date Performed	*8/1/2013*	Jurisdiction	
Analysis Time Period	*A.M. Peak Hour*	Analysis Year	*Alt1H 2045*

Project Description *Interstate 80 Reconstruction*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*2128*	veh/h	Peak-Hour Factor, PHF	*0.97*
AADT		veh/day	%Trucks and Buses, P_T	*12*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.840*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD	*1.67*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*5.0*	mph
FFS	*70.4*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*916*	pc/h/ln
S	*70.0*	mph
D = v_p / S	*13.1*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 10-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*JRE*
Agency or Company	*AECOM*
Date Performed	*1/3/2014*
Analysis Time Period	*P.M. Peak Hour*

Site Information

Highway/Direction of Travel	*I-80 Westbound*
From/To	*Between Ints. 303 and 304*
Jurisdiction	
Analysis Year	*Alt1H 2045*

Project Description *Interstate 80 Reconstruction*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*4440*	veh/h	Peak-Hour Factor, PHF	*0.97*
AADT		veh/day	%Trucks and Buses, P_T	*13*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.830*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD	*1.67*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*5.0*	mph
FFS	*70.4*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1935*	pc/h/ln
S	*63.7*	mph
D = v_p / S	*30.4*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 10-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*JRE*
Agency or Company	*AECOM*
Date Performed	*1/3/2014*
Analysis Time Period	*A.M. Peak Hour*

Site Information

Highway/Direction of Travel	*I-80 Westbound*
From/To	*Between Ints. 304 and 306*
Jurisdiction	
Analysis Year	

Project Description *Interstate 80 Reconstruction*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*2927*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*12*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.840*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*4*	
Total Ramp Density, TRD	*1.67*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*5.0*	mph
FFS	*70.4*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*965*	pc/h/ln
S	*70.0*	mph
D = v_p / S	*13.8*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 10-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*JRE*	Highway/Direction of Travel	*I-80 Westbound*
Agency or Company	*AECOM*	From/To	*Between Ints. 304 and 306*
Date Performed	*1/3/2014*	Jurisdiction	
Analysis Time Period	*P.M. Peak Hour*	Analysis Year	*Alt1H 2045*

Project Description *Interstate 80 Reconstruction*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*6070*	veh/h	Peak-Hour Factor, PHF	*0.97*
AADT		veh/day	%Trucks and Buses, P_T	*13*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.830*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*4*	
Total Ramp Density, TRD	*1.67*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*5.0*	mph
FFS	*70.4*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1984*	pc/h/ln
S	*62.9*	mph
D = v_p / S	*31.6*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 10-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*JRE*
Agency or Company	*AECOM*
Date Performed	*8/1/2013*
Analysis Time Period	*P.M. Peak Hour*

Site Information

Highway/Direction of Travel	*I-80 Westbound*
From/To	*Between Ints. 305 and 306*
Jurisdiction	
Analysis Year	*Alt1H 2045*

Project Description *Interstate 80 Reconstruction*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*6070*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*13*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.830*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*4*	
Total Ramp Density, TRD	*1.50*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*4.5*	mph
FFS	*70.9*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2005*	pc/h/ln
S	*62.5*	mph
D = v_p / S	*32.1*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 10-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*JRE*	Highway/Direction of Travel	*I-80 Westbound*
Agency or Company	*AECOM*	From/To	*Between Ints. 305 and 306*
Date Performed	*8/1/2013*	Jurisdiction	
Analysis Time Period	*A.M. Peak Hour*	Analysis Year	*Alt1H 2045*

Project Description *Interstate 80 Reconstruction*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*2927*	veh/h	Peak-Hour Factor, PHF	*0.93*
AADT		veh/day	%Trucks and Buses, P_T	*12*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*1*
Peak-Hr Direction Prop, D			General Terrain:	*Rolling*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*0.95*	E_R	*2.0*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.840*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*4*	
Total Ramp Density, TRD	*1.50*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*4.5*	mph
FFS	*70.9*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*986*	pc/h/ln
S	*70.0*	mph
D = v_p / S	*14.1*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

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FREEWAY WEAVING WORKSHEET

General Information

Analyst	JRE
Agency/Company	AECOM
Date Performed	1/3/2014
Analysis Time Period	A.M. Peak Hour

Site Information

Freeway/Dir of Travel	I-80 Eastbound
Weaving Segment Location	Between Ints 304 and 305
Analysis Year	Alt 1H 2045 AM

Project Description Interstate 80 Reconstruction

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	4	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_S	2223ft	Freeway maximum capacity, C_{IFL}	2300
Freeway free-flow speed, FFS	60 mph	Terrain type	Rolling

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	2338	0.97	10	0	2.5	2.0	0.870	1.00	2772
V_{RF}	1385	0.97	2	0	2.5	2.0	0.971	1.00	1471
V_{FR}	260	0.97	2	0	2.5	2.0	0.971	1.00	276
V_{RR}	187	0.97	13	0	2.5	2.0	0.837	1.00	230
V_{NW}	3002							V =	4130
V_W	1747								
VR	0.368								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	0 lc/h
Interchange density, ID	0.0 int/mi	Weaving lane changes, LC_W	274 lc/h
Minimum RF lane changes, LC_{RF}	0 lc/pc	Non-weaving lane changes, LC_{NW}	1053 lc/h
Minimum FR lane changes, LC_{FR}	0 lc/pc	Total lane changes, LC_{ALL}	1327 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	0

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	4130 veh/h	Weaving intensity factor, W	0.150
Weaving segment capacity, c_w	5673 veh/h	Weaving segment speed, S	54.2 mph
Weaving segment v/c ratio	0.728	Average weaving speed, S_W	54.1 mph
Weaving segment density, D	21.9 pc/mi/ln	Average non-weaving speed, S_{NW}	54.3 mph
Level of Service, LOS	C	Maximum weaving length, L_{MAX}	6323 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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FREEWAY WEAVING WORKSHEET

General Information

Analyst	JRE
Agency/Company	AECOM
Date Performed	1/3/2014
Analysis Time Period	P.M. Peak Hour

Site Information

Freeway/Dir of Travel	I-80 Eastbound
Weaving Segment Location	Between Ints 304 and 305
Analysis Year	Alt 1H 2045 PM

Project Description Interstate 80 Reconstruction

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	4	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_S	2223ft	Freeway maximum capacity, C_{IFL}	2400
Freeway free-flow speed, FFS	70 mph	Terrain type	Rolling

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	3190	0.97	13	0	2.5	2.0	0.837	1.00	3930
V_{RF}	1273	0.97	2	0	2.5	2.0	0.971	1.00	1352
V_{FR}	363	0.97	2	0	2.5	2.0	0.971	1.00	385
V_{RR}	172	0.97	10	0	2.5	2.0	0.870	1.00	204
V_{NW}	4134							V =	4913
V_W	1737								
VR	0.296								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	0 lc/h
Interchange density, ID	0.0 int/mi	Weaving lane changes, LC_W	274 lc/h
Minimum RF lane changes, LC_{RF}	0 lc/pc	Non-weaving lane changes, LC_{NW}	1286 lc/h
Minimum FR lane changes, LC_{FR}	0 lc/pc	Total lane changes, LC_{ALL}	1560 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	0

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	4913 veh/h	Weaving intensity factor, W	0.171
Weaving segment capacity, c_w	6788 veh/h	Weaving segment speed, S	62.7 mph
Weaving segment v/c ratio	0.724	Average weaving speed, S_W	62.0 mph
Weaving segment density, D	23.4 pc/mi/ln	Average non-weaving speed, S_{NW}	63.0 mph
Level of Service, LOS	C	Maximum weaving length, L_{MAX}	5540 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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FREEWAY WEAVING WORKSHEET

General Information

Analyst	JRE
Agency/Company	AECOM
Date Performed	1/3/2014
Analysis Time Period	A.M. Peak Hour

Site Information

Freeway/Dir of Travel	I-80 Eastbound
Weaving Segment Location	Ints. 306 to 307
Analysis Year	Alt 1H 2045 AM

Project Description Interstate 80 Reconstruction

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	4	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_S	2400ft	Freeway maximum capacity, C_{IFL}	2400
Freeway free-flow speed, FFS	70 mph	Terrain type	Rolling

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	3006	0.97	10	0	2.5	2.0	0.870	1.00	3564
V_{RF}	543	0.97	2	0	2.5	2.0	0.971	1.00	577
V_{FR}	718	0.97	2	0	2.5	2.0	0.971	1.00	762
V_{RR}	0	0.97	10	0	2.5	2.0	0.870	1.00	0
V_{NW}	3564							V =	4264
V_W	1339								
VR	0.273								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	0 lc/h
Interchange density, ID	0.0 int/mi	Weaving lane changes, LC_W	286 lc/h
Minimum RF lane changes, LC_{RF}	0 lc/pc	Non-weaving lane changes, LC_{NW}	1265 lc/h
Minimum FR lane changes, LC_{FR}	0 lc/pc	Total lane changes, LC_{ALL}	1551 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	0

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	4264 veh/h	Weaving intensity factor, W	0.160
Weaving segment capacity, c_w	7576 veh/h	Weaving segment speed, S	63.6 mph
Weaving segment v/c ratio	0.563	Average weaving speed, S_W	62.4 mph
Weaving segment density, D	19.3 pc/mi/ln	Average non-weaving speed, S_{NW}	64.1 mph
Level of Service, LOS	B	Maximum weaving length, L_{MAX}	5297 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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FREEWAY WEAVING WORKSHEET

General Information

Analyst	JRE
Agency/Company	AECOM
Date Performed	1/3/2014
Analysis Time Period	P.M. Peak Hour

Site Information

Freeway/Dir of Travel	I-80 Eastbound
Weaving Segment Location	Between Ints 306 and 307
Analysis Year	Alt 1H 2045 AM

Project Description Interstate 80 Reconstruction

Inputs

Weaving configuration	One-Sided	Segment type	Freeway
Weaving number of lanes, N	4	Freeway minimum speed, S_{MIN}	15
Weaving segment length, L_S	2400ft	Freeway maximum capacity, C_{IFL}	2400
Freeway free-flow speed, FFS	70 mph	Terrain type	Rolling

Conversions to pc/h Under Base Conditions

	V (veh/h)	PHF	Truck (%)	RV (%)	E_T	E_R	f_{HV}	f_p	v (pc/h)
V_{FF}	3538	0.97	10	0	2.5	2.0	0.870	1.00	4195
V_{RF}	558	0.97	2	0	2.5	2.0	0.971	1.00	593
V_{FR}	648	0.97	2	0	2.5	2.0	0.971	1.00	688
V_{RR}	0	0.97	10	0	2.5	2.0	0.870	1.00	0
V_{NW}	4195							V =	4762
V_W	1281								
VR	0.234								

Configuration Characteristics

Minimum maneuver lanes, N_{WL}	2 lc	Minimum weaving lane changes, LC_{MIN}	0 lc/h
Interchange density, ID	0.0 int/mi	Weaving lane changes, LC_W	286 lc/h
Minimum RF lane changes, LC_{RF}	0 lc/pc	Non-weaving lane changes, LC_{NW}	1395 lc/h
Minimum FR lane changes, LC_{FR}	0 lc/pc	Total lane changes, LC_{ALL}	1681 lc/h
Minimum RR lane changes, LC_{RR}	lc/pc	Non-weaving vehicle index, I_{NW}	0

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment flow rate, v	4762 veh/h	Weaving intensity factor, W	0.171
Weaving segment capacity, c_w	7687 veh/h	Weaving segment speed, S	63.1 mph
Weaving segment v/c ratio	0.619	Average weaving speed, S_W	62.0 mph
Weaving segment density, D	21.7 pc/mi/ln	Average non-weaving speed, S_{NW}	63.4 mph
Level of Service, LOS	C	Maximum weaving length, L_{MAX}	4886 ft

Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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RAMP JUNCTION
HCS ANALYSIS

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JRE	Freeway/Dir of Travel	I-80 Eastbound
Agency or Company	AECOM	Junction	Int. 303 from Route 611
Date Performed	1/3/2014	Jurisdiction	
Analysis Time Period	A.M. Peak Hour	Analysis Year	Alt1H 2045

Project Description Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp: ☑ Yes ☐ On ☐ No ☑ Off

L_{up} = 1750 ft

V_u = 337 veh/h

Terrain: Rolling

S_{FF} = 70.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2599	0.94	Rolling	10	1	0.862	0.95	3376
Ramp	190	0.94	Rolling	5	1	0.922	0.95	231
UpStream	337	0.82	Rolling	2	0	0.971	0.95	446
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 533.10 (Equation 25-2 or 25-3)

P_{FM} = 0.599 using Equation (Exhibit 25-5)

V_{12} = 2021 pc/h

V_3 or V_{av34} 1355 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3607	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2252	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 18.2 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Determination

M_S = 0.306 (Exibit 25-19)

S_R = 61.4 mph (Exhibit 25-19)

S_0 = 66.9 mph (Exhibit 25-19)

S = 63.4 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_S = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JRE	Freeway/Dir of Travel	I-80 Eastbound
Agency or Company	AECOM	Junction	Int. 303 from Route 611
Date Performed	1/3/2014	Jurisdiction	
Analysis Time Period	P.M. Peak Hour	Analysis Year	Alt1H 2045

Project Description Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp: ☑ Yes ☐ On ☐ No ☑ Off

L_{up} = 1750 ft

V_u = 449 veh/h

Terrain: Rolling

S_{FF} = 70.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3275	0.94	Rolling	12	1	0.840	0.95	4364
Ramp	268	0.94	Rolling	2	1	0.962	0.95	312
UpStream	449	0.86	Rolling	3	0	0.957	0.95	574
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 761.86 (Equation 25-2 or 25-3)

P_{FM} = 0.599 using Equation (Exhibit 25-5)

V_{12} = 2612 pc/h

V_3 or V_{av34} 1752 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4676	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2924	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 23.4 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Determination

M_S = 0.341 (Exibit 25-19)

S_R = 60.4 mph (Exhibit 25-19)

S_0 = 65.5 mph (Exhibit 25-19)

S = 62.2 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_S = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JRE	Freeway/Dir of Travel	I-80 Westbound
Agency or Company	AECOM	Junction	Int. 303 from Route 611
Date Performed	1/3/2014	Jurisdiction	
Analysis Time Period	A.M. Peak Hour	Analysis Year	Alt1H 2045

Project Description Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp: ☑ Yes ☐ On ☐ No ☑ Off

L_{up} = 2200 ft

V_u = 106 veh/h

Terrain: Rolling

S_{FF} = 70.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2195	0.97	Rolling	12	1	0.840	0.95	2835
Ramp	173	0.74	Rolling	2	0	0.971	0.95	253
UpStream	106	0.94	Rolling	8	1	0.885	0.95	134
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 355.43 (Equation 25-2 or 25-3)

P_{FM} = 1.000 using Equation (Exhibit 25-5)

V_{12} = 2835 pc/h

V_3 or V_{av34} 0 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3088	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3088	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 25.7 (pc/mi/ln)

LOS = C (Exhibit 25-4)

Speed Determination

M_S = 0.365 (Exibit 25-19)

S_R = 59.8 mph (Exhibit 25-19)

S_0 = N/A mph (Exhibit 25-19)

S = 59.8 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_S = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JRE	Freeway/Dir of Travel	I-80 Westbound
Agency or Company	AECOM	Junction	Int. 305 from Main St
Date Performed	1/3/2014	Jurisdiction	
Analysis Time Period	A.M. Peak Hour	Analysis Year	Alt1H 2045

Project Description Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp: ☑ Yes ☐ On ☐ No ☑ Off

L_{up} = 1600 ft

V_u = 891 veh/h

Terrain: Rolling

S_{FF} = 70.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	1857	0.97	Rolling	12	1	0.840	0.95	2398
Ramp	271	0.94	Rolling	8	1	0.885	0.95	343
UpStream	891	0.94	Rolling	8	1	0.885	0.95	1127
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 591.97 (Equation 25-2 or 25-3)

P_{FM} = 0.614 using Equation (Exhibit 25-5)

V_{12} = 1472 pc/h

V_3 or V_{av34} 926 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	2741	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	1815	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 11.3 (pc/mi/ln)

LOS = B (Exhibit 25-4)

Speed Determination

M_S = 0.254 (Exibit 25-19)

S_R = 62.9 mph (Exhibit 25-19)

S_0 = 68.5 mph (Exhibit 25-19)

S = 64.7 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_S = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JRE	Freeway/Dir of Travel	I-80 Westbound
Agency or Company	AECOM	Junction	Int. 305 from Main St
Date Performed	1/3/2014	Jurisdiction	
Analysis Time Period	P.M. Peak Hour	Analysis Year	Alt1H 2045

Project Description Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{up} = ft
V_u = veh/h

Terrain: Rolling

S_{FF} = 70.0 mph S_{FR} = 35.0 mph
Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp
☑ Yes ☑ On
☐ No ☐ Off
L_{down} = 1600 ft
V_D = 1758 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4312	0.97	Rolling	13	1	0.830	0.95	5639
Ramp	505	0.94	Rolling	2	1	0.962	0.95	588
UpStream								
DownStream	1758	0.94	Rolling	2	1	0.962	0.95	2047

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$
L_{EQ} = (Equation 25-2 or 25-3)
P_{FM} = 0.614 using Equation (Exhibit 25-5)
V_{12} = 3462 pc/h
V_3 or V_{av34} 2177 pc/h (Equation 25-4 or 25-5)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No
If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	6227	Exhibit 25-7		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	4050	Exhibit 25-7	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$
D_R = 28.6 (pc/mi/ln)
LOS = D (Exhibit 25-4)

Speed Determination

M_S = 0.454 (Exibit 25-19)
S_R = 57.3 mph (Exhibit 25-19)
S_0 = 64.0 mph (Exhibit 25-19)
S = 59.5 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$
L_{EQ} = (Equation 25-8 or 25-9)
P_{FD} = using Equation (Exhibit 25-12)
V_{12} = pc/h
V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$
D_R = (pc/mi/ln)
LOS = (Exhibit 25-4)

Speed Determination

D_s = (Exhibit 25-19)
S_R = mph (Exhibit 25-19)
S_0 = mph (Exhibit 25-19)
S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JRE	Freeway/Dir of Travel	I-80 Westbound
Agency or Company	AECOM	Junction	Int. 303 from Route 611
Date Performed	1/3/2014	Jurisdiction	
Analysis Time Period	P.M. Peak Hour	Analysis Year	Alt1H 2045

Project Description Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp: ☑ Yes ☐ On ☐ No ☑ Off

L_{up} = 2200 ft

V_u = 204 veh/h

Terrain: Rolling

S_{FF} = 70.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4559	0.97	Rolling	13	1	0.830	0.95	5962
Ramp	322	0.87	Rolling	1	0	0.985	0.95	395
UpStream	204	0.94	Rolling	2	1	0.962	0.95	238
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = 1055.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 using Equation (Exhibit 25-5)

V_{12} = 5962 pc/h

V_3 or V_{av34} 0 pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	6357	Exhibit 25-7		Yes

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	6357	Exhibit 25-7	4600:All	Yes

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 51.1 (pc/mi/ln)

LOS = F (Exhibit 25-4)

Speed Determination

M_S = 2.527 (Exibit 25-19)

S_R = -0.8 mph (Exhibit 25-19)

S_0 = N/A mph (Exhibit 25-19)

S = -0.8 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation (Exhibit 25-12)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 25-14		
$V_{FO} = V_F - V_R$		Exhibit 25-14		
V_R		Exhibit 25-3		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 25-14		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

D_S = (Exhibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JRE	Freeway/Dir of Travel	I-80 Eastbound
Agency or Company	AECOM	Junction	Int. 303 to Rt 611
Date Performed	1/3/2014	Jurisdiction	
Analysis Time Period	A.M. Peak Hour	Analysis Year	Alt1H 2045

Project Description Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp	Terrain: Rolling	Downstream Adj Ramp
☐ Yes ☐ On		☑ Yes ☑ On
☑ No ☐ Off		☐ No ☐ Off
L_{up} = ft		L_{down} = 1750 ft
V_u = veh/h	S_{FF} = 70.0 mph S_{FR} = 35.0 mph Sketch (show lanes, L_A, L_D, V_R, V_f)	V_D = 190 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	2746	0.94	Rolling	10	1	0.862	0.95	3567
Ramp	337	0.72	Rolling	1	0	0.985	0.95	500
UpStream								
DownStream	190	0.72	Rolling	1	0	0.985	0.95	282

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 25-7		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 25-7		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

M_S = (Exibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 using Equation (Exhibit 25-12)

V_{12} = 3567 pc/h

V_3 or V_{av34} 0 pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	3567	Exhibit 25-14	4800	No
$V_{FO} = V_F - V_R$	3067	Exhibit 25-14	4800	No
V_R	500	Exhibit 25-3	3800	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3567	Exhibit 25-14	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 3.4 (pc/mi/ln)

LOS = A (Exhibit 25-4)

Speed Determination

D_s = 0.473 (Exhibit 25-19)

S_R= 56.8 mph (Exhibit 25-19)

S_0= N/A mph (Exhibit 25-19)

S = 56.8 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JRE	Freeway/Dir of Travel	I-80 Eastbound
Agency or Company	AECOM	Junction	Int. 303 to Rt 611
Date Performed	1/3/2014	Jurisdiction	
Analysis Time Period	P.M. Peak Hour	Analysis Year	Alt1H 2045

Project Description Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{up} = ft
V_u = veh/h

Terrain: Rolling

S_{FF} = 70.0 mph S_{FR} = 35.0 mph
Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp
☑ Yes ☑ On
☐ No ☐ Off
L_{down} = 1750 ft
V_D = 268 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3456	0.94	Rolling	12	1	0.840	0.95	4605
Ramp	449	0.97	Rolling	1	0	0.985	0.95	495
UpStream								
DownStream	268	0.97	Rolling	1	0	0.985	0.95	295

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$
L_{EQ} = (Equation 25-2 or 25-3)
P_{FM} = using Equation (Exhibit 25-5)
V_{12} = pc/h
V_3 or V_{av34} pc/h (Equation 25-4 or 25-5)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 25-7		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 25-7		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$
D_R = (pc/mi/ln)
LOS = (Exhibit 25-4)

Speed Determination

M_S = (Exibit 25-19)
S_R = mph (Exhibit 25-19)
S_0 = mph (Exhibit 25-19)
S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$
L_{EQ} = (Equation 25-8 or 25-9)
P_{FD} = 1.000 using Equation (Exhibit 25-12)
V_{12} = 4605 pc/h
V_3 or V_{av34} 0 pc/h (Equation 25-15 or 25-16)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No
If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	4605	Exhibit 25-14	4800	No
$V_{FO} = V_F - V_R$	4110	Exhibit 25-14	4800	No
V_R	495	Exhibit 25-3	3800	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	4605	Exhibit 25-14	4400:All	Yes

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$
D_R = 12.4 (pc/mi/ln)
LOS = B (Exhibit 25-4)

Speed Determination

D_s = 0.473 (Exhibit 25-19)
S_R = 56.8 mph (Exhibit 25-19)
S_0 = N/A mph (Exhibit 25-19)
S = 56.8 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JRE	Freeway/Dir of Travel	I-80 Westbound
Agency or Company	AECOM	Junction	Int. 303 to Rt 611
Date Performed	1/3/2014	Jurisdiction	
Analysis Time Period	A.M. Peak Hour	Analysis Year	Alt1H 2045

Project Description Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N: 3	☑ Yes ☑ On
☑ No ☐ Off	Ramp Number of Lanes, N: 1	☐ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A:	L_{down} = 1750 ft
V_u = veh/h	Deceleration Lane Length L_D: 1000	V_D = 173 veh/h
	Freeway Volume, V_F: 2128	
	Ramp Volume, V_R: 106	
	Freeway Free-Flow Speed, S_{FF}: 70.0	
	Ramp Free-Flow Speed, S_{FR}: 35.0	

Conversion to pc/h Under Base Conditions

	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2128	0.94	Rolling	10	1	0.862	0.95	2764
Ramp	106	0.72	Rolling	1	0	0.985	0.95	157
UpStream								
DownStream	173	0.72	Rolling	1	0	0.985	0.95	257

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 0.684 using Equation (Exhibit 13-7)

V_{12} = 1939 pc/h

V_3 or V_{av34} 825 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	2764	Exhibit 13-8	7200	No
$V_{FO} = V_F - V_R$	2607	Exhibit 13-8	7200	No
V_R	157	Exhibit 13-10	2000	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	1939	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 11.9 (pc/mi/ln)

LOS = B (Exhibit 13-2)

Speed Determination

D_S = 0.442 (Exhibit 13-12)

S_R= 57.6 mph (Exhibit 13-12)

S_0= 76.8 mph (Exhibit 13-12)

S = 62.3 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JRE	Freeway/Dir of Travel	I-80 Westbound
Agency or Company	AECOM	Junction	Int. 303 to Rt 611
Date Performed	1/3/2014	Jurisdiction	
Analysis Time Period	P.M. Peak Hour	Analysis Year	Alt1H 2045

Project Description Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp
☐ Yes ☐ On
☑ No ☐ Off
L_{up} = ft
V_u = veh/h

Freeway Number of Lanes, N	3
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	1000
Freeway Volume, V_F	4440
Ramp Volume, V_R	204
Freeway Free-Flow Speed, S_{FF}	70.0
Ramp Free-Flow Speed, S_{FR}	35.0

Downstream Adj Ramp
☑ Yes ☑ On
☐ No ☐ Off
L_{down} = 1750 ft
V_D = 322 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	4440	0.94	Rolling	10	1	0.862	0.95	5768
Ramp	204	0.72	Rolling	1	0	0.985	0.95	303
UpStream								
DownStream	322	0.72	Rolling	1	0	0.985	0.95	478

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)
P_{FM} = using Equation (Exhibit 13-6)
V_{12} = pc/h
V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)
LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)
S_R= mph (Exhibit 13-11)
S_0= mph (Exhibit 13-11)
S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)
P_{FD} = 0.602 using Equation (Exhibit 13-7)
V_{12} = 3592 pc/h
V_3 or V_{av34} 2176 pc/h (Equation 13-14 or 13-17)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No
If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	5768	Exhibit 13-8	7200	No
$V_{FO} = V_F - V_R$	5465	Exhibit 13-8	7200	No
V_R	303	Exhibit 13-10	2000	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3592	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 26.1 (pc/mi/ln)
LOS = C (Exhibit 13-2)

Speed Determination

D_S = 0.455 (Exhibit 13-12)
S_R= 57.3 mph (Exhibit 13-12)
S_0= 72.2 mph (Exhibit 13-12)
S = 62.1 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JRE	Freeway/Dir of Travel	I-80 Westbound
Agency or Company	AECOM	Junction	Int. 306 to Dreher Avenue
Date Performed	1/3/2014	Jurisdiction	
Analysis Time Period	A.M. Peak Hour	Analysis Year	Alt 1H 2045

Project Description Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp	Terrain: Rolling	Downstream Adj Ramp
☑ Yes ☑ On		☐ Yes ☐ On
☐ No ☐ Off		☑ No ☐ Off
L_{up} = 3680 ft	S_{FF} = 70.0 mph S_{FR} = 35.0 mph	L_{down} = ft
V_u = 473 veh/h	Sketch (show lanes, L_A, L_D, V_R, V_f)	V_D = veh/h

Conversion to pc/h Under Base Conditions

	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	3240	0.91	Rolling	12	1	0.840	0.95	4460
Ramp	313	0.66	Rolling	3	0	0.957	0.95	522
UpStream	473	0.91	Rolling	6	0	0.917	0.95	596
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = using Equation (Exhibit 25-5)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 25-4 or 25-5)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 25-8)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 25-7		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 25-7		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 25-4)

Speed Determination

M_S = (Exibit 25-19)

S_R = mph (Exhibit 25-19)

S_0 = mph (Exhibit 25-19)

S = mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = 4450.82 (Equation 25-8 or 25-9)

P_{FD} = 0.641 using Equation (Exhibit 25-12)

V_{12} = 3046 pc/h

V_3 or V_{av34} 1414 pc/h (Equation 25-15 or 25-16)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 25-18)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	4460	Exhibit 25-14	7200	No
$V_{FO} = V_F - V_R$	3938	Exhibit 25-14	7200	No
V_R	522	Exhibit 25-3	2000	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3046	Exhibit 25-14	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 29.2 (pc/mi/ln)

LOS = D (Exhibit 25-4)

Speed Determination

D_s = 0.475 (Exhibit 25-19)

S_R = 56.7 mph (Exhibit 25-19)

S_0 = 75.2 mph (Exhibit 25-19)

S = 61.5 mph (Exhibit 25-15)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	JRE	Freeway/Dir of Travel	I-80 Westbound
Agency or Company	AECOM	Junction	Int. 306 to Dreher Avenue
Date Performed	1/3/2014	Jurisdiction	
Analysis Time Period	P.M. Peak Hour	Analysis Year	Alt 1H 2045

Project Description Interstate 80 Reconstruction

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	4	Downstream Adj Ramp	
☑ Yes	☑ On	Ramp Number of Lanes, N	1	☐ Yes	☐ On
		Acceleration Lane Length, L_A			
☐ No	☐ Off	Deceleration Lane Length L_D	140	☑ No	☐ Off
		Freeway Volume, V_F	6750	L_{down} =	ft
L_{up} =	3680 ft	Ramp Volume, V_R	680		
		Freeway Free-Flow Speed, S_{FF}	70.0	V_D =	veh/h
V_u =	790 veh/h	Ramp Free-Flow Speed, S_{FR}	35.0		

Conversion to pc/h Under Base Conditions

	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	6750	0.96	Rolling	12	1	0.840	0.95	8808
Ramp	680	0.82	Rolling	3	0	0.957	0.95	912
UpStream	790	0.89	Rolling	1	0	0.985	0.95	948
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 0.436 using Equation (Exhibit 13-7)

V_{12} = 4355 pc/h

V_3 or V_{av34} 2226 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	8808	Exhibit 13-8	9600	No
$V_{FO} = V_F - V_R$	7896	Exhibit 13-8	9600	No
V_R	912	Exhibit 13-10	2000	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	4355	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 40.4 (pc/mi/ln)

LOS = E (Exhibit 13-2)

Speed Determination

D_s = 0.510 (Exhibit 13-12)

S_R= 55.7 mph (Exhibit 13-12)

S_0= 72.0 mph (Exhibit 13-12)

S = 62.9 mph (Exhibit 13-13)

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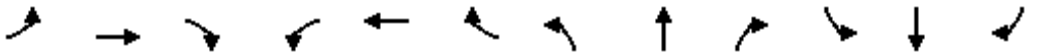
SIGNALIZED INTERSECTION ANALYSIS

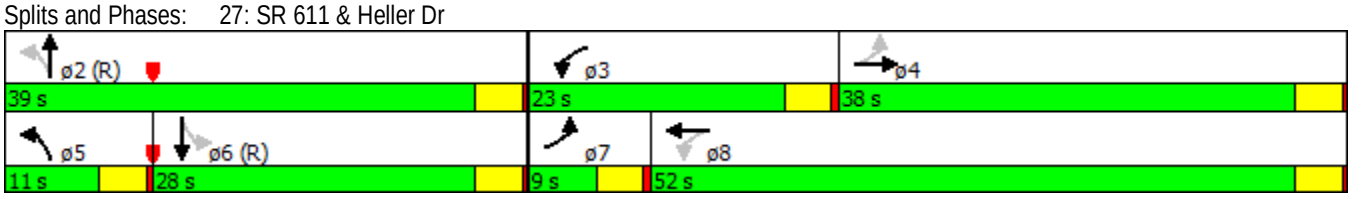


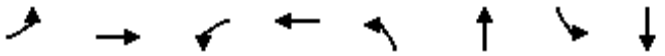
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	6	443	190	173	490	12	108	1	335	12	1	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		-3%			0%			0%			0%	
Storage Length (ft)	150		0	400		0	0		0	50		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.955			0.996			0.850			0.871	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1832	3499	0	1805	3596	0	1805	1615	0	1805	1655	0
Flt Permitted	0.443			0.163			0.674			0.540		
Satd. Flow (perm)	854	3499	0	310	3596	0	1281	1615	0	1026	1655	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		72			3			372			6	
Link Speed (mph)		35			35			30			30	
Link Distance (ft)		557			1414			347			353	
Travel Time (s)		10.9			27.5			7.9			8.0	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	7	492	211	192	544	13	120	1	372	13	1	6
Shared Lane Traffic (%)												
Lane Group Flow (vph)	7	703	0	192	557	0	120	373	0	13	7	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		Yes										
Headway Factor	0.98	0.98	0.98	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		Perm	NA	
Protected Phases	7	4		3	8		5	2			6	
Permitted Phases	4			8			2			6		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	7	4		3	8		5	2		6	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	8.0	20.0		8.0	20.0		8.0	20.0		20.0	20.0	
Total Split (s)	9.0	38.0		23.0	52.0		11.0	39.0		28.0	28.0	
Total Split (%)	9.0%	38.0%		23.0%	52.0%		11.0%	39.0%		28.0%	28.0%	
Maximum Green (s)	5.0	34.0		19.0	48.0		7.0	35.0		24.0	24.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5		0.5	0.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead			Lag	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		None	C-Max		C-Max	C-Max	
Walk Time (s)		5.0			5.0			5.0		5.0	5.0	
Flash Dont Walk (s)		11.0			11.0			11.0		11.0	11.0	
Pedestrian Calls (#/hr)		0			0			0		0	0	
Act Effct Green (s)	30.0	25.0		41.7	39.9		50.3	50.3		37.1	37.1	
Actuated g/C Ratio	0.30	0.25		0.42	0.40		0.50	0.50		0.37	0.37	
v/c Ratio	0.02	0.76		0.60	0.39		0.17	0.37		0.03	0.01	
Control Delay	14.7	36.2		25.9	21.6		16.1	3.2		26.5	17.3	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	14.7	36.2		25.9	21.6		16.1	3.2		26.5	17.3	
LOS	B	D		C	C		B	A		C	B	
Approach Delay		36.0			22.7			6.3			23.3	
Approach LOS		D			C			A			C	

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 100			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 60			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.76			
Intersection Signal Delay: 23.4		Intersection LOS: C	
Intersection Capacity Utilization 58.7%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 27: SR 611 & Heller Dr

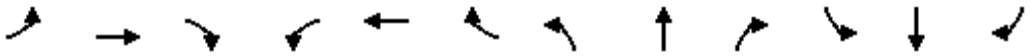




Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	7	703	192	557	120	373	13	7
v/c Ratio	0.02	0.76	0.60	0.39	0.17	0.37	0.03	0.01
Control Delay	14.7	36.2	25.9	21.6	16.1	3.2	26.5	17.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	14.7	36.2	25.9	21.6	16.1	3.2	26.5	17.3
Queue Length 50th (ft)	3	196	77	123	40	0	5	0
Queue Length 95th (ft)	9	240	105	166	86	55	22	12
Internal Link Dist (ft)		477		1334		267		273
Turn Bay Length (ft)	150		400				50	
Base Capacity (vph)	305	1237	413	1727	693	997	380	617
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.57	0.46	0.32	0.17	0.37	0.03	0.01

Intersection Summary

Two Way Analysis cannot be performed on Signalized Intersection.



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	1	1	106	1	337	0	0	190	173
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00
Frt					0.867						0.936	
Flt Protected												
Satd. Flow (prot)	0	0	0	0	1647	0	0	3610	0	0	1778	0
Flt Permitted												
Satd. Flow (perm)	0	0	0	0	1647	0	0	3610	0	0	1778	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		372			504			509			347	
Travel Time (s)		8.5			11.5			11.6			7.9	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	0	0	1	1	118	1	374	0	0	211	192
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	120	0	0	375	0	0	403	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Free			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 33.9%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	1.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR
Vol, veh/h	0	0	0	1	1	106	1	337	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Stop	Stop	Stop	Free	Free	Free
RT Channelized	-	-	None	-	-	Yeild	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0
Mvmt Flow	0	0	0	1	1	118	1	374	0

Major/Minor	Minor1			Major1		
Conflicting Flow All	684	780	187	403	0	0
Stage 1	377	377	-	-	-	-
Stage 2	307	403	-	-	-	-
Critical Hdwy	6.6	6.5	6.9	4.1	-	-
Critical Hdwy Stg 1	5.8	5.5	-	-	-	-
Critical Hdwy Stg 2	5.4	5.5	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	2.2	-	-
Pot Cap-1 Maneuver	402	329	830	1167	-	-
Stage 1	669	619	-	-	-	-
Stage 2	751	603	-	-	-	-
Platoon blocked, %					-	-
Mov Cap-1 Maneuver	402	0	830	1167	-	-
Mov Cap-2 Maneuver	402	0	-	-	-	-
Stage 1	668	0	-	-	-	-
Stage 2	751	0	-	-	-	-

Approach	WB	NB
HCM Control Delay, s	10	0
HCM LOS	B	

Minor Lane/Major Mvmt	NBL	NBT	NBR	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1167	-	-	846	1196	-	-
HCM Lane V/C Ratio	0.001	-	-	0.142	-	-	-
HCM Control Delay (s)	8.1	0	-	10	0	-	-
HCM Lane LOS	A	A	-	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.5	0	-	-

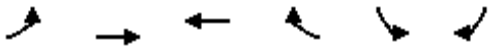
Intersection	
Int Delay, s/veh	

Movement	SBL	SBT	SBR
Vol, veh/h	0	190	173
Conflicting Peds, #/hr	0	0	0
Sign Control	Free	Free	Free
RT Channelized	-	-	None
Storage Length	-	-	-
Veh in Median Storage, #	-	0	-
Grade, %	-	0	-
Peak Hour Factor	90	90	90
Heavy Vehicles, %	0	0	0
Mvmt Flow	0	211	192

Major/Minor	Major2		
Conflicting Flow All	374	0	0
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	4.1	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	2.2	-	-
Pot Cap-1 Maneuver	1196	-	-
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	1196	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	SB
HCM Control Delay, s	0
HCM LOS	

Minor Lane/Major Mvmt



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	337	1	0	0	190	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt						
Flt Protected		0.953			0.950	
Satd. Flow (prot)	0	1811	0	0	1805	0
Flt Permitted		0.953			0.950	
Satd. Flow (perm)	0	1811	0	0	1805	0
Link Speed (mph)		30	30		30	
Link Distance (ft)		487	669		509	
Travel Time (s)		11.1	15.2		11.6	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	374	1	0	0	211	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	375	0	0	211	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		0	0		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Stop	Free		Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 35.9%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	337	1	0	0	190	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	374	1	0	0	211	0

Major/Minor	Minor2		Major2	
Conflicting Flow All	0	422	0	-
Stage 1	0	422	-	-
Stage 2	0	0	-	-
Critical Hdwy	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	-	-	-
Pot Cap-1 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Platoon blocked, %				-
Mov Cap-1 Maneuver	-	0	-	-
Mov Cap-2 Maneuver	-	0	-	-
Stage 1	-	0	-	-
Stage 2	-	0	-	-

Approach	EB	SB
HCM Control Delay, s		0
HCM LOS	-	

Minor Lane/Major Mvmt	EBLn1	SBL	SBR
Capacity (veh/h)	-	-	-
HCM Lane V/C Ratio	-	-	-
HCM Control Delay (s)	-	-	-
HCM Lane LOS	-	-	-
HCM 95th %tile Q(veh)	-	-	-

Lane Group	EBT	EBR	WBL	WBT	NWL	NWR
Lane Configurations						
Volume (vph)	254	288	36	507	66	381
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)		100	150		0	200
Storage Lanes		1	1		1	1
Taper Length (ft)			25		25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850				0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1900	1615	1805	1900	1805	1615
Flt Permitted			0.950		0.950	
Satd. Flow (perm)	1900	1615	1805	1900	1805	1615
Link Speed (mph)	30			30	30	
Link Distance (ft)	1124			1534	676	
Travel Time (s)	25.5			34.9	15.4	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	282	320	40	563	73	423
Shared Lane Traffic (%)						
Lane Group Flow (vph)	282	320	40	563	73	423
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 43.6%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	5

Movement	EBT	EBR	WBL	WBT	NWL	NWR
Vol, veh/h	254	288	36	507	66	381
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Yeild	-	None	-	Yeild
Storage Length	-	100	150	-	0	200
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	282	320	40	563	73	423

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	282	0	925	282
Stage 1	-	-	-	-	282	-
Stage 2	-	-	-	-	643	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1292	-	301	762
Stage 1	-	-	-	-	770	-
Stage 2	-	-	-	-	527	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1292	-	292	762
Mov Cap-2 Maneuver	-	-	-	-	292	-
Stage 1	-	-	-	-	770	-
Stage 2	-	-	-	-	511	-

Approach	EB	WB	NW
HCM Control Delay, s	0	0.5	16.4
HCM LOS			C

Minor Lane/Major Mvmt	NWLn1	NWLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	292	762	-	-	1292	-
HCM Lane V/C Ratio	0.251	0.556	-	-	0.031	-
HCM Control Delay (s)	21.4	15.5	-	-	7.9	-
HCM Lane LOS	C	C	-	-	A	-
HCM 95th %tile Q(veh)	1	3.5	-	-	0.1	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	10	324	10	0	0	0	0	129	138	81	122	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		100	0		0	0		100	150		0
Storage Lanes	0		0	0		0	0		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.996							0.850			
Flt Protected		0.999								0.950		
Satd. Flow (prot)	0	1891	0	0	0	0	0	1900	1615	1805	1900	0
Flt Permitted		0.999								0.950		
Satd. Flow (perm)	0	1891	0	0	0	0	0	1900	1615	1805	1900	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		2085			911			670			1292	
Travel Time (s)		47.4			20.7			15.2			29.4	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	11	360	11	0	0	0	0	143	153	90	136	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	382	0	0	0	0	0	143	153	90	136	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 41.2%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	2.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER
Vol, veh/h	10	324	10	0	0	0	0	129	138
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free
RT Channelized	-	-	Yeild	-	-	None	-	-	Yeild
Storage Length	-	-	-	-	-	-	-	-	100
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0
Mvmt Flow	11	360	11	0	0	0	0	143	153

Major/Minor	Minor2						Major1		
Conflicting Flow All	459	459	136				136	0	0
Stage 1	316	316	-				-	-	-
Stage 2	143	143	-				-	-	-
Critical Hdwy	6.4	6.5	6.2				4.1	-	-
Critical Hdwy Stg 1	5.4	5.5	-				-	-	-
Critical Hdwy Stg 2	5.4	5.5	-				-	-	-
Follow-up Hdwy	3.5	4	3.3				2.2	-	-
Pot Cap-1 Maneuver	564	502	918				1461	-	-
Stage 1	744	659	-				-	-	-
Stage 2	889	782	-				-	-	-
Platoon blocked, %								-	-
Mov Cap-1 Maneuver	529	0	918				1461	-	-
Mov Cap-2 Maneuver	529	0	-				-	-	-
Stage 1	698	0	-				-	-	-
Stage 2	889	0	-				-	-	-

Approach	EB	NE
HCM Control Delay, s	5.1	0
HCM LOS	A	

Minor Lane/Major Mvmt	NEL	NET	NER	EBLn1	SWL	SWT	SWR
Capacity (veh/h)	1461	-	-	31579	1452	-	-
HCM Lane V/C Ratio	-	-	-	0.012	0.062	-	-
HCM Control Delay (s)	0	-	-	5.1	7.6	-	-
HCM Lane LOS	A	-	-	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0	0.2	-	-

Intersection	
Int Delay, s/veh	

Movement	SWL	SWT	SWR
Vol, veh/h	81	122	0
Conflicting Peds, #/hr	0	0	0
Sign Control	Free	Free	Free
RT Channelized	-	-	None
Storage Length	150	-	-
Veh in Median Storage, #	-	0	-
Grade, %	-	0	-
Peak Hour Factor	90	90	90
Heavy Vehicles, %	0	0	0
Mvmt Flow	90	136	0

Major/Minor	Major2		
Conflicting Flow All	143	0	0
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	4.1	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	2.2	-	-
Pot Cap-1 Maneuver	1452	-	-
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	1452	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	SW
HCM Control Delay, s	3
HCM LOS	

Minor Lane/Major Mvmt

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	0	0	0	51	179	83	38	102	0	0	152	38
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		100	150		0	0		100
Storage Lanes	0		0	0		1	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.850						0.850
Flt Protected					0.989		0.950					
Satd. Flow (prot)	0	0	0	0	1879	1615	1805	1900	0	0	1900	1615
Flt Permitted					0.989		0.950					
Satd. Flow (perm)	0	0	0	0	1879	1615	1805	1900	0	0	1900	1615
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		2068			892			1292			511	
Travel Time (s)		47.0			20.3			29.4			11.6	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	0	0	57	199	92	42	113	0	0	169	42
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	256	92	42	113	0	0	169	42
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 41.2%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER
Vol, veh/h	0	0	0	51	179	83	38	102	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free
RT Channelized	-	-	None	-	-	Yeild	-	-	None
Storage Length	-	-	-	-	-	100	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0
Mvmt Flow	0	0	0	57	199	92	42	113	0

Major/Minor	Minor1			Major1		
Conflicting Flow All	367	367	113	169	0	0
Stage 1	198	198	-	-	-	-
Stage 2	169	169	-	-	-	-
Critical Hdwy	6.4	6.5	6.2	4.1	-	-
Critical Hdwy Stg 1	5.4	5.5	-	-	-	-
Critical Hdwy Stg 2	5.4	5.5	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	2.2	-	-
Pot Cap-1 Maneuver	637	565	945	1421	-	-
Stage 1	840	741	-	-	-	-
Stage 2	866	763	-	-	-	-
Platoon blocked, %					-	-
Mov Cap-1 Maneuver	618	0	945	1421	-	-
Mov Cap-2 Maneuver	618	0	-	-	-	-
Stage 1	815	0	-	-	-	-
Stage 2	866	0	-	-	-	-

Approach	WB	NE
HCM Control Delay, s	13.4	2.1
HCM LOS	B	

Minor Lane/Major Mvmt	NEL	NET	NER	WBLn1	WBLn2	SWL	SWT	SWR
Capacity (veh/h)	1421	-	-	618	945	1489	-	-
HCM Lane V/C Ratio	0.03	-	-	0.414	0.098	-	-	-
HCM Control Delay (s)	7.6	-	-	14.9	9.2	0	-	-
HCM Lane LOS	A	-	-	B	A	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	2	0.3	0	-	-

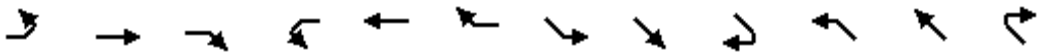
Intersection	
Int Delay, s/veh	

Movement	SWL	SWT	SWR
Vol, veh/h	0	152	38
Conflicting Peds, #/hr	0	0	0
Sign Control	Free	Free	Free
RT Channelized	-	-	Yeild
Storage Length	-	-	100
Veh in Median Storage, #	-	0	-
Grade, %	-	0	-
Peak Hour Factor	90	90	90
Heavy Vehicles, %	0	0	0
Mvmt Flow	0	169	42

Major/Minor	Major2		
Conflicting Flow All	113	0	0
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	4.1	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	2.2	-	-
Pot Cap-1 Maneuver	1489	-	-
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	1489	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	SW
HCM Control Delay, s	0
HCM LOS	

Minor Lane/Major Mvmt

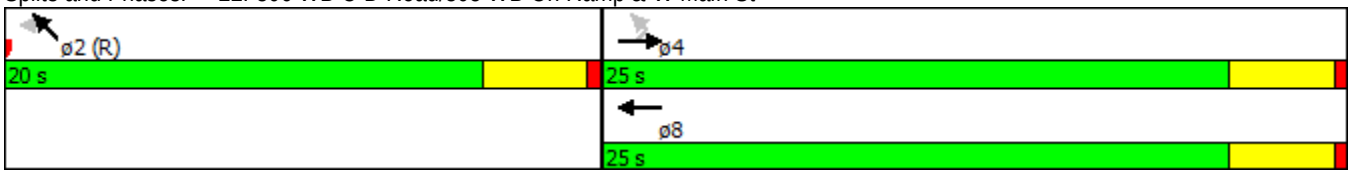


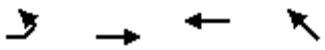
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	47	588	0	0	388	149	0	0	0	155	75	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	50		0	0		0	0		0	0		0
Storage Lanes	1		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.962						0.987	
Flt Protected	0.950										0.970	
Satd. Flow (prot)	1805	1900	0	0	1828	0	0	0	0	0	1819	0
Flt Permitted	0.238										0.970	
Satd. Flow (perm)	452	1900	0	0	1828	0	0	0	0	0	1819	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					58						13	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1534			227			367			2068	
Travel Time (s)		34.9			5.2			8.3			47.0	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	52	653	0	0	431	166	0	0	0	172	83	27
Shared Lane Traffic (%)												
Lane Group Flow (vph)	52	653	0	0	597	0	0	0	0	0	282	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2			2					1	2	
Detector Template	Left	Thru			Thru					Left	Thru	
Leading Detector (ft)	20	100			100					20	100	
Trailing Detector (ft)	0	0			0					0	0	
Detector 1 Position(ft)	0	0			0					0	0	
Detector 1 Size(ft)	20	6			6					20	6	
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex					Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0					0.0	0.0	
Detector 1 Queue (s)	0.0	0.0			0.0					0.0	0.0	
Detector 1 Delay (s)	0.0	0.0			0.0					0.0	0.0	
Detector 2 Position(ft)		94			94						94	
Detector 2 Size(ft)		6			6						6	
Detector 2 Type		Cl+Ex			Cl+Ex						Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0						0.0	
Turn Type	Perm	NA			NA					Perm	NA	
Protected Phases		4			8						2	
Permitted Phases	4									2		
Detector Phase	4	4			8					2	2	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Switch Phase												
Minimum Initial (s)	4.0	4.0			4.0					4.0	4.0	
Minimum Split (s)	20.0	20.0			20.0					20.0	20.0	
Total Split (s)	25.0	25.0			25.0					20.0	20.0	
Total Split (%)	55.6%	55.6%			55.6%					44.4%	44.4%	
Maximum Green (s)	21.0	21.0			21.0					16.0	16.0	
Yellow Time (s)	3.5	3.5			3.5					3.5	3.5	
All-Red Time (s)	0.5	0.5			0.5					0.5	0.5	
Lost Time Adjust (s)	0.0	0.0			0.0						0.0	
Total Lost Time (s)	4.0	4.0			4.0						4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0			3.0					3.0	3.0	
Recall Mode	None	None			None					C-Max	C-Max	
Act Effct Green (s)	19.2	19.2			19.2						17.8	
Actuated g/C Ratio	0.43	0.43			0.43						0.40	
v/c Ratio	0.27	0.81			0.74						0.39	
Control Delay	11.8	20.5			15.5						12.1	
Queue Delay	0.0	0.0			0.0						0.0	
Total Delay	11.8	20.5			15.5						12.1	
LOS	B	C			B						B	
Approach Delay		19.9			15.5						12.1	
Approach LOS		B			B						B	

Intersection Summary			
Area Type:	Other		
Cycle Length: 45			
Actuated Cycle Length: 45			
Offset: 0 (0%), Referenced to phase 2:NWTL and 6:, Start of Green			
Natural Cycle: 45			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.81			
Intersection Signal Delay: 16.8		Intersection LOS: B	
Intersection Capacity Utilization 56.8%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 22: 306 WB C-D Road/305 WB On Ramp & W Main St

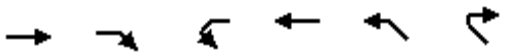




Lane Group	EBL	EBT	WBT	NWT
Lane Group Flow (vph)	52	653	597	282
v/c Ratio	0.27	0.81	0.74	0.39
Control Delay	11.8	20.5	15.5	12.1
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	11.8	20.5	15.5	12.1
Queue Length 50th (ft)	7	125	97	50
Queue Length 95th (ft)	26	#246	185	99
Internal Link Dist (ft)		1454	147	1988
Turn Bay Length (ft)	50			
Base Capacity (vph)	210	886	884	728
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	0.25	0.74	0.68	0.39

Intersection Summary

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



Lane Group	EBT	EBR	WBL	WBT	NWL	NWR
Lane Configurations						
Volume (vph)	324	0	0	447	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt						
Flt Protected						
Satd. Flow (prot)	1900	0	0	1900	0	0
Flt Permitted						
Satd. Flow (perm)	1900	0	0	1900	0	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)						
Link Speed (mph)	30			30	30	
Link Distance (ft)	676			545	2085	
Travel Time (s)	15.4			12.4	47.4	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	360	0	0	497	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	360	0	0	497	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	0	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Turn Type	NA			NA		
Protected Phases	4			8		
Permitted Phases						
Minimum Split (s)	20.0			20.0		
Total Split (s)	20.0			20.0		
Total Split (%)	100.0%			100.0%		
Maximum Green (s)	16.0			16.0		
Yellow Time (s)	3.5			3.5		
All-Red Time (s)	0.5			0.5		
Lost Time Adjust (s)	0.0			0.0		
Total Lost Time (s)	4.0			4.0		
Lead/Lag						
Lead-Lag Optimize?						
Act Effct Green (s)	20.0			20.0		
Actuated g/C Ratio	1.00			1.00		
v/c Ratio	0.19			0.26		
Control Delay	0.2			0.3		
Queue Delay	0.0			0.0		
Total Delay	0.2			0.3		
LOS	A			A		
Approach Delay	0.2			0.3		
Approach LOS	A			A		

Intersection Summary

Area Type:	Other	
Cycle Length: 20		
Actuated Cycle Length: 20		
Offset: 0 (0%), Referenced to phase 2: and 6:, Start of Green		
Natural Cycle: 40		
Control Type: Pretimed		
Maximum v/c Ratio: 0.26		
Intersection Signal Delay: 0.3		Intersection LOS: A
Intersection Capacity Utilization 26.9%		ICU Level of Service A
Analysis Period (min) 15		

Splits and Phases: 25: 305 EB C-D Road & 305 EB Exit and On Ramps/305 EB Exit Ramp

Lane Group	EBT	WBT
Lane Group Flow (vph)	360	497
v/c Ratio	0.19	0.26
Control Delay	0.2	0.3
Queue Delay	0.0	0.0
Total Delay	0.2	0.3
Queue Length 50th (ft)	0	0
Queue Length 95th (ft)	0	0
Internal Link Dist (ft)	596	465
Turn Bay Length (ft)		
Base Capacity (vph)	1900	1900
Starvation Cap Reductn	0	0
Spillback Cap Reductn	0	0
Storage Cap Reductn	0	0
Reduced v/c Ratio	0.19	0.26

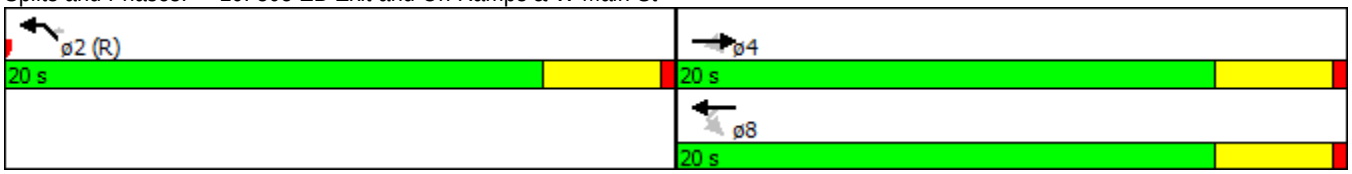
Intersection Summary

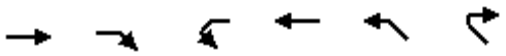
Lane Group	EBT	EBR	WBL	WBT	NWL	NWR
Lane Configurations						
Volume (vph)	254	288	36	507	66	381
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)		100	150		0	200
Storage Lanes		1	1		1	1
Taper Length (ft)			25		25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850				0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1900	1615	1805	1900	1805	1615
Flt Permitted			0.560		0.950	
Satd. Flow (perm)	1900	1615	1064	1900	1805	1615
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		320				423
Link Speed (mph)	30			30	30	
Link Distance (ft)	2247			1534	676	
Travel Time (s)	51.1			34.9	15.4	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	282	320	40	563	73	423
Shared Lane Traffic (%)						
Lane Group Flow (vph)	282	320	40	563	73	423
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Number of Detectors	2	1	1	2	1	1
Detector Template	Thru	Right	Left	Thru	Left	Right
Leading Detector (ft)	100	20	20	100	20	20
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	6	20	20	6	20	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)	94			94		
Detector 2 Size(ft)	6			6		
Detector 2 Type	Cl+Ex			Cl+Ex		
Detector 2 Channel						
Detector 2 Extend (s)	0.0			0.0		
Turn Type	NA	Perm	Perm	NA	Prot	Perm
Protected Phases	4			8	2	
Permitted Phases		4	8			2
Detector Phase	4	4	8	8	2	2

Lane Group	EBT	EBR	WBL	WBT	NWL	NWR
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	20.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	20.0	20.0	20.0	20.0	20.0	20.0
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Maximum Green (s)	16.0	16.0	16.0	16.0	16.0	16.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	C-Max	C-Max
Act Effct Green (s)	14.8	14.8	14.8	14.8	17.2	17.2
Actuated g/C Ratio	0.37	0.37	0.37	0.37	0.43	0.43
v/c Ratio	0.40	0.40	0.10	0.80	0.09	0.45
Control Delay	10.9	3.1	8.4	22.0	7.9	3.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	10.9	3.1	8.4	22.0	7.9	3.0
LOS	B	A	A	C	A	A
Approach Delay	6.7			21.1	3.7	
Approach LOS	A			C	A	

Intersection Summary			
Area Type:	Other		
Cycle Length: 40			
Actuated Cycle Length: 40			
Offset: 0 (0%), Referenced to phase 2:NWL and 6:, Start of Green			
Natural Cycle: 40			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.80			
Intersection Signal Delay: 11.0		Intersection LOS: B	
Intersection Capacity Utilization 43.6%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 16: 305 EB Exit and On Ramps & W Main St





Lane Group	EBT	EBR	WBL	WBT	NWL	NWR
Lane Group Flow (vph)	282	320	40	563	73	423
v/c Ratio	0.40	0.40	0.10	0.80	0.09	0.45
Control Delay	10.9	3.1	8.4	22.0	7.9	3.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	10.9	3.1	8.4	22.0	7.9	3.0
Queue Length 50th (ft)	41	0	5	100	10	0
Queue Length 95th (ft)	83	32	18	#230	26	36
Internal Link Dist (ft)	2167			1454	596	
Turn Bay Length (ft)		100	150			200
Base Capacity (vph)	760	838	425	760	775	934
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.37	0.38	0.09	0.74	0.09	0.45

Intersection Summary

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

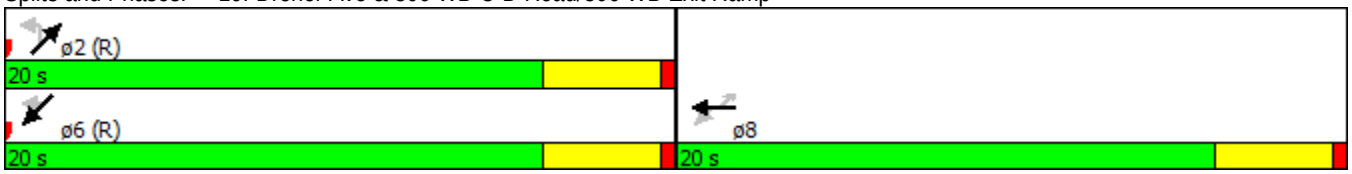
Two Way Analysis cannot be performed on Signalized Intersection.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	0	0	0	51	179	83	38	102	0	0	152	38
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		100	150		0	0		100
Storage Lanes	0		0	0		1	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.850						0.850
Flt Protected					0.989		0.950					
Satd. Flow (prot)	0	0	0	0	1879	1615	1805	1900	0	0	1900	1615
Flt Permitted					0.989		0.650					
Satd. Flow (perm)	0	0	0	0	1879	1615	1235	1900	0	0	1900	1615
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						92						42
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		2068			892			1292			511	
Travel Time (s)		47.0			20.3			29.4			11.6	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	0	0	57	199	92	42	113	0	0	169	42
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	256	92	42	113	0	0	169	42
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1	2	1	1	2			2	1
Detector Template				Left	Thru	Right	Left	Thru			Thru	Right
Leading Detector (ft)				20	100	20	20	100			100	20
Trailing Detector (ft)				0	0	0	0	0			0	0
Detector 1 Position(ft)				0	0	0	0	0			0	0
Detector 1 Size(ft)				20	6	20	20	6			6	20
Detector 1 Type				Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Queue (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Delay (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 2 Position(ft)					94			94			94	
Detector 2 Size(ft)					6			6			6	
Detector 2 Type					Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)					0.0			0.0			0.0	
Turn Type				Perm	NA	Perm	Perm	NA			NA	Perm
Protected Phases					8			2			6	
Permitted Phases				8		8	2					6
Detector Phase				8	8	8	2	2			6	6

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Switch Phase												
Minimum Initial (s)				4.0	4.0	4.0	4.0	4.0			4.0	4.0
Minimum Split (s)				20.0	20.0	20.0	20.0	20.0			20.0	20.0
Total Split (s)				20.0	20.0	20.0	20.0	20.0			20.0	20.0
Total Split (%)				50.0%	50.0%	50.0%	50.0%	50.0%			50.0%	50.0%
Maximum Green (s)				16.0	16.0	16.0	16.0	16.0			16.0	16.0
Yellow Time (s)				3.5	3.5	3.5	3.5	3.5			3.5	3.5
All-Red Time (s)				0.5	0.5	0.5	0.5	0.5			0.5	0.5
Lost Time Adjust (s)					0.0	0.0	0.0	0.0			0.0	0.0
Total Lost Time (s)					4.0	4.0	4.0	4.0			4.0	4.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)				3.0	3.0	3.0	3.0	3.0			3.0	3.0
Recall Mode				None	None	None	C-Max	C-Max			C-Max	C-Max
Act Effct Green (s)					11.0	11.0	23.9	23.9			23.9	23.9
Actuated g/C Ratio					0.28	0.28	0.60	0.60			0.60	0.60
v/c Ratio					0.49	0.18	0.06	0.10			0.15	0.04
Control Delay					14.6	3.6	6.7	6.6			6.8	3.2
Queue Delay					0.0	0.0	0.0	0.0			0.0	0.0
Total Delay					14.6	3.6	6.7	6.6			6.8	3.2
LOS					B	A	A	A			A	A
Approach Delay					11.7			6.6			6.1	
Approach LOS					B			A			A	

Intersection Summary			
Area Type:	Other		
Cycle Length: 40			
Actuated Cycle Length: 40			
Offset: 0 (0%), Referenced to phase 2:NETL and 6:SWT, Start of Green			
Natural Cycle: 40			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.49			
Intersection Signal Delay: 8.9		Intersection LOS: A	
Intersection Capacity Utilization 41.2%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 19: Dreher Ave & 306 WB C-D Road/306 WB Exit Ramp



Lane Group	WBT	WBR	NEL	NET	SWT	SWR
Lane Group Flow (vph)	256	92	42	113	169	42
v/c Ratio	0.49	0.18	0.06	0.10	0.15	0.04
Control Delay	14.6	3.6	6.7	6.6	6.8	3.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	14.6	3.6	6.7	6.6	6.8	3.2
Queue Length 50th (ft)	48	0	4	11	16	0
Queue Length 95th (ft)	76	17	18	36	51	12
Internal Link Dist (ft)	812			1212	431	
Turn Bay Length (ft)		100	150			100
Base Capacity (vph)	751	701	738	1135	1135	982
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.34	0.13	0.06	0.10	0.15	0.04

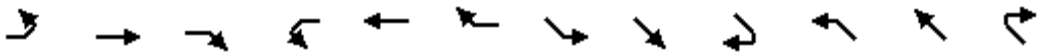
Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (veh/h)	0	0	0	51	179	83	38	102	0	0	152	38
Number				3	8	18	5	2	12	1	6	16
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
Adj Sat Flow, veh/h/ln				1900	1900	1900	1900	1900	0	0	1900	1900
Adj Flow Rate, veh/h				57	199	0	42	113	0	0	169	0
Adj No. of Lanes				0	1	1	1	1	0	0	1	1
Peak Hour Factor				0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %				0	0	0	0	0	0	0	0	0
Cap, veh/h				73	254	281	874	1046	0	0	1046	889
Arrive On Green				0.17	0.17	0.00	0.55	0.55	0.00	0.00	0.55	0.00
Sat Flow, veh/h				418	1461	1615	1236	1900	0	0	1900	1615
Grp Volume(v), veh/h				256	0	0	42	113	0	0	169	0
Grp Sat Flow(s),veh/h/ln				1879	0	1615	1236	1900	0	0	1900	1615
Q Serve(g_s), s				3.8	0.0	0.0	0.5	0.8	0.0	0.0	1.3	0.0
Cycle Q Clear(g_c), s				3.8	0.0	0.0	1.8	0.8	0.0	0.0	1.3	0.0
Prop In Lane				0.22		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				327	0	281	874	1046	0	0	1046	889
V/C Ratio(X)				0.78	0.00	0.00	0.05	0.11	0.00	0.00	0.16	0.00
Avail Cap(c_a), veh/h				1035	0	889	874	1046	0	0	1046	889
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				11.5	0.0	0.0	3.7	3.1	0.0	0.0	3.2	0.0
Incr Delay (d2), s/veh				4.1	0.0	0.0	0.1	0.2	0.0	0.0	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				2.3	0.0	0.0	0.2	0.5	0.0	0.0	0.8	0.0
LnGrp Delay(d),s/veh				15.6	0.0	0.0	3.8	3.3	0.0	0.0	3.5	0.0
LnGrp LOS				B			A	A			A	
Approach Vol, veh/h					256			155			169	
Approach Delay, s/veh					15.6			3.4			3.5	
Approach LOS					B			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2				6		8
Phs Duration (G+Y+Rc), s		30.9				30.9		9.1
Change Period (Y+Rc), s		4.0				4.0		4.0
Max Green Setting (Gmax), s		16.0				16.0		16.0
Max Q Clear Time (g_c+I1), s		3.8				3.3		5.8
Green Ext Time (p_c), s		1.3				1.4		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	8.8
HCM 2010 LOS	A

Two Way Analysis cannot be performed on Signalized Intersection.



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	47	588	0	0	388	149	0	0	0	155	75	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	50		0	0		0	0		0	0		0
Storage Lanes	1		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.962						0.987	
Flt Protected	0.950										0.970	
Satd. Flow (prot)	1805	1900	0	0	1828	0	0	0	0	0	1819	0
Flt Permitted	0.950										0.970	
Satd. Flow (perm)	1805	1900	0	0	1828	0	0	0	0	0	1819	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1534			227			367			2068	
Travel Time (s)		34.9			5.2			8.3			47.0	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	52	653	0	0	431	166	0	0	0	172	83	27
Shared Lane Traffic (%)												
Lane Group Flow (vph)	52	653	0	0	597	0	0	0	0	0	282	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 56.8%		ICU Level of Service B	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER
Vol, veh/h	47	588	0	0	388	149	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	Yeild	-	-	None
Storage Length	50	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0
Mvmt Flow	52	653	0	0	431	166	0	0	0

Major/Minor	Major1			Major2		
Conflicting Flow All	431	0	0	653	0	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	1139	-	-	943	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Platoon blocked, %		-	-		-	-
Mov Cap-1 Maneuver	1139	-	-	943	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB
HCM Control Delay, s	0.6	0
HCM LOS		

Minor Lane/Major Mvmt	NWLn1	EBL	EBT	EBR	WBL	WBT	WBR
Capacity (veh/h)	2124	1139	-	-	943	-	-
HCM Lane V/C Ratio	0.133	0.046	-	-	-	-	-
HCM Control Delay (s)	7	8.3	-	-	0	-	-
HCM Lane LOS	A	A	-	-	A	-	-
HCM 95th %tile Q(veh)	0.5	0.1	-	-	0	-	-

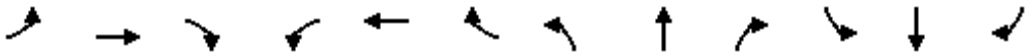
Intersection	
Int Delay, s/veh	

Movement	NWL	NWT	NWR
Vol, veh/h	155	75	24
Conflicting Peds, #/hr	0	0	0
Sign Control	Stop	Stop	Stop
RT Channelized	-	-	Yeild
Storage Length	-	-	-
Veh in Median Storage, #	-	0	-
Grade, %	-	0	-
Peak Hour Factor	90	90	90
Heavy Vehicles, %	0	0	0
Mvmt Flow	172	83	27

Major/Minor	Minor1		
Conflicting Flow All	1189	1189	653
Stage 1	758	758	-
Stage 2	431	431	-
Critical Hdwy	6.4	6.5	6.2
Critical Hdwy Stg 1	5.4	5.5	-
Critical Hdwy Stg 2	5.4	5.5	-
Follow-up Hdwy	3.5	4	3.3
Pot Cap-1 Maneuver	210	190	471
Stage 1	466	418	-
Stage 2	660	586	-
Platoon blocked, %			
Mov Cap-1 Maneuver	200	0	471
Mov Cap-2 Maneuver	200	0	-
Stage 1	445	0	-
Stage 2	660	0	-

Approach	NW
HCM Control Delay, s	7
HCM LOS	A

Minor Lane/Major Mvmt

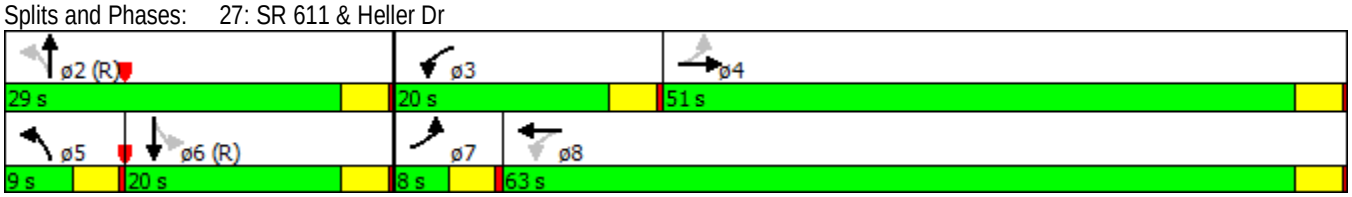


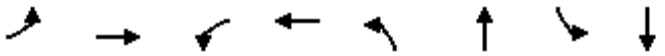
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	15	610	268	322	752	33	204	1	448	24	1	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		-3%			0%			0%			0%	
Storage Length (ft)	150		0	400		0	0		0	50		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.954			0.994			0.850			0.862	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1832	3496	0	1805	3588	0	1805	1615	0	1805	1638	0
Flt Permitted	0.325			0.115			0.619			0.356		
Satd. Flow (perm)	627	3496	0	218	3588	0	1176	1615	0	676	1638	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		94			8			352			11	
Link Speed (mph)		35			35			30			30	
Link Distance (ft)		557			1414			347			353	
Travel Time (s)		10.9			27.5			7.9			8.0	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	17	678	298	358	836	37	227	1	498	27	1	11
Shared Lane Traffic (%)												
Lane Group Flow (vph)	17	976	0	358	873	0	227	499	0	27	12	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		Yes										
Headway Factor	0.98	0.98	0.98	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		Perm	NA	
Protected Phases	7	4		3	8		5	2			6	
Permitted Phases	4			8			2			6		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	7	4		3	8		5	2		6	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	8.0	20.0		8.0	20.0		8.0	20.0		20.0	20.0	
Total Split (s)	8.0	51.0		20.0	63.0		9.0	29.0		20.0	20.0	
Total Split (%)	8.0%	51.0%		20.0%	63.0%		9.0%	29.0%		20.0%	20.0%	
Maximum Green (s)	4.0	47.0		16.0	59.0		5.0	25.0		16.0	16.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5		0.5	0.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead			Lag	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		None	C-Max		C-Max	C-Max	
Walk Time (s)		5.0			5.0			5.0		5.0	5.0	
Flash Dont Walk (s)		11.0			11.0			11.0		11.0	11.0	
Pedestrian Calls (#/hr)		0			0			0		0	0	
Act Effct Green (s)	38.8	34.8		54.6	51.4		37.4	37.4		21.4	21.4	
Actuated g/C Ratio	0.39	0.35		0.55	0.51		0.37	0.37		0.21	0.21	
v/c Ratio	0.06	0.76		0.97	0.47		0.44	0.61		0.19	0.03	
Control Delay	10.1	29.8		66.0	16.2		27.7	11.8		40.1	19.7	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	10.1	29.8		66.0	16.2		27.7	11.8		40.1	19.7	
LOS	B	C		E	B		C	B		D	B	
Approach Delay		29.4			30.7			16.8			33.8	
Approach LOS		C			C			B			C	

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 100			
Offset: 91 (91%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 65			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.97			
Intersection Signal Delay: 26.9		Intersection LOS: C	
Intersection Capacity Utilization 81.1%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 27: SR 611 & Heller Dr



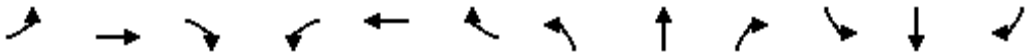


Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	17	976	358	873	227	499	27	12
v/c Ratio	0.06	0.76	0.97	0.47	0.44	0.61	0.19	0.03
Control Delay	10.1	29.8	66.0	16.2	27.7	11.8	40.1	19.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	10.1	29.8	66.0	16.2	27.7	11.8	40.1	19.7
Queue Length 50th (ft)	5	260	168	162	103	64	15	1
Queue Length 95th (ft)	12	294	#326	211	187	197	42	17
Internal Link Dist (ft)		477		1334		267		273
Turn Bay Length (ft)	150		400				50	
Base Capacity (vph)	291	1692	372	2120	515	824	145	359
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.06	0.58	0.96	0.41	0.44	0.61	0.19	0.03

Intersection Summary

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

Two Way Analysis cannot be performed on Signalized Intersection.



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	1	1	204	1	449	0	0	268	322
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00
Frt					0.866						0.926	
Flt Protected												
Satd. Flow (prot)	0	0	0	0	1645	0	0	3610	0	0	1759	0
Flt Permitted												
Satd. Flow (perm)	0	0	0	0	1645	0	0	3610	0	0	1759	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		372			504			509			347	
Travel Time (s)		8.5			11.5			11.6			7.9	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	0	0	1	1	227	1	499	0	0	298	358
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	229	0	0	500	0	0	656	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Free			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 53.2%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	1.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR
Vol, veh/h	0	0	0	1	1	204	1	449	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Stop	Stop	Stop	Free	Free	Free
RT Channelized	-	-	None	-	-	Yeild	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0
Mvmt Flow	0	0	0	1	1	227	1	499	0

Major/Minor	Minor1			Major1		
Conflicting Flow All	978	1157	249	656	0	0
Stage 1	501	501	-	-	-	-
Stage 2	477	656	-	-	-	-
Critical Hdwy	6.6	6.5	6.9	4.1	-	-
Critical Hdwy Stg 1	5.8	5.5	-	-	-	-
Critical Hdwy Stg 2	5.4	5.5	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	2.2	-	-
Pot Cap-1 Maneuver	265	198	757	941	-	-
Stage 1	580	546	-	-	-	-
Stage 2	629	465	-	-	-	-
Platoon blocked, %					-	-
Mov Cap-1 Maneuver	265	0	757	941	-	-
Mov Cap-2 Maneuver	265	0	-	-	-	-
Stage 1	579	0	-	-	-	-
Stage 2	629	0	-	-	-	-

Approach	WB	NB
HCM Control Delay, s	11.7	0
HCM LOS	B	

Minor Lane/Major Mvmt	NBL	NBT	NBR	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	941	-	-	764	1075	-	-
HCM Lane V/C Ratio	0.001	-	-	0.3	-	-	-
HCM Control Delay (s)	8.8	0	-	11.7	0	-	-
HCM Lane LOS	A	A	-	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	1.3	0	-	-

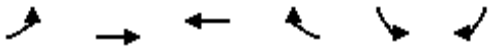
Intersection	
Int Delay, s/veh	

Movement	SBL	SBT	SBR
Vol, veh/h	0	268	322
Conflicting Peds, #/hr	0	0	0
Sign Control	Free	Free	Free
RT Channelized	-	-	None
Storage Length	-	-	-
Veh in Median Storage, #	-	0	-
Grade, %	-	0	-
Peak Hour Factor	90	90	90
Heavy Vehicles, %	0	0	0
Mvmt Flow	0	298	358

Major/Minor	Major2		
Conflicting Flow All	499	0	0
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	4.1	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	2.2	-	-
Pot Cap-1 Maneuver	1075	-	-
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	1075	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	SB
HCM Control Delay, s	0
HCM LOS	

Minor Lane/Major Mvmt



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	449	1	0	0	268	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt						
Flt Protected		0.952			0.950	
Satd. Flow (prot)	0	1809	0	0	1805	0
Flt Permitted		0.952			0.950	
Satd. Flow (perm)	0	1809	0	0	1805	0
Link Speed (mph)		30	30		30	
Link Distance (ft)		487	669		509	
Travel Time (s)		11.1	15.2		11.6	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	499	1	0	0	298	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	500	0	0	298	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		0	0		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Stop	Free		Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 46.4%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	449	1	0	0	268	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	499	1	0	0	298	0

Major/Minor	Minor2		Major2	
Conflicting Flow All	0	596	0	-
Stage 1	0	596	-	-
Stage 2	0	0	-	-
Critical Hdwy	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	-	-	-
Pot Cap-1 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Platoon blocked, %				-
Mov Cap-1 Maneuver	-	0	-	-
Mov Cap-2 Maneuver	-	0	-	-
Stage 1	-	0	-	-
Stage 2	-	0	-	-

Approach	EB	SB
HCM Control Delay, s		0
HCM LOS	-	

Minor Lane/Major Mvmt	EBLn1	SBL	SBR
Capacity (veh/h)	-	-	-
HCM Lane V/C Ratio	-	-	-
HCM Control Delay (s)	-	-	-
HCM Lane LOS	-	-	-
HCM 95th %tile Q(veh)	-	-	-

Lane Group	EBT	EBR	WBL	WBT	NWL	NWR
Lane Configurations						
Volume (vph)	322	317	53	986	140	395
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)		100	150		0	200
Storage Lanes		1	1		1	1
Taper Length (ft)			25		25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850				0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1900	1615	1805	1900	1805	1615
Flt Permitted			0.950		0.950	
Satd. Flow (perm)	1900	1615	1805	1900	1805	1615
Link Speed (mph)	30			30	30	
Link Distance (ft)	1124			1534	676	
Travel Time (s)	25.5			34.9	15.4	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	358	352	59	1096	156	439
Shared Lane Traffic (%)						
Lane Group Flow (vph)	358	352	59	1096	156	439
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 66.3%		ICU Level of Service C	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	20.3

Movement	EBT	EBR	WBL	WBT	NWL	NWR
Vol, veh/h	322	317	53	986	140	395
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Yeild	-	None	-	Yeild
Storage Length	-	100	150	-	0	200
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	358	352	59	1096	156	439

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	358	0	1571	358
Stage 1	-	-	-	-	358	-
Stage 2	-	-	-	-	1213	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1212	-	~ 123	691
Stage 1	-	-	-	-	712	-
Stage 2	-	-	-	-	284	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1212	-	~ 117	691
Mov Cap-2 Maneuver	-	-	-	-	~ 117	-
Stage 1	-	-	-	-	712	-
Stage 2	-	-	-	-	270	-

Approach	EB	WB	NW
HCM Control Delay, s	0	0.4	83.1
HCM LOS			F

Minor Lane/Major Mvmt	NWLn1	NWLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	117	691	-	-	1212	-
HCM Lane V/C Ratio	1.33	0.635	-	-	0.049	-
HCM Control Delay (s)	264.5	18.8	-	-	8.1	-
HCM Lane LOS	F	C	-	-	A	-
HCM 95th %tile Q(veh)	10.4	4.6	-	-	0.2	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	10	369	10	0	0	0	0	111	85	104	307	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		100	0		0	0		100	150		0
Storage Lanes	0		0	0		0	0		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.997							0.850			
Flt Protected		0.999								0.950		
Satd. Flow (prot)	0	1892	0	0	0	0	0	1900	1615	1805	1900	0
Flt Permitted		0.999								0.950		
Satd. Flow (perm)	0	1892	0	0	0	0	0	1900	1615	1805	1900	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		2085			911			670			1292	
Travel Time (s)		47.4			20.7			15.2			29.4	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	11	410	11	0	0	0	0	123	94	116	341	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	432	0	0	0	0	0	123	94	116	341	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 55.9%		ICU Level of Service B	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	2.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER
Vol, veh/h	10	369	10	0	0	0	0	111	85
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free
RT Channelized	-	-	Yeild	-	-	None	-	-	Yeild
Storage Length	-	-	-	-	-	-	-	-	100
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0
Mvmt Flow	11	410	11	0	0	0	0	123	94

Major/Minor	Minor2						Major1		
Conflicting Flow All	695	695	341				341	0	0
Stage 1	572	572	-				-	-	-
Stage 2	123	123	-				-	-	-
Critical Hdwy	6.4	6.5	6.2				4.1	-	-
Critical Hdwy Stg 1	5.4	5.5	-				-	-	-
Critical Hdwy Stg 2	5.4	5.5	-				-	-	-
Follow-up Hdwy	3.5	4	3.3				2.2	-	-
Pot Cap-1 Maneuver	411	~ 368	706				1229	-	-
Stage 1	569	508	-				-	-	-
Stage 2	907	798	-				-	-	-
Platoon blocked, %								-	-
Mov Cap-1 Maneuver	379	0	706				1229	-	-
Mov Cap-2 Maneuver	379	0	-				-	-	-
Stage 1	524	0	-				-	-	-
Stage 2	907	0	-				-	-	-

Approach	EB	NE
HCM Control Delay, s	5.1	0
HCM LOS	A	

Minor Lane/Major Mvmt	NEL	NET	NER	EBLn1	SWL	SWT	SWR
Capacity (veh/h)	1229	-	-	27463	1477	-	-
HCM Lane V/C Ratio	-	-	-	0.016	0.078	-	-
HCM Control Delay (s)	0	-	-	5.1	7.6	-	-
HCM Lane LOS	A	-	-	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0	0.3	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	

Movement	SWL	SWT	SWR
Vol, veh/h	104	307	0
Conflicting Peds, #/hr	0	0	0
Sign Control	Free	Free	Free
RT Channelized	-	-	None
Storage Length	150	-	-
Veh in Median Storage, #	-	0	-
Grade, %	-	0	-
Peak Hour Factor	90	90	90
Heavy Vehicles, %	0	0	0
Mvmt Flow	116	341	0

Major/Minor	Major2		
Conflicting Flow All	123	0	0
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	4.1	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	2.2	-	-
Pot Cap-1 Maneuver	1477	-	-
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	1477	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	SW
HCM Control Delay, s	1.9
HCM LOS	

Minor Lane/Major Mvmt

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	0	0	0	166	377	138	72	49	0	0	245	72
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		100	150		0	0		100
Storage Lanes	0		0	0		1	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.850						0.850
Flt Protected					0.985		0.950					
Satd. Flow (prot)	0	0	0	0	1872	1615	1805	1900	0	0	1900	1615
Flt Permitted					0.985		0.950					
Satd. Flow (perm)	0	0	0	0	1872	1615	1805	1900	0	0	1900	1615
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		2068			892			1292			511	
Travel Time (s)		47.0			20.3			29.4			11.6	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	0	0	184	419	153	80	54	0	0	272	80
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	603	153	80	54	0	0	272	80
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 55.9%		ICU Level of Service B	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	62.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER
Vol, veh/h	0	0	0	166	377	138	72	49	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free
RT Channelized	-	-	None	-	-	Yeild	-	-	None
Storage Length	-	-	-	-	-	100	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0
Mvmt Flow	0	0	0	184	419	153	80	54	0

Major/Minor	Minor1			Major1		
Conflicting Flow All	486	486	54	272	0	0
Stage 1	214	214	-	-	-	-
Stage 2	272	272	-	-	-	-
Critical Hdwy	6.4	6.5	6.2	4.1	-	-
Critical Hdwy Stg 1	5.4	5.5	-	-	-	-
Critical Hdwy Stg 2	5.4	5.5	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	2.2	-	-
Pot Cap-1 Maneuver	544	484	1019	1303	-	-
Stage 1	826	729	-	-	-	-
Stage 2	778	688	-	-	-	-
Platoon blocked, %					-	-
Mov Cap-1 Maneuver	511	0	1019	1303	-	-
Mov Cap-2 Maneuver	511	0	-	-	-	-
Stage 1	775	0	-	-	-	-
Stage 2	778	0	-	-	-	-

Approach	WB	NE
HCM Control Delay, s	102.5	4.7
HCM LOS	F	

Minor Lane/Major Mvmt	NEL	NET	NER	WBLn1	WBLn2	SWL	SWT	SWR
Capacity (veh/h)	1303	-	-	511	1019	1564	-	-
HCM Lane V/C Ratio	0.061	-	-	1.181	0.15	-	-	-
HCM Control Delay (s)	7.9	-	-	126.2	9.2	0	-	-
HCM Lane LOS	A	-	-	F	A	A	-	-
HCM 95th %tile Q(veh)	0.2	-	-	21.9	0.5	0	-	-

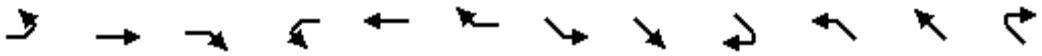
Intersection	
Int Delay, s/veh	

Movement	SWL	SWT	SWR
Vol, veh/h	0	245	72
Conflicting Peds, #/hr	0	0	0
Sign Control	Free	Free	Free
RT Channelized	-	-	Yeild
Storage Length	-	-	100
Veh in Median Storage, #	-	0	-
Grade, %	-	0	-
Peak Hour Factor	90	90	90
Heavy Vehicles, %	0	0	0
Mvmt Flow	0	272	80

Major/Minor	Major2		
Conflicting Flow All	54	0	0
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	4.1	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	2.2	-	-
Pot Cap-1 Maneuver	1564	-	-
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	1564	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	SW
HCM Control Delay, s	0
HCM LOS	

Minor Lane/Major Mvmt

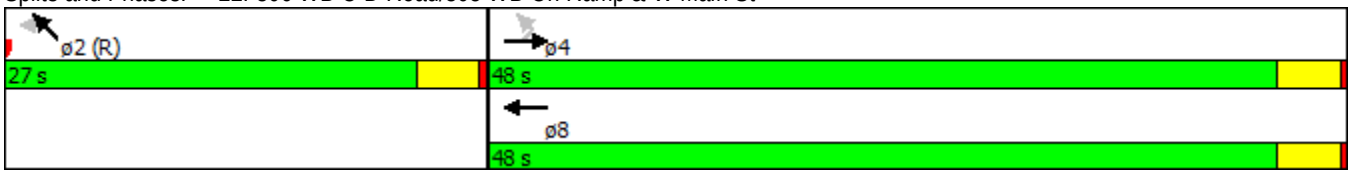


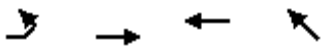
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	72	645	0	0	711	288	0	0	0	332	145	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	50		0	0		0	0		0	0		0
Storage Lanes	1		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.961						0.988	
Flt Protected	0.950										0.969	
Satd. Flow (prot)	1805	1900	0	0	1826	0	0	0	0	0	1819	0
Flt Permitted	0.091										0.969	
Satd. Flow (perm)	173	1900	0	0	1826	0	0	0	0	0	1819	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					47						7	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1534			227			367			2068	
Travel Time (s)		34.9			5.2			8.3			47.0	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	80	717	0	0	790	320	0	0	0	369	161	50
Shared Lane Traffic (%)												
Lane Group Flow (vph)	80	717	0	0	1110	0	0	0	0	0	580	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2			2					1	2	
Detector Template	Left	Thru			Thru					Left	Thru	
Leading Detector (ft)	20	100			100					20	100	
Trailing Detector (ft)	0	0			0					0	0	
Detector 1 Position(ft)	0	0			0					0	0	
Detector 1 Size(ft)	20	6			6					20	6	
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex					Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0					0.0	0.0	
Detector 1 Queue (s)	0.0	0.0			0.0					0.0	0.0	
Detector 1 Delay (s)	0.0	0.0			0.0					0.0	0.0	
Detector 2 Position(ft)		94			94						94	
Detector 2 Size(ft)		6			6						6	
Detector 2 Type		Cl+Ex			Cl+Ex						Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0						0.0	
Turn Type	Perm	NA			NA					Perm	NA	
Protected Phases		4			8						2	
Permitted Phases	4									2		
Detector Phase	4	4			8					2	2	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Switch Phase												
Minimum Initial (s)	4.0	4.0			4.0					4.0	4.0	
Minimum Split (s)	20.0	20.0			20.0					20.0	20.0	
Total Split (s)	48.0	48.0			48.0					27.0	27.0	
Total Split (%)	64.0%	64.0%			64.0%					36.0%	36.0%	
Maximum Green (s)	44.0	44.0			44.0					23.0	23.0	
Yellow Time (s)	3.5	3.5			3.5					3.5	3.5	
All-Red Time (s)	0.5	0.5			0.5					0.5	0.5	
Lost Time Adjust (s)	0.0	0.0			0.0						0.0	
Total Lost Time (s)	4.0	4.0			4.0						4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0			3.0					3.0	3.0	
Recall Mode	None	None			None					C-Max	C-Max	
Act Effct Green (s)	44.0	44.0			44.0						23.0	
Actuated g/C Ratio	0.59	0.59			0.59						0.31	
v/c Ratio	0.79	0.64			1.02						1.03	
Control Delay	67.3	13.7			49.4						74.7	
Queue Delay	0.0	0.0			0.0						0.0	
Total Delay	67.3	13.7			49.4						74.7	
LOS	E	B			D						E	
Approach Delay		19.1			49.4						74.7	
Approach LOS		B			D						E	

Intersection Summary			
Area Type:	Other		
Cycle Length: 75			
Actuated Cycle Length: 75			
Offset: 0 (0%), Referenced to phase 2:NWTL and 6:, Start of Green			
Natural Cycle: 75			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.03			
Intersection Signal Delay: 45.6		Intersection LOS: D	
Intersection Capacity Utilization 95.2%		ICU Level of Service F	
Analysis Period (min) 15			

Splits and Phases: 22: 306 WB C-D Road/305 WB On Ramp & W Main St





Lane Group	EBL	EBT	WBT	NWT
Lane Group Flow (vph)	80	717	1110	580
v/c Ratio	0.79	0.64	1.02	1.03
Control Delay	67.3	13.7	49.4	74.7
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	67.3	13.7	49.4	74.7
Queue Length 50th (ft)	26	200	~493	~293
Queue Length 95th (ft)	#112	310	#782	#484
Internal Link Dist (ft)		1454	147	1988
Turn Bay Length (ft)	50			
Base Capacity (vph)	101	1114	1090	562
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	0.79	0.64	1.02	1.03

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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

Lane Group	EBT	EBR	WBL	WBT	NWL	NWR
Lane Configurations						
Volume (vph)	369	0	0	535	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt						
Flt Protected						
Satd. Flow (prot)	1900	0	0	1900	0	0
Flt Permitted						
Satd. Flow (perm)	1900	0	0	1900	0	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)						
Link Speed (mph)	30			30	30	
Link Distance (ft)	676			545	2085	
Travel Time (s)	15.4			12.4	47.4	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	410	0	0	594	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	410	0	0	594	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	0	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Turn Type	NA			NA		
Protected Phases	4			8		
Permitted Phases						
Minimum Split (s)	20.0			20.0		
Total Split (s)	20.0			20.0		
Total Split (%)	100.0%			100.0%		
Maximum Green (s)	16.0			16.0		
Yellow Time (s)	3.5			3.5		
All-Red Time (s)	0.5			0.5		
Lost Time Adjust (s)	0.0			0.0		
Total Lost Time (s)	4.0			4.0		
Lead/Lag						
Lead-Lag Optimize?						
Act Effct Green (s)	20.0			20.0		
Actuated g/C Ratio	1.00			1.00		
v/c Ratio	0.22			0.31		
Control Delay	0.3			0.4		
Queue Delay	0.0			0.0		
Total Delay	0.3			0.4		
LOS	A			A		
Approach Delay	0.3			0.4		
Approach LOS	A			A		

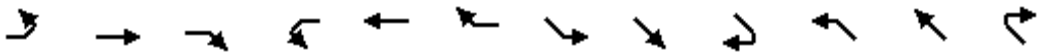
Intersection Summary

Area Type:	Other	
Cycle Length: 20		
Actuated Cycle Length: 20		
Offset: 0 (0%), Referenced to phase 2: and 6:, Start of Green		
Natural Cycle: 40		
Control Type: Pretimed		
Maximum v/c Ratio: 0.31		
Intersection Signal Delay: 0.4		Intersection LOS: A
Intersection Capacity Utilization 31.5%		ICU Level of Service A
Analysis Period (min) 15		

Splits and Phases: 25: 305 EB C-D Road & 305 EB Exit and On Ramps/305 EB Exit Ramp

Lane Group	EBT	WBT
Lane Group Flow (vph)	410	594
v/c Ratio	0.22	0.31
Control Delay	0.3	0.4
Queue Delay	0.0	0.0
Total Delay	0.3	0.4
Queue Length 50th (ft)	0	0
Queue Length 95th (ft)	0	0
Internal Link Dist (ft)	596	465
Turn Bay Length (ft)		
Base Capacity (vph)	1900	1900
Starvation Cap Reductn	0	0
Spillback Cap Reductn	0	0
Storage Cap Reductn	0	0
Reduced v/c Ratio	0.22	0.31

Intersection Summary



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	72	645	0	0	711	288	0	0	0	332	145	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	50		0	0		0	0		0	0		0
Storage Lanes	1		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.961						0.988	
Flt Protected	0.950										0.969	
Satd. Flow (prot)	1805	1900	0	0	1826	0	0	0	0	0	1819	0
Flt Permitted	0.950										0.969	
Satd. Flow (perm)	1805	1900	0	0	1826	0	0	0	0	0	1819	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1534			227			367			2068	
Travel Time (s)		34.9			5.2			8.3			47.0	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	80	717	0	0	790	320	0	0	0	369	161	50
Shared Lane Traffic (%)												
Lane Group Flow (vph)	80	717	0	0	1110	0	0	0	0	0	580	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 95.2%		ICU Level of Service F	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	251.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER
Vol, veh/h	72	645	0	0	711	288	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	Yeild	-	-	None
Storage Length	50	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0
Mvmt Flow	80	717	0	0	790	320	0	0	0

Major/Minor	Major1			Major2		
Conflicting Flow All	790	0	0	717	0	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	839	-	-	893	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Platoon blocked, %		-	-		-	-
Mov Cap-1 Maneuver	839	-	-	893	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB
HCM Control Delay, s	1	0
HCM LOS		

Minor Lane/Major Mvmt	NWLn1	EBL	EBT	EBR	WBL	WBT	WBR
Capacity (veh/h)	177	839	-	-	893	-	-
HCM Lane V/C Ratio	3.277	0.095	-	-	-	-	-
HCM Control Delay (s)	$ 1078.4	9.7	-	-	0	-	-
HCM Lane LOS	F	A	-	-	A	-	-
HCM 95th %tile Q(veh)	54.4	0.3	-	-	0	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	

Movement	NWL	NWT	NWR
Vol, veh/h	332	145	45
Conflicting Peds, #/hr	0	0	0
Sign Control	Stop	Stop	Stop
RT Channelized	-	-	Yeild
Storage Length	-	-	-
Veh in Median Storage, #	-	0	-
Grade, %	-	0	-
Peak Hour Factor	90	90	90
Heavy Vehicles, %	0	0	0
Mvmt Flow	369	161	50

Major/Minor	Minor1		
Conflicting Flow All	1667	1667	717
Stage 1	877	877	-
Stage 2	790	790	-
Critical Hdwy	6.4	6.5	6.2
Critical Hdwy Stg 1	5.4	5.5	-
Critical Hdwy Stg 2	5.4	5.5	-
Follow-up Hdwy	3.5	4	3.3
Pot Cap-1 Maneuver	~ 107	~ 97	433
Stage 1	410	369	-
Stage 2	451	404	-
Platoon blocked, %			
Mov Cap-1 Maneuver	~ 97	0	433
Mov Cap-2 Maneuver	~ 97	0	-
Stage 1	371	0	-
Stage 2	451	0	-

Approach	NW
HCM Control Delay, s	$ 1078.4
HCM LOS	F

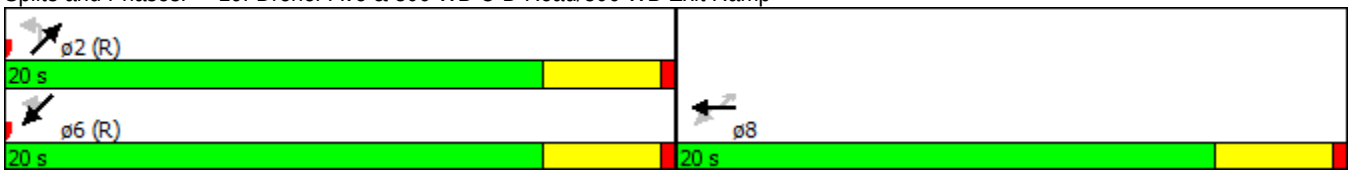
Minor Lane/Major Mvmt

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	0	0	0	166	377	138	72	49	0	0	245	72
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		100	150		0	0		100
Storage Lanes	0		0	0		1	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.850						0.850
Flt Protected					0.985		0.950					
Satd. Flow (prot)	0	0	0	0	1872	1615	1805	1900	0	0	1900	1615
Flt Permitted					0.985		0.587					
Satd. Flow (perm)	0	0	0	0	1872	1615	1115	1900	0	0	1900	1615
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						153						80
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		2068			892			1292			511	
Travel Time (s)		47.0			20.3			29.4			11.6	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	0	0	184	419	153	80	54	0	0	272	80
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	603	153	80	54	0	0	272	80
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1	2	1	1	2			2	1
Detector Template				Left	Thru	Right	Left	Thru			Thru	Right
Leading Detector (ft)				20	100	20	20	100			100	20
Trailing Detector (ft)				0	0	0	0	0			0	0
Detector 1 Position(ft)				0	0	0	0	0			0	0
Detector 1 Size(ft)				20	6	20	20	6			6	20
Detector 1 Type				Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Queue (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Delay (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 2 Position(ft)					94			94			94	
Detector 2 Size(ft)					6			6			6	
Detector 2 Type					Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)					0.0			0.0			0.0	
Turn Type				Perm	NA	Perm	Perm	NA			NA	Perm
Protected Phases					8			2			6	
Permitted Phases				8		8	2					6
Detector Phase				8	8	8	2	2			6	6

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Switch Phase												
Minimum Initial (s)				4.0	4.0	4.0	4.0	4.0			4.0	4.0
Minimum Split (s)				20.0	20.0	20.0	20.0	20.0			20.0	20.0
Total Split (s)				20.0	20.0	20.0	20.0	20.0			20.0	20.0
Total Split (%)				50.0%	50.0%	50.0%	50.0%	50.0%			50.0%	50.0%
Maximum Green (s)				16.0	16.0	16.0	16.0	16.0			16.0	16.0
Yellow Time (s)				3.5	3.5	3.5	3.5	3.5			3.5	3.5
All-Red Time (s)				0.5	0.5	0.5	0.5	0.5			0.5	0.5
Lost Time Adjust (s)					0.0	0.0	0.0	0.0			0.0	0.0
Total Lost Time (s)					4.0	4.0	4.0	4.0			4.0	4.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)				3.0	3.0	3.0	3.0	3.0			3.0	3.0
Recall Mode				None	None	None	C-Max	C-Max			C-Max	C-Max
Act Effct Green (s)					15.3	15.3	16.7	16.7			16.7	16.7
Actuated g/C Ratio					0.38	0.38	0.42	0.42			0.42	0.42
v/c Ratio					0.84	0.22	0.17	0.07			0.34	0.11
Control Delay					25.3	2.9	9.0	7.8			9.9	3.1
Queue Delay					0.0	0.0	0.0	0.0			0.0	0.0
Total Delay					25.3	2.9	9.0	7.8			9.9	3.1
LOS					C	A	A	A			A	A
Approach Delay					20.7			8.5			8.3	
Approach LOS					C			A			A	

Intersection Summary			
Area Type:	Other		
Cycle Length: 40			
Actuated Cycle Length: 40			
Offset: 0 (0%), Referenced to phase 2:NETL and 6:SWT, Start of Green			
Natural Cycle: 45			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.84			
Intersection Signal Delay: 15.9		Intersection LOS: B	
Intersection Capacity Utilization 55.9%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 19: Dreher Ave & 306 WB C-D Road/306 WB Exit Ramp



Lane Group	WBT	WBR	NEL	NET	SWT	SWR
Lane Group Flow (vph)	603	153	80	54	272	80
v/c Ratio	0.84	0.22	0.17	0.07	0.34	0.11
Control Delay	25.3	2.9	9.0	7.8	9.9	3.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.3	2.9	9.0	7.8	9.9	3.1
Queue Length 50th (ft)	112	0	11	7	40	0
Queue Length 95th (ft)	#257	22	30	21	80	16
Internal Link Dist (ft)	812			1212	431	
Turn Bay Length (ft)		100	150			100
Base Capacity (vph)	748	737	465	793	793	721
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.81	0.21	0.17	0.07	0.34	0.11

Intersection Summary

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

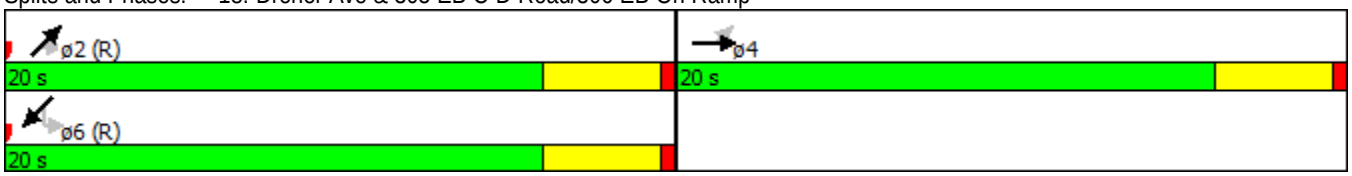
Two Way Analysis cannot be performed on Signalized Intersection.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	10	369	10	0	0	0	0	111	85	104	307	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		100	0		0	0		100	150		0
Storage Lanes	0		0	0		0	0		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.997							0.850			
Flt Protected		0.999								0.950		
Satd. Flow (prot)	0	1892	0	0	0	0	0	1900	1615	1805	1900	0
Flt Permitted		0.999								0.678		
Satd. Flow (perm)	0	1892	0	0	0	0	0	1900	1615	1288	1900	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		4							94			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		2085			911			670			1292	
Travel Time (s)		47.4			20.7			15.2			29.4	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	11	410	11	0	0	0	0	123	94	116	341	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	432	0	0	0	0	0	123	94	116	341	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2						2	1	1	2	
Detector Template	Left	Thru						Thru	Right	Left	Thru	
Leading Detector (ft)	20	100						100	20	20	100	
Trailing Detector (ft)	0	0						0	0	0	0	
Detector 1 Position(ft)	0	0						0	0	0	0	
Detector 1 Size(ft)	20	6						6	20	20	6	
Detector 1 Type	Cl+Ex	Cl+Ex						Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0						0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0						0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0						0.0	0.0	0.0	0.0	
Detector 2 Position(ft)		94						94			94	
Detector 2 Size(ft)		6						6			6	
Detector 2 Type		Cl+Ex						Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0						0.0			0.0	
Turn Type	Perm	NA						NA	Perm	Perm	NA	
Protected Phases		4						2			6	
Permitted Phases	4								2	6		
Detector Phase	4	4						2	2	6	6	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Switch Phase												
Minimum Initial (s)	4.0	4.0						4.0	4.0	4.0	4.0	
Minimum Split (s)	20.0	20.0						20.0	20.0	20.0	20.0	
Total Split (s)	20.0	20.0						20.0	20.0	20.0	20.0	
Total Split (%)	50.0%	50.0%						50.0%	50.0%	50.0%	50.0%	
Maximum Green (s)	16.0	16.0						16.0	16.0	16.0	16.0	
Yellow Time (s)	3.5	3.5						3.5	3.5	3.5	3.5	
All-Red Time (s)	0.5	0.5						0.5	0.5	0.5	0.5	
Lost Time Adjust (s)		0.0						0.0	0.0	0.0	0.0	
Total Lost Time (s)		4.0						4.0	4.0	4.0	4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0						3.0	3.0	3.0	3.0	
Recall Mode	None	None						C-Max	C-Max	C-Max	C-Max	
Act Effct Green (s)		13.4						18.6	18.6	18.6	18.6	
Actuated g/C Ratio		0.34						0.46	0.46	0.46	0.46	
v/c Ratio		0.68						0.14	0.12	0.19	0.39	
Control Delay		16.8						7.8	2.9	9.7	10.5	
Queue Delay		0.0						0.0	0.0	0.0	0.0	
Total Delay		16.8						7.8	2.9	9.7	10.5	
LOS		B						A	A	A	B	
Approach Delay		16.8						5.7			10.3	
Approach LOS		B						A			B	

Intersection Summary			
Area Type:	Other		
Cycle Length: 40			
Actuated Cycle Length: 40			
Offset: 0 (0%), Referenced to phase 2:NET and 6:SWTL, Start of Green			
Natural Cycle: 40			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.68			
Intersection Signal Delay: 11.9		Intersection LOS: B	
Intersection Capacity Utilization 55.9%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 18: Dreher Ave & 305 EB C-D Road/306 EB On Ramp



Lane Group	EBT	NET	NER	SWL	SWT
Lane Group Flow (vph)	432	123	94	116	341
v/c Ratio	0.68	0.14	0.12	0.19	0.39
Control Delay	16.8	7.8	2.9	9.7	10.5
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	16.8	7.8	2.9	9.7	10.5
Queue Length 50th (ft)	77	15	0	20	63
Queue Length 95th (ft)	132	39	17	m43	m112
Internal Link Dist (ft)	2005	590			1212
Turn Bay Length (ft)			100	150	
Base Capacity (vph)	759	883	801	599	883
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	0.57	0.14	0.12	0.19	0.39

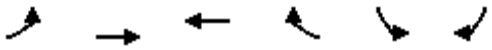
Intersection Summary

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

Lane Group	EBL	EBR	NEL	NET	SWT	SWR
Lane Configurations						
Volume (vph)	80	34	138	129	115	81
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	100	150			0
Storage Lanes	1	1	1			1
Taper Length (ft)	25		25			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1805	1615	1805	1900	1900	1615
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	1805	1615	1805	1900	1900	1615
Link Speed (mph)	30			30	30	
Link Distance (ft)	2085			670	1292	
Travel Time (s)	47.4			15.2	29.4	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	89	38	153	143	128	90
Shared Lane Traffic (%)						
Lane Group Flow (vph)	89	38	153	143	128	90
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15			9
Sign Control	Stop			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 25.4%		ICU Level of Service A	
Analysis Period (min) 15			

Two Way Analysis cannot be performed on Signalized Intersection.

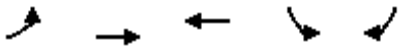


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	190	443	502	173	335	108
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	150			75	0	0
Storage Lanes	1			0	1	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	0.95	0.95	0.95	1.00	1.00
Frt			0.962			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1805	3610	3473	0	1805	1615
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1805	3610	3473	0	1805	1615
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			53			120
Link Speed (mph)		30	35		30	
Link Distance (ft)		1150	796		1035	
Travel Time (s)		26.1	15.5		23.5	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	211	492	558	192	372	120
Shared Lane Traffic (%)						
Lane Group Flow (vph)	211	492	750	0	372	120
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Number of Detectors	1	2	2		1	1
Detector Template	Left	Thru	Thru		Left	Right
Leading Detector (ft)	20	100	100		20	20
Trailing Detector (ft)	0	0	0		0	0
Detector 1 Position(ft)	0	0	0		0	0
Detector 1 Size(ft)	20	6	6		20	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0
Detector 2 Position(ft)		94	94			
Detector 2 Size(ft)		6	6			
Detector 2 Type		Cl+Ex	Cl+Ex			
Detector 2 Channel						
Detector 2 Extend (s)		0.0	0.0			
Turn Type	Prot	NA	NA		Prot	Free
Protected Phases	5	2	6		4	
Permitted Phases						Free
Detector Phase	5	2	6		4	

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0		4.0	
Minimum Split (s)	8.0	28.0	20.0		20.0	
Total Split (s)	26.0	66.0	40.0		34.0	
Total Split (%)	26.0%	66.0%	40.0%		34.0%	
Maximum Green (s)	22.0	62.0	36.0		30.0	
Yellow Time (s)	3.5	3.5	3.5		3.5	
All-Red Time (s)	0.5	0.5	0.5		0.5	
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	
Total Lost Time (s)	4.0	4.0	4.0		4.0	
Lead/Lag	Lead		Lag			
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0		3.0	
Recall Mode	None	C-Max	Max		None	
Walk Time (s)		7.0	5.0			
Flash Dont Walk (s)		17.0	11.0			
Pedestrian Calls (#/hr)		0	0			
Act Effct Green (s)	16.7	67.0	46.3		25.0	100.0
Actuated g/C Ratio	0.17	0.67	0.46		0.25	1.00
v/c Ratio	0.70	0.20	0.46		0.83	0.07
Control Delay	51.5	7.1	19.7		50.8	0.1
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	51.5	7.1	19.7		50.8	0.1
LOS	D	A	B		D	A
Approach Delay		20.4	19.7		38.4	
Approach LOS		C	B		D	

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 100			
Offset: 0 (0%), Referenced to phase 2:EBT, Start of Green			
Natural Cycle: 55			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.83			
Intersection Signal Delay: 24.7		Intersection LOS: C	
Intersection Capacity Utilization 58.5%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 6: SR 611 & Connector Rd



Lane Group	EBL	EBT	WBT	SBL	SBR
Lane Group Flow (vph)	211	492	750	372	120
v/c Ratio	0.70	0.20	0.46	0.83	0.07
Control Delay	51.5	7.1	19.7	50.8	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	51.5	7.1	19.7	50.8	0.1
Queue Length 50th (ft)	128	57	156	222	0
Queue Length 95th (ft)	194	91	247	313	0
Internal Link Dist (ft)		1070	716	955	
Turn Bay Length (ft)	150				
Base Capacity (vph)	397	2419	1637	541	1615
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	0.53	0.20	0.46	0.69	0.07

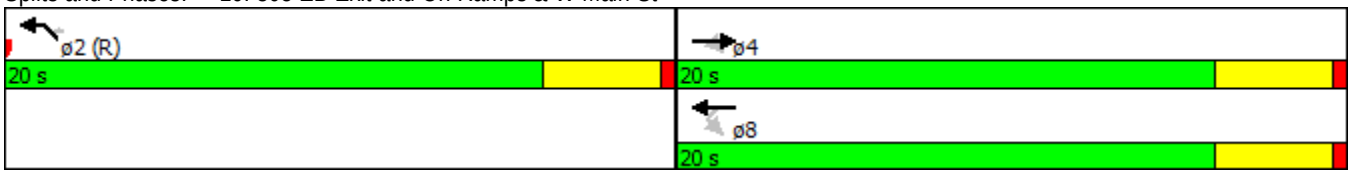
Intersection Summary

Lane Group	EBT	EBR	WBL	WBT	NWL	NWR
Lane Configurations						
Volume (vph)	254	288	36	507	49	284
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)		100	150		0	200
Storage Lanes		1	1		1	1
Taper Length (ft)			25		25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850				0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1900	1615	1805	1900	1805	1615
Flt Permitted			0.560		0.950	
Satd. Flow (perm)	1900	1615	1064	1900	1805	1615
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		320				316
Link Speed (mph)	30			30	30	
Link Distance (ft)	2247			1534	676	
Travel Time (s)	51.1			34.9	15.4	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	282	320	40	563	54	316
Shared Lane Traffic (%)						
Lane Group Flow (vph)	282	320	40	563	54	316
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	24	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Number of Detectors	2	1	1	2	1	1
Detector Template	Thru	Right	Left	Thru	Left	Right
Leading Detector (ft)	100	20	20	100	20	20
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	6	20	20	6	20	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)	94			94		
Detector 2 Size(ft)	6			6		
Detector 2 Type	Cl+Ex			Cl+Ex		
Detector 2 Channel						
Detector 2 Extend (s)	0.0			0.0		
Turn Type	NA	Perm	Perm	NA	Prot	Perm
Protected Phases	4			8	2	
Permitted Phases		4	8			2
Detector Phase	4	4	8	8	2	2

Lane Group	EBT	EBR	WBL	WBT	NWL	NWR
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	20.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	20.0	20.0	20.0	20.0	20.0	20.0
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Maximum Green (s)	16.0	16.0	16.0	16.0	16.0	16.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	C-Max	C-Max
Act Effct Green (s)	14.8	14.8	14.8	14.8	17.2	17.2
Actuated g/C Ratio	0.37	0.37	0.37	0.37	0.43	0.43
v/c Ratio	0.40	0.40	0.10	0.80	0.07	0.36
Control Delay	10.9	3.1	8.4	22.0	7.8	2.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	10.9	3.1	8.4	22.0	7.8	2.8
LOS	B	A	A	C	A	A
Approach Delay	6.7			21.1	3.5	
Approach LOS	A			C	A	

Intersection Summary	
Area Type:	Other
Cycle Length: 40	
Actuated Cycle Length: 40	
Offset: 0 (0%), Referenced to phase 2:NWL and 6:, Start of Green	
Natural Cycle: 40	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.80	
Intersection Signal Delay: 11.5	Intersection LOS: B
Intersection Capacity Utilization 37.6%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 16: 305 EB Exit and On Ramps & W Main St



Two Way Analysis cannot be performed on Signalized Intersection.

Lane Group	EBT	EBR	WBL	WBT	NWL	NWR
Lane Configurations						
Volume (vph)	254	288	36	507	49	284
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)		100	150		0	200
Storage Lanes		1	1		1	1
Taper Length (ft)			25		25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850				0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1900	1615	1805	1900	1805	1615
Flt Permitted			0.950		0.950	
Satd. Flow (perm)	1900	1615	1805	1900	1805	1615
Link Speed (mph)	30			30	30	
Link Distance (ft)	1124			1534	676	
Travel Time (s)	25.5			34.9	15.4	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	282	320	40	563	54	316
Shared Lane Traffic (%)						
Lane Group Flow (vph)	282	320	40	563	54	316
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	24	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 37.6%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	3.5

Movement	EBT	EBR	WBL	WBT	NWL	NWR
Vol, veh/h	254	288	36	507	49	284
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Yeild	-	None	-	Yeild
Storage Length	-	100	150	-	0	200
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	282	320	40	563	54	316

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	282	0	925	282
Stage 1	-	-	-	-	282	-
Stage 2	-	-	-	-	643	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1292	-	301	762
Stage 1	-	-	-	-	770	-
Stage 2	-	-	-	-	527	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1292	-	292	762
Mov Cap-2 Maneuver	-	-	-	-	292	-
Stage 1	-	-	-	-	770	-
Stage 2	-	-	-	-	511	-

Approach	EB	WB	NW
HCM Control Delay, s	0	0.5	14
HCM LOS			B

Minor Lane/Major Mvmt	NWLn1	NWLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	292	762	-	-	1292	-
HCM Lane V/C Ratio	0.186	0.414	-	-	0.031	-
HCM Control Delay (s)	20.1	13	-	-	7.9	-
HCM Lane LOS	C	B	-	-	A	-
HCM 95th %tile Q(veh)	0.7	2	-	-	0.1	-

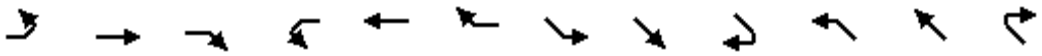
Intersection	
Int Delay, s/veh	4.5

Movement	EBL	EBR	NEL	NET	SWT	SWR
Vol, veh/h	80	34	138	129	115	81
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Yeild	-	Yeild	-	None
Storage Length	0	100	150	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	89	38	153	143	128	90

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	578	128	128	0	-	0
Stage 1	128	-	-	-	-	-
Stage 2	450	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	481	927	1470	-	-	-
Stage 1	903	-	-	-	-	-
Stage 2	647	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	431	927	1470	-	-	-
Mov Cap-2 Maneuver	431	-	-	-	-	-
Stage 1	903	-	-	-	-	-
Stage 2	580	-	-	-	-	-

Approach	EB	NE	SW
HCM Control Delay, s	13.6	4	0
HCM LOS	B		

Minor Lane/Major Mvmt	NEL	NET	EBLn1	EBLn2	SWT	SWR
Capacity (veh/h)	1470	-	431	927	-	-
HCM Lane V/C Ratio	0.104	-	0.206	0.041	-	-
HCM Control Delay (s)	7.7	-	15.5	9	-	-
HCM Lane LOS	A	-	C	A	-	-
HCM 95th %tile Q(veh)	0.3	-	0.8	0.1	-	-

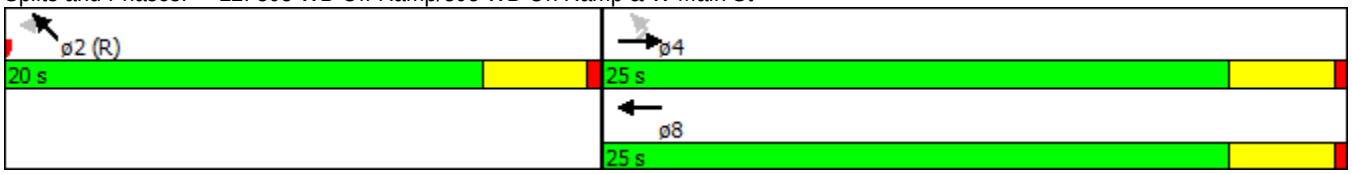


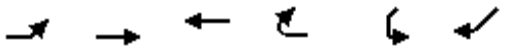
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	47	491	0	0	388	149	0	0	0	206	1	107
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	50		0	0		0	0		0	0		0
Storage Lanes	1		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.962						0.954	
Flt Protected	0.950										0.968	
Satd. Flow (prot)	1805	1900	0	0	1828	0	0	0	0	0	1755	0
Flt Permitted	0.222										0.968	
Satd. Flow (perm)	422	1900	0	0	1828	0	0	0	0	0	1755	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					58						64	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1534			227			367			1020	
Travel Time (s)		34.9			5.2			8.3			23.2	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	52	546	0	0	431	166	0	0	0	229	1	119
Shared Lane Traffic (%)												
Lane Group Flow (vph)	52	546	0	0	597	0	0	0	0	0	349	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2			2					1	2	
Detector Template	Left	Thru			Thru					Left	Thru	
Leading Detector (ft)	20	100			100					20	100	
Trailing Detector (ft)	0	0			0					0	0	
Detector 1 Position(ft)	0	0			0					0	0	
Detector 1 Size(ft)	20	6			6					20	6	
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex					Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0					0.0	0.0	
Detector 1 Queue (s)	0.0	0.0			0.0					0.0	0.0	
Detector 1 Delay (s)	0.0	0.0			0.0					0.0	0.0	
Detector 2 Position(ft)		94			94						94	
Detector 2 Size(ft)		6			6						6	
Detector 2 Type		Cl+Ex			Cl+Ex						Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0						0.0	
Turn Type	Perm	NA			NA					Perm	NA	
Protected Phases		4			8						2	
Permitted Phases	4									2		
Detector Phase	4	4			8					2	2	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Switch Phase												
Minimum Initial (s)	4.0	4.0			4.0					4.0	4.0	
Minimum Split (s)	20.0	20.0			20.0					20.0	20.0	
Total Split (s)	25.0	25.0			25.0					20.0	20.0	
Total Split (%)	55.6%	55.6%			55.6%					44.4%	44.4%	
Maximum Green (s)	21.0	21.0			21.0					16.0	16.0	
Yellow Time (s)	3.5	3.5			3.5					3.5	3.5	
All-Red Time (s)	0.5	0.5			0.5					0.5	0.5	
Lost Time Adjust (s)	0.0	0.0			0.0						0.0	
Total Lost Time (s)	4.0	4.0			4.0						4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0			3.0					3.0	3.0	
Recall Mode	None	None			None					C-Max	C-Max	
Act Effct Green (s)	18.0	18.0			18.0						19.0	
Actuated g/C Ratio	0.40	0.40			0.40						0.42	
v/c Ratio	0.31	0.72			0.78						0.45	
Control Delay	13.5	16.8			18.0						10.9	
Queue Delay	0.0	0.0			0.0						0.0	
Total Delay	13.5	16.8			18.0						10.9	
LOS	B	B			B						B	
Approach Delay		16.5			18.0						10.9	
Approach LOS		B			B						B	

Intersection Summary			
Area Type:	Other		
Cycle Length: 45			
Actuated Cycle Length: 45			
Offset: 0 (0%), Referenced to phase 2:NWTL and 6:, Start of Green			
Natural Cycle: 45			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.78			
Intersection Signal Delay: 15.8		Intersection LOS: B	
Intersection Capacity Utilization 60.8%		ICU Level of Service B	
Analysis Period (min) 15			

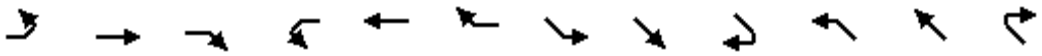
Splits and Phases: 22: 305 WB Off Ramp/305 WB On Ramp & W Main St





Lane Group	EBL	EBT	WBT	WBR	SWL	SWR
Lane Configurations						
Volume (vph)	324	10	10	219	114	333
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200			100	150	0
Storage Lanes	1			1	1	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1805	1900	1900	1615	1805	1615
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1805	1900	1900	1615	1805	1615
Link Speed (mph)		30	30		30	
Link Distance (ft)		676	2085		474	
Travel Time (s)		15.4	47.4		10.8	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	360	11	11	243	127	370
Shared Lane Traffic (%)						
Lane Group Flow (vph)	360	11	11	243	127	370
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 38.2%		ICU Level of Service A	
Analysis Period (min) 15			



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	47	491	0	0	388	149	0	0	0	206	1	107
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	50		0	0		0	0		0	0		0
Storage Lanes	1		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.962						0.954	
Flt Protected	0.950										0.968	
Satd. Flow (prot)	1805	1900	0	0	1828	0	0	0	0	0	1755	0
Flt Permitted	0.950										0.968	
Satd. Flow (perm)	1805	1900	0	0	1828	0	0	0	0	0	1755	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1534			227			367			1020	
Travel Time (s)		34.9			5.2			8.3			23.2	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	52	546	0	0	431	166	0	0	0	229	1	119
Shared Lane Traffic (%)												
Lane Group Flow (vph)	52	546	0	0	597	0	0	0	0	0	349	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 60.8%		ICU Level of Service B	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER
Vol, veh/h	47	491	0	0	388	149	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	Yeild	-	-	None
Storage Length	50	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0
Mvmt Flow	52	546	0	0	431	166	0	0	0

Major/Minor	Major1			Major2		
Conflicting Flow All	431	0	0	546	0	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	1139	-	-	1033	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Platoon blocked, %		-	-		-	-
Mov Cap-1 Maneuver	1139	-	-	1033	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB
HCM Control Delay, s	0.7	0
HCM LOS		

Minor Lane/Major Mvmt	NWLn1	EBL	EBT	EBR	WBL	WBT	WBR
Capacity (veh/h)	659	1139	-	-	1033	-	-
HCM Lane V/C Ratio	0.529	0.046	-	-	-	-	-
HCM Control Delay (s)	16.4	8.3	-	-	0	-	-
HCM Lane LOS	C	A	-	-	A	-	-
HCM 95th %tile Q(veh)	3.1	0.1	-	-	0	-	-

Intersection	
Int Delay, s/veh	

Movement	NWL	NWT	NWR
Vol, veh/h	206	1	107
Conflicting Peds, #/hr	0	0	0
Sign Control	Stop	Stop	Stop
RT Channelized	-	-	Yeild
Storage Length	-	-	-
Veh in Median Storage, #	-	0	-
Grade, %	-	0	-
Peak Hour Factor	90	90	90
Heavy Vehicles, %	0	0	0
Mvmt Flow	229	1	119

Major/Minor	Minor1		
Conflicting Flow All	1081	1081	546
Stage 1	650	650	-
Stage 2	431	431	-
Critical Hdwy	6.4	6.5	6.2
Critical Hdwy Stg 1	5.4	5.5	-
Critical Hdwy Stg 2	5.4	5.5	-
Follow-up Hdwy	3.5	4	3.3
Pot Cap-1 Maneuver	243	220	541
Stage 1	523	468	-
Stage 2	660	586	-
Platoon blocked, %			
Mov Cap-1 Maneuver	232	0	541
Mov Cap-2 Maneuver	232	0	-
Stage 1	499	0	-
Stage 2	660	0	-

Approach	NW
HCM Control Delay, s	16.4
HCM LOS	C

Minor Lane/Major Mvmt

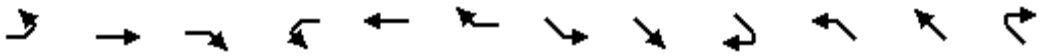
Intersection	
Int Delay, s/veh	8.7

Movement	EBL	EBT	WBT	WBR	SWL	SWR
Vol, veh/h	324	10	10	219	114	333
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Yeild	-	None
Storage Length	200	-	-	100	150	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	360	11	11	243	127	370

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	11	0	-	0	742	11
Stage 1	-	-	-	-	11	-
Stage 2	-	-	-	-	731	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1621	-	-	-	386	1076
Stage 1	-	-	-	-	1017	-
Stage 2	-	-	-	-	480	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1621	-	-	-	300	1076
Mov Cap-2 Maneuver	-	-	-	-	300	-
Stage 1	-	-	-	-	1017	-
Stage 2	-	-	-	-	373	-

Approach	EB	WB	SW
HCM Control Delay, s	7.6	0	14
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SWLn1	SWLn2
Capacity (veh/h)	1621	-	-	-	300	1076
HCM Lane V/C Ratio	0.222	-	-	-	0.422	0.344
HCM Control Delay (s)	7.9	-	-	-	25.5	10.1
HCM Lane LOS	A	-	-	-	D	B
HCM 95th %tile Q(veh)	0.9	-	-	-	2	1.5

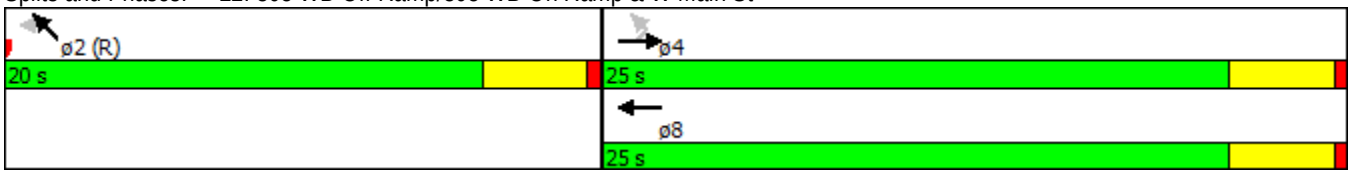


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	47	538	0	0	388	149	0	0	0	206	1	107
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	50		0	0		0	0		0	0		0
Storage Lanes	1		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.962						0.954	
Flt Protected	0.950										0.968	
Satd. Flow (prot)	1805	1900	0	0	1828	0	0	0	0	0	1755	0
Flt Permitted	0.222										0.968	
Satd. Flow (perm)	422	1900	0	0	1828	0	0	0	0	0	1755	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					58						64	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1534			227			367			1020	
Travel Time (s)		34.9			5.2			8.3			23.2	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	52	598	0	0	431	166	0	0	0	229	1	119
Shared Lane Traffic (%)												
Lane Group Flow (vph)	52	598	0	0	597	0	0	0	0	0	349	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2			2					1	2	
Detector Template	Left	Thru			Thru					Left	Thru	
Leading Detector (ft)	20	100			100					20	100	
Trailing Detector (ft)	0	0			0					0	0	
Detector 1 Position(ft)	0	0			0					0	0	
Detector 1 Size(ft)	20	6			6					20	6	
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex					Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0					0.0	0.0	
Detector 1 Queue (s)	0.0	0.0			0.0					0.0	0.0	
Detector 1 Delay (s)	0.0	0.0			0.0					0.0	0.0	
Detector 2 Position(ft)		94			94						94	
Detector 2 Size(ft)		6			6						6	
Detector 2 Type		Cl+Ex			Cl+Ex						Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0						0.0	
Turn Type	Perm	NA			NA					Perm	NA	
Protected Phases		4			8						2	
Permitted Phases	4									2		
Detector Phase	4	4			8					2	2	

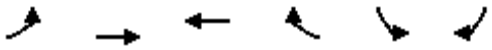
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Switch Phase												
Minimum Initial (s)	4.0	4.0			4.0					4.0	4.0	
Minimum Split (s)	20.0	20.0			20.0					20.0	20.0	
Total Split (s)	25.0	25.0			25.0					20.0	20.0	
Total Split (%)	55.6%	55.6%			55.6%					44.4%	44.4%	
Maximum Green (s)	21.0	21.0			21.0					16.0	16.0	
Yellow Time (s)	3.5	3.5			3.5					3.5	3.5	
All-Red Time (s)	0.5	0.5			0.5					0.5	0.5	
Lost Time Adjust (s)	0.0	0.0			0.0						0.0	
Total Lost Time (s)	4.0	4.0			4.0						4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0			3.0					3.0	3.0	
Recall Mode	None	None			None					C-Max	C-Max	
Act Effct Green (s)	18.5	18.5			18.5						18.5	
Actuated g/C Ratio	0.41	0.41			0.41						0.41	
v/c Ratio	0.30	0.77			0.76						0.46	
Control Delay	13.1	18.3			16.8						11.2	
Queue Delay	0.0	0.0			0.0						0.0	
Total Delay	13.1	18.3			16.8						11.2	
LOS	B	B			B						B	
Approach Delay		17.9			16.8						11.2	
Approach LOS		B			B						B	

Intersection Summary			
Area Type:	Other		
Cycle Length: 45			
Actuated Cycle Length: 45			
Offset: 0 (0%), Referenced to phase 2:NWTL and 6:, Start of Green			
Natural Cycle: 45			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.77			
Intersection Signal Delay: 16.0		Intersection LOS: B	
Intersection Capacity Utilization 60.8%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 22: 305 WB Off Ramp/305 WB On Ramp & W Main St



Two Way Analysis cannot be performed on Signalized Intersection.

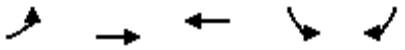


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	268	610	785	322	449	204
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	150			75	0	0
Storage Lanes	1			0	1	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	0.95	0.95	0.95	1.00	1.00
Frt			0.956			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1805	3610	3451	0	1805	1615
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1805	3610	3451	0	1805	1615
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			73			180
Link Speed (mph)		30	35		30	
Link Distance (ft)		1150	796		1035	
Travel Time (s)		26.1	15.5		23.5	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	298	678	872	358	499	227
Shared Lane Traffic (%)						
Lane Group Flow (vph)	298	678	1230	0	499	227
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Number of Detectors	1	2	2		1	1
Detector Template	Left	Thru	Thru		Left	Right
Leading Detector (ft)	20	100	100		20	20
Trailing Detector (ft)	0	0	0		0	0
Detector 1 Position(ft)	0	0	0		0	0
Detector 1 Size(ft)	20	6	6		20	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0
Detector 2 Position(ft)		94	94			
Detector 2 Size(ft)		6	6			
Detector 2 Type		Cl+Ex	Cl+Ex			
Detector 2 Channel						
Detector 2 Extend (s)		0.0	0.0			
Turn Type	Prot	NA	NA		Prot	Free
Protected Phases	5	2	6		4	
Permitted Phases						Free
Detector Phase	5	2	6		4	

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0		4.0	
Minimum Split (s)	8.0	28.0	28.0		20.0	
Total Split (s)	22.0	65.0	43.0		35.0	
Total Split (%)	22.0%	65.0%	43.0%		35.0%	
Maximum Green (s)	18.0	61.0	39.0		31.0	
Yellow Time (s)	3.5	3.5	3.5		3.5	
All-Red Time (s)	0.5	0.5	0.5		0.5	
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	
Total Lost Time (s)	4.0	4.0	4.0		4.0	
Lead/Lag	Lead		Lag			
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0		3.0	
Recall Mode	None	C-Max	C-Max		Max	
Walk Time (s)		7.0	7.0			
Flash Dont Walk (s)		17.0	17.0			
Pedestrian Calls (#/hr)		0	0			
Act Effct Green (s)	17.9	61.0	39.1		31.0	100.0
Actuated g/C Ratio	0.18	0.61	0.39		0.31	1.00
v/c Ratio	0.93	0.31	0.88		0.89	0.14
Control Delay	76.4	9.8	35.5		53.3	0.2
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	76.4	9.8	35.5		53.3	0.2
LOS	E	A	D		D	A
Approach Delay		30.1	35.5		36.7	
Approach LOS		C	D		D	

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 100			
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green			
Natural Cycle: 80			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.93			
Intersection Signal Delay: 34.0		Intersection LOS: C	
Intersection Capacity Utilization 81.7%		ICU Level of Service D	
Analysis Period (min) 15			

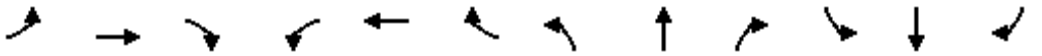
Splits and Phases: 6: SR 611 & Connector Rd



Lane Group	EBL	EBT	WBT	SBL	SBR
Lane Group Flow (vph)	298	678	1230	499	227
v/c Ratio	0.93	0.31	0.88	0.89	0.14
Control Delay	76.4	9.8	35.5	53.3	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	76.4	9.8	35.5	53.3	0.2
Queue Length 50th (ft)	188	100	358	302	0
Queue Length 95th (ft)	#345	132	#474	#490	0
Internal Link Dist (ft)		1070	716	955	
Turn Bay Length (ft)	150				
Base Capacity (vph)	324	2202	1395	559	1615
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	0.92	0.31	0.88	0.89	0.14

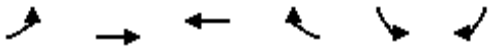
Intersection Summary

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



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	1	1	204	1	449	0	0	268	322
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00
Frt					0.866							0.850
Flt Protected												
Satd. Flow (prot)	0	0	0	0	1645	0	0	3610	0	0	1900	1615
Flt Permitted												
Satd. Flow (perm)	0	0	0	0	1645	0	0	3610	0	0	1900	1615
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		372			504			509			346	
Travel Time (s)		8.5			11.5			11.6			7.9	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	0	0	1	1	227	1	499	0	0	298	358
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	229	0	0	500	0	0	298	358
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Free			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 55.1%		ICU Level of Service B	
Analysis Period (min) 15			



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	449	1	0	0	268	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt						
Flt Protected		0.952			0.950	
Satd. Flow (prot)	0	1809	0	0	1805	0
Flt Permitted		0.952			0.950	
Satd. Flow (perm)	0	1809	0	0	1805	0
Link Speed (mph)		30	30		30	
Link Distance (ft)		487	669		509	
Travel Time (s)		11.1	15.2		11.6	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	499	1	0	0	298	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	500	0	0	298	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		0	0		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Stop	Free		Free	

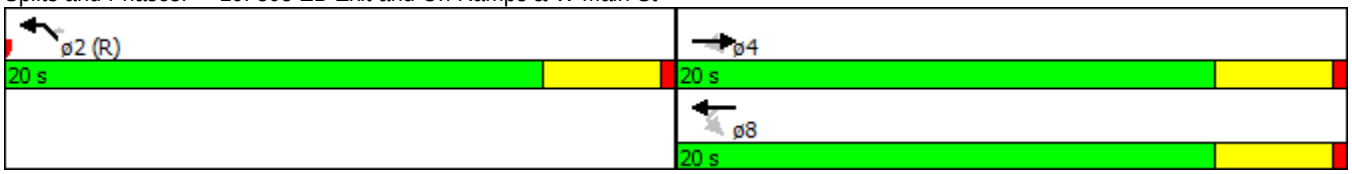
Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 46.4%		ICU Level of Service A	
Analysis Period (min) 15			

Lane Group	EBT	EBR	WBL	WBT	NWL	NWR
Lane Configurations						
Volume (vph)	322	317	53	986	109	308
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)		100	150		0	200
Storage Lanes		1	1		1	1
Taper Length (ft)			25		25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850				0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1900	1615	1805	1900	1805	1615
Flt Permitted			0.480		0.950	
Satd. Flow (perm)	1900	1615	912	1900	1805	1615
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		352				342
Link Speed (mph)	30			30	30	
Link Distance (ft)	2247			1534	676	
Travel Time (s)	51.1			34.9	15.4	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	358	352	59	1096	121	342
Shared Lane Traffic (%)						
Lane Group Flow (vph)	358	352	59	1096	121	342
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	24	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Number of Detectors	2	1	1	2	1	1
Detector Template	Thru	Right	Left	Thru	Left	Right
Leading Detector (ft)	100	20	20	100	20	20
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	6	20	20	6	20	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)	94			94		
Detector 2 Size(ft)	6			6		
Detector 2 Type	Cl+Ex			Cl+Ex		
Detector 2 Channel						
Detector 2 Extend (s)	0.0			0.0		
Turn Type	NA	Perm	Perm	NA	Prot	Perm
Protected Phases	4			8	2	
Permitted Phases		4	8			2
Detector Phase	4	4	8	8	2	2

Lane Group	EBT	EBR	WBL	WBT	NWL	NWR
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	20.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	20.0	20.0	20.0	20.0	20.0	20.0
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Maximum Green (s)	16.0	16.0	16.0	16.0	16.0	16.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	C-Max	C-Max
Act Effct Green (s)	16.0	16.0	16.0	16.0	16.0	16.0
Actuated g/C Ratio	0.40	0.40	0.40	0.40	0.40	0.40
v/c Ratio	0.47	0.41	0.16	1.44	0.17	0.40
Control Delay	11.4	3.0	9.2	225.3	8.5	3.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.4	3.0	9.2	225.3	8.5	3.0
LOS	B	A	A	F	A	A
Approach Delay	7.3			214.2	4.4	
Approach LOS	A			F	A	

Intersection Summary	
Area Type:	Other
Cycle Length: 40	
Actuated Cycle Length: 40	
Offset: 0 (0%), Referenced to phase 2:NWL and 6:, Start of Green	
Natural Cycle: 65	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.44	
Intersection Signal Delay: 109.4	Intersection LOS: F
Intersection Capacity Utilization 64.6%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 16: 305 EB Exit and On Ramps & W Main St



Two Way Analysis cannot be performed on Signalized Intersection.

Lane Group	EBT	EBR	WBL	WBT	NWL	NWR
Lane Configurations						
Volume (vph)	322	317	53	986	109	308
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)		100	150		0	200
Storage Lanes		1	1		1	1
Taper Length (ft)			25		25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850				0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1900	1615	1805	1900	1805	1615
Flt Permitted			0.950		0.950	
Satd. Flow (perm)	1900	1615	1805	1900	1805	1615
Link Speed (mph)	30			30	30	
Link Distance (ft)	1124			1534	676	
Travel Time (s)	25.5			34.9	15.4	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	358	352	59	1096	121	342
Shared Lane Traffic (%)						
Lane Group Flow (vph)	358	352	59	1096	121	342
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	24	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 64.6%		ICU Level of Service C	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	10.9

Movement	EBT	EBR	WBL	WBT	NWL	NWR
Vol, veh/h	322	317	53	986	109	308
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Yeild	-	None	-	Yeild
Storage Length	-	100	150	-	0	200
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	358	352	59	1096	121	342

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	358	0	1571	358
Stage 1	-	-	-	-	358	-
Stage 2	-	-	-	-	1213	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1212	-	123	691
Stage 1	-	-	-	-	712	-
Stage 2	-	-	-	-	284	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1212	-	~ 117	691
Mov Cap-2 Maneuver	-	-	-	-	~ 117	-
Stage 1	-	-	-	-	712	-
Stage 2	-	-	-	-	270	-

Approach	EB	WB	NW
HCM Control Delay, s	0	0.4	54
HCM LOS			F

Minor Lane/Major Mvmt	NWLn1	NWLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	117	691	-	-	1212	-
HCM Lane V/C Ratio	1.035	0.495	-	-	0.049	-
HCM Control Delay (s)	163.7	15.2	-	-	8.1	-
HCM Lane LOS	F	C	-	-	A	-
HCM 95th %tile Q(veh)	7	2.8	-	-	0.2	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Lane Group	EBL	EBR	NEL	NET	SWT	SWR
Lane Configurations						
Volume (vph)	83	35	85	111	109	312
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	100	150			0
Storage Lanes	1	1	1			1
Taper Length (ft)	25		25			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1805	1615	1805	1900	1900	1615
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	1805	1615	1805	1900	1900	1615
Link Speed (mph)	30			30	30	
Link Distance (ft)	2085			670	1292	
Travel Time (s)	47.4			15.2	29.4	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	92	39	94	123	121	347
Shared Lane Traffic (%)						
Lane Group Flow (vph)	92	39	94	123	121	347
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15			9
Sign Control	Stop			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 30.7%		ICU Level of Service A	
Analysis Period (min) 15			

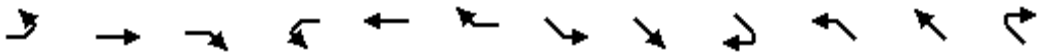
Intersection	
Int Delay, s/veh	2.8

Movement	EBL	EBR	NEL	NET	SWT	SWR
Vol, veh/h	83	35	85	111	109	312
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Yeild	-	Yeild	-	None
Storage Length	0	100	150	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	92	39	94	123	121	347

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	433	121	121	0	-	0
Stage 1	121	-	-	-	-	-
Stage 2	312	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	584	936	1479	-	-	-
Stage 1	909	-	-	-	-	-
Stage 2	747	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	547	936	1479	-	-	-
Mov Cap-2 Maneuver	547	-	-	-	-	-
Stage 1	909	-	-	-	-	-
Stage 2	700	-	-	-	-	-

Approach	EB	NE	SW
HCM Control Delay, s	11.7	3.3	0
HCM LOS	B		

Minor Lane/Major Mvmt	NEL	NET	EBLn1	EBLn2	SWT	SWR
Capacity (veh/h)	1479	-	547	936	-	-
HCM Lane V/C Ratio	0.064	-	0.169	0.042	-	-
HCM Control Delay (s)	7.6	-	12.9	9	-	-
HCM Lane LOS	A	-	B	A	-	-
HCM 95th %tile Q(veh)	0.2	-	0.6	0.1	-	-



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	72	558	0	0	711	288	0	0	0	497	1	183
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	50		0	0		0	0		0	0		0
Storage Lanes	1		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.961						0.964	
Flt Protected	0.950										0.965	
Satd. Flow (prot)	1805	1900	0	0	1826	0	0	0	0	0	1767	0
Flt Permitted	0.950										0.965	
Satd. Flow (perm)	1805	1900	0	0	1826	0	0	0	0	0	1767	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1534			227			367			1020	
Travel Time (s)		34.9			5.2			8.3			23.2	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	80	620	0	0	790	320	0	0	0	552	1	203
Shared Lane Traffic (%)												
Lane Group Flow (vph)	80	620	0	0	1110	0	0	0	0	0	756	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 105.3%		ICU Level of Service G	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	545.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER
Vol, veh/h	72	558	0	0	711	288	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	Yeild	-	-	None
Storage Length	50	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0
Mvmt Flow	80	620	0	0	790	320	0	0	0

Major/Minor	Major1			Major2		
Conflicting Flow All	790	0	0	620	0	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	839	-	-	970	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Platoon blocked, %		-	-		-	-
Mov Cap-1 Maneuver	839	-	-	970	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB
HCM Control Delay, s	1.1	0
HCM LOS		

Minor Lane/Major Mvmt	NWLn1	EBL	EBT	EBR	WBL	WBT	WBR
Capacity (veh/h)	152	839	-	-	970	-	-
HCM Lane V/C Ratio	4.978	0.095	-	-	-	-	-
HCM Control Delay (s)	$ 1848	9.7	-	-	0	-	-
HCM Lane LOS	F	A	-	-	A	-	-
HCM 95th %tile Q(veh)	79.2	0.3	-	-	0	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

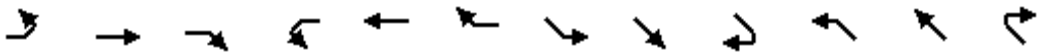
Intersection			
Int Delay, s/veh			

Movement	NWL	NWT	NWR
Vol, veh/h	497	1	183
Conflicting Peds, #/hr	0	0	0
Sign Control	Stop	Stop	Stop
RT Channelized	-	-	Yeild
Storage Length	-	-	-
Veh in Median Storage, #	-	0	-
Grade, %	-	0	-
Peak Hour Factor	90	90	90
Heavy Vehicles, %	0	0	0
Mvmt Flow	552	1	203

Major/Minor	Minor1		
Conflicting Flow All	1570	1570	620
Stage 1	780	780	-
Stage 2	790	790	-
Critical Hdwy	6.4	6.5	6.2
Critical Hdwy Stg 1	5.4	5.5	-
Critical Hdwy Stg 2	5.4	5.5	-
Follow-up Hdwy	3.5	4	3.3
Pot Cap-1 Maneuver	~ 123	112	492
Stage 1	~ 455	409	-
Stage 2	~ 451	404	-
Platoon blocked, %			
Mov Cap-1 Maneuver	~ 111	0	492
Mov Cap-2 Maneuver	~ 111	0	-
Stage 1	~ 412	0	-
Stage 2	~ 451	0	-

Approach	NW
HCM Control Delay, s	$ 1848
HCM LOS	F

Minor Lane/Major Mvmt

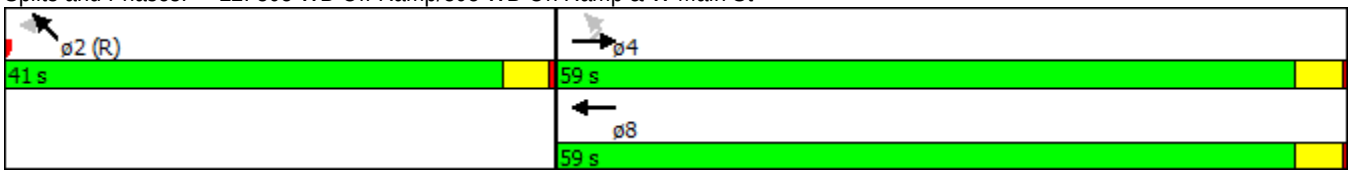


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	72	558	0	0	711	288	0	0	0	497	1	183
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	50		0	0		0	0		0	0		0
Storage Lanes	1		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.961						0.964	
Flt Protected	0.950										0.965	
Satd. Flow (prot)	1805	1900	0	0	1826	0	0	0	0	0	1767	0
Flt Permitted	0.073										0.965	
Satd. Flow (perm)	139	1900	0	0	1826	0	0	0	0	0	1767	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					32						21	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1534			227			367			1020	
Travel Time (s)		34.9			5.2			8.3			23.2	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	80	620	0	0	790	320	0	0	0	552	1	203
Shared Lane Traffic (%)												
Lane Group Flow (vph)	80	620	0	0	1110	0	0	0	0	0	756	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2			2					1	2	
Detector Template	Left	Thru			Thru					Left	Thru	
Leading Detector (ft)	20	100			100					20	100	
Trailing Detector (ft)	0	0			0					0	0	
Detector 1 Position(ft)	0	0			0					0	0	
Detector 1 Size(ft)	20	6			6					20	6	
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex					Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0					0.0	0.0	
Detector 1 Queue (s)	0.0	0.0			0.0					0.0	0.0	
Detector 1 Delay (s)	0.0	0.0			0.0					0.0	0.0	
Detector 2 Position(ft)		94			94						94	
Detector 2 Size(ft)		6			6						6	
Detector 2 Type		Cl+Ex			Cl+Ex						Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0						0.0	
Turn Type	Perm	NA			NA					Perm	NA	
Protected Phases		4			8						2	
Permitted Phases	4									2		
Detector Phase	4	4			8					2	2	

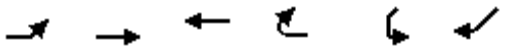
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Switch Phase												
Minimum Initial (s)	4.0	4.0			4.0					4.0	4.0	
Minimum Split (s)	20.0	20.0			20.0					20.0	20.0	
Total Split (s)	59.0	59.0			59.0					41.0	41.0	
Total Split (%)	59.0%	59.0%			59.0%					41.0%	41.0%	
Maximum Green (s)	55.0	55.0			55.0					37.0	37.0	
Yellow Time (s)	3.5	3.5			3.5					3.5	3.5	
All-Red Time (s)	0.5	0.5			0.5					0.5	0.5	
Lost Time Adjust (s)	0.0	0.0			0.0						0.0	
Total Lost Time (s)	4.0	4.0			4.0						4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0			3.0					3.0	3.0	
Recall Mode	None	None			None					C-Max	C-Max	
Act Effct Green (s)	55.0	55.0			55.0						37.0	
Actuated g/C Ratio	0.55	0.55			0.55						0.37	
v/c Ratio	1.05	0.59			1.09						1.13	
Control Delay	148.3	18.0			79.5						108.1	
Queue Delay	0.0	0.0			0.0						0.0	
Total Delay	148.3	18.0			79.5						108.1	
LOS	F	B			E						F	
Approach Delay		32.9			79.5						108.1	
Approach LOS		C			E						F	

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 100			
Offset: 0 (0%), Referenced to phase 2:NWTL and 6:, Start of Green			
Natural Cycle: 100			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.13			
Intersection Signal Delay: 75.2		Intersection LOS: E	
Intersection Capacity Utilization 105.3%		ICU Level of Service G	
Analysis Period (min) 15			

Splits and Phases: 22: 305 WB Off Ramp/305 WB On Ramp & W Main St



Two Way Analysis cannot be performed on Signalized Intersection.



Lane Group	EBL	EBT	WBT	WBR	SWL	SWR
Lane Configurations						
Volume (vph)	369	10	10	189	118	417
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200			100	150	0
Storage Lanes	1			1	1	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1805	1900	1900	1615	1805	1615
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1805	1900	1900	1615	1805	1615
Link Speed (mph)		30	30		30	
Link Distance (ft)		676	2085		474	
Travel Time (s)		15.4	47.4		10.8	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	410	11	11	210	131	463
Shared Lane Traffic (%)						
Lane Group Flow (vph)	410	11	11	210	131	463
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 40.3%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	10.3

Movement	EBL	EBT	WBT	WBR	SWL	SWR
Vol, veh/h	369	10	10	189	118	417
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Yeild	-	None
Storage Length	200	-	-	100	150	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	410	11	11	210	131	463

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	11	0	-	0	842	11
Stage 1	-	-	-	-	11	-
Stage 2	-	-	-	-	831	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1621	-	-	-	337	1076
Stage 1	-	-	-	-	1017	-
Stage 2	-	-	-	-	431	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1621	-	-	-	252	1076
Mov Cap-2 Maneuver	-	-	-	-	252	-
Stage 1	-	-	-	-	1017	-
Stage 2	-	-	-	-	322	-

Approach	EB	WB	SW
HCM Control Delay, s	7.8	0	16
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SWLn1	SWLn2
Capacity (veh/h)	1621	-	-	-	252	1076
HCM Lane V/C Ratio	0.253	-	-	-	0.52	0.431
HCM Control Delay (s)	8	-	-	-	33.8	10.9
HCM Lane LOS	A	-	-	-	D	B
HCM 95th %tile Q(veh)	1	-	-	-	2.8	2.2

Lane Group	EBT	EBR	WBL	WBT	NWL	NWR
Lane Configurations						
Volume (vph)	322	317	53	986	109	308
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)		100	150		0	200
Storage Lanes		1	1		1	1
Taper Length (ft)			25		25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850				0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1900	1615	1805	1900	1805	1615
Flt Permitted			0.950		0.950	
Satd. Flow (perm)	1900	1615	1805	1900	1805	1615
Link Speed (mph)	30			30	30	
Link Distance (ft)	1124			1534	676	
Travel Time (s)	25.5			34.9	15.4	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	358	352	59	1096	121	342
Shared Lane Traffic (%)						
Lane Group Flow (vph)	358	352	59	1096	121	342
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	24	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 64.6%		ICU Level of Service C	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	10.9

Movement	EBT	EBR	WBL	WBT	NWL	NWR
Vol, veh/h	322	317	53	986	109	308
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Yeild	-	None	-	Yeild
Storage Length	-	100	150	-	0	200
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	358	352	59	1096	121	342

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	358	0	1571	358
Stage 1	-	-	-	-	358	-
Stage 2	-	-	-	-	1213	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1212	-	123	691
Stage 1	-	-	-	-	712	-
Stage 2	-	-	-	-	284	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1212	-	~ 117	691
Mov Cap-2 Maneuver	-	-	-	-	~ 117	-
Stage 1	-	-	-	-	712	-
Stage 2	-	-	-	-	270	-

Approach	EB	WB	NW
HCM Control Delay, s	0	0.4	54
HCM LOS			F

Minor Lane/Major Mvmt	NWLn1	NWLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	117	691	-	-	1212	-
HCM Lane V/C Ratio	1.035	0.495	-	-	0.049	-
HCM Control Delay (s)	163.7	15.2	-	-	8.1	-
HCM Lane LOS	F	C	-	-	A	-
HCM 95th %tile Q(veh)	7	2.8	-	-	0.2	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Lane Group	EBL	EBR	NEL	NET	SWT	SWR
Lane Configurations						
Volume (vph)	83	35	85	111	109	312
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	100	150			0
Storage Lanes	1	1	1			1
Taper Length (ft)	25		25			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1805	1615	1805	1900	1900	1615
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	1805	1615	1805	1900	1900	1615
Link Speed (mph)	30			30	30	
Link Distance (ft)	2085			670	1292	
Travel Time (s)	47.4			15.2	29.4	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	92	39	94	123	121	347
Shared Lane Traffic (%)						
Lane Group Flow (vph)	92	39	94	123	121	347
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15			9
Sign Control	Stop			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 30.7%		ICU Level of Service A	
Analysis Period (min) 15			

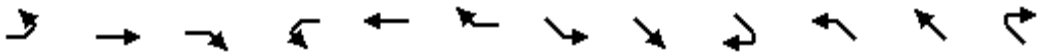
Intersection	
Int Delay, s/veh	2.8

Movement	EBL	EBR	NEL	NET	SWT	SWR
Vol, veh/h	83	35	85	111	109	312
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Yeild	-	Yeild	-	None
Storage Length	0	100	150	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	92	39	94	123	121	347

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	433	121	121	0	-	0
Stage 1	121	-	-	-	-	-
Stage 2	312	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	584	936	1479	-	-	-
Stage 1	909	-	-	-	-	-
Stage 2	747	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	547	936	1479	-	-	-
Mov Cap-2 Maneuver	547	-	-	-	-	-
Stage 1	909	-	-	-	-	-
Stage 2	700	-	-	-	-	-

Approach	EB	NE	SW
HCM Control Delay, s	11.7	3.3	0
HCM LOS	B		

Minor Lane/Major Mvmt	NEL	NET	EBLn1	EBLn2	SWT	SWR
Capacity (veh/h)	1479	-	547	936	-	-
HCM Lane V/C Ratio	0.064	-	0.169	0.042	-	-
HCM Control Delay (s)	7.6	-	12.9	9	-	-
HCM Lane LOS	A	-	B	A	-	-
HCM 95th %tile Q(veh)	0.2	-	0.6	0.1	-	-



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	72	558	0	0	711	288	0	0	0	497	1	183
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	50		0	0		0	0		0	0		0
Storage Lanes	1		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.961						0.964	
Flt Protected	0.950										0.965	
Satd. Flow (prot)	1805	1900	0	0	1826	0	0	0	0	0	1767	0
Flt Permitted	0.950										0.965	
Satd. Flow (perm)	1805	1900	0	0	1826	0	0	0	0	0	1767	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1534			227			367			1020	
Travel Time (s)		34.9			5.2			8.3			23.2	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	80	620	0	0	790	320	0	0	0	552	1	203
Shared Lane Traffic (%)												
Lane Group Flow (vph)	80	620	0	0	1110	0	0	0	0	0	756	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 105.3%		ICU Level of Service G	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	545.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER
Vol, veh/h	72	558	0	0	711	288	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	Yeild	-	-	None
Storage Length	50	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0
Mvmt Flow	80	620	0	0	790	320	0	0	0

Major/Minor	Major1			Major2		
Conflicting Flow All	790	0	0	620	0	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	839	-	-	970	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Platoon blocked, %		-	-		-	-
Mov Cap-1 Maneuver	839	-	-	970	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB
HCM Control Delay, s	1.1	0
HCM LOS		

Minor Lane/Major Mvmt	NWLn1	EBL	EBT	EBR	WBL	WBT	WBR
Capacity (veh/h)	152	839	-	-	970	-	-
HCM Lane V/C Ratio	4.978	0.095	-	-	-	-	-
HCM Control Delay (s)	$ 1848	9.7	-	-	0	-	-
HCM Lane LOS	F	A	-	-	A	-	-
HCM 95th %tile Q(veh)	79.2	0.3	-	-	0	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

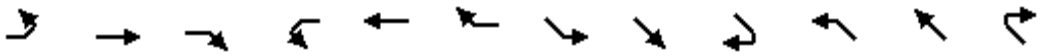
Intersection			
Int Delay, s/veh			

Movement	NWL	NWT	NWR
Vol, veh/h	497	1	183
Conflicting Peds, #/hr	0	0	0
Sign Control	Stop	Stop	Stop
RT Channelized	-	-	Yeild
Storage Length	-	-	-
Veh in Median Storage, #	-	0	-
Grade, %	-	0	-
Peak Hour Factor	90	90	90
Heavy Vehicles, %	0	0	0
Mvmt Flow	552	1	203

Major/Minor	Minor1		
Conflicting Flow All	1570	1570	620
Stage 1	780	780	-
Stage 2	790	790	-
Critical Hdwy	6.4	6.5	6.2
Critical Hdwy Stg 1	5.4	5.5	-
Critical Hdwy Stg 2	5.4	5.5	-
Follow-up Hdwy	3.5	4	3.3
Pot Cap-1 Maneuver	~ 123	112	492
Stage 1	~ 455	409	-
Stage 2	~ 451	404	-
Platoon blocked, %			
Mov Cap-1 Maneuver	~ 111	0	492
Mov Cap-2 Maneuver	~ 111	0	-
Stage 1	~ 412	0	-
Stage 2	~ 451	0	-

Approach	NW
HCM Control Delay, s	$ 1848
HCM LOS	F

Minor Lane/Major Mvmt

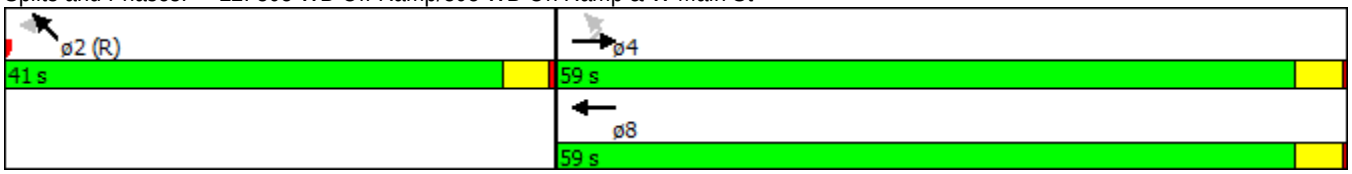


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	72	558	0	0	711	288	0	0	0	497	1	183
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	50		0	0		0	0		0	0		0
Storage Lanes	1		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.961						0.964	
Flt Protected	0.950										0.965	
Satd. Flow (prot)	1805	1900	0	0	1826	0	0	0	0	0	1767	0
Flt Permitted	0.073										0.965	
Satd. Flow (perm)	139	1900	0	0	1826	0	0	0	0	0	1767	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					32						21	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1534			227			367			1020	
Travel Time (s)		34.9			5.2			8.3			23.2	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	80	620	0	0	790	320	0	0	0	552	1	203
Shared Lane Traffic (%)												
Lane Group Flow (vph)	80	620	0	0	1110	0	0	0	0	0	756	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2			2					1	2	
Detector Template	Left	Thru			Thru					Left	Thru	
Leading Detector (ft)	20	100			100					20	100	
Trailing Detector (ft)	0	0			0					0	0	
Detector 1 Position(ft)	0	0			0					0	0	
Detector 1 Size(ft)	20	6			6					20	6	
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex					Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0					0.0	0.0	
Detector 1 Queue (s)	0.0	0.0			0.0					0.0	0.0	
Detector 1 Delay (s)	0.0	0.0			0.0					0.0	0.0	
Detector 2 Position(ft)		94			94						94	
Detector 2 Size(ft)		6			6						6	
Detector 2 Type		Cl+Ex			Cl+Ex						Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0						0.0	
Turn Type	Perm	NA			NA					Perm	NA	
Protected Phases		4			8						2	
Permitted Phases	4									2		
Detector Phase	4	4			8					2	2	

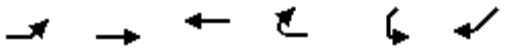
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Switch Phase												
Minimum Initial (s)	4.0	4.0			4.0					4.0	4.0	
Minimum Split (s)	20.0	20.0			20.0					20.0	20.0	
Total Split (s)	59.0	59.0			59.0					41.0	41.0	
Total Split (%)	59.0%	59.0%			59.0%					41.0%	41.0%	
Maximum Green (s)	55.0	55.0			55.0					37.0	37.0	
Yellow Time (s)	3.5	3.5			3.5					3.5	3.5	
All-Red Time (s)	0.5	0.5			0.5					0.5	0.5	
Lost Time Adjust (s)	0.0	0.0			0.0						0.0	
Total Lost Time (s)	4.0	4.0			4.0						4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0			3.0					3.0	3.0	
Recall Mode	None	None			None					C-Max	C-Max	
Act Effct Green (s)	55.0	55.0			55.0						37.0	
Actuated g/C Ratio	0.55	0.55			0.55						0.37	
v/c Ratio	1.05	0.59			1.09						1.13	
Control Delay	148.3	18.0			79.5						108.1	
Queue Delay	0.0	0.0			0.0						0.0	
Total Delay	148.3	18.0			79.5						108.1	
LOS	F	B			E						F	
Approach Delay		32.9			79.5						108.1	
Approach LOS		C			E						F	

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 100			
Offset: 0 (0%), Referenced to phase 2:NWTL and 6:, Start of Green			
Natural Cycle: 100			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.13			
Intersection Signal Delay: 75.2		Intersection LOS: E	
Intersection Capacity Utilization 105.3%		ICU Level of Service G	
Analysis Period (min) 15			

Splits and Phases: 22: 305 WB Off Ramp/305 WB On Ramp & W Main St



Two Way Analysis cannot be performed on Signalized Intersection.



Lane Group	EBL	EBT	WBT	WBR	SWL	SWR
Lane Configurations						
Volume (vph)	369	10	10	189	118	417
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200			100	150	0
Storage Lanes	1			1	1	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1805	1900	1900	1615	1805	1615
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1805	1900	1900	1615	1805	1615
Link Speed (mph)		30	30		30	
Link Distance (ft)		676	2085		474	
Travel Time (s)		15.4	47.4		10.8	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	410	11	11	210	131	463
Shared Lane Traffic (%)						
Lane Group Flow (vph)	410	11	11	210	131	463
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 40.3%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	10.3

Movement	EBL	EBT	WBT	WBR	SWL	SWR
Vol, veh/h	369	10	10	189	118	417
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Yeild	-	None
Storage Length	200	-	-	100	150	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	410	11	11	210	131	463

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	11	0	-	0	842	11
Stage 1	-	-	-	-	11	-
Stage 2	-	-	-	-	831	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1621	-	-	-	337	1076
Stage 1	-	-	-	-	1017	-
Stage 2	-	-	-	-	431	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1621	-	-	-	252	1076
Mov Cap-2 Maneuver	-	-	-	-	252	-
Stage 1	-	-	-	-	1017	-
Stage 2	-	-	-	-	322	-

Approach	EB	WB	SW
HCM Control Delay, s	7.8	0	16
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SWLn1	SWLn2
Capacity (veh/h)	1621	-	-	-	252	1076
HCM Lane V/C Ratio	0.253	-	-	-	0.52	0.431
HCM Control Delay (s)	8	-	-	-	33.8	10.9
HCM Lane LOS	A	-	-	-	D	B
HCM 95th %tile Q(veh)	1	-	-	-	2.8	2.2

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	72	630	0	0	711	288	0	0	0	497	1	183
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	50		0	0		0	0		0	0		0
Storage Lanes	1		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.961						0.964	
Flt Protected	0.950										0.965	
Satd. Flow (prot)	1805	1900	0	0	1826	0	0	0	0	0	1767	0
Flt Permitted	0.950										0.965	
Satd. Flow (perm)	1805	1900	0	0	1826	0	0	0	0	0	1767	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1534			227			367			1020	
Travel Time (s)		34.9			5.2			8.3			23.2	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	80	700	0	0	790	320	0	0	0	552	1	203
Shared Lane Traffic (%)												
Lane Group Flow (vph)	80	700	0	0	1110	0	0	0	0	0	756	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 105.3%		ICU Level of Service G	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	610.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER
Vol, veh/h	72	630	0	0	711	288	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	Yeild	-	-	None
Storage Length	50	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0
Mvmt Flow	80	700	0	0	790	320	0	0	0

Major/Minor	Major1			Major2		
Conflicting Flow All	790	0	0	700	0	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	839	-	-	906	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Platoon blocked, %		-	-		-	-
Mov Cap-1 Maneuver	839	-	-	906	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB
HCM Control Delay, s	1	0
HCM LOS		

Minor Lane/Major Mvmt	NWLn1	EBL	EBT	EBR	WBL	WBT	WBR
Capacity (veh/h)	135	839	-	-	906	-	-
HCM Lane V/C Ratio	5.605	0.095	-	-	-	-	-
HCM Control Delay (s)	$ 2135.9	9.7	-	-	0	-	-
HCM Lane LOS	F	A	-	-	A	-	-
HCM 95th %tile Q(veh)	81.2	0.3	-	-	0	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	

Movement	NWL	NWT	NWR
Vol, veh/h	497	1	183
Conflicting Peds, #/hr	0	0	0
Sign Control	Stop	Stop	Stop
RT Channelized	-	-	Yeild
Storage Length	-	-	-
Veh in Median Storage, #	-	0	-
Grade, %	-	0	-
Peak Hour Factor	90	90	90
Heavy Vehicles, %	0	0	0
Mvmt Flow	552	1	203

Major/Minor	Minor1		
Conflicting Flow All	1650	1650	700
Stage 1	860	860	-
Stage 2	790	790	-
Critical Hdwy	6.4	6.5	6.2
Critical Hdwy Stg 1	5.4	5.5	-
Critical Hdwy Stg 2	5.4	5.5	-
Follow-up Hdwy	3.5	4	3.3
Pot Cap-1 Maneuver	~ 110	100	443
Stage 1	~ 418	376	-
Stage 2	~ 451	404	-
Platoon blocked, %			
Mov Cap-1 Maneuver	~ 100	0	443
Mov Cap-2 Maneuver	~ 100	0	-
Stage 1	~ 378	0	-
Stage 2	~ 451	0	-

Approach	NW
HCM Control Delay, s	$ 2135.9
HCM LOS	F

Minor Lane/Major Mvmt

CONCEPTUAL PHASE I COST ESTIMATE

Pennsylvania Department of Transportation, District 5-0
Agreement No. E02656, Monroe County
I-80 Reconstruction

ALTERNATIVE NAME: Alternative H

APPROX. QUANTITY	UNIT	ITEM DESCRIPTION	UNIT PRICE	TOTAL ITEM COST	NOTES
		ROADWAY			
751,710	CY	CLASS 1 EXCAVATION	$7.00	$5,261,970	
751,710	CY	COMMON BORROW EXCAVATION	$6.00	$4,510,260	
161,163	CY	FOREIGN BORROW EXCAVATION	$8.00	$1,289,304	
231,657	SY	FULL DEPTH PAVEMENT CONSTRUCTION - SR 80	$74.00	$17,142,618	
118,635	SY	FULL DEPTH PAVEMENT CONSTRUCTION - RAMPS	$74.00	$8,778,990	
42,372	SY	FULL DEPTH PAVEMENT CONSTRUCTION - SIDE ROADS	$74.00	$3,135,528	
27,486	GAL	BITUMINOUS TACK COAT - SR 80, RAMPS, & SIDE ROADS	$1.50	$41,229	
58,937	LF	GUIDE RAIL	$10.00	$589,369	
19,550	LF	CONCRETE GLARE SCREEN	$50.00	$977,500	
		ROADWAY SUBTOTAL		**$41,727,000**	
		STRUCTURES			
1	EA	BRIDGES AND RETAINING WALLS		$203,618,700	
		STRUCTURES SUBTOTAL		**$203,618,700**	
		CONCEPTUAL QUANTITY SUBTOTAL		***$245,345,700***	
		OTHER			
		DRAINAGE	5%	$2,086,350	% of Roadway
		IMPACT ATTENUATORS	1%	$417,270	% of Roadway
		MAINTENANCE AND PROTECTION OF TRAFFIC	10%	$4,172,700	% of Roadway
		EROSION AND SEDIMENT CONTROL	2%	$834,540	% of Roadway
		STORM WATER MANAGEMENT	2%	$834,540	% of Roadway
		PAVEMENT MARKINGS, SIGNS AND DELINEATORS	5%	$2,086,350	% of Roadway
		HIGHWAY LIGHTING	0%	$0	% of Roadway
		TRAFFIC SIGNALS	5%	$2,086,350	% of Roadway
		OTHER SUBTOTAL		**$257,863,800**	
		INFLATION (7 YEARS (2020) @3%)	1.230	317,139,948	
		CONSTRUCTION SERVICES (CE&I)	10%	31,713,995	
		CONSTRUCTION CONSULTATION	2%	6,342,799	
		CONTINGENCY	15%	47,570,992	
		CONSTRUCTION TOTAL		**$402,768,000**	
		RIGHT-OF-WAY TOTAL	20%	**$8,346,000**	% of Roadway
		UTILITIES TOTAL	2%	**$835,000**	% of Roadway
		DESIGN TOTAL	10%	**$40,277,000**	% of Construction

NOTE: Transportation Management Plan (MPT/ITS) includes the following:

Maintenance and Protection of Traffic
Other corridor signal enhancements
ITS relocations/system expansion
ITS for use during construction as part of TMP

CONCEPTUAL PHASE I COST ESTIMATE

Pennsylvania Department of Transportation, District 5-0
Agreement No. E02656, Monroe County
I-80 Reconstruction

ALTERNATIVE NAME: Alternative I

APPROX. QUANTITY	UNIT	ITEM DESCRIPTION	UNIT PRICE	TOTAL ITEM COST	NOTES
		ROADWAY			
751,710	CY	CLASS 1 EXCAVATION	$7.00	$5,261,970	
751,710	CY	COMMON BORROW EXCAVATION	$6.00	$4,510,260	
161,163	CY	FOREIGN BORROW EXCAVATION	$8.00	$1,289,304	
218,156	SY	FULL DEPTH PAVEMENT CONSTRUCTION - SR 80	$74.00	$16,143,544	
106,037	SY	FULL DEPTH PAVEMENT CONSTRUCTION - RAMPS	$74.00	$7,846,738	
44,456	SY	FULL DEPTH PAVEMENT CONSTRUCTION - SIDE ROADS	$74.00	$3,289,744	
25,805	GAL	BITUMINOUS TACK COAT - SR 80, RAMPS, & SIDE ROADS	$1.50	$38,708	
49,963	LF	GUIDE RAIL	$10.00	$499,630	
19,550	LF	CONCRETE GLARE SCREEN	$50.00	$977,500	
		ROADWAY SUBTOTAL		**$39,858,000**	
		STRUCTURES			
1	EA	BRIDGES AND RETAINING WALLS		$206,364,000	
		STRUCTURES SUBTOTAL		**$206,364,000**	
		CONCEPTUAL QUANTITY SUBTOTAL		***$246,222,000***	
		OTHER			
		DRAINAGE	5%	$1,992,900	% of Roadway
		IMPACT ATTENUATORS	1%	$398,580	% of Roadway
		MAINTENANCE AND PROTECTION OF TRAFFIC	10%	$3,985,800	% of Roadway
		EROSION AND SEDIMENT CONTROL	2%	$797,160	% of Roadway
		STORM WATER MANAGEMENT	2%	$797,160	% of Roadway
		PAVEMENT MARKINGS, SIGNS AND DELINEATORS	5%	$1,992,900	% of Roadway
		HIGHWAY LIGHTING	0%	$0	% of Roadway
		TRAFFIC SIGNALS	5%	$1,992,900	% of Roadway
		OTHER SUBTOTAL		**$258,179,400**	
		INFLATION (7 YEARS (2020) @3%)	1.230	317,528,097	
		CONSTRUCTION SERVICES (CE&I)	10%	31,752,810	
		CONSTRUCTION CONSULTATION	2%	6,350,562	
		CONTINGENCY	15%	47,629,214	
		CONSTRUCTION TOTAL		**$403,261,000**	

		RIGHT-OF-WAY TOTAL	20%	**$7,972,000**	% of Roadway
		UTILITIES TOTAL	2%	**$798,000**	% of Roadway
		DESIGN TOTAL	10%	**$40,327,000**	% of Construction

NOTE: Transportation Management Plan (MPT/ITS) includes the following:

Maintenance and Protection of Traffic
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I-80 Reconstruction

Bridge Cost Estimate

Unit Cost ($/SF): 550 Bridge
300 Culvert

Bridge	Alternate H		Alternate I							
	SF	Cost	SF	Cost						
611 Connector/I-80	7584	$4,171,200	9324	$5,128,200						
I-80/Pocono Creek	21750	$11,962,500	22910	$12,600,500						
I-80/Bridge Street	11250	$6,187,500	11325	$6,228,750						
Ramp G/I-80	10428	$5,735,400	9702	$5,336,100						
Ramp G Viaduct	0	$0	16335	$8,984,250						
I-80/Main St	34800	$19,140,000	30750	$16,912,500						
I-80/Dreher Ave	9450	$5,197,500	10350	$5,692,500						
I-80/McMichaels Creek	57300	$31,515,000	57300	$31,515,000						
191/I-80	10800	$5,940,000	10800	$5,940,000						
191/McMichaels Creek	9828	$5,405,400	9828	$5,405,400						
I-80/Brodhead Creek	59400	$32,670,000	59400	$32,670,000						
Ramp G/Main St On-Ramp	10626	$5,844,300	9900	$5,445,000						
611/611 Connector	0	$0	7896	$4,342,800						
I-80 EB Ramps/Wetland	14940	$8,217,000	11520	$6,336,000						
Hemlock Rd/Lit Pocono Crk	0	$0	3520	$1,936,000						
I-80 EB Ramps/Lit Poc Crk (C)*	1323	$396,900	1088	$326,400						
I-80/Little Pocono Creek (C)	3801	$1,140,300	4116	$1,234,800						
I-80 WB Off-Ramp/Lit Poc Crk (C)	1218	$365,400	464	$139,200						
Main Street/Little Pocono Crk (C)	0	$0	688	$206,400						
Total Bridge Cost:		$143,888,400		$156,379,800						

* (C) represents proposed culvert

Wall Height: 15 (assume 15' height throughout project)

Retaining Wall Cost Estimate

Unit Cost ($/SF): 140

Retaining Wall	Alternate H		Alternate I							
	LF	Cost	LF	Cost						
Western Limit to 303	2642	$5,548,200	1692	$3,553,200						
303 to Bridge St	4105	$8,620,500	2326	$4,884,600						
Bridge St to 304	593	$1,245,300	1088	$2,284,800						
304 to Main St	7372	$15,481,200	6700	$14,070,000						
Main St to Dreher Ave	3143	$6,600,300	2588	$5,434,800						
Dreher Ave to McMichaels	4396	$9,231,600	3216	$6,753,600						
McMichaels to 191	1755	$3,685,500	1755	$3,685,500						
191 to Brodhead	4437	$9,317,700	4437	$9,317,700						
Total Retaining Wall Cost:		$59,730,300		$49,984,200						

Total Cost (Bridge & Ret. Wall):	$203,618,700	$206,364,000			

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