Appendix E:
JTA Traffic Analysis

US 26/Brookwood Parkway/Helvetia Road Interchange Project

JTA US 26/Brookwood/Helvetia Interchange Analysis Key # 16842
Final Technical Memorandum

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INTRODUCTION

In 2009, the Oregon Legislature provided funds for the planning, design, and construction of the Brookwood/Helvetia interchange with US 26 as part of House Bill 2001, the Oregon Jobs and Transportation Act (JTA). The project will improve the interchange by reducing congestion and increasing safety. The JTA provides $45 million of the $70 million total cost of the interchange, which includes the following elements:

- Constructing a new westbound US 26 to southbound Brookwood Parkway exit loop ramp
- Reconstructing the westbound entrance ramp
- Widen the structure of the overcrossing to allow for up to six travel lane and the associated shoulders, bicycle, and pedestrian needs on Brookwood Parkway
- Extending the northbound right-turn lane from Brookwood Parkway to the eastbound US 26 on-ramp
- Provide for at least two north and southbound through lanes on Brookwood Parkway through the interchange

This technical memorandum provides the data, analysis, and conclusions of the traffic-related impacts of the proposed ultimate design within the JTA study area, as well as potential phases of the project from phase 1 through the ultimate design.

The JTA study area is focused on the US 26/Brookwood/Helvetia interchange. As shown in **Figure 1**, the JTA study area includes US 26 operations at the interchange and operations on Brookwood/Helvetia from Schaff Road on the north to just north of Huffman Road on the south.

PHASING ALTERNATIVES

As shown in **Figure 2**, there are three potential phases, in addition to a no-build alternative, that are being studied as potential phases leading up to an ultimate design. The three initial phases are described below. Note that two designs for phase two were studied, with the intention of identifying the one that best meets the needs of the transportation system as a whole. The phases were analyzed for opening day (2015), interim year, and ultimate design year (2035).

No-Build:

There are currently no planned transportation improvement projects within the JTA study area; therefore, the no-build alternative lane configurations were identical to the existing lane configurations. While the shoulders on both sides of the Brookwood/Helvetia overcrossing are wide enough to accommodate pedestrians and/or bicyclists, there are no designated pedestrian or bicycle facilities within the JTA study area. Brookwood to the south has a posted speed limit of 55 miles per hour while Helvetia to the north is not posted and is governed by the basic rule. **Figure 3** graphically depicts the lane configurations for existing and no-build.

Phase 1, New Loop Ramp:

This alternative includes the addition of a loop ramp from a new westbound US 26 off-ramp to southbound Brookwood Parkway. The one-lane off-ramp would widen to two lanes once the single exit lane clears the Brookwood/Helvetia overpass structure and begins to curve as it approaches Brookwood/Helvetia. The loop ramp would provide for two right-turn lanes through

the signalized interchange ramp terminal. The loop ramp would connect to Brookwood/Helvetia in the location of the current Jacobson intersection. The westbound on-ramp would be shifted north to the location of the current Jacobson intersection. The Jacobson Road connection, in turn, would be shifted about 700 feet to the north. The section of Helvetia between the new Jacobson Road connection and the new westbound off ramp will be widened to accommodate a four lane cross section. The current westbound off-ramp would remain in its current location, but the allowable movements would be limited to right turns off of the freeway only. The lane geometry of the west approach to the eastbound ramp terminal would be slightly modified; the current left turn lane would become a shared left, through, right turn lane. Additionally, a roughly 900 foot northbound right-turn lane from Brookwood to the eastbound US 26 on-ramp would be provided to accommodate queuing emanating from the ramp-meter. **Figure 4** graphically depicts the lane configurations for Phase 1.

Phase 2, Increase Westbound-to-Southbound Capacity:

As land use served by the Brookwood/Helvetia interchange develops, traffic volumes at the interchange will increase, eventually exceeding the operational capacity of the Phase 1 improvements. Phase 2 provides additional capacity at the interchange primarily to serve westbound-to-southbound traffic flow. Two options have been developed for this phase: Option A and Option B. Which option is needed first will depend on where traffic volumes increase over time. The two Phase 2 options are described below, along with an indication of which particular movements benefit from additional capacity provided in the phase.

Phase 2, Option A, Widen Southbound Brookwood/Helvetia:

This alternative builds upon the capacity enhancements of Phase 1 by widening southbound Brookwood/Helvetia to three lanes from the loop ramp south to either Huffman Street or Evergreen Parkway, which are south of the JTA study area. This option provides additional capacity southbound on Brookwood/Helvetia to help accommodate growth in the total traffic moving through the westbound and eastbound ramp terminal intersections, including traffic from the loop ramp, southbound traffic on Helvetia, and traffic on the US 26 westbound off-ramp. It does not provide additional capacity on US 26. **Figure 5** graphically depicts the lane configurations for Phase 2, Option A.

Phase 2, Option B, Two-Lane Loop Ramp Exit:

This alternative builds upon the capacity enhancements of Phase 1 by widening the one-lane loop ramp to two lanes. This widening results in one dedicated and one choice lane off of US 26 to the loop ramp. This option provides additional capacity on westbound US 26 to help accommodate growth in traffic on the loop ramp. It does not provide additional capacity on Brookwood/Helvetia. **Figure 6** graphically depicts the lane configurations for Phase 2, Option B.

Phase 3, Ultimate Design:

This alternative combines the improvements of Phase 1, Phase 2A, and Phase 2B and results in a two-lane off-ramp from westbound US 26, a two-lane loop ramp, two right-turn lanes from the loop ramp to southbound Brookwood Parkway and three southbound through lanes on Brookwood to south of the JTA study area. Phase 3 would also include the relocation of Jacobson roughly 700 feet north on Helvetia, an additional right-turn lane from eastbound US26

to southbound Brookwood, and an additional 900 feet of storage length for the northbound right-turn from Brookwood to US 26 eastbound. **Figure 7** graphically depicts the lane configurations for Phase 3.

EXISTING TRAFFIC VOLUME DEVELOPMENT

Oregon Department of Transportation's (ODOT) Transportation Planning Analysis Unit (TPAU) has developed procedures for calculating current year traffic volumes from traffic count data. The procedure is outlined in the Analysis Procedure Manual (APM) and is used to determine the 30th highest hour volumes for existing analysis.

Initial raw count data was collected on Wednesday, May 25, 2011 at the following locations:

- Helvetia Road and Schaff Road
- Helvetia Road and Jacobson Road
- Brookwood Parkway and US 26 Westbound Ramp Terminal
- Brookwood Parkway and US 26 Eastbound Ramp Terminal
- Brookwood Parkway and Meek Road
- Brookwood Parkway and Huffman Street

Traffic data for all of the above locations were collected for a three-hour AM peak period (6 to 9 AM) and three-hour PM peak period (4 to 7 PM), with the exception of the two ramp terminals. Both ramp terminals were counted for a 16-hour period from 5 AM to 9 PM.

The raw data was processed, and the peak hours for the AM and PM periods were identified. A common peak hour was chosen based upon a majority of intersection counts with the same peak hour. The common peak hour chosen was 7:30 to 8:30 for the AM peak period and 4:30 to 5:30 for the PM peak period. The existing traffic count information is summarized in **Appendix A.**

The 30th highest hour traffic volumes are calculated by applying a seasonal factor to the peak hour volumes. Automatic Traffic Recorder (ATR) Characteristic Tables were used for calculating seasonal adjustment factors, because representative ATRs were easily identified. The ATR closest to the JTA study area with similar traffic flows, area type, and lane configurations was used. For locations on US 26, the ATRs with similar characteristics are:

- 09-007 (US 97; MP 135.95; The Dalles-California Highway; 0.49 mile south of Empire Avenue
- 20-011 (OR 569; MP 12.00; Beltline Highway; 0.76 mile west of I-5

A seasonal factor of 1.04 was determined for ATR 09-007. This seasonal factor was calculated by comparing five years'worth of ATR data (from 2005 to 2009) averaged for the count month (May) and June. The average for both months was used in accordance with APM procedures that suggest that when counts are near the end of a month, they should be averaged with data from the following month. The average ATR data from May/June was compared with the peak month at the ATR (generally August for most of the five years). The lowest percent and highest percent of overall Average Daily Traffic (ADT) were removed from the data set, and the remaining three years of count month data (May/June) were compared to the peak month data, yielding a seasonal adjustment factor of 1.04.

A similar procedure was completed for ATR 20-011, with the resultant seasonal factor calculated to be 1.05. Taking the average of the two seasonal factors calculated from the ATRs results in a seasonal factor of 1.05. This factor is then applied to all of the raw count turning-movement volumes from the data collection effort. The seasonally adjusted volumes were input into Synchro and balanced accordingly. To err on the side of caution, it is preferable to add traffic to the system instead of removing it, and that approach was taken whenever possible. A spreadsheet detailing the calculations used in developing the seasonal adjustment factors are found in **Appendix B.**

After the application of the annual and seasonal factors, traffic volumes were balanced across the JTA study area to account for the lack of traffic sources or sinks along Brookwood Parkway/Helvetia Road between Schaff Road and Huffman Street. The majority of the differences in traffic volumes were small, on the order of 5 to 20 vehicles; however, there was a difference of 190 vehicles in the southbound direction between the westbound and eastbound ramp terminals.

To validate the May ramp terminal counts, additional data was collected on Wednesday, July 20, 2011, at both the eastbound and westbound ramp terminals, as well as one location on US 26 between the Cornelius Pass and Brookwood/Helvetia interchanges. The existing traffic counts for both May and July are in **Appendix A.**

The July counts resulted in no imbalance of volumes between the eastbound and westbound ramp terminals and were deemed more accurate than the original May counts. The July ramp terminal counts were used, with the exception of a few isolated turning-movement volumes to/from US 26. At specific turn locations, the higher May counts were used. Volume was then added to the northbound and southbound through movements to balance the corridor.

The resultant volumes are balanced between the ramp terminals and use the highest volumes collected for the individual ramp terminal movements, which is a conservative approach in determining operations for the ramp terminals. **Figure 8** depicts existing year 2011 30th highest hour turning movement volumes. All volumes shown are in vehicles (NOT Passenger Car Equivalents).

Pedestrian and bicycle counts were conducted at the same time as the vehicular volume counts. The non vehicular count volumes were very low, indicative of a rural high vehicular speed interchange with no dedicated pedestrian or bicycle facilities. The JTA study area intersections served, at maximum, one pedestrian and three bicycles per hour.

2035 VOLUME DEVELOPMENT

For volume development, the ODOT APM methods were used. To convert model volumes to design hour volumes the link-based method, was followed, as instructed by the APM. The two most commonly used link based methods are the growth method and the difference method.

Both methods were compared in a spreadsheet. When the difference between the growth and difference methods were large, the difference method was used. When the difference between the two methods was small, the average of the growth and difference methods was used. This technique is consistent with the preferred method in National Cooperative Highway Research

Program (NCHRP) Report 255. The forecasted approach (link) volumes were then input into a NCHRP Report 255 spreadsheet and, through an iterative process, the 2035 turning-movement volumes were calculated. These volumes were rounded to the nearest five vehicles and then balanced in Synchro. This link-based process was also used for the US 26 mainline projections. Interchange ramp volumes were held constant based on the intersection forecasts, and the freeway mainline volumes were balanced outward from the freeway segment between the Cornelius Pass and Brookwood/Helvetia interchanges. **Figures 9** and **10** depict future year 2035 volumes for No Build and Build lane configurations, respectively. All volumes shown are in calculated turn vehicles (NOT PCE's).

INTERIM YEAR VOLUME DEVELOPMENT

Interim year volumes were calculated using a compounding growth rate equation, resulting in less growth in the earlier years and more growth in each subsequent year. An analysis of METRO's MetroScope models over the years has shown that a compounding growth rate more closely fits projected volumes than linear growth equations. **Figures 11** through **13** depict interim year 2015 and 2025 volumes for the No Build and Build lane configurations. All volumes shown are in vehicles (NOT PCE's).

AVERAGE DAILY TRAFFIC AND TRUCK PERCENTAGE

Average daily traffic (ADT) volumes were calculated using the 16-hour counts collected at the interchange ramp terminals and 18-hour counts collected along the US 26 mainline to the east of the Brookwood Parkway interchange.

The Federal Highway Administration breaks down the traffic composition into 13 classifications. ODOT's standard is to denote classes four through 13 as heavy vehicles. An evaluation of the METRO travel demand model heavy vehicle travel patterns was conducted and deemed to be not representative of actual conditions. Therefore, existing heavy vehicle percentages were assumed for all future year phases.

Figure 14 depicts link based ADT volumes and heavy vehicle percentages within the JTA study area for the years 2011, 2015, and 2035.

SAFETY ANALYSES

Traffic and roadway design engineers are continually engaged in working to ensure that a system is designed and operated such that the frequency and severity of crashes can be reduced for all modes of travel. Improving roadway safety (reducing the frequency and/or severity of crashes) requires consideration of several elements that influence traffic operations: in addition to design aspects of a roadway, driver education, enforcement, and emergency medical services are also essential.

A crash analysis was conducted to determine whether any significant, documented safety issues exist within the JTA study area and to identify specific measures or general strategies for improving overall safety. As part of the crash analysis, historical crash data was reviewed,

intersection crash rates were calculated, and the state's Safety Priority Index System (SPIS) was examined.

Crash Rates

Crash rates were calculated for the JTA study area intersections, and for the segment of US 26 surrounding the interchange. At intersections, the crash rate is calculated as the number of crashes per million vehicles entering the intersection. Intersections with a crash rate greater than 1.0 crashes per million entering vehicles (crashes/mev) generally warrant closer investigation but are not necessarily indicative of safety concerns. None of the study intersections had a crash rate higher than 1.0 crashes/mev. In fact, the highest crash rate is 0.20 at the eastbound ramp terminal.

For the US 26 mainline segment surrounding the interchange (M.P. 61.79-62.79), the crash rate is calculated as the number of crashes per million vehicle miles traveled (crashes/mvm). Along the US 26 segment surrounding the JTA study area, the two-year average crash rate is 0.29. For comparable freeway/expressways within urban segments, the three year crash rate was approximately three times the rate at 0.64 crashes/mvm.[1]

Crash History

The crash analysis included a review of crash history data supplied by the ODOT Crash Analysis and Reporting Unit for the period between January 1, 2008, and December 31, 2010, which represents the three most recent full years for which crash data were available at the time of the analysis. The data is summarized in **Table 1**, with the detailed reports contained in **Appendix D.**

For the study intersections, the ODOT database includes records for 13 crashes. The data highlights the corridor as having a low incidence of traffic crashes, and no reported serious injuries or fatalities. Approximately 38 percent (5 crashes) of all reported crashes involved minor injuries, and the remaining 62 percent (8 crashes) were property-damage-only (PDO) crashes. The majority of crashes (8) were rear-end-related, a type of crash that is frequently attributed to congestion and queuing. None of the reported crashes were recorded as speed- or alcohol-related. There were not any reported bicycle or pedestrian crashes within the JTA study area. There are no obvious crash trends that would warrant mitigation.

For the segment of US 26 surrounding the interchange, the ODOT database includes records for 21 crashes. The data highlights the corridor as having a low incidence of traffic crashes (with a crash rate lower than the statewide average), only one report of a serious injury (5 percent of the freeway crashes), and no fatalities.

Looking at the entire study (US 26 and the JTA study area intersections), approximately 50 percent of the reported crashes involved minor injuries, 47 percent were PDO, and only three percent were serious injury crashes. Rear-end-related (21), and fixed-object related (5) crashes make up the majority of the collision types. None of the reported crashes were recorded as alcohol-related, and only two of the crashes were recorded as speed-related. There are no obvious crash trends that would warrant mitigation.

[1] 2009 Oregon State Highway Crash Rate Tables, Table 4, ODOT, August 2010.

Looking at the interchange area as a whole, the severity of crashes are relatively low, as shown in the chart to the right. The review of historical crash data does not suggest that any significant crash patterns are present, with regard to details such as location, year, time of day, or weather.

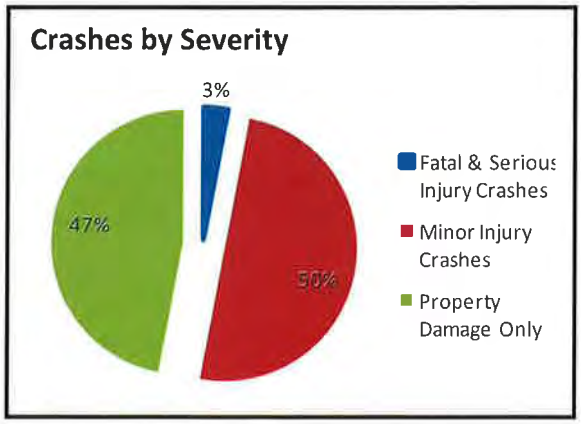

Table 1. Summary of Collision Types within the Brookwood JTA Study Area (January 1, 2008, through December 31, 2010)

Study Location	Collision Type								Total	Severity			Crash Rate
	Rear End	Fixed Object	Angle	Turning	Head On	Non-Collision	Bicycle	Pedestrian		Fatal & Serious Injury Crashes	Minor Injury Crashes	Property Damage Only	
Brookwood Parkway / Helvetia Road													
At Jacobson Rd	0	0	0	0	0	0	0	0	**0**	0	0	0	0.00
At WB Ramp Terminal	2	1	0	1	0	0	0	0	**4**	0	3	1	0.18
At EB Ramp Terminal	3	1	0	1	0	1	0	0	**6**	0	2	4	0.20
At Meek Rd	3	0	0	0	0	0	0	0	**3**	0	0	3	0.10
US 26 (M.P. 61.79-62.79)	13	3	0	0	0	0	0	0	**21**	1	12	8	0.34
Total JTA Study Area Crashes	**21**	**5**	**0**	**2**	**0**	**1**	**0**	**0**	**34**	1	17	16	
% Crashes by Type	62%	15%	0%	6%	0%	3%	0%	0%		3%	50%	47%	

NOTE: Crashes occurred between January 1, 2008 and December 31, 2010.

Safety Priority Index System (SPIS)

The SPIS is a method used in Oregon to identify safety problem areas along state highways. Highways are evaluated in approximately one-tenth-mile increments (often grouped into larger segments). Each year these segments are ranked by assigning a SPIS score based on the frequency and severity crashes observed, while taking traffic volume into account. When a segment is ranked in the top 10 percent of the index, a crash analysis is typically warranted and corrective actions are considered. Along US 26 within the JTA study area, there are no segments identified in the top 10 percent of the most recent (2010) SPIS rankings.

MOBILITY STANDARDS

ODOT mobility standards apply to the US 26 mainline and ramps, and to both ramp terminals. ODOT uses the volume-to-capacity (v/c) ratio as its standard measurment. As volume approaches capacity, the v/c ratio increases towards 1.0. A v/c ratio of 1.0 indicates that the volume at the given location is at capacity. A v/c ratio greater than 1.0 indicates that the volume exceeds the capacity of the location. For existing and no-build conditions, the applicable v/c standard is based on the Oregon Highway Plan (OHP) and is not to exceed 0.99. For any build conditions, the applicable v/c standard is based on the Highway Design Manual (HDM) and is not to exceed 0.75. The Washington County v/c standard applies to all other intersections in the JTA study area and is 0.99. None of the JTA study area intersections are governed by the City of Hillsboro.

Due to the cost of the ultimate design, the interchange will have to be phased over multiple years as funding becomes available. The initial goal of each phase is to meet HDM standards (v/c of less than 0.75) on the opening day of the phase. The following phase should be opened before the preceeding phase fails to meet OHP standards (v/c of less than 1.00). For example, Phase 1 should be built before existing operations exceed a v/c ratio 1.00. When Phase 1 construction completes, it should operate at a v/c ratio of less than 0.75. Phase 2A or 2B should be build before phase 1 operations exceed a v/c ratio of 1.00. When Phase 2A or 2B construction completes it should operate at a v/c ratio of less than 0.75. Etc…

TRAFFIC OPERATIONS RESULTS

This section describes, in detail, the operations of each phase under opening day volume as well as breakdown year volume. Breakdown is defined as an intersection or ramp area that fails to meet applicable standards and/or queuing that poses a potential safety concern. Detailed operational analysis is in **Appendix C.**

One trouble spot common to all scenarios in all time periods and lane configurations is the western approach to the intersection of Brookwood Pkwy at Meek Rd. This approach experiences excessive congestion today and is not expected to improve under any scenario. Although not included in this analysis, it is ODOT's intention to close Meek Rd and, with the City of Hillsboro and/or Washington County assistance, provide alternative access to Brookwood Pkwy via a new roadway. The alternative access for Meek Rd will be identified as part of the IAMP process for the Brookwood/Helvetia interchange.

Existing (2011):

All ODOT and Washington County facilities meet applicable OHP standards (v/c less than 1.00) and Washington County standards (v/c less than 0.99) with existing year volumes. **Figures 15** and **16** depict the existing 2011 v/c ratios, delay, and queue lengths.

No-Build (2015):

With a 11 percent growth in total interchange traffic volumes, an increase that is likely to occur around 2015, the existing ODOT facilities meet the applicable OHP standards (v/c less than 1.00), but the SimTraffic micro-simulation model shows queuing on the westbound off-ramp

from US 26 to Brookwood that extends back into the safe stopping sight distance for traffic exiting the freeway. All Washington County facilities meet applicable standards. There are no other excessive queues or delays experienced by drivers under the 2015 no-build conditions. **Figures 17** and **18** depict the 2015 no-build v/c ratios, delay, and queue lengths.

Phase 1, New Loop Ramp (2015):

All ODOT facilities are expected to meet the applicable HDM standards (v/c less than 0.75) under Phase 1 operations in 2015. The addition of the westbound-to-southbound loop ramp with this phase improves operations at the westbound ramp terminal and eliminates the safety concerns for vehicles exiting the freeway that were present in the no-build scenario. All Washington County facilities meet applicable standards. There are no other excessive queues or delays experienced by drivers under the 2015 Phase 1 conditions. **Figures 19** and **20** depict the 2015 Phase 1 v/c ratios, delay, and queue lengths.

Phase 1, New Loop Ramp (2023-2027):

With a 28 percent growth in total interchange traffic volumes, an increase that is likely to occur between the year 2023 and the year 2027, the Phase 1 ODOT facilities meet the applicable OHP standards (v/c less than 1.00), but the SimTraffic micro-simulation model shows slowing and congestion around the diverge point of the westbound-to-southbound loop ramp from US 26 to Brookwood. This exit ramp has a v/c ratio of 0.83 and traffic volumes near the capacity point, and any small amounts of friction (lane changing, cautious driving, tapping the breaks) can lead to the breakdown of the traffic stream.

Demand for the eastbound on-ramp meter exceeds its capacity of 800 vehicles per hour (vph) in the PM peak hour and is creating a standing queue that affects operations along northbound Brookwood. All Washington County facilities meet applicable standards. There are no other excessive queues or delays experienced by drivers under the 2025 Phase 1 conditions. **Figures 21** and **22** depict the 2023-2027 Phase 1 v/c ratios, delay, and queue lengths.

Phase 2, Option A, Widen Southbound Brookwood/Helvetia (2023-2027):

With a 28 percent growth in total interchange traffic volumes, and the addition of a southbound through lane on Brookwood in Phase 2, Option A, one ODOT facility is expected to continue to fail to meet the applicable HDM standards. The westbound off-ramp from US 26 to southbound Brookwood is expected to have a v/c ratio of 0.83, which exceeds the HDM standard of 0.75. The addition of a southbound through lane on Brookwood to the south of the westbound ramp terminal fails to alleviate the slowing and congestion around the diverge point of the westbound-to southbound loop ramp from US 26 to Brookwood. As a result, the addition of another southbound through lane on Brookwood under Phase 2A does not extend the functional life of the interchange compared to Phase 1, because congestion will remain on the freeway at the diverge point of the westbound-to-southbound loop ramp from US 26 to Brookwood.

Demand for the eastbound on-ramp meter exceeds its capacity of 800 vehicles per hour (vph) in the PM peak hour and is creating a standing queue that affects operations along northbound Brookwood. All Washington County facilities meet applicable standards. There are no other excessive queues or delays experienced by drivers under the 2025 Phase 2A conditions. **Figures 23** and **24** depict the 2023-2027 Phase 2, Option A v/c ratios, delay, and queue lengths.

Phase 2, Option B, Two-Lane Loop Ramp Exit (2023-2027):

With a 28 percent growth in total interchange traffic volumes, and the addition of a second exit lane to the loop ramp in Phase 2, Option B, one ODOT facility fails to meet the applicable HDM standard. The eastbound ramp terminal is expected to have a v/c ratio of 0.78, which exceeds the HDM standard of 0.75. While the v/c ratio is over the standard, the average vehicle through the intersection would only experience a 14-second delay, and no long standing queues are expected to be present.

The addition of the second off-ramp lane from westbound US 26 to southbound Brookwood also alleviates the slowing and congestion around the diverge point of the westbound-to-southbound loop ramp from US 26 to Brookwood.

The demand for the eastbound on-ramp to US 26 exceeds capacity and continues to affect operations on northbound Brookwood with a 28 percent growth in total interchange traffic volumes. All Washington County facilities meet applicable standards. There are no other excessive queues or delays experienced by drivers under the 2025 Phase 2B conditions. **Figures 25** and **26** depict the 2023-2027 Phase 2, Option B v/c ratios, delay, and queue lengths.

No-Build (2035):

By 2035, without interchange improvements, both ramp terminals would fail to meet the OHP standard (v/c less than 1.00) in at least one peak hour with demands that are expected to exceed capacity in 2035. The demand for both the westbound and eastbound off-ramps from US 26 to Brookwood/Helvetia are expected to exceed capacity. The resulting queues are expected to influence operations on the US 26 mainline and result in safety concerns in both directions.

The demand for the eastbound on-ramp to US 26 exceeds its capacity and affects operations on northbound Brookwood. The merge area from Brookwood to US 26 eastbound is expected to operate with a v/c ratio of 0.84. This ratio could be higher if there is a change in the ramp-meter rate. Today the ramp-meter allows 800 vph onto westbound US 26 in the PM peak hour. In 2035 the demand for the ramp is expected to climb to 950 vph. If the ramp-meter rate were to increase, it could result in slowing, congestion, and safety concerns around the merge area.

The east approach to the intersection of Helvetia at Jacobson is expected to have a demand that exceeds the capacity of the stopped side street. This condition fails to meet applicable Washington County standards. **Figures 27** and **28** depict the 2035 no-build v/c ratios, delay, and queue lengths.

Phase 2, Option B, Two-Lane Loop Ramp Exit (2035+):

With a 50 percent growth in total interchange traffic volumes, an increase that is likely to occur on or after 2035, the ODOT facilities meet the applicable OHP standards (v/c less than 1.00) under Phase 2, Option B. However, both ramp terminals would fail to meet the HDM standards (v/c less than 0.75) which the ODOT regulations require if this was the ultimate design.

While the v/c ratios are over the standard, the vehicles through the intersections would experience an average delay of less than 27 seconds. The only queue that would be expected is a roughly 850 foot queue on the loop ramp as it approaches southbound Brookwood. This queue

does not cause safety concerns, as there is still safe stopping sight distance after the diverge point from US 26.

Consistent with the results shown in the 2023-2027 analysis, the second off-ramp lane from westbound US 26 to southbound Brookwood has alleviated the slowing and congestion around the diverge point of the westbound-to-southbound loop ramp.

The demand for the eastbound on-ramp to US 26 continues to exceed capacity and continues to affect operations on northbound Brookwood. As with the no-build scenario, the merge area from Brookwood to US 26 eastbound operates near capacity.

All Washington County facilities meet applicable standards. There are no other excessive queues or delays experienced by drivers under the 2035 Phase 2, Option B conditions. **Figures 29** and **30** depict the 2035 Phase 2, Option B v/c ratios, delay, and queue lengths.

It should be noted that development patterns around the interchange may not follow those used in the METRO travel demand model, because the areas to the southwest of the interchange are likely to experience significant land use development over the next 20 years or more. As a result of the uncertainty in growth patterns, it is possible that Phase 2, Option B will not function adequately and that the addition of an additional southbound lane on Brookwood as part of Phase 2, Option A may be needed sooner than 2035. In fact, it is possible that changes in growth patterns could result in Phase 2, Option A improvements being needed before Phase 2, Option B improvements.

Phase 3, Ultimate Design (2035+):

This alternative combines the improvements of Phase 1, Phase 2A, and Phase 2B and results in a two-lane off-ramp from US 26 to southbound Brookwood Parkway and three southbound through lanes on Brookwood to south of the JTA study area. With a 50 percent growth in total interchange traffic volumes, an increase that is likely to occur on or after 2035, the westbound ramp terminal fails to meet ODOT HDM standards (v/c less than 0.75), with an expected v/c ratio of 0.86. Although the v/c ratio is greater than the standard, the average vehicle through the intersection would experience a delay of less than a 15 seconds. A design exception would need to be obtained for a design that fails to meet ODOT's standards in the forecast year.

The demand for the eastbound on-ramp to US 26 exceeds capacity and continues to affect operations on northbound Brookwood. As with the 2035 no-build and 2035 Phase 2, Option B scenarios, the merge area from Brookwood to US 26 eastbound operates near capacity.

All Washington County facilities meet applicable standards. There are no other excessive queues or delays experienced by drivers under the 2035 Phase 3 conditions. **Figures 31** and **32** depict the 2035 Phase 3 v/c ratios, delay, and queue lengths.

SUMMARY OF FINDINGS

Analysis of the proposed phases and eventual fully redesigned Brookwood/Helvetia interchange using projected interim and 2035 future year traffic volumes reveal the following high-level findings.

No-Build:

- Review of existing crash data in the interchange study area found relatively low crash rates and no significant safety concerns.
- With an 11 percent increase (roughly year 2015) in total interchange traffic volumes through the study area intersections, the existing interchange is expected to have operations degrade to a point where capacity constraints at the westbound ramp terminal would cause queuing that would extend back into the safe stopping distance of the westbound US 26 off ramp, causing a safety concern.

Phase 1, New Loop Ramp:

- An opening day (year 2015) analysis of Phase 1 shows that the proposed new westbound US 26 to southbound Brookwood Pkwy exit loop ramp operations would meet jurisdictional standards. The demand at the US 26 eastbound on-ramp meter is higher than the ramp meter service rate, resulting in a standing queues that would influence operations along northbound Brookwood Parkway.
- A 28 percent growth in total interchange traffic volumes (roughly years 2023 to 2027) would cause Phase 1 to fail to meet jurisdictional standards due to slowing and friction on mainline US 26 westbound around the diverge area to southbound Brookwood.

Phase 2, Increase Westbound-to-Southbound Capacity:

- Analysis of Phase 2A with a 28 percent growth in total interchange traffic volumes (roughly years 2023 to 2027), shows that the addition of a third southbound lane on Brookwood/Helvetia would not address the first breakdown in operations of the Phase 1 interchange, which is projected to occur along westbound US 26 as traffic volumes increase on the exit loop ramp to southbound Brookwood Pkwy.
- Analysis of Phase 2B, with a 28 percent growth in total interchange traffic volumes (roughly years 2023 to 2027), shows that the addition of a second exit lane (choice lane) to the loop ramp results in a notable improvement in operations on the US 26 mainline. Phase 2B is expected to be a viable phase until total interchange traffic volume grows by 50 percent, which, based on the Metro model, is not expected to occur until roughly year 2035 or later.
- It should be noted that development patterns around the interchange may not follow those used in the Metro travel demand model, because the areas to the southwest of the interchange are likely to experience significant land use development over the next 20 years and more. As a result of the uncertainty in growth patterns, it is possible that Phase 2, Option B will not function adequately and that the addition of an additional southbound lane on Brookwood as part of Phase 2, Option A may be needed sooner than 2035. In fact, it is possible that Phase 2, Option A may be needed on a time frame similar to that of Phase 2, Option B.

Phase 3, Ultimate Design:

- Under the 50 percent traffic growth time frame (roughly year 2035), there is only one area of potential concern of Phase 3. The demand at the ramp-meter to eastbound US 26 is higher than the ramp meter service rate, which may result in standing queues that would exceed the storage length of the additional northbound right-turn lane and end up having an influence on operations along northbound Brookwood Parkway.

Table 2 on the next page shows a summary of the operations of each phase on opening day and when and how each phase would be expected to fail to meet standards. Only operations that would be expected to fail to meet standards or would create unsafe operations are listed in the summary table. The picture below **Table** 2 represents a graphical timeline of when each phase would be expected to open and when it would be expected to fail to meet standards, based on projected METRO growth patterns.

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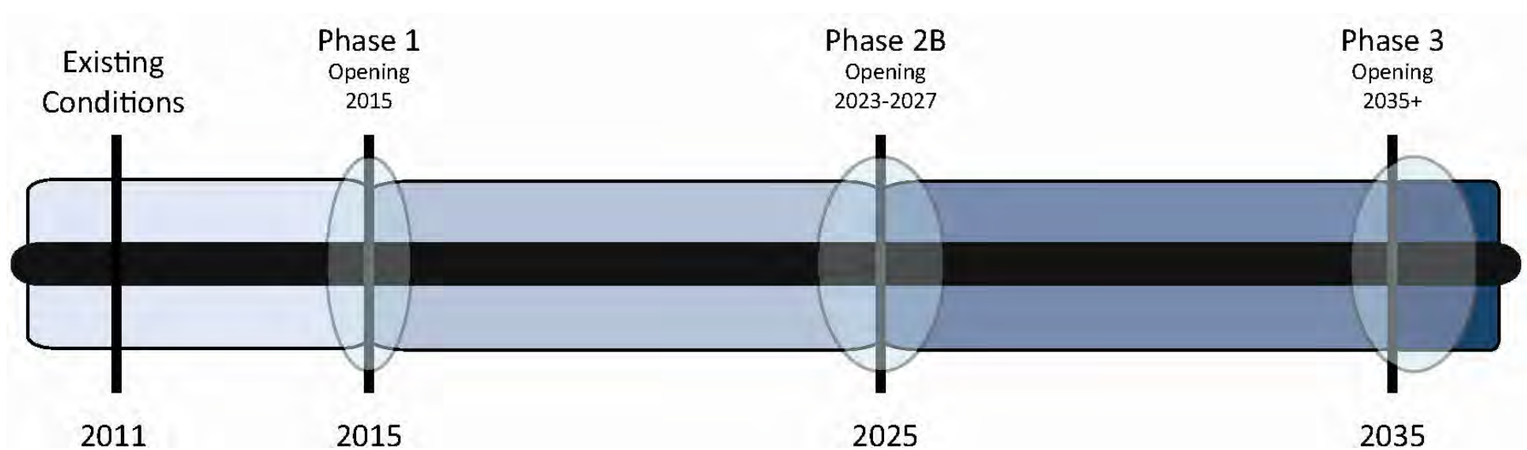
Table 2: Traffic Operations Summary

Scenario / Standard	Existing	No-Build		Phase 1		Phase 2A	Phase 2B		Phase 3
	2011 (v/c[1] < 0.99)	**2015 (v/c < 0.99)**	**2035 + (v/c < 0.99)**	**2015 (v/c < 0.75)**	**2023-2027 (v/c < 0.99)**	**2023-2027 (v/c < 0.75)**	**2023-2027 (v/c < 0.75)**	**2035+ (v/c < 0.99)**	**2035+ (v/c < 0.75)**
Ramp Terminal Capacity	Meets Standards	Meets Standards	Both ramp terminals would fail to meet Oregon Highway Plan (OHP) v/c standards in at least one time period.	Meets Standards	Meets Standards	Westbound ramp terminal would not meet Highway Design Manual (HDM) v/c standards in the AM peak.	Eastbound ramp terminal would not meet HDM v/c standards in the AM peak.	Meets Standards	Westbound ramp terminal would not meet HDM v/c standards in the AM peak.
Freeway Capacity	Meets Standards	Meets Standards	The westbound off-ramp to Brookwood would fail to meet the OHP v/c standards in the AM peak.	Meets Standards	Meets Standards	Westbound off-ramp to southbound Brookwood would not meet HDM v/c standards in the AM peak.	Meets Standards	Meets Standards	Meets Standards
Queuing	Meets Standards	Eastbound on-ramp demand exceeds capacity, and the associated queue impacts operations on northbound Brookwood in the PM peak. Westbound off-ramp queuing approaching Brookwood/Helvetia backs into the safe stopping sight distance of the US26 mainline off-ramp, causing a safety concern.	Eastbound on-ramp demand exceeds capacity, and the associated queue impacts operations on northbound Brookwood in the PM peak. Congestion/queuing would be expected to occur on the US 26 mainline due to demand that exceeds capacity for the westbound off-ramp to Brookwood/Helvetia.	Eastbound on-ramp demand exceeds capacity, and the associated queue impacts operations on northbound Brookwood in the PM peak.	Eastbound on-ramp demand exceeds capacity, and the associated queue impacts operations on northbound Brookwood in the PM peak. The demand for the westbound loop ramp to southbound Brookwood exceeds capacity and causes slowing/friction on the US 26 mainline in the AM peak.	Eastbound on-ramp demand exceeds capacity, and the associated queue impacts operations on northbound Brookwood in the PM peak. The demand for the westbound loop ramp to southbound Brookwood exceeds capacity and causes slowing/friction on the US 26 mainline in the AM peak.	Eastbound on-ramp demand exceeds capacity, and the associated queue impacts operations on northbound Brookwood in the PM peak.	Eastbound on-ramp demand exceeds capacity, and the associated queue impacts operations on northbound Brookwood in the PM peak.	Eastbound on-ramp demand exceeds capacity, and the associated queue impacts operations on northbound Brookwood in the PM peak.

[1]*v/c = volume-to-capacity ratio.*

SOURCE: Intersection operational results were obtained through the use of the Synchro/SimTraffic model. US 26 operational results were obtained through the use of the Highway Capacity Software.

NOTE: All HCS freeway results are based on the 2003 Highway Capacity Manual (HCM) Methodologies and are subject to the exlusions of the 2003 HCM.



Potential JTA Phasing Timeline

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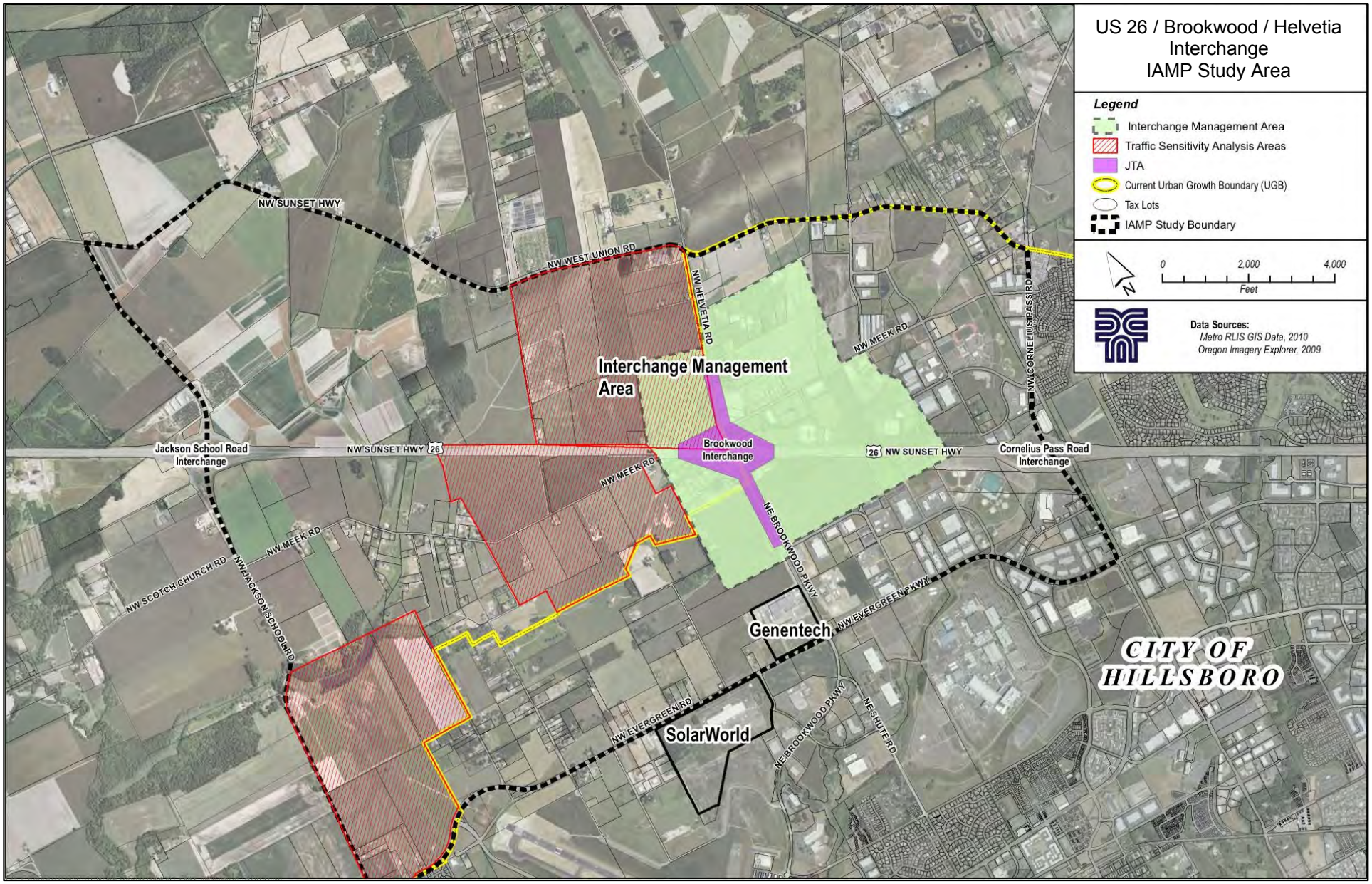

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FIGURE 1

JTA Study Area

JTA Brookwood Interchange Analysis

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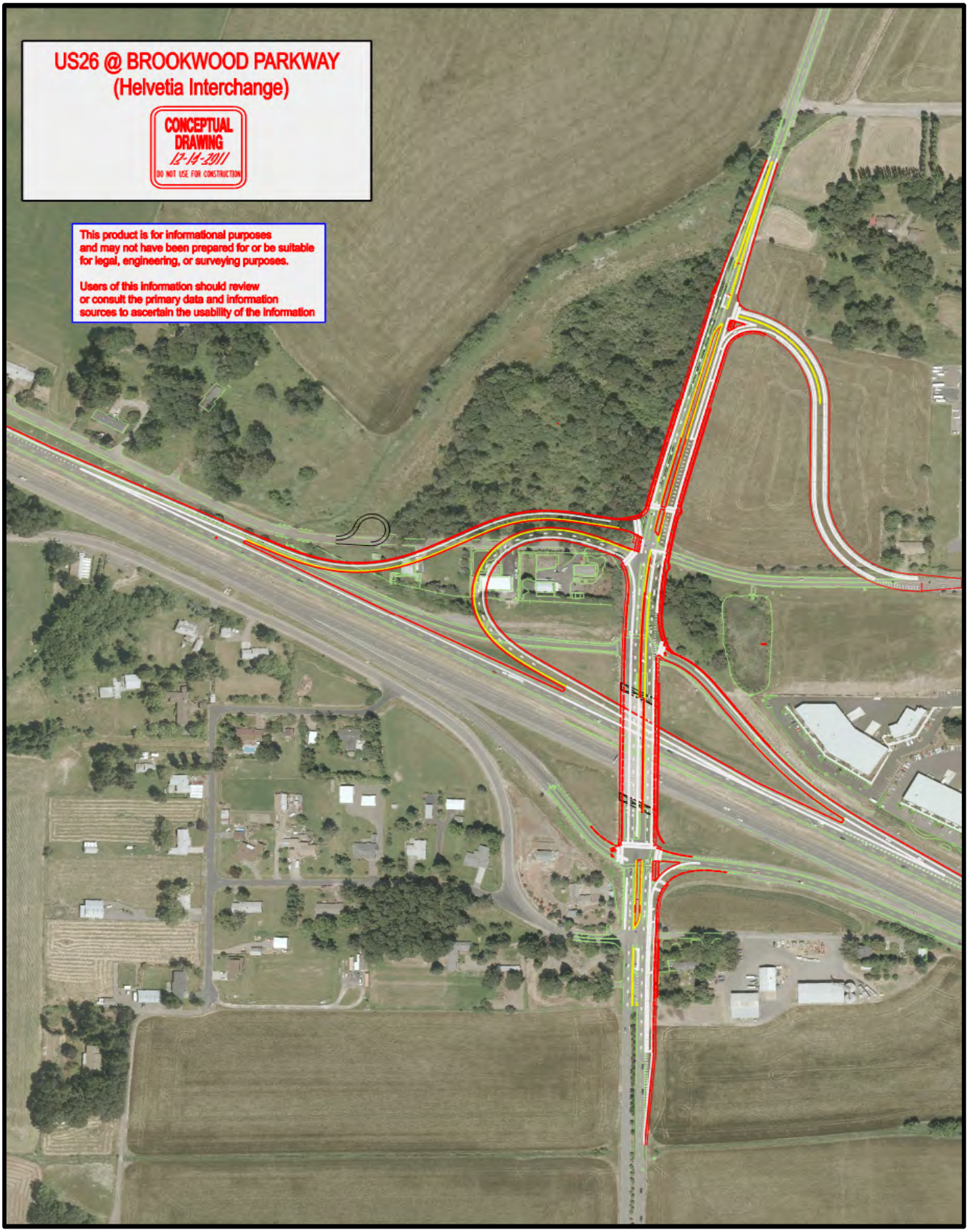

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FIGURE 2

Proposed Phase 1 Design

JTA Brookwood Interchange Analysis

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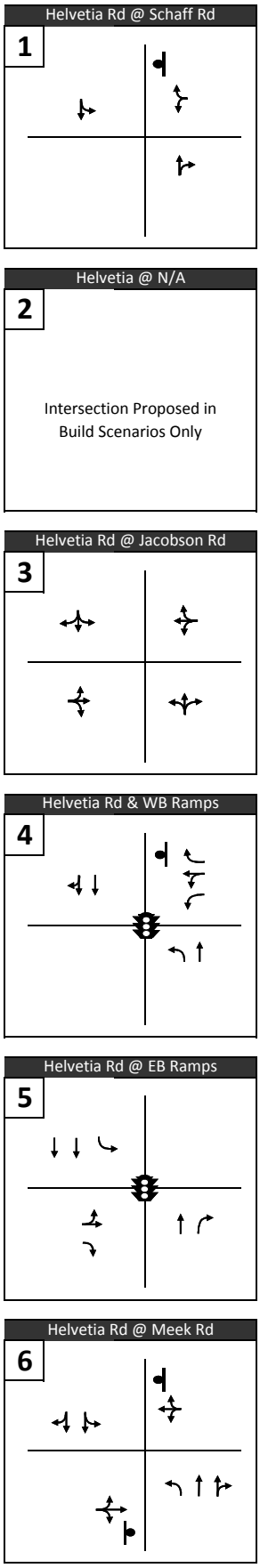

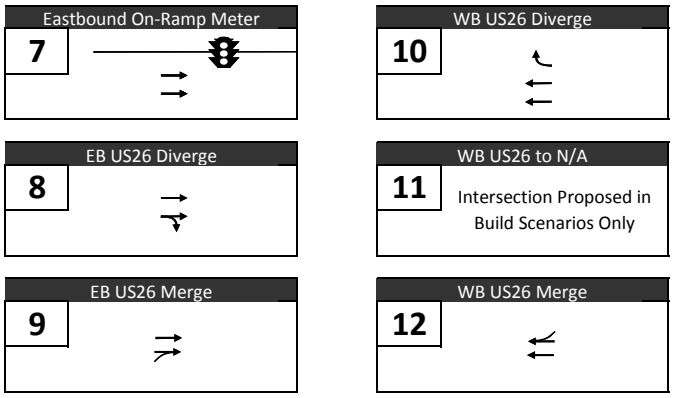

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Legend

→ Existing Turning Movement

FIGURE 3

Existing Lane Configurations

JTA Brookwood Interchange Analysis

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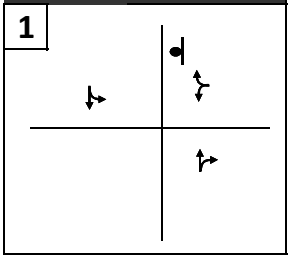
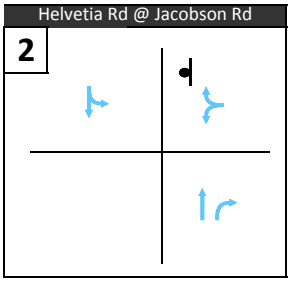
Helvetia Rd @ Schaff Rd

1



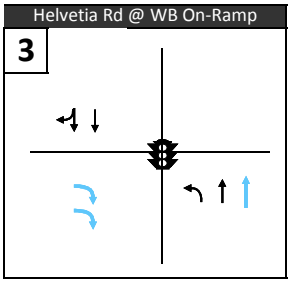
Helvetia Rd @ Jacobson Rd

2



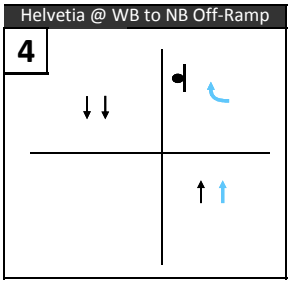
Helvetia Rd @ WB On-Ramp

3



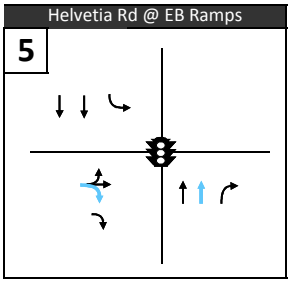
Helvetia @ WB to NB Off-Ramp

4



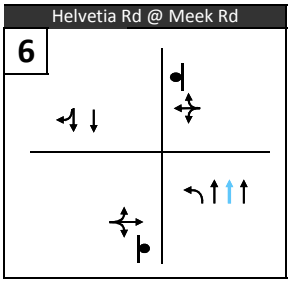
Helvetia Rd @ EB Ramps

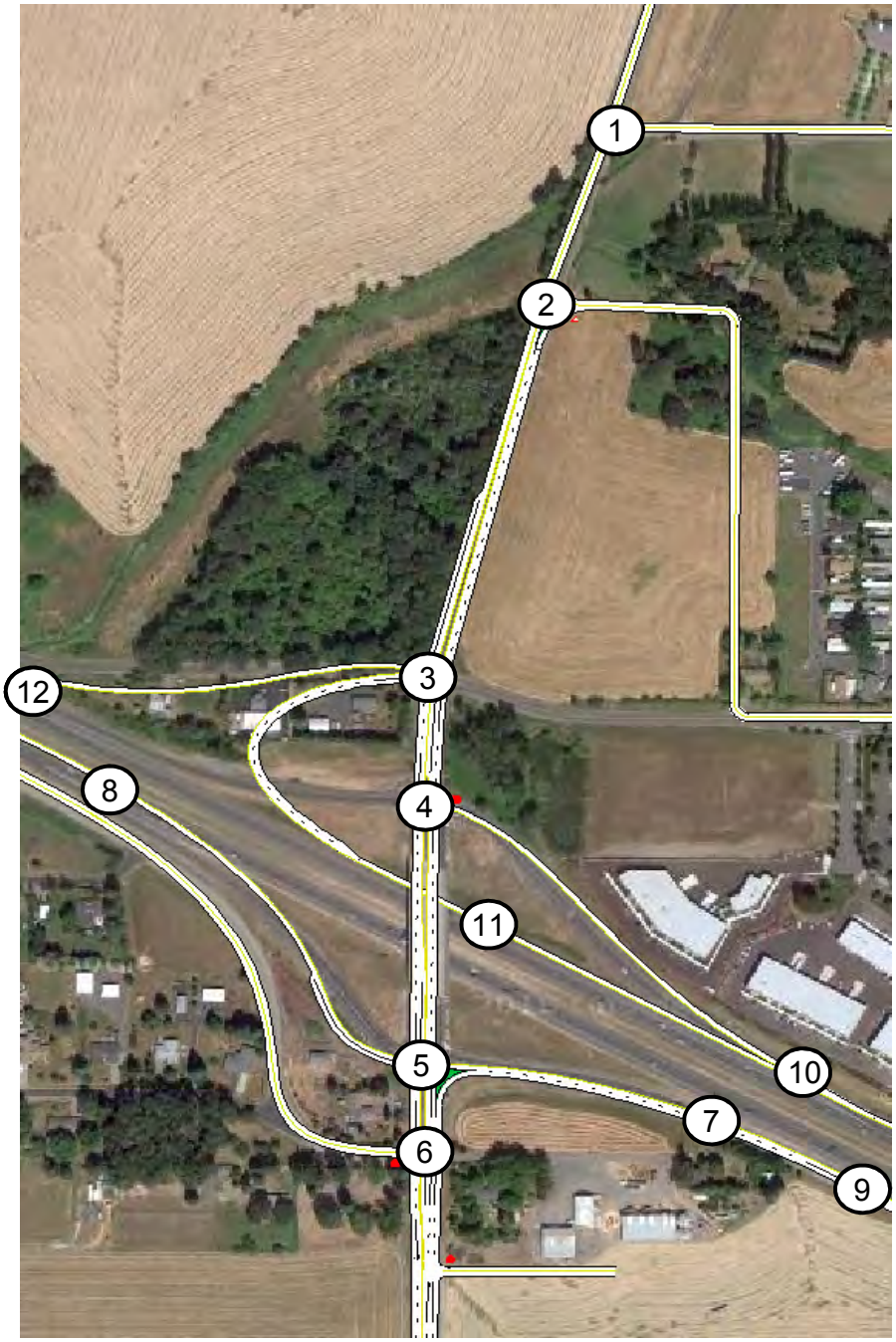
5



Helvetia Rd @ Meek Rd

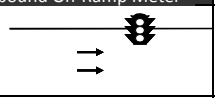
6





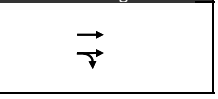
Eastbound On-Ramp Meter

7



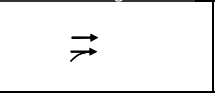
EB US26 Diverge

8



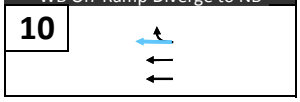
EB US26 Merge

9



WB Off-Ramp Diverge to NB

10

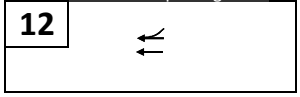


WB Off-Ramp Diverge to SB

11

WB On-Ramp Merge

12



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Legend

Existing Turning Movement

New Phase 1 Turning Movement

FIGURE 4

Phase 1 Lane Configurations

JTA Brookwood Interchange Analysis

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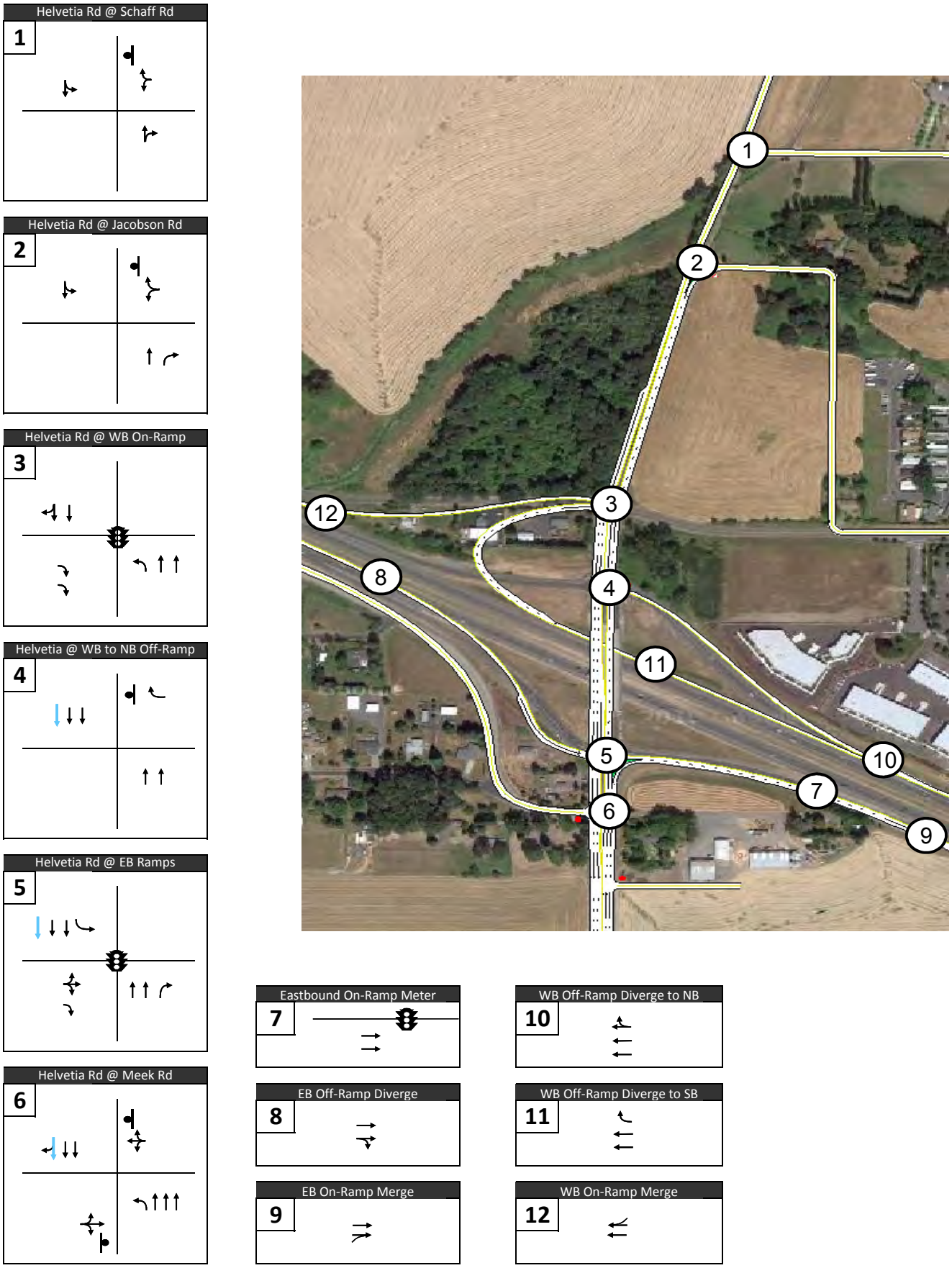

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Legend

Phase 1 Turning Movement

New Phase 2, Option A Turning Movement

FIGURE 5

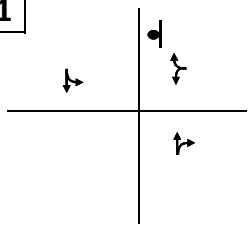
Phase 2, Option A Lane Configurations

JTA Brookwood Interchange Analysis

Printed: 1/12/2012

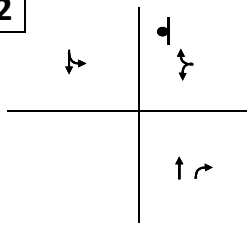
Helvetia Rd @ Schaff Rd

1



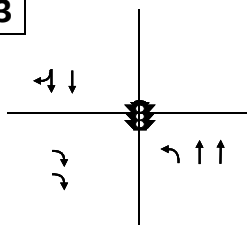
Helvetia Rd @ Jacobson Rd

2



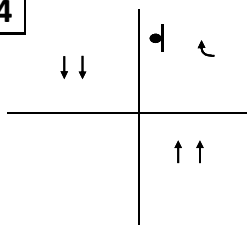
Helvetia Rd @ WB On-Ramp

3



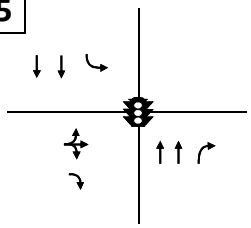
Helvetia @ WB to NB Off-Ramp

4



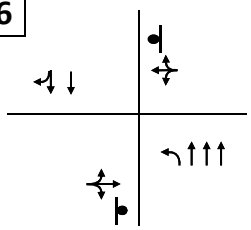
Helvetia Rd @ EB Ramps

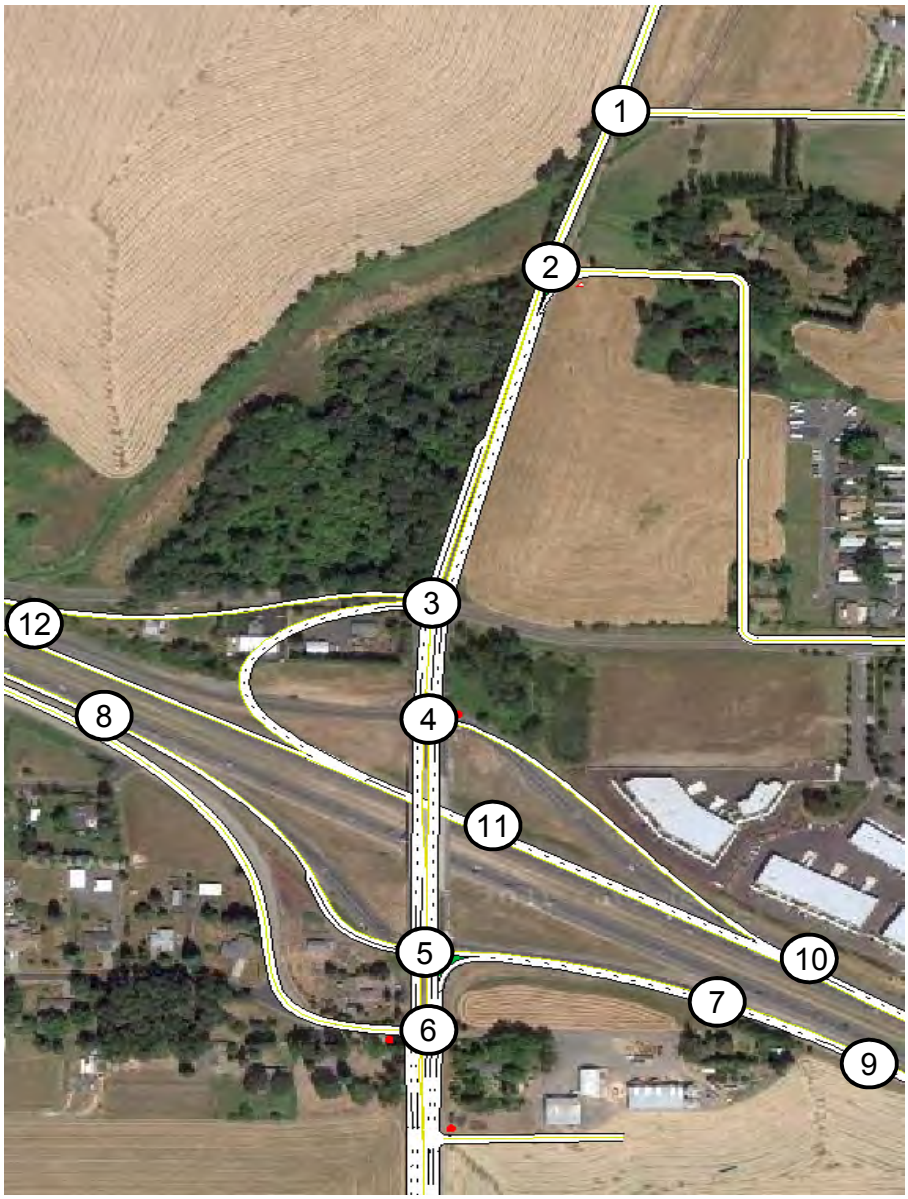
5



Helvetia Rd @ Meek Rd

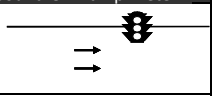
6





Eastbound On-Ramp Meter

7



EB US26 Diverge

8

EB US26 Merge

9

WB Off-Ramp Diverge to NB

10

WB Off-Ramp Diverge to SB

11

WB On-Ramp Merge

12

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Legend

→ Phase 1 Turning Movement

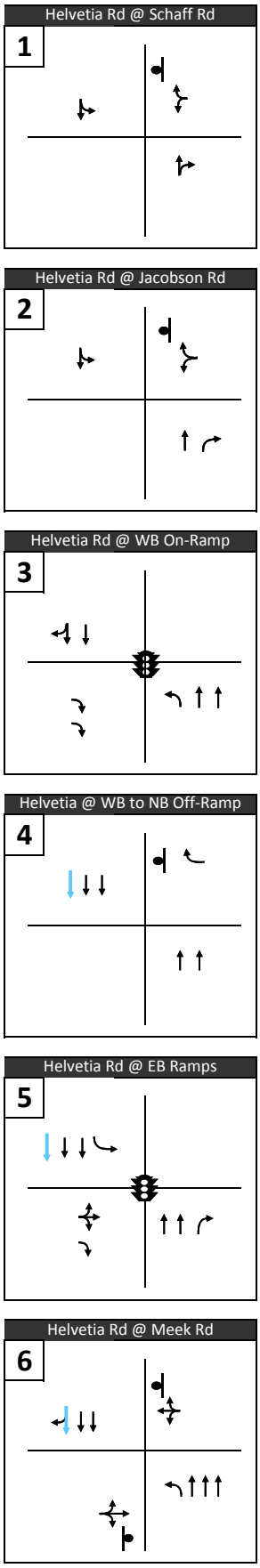
→ New Phase 2 Option B Turning Movement

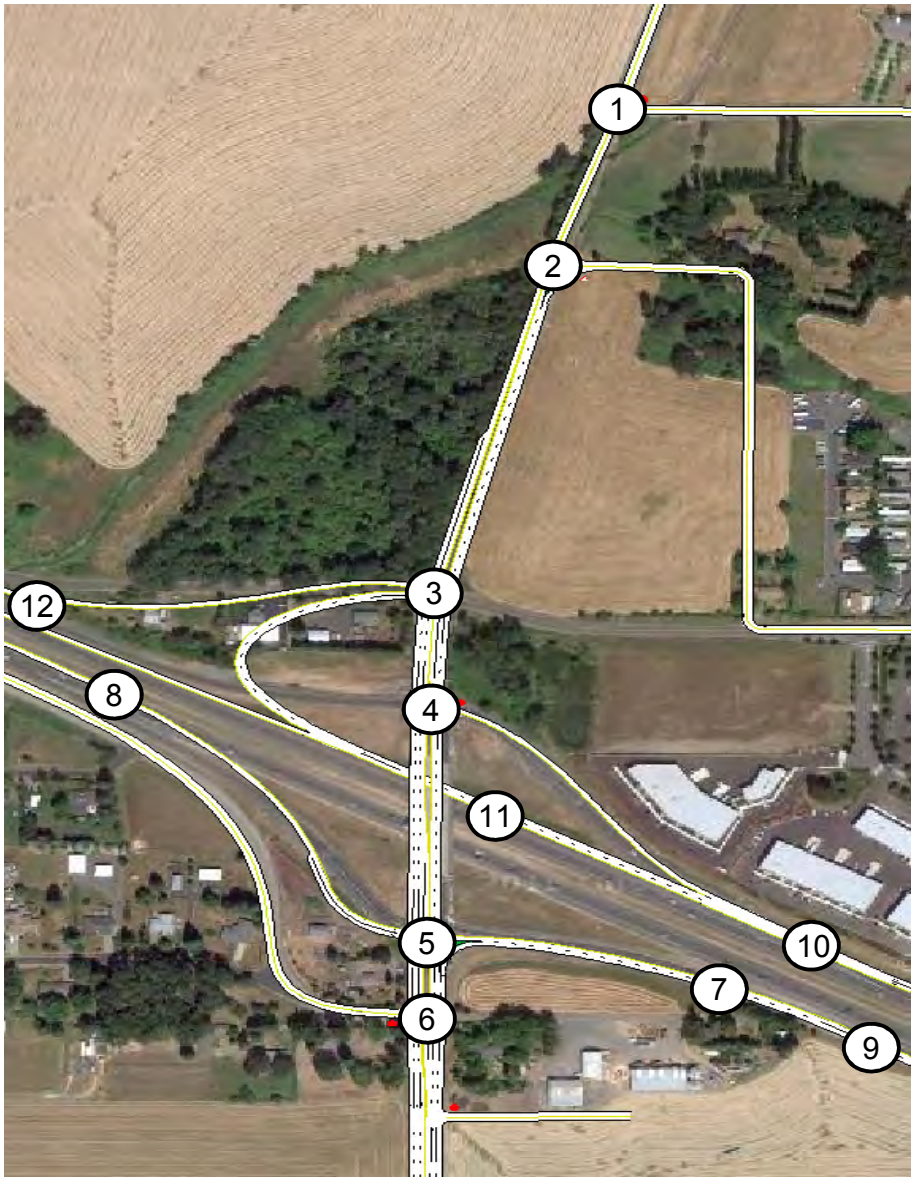
FIGURE 6

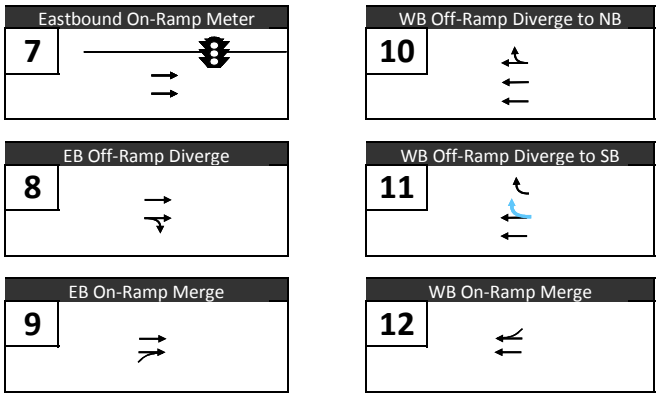
Phase 2, Option B Lane Configurations

JTA Brookwood Interchange Analysis

Printed: 1/12/2012







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Legend

Phase 1 Turning Movement

New Phase 3 Turning Movement

FIGURE 7

Phase 3 Lane Configurations

JTA Brookwood Interchange Analysis

Printed: 1/12/2012

AM Peak Period

1 Helvetia Rd & Schaff Rd
310 5 5 5 145 5
TEV: 475

2 Helvetia Rd @ N/A
Intersection Proposed in Build Scenarios Only

3 Helvetia Rd & Jacobson Rd
0 305 10 5 0 165 0 0 5 5 145 210
TEV: 850

4 Helvetia Rd & WB Ramps
25 450 40 0 1260 55 320
TEV: 2150

5 Brookwood Pkwy & EB Ramps
1670 40 60 0 175 315 465
TEV: 2725

6 Brookwood Pkwy & Meek Rd
5 1840 0 0 0 0 15 5 20 10 765 5
TEV: 2665

7 Eastbound On-Ramp Meter
505

PM Peak Period

1 Helvetia Rd & Schaff Rd
130 0 0 0 450 0
TEV: 580

2 Helvetia Rd @ N/A
Intersection Proposed in Build Scenarios Only

3 Helvetia Rd & Jacobson Rd
0 125 5 5 0 170 0 0 15 10 445 455
TEV: 1230

4 Helvetia Rd & WB Ramps
75 235 55 0 625 190 855
TEV: 2035

5 Brookwood Pkwy & EB Ramps
845 15 60 0 60 985 780
TEV: 2745

6 Brookwood Pkwy & Meek Rd
15 890 0 0 0 0 5 0 15 35 1760 0
TEV: 2720

7 Eastbound On-Ramp Meter
795

AM Peak Period

8 EB US26 Diverge
1695
235

9 EB US26 Merge
1695
505

10 WB US26 Diverge
1300
1000

11 WB US26 to N/A
Intersection Proposed in Build Scenarios Only

12 WB US26 Merge
80
1000

PM Peak Period

8 EB US26 Diverge
1505
120

9 EB US26 Merge
1505
795

10 WB US26 Diverge
680
1800

11 WB US26 to N/A
Intersection Proposed in Build Scenarios Only

12 WB US26 Merge
265
1800

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Legend

TEV: Total Entering Volume

Peak Hour Volume

→ Turning Movement

FIGURE 8

Year 2011 Turning Movement Volumes
Existing Configurations

JTA Brookwood Interchange Analysis

AM Peak Period

1 Helvetia Rd & Schaff Rd
410 45 10 45 165 205
TEV: 880

2 Helvetia Rd @ N/A
Intersection Proposed in Build Scenarios Only

3 Helvetia Rd & Jacobson Rd
0 440 15 5 0 155 0 0 0 5 365 275
TEV: 1260

4 Helvetia Rd & WB Ramps
30 565 0 100 0 1795 60 545
TEV: 3095

5 Brookwood Pkwy & EB Ramps
2325 35 85 0 275 520 505
TEV: 3745

6 Brookwood Pkwy & Meek Rd
20 2580 0 0 0 0 50 5 80 35 975 5
TEV: 3750

7 Eastbound On-Ramp Meter
540

PM Peak Period

1 Helvetia Rd & Schaff Rd
270 0 0 30 470 210
TEV: 980

2 Helvetia Rd @ N/A
Intersection Proposed in Build Scenarios Only

3 Helvetia Rd & Jacobson Rd
0 290 10 10 0 275 0 0 0 0 670 520
TEV: 1775

4 Helvetia Rd & WB Ramps
135 430 70 0 730 290 1120
TEV: 2775

5 Brookwood Pkwy & EB Ramps
1155 5 20 0 80 1390 945
TEV: 3595

6 Brookwood Pkwy & Meek Rd
45 1190 25 75 110 2310
TEV: 3755

7 Eastbound On-Ramp Meter
950

AM Peak Period

8 EB US26 Diverge
2225 360

9 EB US26 Merge
2225 540

10 WB US26 Diverge
1895 2035

11 WB US26 to N/A
Intersection Proposed in Build Scenarios Only

12 WB US26 Merge
90 2035

PM Peak Period

8 EB US26 Diverge
2845 100

9 EB US26 Merge
2845 950

10 WB US26 Diverge
800 2855

11 WB US26 to N/A
Intersection Proposed in Build Scenarios Only

12 WB US26 Merge
425 2855

DAVID EVANS AND ASSOCIATES INC.

Legend

TEV: Total Entering Volume

Peak Hour Volume

→ Turning Movement

FIGURE 9

Year 2035 Turning Movement Volumes
No Build Configurations

JTA Brookwood Interchange Analysis

AM Peak Period

Helvetia Rd @ Schaff Rd
1
410 ↓ 45 ↳
10 ↰
45 ↱
165 ↑ 205 ↱
TEV: 880

Helvetia Rd @ Jacobson Rd
2
440 ↓ 15 ↳
5 ↰
155 ↱
365 ↑ 275 ↱
TEV: 1255

Helvetia Rd @ WB On-Ramp
3
30 ↰ 565 ↓
60 ↰ 640 ↑
1795 ↳
TEV: 3090

Helvetia Rd @ WB Off-Ramp
4
2360 ↓
100 ↰
600 ↑
TEV: 3060

Brookwood Pkwy @ EB Ramps
5
2325 ↓ 35 ↳
85 ↱
0 →
275 ↳
515 ↑ 505 ↱
TEV: 3740

Brookwood Pkwy @ Meek Rd
6
20 ↰ 2580 ↓
50 ↱
80 ↳
35 ↰ 970 ↑
TEV: 3735

Eastbound On-Ramp Meter
7
540 →

PM Peak Period

Helvetia Rd @ Schaff Rd
1
270 ↓ 0 ↳
0 ↰
30 ↱
470 ↑ 210 ↱
TEV: 980

Helvetia Rd @ Jacobson Rd
2
290 ↓ 10 ↳
10 ↰
275 ↱
670 ↑ 520 ↱
TEV: 1775

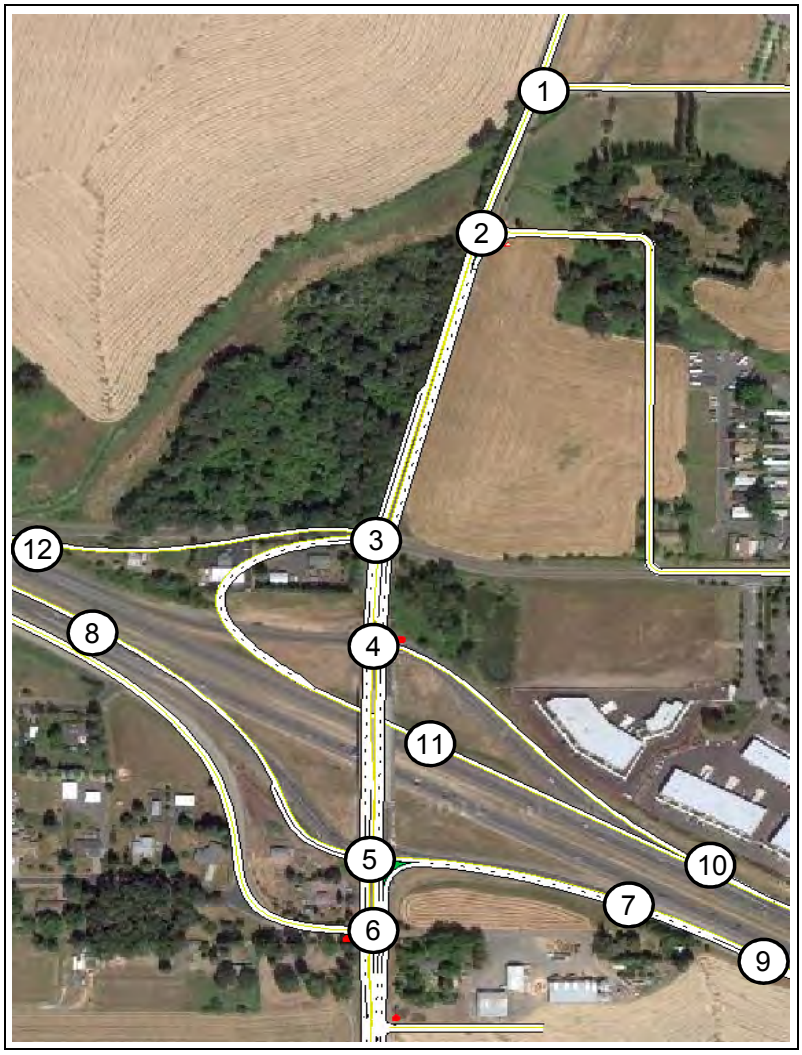
Helvetia Rd @ WB On-Ramp
3
135 ↰ 430 ↓
290 ↰ 1190 ↑
730 ↳
TEV: 2775

Helvetia Rd @ WB Off-Ramp
4
1160 ↓
70 ↰
1410 ↑
TEV: 2640

Brookwood Pkwy @ EB Ramps
5
1155 ↓ 5 ↳
20 ↱
0 →
80 ↳
1390 ↑ 945 ↱
TEV: 3595

Brookwood Pkwy @ Meek Rd
6
45 ↰ 1190 ↓
25 ↱
75 ↳
110 ↰ 2310 ↑
TEV: 3755

Eastbound On-Ramp Meter
7
950 →



AM Peak Period

EB US26 Diverge
8
2225 →
360 ⇄

EB US26 Merge
9
2225 →
540 ⇄

WB Off-Ramp Diverge to NB
10
100 ↰
3830 ←

WB Off-Ramp Diverge to SB
11
1795 ↰
2035 ←

WB US26 Merge
12
90 ↱
2035 ←

PM Peak Period

EB US26 Diverge
8
2845 →
100 ⇄

EB US26 Merge
9
2845 →
950 ⇄

WB Off-Ramp Diverge to NB
10
70 ↰
3585 ←

WB Off-Ramp Diverge to SB
11
730 ↰
2855 ←

WB US26 Merge
12
425 ↱
2855 ←

DAVID EVANS AND ASSOCIATES INC.

Legend

TEV:	Total Entering Volume
###	Peak Hour Volume
→	Turning Movement

FIGURE 10

Year 2035 Turning Movement Volumes
Build Configurations

JTA Brookwood Interchange Analysis

Printed: 1/12/2012

AM Peak Period

1 Helvetia Rd & Schaff Rd
365 5 5 175 10
TEV: 565

2 Helvetia Rd @ N/A
Intersection Proposed in Build Scenarios Only

3 Helvetia Rd & Jacobson Rd
0 360 10 5 0 135 0 0 0 0 180 235
TEV: 925

4 Helvetia Rd & WB Ramps
25 470 0 45 0 1335 35 375
TEV: 2285

5 Brookwood Pkwy & EB Ramps
1765 40 65 0 190 345 470
TEV: 2875

6 Brookwood Pkwy & Meek Rd
5 1950 0 0 0 0 20 5 25 10 795 5
TEV: 2815

7 Eastbound On-Ramp Meter
510

PM Peak Period

1 Helvetia Rd & Schaff Rd
150 0 0 5 480 5
TEV: 640

2 Helvetia Rd @ N/A
Intersection Proposed in Build Scenarios Only

3 Helvetia Rd & Jacobson Rd
0 150 5 5 0 195 0 0 0 0 480 470
TEV: 1305

4 Helvetia Rd & WB Ramps
85 260 55 0 640 205 895
TEV: 2140

5 Brookwood Pkwy & EB Ramps
890 10 50 0 65 1050 805
TEV: 2870

6 Brookwood Pkwy & Meek Rd
20 935 5 20 40 1850
TEV: 2870

7 Eastbound On-Ramp Meter
815

AM Peak Period

8 EB US26 Diverge
1775 255

9 EB US26 Merge
1775 510

10 WB US26 Diverge
1380 1125

11 WB US26 to N/A
Intersection Proposed in Build Scenarios Only

12 WB US26 Merge
60 1125

PM Peak Period

8 EB US26 Diverge
1675 115

9 EB US26 Merge
1675 815

10 WB US26 Diverge
695 1945

11 WB US26 to N/A
Intersection Proposed in Build Scenarios Only

12 WB US26 Merge
290 1945

DAVID EVANS AND ASSOCIATES INC.

Legend

TEV: Total Entering Volume

Peak Hour Volume

→ Turning Movement

FIGURE 11

Year 2015 Turning Movement Volumes
No Build Configurations

JTA Brookwood Interchange Analysis

AM Peak Period

Helvetia Rd @ Schaff Rd
1
365 5
5 5
175 10
TEV: 565

Helvetia Rd @ Jacobson Rd
2
360 10
5 135
180 240
TEV: 930

Helvetia Rd @ WB On-Ramp
3
25 470
35 420
1335
TEV: 2285

Helvetia Rd @ WB Off-Ramp
4
1805
45
410
TEV: 2260

Brookwood @ EB Ramps
5
1765 40
65 0 190
345 470
TEV: 2875

Brookwood @ Meek Rd
6
5 1950
20 25
10 795
TEV: 2805

Eastbound On-Ramp Meter
7
510

PM Peak Period

Helvetia Rd @ Schaff Rd
1
150 0
0 5
480 5
TEV: 640

Helvetia Rd @ Jacobson Rd
2
150 5
5 195
480 470
TEV: 1305

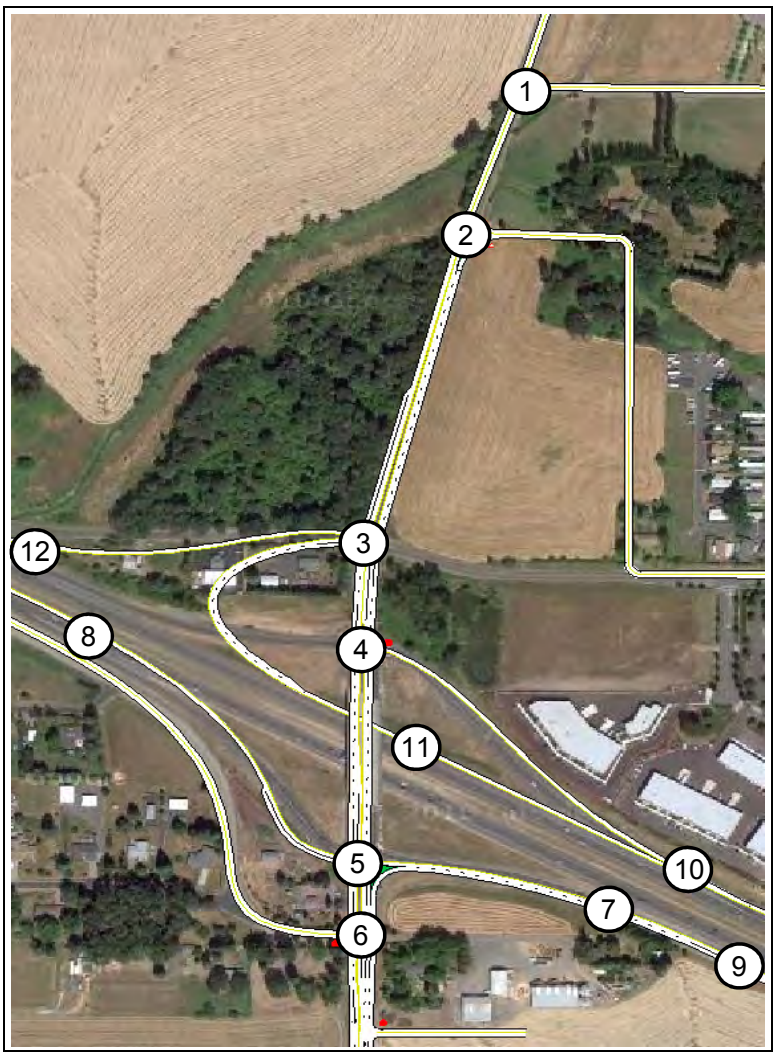
Helvetia Rd @ WB On-Ramp
3
85 260
205 950
640
TEV: 2140

Helvetia Rd @ WB Off-Ramp
4
900
55
1100
TEV: 2055

Brookwood @ EB Ramps
5
890 10
50 0 65
1050 805
TEV: 2870

Brookwood @ Meek Rd
6
20 935
5 20
40 1850
TEV: 2870

Eastbound On-Ramp Meter
7
815



AM Peak Period

EB US26 Diverge
8
1775
255

EB US26 Merge
9
1775
510

WB Off-Ramp Diverge to NB
10
45
2460

WB Off-Ramp Diverge to SB
11
1335
1125

WB US26 Merge
12
60
1125

PM Peak Period

EB US26 Diverge
8
1675
115

EB US26 Merge
9
1675
815

WB Off-Ramp Diverge to NB
10
55
2590

WB Off-Ramp Diverge to SB
11
640
1945

WB US26 Merge
12
290
1945

DAVID EVANS AND ASSOCIATES INC.

Legend

TEV:	Total Entering Volume
###	Peak Hour Volume
→	Turning Movement

FIGURE 12

Year 2015 Turning Movement Volumes
Build Configurations

JTA Brookwood Interchange Analysis

Printed: 1/12/2012

AM Peak Period

Helvetia Rd @ Schaff Rd
1
385 20 5 20 210 45
TEV: 685

Helvetia Rd @ Jacobson Rd
2
390 15 5 165 250 265
TEV: 1090

Helvetia Rd @ WB On-Ramp
3
30 525 45 515 1550
TEV: 2665

Helvetia Rd @ WB Off-Ramp
4
2075 65 495
TEV: 2635

Brookwood @ EB Ramps
5
2040 35 75 0 230 420 490
TEV: 3290

Brookwood @ Meek Rd
6
10 2260 30 45 20 880
TEV: 3245

Eastbound On-Ramp Meter
7
525

PM Peak Period

Helvetia Rd @ Schaff Rd
1
210 0 0 5 550 25
TEV: 790

Helvetia Rd @ Jacobson Rd
2
210 5 5 230 570 495
TEV: 1515

Helvetia Rd @ WB On-Ramp
3
105 335 245 1065 685
TEV: 2435

Helvetia Rd @ WB Off-Ramp
4
1020 65 1245
TEV: 2330

Brookwood @ EB Ramps
5
1010 10 30 0 70 1215 870
TEV: 3205

Brookwood @ Meek Rd
6
30 1050 15 40 70 2070
TEV: 3275

Eastbound On-Ramp Meter
7
880

AM Peak Period

EB US26 Diverge
8
1985
305

EB US26 Merge
9
1985
525

WB Off-Ramp Diverge to NB
10
65
3065

WB Off-Ramp Diverge to SB
11
1550
1515

WB US26 Merge
12
75
1515

PM Peak Period

EB US26 Diverge
8
2180
100

EB US26 Merge
9
2180
880

WB Off-Ramp Diverge to NB
10
65
3040

WB Off-Ramp Diverge to SB
11
685
2355

WB US26 Merge
12
350
2355

DAVID EVANS AND ASSOCIATES INC.

Legend

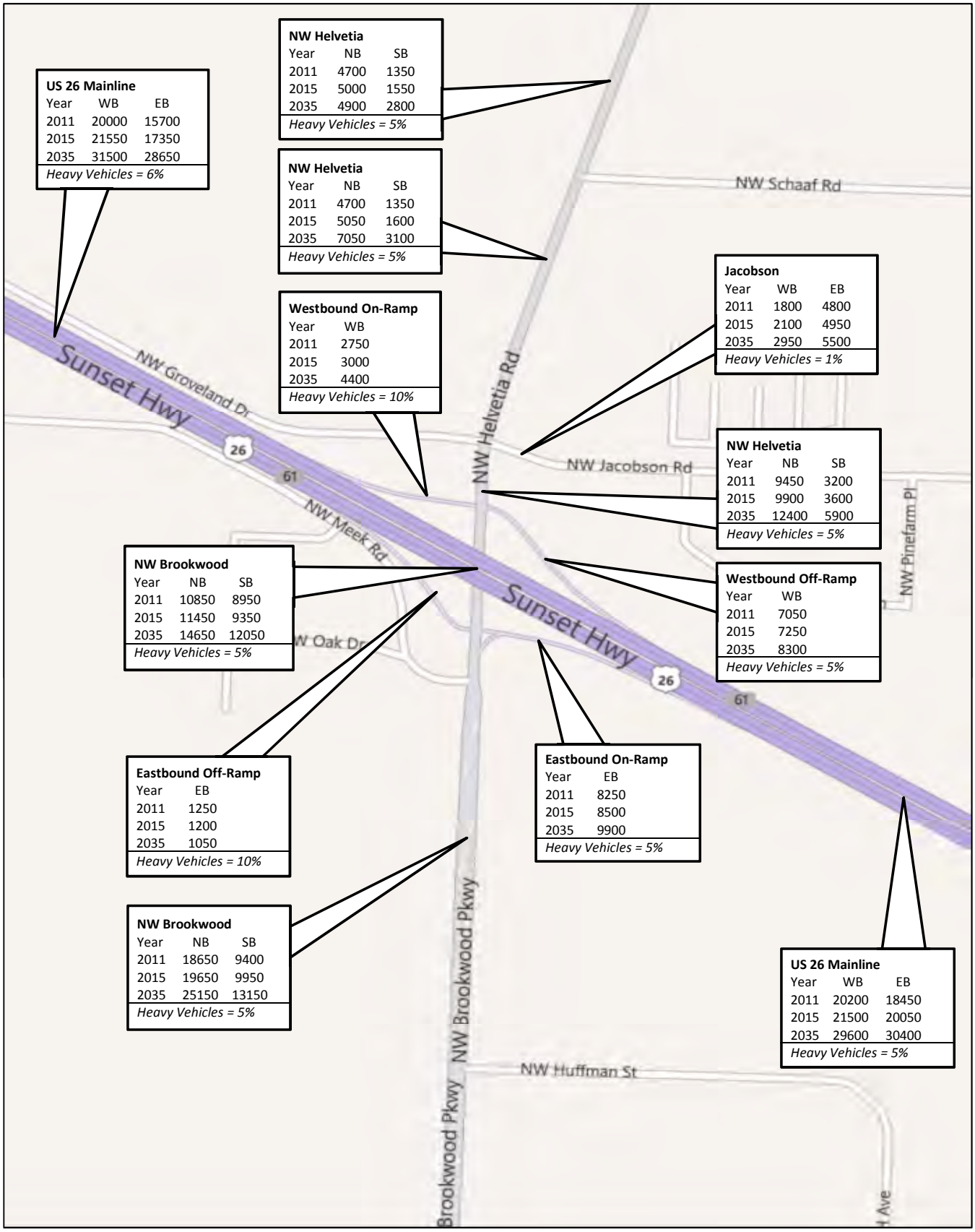
TEV:	Total Entering Volume
###	Peak Hour Volume
→	Turning Movement

FIGURE 13

Year 2025 Turning Movement Volumes
Build Configurations

JTA Brookwood Interchange Analysis

Printed: 1/12/2012



DAVID EVANS AND ASSOCIATES INC.

Legend

NOTE: Heavy vehicle percentages are bi-directional and are assumed to remain constant into future years.

FIGURE 14

Average Daily Traffic
Vehicle Volumes and Heavy Vehicle Percentages

JTA Brookwood Interchange Analysis

Printed: 12/8/2011

AM Peak Period

1 Helvetia Rd @ Schaff Rd
0.01 (0)
0.03 (3)
0.14 (--)

2 Helvetia Rd @ N/A
Intersection Proposed in Build Scenarios Only

3 Helvetia Rd @ Jacobson Rd
0.01 (--)
0.40 (14)
0.01 (11)
0.01 (--)

4 Helvetia Rd & WB Ramps
0.61 (26)
0.04 (25)
0.74 (24)
0.73 (24)
0.43 (53)
0.52 (20)
Overall V/C: 0.68 (25)

5 Brookwood Pkwy @ EB Ramps
0.65 (5)
0.08 (23)
0.30 (66)
0.87 (34)
0.43 (13)
0.33 (3)
Overall V/C: 0.68 (9)

6 Brookwood Pkwy @ Meek Rd
0.60 (--)
0 (0)
1.65 (160)
0.04 (20)
0.33 (--)
0.17 (--)

7 EB On-Ramp Meter
0.63 (71)

PM Peak Period

1 Helvetia Rd @ Schaff Rd
0.00 (0)
0.00 (0)
0.28 (--)

2 Helvetia Rd @ N/A
Intersection Proposed in Build Scenarios Only

3 Helvetia Rd @ Jacobson Rd
0.01 (--)
0.45 (34)
0.02 (2)
0.01 (--)

4 Helvetia Rd & WB Ramps
0.21 (12)
0.10 (66)
0.75 (64)
0.75 (64)
0.54 (41)
0.83 (31)
Overall V/C: 0.81 (40)

5 Brookwood Pkwy @ EB Ramps
0.31 (4)
0.47 (33)
0.44 (52)
0.04 (12)
0.78 (7)
0.51 (4)
Overall V/C: 0.75 (6)

6 Brookwood Pkwy @ Meek Rd
0.29 (--)
0 (0)
0.16 (>200)
0.05 (14)
0.73 (--)
0.37 (--)

7 EB On-Ramp Meter
0.99 (99)

AM Peak Period

8 EB US26 Diverge
0.11 (--)

9 EB US26 Merge
0.55 (--)

10 WB US26 Diverge
0.81 (--)

11 WB US26 to N/A
Intersection Proposed in Build Scenarios Only

12 WB US26 Merge
0.26 (--)

PM Peak Period

8 EB US26 Diverge
0.068 (--)

9 EB US26 Merge
0.54 (--)

10 WB US26 Diverge
0.40 (--)

11 WB US26 to N/A
Intersection Proposed in Build Scenarios Only

12 WB US26 Merge
0.49 (--)

DAVID EVANS AND ASSOCIATES INC.

Legend

→ Turning Movement

#.## (##) Lane Group V/C Ratio (Lane Group Delay in Seconds)

Note: (--) Delay is not a HCM output for Merge or Diverge areas, or uncontrolled approaches to intersections.

Source: V/C ratio from Synchro and Delay values from SimTraffic

FIGURE 15

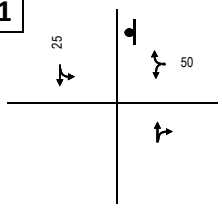
Existing (2011)
Volume to Capacity Ratios (V/C)
and Delay

JTA Brookwood Interchange Analysis

Printed: 1/12/2012

AM Peak Period

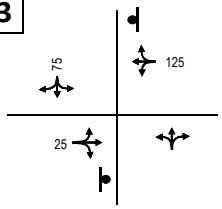
Helvetia Rd @ Schaff Rd
1



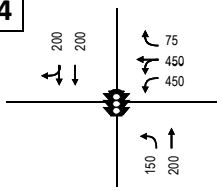
Helvetia Rd @ N/A
2

Intersection Proposed in Build Scenarios Only

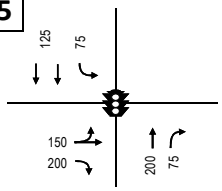
Helvetia Rd @ Jacobson Rd
3



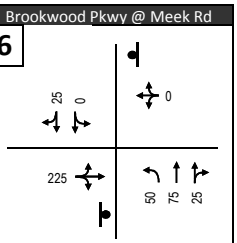
Helvetia Rd & WB Ramps
4



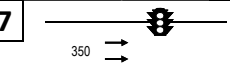
Brookwood Pkwy @ EB Ramps
5



Brookwood Pkwy @ Meek Rd
6

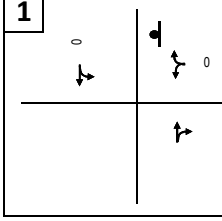


EB On-Ramp Meter
7



PM Peak Period

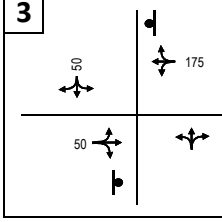
Helvetia Rd @ Schaff Rd
1



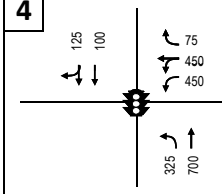
Helvetia Rd @ N/A
2

Intersection Proposed in Build Scenarios Only

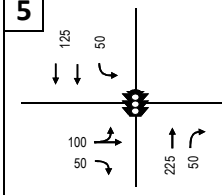
Helvetia Rd @ Jacobson Rd
3



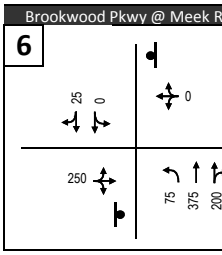
Helvetia Rd & WB Ramps
4



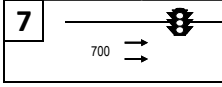
Brookwood Pkwy @ EB Ramps
5

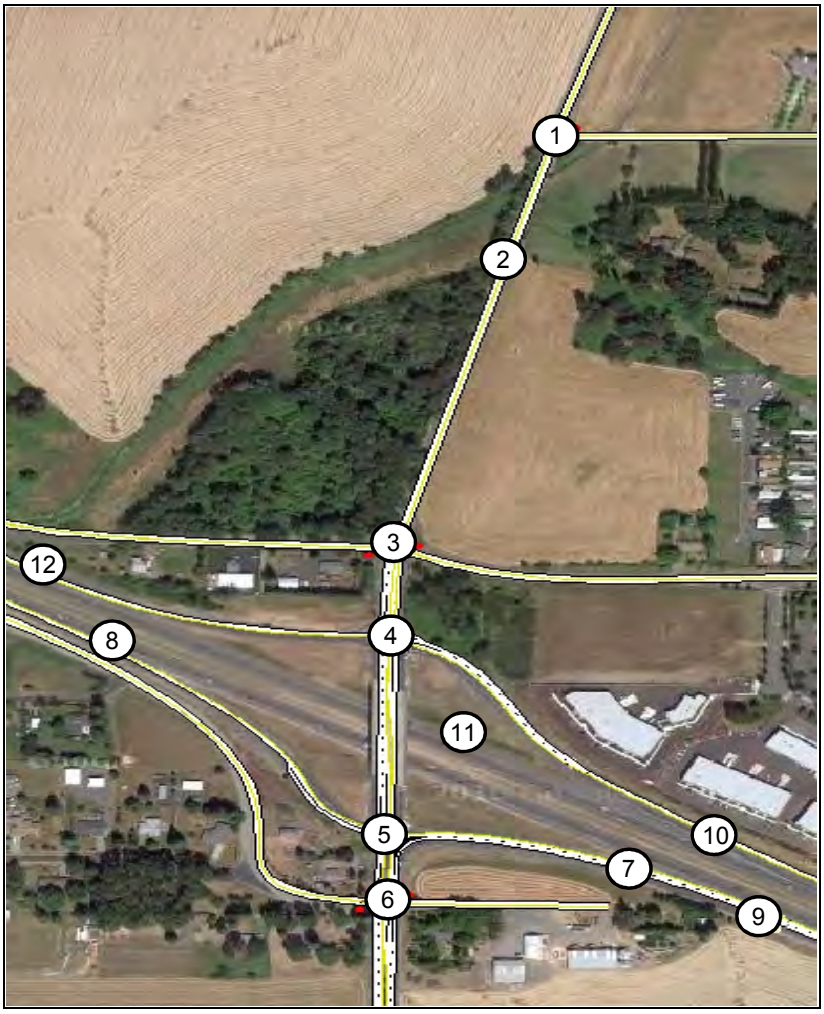


Brookwood Pkwy @ Meek Rd
6



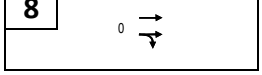
EB On-Ramp Meter
7



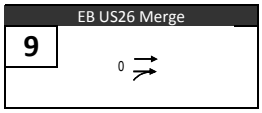


AM Peak Period

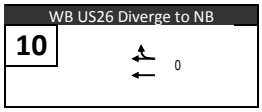
EB US26 Diverge
8



EB US26 Merge
9



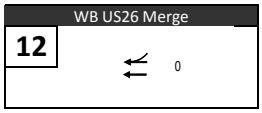
WB US26 Diverge to NB
10



WB US26 Diverge to SB
11

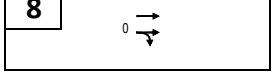
Intersection Proposed in Build Scenarios Only

WB US26 Merge
12

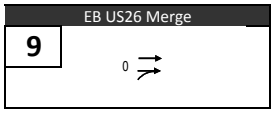


PM Peak Period

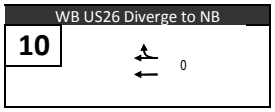
EB US26 Diverge
8



EB US26 Merge
9



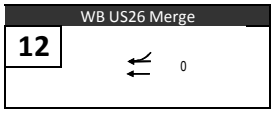
WB US26 Diverge to NB
10



WB US26 Diverge to SB
11

Intersection Proposed in Build Scenarios Only

WB US26 Merge
12



DAVID EVANS AND ASSOCIATES INC.

Legend

→ Turning Movement

95% Queue Length (Feet)

Source: SimTraffic

FIGURE 16

Existing (2011) Queue Length

JTA Brookwood Interchange Analysis

Printed: 1/12/2012

AM Peak Period

Helvetia Rd @ Schaff Rd
1
0.01 (0)
0.04 (3)
0.17 (--)

Helvetia Rd @ N/A
2
Intersection Proposed in Build Scenarios Only

Helvetia Rd @ Jacobson Rd
3
0.01 (--)
0.37 (12)
0.00 (0)
0.01 (--)

Helvetia Rd & WB Ramps
4
0.33 (21)
0.07 (41)
1.18 (41)
1.18 (41)
0.39 (40)
0.40 (25)
Overall V/C: 0.71 (34)

Helvetia Rd @ EB Ramps
5
0.79 (5)
0.30 (48)
0.18 (73)
0.62 (57)
0.37 (4)
0.33 (3)
Overall V/C: 0.75 (10)

Helvetia Rd @ Meek Rd
6
0.64 (0)
0.00 (0)
>2.00 (>200)
0.05 (21)
0.35 (0)

EB On-Ramp Meter
7
0.64 (5)

PM Peak Period

Helvetia Rd @ Schaff Rd
1
0.00 (0)
0.01 (5)
0.31 (--)

Helvetia Rd @ N/A
2
Intersection Proposed in Build Scenarios Only

Helvetia Rd @ Jacobson Rd
3
0.01 (--)
0.51 (69)
0.00 (0)
0.00 (--)

Helvetia Rd & WB Ramps
4
0.24 (11)
0.10 (66)
0.81 (61)
0.81 (61)
0.56 (50)
0.85 (36)
Overall V/C: 0.84 (42)

Helvetia Rd @ EB Ramps
5
0.33 (3)
0.32 (36)
0.38 (50)
0.04 (12)
0.82 (10)
0.52 (6)
Overall V/C: 0.79 (8)

Helvetia Rd @ Meek Rd
6
0.31 (1)
0.00 (0)
0.20 (>200)
0.06 (37)
0.77 (0)

EB On-Ramp Meter
7
1.02 (175)

AM Peak Period

EB US26 Diverge
8
0.11 (--)

EB US26 Merge
9
0.53 (--)

WB US26 Diverge
10
0.74 (--)

WB US26 to N/A
11
Intersection Proposed in Build Scenarios Only

WB US26 Merge
12
0.28 (--)

PM Peak Period

EB US26 Diverge
8
0.07 (--)

EB US26 Merge
9
0.57 (--)

WB US26 Diverge
10
0.40 (--)

WB US26 to N/A
11
Intersection Proposed in Build Scenarios Only

WB US26 Merge
12
0.52 (--)

DAVID EVANS AND ASSOCIATES INC.

Legend

→ Turning Movement

#.## (##) Lane Group V/C Ratio (Lane Group Delay in Seconds)

Note: (--) Delay is not a HCM output for Merge or Diverge areas, or uncontrolled approaches to intersections.

Source: V/C ratio from Synchro and Delay values from SimTraffic

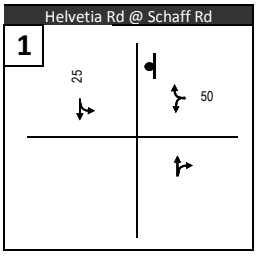
FIGURE 17

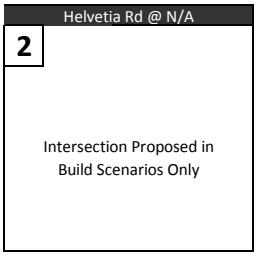
No-Build (2015)
Volume to Capacity Ratios (V/C)
and Delay

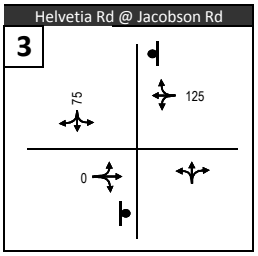
JTA Brookwood Interchange Analysis

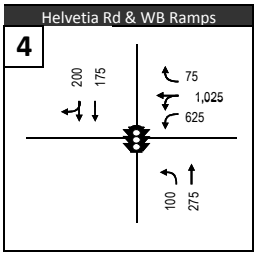
Printed: 1/12/2012

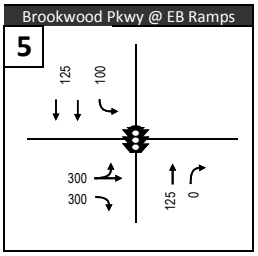
AM Peak Period

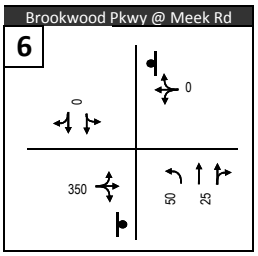


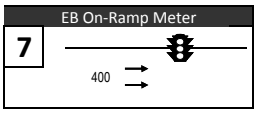




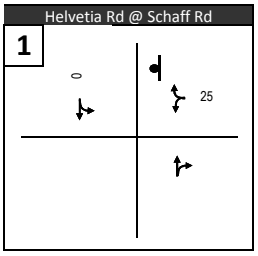


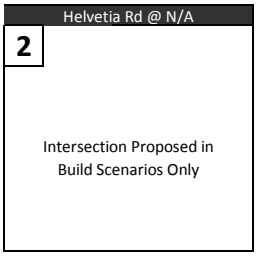


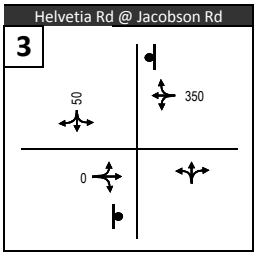


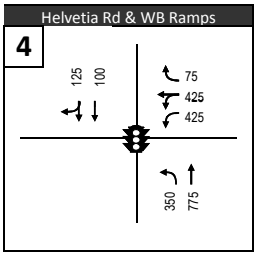


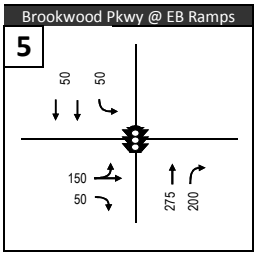
PM Peak Period

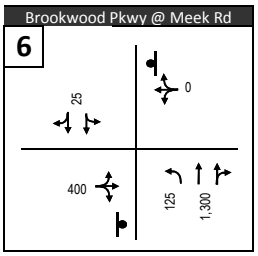


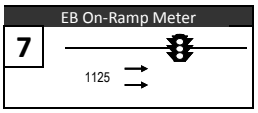


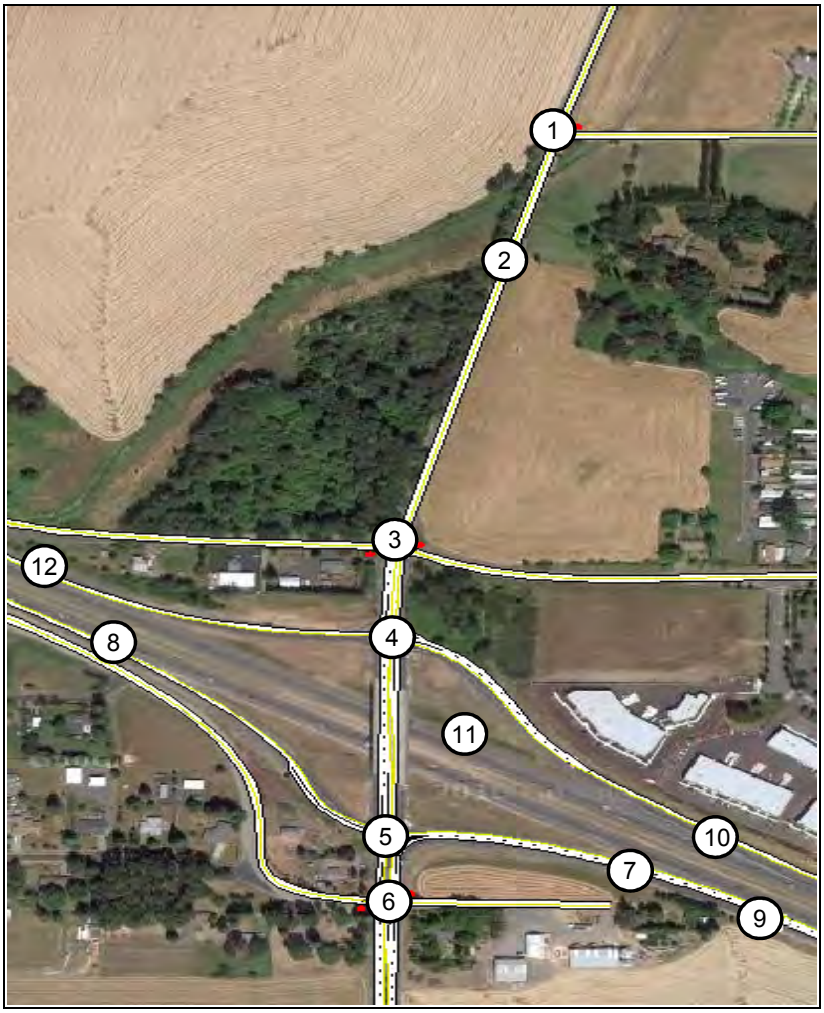




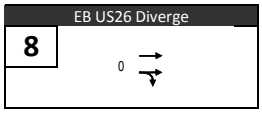


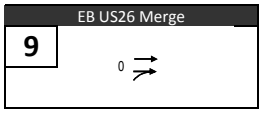


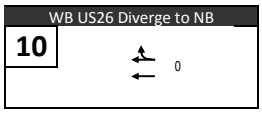


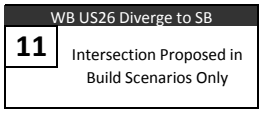


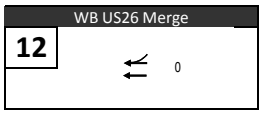
AM Peak Period



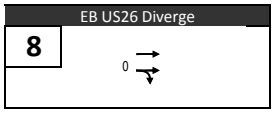


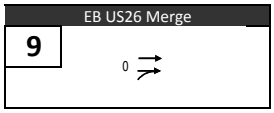


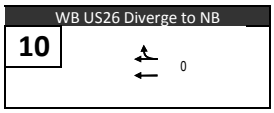


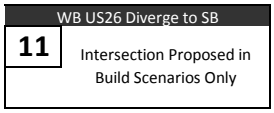


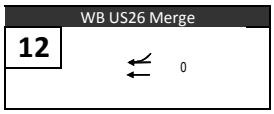
PM Peak Period











DAVID EVANS AND ASSOCIATES INC.

Legend

→ Turning Movement

95% Queue Length (Feet)

Source: SimTraffic

FIGURE 18

No-Build (2015)
Queue Length

JTA Brookwood Interchange Analysis

Printed: 1/12/2012

AM Peak Period

Helvetia Rd @ Schaff Rd
1
0.00 (1)
0.02 (5)
0.12 (--)

Helvetia Rd @ Jacobson Rd
2
0.01 (1)
0.34 (10)
0.12 (0)
0.16 (0)

Helvetia Rd @ WB On-Ramp
3
0.65 (20)
0.63 (8)
0.04 (27)
0.14 (13)
Overall V/C: 0.64 (12)

Helvetia @ WB to NB Off-Ramp
4
0.54 (--)
0.06 (5)
0.12 (--)

Brookwood Pkwy @ EB Ramps
5
0.69 (6)
0.38 (63)
0.55 (107)
0.57 (45)
0.16 (3)
0.34 (3)
Overall V/C: 0.68 (11)

Brookwood Pkwy @ Meek Rd
6
0.59 (1)
0.87 (97)
0.03 (30)
0.19 (0)

EB On-Ramp Meter
7
0.64 (15)

PM Peak Period

Helvetia Rd @ Schaff Rd
1
0.00 (0)
0.01 (7)
0.31 (--)

Helvetia Rd @ Jacobson Rd
2
0.01 (1)
0.56 (15)
0.31 (0)
0.31 (0)

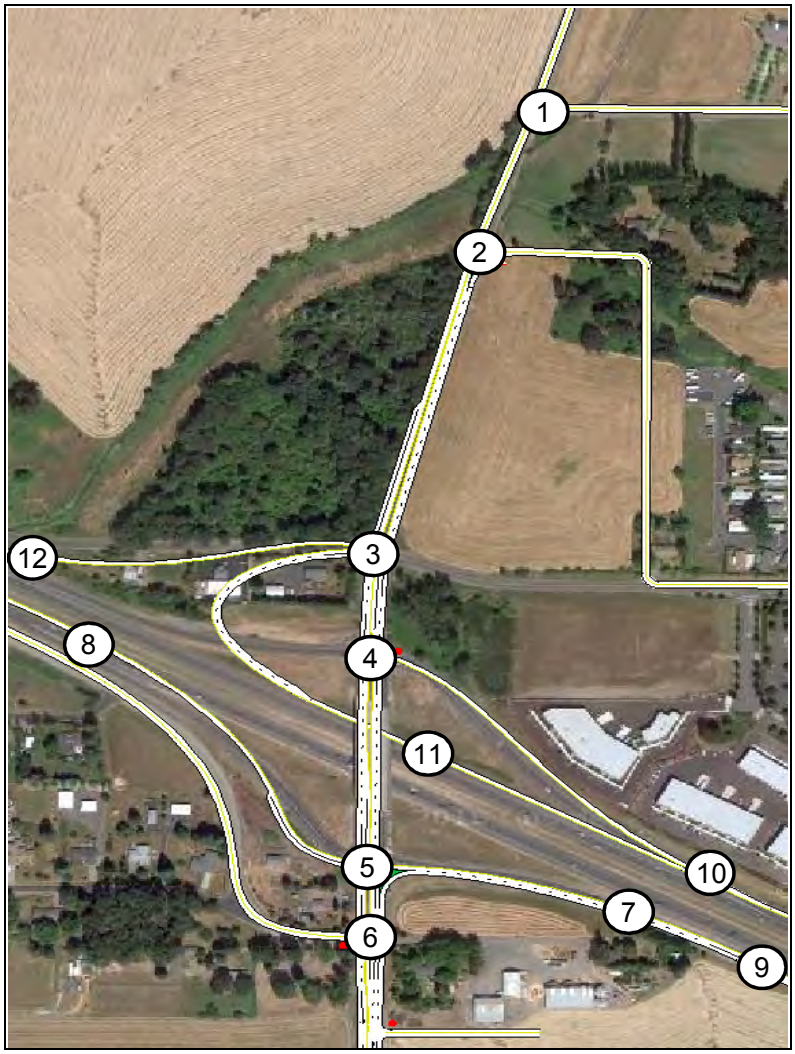
Helvetia Rd @ WB On-Ramp
3
0.27 (15)
0.23 (4)
0.25 (19)
0.33 (7)
Overall V/C: 0.32 (8)

Helvetia @ WB to NB Off-Ramp
4
0.28 (--)
0.10 (11)
0.35 (--)

Brookwood Pkwy @ EB Ramps
5
0.33 (2)
0.24 (48)
0.37 (56)
0.04 (9)
0.41 (2)
0.57 (5)
Overall V/C: 0.55 (4)

Brookwood Pkwy @ Meek Rd
6
0.31 (1)
0.13 (26)
0.06 (7)
0.46 (0)

EB On-Ramp Meter
7
1.02 (197)



AM Peak Period

EB Off-Ramp Diverge
8
0.11 (--)

EB On-Ramp Merge
9
0.53 (--)

WB Off-Ramp Diverge to NB
10
0.02 (--)

WB Off-Ramp Diverge to SB
11
0.72 (--)

WB On-Ramp Merge
12
0.28 (--)

PM Peak Period

EB Off-Ramp Diverge
8
0.07 (--)

EB On-Ramp Merge
9
0.57 (--)

WB Off-Ramp Diverge to NB
10
0.03 (--)

WB Off-Ramp Diverge to SB
11
0.34 (--)

WB On-Ramp Merge
12
0.52 (--)

DAVID EVANS AND ASSOCIATES INC.

Legend

→ Turning Movement

#.## (##) Lane Group V/C Ratio (Lane Group Delay in Seconds)

Note: (--) Delay is not a HCM output for Merge or Diverge areas, or uncontrolled approaches to intersections.

Source: V/C ratio from Synchro and Delay values from SimTraffic

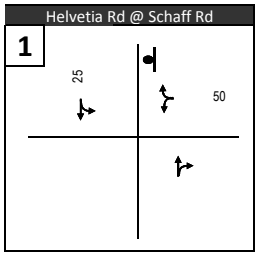
FIGURE 19

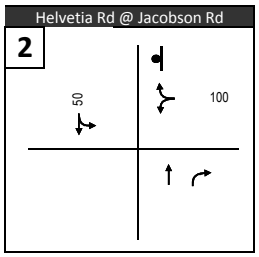
Phase 1 (2015)
Volume to Capacity Ratios (V/C)
and Delay

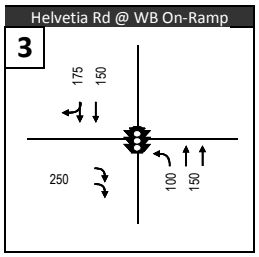
JTA Brookwood Interchange Analysis

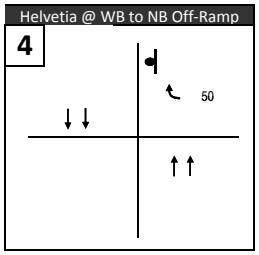
Printed: 1/12/2012

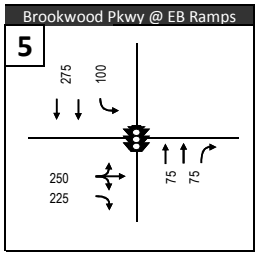
AM Peak Period

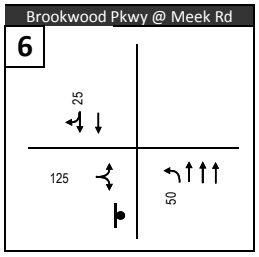


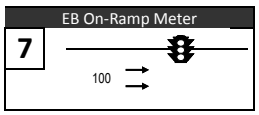




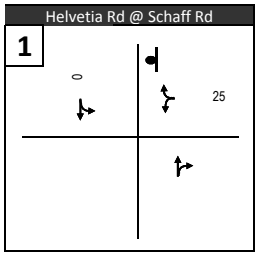


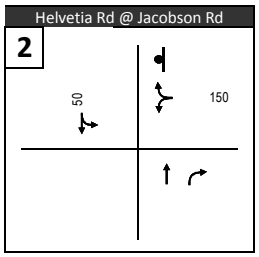


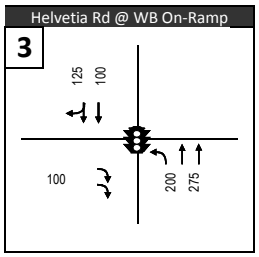


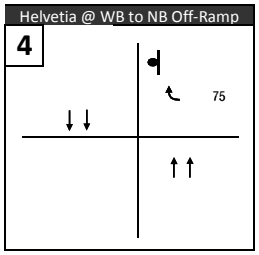


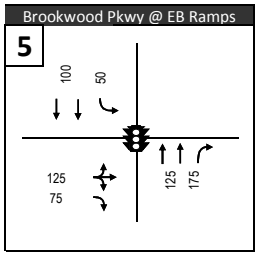
PM Peak Period

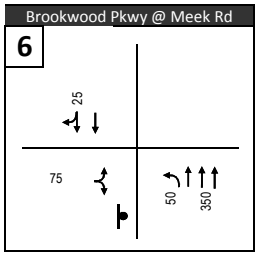


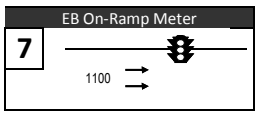


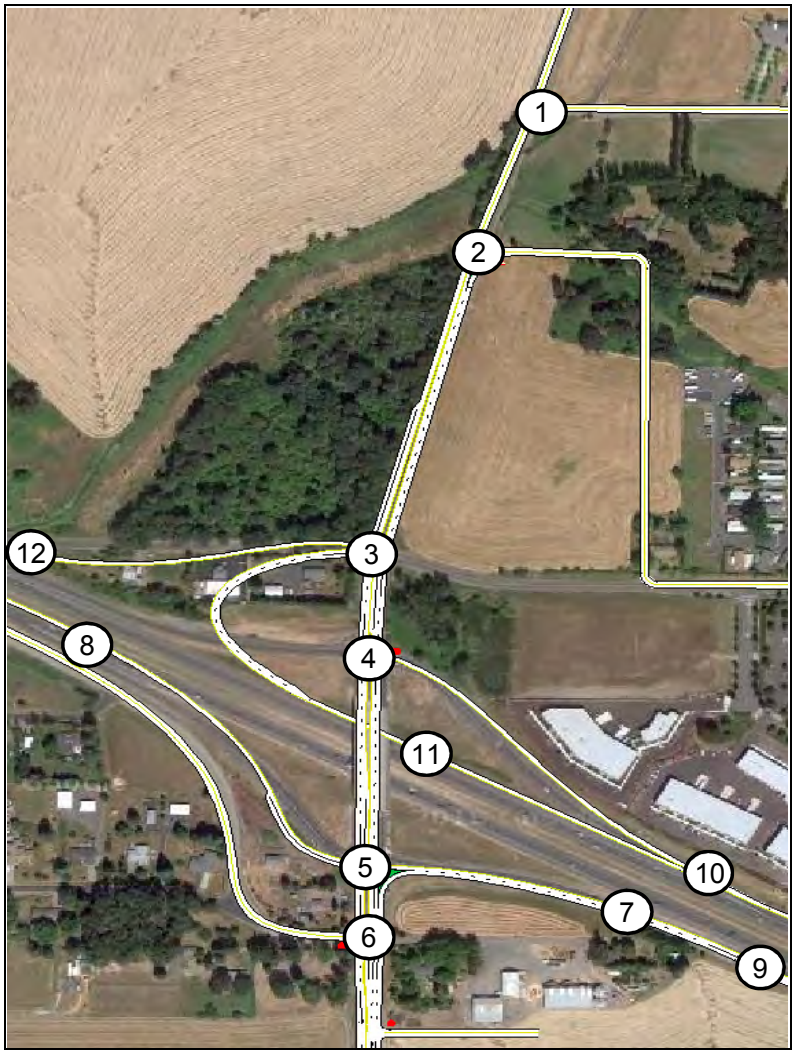




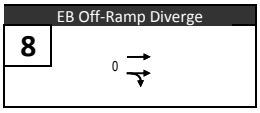


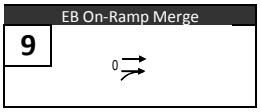


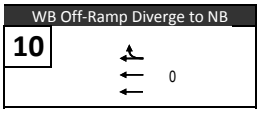


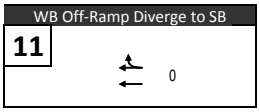


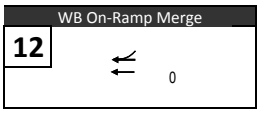
AM Peak Period



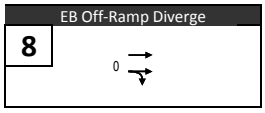


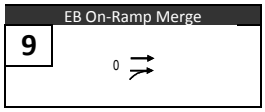


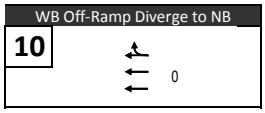


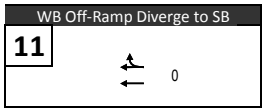


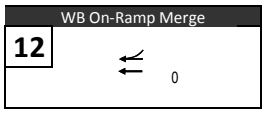
PM Peak Period











DAVID EVANS AND ASSOCIATES INC.

Legend

→ Turning Movement

95% Queue Length (Feet)

Source: SimTraffic

FIGURE 20

Phase 1 (2015)
Queue Length

JTA Brookwood Interchange Analysis

Printed: 1/12/2012

AM Peak Period

Helvetia Rd @ Schaff Rd
1
0.02 (1)
0.06 (7)
0.17 (--)

Helvetia Rd @ Jacobson Rd
2
0.02 (2)
0.06 (17)
0.16 (--)
0.17 (--)

Helvetia Rd @ WB On-Ramp
3
0.55 (19)
0.55 (19)
0.83 (12)
0.06 (24)
0.17 (11)
Overall V/C: 0.73 (13)

Helvetia @ WB to NB Off-Ramp
4
0.62 (--)
0.09 (9)
0.15 (--)

Brookwood Pkwy @ EB Ramps
5
0.78 (8)
0.43 (63)
0.71 (75)
0.76 (50)
0.18 (4)
0.35 (3)
Overall V/C: 0.78 (12)

Brookwood Pkwy @ Meek Rd
6
0.68 (0)
1.39 (>200)
0.06 (42)
0.21 (--)

EB On-Ramp Meter
7
0.66 (15)

PM Peak Period

Helvetia Rd @ Schaff Rd
1
0.00 (0)
0.02 (11)
0.36 (--)

Helvetia Rd @ Jacobson Rd
2
0.01 (1)
0.82 (26)
0.37 (--)
0.32 (--)

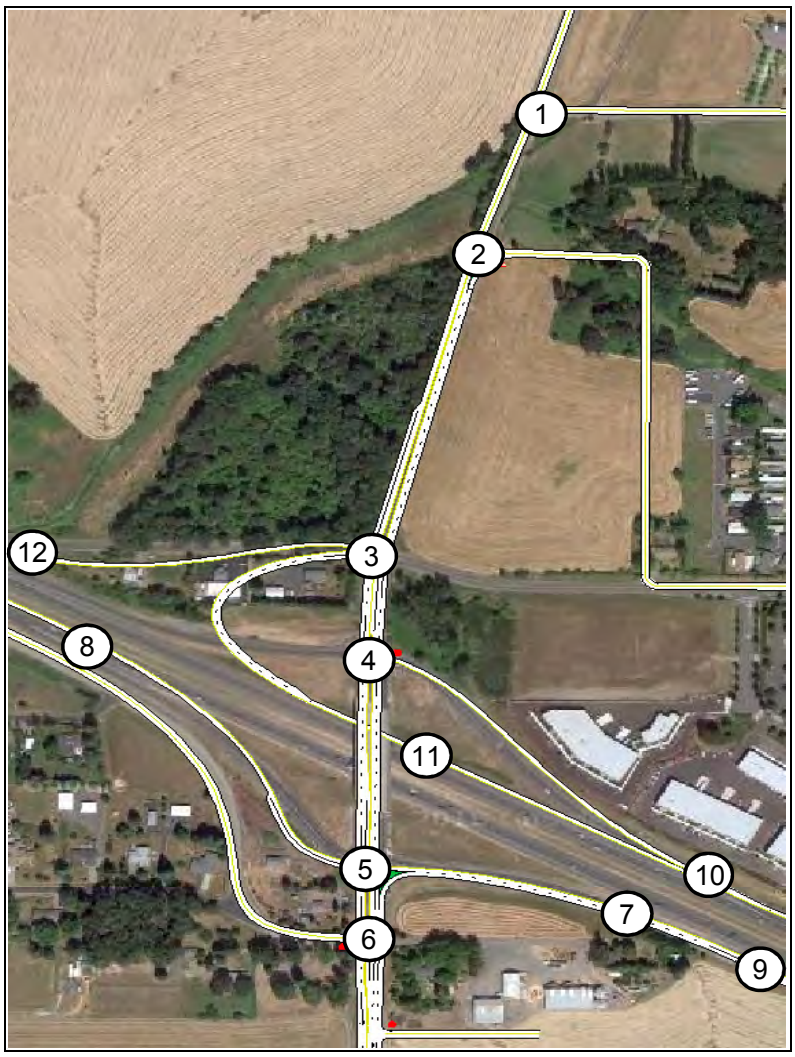
Helvetia Rd @ WB On-Ramp
3
0.31 (13)
0.31 (14)
0.25 (5)
0.32 (18)
0.37 (5)
Overall V/C: 0.36 (8)

Helvetia @ WB to NB Off-Ramp
4
0.32 (--)
0.12 (12)
0.39 (--)

Brookwood Pkwy @ EB Ramps
5
0.37 (2)
0.24 (52)
0.25 (58)
0.04 (12)
0.47 (2)
0.62 (7)
Overall V/C: 0.58 (4)

Brookwood Pkwy @ Meek Rd
6
0.35 (0)
0.55 (>200)
0.12 (9)
0.52 (--)

EB On-Ramp Meter
7
1.10 (>200)



AM Peak Period

EB Off-Ramp Diverge
8
0.16 (--)

EB On-Ramp Merge
9
0.59 (--)

WB Off-Ramp Diverge to NB
10
0.03 (--)

WB Off-Ramp Diverge to SB
11
0.83 (--)

WB On-Ramp Merge
12
0.37 (--)

PM Peak Period

EB Off-Ramp Diverge
8
0.05 (--)

EB On-Ramp Merge
9
0.69 (--)

WB Off-Ramp Diverge to NB
10
0.03 (--)

WB Off-Ramp Diverge to SB
11
0.34 (--)

WB On-Ramp Merge
12
0.62 (--)

DAVID EVANS AND ASSOCIATES INC.

Legend

→ Turning Movement

#.## (##) Lane Group V/C Ratio (Lane Group Delay in Seconds)

Note: (--) Delay is not a HCM output for Merge or Diverge areas, or uncontrolled approaches to intersections.

Source: V/C ratio from Synchro and Delay values from SimTraffic

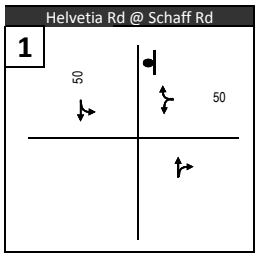
FIGURE 21

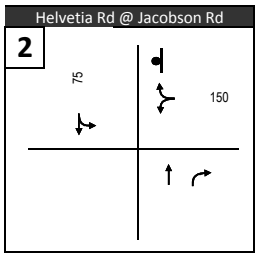
Phase 1 (2023 - 2027)
Volume to Capacity Ratios (V/C)
and Delay

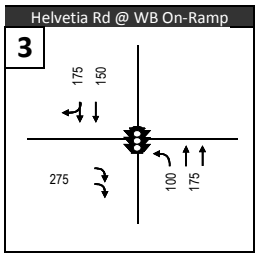
JTA Brookwood Interchange Analysis

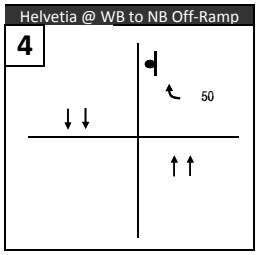
Printed: 1/12/2012

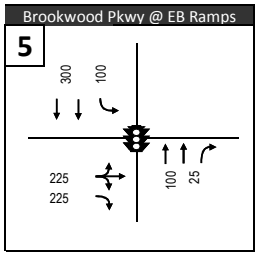
AM Peak Period

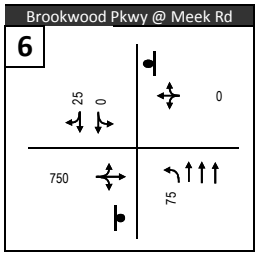


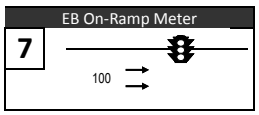




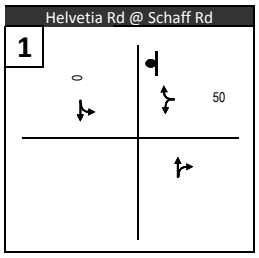


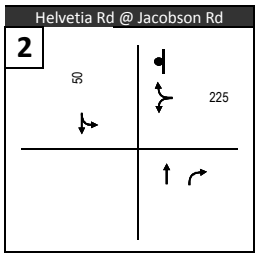


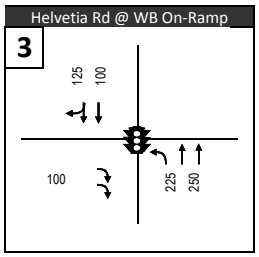


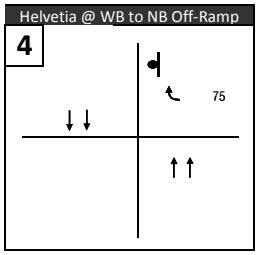


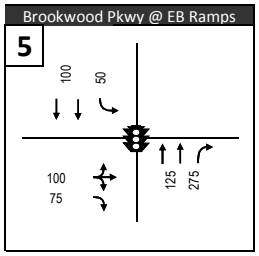
PM Peak Period

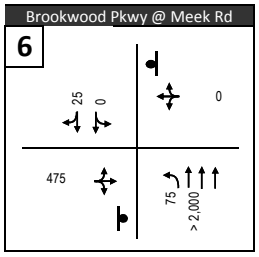


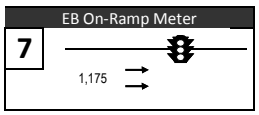


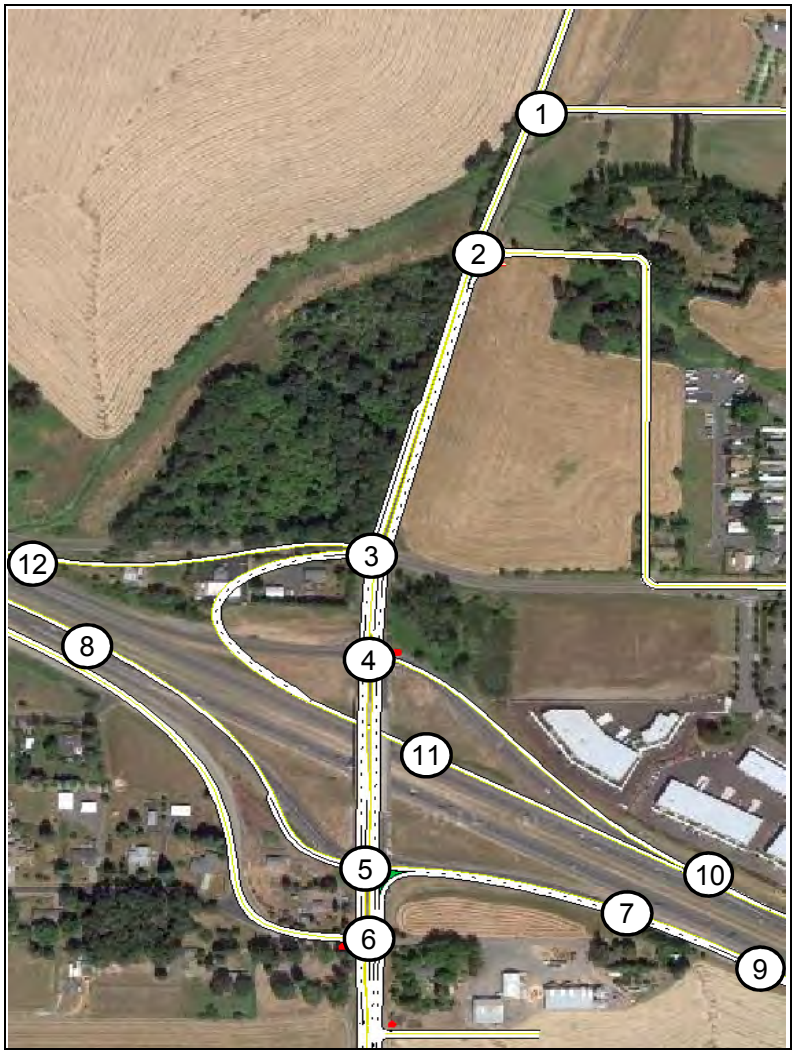




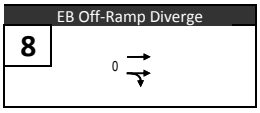


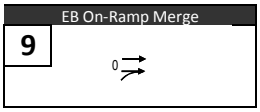


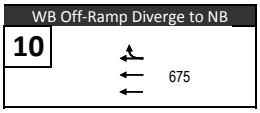


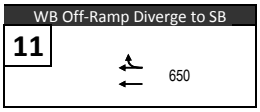


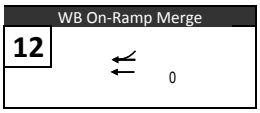
AM Peak Period



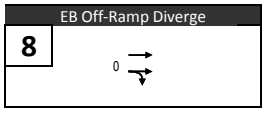


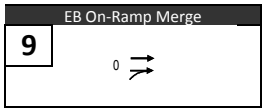


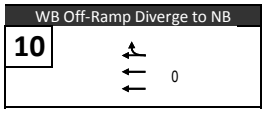


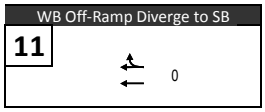


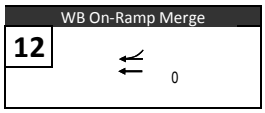
PM Peak Period











DAVID EVANS AND ASSOCIATES INC.

Legend

→ Turning Movement

95% Queue Length (Feet)

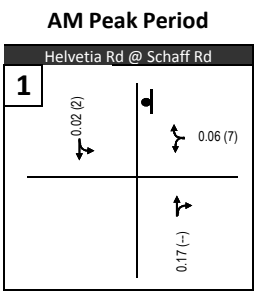
Source: SimTraffic

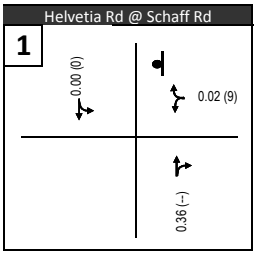
FIGURE 22

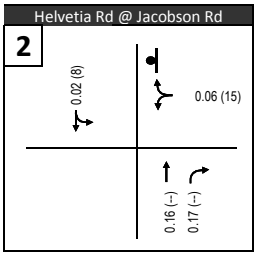
Phase 1 (2023 - 2027)
Queue Length

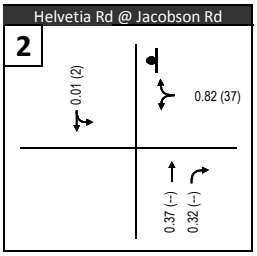
JTA Brookwood Interchange Analysis

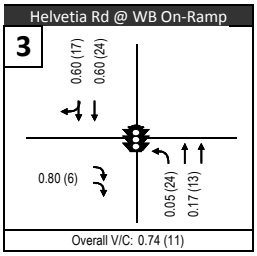
Printed: 1/12/2012

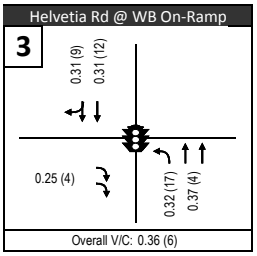


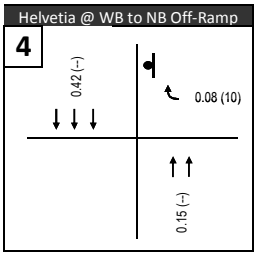


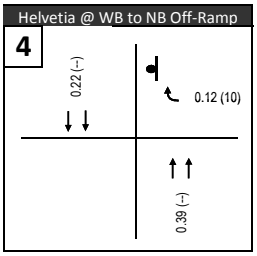


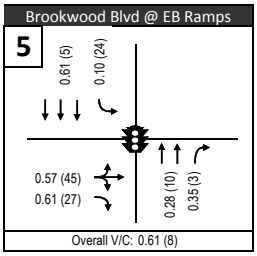


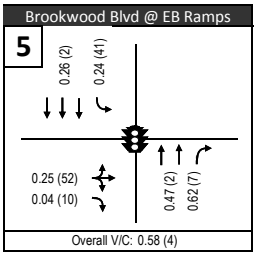


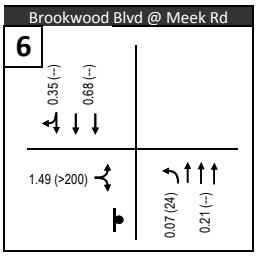


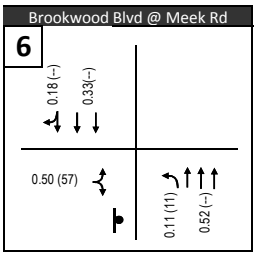


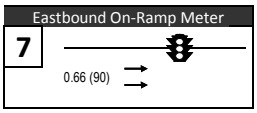


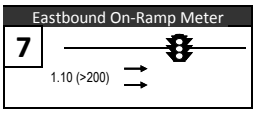


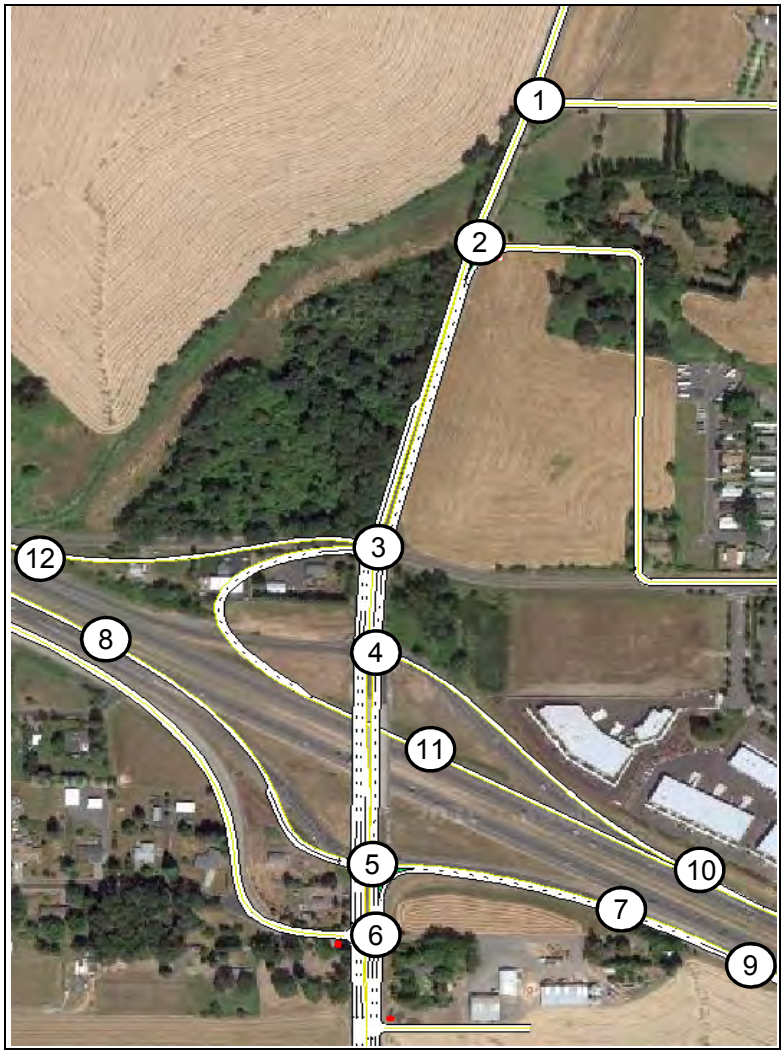


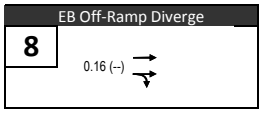


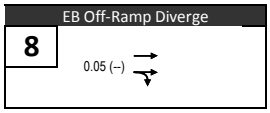


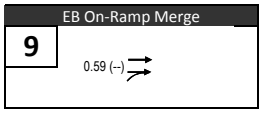


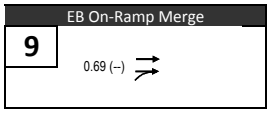


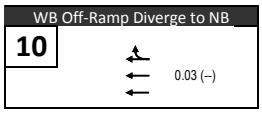


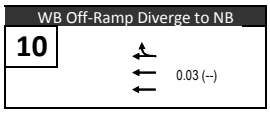


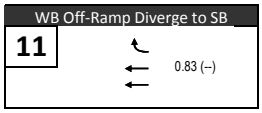


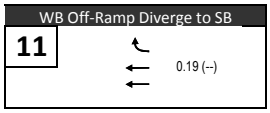


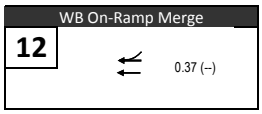


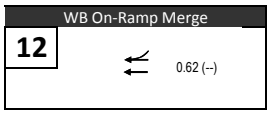












DAVID EVANS AND ASSOCIATES INC.

Legend

→ Turning Movement

#.## (##) Lane Group V/C Ratio (Lane Group Delay in Seconds)

Note: (--) Delay is not a HCM output for Merge or Diverge areas, or uncontrolled approaches to intersections.

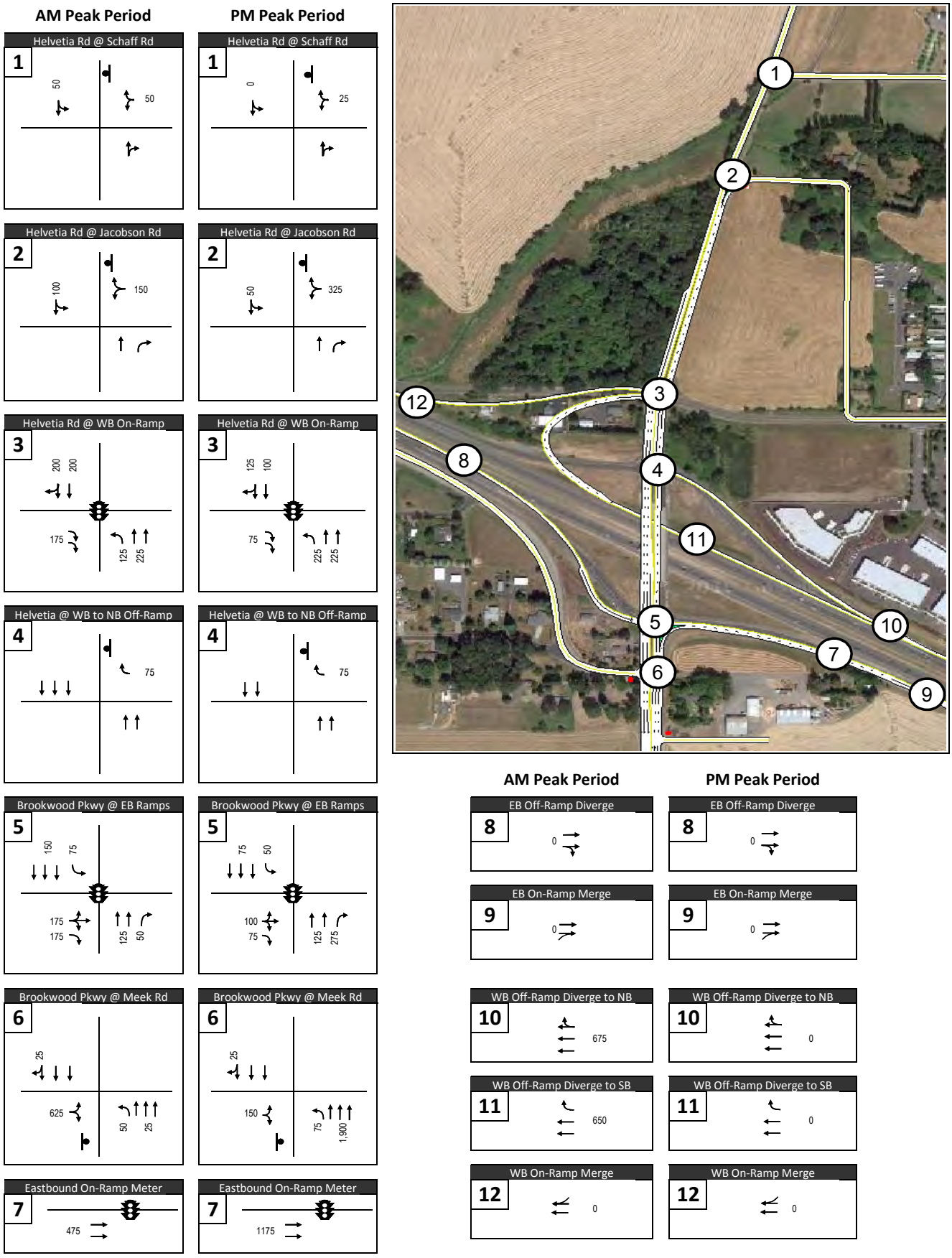
Source: V/C ratio from Synchro and Delay values from SimTraffic

FIGURE 23

Phase 2 Option A (2023 - 2027)
Volume to Capacity Ratios (V/C)
and Delay

JTA Brookwood Interchange Analysis

Printed: 1/12/2012



DAVID EVANS AND ASSOCIATES INC.

Legend

→ Turning Movement

95% Queue Length (Feet)

Source: SimTraffic

FIGURE 24

Phase 2 Option A (2023 - 2027)
Queue Length

JTA Brookwood Interchange Analysis

Printed: 1/12/2012

AM Peak Period

Helvetia Rd @ Schaff Rd
1
0.02 (1)
0.06 (7)
0.17 (--)

Helvetia Rd @ Jacobson Rd
2
0.02 (1)
0.49 (13)
0.16 (--)
0.17 (--)

Helvetia Rd @ WB On-Ramp
3
0.55 (14)
0.55 (19)
0.83 (15)
0.06 (26)
0.17 (12)
Overall V/C: 0.73 (15)

Helvetia @ WB to NB Off-Ramp
4
0.62 (--)
0.09 (4)
0.15 (--)

Brookwood Pkwy @ EB Ramps
5
0.78 (10)
0.43 (66)
0.71 (75)
0.76 (53)
0.18 (5)
0.35 (3)
Overall V/C: 0.78 (14)

Brookwood Pkwy @ Meek Rd
6
0.68 (0)
1.39 (>200)
0.06 (46)
0.21 (--)

Eastbound On-Ramp Meter
7
0.66 (15)

PM Peak Period

Helvetia Rd @ Schaff Rd
1
0.00 (0)
0.02 (9)
0.36 (--)

Helvetia Rd @ Jacobson Rd
2
0.01 (2)
0.82 (28)
0.37 (--)
0.32 (--)

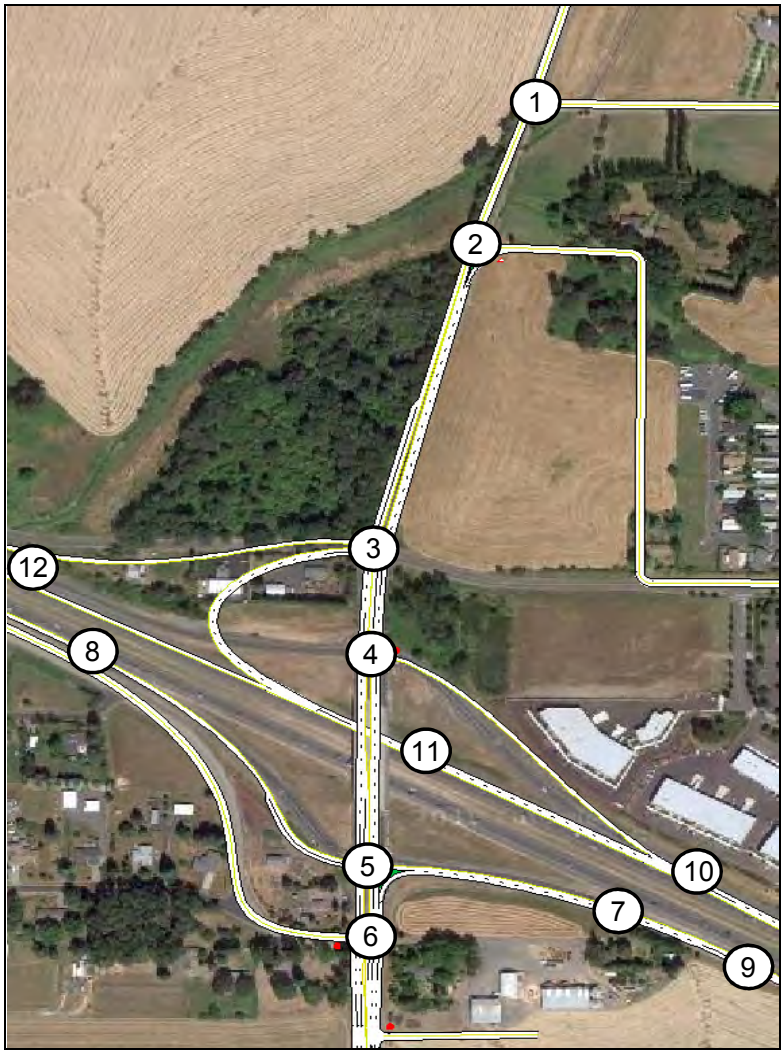
Helvetia Rd @ WB On-Ramp
3
0.31 (10)
0.31 (14)
0.25 (5)
0.32 (17)
0.37 (5)
Overall V/C: 0.36 (8)

Helvetia @ WB to NB Off-Ramp
4
0.32 (--)
0.12 (12)
0.39 (--)

Brookwood Pkwy @ EB Ramps
5
0.37 (2)
0.24 (52)
0.25 (61)
0.04 (12)
0.47 (2)
0.62 (7)
Overall V/C: 0.58 (5)

Brookwood Pkwy @ Meek Rd
6
0.35 (0)
0.55 (138)
0.12 (9)
0.52 (--)

Eastbound On-Ramp Meter
7
1.10 (>200)



AM Peak Period

EB Off-Ramp Diverge
8
0.16 (--)

EB On-Ramp Merge
9
0.59 (--)

WB Off-Ramp Diverge to NB
10
0.03 (--)

WB Off-Ramp Diverge to SB
11
0.44 (--)

WB On-Ramp Merge
12
0.37 (--)

PM Peak Period

EB Off-Ramp Diverge
8
0.05 (--)

EB On-Ramp Merge
9
0.69 (--)

WB Off-Ramp Diverge to NB
10
0.03 (--)

WB Off-Ramp Diverge to SB
11
0.19 (--)

WB On-Ramp Merge
12
0.62 (--)

DAVID EVANS AND ASSOCIATES INC.

Legend

→ Turning Movement

#.## (##) Lane Group V/C Ratio (Lane Group Delay in Seconds)

Note: (--) Delay is not a HCM output for Merge or Diverge areas, or uncontrolled approaches to intersections.

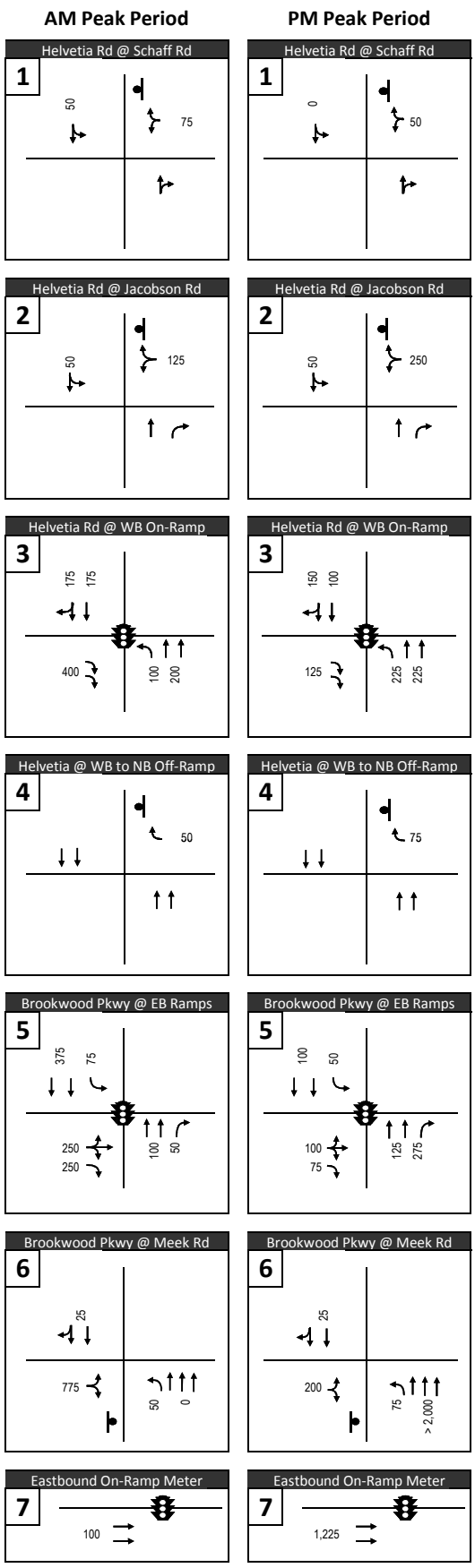
Source: V/C ratio from Synchro and Delay values from SimTraffic

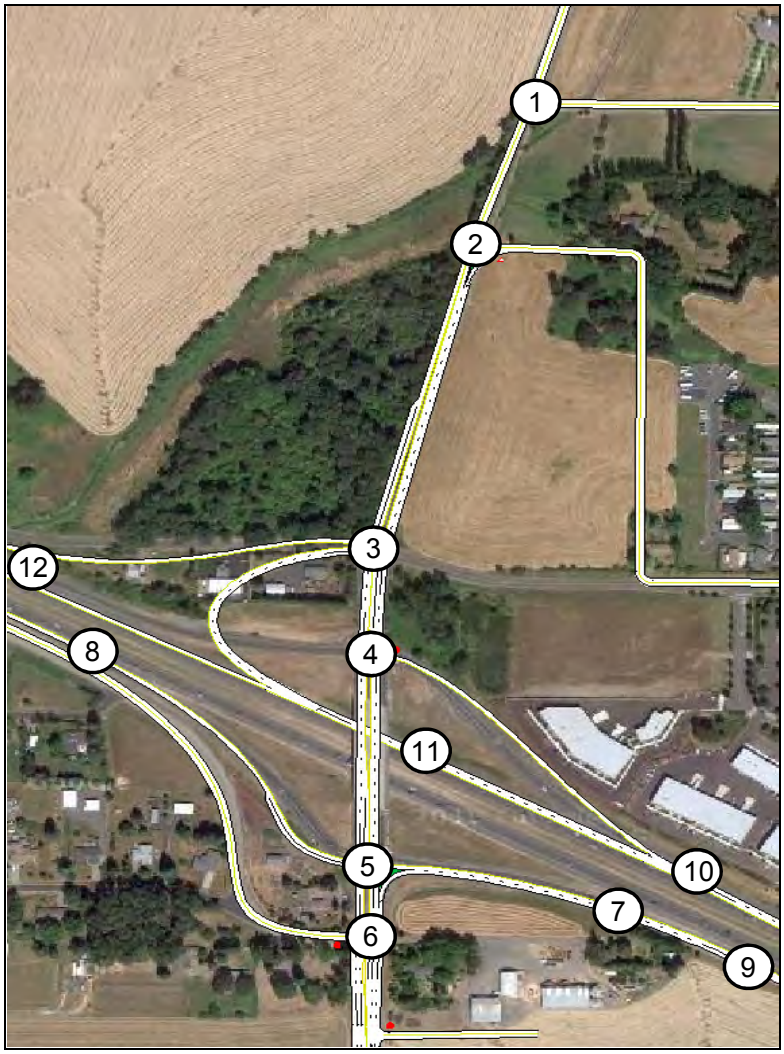
FIGURE 25

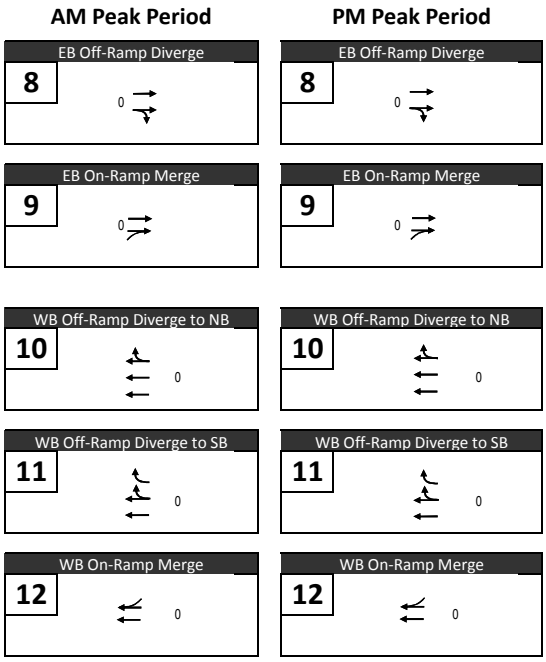
Phase 2 Option B (2023 - 2027)
Volume to Capacity Ratios (V/C)
and Delay

JTA Brookwood Interchange Analysis

Printed: 1/12/2012







DAVID EVANS AND ASSOCIATES INC.

Legend

→ Turning Movement

95% Queue Length (Feet)

Source: SimTraffic

FIGURE 26

Phase 2 Option B (2023 - 2027)
Queue Length

JTA Brookwood Interchange Analysis

Printed: 1/12/2012

AM Peak Period

Helvetia Rd @ Schaff Rd
1
0.07 (7)
0.39 (29)
0.34 (--)

Helvetia Rd @ N/A
2
Intersection Proposed in Build Scenarios Only

Helvetia Rd @ Jacobson Rd
3
0.03 (--)
0.56 (61)
0.00 (0)
0.01 (--)

Helvetia Rd & WB Ramps
4
0.77 (35)
0.11 (58)
1.05 (56)
1.05 (56)
0.47 (54)
0.88 (50)
Overall V/C: 0.98 (50)

Brookwood Pkwy @ EB Ramps
5
0.91 (6)
0.07 (25)
0.43 (>200)
1.68 (>200)
0.70 (18)
0.36 (3)
Overall V/C: 1.01 (58)

Brookwood Pkwy @ Meek Rd
6
0.86 (0)
0.00 (0)
>2.00 (>200)
0.94 (43)
0.42 (--)

EB On-Ramp Meter
7
0.68 (93)

PM Peak Period

Helvetia Rd @ Schaff Rd
1
0.00 (0)
0.10 (6)
0.43 (--)

Helvetia Rd @ N/A
2
Intersection Proposed in Build Scenarios Only

Helvetia Rd @ Jacobson Rd
3
0.04 (--)
1.23 (>200)
0.00 (0)
0.00 (--)

Helvetia Rd & WB Ramps
4
0.48 (12)
0.13 (166)
0.87 (163)
0.87 (163)
0.65 (57)
1.09 (47)
Overall V/C: 1.02 (77)

Brookwood Pkwy @ EB Ramps
5
0.42 (3)
0.18 (40)
0.18 (175)
0.05 (13)
1.07 (17)
0.66 (7)
Overall V/C: 1.01 (11)

Brookwood Pkwy @ Meek Rd
6
0.40 (0)
0.00 (0)
>2.00 (>200)
0.21 (159)
0.96 (--)

EB On-Ramp Meter
7
1.19 (>200)

AM Peak Period

EB US26 Diverge
8
0.23 (--)

EB US26 Merge
9
0.69 (--)

WB US26 Diverge
10
1.01 (--)

WB US26 to N/A
11
Intersection Proposed in Build Scenarios Only

WB US26 Merge
12
0.50 (--)

PM Peak Period

EB US26 Diverge
8
0.07 (--)

EB US26 Merge
9
0.84 (--)

WB US26 Diverge
10
0.45 (--)

WB US26 to N/A
11
Intersection Proposed in Build Scenarios Only

WB US26 Merge
12
0.76 (--)

DAVID EVANS AND ASSOCIATES INC.

Legend

→ Turning Movement

#.## (##) Lane Group V/C Ratio (Lane Group Delay in Seconds)

Note: (--) Delay is not a HCM output for Merge or Diverge areas, or uncontrolled approaches to intersections.

Source: V/C ratio from Synchro and Delay values from SimTraffic

FIGURE 27

No-Build (2035+)
Volume to Capacity Ratios (V/C)
and Delay

JTA Brookwood Interchange Analysis

Printed: 1/12/2012

AM Peak Period

1 Helvetia Rd @ Schaff Rd
225
125

2 Helvetia Rd @ N/A
Intersection Proposed in Build Scenarios Only

3 Helvetia Rd @ Jacobson Rd
175
325
0

4 Helvetia Rd & WB Ramps
275
275
75
>2,000
675
250
675

5 Brookwood Pkwy @ EB Ramps
150
75
1,525
375
225
100

6 Brookwood Pkwy @ Meek Rd
25
0
650
75
175

7 EB On-Ramp Meter
500

PM Peak Period

1 Helvetia Rd @ Schaff Rd
0
50

2 Helvetia Rd @ N/A
Intersection Proposed in Build Scenarios Only

3 Helvetia Rd @ Jacobson Rd
125
> 2,000
0

4 Helvetia Rd & WB Ramps
150
150
75
> 2,000
825
375
700

5 Brookwood Pkwy @ EB Ramps
50
25
100
75
200
75

6 Brookwood Pkwy @ Meek Rd
25
0
625
200
> 2,000

7 EB On-Ramp Meter
625

AM Peak Period

8 EB US26 Diverge
400

9 EB US26 Merge
0

10 WB US26 Diverge to NB
>2,000

11 WB US26 Diverge to SB
Intersection Proposed in Build Scenarios Only

12 WB US26 Merge
0

PM Peak Period

8 EB US26 Diverge
0

9 EB US26 Merge
0

10 WB US26 Diverge to NB
>2,000

11 WB US26 Diverge to SB
Intersection Proposed in Build Scenarios Only

12 WB US26 Merge
0

DAVID EVANS AND ASSOCIATES INC.

Legend

→ Turning Movement

95% Queue Length (Feet)

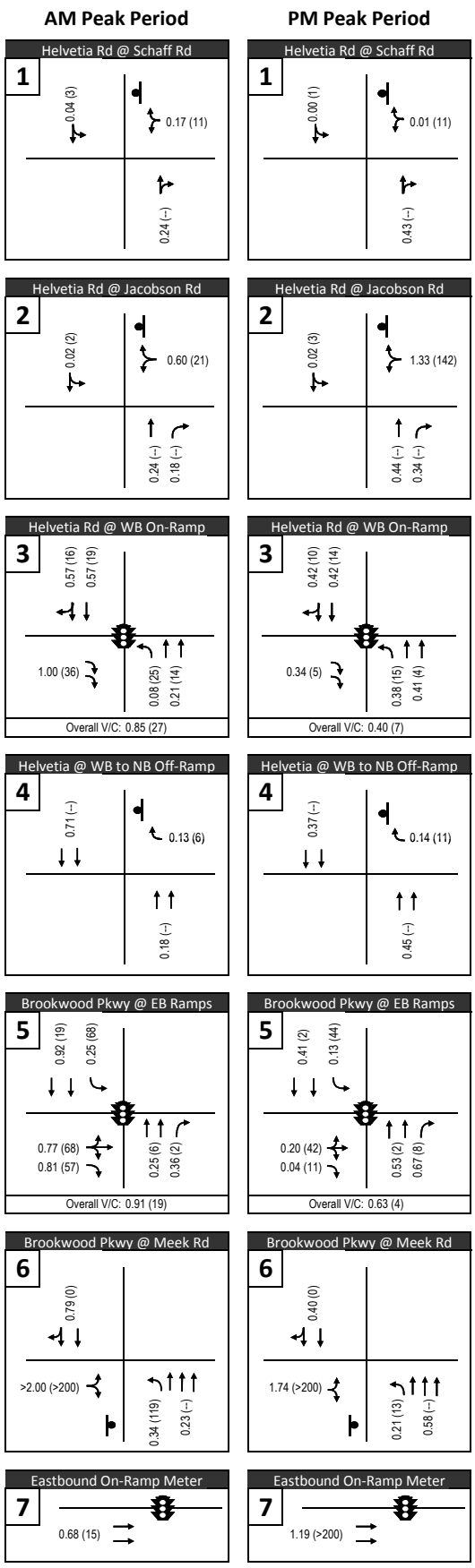
Source: SimTraffic

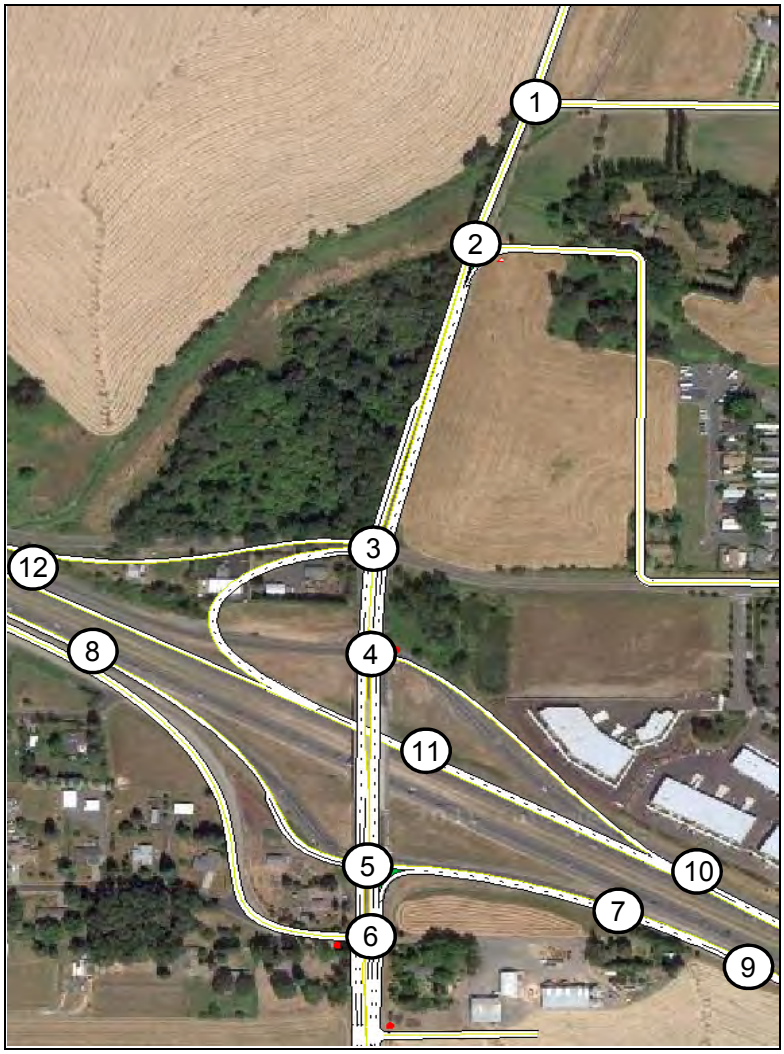
FIGURE 28

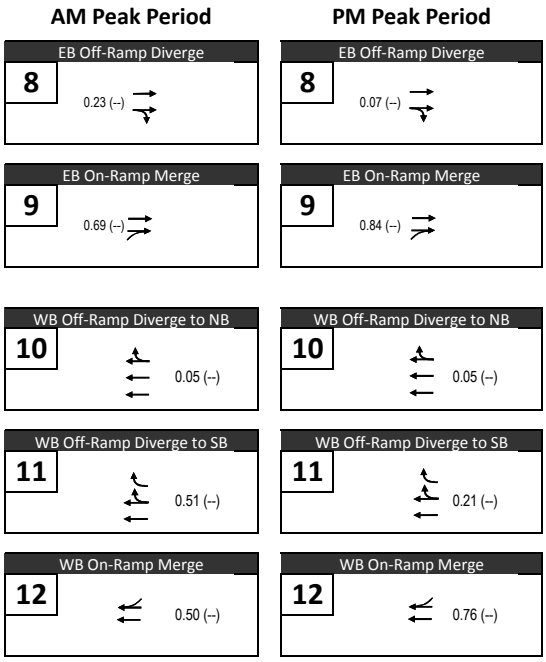
No-Build (2035+) Queue Length

JTA Brookwood Interchange Analysis

Printed: 1/12/2012







DAVID EVANS AND ASSOCIATES INC.

Legend

→ Turning Movement

#.## (##) Lane Group V/C Ratio (Lane Group Delay in Seconds)

Note: (--) Delay is not a HCM output for Merge or Diverge areas, or uncontrolled approaches to intersections.

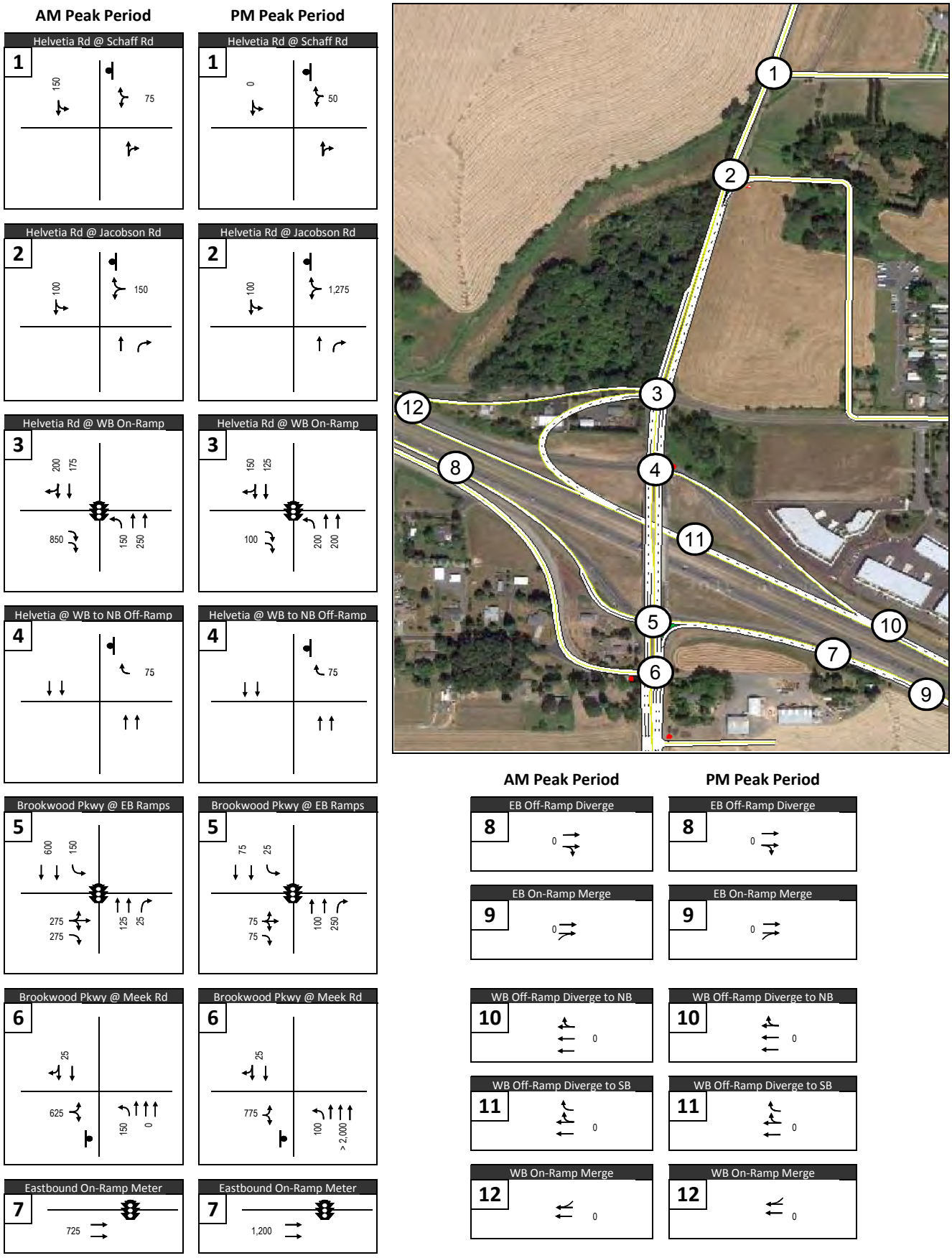
Source: V/C ratio from Synchro and Delay values from SimTraffic

FIGURE 29

Phase 2 Option B (2035+)
Volume to Capacity Ratios (V/C)
and Delay

JTA Brookwood Interchange Analysis

Printed: 1/12/2012



DAVID EVANS AND ASSOCIATES INC.

Legend

→ Turning Movement

95% Queue Length (Feet)

Source: SimTraffic

FIGURE 30

Phase 2 Option B (2035+)
Queue Length

JTA Brookwood Interchange Analysis

Printed: 1/12/2012

AM Peak Period

Helvetia Rd @ Schaff Rd
1
0.04 (4)
0.17 (12)
0.24 (--)

Helvetia Rd @ Jacobson Rd
2
0.02 (2)
0.60 (26)
0.24 (--)
0.18 (--)

Helvetia Rd @ WB On-Ramp
3
0.68 (25)
0.68 (32)
0.93 (10)
0.07 (26)
0.21 (16)
Overall V/C: 0.86 (14)

Helvetia @ WB to NB Off-Ramp
4
0.47 (--)
0.12 (6)
0.18 (--)

Brookwood Pkwy @ EB Ramps
5
0.70 (7)
0.15 (32)
0.64 (37)
0.68 (31)
0.30 (8)
0.36 (3)
Overall V/C: 0.70 (9)

Brookwood Pkwy @ Meek Rd
6
0.40 (--)
0.77 (--)
> 2.00 (>200)
0.16 (37)
0.23 (--)

Eastbound On-Ramp Meter
7
0.68 (109)

PM Peak Period

Helvetia Rd @ Schaff Rd
1
0.00 (0)
0.10 (13)
0.43 (--)

Helvetia Rd @ Jacobson Rd
2
0.02 (2)
1.33 (142)
0.44 (--)
0.34 (--)

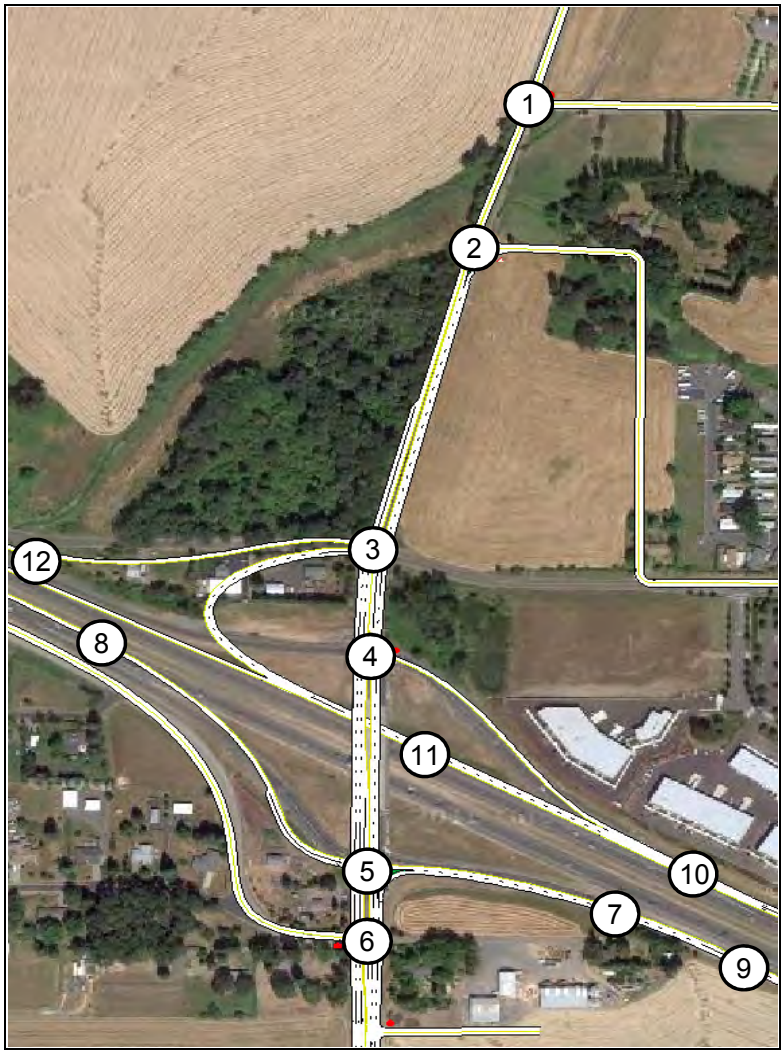
Helvetia Rd @ WB On-Ramp
3
0.42 (11)
0.42 (13)
0.34 (4)
0.38 (17)
0.41 (4)
Overall V/C: 0.40 (7)

Helvetia @ WB to NB Off-Ramp
4
0.24 (--)
0.14 (14)
0.45 (--)

Brookwood Pkwy @ EB Ramps
5
0.29 (2)
0.13 (50)
0.20 (51)
0.04 (11)
0.53 (2)
0.67 (8)
Overall V/C: 0.62 (4)

Brookwood Pkwy @ Meek Rd
6
0.21 (--)
0.37 (--)
1.53 (>200)
0.20 (12)
0.58 (--)

Eastbound On-Ramp Meter
7
1.19 (>200)



AM Peak Period

EB Off-Ramp Diverge
8
0.23 (--)

EB On-Ramp Merge
9
0.69 (--)

WB Off-Ramp Diverge to NB
10
0.05 (--)

WB Off-Ramp Diverge to SB
11
0.51 (--)

WB On-Ramp Merge
12
0.50 (--)

PM Peak Period

EB Off-Ramp Diverge
8
0.07 (--)

EB On-Ramp Merge
9
0.84 (--)

WB Off-Ramp Diverge to NB
10
0.05 (--)

WB Off-Ramp Diverge to SB
11
0.21 (--)

WB On-Ramp Merge
12
0.76 (--)

DAVID EVANS AND ASSOCIATES INC.

Legend

→ Turning Movement

#.## (##) Lane Group V/C Ratio (Lane Group Delay in Seconds)

Note: (--) Delay is not a HCM output for Merge or Diverge areas, or uncontrolled approaches to intersections.

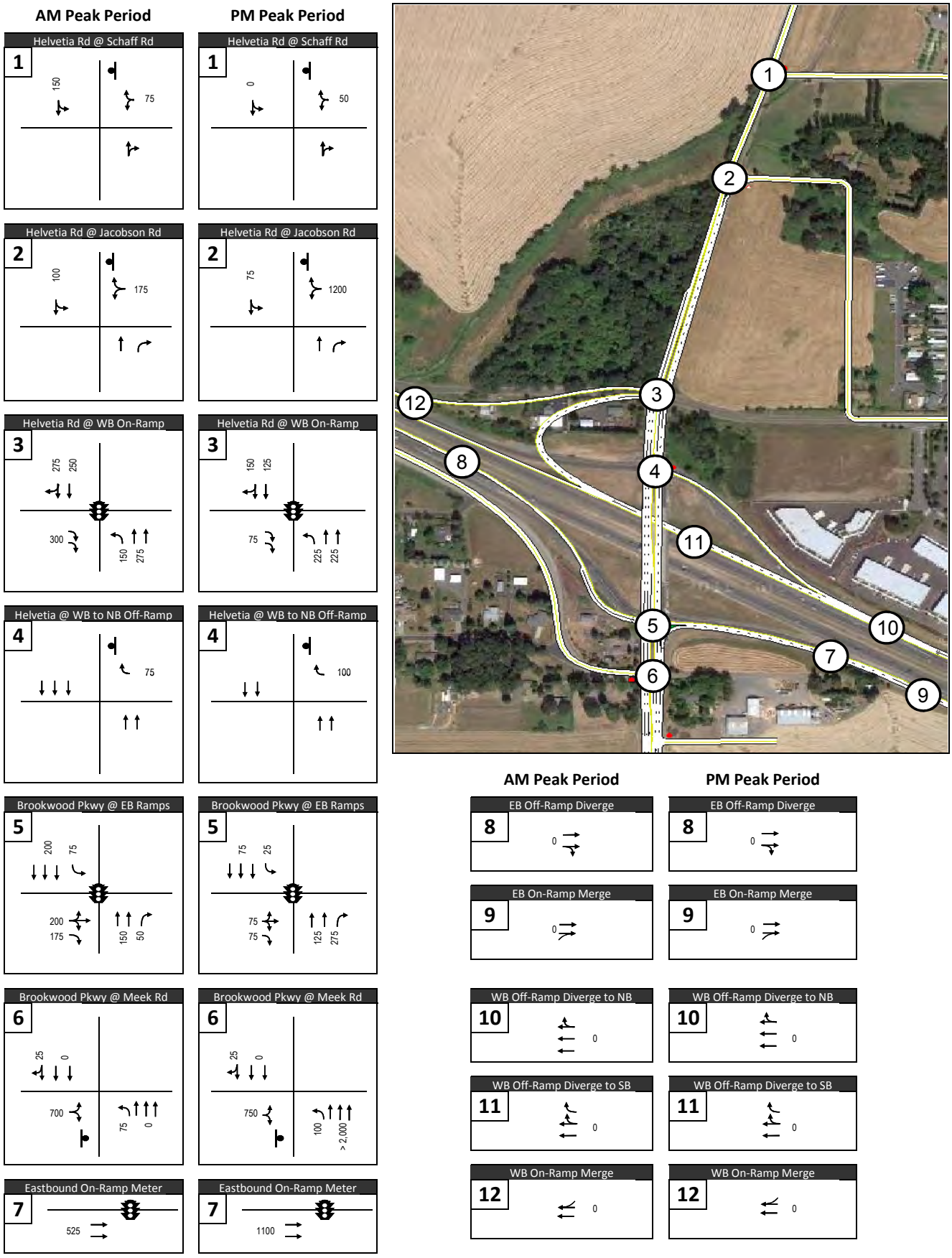
Source: V/C ratio from Synchro and Delay values from SimTraffic

FIGURE 31

Phase 3 (2035+)
Volume to Capacity Ratios (V/C) and Delay

JTA Brookwood Interchange Analysis

Printed: 1/12/2012



DAVID EVANS AND ASSOCIATES INC.

Legend

→ Turning Movement

95% Queue Length (Feet)

Source: SimTraffic

FIGURE 32

Phase 3 (2035+)
Queue Length

JTA Brookwood Interchange Analysis

Printed: 1/12/2012

Appendices

Appendix A: Existing Traffic Counts

Appendix B: Volume Development

Appendix C: Operations

Appendix D: Crash Data

US 26/Brookwood Parkway/Helvetia Road Interchange Project

JTA US 26/Brookwood/Helvetia Interchange Analysis Key # 16842

Technical Appendix

Prepared for:

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January 2012

Appendix A: Traffic Count Summary……..Page 3

Appendix B: Volume Development Worksheets……Page 26

Appendix C: Synchro/SimTraffic Reports……..Page 32

Year 2011 Existing Conditions……Page 33

Year 2015 No-Build……Page 70

Year 2035 No-Build……Page 107

Year 2015 Phase 1……Page 144

Year 2025 Phase 1……Page 191

Year 2025 Phase 2A……Page 238

Year 2025 Phase 2B……Page 285

Year 2035 Phase 2B……Page 332

Year 2035 Phase 3……Page 379

Appendix D: Raw Crash Data……Page 426

Appendix A:
Traffic Count Summary

DATE : 5-25-2011	LOCATION: BROOKWOOD PKWY @ HWY 26 WB RAMPS

	Eastbound			Westbound			Northbound			Southbound			Totals	
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	15-min	Hourly
0500	0	0	0	70	0	0	2	7	0	0	6	0	85	
0515	0	0	0	180	1	0	1	10	0	0	16	2	210	
0530	0	0	0	255	1	1	3	28	0	0	31	1	320	
0545	0	0	0	164	0	1	1	48	0	0	31	0	245	860
0600	0	0	0	137	0	0	3	31	0	0	28	0	199	974
0615	0	0	0	150	0	5	2	45	0	0	44	1	247	1011
0630	0	0	0	402	0	18	11	141	0	0	99	8	679	1370
0645	0	0	0	213	0	10	5	39	0	0	51	6	324	1449
0700	0	0	0	213	0	10	7	39	0	0	54	6	329	1579
0715	0	0	0	222	0	6	18	72	0	0	69	14	401	1733
0730	0	0	0	257	0	8	11	118	0	0	114	10	518	1572
0745	0	0	0	281	0	7	17	89	0	0	128	4	526	1774
0800	0	0	0	288	0	13	16	70	0	0	92	6	485	1930
0815	0	0	0	270	0	8	12	52	0	0	83	6	431	1960
0830	0	0	0	253	0	9	14	110	0	0	114	6	506	1948
0845	0	0	0	262	1	16	9	91	0	0	114	8	501	1923
0900	0	0	0	235	0	3	8	45	0	0	78	6	375	1813
0915	0	0	0	177	0	9	20	46	0	0	47	4	303	1685
0930	0	0	0	175	0	10	16	40	0	0	47	3	291	1470
0945	0	0	0	166	0	11	5	34	0	0	44	9	269	1238
1000	0	0	0	114	0	7	9	42	0	0	54	8	234	1097
1015	0	0	0	112	0	13	14	39	0	0	44	3	225	1019
1030	0	0	0	111	0	10	19	46	0	0	42	9	237	965
1045	0	0	0	93	1	10	16	36	0	0	51	5	212	908
1100	0	0	0	104	0	11	26	40	0	0	63	4	248	922
1115	0	0	0	122	0	14	20	31	0	0	47	2	236	933
1130	0	0	0	107	0	15	27	44	0	0	37	8	238	934
1145	0	0	0	104	1	12	12	48	0	0	47	11	235	957
1200	0	0	0	125	2	11	20	64	0	0	49	5	276	985
1215	0	0	0	114	0	6	21	55	0	0	51	6	253	1002
1230	0	0	0	106	0	17	13	48	0	0	60	6	250	1014
1245	0	0	0	131	0	19	15	49	0	0	42	3	259	1038
1300	0	0	0	120	1	15	21	46	0	0	60	8	271	1033
1315	0	0	0	93	0	12	15	64	0	0	43	7	234	1014
1330	0	0	0	90	0	14	19	57	0	0	82	6	268	1032
1345	0	0	0	113	0	17	18	53	0	0	59	9	269	1042
1400	0	0	0	97	0	15	31	40	0	0	55	6	244	1015
1415	0	0	0	100	0	11	27	51	0	0	57	5	251	1032
1430	0	0	0	106	0	18	31	64	0	0	57	13	289	1053
1445	0	0	0	120	1	12	34	55	0	0	54	12	288	1072
1500	0	0	0	135	1	9	34	49	0	0	49	13	290	1118
1515	0	0	0	133	0	12	24	76	0	0	57	5	307	1174
1530	0	0	0	143	0	12	52	116	0	0	96	27	446	1331
1545	0	0	0	152	0	13	51	122	0	0	69	17	424	1467
1600	0	0	0	138	1	24	39	112	0	0	63	8	385	1562
1615	0	0	0	153	4	13	48	200	0	0	63	25	506	1761
1630	0	0	0	144	1	12	44	233	0	0	88	30	552	1867
1645	0	0	0	154	1	12	44	175	0	0	52	15	453	1896
1700	0	0	0	142	1	22	53	227	0	0	52	18	515	2026
1715	0	0	0	148	0	21	57	253	0	0	49	14	542	2062
1730	0	0	0	145	0	22	51	186	0	0	87	14	505	2015
1745	0	0	0	146	0	20	38	138	0	0	54	8	404	1966
1800	0	0	0	117	0	11	30	131	0	0	58	13	360	1811
1815	0	0	0	112	0	9	37	96	0	0	38	12	304	1573
1830	0	0	0	87	0	15	25	80	0	0	62	12	281	1349
1845	0	0	0	126	0	9	26	45	0	0	40	15	261	1206
1900	0	0	0	102	0	13	16	44	0	0	35	9	219	1065
1915	0	0	0	87	0	3	22	62	0	0	38	6	218	979
1930	0	0	0	63	1	7	25	43	0	0	30	12	181	879
1945	0	0	0	82	0	3	23	29	0	0	28	2	167	785
2000	0	0	0	61	0	4	23	28	0	0	30	13	159	725
2015	0	0	0	74	0	4	10	29	0	0	50	3	170	677
2030	0	0	0	77	0	6	12	24	0	0	53	9	181	677
2045	0	0	0	69	0	15	11	29	0	0	41	1	166	676

DATE : 5-25-2011	LOCATION: BROOKWOOD PKWY @ HWY 26 EB RAMPS

	Eastbound			Westbound			Northbound			Southbound			Totals	
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	15-min	Hourly
0500	2	0	11	0	0	0	0	5	53	3	69	0	143	
0515	5	0	20	0	0	0	0	7	61	3	179	0	275	
0530	11	0	20	0	0	0	0	15	74	3	281	0	404	
0545	19	0	38	0	0	0	0	31	88	5	214	0	395	1217
0600	7	0	24	0	0	0	0	33	140	9	146	0	359	1433
0615	5	0	26	0	0	0	0	34	166	7	205	0	443	1601
0630	8	0	44	0	0	0	0	48	154	1	269	0	524	1721
0645	14	0	54	0	0	0	0	79	122	3	311	0	583	1909
0700	8	0	41	0	0	0	0	37	126	4	302	0	518	2068
0715	11	0	42	0	0	0	0	71	126	8	314	0	572	2197
0730	14	1	54	0	0	0	0	111	115	10	391	0	696	2369
0745	21	0	58	0	0	0	0	88	101	9	462	0	739	2525
0800	13	0	29	0	0	0	0	68	106	10	412	0	638	2645
0815	13	0	34	0	0	0	0	53	123	7	390	0	620	2693
0830	7	0	38	0	0	0	0	100	117	6	372	0	640	2637
0845	13	0	27	0	0	0	0	85	90	9	411	0	635	2533
0900	4	0	23	0	0	0	0	48	103	9	335	0	522	2417
0915	3	1	17	0	0	0	0	62	113	3	261	0	460	2257
0930	6	0	25	0	0	0	0	48	102	9	220	0	410	2027
0945	6	0	28	0	0	0	0	28	72	4	243	0	381	1773
1000	4	0	25	0	0	0	0	45	101	20	173	0	368	1619
1015	9	0	22	0	0	0	0	46	102	8	173	0	360	1519
1030	9	0	24	0	0	0	0	52	114	11	173	0	383	1492
1045	5	0	20	0	0	0	0	45	94	9	145	0	318	1429
1100	4	0	19	0	0	0	0	58	133	20	162	0	396	1457
1115	4	0	23	0	0	0	0	43	145	13	174	0	402	1499
1130	5	0	19	0	0	0	0	65	121	10	162	0	382	1498
1145	8	0	26	0	0	0	0	63	108	12	155	0	372	1552
1200	9	0	13	0	0	0	0	76	146	7	171	0	422	1578
1215	4	0	11	0	0	0	0	76	130	11	182	0	414	1590
1230	10	0	17	0	0	0	0	48	123	8	186	0	392	1600
1245	10	0	21	0	0	0	0	54	113	11	173	0	382	1610
1300	10	0	29	0	0	0	0	54	133	17	188	0	431	1619
1315	13	0	22	0	0	0	0	69	125	12	137	0	378	1583
1330	9	1	19	0	0	0	0	62	122	16	176	0	405	1596
1345	8	0	17	0	0	0	0	61	108	6	178	0	378	1592
1400	7	0	19	0	0	0	0	61	131	13	159	0	390	1551
1415	4	0	12	0	0	0	0	77	155	14	152	0	414	1587
1430	8	0	15	0	0	0	0	83	160	13	168	0	447	1629
1445	6	1	22	0	0	0	0	86	164	20	163	0	462	1713
1500	4	1	22	0	0	0	0	75	166	11	177	0	456	1779
1515	7	2	19	0	0	0	0	106	190	14	190	0	528	1893
1530	24	0	24	0	0	0	0	127	227	9	220	0	631	2077
1545	16	0	18	0	0	0	0	152	196	9	232	0	623	2238
1600	7	0	16	0	0	0	0	148	216	8	200	0	595	2377
1615	7	0	14	0	0	0	0	233	184	2	224	0	664	2513
1630	12	0	21	0	0	0	0	266	152	5	238	0	694	2576
1645	16	0	9	0	0	0	0	198	184	6	210	0	623	2576
1700	19	1	15	0	0	0	0	253	196	4	201	0	689	2670
1715	15	0	14	0	0	0	0	287	179	1	203	0	699	2705
1730	15	0	20	0	0	0	0	237	185	8	241	0	706	2717
1745	5	0	18	0	0	0	0	172	218	4	213	0	630	2724
1800	11	0	18	0	0	0	0	157	210	6	170	0	572	2607
1815	4	0	12	0	0	0	0	134	246	4	140	0	540	2448
1830	5	0	7	0	0	0	0	105	253	11	143	0	524	2266
1845	7	0	13	0	0	0	0	83	149	8	160	0	420	2056
1900	6	0	4	0	0	0	0	50	130	12	150	0	352	1836
1915	10	0	18	0	0	0	0	70	96	8	111	0	313	1609
1930	6	0	6	0	0	0	0	57	81	8	91	0	249	1334
1945	3	0	2	0	0	0	0	50	70	7	103	0	235	1149
2000	3	0	4	0	0	0	0	54	62	7	105	0	235	1032
2015	1	0	3	0	0	0	0	37	76	10	109	0	236	955
2030	3	0	3	0	0	0	0	37	54	3	127	0	227	933
2045	3	0	3	0	0	0	0	35	50	10	108	0	209	907

Date Counted: 7/20/11
Location/Intersection: Helvetia Rd & US 26 WB Ramps

Summary of all movements (AM)

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
7:00 AM	0	0	0	213	0	4	11	49	0	0	45	4	326
7:15 AM	0	0	0	261	0	13	9	60	0	0	69	4	416
7:30 AM	0	0	0	335	0	9	7	66	0	0	101	5	523
7:45 AM	0	0	0	385	0	8	6	82	0	0	113	15	609
8:00 AM	0	0	0	271	0	12	8	51	0	0	88	3	433
8:15 AM	0	0	0	269	0	12	10	46	0	0	84	3	424
8:30 AM	0	0	0	295	0	7	5	48	0	0	73	8	436
8:45 AM	0	0	0	290	0	12	16	38	0	0	83	1	440
	EBL	**EBT**	**EBR**	**WBL**	**WBT**	**WBR**	**NBL**	**NBT**	**NBR**	**SBL**	**SBT**	**SBR**	**All**
7:30 - 8:30	0	0	0	1260	0	41	31	245	0	0	386	26	1989

Summary of all movements

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
4:00 PM	0	0	0	137	1	12	43	107	0	0	62	18	380
4:15 PM	0	0	0	154	0	17	47	167	0	0	58	21	464
4:30 PM	0	0	0	173	0	13	48	145	0	0	79	31	489
4:45 PM	0	0	0	148	0	11	46	139	0	0	55	17	416
5:00 PM	0	0	0	150	1	16	50	181	0	0	56	16	470
5:15 PM	0	0	0	156	0	17	47	214	0	0	45	13	492
5:30 PM	0	0	0	150	0	20	54	180	0	0	56	10	470
5:45 PM	0	0	0	152	0	9	33	138	0	0	53	6	391
	EBL	**EBT**	**EBR**	**WBL**	**WBT**	**WBR**	**NBL**	**NBT**	**NBR**	**SBL**	**SBT**	**SBR**	**All**
4:30 - 5:30	0	0	0	627	1	57	191	679	0	0	235	77	1867

Date Counted: 7/20/11
Location/Intersection: Brookwood Parkway & US 26 EB Ramps

Summary of all movements

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
7:00 AM	9	0	44	0	0	0	0	55	133	2	260	0	503
7:15 AM	13	0	33	0	0	0	0	59	128	6	328	0	567
7:30 AM	10	0	37	0	0	0	0	59	107	9	435	0	657
7:45 AM	16	0	48	0	0	0	0	72	98	11	475	0	720
8:00 AM	6	0	21	0	0	0	0	51	116	9	351	0	554
8:15 AM	8	0	33	0	0	0	0	45	115	12	336	0	549
8:30 AM	5	0	27	0	0	0	0	38	110	8	367	0	555
8:45 AM	11	0	35	0	0	0	0	45	88	11	360	0	550
	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
7:30 - 8:30	40	0	139	0	0	0	0	227	436	41	1597	0	2480

Summary of all movements

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
4:00 PM	8	0	18	0	0	0	0	143	217	6	199	0	591
4:15 PM	9	1	18	0	0	0	0	203	174	6	199	0	610
4:30 PM	8	0	18	0	0	0	0	192	172	5	252	0	647
4:45 PM	3	0	13	0	0	0	0	181	179	4	200	0	580
5:00 PM	10	0	14	0	0	0	0	221	224	4	205	0	678
5:15 PM	15	1	17	0	0	0	0	243	204	3	189	0	672
5:30 PM	12	0	11	0	0	0	0	216	199	4	204	0	646
5:45 PM	15	1	15	0	0	0	0	162	201	4	207	0	605
	EBL	**EBT**	**EBR**	**WBL**	**WBT**	**WBR**	**NBL**	**NBT**	**NBR**	**SBL**	**SBT**	**SBR**	**All**
4:30 - 5:30	36	1	62	0	0	0	0	837	779	16	846	0	2577

LOCATION: HELVETIA RD @ SCHAFF RD 1600-1900 | Site: 0016
CITY: HILLSBORO, OR | Date: 5/25/2011
FILENAME: V12CJ 11-024 S | Wednesday

Peak Hour Detail

Interval		Southbound HELVETIA				Westbound SCHAFF				Northbound HELVETIA				Eastbound			
Begin	Ped1	Right	Thru	Left	Ped2	Right	Thru	Left	Ped3	Right	Thru	Left	Ped4	Right	Thru	Left	Total
4:00 PM	0	0	31	0	0	0	0	1	0	1	65	0	0	0	0	0	98
4:15 PM	0	0	47	0	0	1	0	0	0	0	86	0	0	0	0	0	134
4:30 PM	0	0	46	0	0	0	0	0	0	0	119	0	0	0	0	0	165
4:45 PM	0	0	26	0	0	0	0	1	0	0	95	0	0	0	0	0	122
5:00 PM	0	0	32	0	0	0	0	0	0	0	123	0	0	0	0	0	155
5:15 PM	0	0	33	0	0	0	0	0	0	1	112	0	0	0	0	0	146
5:30 PM	0	0	48	0	0	0	0	1	0	1	103	0	0	0	0	0	153
5:45 PM	0	0	32	0	0	0	0	1	0	0	69	0	0	0	0	0	102
6:00 PM	0	0	34	0	0	0	0	0	0	0	69	0	0	0	0	0	103
6:15 PM	0	0	26	0	0	0	0	0	0	1	56	0	0	0	0	0	83
6:30 PM	1	0	37	0	0	0	0	0	0	1	47	0	0	0	0	0	86
6:45 PM	0	0	41	0	0	0	0	0	0	0	36	0	0	0	0	0	77
Totals	1	0	433	0	0	1	0	4	0	5	980	0	0	0	0	0	1424
Entering		433				5				985				0			
Exiting		437				0				981				5			

Vehicle Totals

Cars	1	0	428	0	0	1	0	4	0	5	972	0	0	0	0	0	1411
	100%		98.8%			100%		100%		100%	99.2%						99.1%
Light	0	0	3	0	0	0	0	0	0	0	4	0	0	0	0	0	7
	0.0%		0.7%			0.0%		0.0%		0.0%	0.4%						0.5%
Bike	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2
	0.0%		0.5%			0.0%		0.0%		0.0%	0.0%						0.1%
Medium	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	4
	0.0%		0.0%			0.0%		0.0%		0.0%	0.4%						0.3%
Heavy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0.0%		0.0%			0.0%		0.0%		0.0%	0.0%						0.0%

LOCATION: HELVETIA RD @ SCHAFF RD 1600-1900 | Site: 0016
CITY: HILLSBORO, OR | Date: 5/25/2011
FILENAME: V12CJ 11-024 S | Wednesday

Peak Hour Detail

Peak Hour: 4:30 PM - 5:30 PM

Interval Begin	Ped1	Southbound HELVETIA Right	Thru	Left	Ped2	Westbound SCHAFF Right	Thru	Left	Ped3	Northbound HELVETIA Right	Thru	Left	Ped4	Eastbound Right	Thru	Left	Total
Totals	0	0	137	0	0	0	0	1	0	1	449	0	0	0	0	0	588
Factor			0.74					0.25		0.25	0.91						0.89
Entering			137				1				450				0		
Factor			0.74				0.25				0.91						
Exiting			138				0				449				1		
Factor			0.75								0.91				0.25		

Peak Vehicles

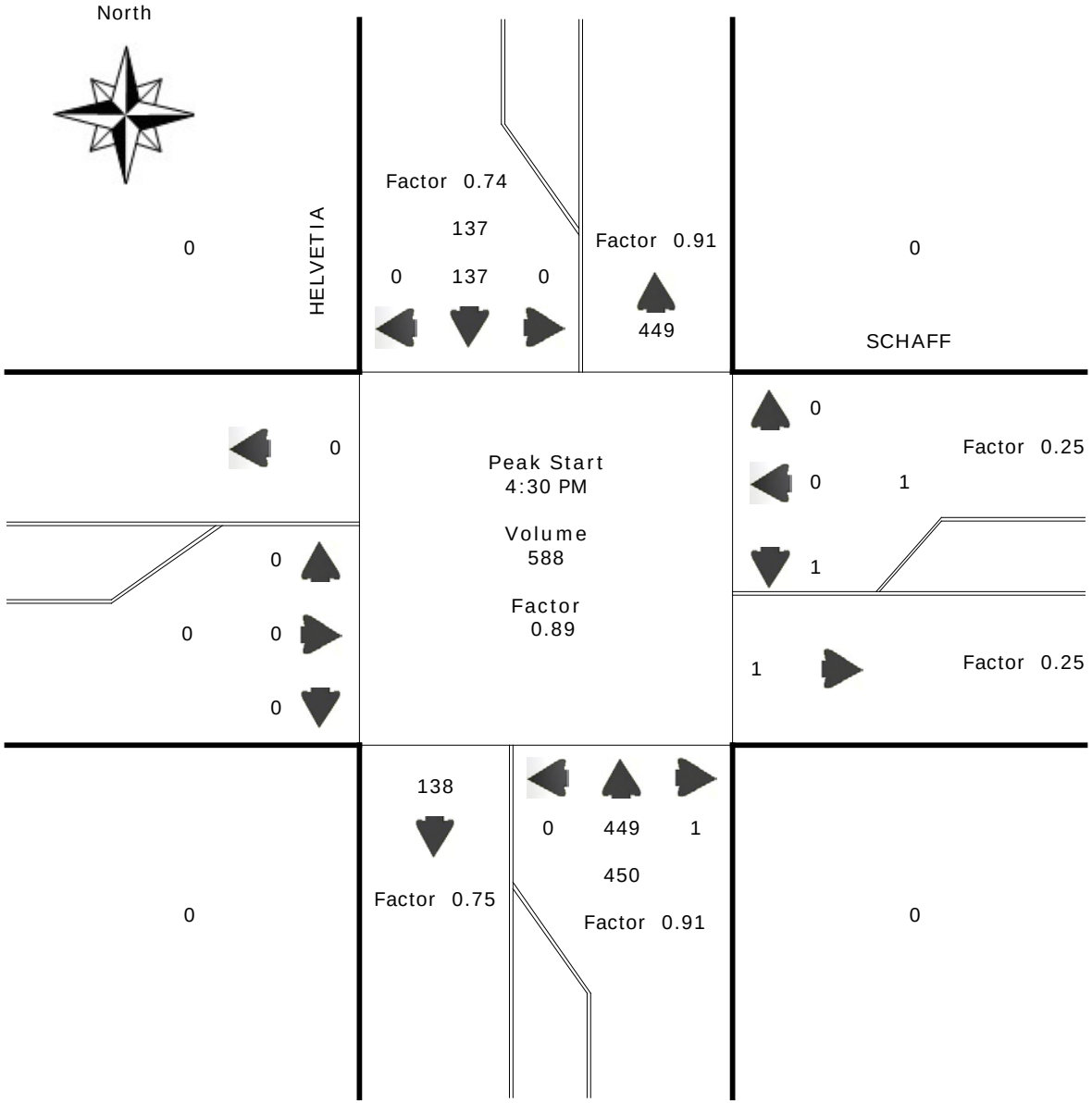
Cars	0	0	136	0	0	0	0	1	0	1	447	0	0	0	0	0	585
			99.3%					100%		100%	99.6%						99.5%
Light	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	2
			0.7%					0.0%		0.0%	0.2%						0.3%
Bike	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			0.0%					0.0%		0.0%	0.0%						0.0%
Medium	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
			0.0%					0.0%		0.0%	0.2%						0.2%
Heavy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			0.0%					0.0%		0.0%	0.0%						0.0%

LOCATION: HELVETIA RD @ SCHAFF RD 1600-1900
CITY: HILLSBORO, OR
FILENAME: V12CJ 11-024 S

Site: 0016
Date: 5/25/2011
Wednesday

Peak Hour Detail

Peak Hour Diagram



LOCATION: HELVETIA RD @ SCHAFF RD 0600-0900 | Site: 0016
CITY: HILLSBORO, OR | Date: 5/25/2011
FILENAME: V12CI 11-024 S | Wednesday

Peak Hour Detail

Interval		Southbound HELVETIA				Westbound				Northbound HELVETIA				Eastbound SCHAFF			
Begin	Ped1	Right	Thru	Left	Ped2	Right	Thru	Left	Ped3	Right	Thru	Left	Ped4	Right	Thru	Left	Total
6:00 AM	0	0	15	0	0	0	0	0	0	0	10	0	0	0	0	0	25
6:15 AM	0	0	26	0	0	0	0	0	0	0	14	0	0	0	0	0	40
6:30 AM	0	0	28	0	0	0	0	0	0	0	25	0	0	0	0	0	53
6:45 AM	0	0	23	0	0	1	0	0	0	1	31	0	0	0	0	0	56
7:00 AM	0	0	38	0	0	0	0	1	0	2	29	0	0	0	0	0	70
7:15 AM	0	0	58	0	0	0	0	1	0	0	43	0	0	0	0	0	102
7:30 AM	0	0	100	1	0	2	0	1	0	0	73	0	0	0	0	0	177
7:45 AM	0	0	86	1	0	0	0	2	0	0	32	0	0	0	0	0	121
8:00 AM	0	0	55	0	0	1	0	0	0	1	26	0	0	0	0	0	83
8:15 AM	0	0	52	0	1	0	0	0	0	0	22	0	0	0	0	0	75
8:30 AM	0	0	49	0	0	0	0	0	0	0	22	0	0	0	0	0	71
8:45 AM	0	0	53	0	0	0	0	0	0	0	18	0	0	0	0	0	71
Totals	0	0	583	2	1	4	0	5	0	4	345	0	0	0	0	0	944
Entering			585				9				349				0		
Exiting			588				0				349				6		

Vehicle Totals

Cars	0	0	571	2	1	3	0	5	0	3	330	0	0	0	0	0	915
			97.9%	100%	100%	75.0%		100%		75.0%	95.7%						96.9%
Light	0	0	11	0	0	0	0	0	0	0	10	0	0	0	0	0	21
			1.9%	0.0%	0.0%	0.0%		0.0%		0.0%	2.9%						2.2%
Bike	0	0	1	0	0	0	0	0	0	0	2	0	0	0	0	0	3
			0.2%	0.0%	0.0%	0.0%		0.0%		0.0%	0.6%						0.3%
Medium	0	0	0	0	0	1	0	0	0	1	3	0	0	0	0	0	5
			0.0%	0.0%	0.0%	25.0%		0.0%		25.0%	0.9%						0.5%
Heavy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			0.0%	0.0%	0.0%	0.0%		0.0%		0.0%	0.0%						0.0%

LOCATION: HELVETIA RD @ SCHAFF RD 0600-0900 | Site: 0016
CITY: HILLSBORO, OR | Date: 5/25/2011
FILENAME: V12CI 11-024 S | Wednesday

Peak Hour Detail

Peak Hour: 7:15 AM - 8:15 AM

Interval Begin	Ped1	Southbound HELVETIA Right	Thru	Left	Ped2	Westbound Right	Thru	Left	Ped3	Northbound HELVETIA Right	Thru	Left	Ped4	Eastbound SCHAFF Right	Thru	Left	Total
Totals	0	0	299	2	0	3	0	4	0	1	174	0	0	0	0	0	483
Factor			0.75	0.50		0.38		0.50		0.25	0.60						0.68
Entering			301				7				175				0		
Factor			0.75				0.58				0.60						
Exiting			303				0				177				3		
Factor			0.75								0.59				0.75		

Peak Vehicles

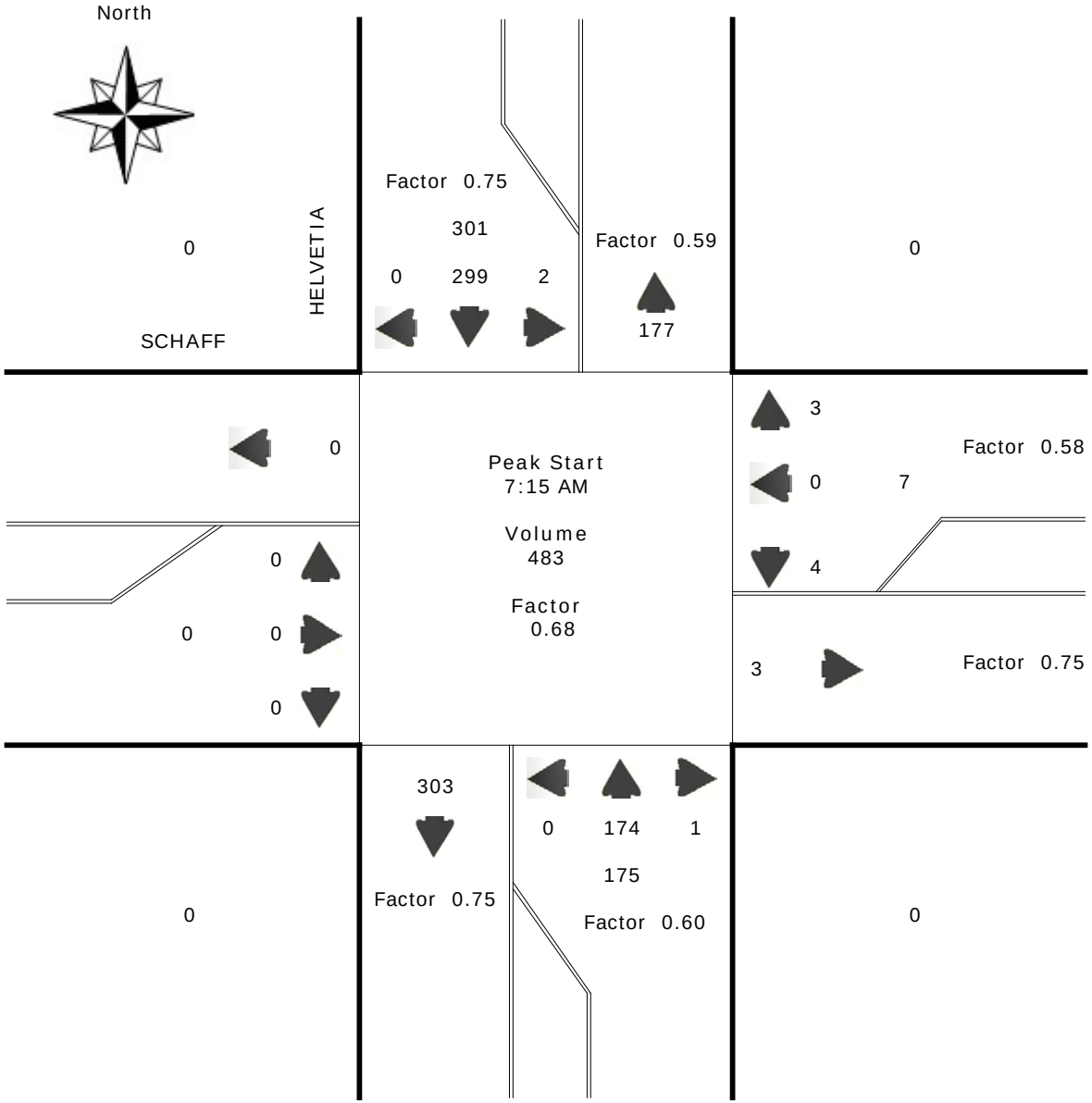
Cars	0	0	293	2	0	2	0	4	0	0	166	0	0	0	0	0	467
			98.0%	100%		66.7%		100%		0.0%	95.4%						96.7%
Light	0	0	6	0	0	0	0	0	0	0	8	0	0	0	0	0	14
			2.0%	0.0%		0.0%		0.0%		0.0%	4.6%						2.9%
Bike	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			0.0%	0.0%		0.0%		0.0%		0.0%	0.0%						0.0%
Medium	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	2
			0.0%	0.0%		33.3%		0.0%		100%	0.0%						0.4%
Heavy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			0.0%	0.0%		0.0%		0.0%		0.0%	0.0%						0.0%

LOCATION: HELVETIA RD @ SCHAFF RD 0600-0900
CITY: HILLSBORO, OR
FILENAME: V12CI 11-024 S

Site: 0016
Date: 5/25/2011
Wednesday

Peak Hour Detail

Peak Hour Diagram



LOCATION: BROOKWOOD PKWY @ MEEK RD 1600-1900
CITY: HILLSBORO, OR
FILENAME: V12CE 11-024 N

Site: 0016
Date: 5/25/2011
Wednesday

Peak Hour Detail

Interval		Southbound BROOKWOOD				Westbound MEEK				Northbound BROOKWOOD				Eastbound MEEK			
Begin	Ped1	Right	Thru	Left	Ped2	Right	Thru	Left	Ped3	Right	Thru	Left	Ped4	Right	Thru	Left	Total
4:00 PM	0	8	212	0	0	0	0	0	0	0	354	6	0	3	0	1	584
4:15 PM	0	2	231	0	0	0	0	0	0	0	433	9	0	5	0	2	682
4:30 PM	0	6	249	0	0	0	0	0	0	0	432	11	0	3	0	0	701
4:45 PM	0	3	218	0	0	0	0	0	0	0	384	8	0	3	0	2	618
5:00 PM	0	5	207	0	0	0	0	0	0	0	461	8	0	1	0	0	682
5:15 PM	0	1	203	0	0	0	0	2	0	0	486	6	0	7	0	1	706
5:30 PM	0	3	266	0	0	0	0	0	0	0	383	3	0	5	0	1	661
5:45 PM	0	3	248	0	0	0	0	0	0	0	378	1	0	0	0	0	630
6:00 PM	0	5	188	1	0	2	0	0	0	0	358	4	0	0	0	1	559
6:15 PM	0	4	138	0	0	0	0	0	0	0	288	7	0	0	0	0	437
6:30 PM	0	1	149	0	0	0	0	0	0	0	341	3	0	1	0	0	495
6:45 PM	0	0	169	0	0	0	0	0	0	0	216	5	0	1	0	0	391
Totals	0	41	2478	1	0	2	0	2	0	0	4514	71	0	29	0	8	7146
Entering			2520				4				4585				37		
Exiting			2509				112				4524				1		

Vehicle Totals

Cars	0	41	2434	1	0	2	0	2	0	0	4445	70	0	29	0	8	7032
		100%	98.2%	100%		100%		100%			98.5%	98.6%		100%		100%	98.4%
Light	0	0	24	0	0	0	0	0	0	0	31	1	0	0	0	0	56
		0.0%	1.0%	0.0%		0.0%		0.0%			0.7%	1.4%		0.0%		0.0%	0.8%
Bike	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	2
		0.0%	0.0%	0.0%		0.0%		0.0%			0.0%	0.0%		0.0%		0.0%	0.0%
Medium	0	0	19	0	0	0	0	0	0	0	31	0	0	0	0	0	50
		0.0%	0.8%	0.0%		0.0%		0.0%			0.7%	0.0%		0.0%		0.0%	0.7%
Heavy	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	6
		0.0%	0.0%	0.0%		0.0%		0.0%			0.1%	0.0%		0.0%		0.0%	0.1%

LOCATION: BROOKWOOD PKWY @ MEEK RD 1600-1900 | Site: 0016
CITY: HILLSBORO, OR | Date: 5/25/2011
FILENAME: V12CE 11-024 N | Wednesday

Peak Hour Detail

Peak Hour: 4:30 PM - 5:30 PM

Interval		Southbound BROOKWOOD				Westbound MEEK				Northbound BROOKWOOD				Eastbound MEEK			
Begin	Ped1	Right	Thru	Left	Ped2	Right	Thru	Left	Ped3	Right	Thru	Left	Ped4	Right	Thru	Left	Total
Totals	0	15	877	0	0	0	0	2	0	0	1763	33	0	14	0	3	2707
Factor		0.63	0.88					0.25			0.91	0.75		0.50		0.38	0.96
Entering			892				2				1796				17		
Factor			0.87				0.25				0.91				0.53		
Exiting			893				48				1766				0		
Factor			0.89				0.71				0.91						

Peak Vehicles

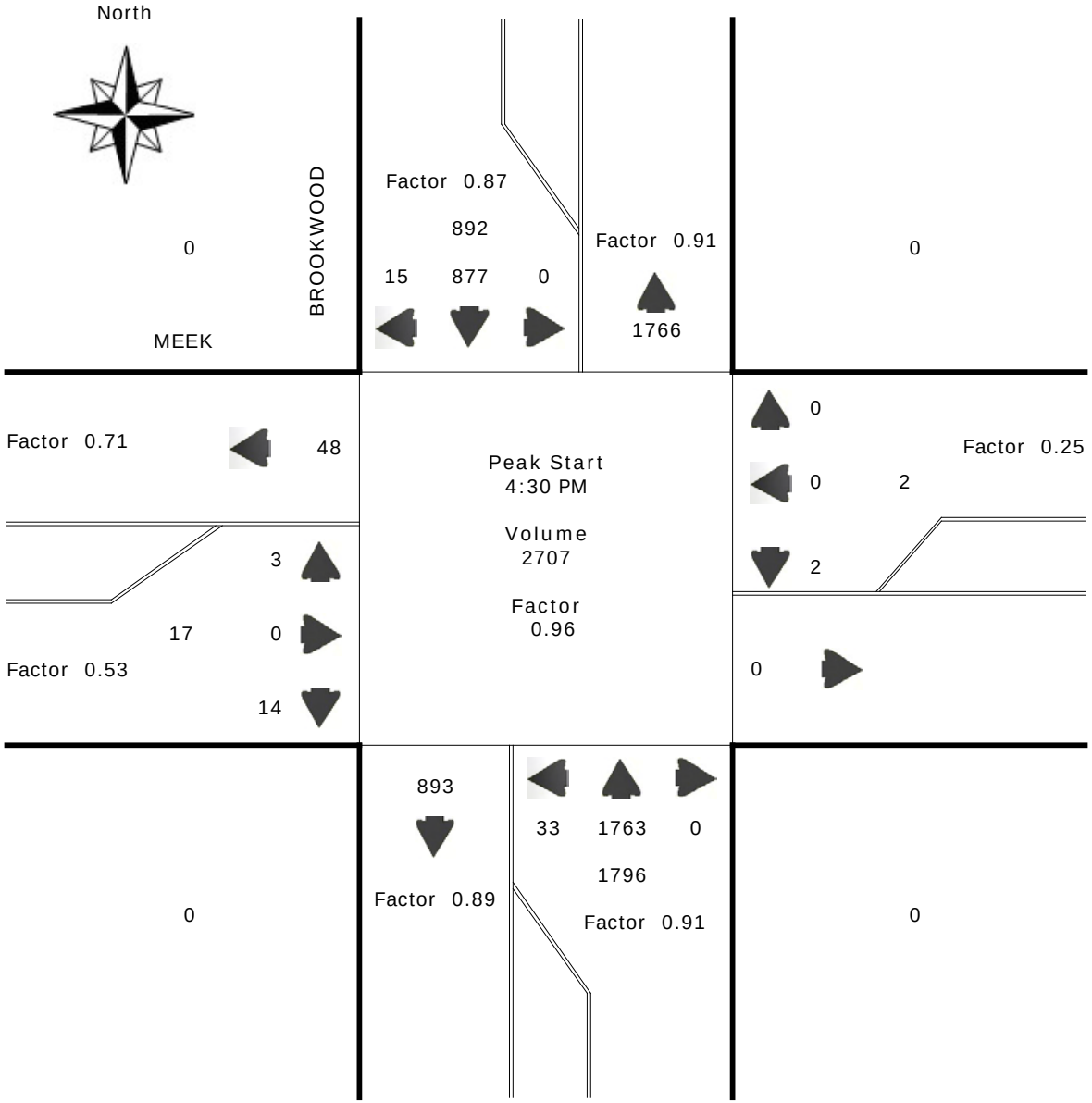
Cars	0	15	869	0	0	0	0	2	0	0	1736	33	0	14	0	3	2672
		100%	99.1%					100%			98.5%	100%		100%		100%	98.7%
Light	0	0	5	0	0	0	0	0	0	0	9	0	0	0	0	0	14
		0.0%	0.6%					0.0%			0.5%	0.0%		0.0%		0.0%	0.5%
Bike	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		0.0%	0.0%					0.0%			0.0%	0.0%		0.0%		0.0%	0.0%
Medium	0	0	3	0	0	0	0	0	0	0	16	0	0	0	0	0	19
		0.0%	0.3%					0.0%			0.9%	0.0%		0.0%		0.0%	0.7%
Heavy	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	2
		0.0%	0.0%					0.0%			0.1%	0.0%		0.0%		0.0%	0.1%

LOCATION: BROOKWOOD PKWY @ MEEK RD 1600-1900
CITY: HILLSBORO, OR
FILENAME: V12CE 11-024 N

Site: 0016
Date: 5/25/2011
Wednesday

Peak Hour Detail

Peak Hour Diagram



LOCATION: BROOKWOOD PKWY @ MEEK RD 0600-0900
CITY: HILLSBORO, OR
FILENAME: V12CF 11-024 N

Site: 0016
Date: 5/25/2011
Wednesday

Peak Hour Detail

Interval		Southbound BROOKWOOD				Westbound MEEK				Northbound BROOKWOOD				Eastbound MEEK			
Begin	Ped1	Right	Thru	Left	Ped2	Right	Thru	Left	Ped3	Right	Thru	Left	Ped4	Right	Thru	Left	Total
6:00 AM	0	1	176	0	0	0	0	0	0	0	162	1	0	3	0	0	343
6:15 AM	0	0	219	0	0	0	0	0	0	0	205	0	0	1	0	6	431
6:30 AM	0	2	308	0	0	0	0	0	0	0	196	0	0	2	0	0	508
6:45 AM	0	0	347	0	0	0	0	0	0	0	205	1	0	5	0	0	558
7:00 AM	0	0	343	0	0	0	0	0	0	1	159	0	0	5	0	2	510
7:15 AM	0	0	351	0	0	2	0	0	0	2	206	3	0	4	0	1	569
7:30 AM	0	1	428	0	0	0	0	0	0	1	218	2	0	4	0	6	660
7:45 AM	0	1	519	0	0	0	0	0	0	0	200	3	0	8	2	3	736
8:00 AM	0	1	441	0	0	0	0	0	0	0	174	0	0	3	0	4	623
8:15 AM	0	3	454	0	0	0	0	0	0	1	171	4	0	4	1	3	641
8:30 AM	0	1	413	0	0	0	0	0	0	1	228	1	0	2	0	3	649
8:45 AM	0	2	425	0	0	0	0	0	0	0	176	1	0	5	0	3	612
Totals	0	12	4424	0	0	2	0	0	0	6	2300	16	0	46	3	31	6840
Entering			4436				2				2322				80		
Exiting			4470				28				2333				9		

Vehicle Totals

Cars	0	10	4224	0	0	0	0	0	0	4	2150	15	0	43	0	26	6472
		83.3%	95.5%			0.0%				66.7%	93.5%	93.8%		93.5%	0.0%	83.9%	94.6%
Light	0	1	48	0	0	1	0	0	0	1	65	1	0	3	3	2	125
		8.3%	1.1%			50.0%				16.7%	2.8%	6.3%		6.5%	100%	6.5%	1.8%
Bike	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	2	5
		8.3%	0.0%			0.0%				0.0%	0.0%	0.0%		0.0%	0.0%	6.5%	0.1%
Medium	0	0	114	0	0	1	0	0	0	1	71	0	0	0	0	1	188
		0.0%	2.6%			50.0%				16.7%	3.1%	0.0%		0.0%	0.0%	3.2%	2.7%
Heavy	0	0	36	0	0	0	0	0	0	0	14	0	0	0	0	0	50
		0.0%	0.8%			0.0%				0.0%	0.6%	0.0%		0.0%	0.0%	0.0%	0.7%

LOCATION: BROOKWOOD PKWY @ MEEK RD 0600-0900 | Site: 0016
CITY: HILLSBORO, OR | Date: 5/25/2011
FILENAME: V12CF 11-024 N | Wednesday

Peak Hour Detail

Peak Hour: 7:30 AM - 8:30 AM

Interval		Southbound BROOKWOOD				Westbound MEEK				Northbound BROOKWOOD				Eastbound MEEK			
Begin	Ped1	Right	Thru	Left	Ped2	Right	Thru	Left	Ped3	Right	Thru	Left	Ped4	Right	Thru	Left	Total
Totals	0	6	1842	0	0	0	0	0	0	2	763	9	0	19	3	16	2660
Factor		0.50	0.89							0.50	0.88	0.56		0.59	0.38	0.67	0.90
Entering			1848				0				774				38		
Factor			0.89								0.88				0.73		
Exiting			1861				15				779				5		
Factor			0.88				0.54				0.87				0.63		

Peak Vehicles

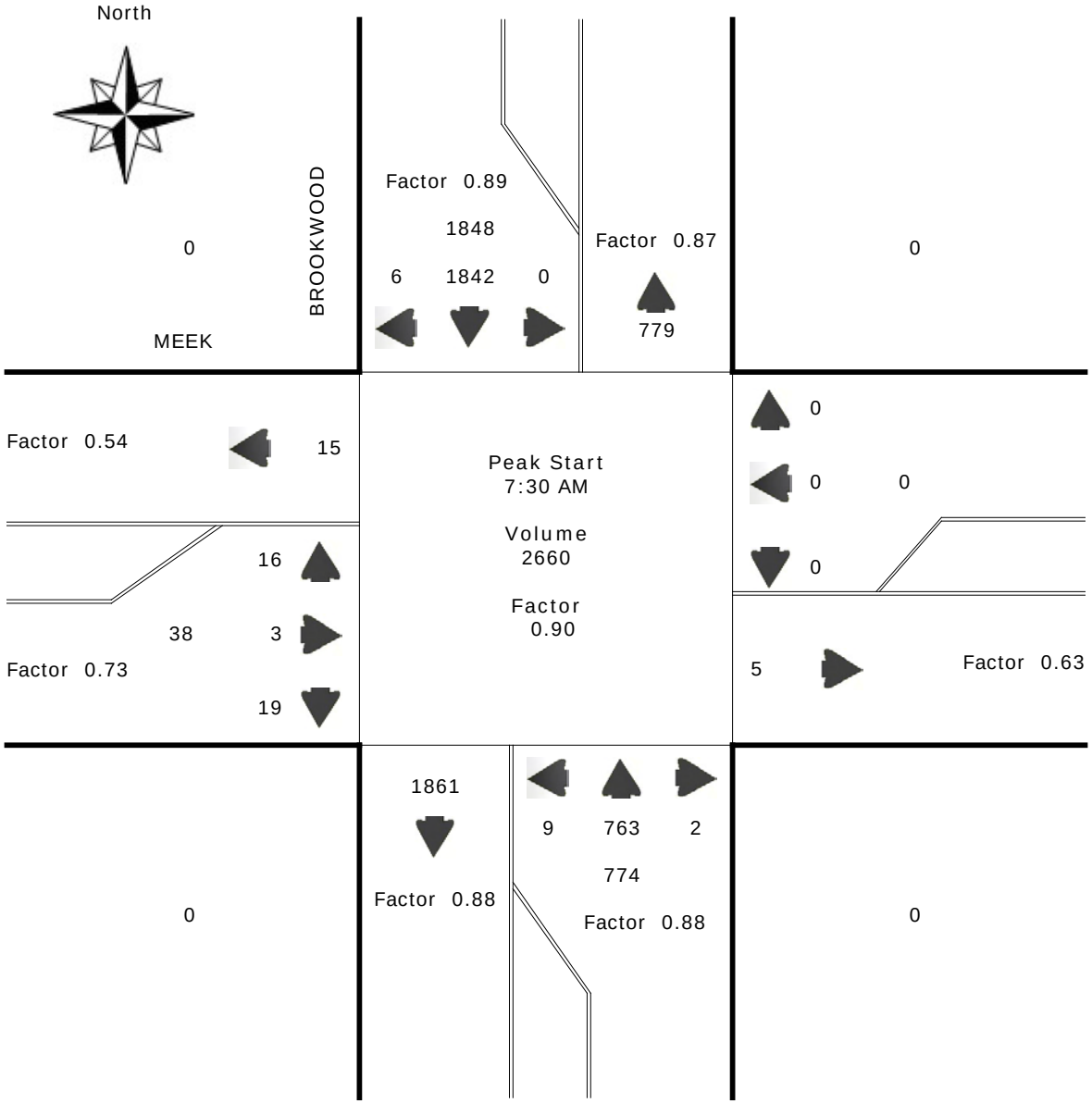
Cars	0	5	1778	0	0	0	0	0	0	2	702	8	0	17	0	15	2527
		83.3%	96.5%							100%	92.0%	88.9%		89.5%	0.0%	93.8%	95.0%
Light	0	1	18	0	0	0	0	0	0	0	25	1	0	2	3	1	51
		16.7%	1.0%							0.0%	3.3%	11.1%		10.5%	100%	6.3%	1.9%
Bike	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		0.0%	0.0%							0.0%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%
Medium	0	0	35	0	0	0	0	0	0	0	27	0	0	0	0	0	62
		0.0%	1.9%							0.0%	3.5%	0.0%		0.0%	0.0%	0.0%	2.3%
Heavy	0	0	11	0	0	0	0	0	0	0	9	0	0	0	0	0	20
		0.0%	0.6%							0.0%	1.2%	0.0%		0.0%	0.0%	0.0%	0.8%

LOCATION: BROOKWOOD PKWY @ MEEK RD 0600-0900
CITY: HILLSBORO, OR
FILENAME: V12CF 11-024 N

Site: 0016
Date: 5/25/2011
Wednesday

Peak Hour Detail

Peak Hour Diagram



LOCATION: HELVETIA RD @ GROVELAND RD 1600-1900
CITY: HILLSBORO, OR
FILENAME: V12BG 11-024 S 1

Site: 0014
Date: 5/25/2011
Wednesday

Peak Hour Detail

Interval		Southbound HELVETIA				Westbound JACOBSON				Northbound HELVETIA				Eastbound GROVELAND			
Begin	Ped1	Right	Thru	Left	Ped2	Right	Thru	Left	Ped3	Right	Thru	Left	Ped4	Right	Thru	Left	Total
4:00 PM	0	0	35	0	0	0	1	39	0	66	62	2	0	1	1	0	207
4:15 PM	0	0	45	2	0	0	0	47	0	120	87	4	0	4	0	0	309
4:30 PM	0	1	43	2	0	2	1	73	0	132	118	1	0	4	0	1	378
4:45 PM	0	0	25	0	0	1	0	40	0	92	95	2	0	3	0	0	258
5:00 PM	0	0	33	2	0	1	0	36	0	122	129	2	0	3	0	0	328
5:15 PM	0	0	29	1	0	2	0	32	0	159	111	5	0	2	0	0	341
5:30 PM	0	1	45	2	0	1	1	53	0	106	97	0	0	2	0	1	309
5:45 PM	0	0	31	2	0	4	0	33	0	103	67	0	0	0	0	0	240
6:00 PM	0	0	34	1	0	0	0	36	0	57	63	1	0	1	1	0	194
6:15 PM	0	0	23	2	0	1	0	30	0	50	54	2	0	0	0	0	162
6:30 PM	0	0	39	3	0	0	0	32	0	43	42	1	0	0	0	0	160
6:45 PM	0	0	34	1	0	1	0	18	0	29	37	2	0	2	0	0	124
Totals	0	2	416	18	0	13	3	469	0	1079	962	22	0	22	2	2	3010
Entering		436				485				2063				26			
Exiting		907				27				977				1099			

Vehicle Totals

Cars	0	2	413	17	0	13	3	463	0	1064	950	20	0	21	2	1	2969
		100%	99.3%	94.4%		100%	100%	98.7%		98.6%	98.8%	90.9%		95.5%	100%	50.0%	98.6%
Light	0	0	3	0	0	0	0	4	0	7	9	1	0	1	0	1	26
		0.0%	0.7%	0.0%		0.0%	0.0%	0.9%		0.6%	0.9%	4.5%		4.5%	0.0%	50.0%	0.9%
Bike	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	2
		0.0%	0.0%	5.6%		0.0%	0.0%	0.0%		0.1%	0.0%	0.0%		0.0%	0.0%	0.0%	0.1%
Medium	0	0	0	0	0	0	0	1	0	0	3	0	0	0	0	0	4
		0.0%	0.0%	0.0%		0.0%	0.0%	0.2%		0.0%	0.3%	0.0%		0.0%	0.0%	0.0%	0.1%
Heavy	0	0	0	0	0	0	0	1	0	7	0	1	0	0	0	0	9
		0.0%	0.0%	0.0%		0.0%	0.0%	0.2%		0.6%	0.0%	4.5%		0.0%	0.0%	0.0%	0.3%

LOCATION: HELVETIA RD @ GROVELAND RD 1600-1900 | Site: 0014
CITY: HILLSBORO, OR | Date: 5/25/2011
FILENAME: V12BG 11-024 S 1 | Wednesday

Peak Hour Detail

Peak Hour: 4:30 PM - 5:30 PM

Interval Begin	Ped1	Southbound HELVETIA Right	Thru	Left	Ped2	Westbound JACOBSON Right	Thru	Left	Ped3	Northbound HELVETIA Right	Thru	Left	Ped4	Eastbound GROVELAND Right	Thru	Left	Total
Totals	0	1	130	5	0	6	1	181	0	505	453	10	0	12	0	1	1305
Factor		0.25	0.76	0.63		0.75	0.25	0.62		0.79	0.88	0.50		0.75		0.25	0.86
Entering			136				188				968				13		
Factor			0.74				0.62				0.88				0.65		
Exiting			323				12				460				510		
Factor			0.67				0.60				0.88				0.80		

Peak Vehicles

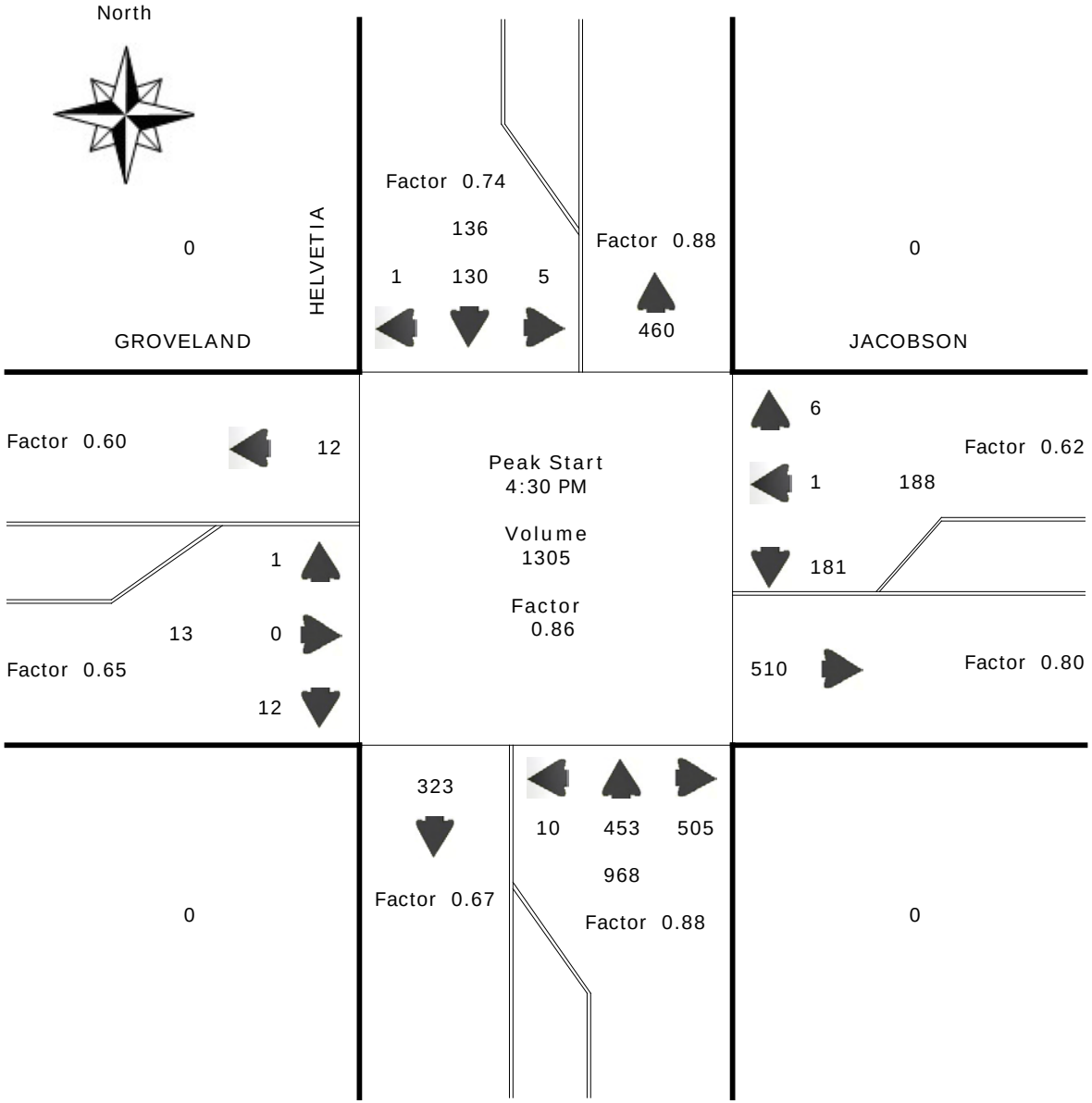
Cars	0	1	130	5	0	6	1	181	0	496	448	9	0	11	0	0	1288
		100%	100%	100%		100%	100%	100%		98.2%	98.9%	90.0%		91.7%		0.0%	98.7%
Light	0	0	0	0	0	0	0	0	0	3	5	1	0	1	0	1	11
		0.0%	0.0%	0.0%		0.0%	0.0%	0.0%		0.6%	1.1%	10.0%		8.3%		100%	0.8%
Bike	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		0.0%	0.0%	0.0%		0.0%	0.0%	0.0%		0.0%	0.0%	0.0%		0.0%		0.0%	0.0%
Medium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		0.0%	0.0%	0.0%		0.0%	0.0%	0.0%		0.0%	0.0%	0.0%		0.0%		0.0%	0.0%
Heavy	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	6
		0.0%	0.0%	0.0%		0.0%	0.0%	0.0%		1.2%	0.0%	0.0%		0.0%		0.0%	0.5%

LOCATION: HELVETIA RD @ GROVELAND RD 1600-1900
CITY: HILLSBORO, OR
FILENAME: V12BG 11-024 S 1

Site: 0014
Date: 5/25/2011
Wednesday

Peak Hour Detail

Peak Hour Diagram



LOCATION: HELVETIA RD @ GROVELAND RD 0600-0900
CITY: HILLSBORO, OR
FILENAME: V12BF 11-024 S

Site: 0016
Date: 5/25/2011
Wednesday

Peak Hour Detail

Interval		Southbound HELVETIA				Westbound JACOBSON				Northbound HELVETIA				Eastbound GROVELAND			
Begin	Ped1	Right	Thru	Left	Ped2	Right	Thru	Left	Ped3	Right	Thru	Left	Ped4	Right	Thru	Left	Total
6:00 AM	0	0	16	0	0	0	0	11	0	25	12	0	0	1	0	0	65
6:15 AM	0	0	26	0	0	1	0	20	0	32	12	1	0	0	0	0	92
6:30 AM	0	0	26	0	0	0	0	27	0	35	25	1	0	0	1	0	115
6:45 AM	0	0	23	1	0	1	0	35	0	70	31	1	0	1	0	0	163
7:00 AM	0	0	36	1	0	2	0	18	0	25	34	0	0	2	0	0	118
7:15 AM	0	1	60	1	0	1	1	39	0	41	42	0	0	0	0	0	186
7:30 AM	0	0	95	4	0	1	0	54	0	51	68	0	0	1	0	0	274
7:45 AM	0	0	87	2	0	1	0	51	0	74	33	0	0	1	0	0	249
8:00 AM	0	0	51	2	0	1	0	45	0	54	30	4	0	2	0	0	189
8:15 AM	0	0	48	2	0	0	0	43	0	40	21	1	0	0	0	0	155
8:30 AM	0	0	46	3	0	1	0	76	0	86	20	3	0	1	0	0	236
8:45 AM	0	0	49	7	0	1	0	81	0	89	20	2	0	0	1	0	250
Totals	0	1	563	23	0	10	1	500	0	622	348	13	0	9	2	0	2092
Entering		587				511				983				11			
Exiting		1072				15				358				647			

Vehicle Totals

Cars	0	1	550	22	0	7	1	479	0	596	335	12	0	9	2	0	2014
		100%	97.7%	95.7%		70.0%	100%	95.8%		95.8%	96.3%	92.3%		100%	100%		96.3%
Light	0	0	12	1	0	2	0	14	0	23	8	1	0	0	0	0	61
		0.0%	2.1%	4.3%		20.0%	0.0%	2.8%		3.7%	2.3%	7.7%		0.0%	0.0%		2.9%
Bike	0	0	1	0	0	0	0	2	0	0	2	0	0	0	0	0	5
		0.0%	0.2%	0.0%		0.0%	0.0%	0.4%		0.0%	0.6%	0.0%		0.0%	0.0%		0.2%
Medium	0	0	0	0	0	1	0	1	0	1	0	0	0	0	0	0	3
		0.0%	0.0%	0.0%		10.0%	0.0%	0.2%		0.2%	0.0%	0.0%		0.0%	0.0%		0.1%
Heavy	0	0	0	0	0	0	0	4	0	2	3	0	0	0	0	0	9
		0.0%	0.0%	0.0%		0.0%	0.0%	0.8%		0.3%	0.9%	0.0%		0.0%	0.0%		0.4%

LOCATION: HELVETIA RD @ GROVELAND RD 0600-0900 | Site: 0016
CITY: HILLSBORO, OR | Date: 5/25/2011
FILENAME: V12BF 11-024 S | Wednesday

Peak Hour Detail

Peak Hour: 7:15 AM - 8:15 AM

Interval Begin	Ped1	Southbound HELVETIA Right	Thru	Left	Ped2	Westbound JACOBSON Right	Thru	Left	Ped3	Northbound HELVETIA Right	Thru	Left	Ped4	Eastbound GROVELAND Right	Thru	Left	Total
Totals	0	1	293	9	0	4	1	189	0	220	173	4	0	4	0	0	898
Factor		0.25	0.77	0.56		1.00	0.25	0.88		0.74	0.64	0.25		0.50			0.82
Entering			303				194				397				4		
Factor			0.77				0.88				0.83				0.50		
Exiting			486				6				177				229		
Factor			0.81				0.38				0.64				0.75		

Peak Vehicles

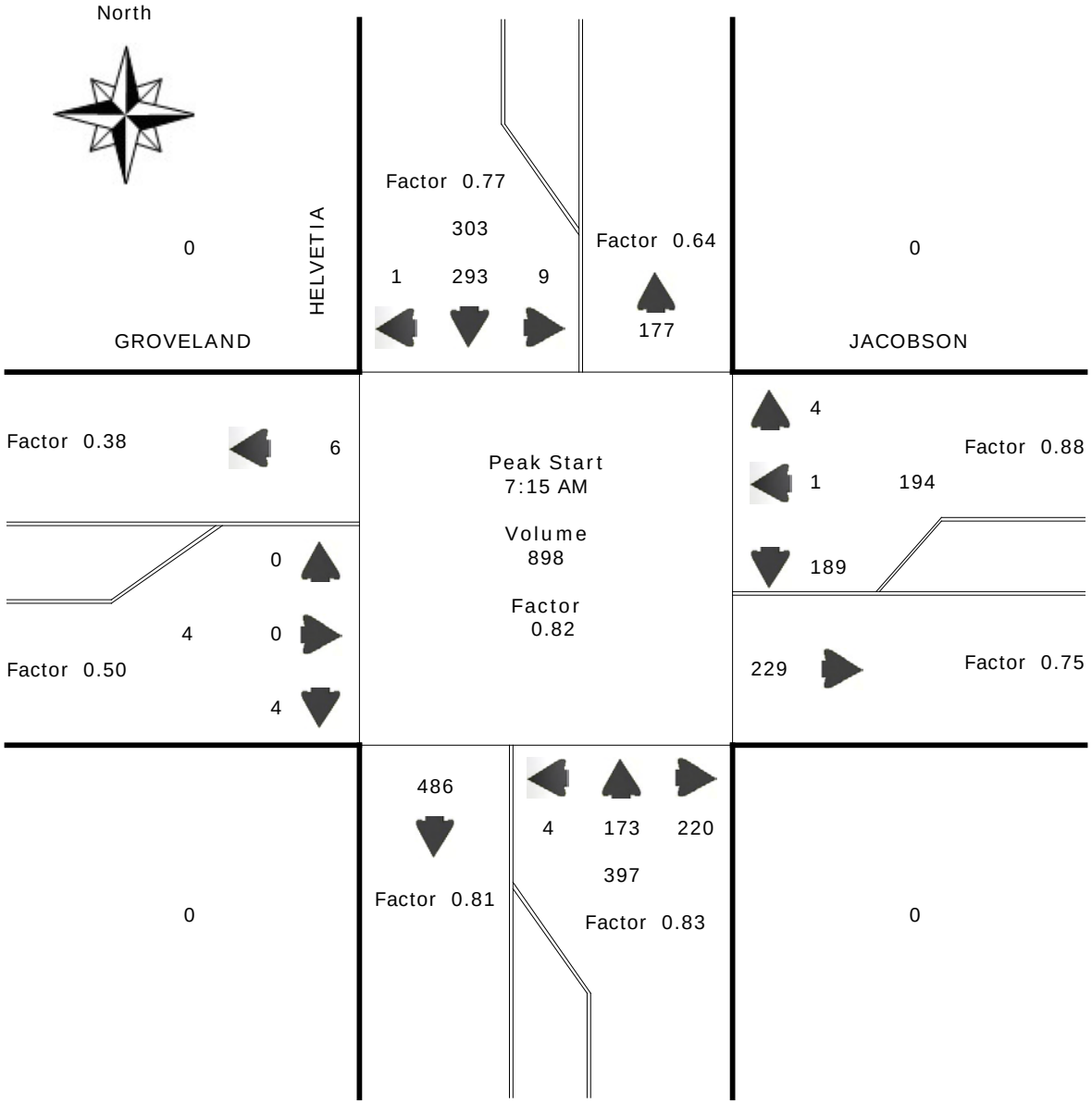
Cars	0	1	285	9	0	1	1	181	0	215	167	4	0	4	0	0	868
		100%	97.3%	100%		25.0%	100%	95.8%		97.7%	96.5%	100%		100%			96.7%
Light	0	0	8	0	0	2	0	6	0	2	6	0	0	0	0	0	24
		0.0%	2.7%	0.0%		50.0%	0.0%	3.2%		0.9%	3.5%	0.0%		0.0%			2.7%
Bike	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		0.0%	0.0%	0.0%		0.0%	0.0%	0.0%		0.0%	0.0%	0.0%		0.0%			0.0%
Medium	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	2
		0.0%	0.0%	0.0%		25.0%	0.0%	0.0%		0.5%	0.0%	0.0%		0.0%			0.2%
Heavy	0	0	0	0	0	0	0	2	0	2	0	0	0	0	0	0	4
		0.0%	0.0%	0.0%		0.0%	0.0%	1.1%		0.9%	0.0%	0.0%		0.0%			0.4%

LOCATION: HELVETIA RD @ GROVELAND RD 0600-0900
CITY: HILLSBORO, OR
FILENAME: V12BF 11-024 S

Site: 0016
Date: 5/25/2011
Wednesday

Peak Hour Detail

Peak Hour Diagram



Quality Counts
TRANSPORTATION DATA COLLECTION SERVICES

16285 SW 85th Ave, Ste 302
Tigard, OR 97224
Ph:503-620-4242

Date Counted: 7/20/11
Location/Intersection: US 26 Mainline East of Brookwood Pkwy Interchange

	Eastbound						
	Class 1	Class 2	Class 3	Class 4	Class 5	Class 6 - 13	
	Motorcycles	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single - >6 Axle Multi	Interval Total
5:00 AM	1	96	52	0	3	9	161
5:15 AM	4	142	88	0	3	7	244
5:30 AM	2	163	140	0	0	9	314
5:45 AM	2	167	144	0	3	9	325
6:00 AM	3	218	219	4	5	16	465
6:15 AM	1	276	272	1	18	25	593
6:30 AM	3	287	248	0	13	16	567
6:45 AM	4	277	269	1	12	13	576
7:00 AM	4	311	228	0	7	11	561
7:15 AM	4	282	287	1	10	30	614
7:30 AM	6	322	252	1	15	19	615
7:45 AM	3	232	247	2	11	25	520
8:00 AM	2	243	232	4	17	18	516
8:15 AM	3	227	247	3	10	29	519
8:30 AM	5	245	183	1	12	17	463
8:45 AM	2	197	213	0	7	30	449
9:00 AM	1	156	191	2	14	19	383
9:15 AM	1	208	224	1	7	23	464
9:30 AM	3	173	204	1	12	17	410
9:45 AM	0	170	167	1	16	31	385
10:00 AM	2	171	186	2	12	22	395
10:15 AM	2	150	170	1	11	28	362
10:30 AM	1	156	174	1	15	26	373
10:45 AM	0	154	207	0	10	15	386
11:00 AM	2	157	174	2	9	21	365
11:15 AM	2	175	195	0	17	22	411
11:30 AM	4	212	190	1	18	31	456
11:45 AM	4	159	199	1	14	21	398
12:00 PM	5	188	225	2	20	34	474
12:15 PM	12	198	204	3	12	25	454
12:30 PM	4	188	236	2	12	25	467
12:45 PM	7	189	215	2	13	21	447
1:00 PM	4	203	198	5	9	15	434
1:15 PM	3	203	193	2	23	31	455
1:30 PM	2	199	212	0	14	26	453
1:45 PM	1	178	209	3	10	23	424
2:00 PM	0	163	202	2	9	21	397
2:15 PM	9	193	194	2	7	21	426
2:30 PM	5	189	204	0	13	15	426
2:45 PM	3	202	241	0	14	19	479
3:00 PM	1	171	200	1	21	15	409
3:15 PM	1	212	273	2	11	11	510
3:30 PM	7	271	237	2	12	14	543
3:45 PM	3	256	211	5	6	9	490
4:00 PM	2	256	215	4	12	4	493
4:15 PM	3	260	224	1	9	9	506
4:30 PM	3	278	225	1	7	3	517
4:45 PM	4	277	223	0	9	9	522
5:00 PM	6	304	228	3	9	1	551
5:15 PM	7	352	268	1	4	9	641
5:30 PM	7	317	253	2	6	8	593
5:45 PM	6	326	240	2	6	4	584
6:00 PM	10	323	228	3	4	4	572
6:15 PM	5	297	221	0	4	7	534
6:30 PM	2	248	177	0	5	3	435
6:45 PM	5	233	188	1	4	4	435
7:00 PM	4	218	172	1	3	5	403
7:15 PM	2	169	131	0	5	5	312
7:30 PM	3	143	113	0	7	4	270
7:45 PM	4	146	139	0	3	3	295
8:00 PM	5	141	131	1	1	2	281
8:15 PM	2	183	155	1	0	3	344
8:30 PM	2	125	91	1	3	4	226
8:45 PM	1	93	111	0	0	3	208
9:00 PM	0	127	87	0	1	0	215
9:15 PM	1	135	67	0	3	4	210
9:30 PM	1	137	80	0	1	4	223
9:45 PM	2	81	54	0	0	1	138
10:00 PM	0	86	49	0	2	4	141
10:15 PM	0	79	34	0	0	2	115
10:30 PM	2	75	57	0	0	2	136
10:45 PM	1	51	43	0	0	4	99
Total	228	14389	13260	86	615	999	29577
%	0.77%	48.65%	44.83%	0.29%	2.08%	3.38%	
	Class 1	Class 2	Class 3	Class 4	Class 5	Class 6 - 13	

	Westbound						
	Class 1	Class 2	Class 3	Class 4	Class 5	Class 6 - 13	
	Motorcycles	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single - >6 Axle Multi	Interval Total
5:00 AM	0	43	52	0	3	6	104
5:15 AM	4	85	131	0	6	9	235
5:30 AM	6	150	176	1	8	13	354
5:45 AM	1	120	136	0	3	16	276
6:00 AM	2	121	105	0	3	18	249
6:15 AM	0	147	171	0	9	13	340
6:30 AM	2	195	192	1	6	26	422
6:45 AM	4	191	220	1	8	27	451
7:00 AM	7	191	203	1	8	12	422
7:15 AM	6	240	218	3	9	24	500
7:30 AM	9	263	329	0	12	23	636
7:45 AM	6	259	295	0	14	25	599
8:00 AM	2	241	240	1	13	26	523
8:15 AM	5	241	250	2	18	27	543
8:30 AM	2	231	290	5	21	15	564
8:45 AM	4	254	281	2	12	14	567
9:00 AM	4	221	261	5	16	20	527
9:15 AM	4	231	224	2	18	23	502
9:30 AM	0	206	230	2	14	28	480
9:45 AM	2	191	226	7	12	31	469
10:00 AM	2	190	193	3	11	36	435
10:15 AM	6	166	226	1	24	24	447
10:30 AM	3	175	227	1	14	29	449
10:45 AM	1	177	235	0	15	31	459
11:00 AM	3	177	208	3	16	28	435
11:15 AM	4	143	246	2	12	10	417
11:30 AM	8	186	230	1	23	19	467
11:45 AM	2	150	216	0	23	30	421
12:00 PM	8	167	202	1	12	20	410
12:15 PM	2	177	228	0	14	19	440
12:30 PM	2	168	203	1	11	21	406
12:45 PM	1	175	229	1	14	20	440
1:00 PM	0	195	210	3	7	23	438
1:15 PM	3	245	208	3	13	20	492
1:30 PM	1	284	230	0	6	18	539
1:45 PM	0	217	184	0	3	22	426
2:00 PM	1	224	203	2	3	27	460
2:15 PM	2	233	256	0	2	16	509
2:30 PM	2	239	251	1	2	14	509
2:45 PM	4	254	229	0	8	9	504
3:00 PM	3	248	236	2	4	3	496
3:15 PM	2	289	239	3	2	4	539
3:30 PM	4	284	264	3	8	11	574
3:45 PM	0	259	347	0	6	3	615
4:00 PM	0	284	314	4	6	5	613
4:15 PM	1	262	323	6	5	7	604
4:30 PM	0	304	330	0	7	9	650
4:45 PM	2	334	292	0	9	8	645
5:00 PM	1	315	326	0	3	5	650
5:15 PM	2	318	327	1	4	5	657
5:30 PM	2	289	279	0	2	3	575
5:45 PM	2	270	272	0	0	8	552
6:00 PM	3	283	259	1	8	5	559
6:15 PM	2	247	225	1	4	1	480
6:30 PM	3	241	210	1	3	4	462
6:45 PM	0	161	151	0	5	2	319
7:00 PM	0	149	142	0	1	3	295
7:15 PM	0	189	184	0	1	5	379
7:30 PM	0	155	150	0	3	5	313
7:45 PM	0	138	159	0	3	0	300
8:00 PM	0	136	146	0	4	4	290
8:15 PM	0	134	139	0	0	3	276
8:30 PM	0	128	132	0	3	1	264
8:45 PM	0	146	104	0	3	3	256
9:00 PM	2	120	129	0	0	4	255
9:15 PM	0	107	124	0	4	2	237
9:30 PM	0	148	119	0	1	0	268
9:45 PM	1	93	75	0	3	0	172
10:00 PM	0	108	78	0	1	2	189
10:15 PM	0	90	83	0	0	1	174
10:30 PM	0	68	61	0	0	2	131
10:45 PM	0	62	70	0	2	0	134
Total	155	14122	14933	78	551	950	30789
%	0.50%	45.87%	48.50%	0.25%	1.79%	3.09%	
	Class 1	Class 2	Class 3	Class 4	Class 5	Class 6 - 13	

Appendix B:

Volume Development Worksheets

Table 1: Seasonal Adjustment Worksheet

Bend-Empire (09-007) US97; MP 135.95; THE DALLES-CALIFORNIA HIGHWAY NO. 4; 0.49 mile south of Empire Avenue

Peak Month

Year	Month	% ADT	AWT
2009	Aug	118	50,000
2008	Jul	118	51,366
2007	Aug	117	54,739
2006	Aug	117	54,043
2005	Aug	121	52,537
		117.7	**52,035**

Count Month (May)

Year	Month	% ADT	AWT
2009	May	112	47,067
2008	May	113	49,172
2007	May	110	51,388
2006	May	109	50,069
2005	May	110	47,796

Count Month (June)

Year	Month	% ADT	AWT
2009	June	116	49,000
2008	June	117	50,599
2007	June	116	54,126
2006	June	115	52,992
2005	June	112	48,800

Count Month Average

Year	Month	% ADT	AWT
2009	May-Jun	114	48,034
2008	May-Jun	115	49,886
2007	May-Jun	113	52,757
2006	May-Jun	112	51,531
2005	May-Jun	111	48,298
		113.0	**50,774**

Seasonal Factor **1.04**

Beltline (20-011) OR569; MP 12.00; BELTLINE HIGHWAY NO. 69; 0.76 mile west of Pacific Highway No. 1 (I-5)

Peak Month

Year	Month	% ADT	AWT
2009	Aug	118	57,413
2008	June	112	50,600
2007	Aug	110	52,000
2006	June	112	55,584
2005	June	127	66,607
		114.0	**54,532**

Count Month (May)

Year	Month	% ADT	AWT
2009	May	103	50,000
2008	May	106	48,200
2007	May	106	50,100
2006	May	107	53,195
2005	May	112	58,336

Count Month (June)

Year	Month	% ADT	AWT
2009	June	107	52,000
2008	June	112	50,600
2007	June	107	50,500
2006	June	112	55,584
2005	June	127	66,607

Count Month Average

Year	Month	% ADT	AWT
2009	May-Jun	105	51,000
2008	May-Jun	109	49,400
2007	May-Jun	106.5	50,300
2006	May-Jun	109.5	54,390
2005	May-Jun	119.5	62,472
		108.3	**51,363**

Seasonal Factor **1.05**

2 ATR Average **1.05**

Note: Data shown in grray was removed from calculation as per APM

Table 2: 2035 Link Volume Calculations for the AM Peak Period

				Volumes	Model	Model	2005-2035 Model Comparison			2035 Volume Estimates						
Road	From	To	Direction	2011	2005	2035	Annual Growth	Total Growth	Volume Growth	Volume Difference	Volume Growth	Absolute Difference	Average	Forecast Used	Method Used	Comments
Helvetia Rd/Brookwood Pkwy	Genentech	Huffman St	NB	850	1098	1406	0.9%	22.4%	246	1096	1041	5%	1069	**1096**	Difference Method	To be consistent with method used for opposing direction
	Huffman St	Genentech	SB	1825	1322	2281	2.4%	58.0%	767	2592	2884	11%	2738	**2592**	Difference Method	Absolute difference >10% --> Used difference only
	Huffman St	Meek Rd	NB	855	1016	1429	1.4%	32.5%	330	1185	1133	5%	1159	**1185**	Difference Method	To be consistent with method used for opposing direction
	Meek Rd	Huffman St	SB	1955	1360	2491	2.8%	66.5%	905	2860	3256	13%	3058	**2860**	Difference Method	Absolute difference >10% --> Used difference only
	Meek Rd	EB Ramp Terminal	NB	855	1069	1508	1.4%	32.9%	351	1206	1136	6%	1171	**1206**	Difference Method	To be consistent with method used for opposing direction
	EB Ramp Terminal	Meek Rd	SB	1935	1313	2408	2.8%	66.7%	876	2811	3226	14%	3018	**2811**	Difference Method	Absolute difference >10% --> Used difference only
	EB Ramp Terminal	WB off-ramps	NB	415	595	1004	2.3%	55.0%	327	742	643	14%	693	**742**	Difference Method	Absolute difference >10% --> Used difference only
	WB off-ramps	EB Ramp Terminal	SB	1780	1246	2141	2.4%	57.5%	716	2496	2803	12%	2649	**2496**	Difference Method	Absolute difference >10% --> Used difference only
	WB off-ramps	WB on-ramp	NB	455	648	1129	2.5%	59.4%	385	840	725	15%	782	**840**	Difference Method	Absolute difference >10% --> Used difference only
	WB on-ramp	WB off-ramps	SB	490	596	823	1.3%	30.5%	182	672	639	5%	655	**672**	Difference Method	To be consistent with method used for opposing direction
	WB on-ramp	Jacobson Rd	NB	395	556	961	2.4%	58.3%	324	719	625	14%	672	**719**	Difference Method	Absolute difference >10% --> Used difference only
	Jacobson Rd	WB on-ramp	SB	515	711	1002	1.4%	32.7%	233	748	684	9%	716	**748**	Difference Method	To be consistent with method used for opposing direction
	Jacobson Rd	Schaff Rd	NB	165	259	529	3.5%	83.4%	216	381	303	23%	342	**381**	Difference Method	Absolute difference >10% --> Used difference only
	Schaff Rd	Jacobson Rd	SB	315	427	724	2.3%	55.6%	238	553	490	12%	521	**553**	Difference Method	Absolute difference >10% --> Used difference only
	Schaff Rd	West Union Rd	NB	165	259	308	0.6%	15.1%	39	204	190	7%	197	**204**	Difference Method	To be consistent with method used for opposing direction
	West Union Rd	Schaff Rd	SB	315	427	690	2.1%	49.3%	210	525	470	11%	498	**525**	Difference Method	Absolute difference >10% --> Used difference only
Huffman Street	E of Brookwood Pkwy	Brookwood Pkwy	WB	40	33	392	36.3%	870.3%	287	327	388	17%	358	**327**	Difference Method	Absolute difference >10% --> Used difference only
	Brookwood Pkwy	E of Brookwood Pkwy	EB	165	154	436	6.1%	146.5%	226	391	407	4%	399	**391**	Difference Method	To be consistent with method used for opposing direction
	Brookwood Pkwy	W of Brookwood Pkwy	WB	0	0	371	-	-	371	371	-	-	371	**371**	Manual	Not in 2005 model - used 2035 volume
	W of Brookwood Pkwy	Brookwood Pkwy	EB	0	0	229	-	-	229	229	-	-	229	**229**	Manual	Not in 2005 model - used 2035 volume
Meek Road	Brookwood Pkwy	Sewell Rd	WB	15	8	53	18.8%	450.0%	36	51	83	47%	67	**51**	Difference Method	Absolute difference >10% --> Used difference only
	Sewell Rd	Brookwood Pkwy	EB	45	109	215	3.2%	77.8%	85	130	80	47%	105	**130**	Difference Method	Absolute difference >10% --> Used difference only
EB Ramp Terminal	US-26 off	Brookwood Pkwy	EB	260	249	509	3.5%	83.5%	208	468	477	2%	473	**473**	Average of Difference and Growth	
	Brookwood Pkwy	US-26 on	EB	545	656	746	0.5%	11.0%	72	617	605	2%	611	**611**	Average of Difference and Growth	
WB Off-Ramps	US-26 off	NB Helvetia	WB	40	54	124	4.3%	103.7%	56	96	81	16%	89	**96**	Difference Method	Absolute difference >10% --> Used difference only
	US-26 off	SB Helvetia	EB	1290	650	1318	3.4%	82.2%	534	1824	2351	25%	2087	**1824**	Difference Method	Absolute difference >10% --> Used difference only
WB on-ramp	Helvetia Rd	US-26 on	WB	85	209	346	2.2%	52.4%	110	195	130	40%	162	**130**	Difference Method	Absolute difference >10% --> Used difference only
Jacobson Road	E of Helvetia Rd	Helvetia Rd	WB	215	285	302	0.2%	4.8%	14	229	225	1%	227	**227**	Average of Difference and Growth	
	Helvetia Rd	E of Helvetia Rd	EB	245	298	456	1.8%	42.4%	126	371	349	6%	360	**360**	Average of Difference and Growth	
Schaff Road	E of Helvetia Rd	Helvetia Rd	WB	10	0	46	-	-	46	56	-	-	56	**56**	Manual	Not in 2005 model - used 2035 volume
	Helvetia Rd	E of Helvetia Rd	EB	10	0	232	-	-	232	242	-	-	242	**242**	Manual	Not in 2005 model - used 2035 volume

Greater than 10% difference between difference and growth methods

Table 3: 2035 Link Volume Calculations for the PM Peak Period

Road	From	To	Direction	Volumes 2011	Model 2005	Model 2035	2005-2035 Model Comparison Annual Growth	Total Growth	Volume Difference	2035 Volume Estimates Volume Difference	Volume Growth	Absolute Difference	Average	Forecast Used	Method Used	Comments
Helvetia Rd/Brookwood Pkwy	Genentech	Huffman St	NB	1750	1178	2025	2.4%	57.5%	678	2428	2757	13%	2592	**2428**	Difference Method	Absolute difference >10% --> Used difference only
	Huffman St	Genentech	SB	930	1160	1389	0.7%	15.8%	183	1113	1077	3%	1095	**1113**	Difference Method	To be consistent with method used for opposing direction
	Huffman St	Meek Rd	NB	1900	1196	2162	2.7%	64.6%	773	2673	3128	16%	2900	**2673**	Difference Method	Absolute difference >10% --> Used difference only
	Meek Rd	Huffman St	SB	960	1086	1522	1.3%	32.1%	349	1309	1268	3%	1289	**1309**	Difference Method	To be consistent with method used for opposing direction
	Meek Rd	EB Ramp Terminal	NB	1870	1164	2068	2.6%	62.1%	723	2593	3032	16%	2813	**2593**	Difference Method	Absolute difference >10% --> Used difference only
	EB Ramp Terminal	Meek Rd	SB	955	1087	1498	1.3%	30.2%	329	1284	1244	3%	1264	**1284**	Difference Method	To be consistent with method used for opposing direction
	EB Ramp Terminal	WB off-ramps	NB	1165	680	1293	3.0%	72.1%	490	1655	2005	19%	1830	**1655**	Difference Method	Absolute difference >10% --> Used difference only
	WB off-ramps	EB Ramp Terminal	SB	910	1045	1345	1.0%	23.0%	240	1150	1119	3%	1134	**1150**	Difference Method	To be consistent with method used for opposing direction
	WB off-ramps	WB on-ramp	NB	1235	786	1422	2.7%	64.7%	509	1744	2034	15%	1889	**1744**	Difference Method	Absolute difference >10% --> Used difference only
	WB on-ramp	WB off-ramps	SB	265	430	599	1.3%	31.4%	135	400	348	14%	374	**400**	Difference Method	Absolute difference >10% --> Used difference only
	WB on-ramp	Jacobson Rd	NB	1025	596	1109	2.9%	68.9%	410	1435	1731	19%	1583	**1435**	Difference Method	Absolute difference >10% --> Used difference only
	Jacobson Rd	WB on-ramp	SB	345	592	841	1.4%	33.6%	199	544	461	17%	503	**544**	Difference Method	Absolute difference >10% --> Used difference only
	Jacobson Rd	Schaff Rd	NB	485	349	722	3.6%	85.5%	298	783	900	14%	842	**783**	Difference Method	Absolute difference >10% --> Used difference only
	Schaff Rd	Jacobson Rd	SB	155	317	484	1.8%	42.1%	134	289	220	27%	254	**289**	Difference Method	Absolute difference >10% --> Used difference only
	Schaff Rd	West Union Rd	NB	480	349	490	1.3%	32.3%	113	593	635	7%	614	**614**	Average of Difference and Growth	
	West Union Rd	Schaff Rd	SB	150	317	339	0.2%	5.6%	18	168	158	6%	163	**163**	Average of Difference and Growth	
Huffman Street	E of Brookwood Pkwy	Brookwood Pkwy	WB	175	148	477	7.4%	177.8%	263	438	486	10%	462	**438**	Difference Method	Absolute difference >10% --> Used difference only
	Brookwood Pkwy	E of Brookwood Pkwy	EB	55	56	589	31.7%	761.4%	426	481	474	2%	478	**481**	Difference Method	To be consistent with method used for opposing direction
	Brookwood Pkwy	W of Brookwood Pkwy	WB	0	0	323	-	-	258	258	-	-	258	**258**	Manual	Not in 2005 model - used 2035 volume
	W of Brookwood Pkwy	Brookwood Pkwy	EB	0	0	439	-	-	351	351	-	-	351	**351**	Manual	Not in 2005 model - used 2035 volume
Meek Road	Brookwood Pkwy	Sewell Rd	WB	50	52	189	8.8%	210.8%	110	160	155	3%	157	**157**	Average of Difference and Growth	
	Sewell Rd	Brookwood Pkwy	EB	20	20	119	16.5%	396.0%	79	99	99	0%	99	**99**	Average of Difference and Growth	
EB Ramp Terminal	US-26 off	Brookwood Pkwy	EB	125	220	219	0.0%	-0.4%	-1	124	125	0%	124	**124**	Average of Difference and Growth	
	Brookwood Pkwy	US-26 on	EB	785	663	841	0.9%	21.5%	142	927	954	3%	941	**941**	Average of Difference and Growth	
WB Off-Ramps	US-26 off	NB Helvetia	WB	70	106	129	0.7%	17.4%	18	88	82	7%	85	**85**	Average of Difference and Growth	
	US-26 off	SB Helvetia	EB	645	615	746	0.7%	17.0%	105	750	755	1%	752	**752**	Average of Difference and Growth	
WB on-ramp	Helvetia Rd	US-26 on	WB	290	353	556	1.9%	46.0%	162	452	423	7%	438	**438**	Average of Difference and Growth	
Jacobson Road	E of Helvetia Rd	Helvetia Rd	WB	200	277	363	1.0%	24.8%	69	269	250	7%	259	**269**	Difference Method	To be consistent with method used for opposing direction
	Helvetia Rd	E of Helvetia Rd	EB	550	248	393	1.9%	46.8%	116	666	807	19%	737	**666**	Difference Method	Absolute difference >10% --> Used difference only
Schaff Road	E of Helvetia Rd	Helvetia Rd	WB	5	0	157	-	-	126	131	-	-	131	**131**	Manual	Not in 2005 model - used 2035 volume
	Helvetia Rd	E of Helvetia Rd	EB	5	0	244	-	-	195	200	-	-	200	**200**	Manual	Not in 2005 model - used 2035 volume

Greater than 10% difference between difference and growth methods

Project: Brookwood IAMP
Job #: ODOT0000-0701
Subject: Turning Movement Volume Development
AM Peak Hour Volumes 7:30 AM - 8:30 AM

Table 4: Turning Movements for 2011 and 2035
AM Peak Hour Volumes 7:30 AM - 8:30 AM

				2011 Existing Conditions								2035 Fatal Flaw				
	Intersection	Direction	Movement	2011 Existing Raw Counts	Annual Growth Factor = 1.00 Seasonal GF = 1.05	Seasonal Growth	Volumes rounded to nearest 5 vehicles	Final Balanced Volumes for Synchro (2011 config)	Balanced and Rounded Volumes Change	Final Balanced Volumes for Synchro (2035 config)		2035 Fatal Flaw NCHRP 255-Link Unbalanced	Final Balanced Volumes for Synchro	2011 - 2035 Volume Growth		Opening Year 2015	Opening Year 2025
1	**Helvetia Rd & Schaff Rd**		L	0	0	0	0	0	0	0		0	0	0			
	3 hr Turning Movement Counts	EB	T	0	0	0	0	0	0	0		0	0	0			
	Count Date: 5/25/2011		R	0	0	0	0	0	0	0		0	0	0			
			L	3	3	0	5	5	2	5		50	45	40		5	20
	Unsignalized	WB	T	0	0	0	0	0	0	0		0	0	0			
			R	3	3	0	5	5	2	5		9	10	5		5	5
			L	0	0	0	0	0	0	0		0	0	0			
	AM Peak Hour: 7:15 AM-8:15 AM	NB	T	153	161	8	160	145	-16	155		150	155	0		175	210
	AM Peak Hour Used: 7:30 AM-8:30 AM		R	1	1	0	0	5	4	5		196	200	195		10	45
			L	2	2	0	0	5	3	5		46	45	40		5	20
	PHF:	SB	T	293	308	15	310	310	2	315		443	425	110		365	385
	0.64		R	0	0	0	0	0	0	0		0	0	0			
		TEV		**455**	**478**	**23**	**480**	**475**	**-3**	**490**		**894**	**880**	**390**		**540**	**690**
2	**Helvetia Rd & Jacobson Rd**		L	0	0	0	0	0	0	0		0	0	0			
	3 hr Turning Movement Counts	EB	T	0	0	0	0	0	0	0		0	0	0			
	Count Date: 5/25/2011		R	4	4	0	5	5	1	0		0	0	0			
			L	193	203	10	205	165	-38	165		171	165	0		165	165
	Unsignalized	WB	T	0	0	0	0	0	0	0		0	0	0			
			R	3	3	0	5	5	2	5		7	5	0		5	5
			L	5	5	0	5	5	0	0		0	0	0			
	AM Peak Hour: 7:15 AM-8:15 AM	NB	T	152	160	8	160	145	-15	155		329	350	195		180	250
	AM Peak Hour Used: 7:30 AM-8:30 AM		R	219	230	11	230	210	-20	230		268	290	60		240	265
			L	10	11	1	10	10	-1	10		14	15	5		10	15
	PHF:	SB	T	281	295	14	295	305	10	310		471	455	145		360	390
	0.79		R	0	0	0	0	0	0	0		0	0	0			
		TEV		**867**	**910**	**43**	**915**	**850**	**-60**	**875**		**1260**	**1280**	**405**		**930**	**1090**
3	**Helvetia Rd & WB On-ramp**		L	0	0	0	0	0	0	0		0	0	0			
	16 hr Turning Movement Counts	EB	T	0	0	0	0	0	0	0		0	0	0			
	Count Date: 7/20/2011		R	0	0	0	0	0	0	0		0	0	0			
			L	0	0	0	0	0	0	0		0	0	0			
	Signalized	WB	T	0	0	0	0	0	0	0		0	0	0			
			R	0	0	0	0	0	0	0		0	0	0			
			L	31	31	0	30	0	-31	30		50	55	25		35	45
	AM Peak Hour: 7:30 AM-8:30 AM	NB	T	245	245	0	245	0	-245	385		609	640	255		420	515
	AM Peak Hour Used: 7:30 AM-8:30 AM		R	0	0	0	0	0	0	0		0	0	0			
			L	0	0	0	0	0	0	0		0	0	0			
	PHF:	SB	T	386	386	0	385	0	-386	450		567	585	135		470	525
	0.82		R	26	26	0	25	0	-26	25		33	35	10		25	30
		TEV		**688**	**688**	**0**	**685**	**0**	**-688**	**890**		**1259**	**1315**	**425**		**950**	**1120**
4	**Helvetia Rd & WB Off-ramps**		L	0	0	0	0	0	0	0		0	0	0			
	16 hr Turning Movement Counts	EB	T	0	0	0	0	0	0	0		0	0	0			
	Count Date: 7/20/2011		R	0	0	0	0	0	0	1260		1794	1795	535		1335	1550
			L	1260	1260	0	1260	1260	0	0		0	0	0			
	Signalized (2011)	WB	T	0	0	0	0	0	0	0		0	0	0			
	Unsignalized (2035)		R	41	41	0	40	40	-1	40		96	95	55		45	65
			L	31	31	0	30	55	24	0		0	0	0			
	AM Peak Hour: 7:30 AM-8:30 AM	NB	T	245	245	0	245	320	75	375		604	600	225		405	495
	AM Peak Hour Used: 7:30 AM-8:30 AM		R	0	0	0	0	0	0	0		0	0	0			
			L	0	0	0	0	0	0	0		0	0	0			
	PHF:	SB	T	386	386	0	385	450	64	450		567	585	135		470	525
	0.82		R	26	26	0	25	25	-1	0		0	0	0			
		TEV		**1989**	**1989**	**0**	**1985**	**2150**	**161**	**2125**		**3061**	**3075**	**950**		**2260**	**2635**
5	**Brookwood Pkwy & EB Ramps**		L	40	40	0	40	60	20	60		87	85	25		65	75
	16 hr Turning Movement Counts	EB	T	0	0	0	0	0	0	0		0	0	0			
	Count Date: 7/20/2011		R	139	139	0	140	175	36	175		274	275	100		190	230
			L	0	0	0	0	0	0	0		0	0	0			
	Signalized	WB	T	0	0	0	0	0	0	0		0	0	0			
			R	0	0	0	0	0	0	0		0	0	0			
			L	0	0	0	0	0	0	0		0	0	0			
	AM Peak Hour: 7:15 AM-8:15 AM	NB	T	227	227	0	225	315	88	315		515	515	200		345	420
	AM Peak Hour Used: 7:30 AM-8:30 AM		R	436	436	0	435	465	29	465		503	505	40		470	490
			L	41	41	0	40	40	-1	40		34	35	-5		40	35
	PHF:	SB	T	1597	1597	0	1595	1670	73	1670		2347	2345	675		1765	2040
	0.86		R	0	0	0	0	0	0	0		0	0	0			
		TEV		**2480**	**2480**	**0**	**2475**	**2725**	**245**	**2725**		**3760**	**3760**	**1035**		**2875**	**3290**
6	**Brookwood Pkwy & Meek Rd**		L	16	17	1	15	15	-2	15		51	50	35		20	30
	3 hr Turning Movement Counts	EB	T	3	3	0	5	5	2	5		0	0	-5		0	0
	Count Date: 5/25/2011		R	19	20	1	20	20	0	20		78	80	60		25	45
			L	0	0	0	0	0	0	0		0	0	0			
	Unsignalized	WB	T	0	0	0	0	0	0	0		0	0	0			
			R	0	0	0	0	0	0	0		0	0	0			
			L	9	9	0	10	10	1	10		33	35	25		10	20
	AM Peak Hour: 7:30 AM-8:30 AM	NB	T	763	801	38	800	765	-36	765		970	970	205		795	880
	AM Peak Hour Used: 7:30 AM-8:30 AM		R	2	2	0	0	5	3	5		0	0	-5		0	0
			L	0	0	0	0	0	0	0		0	0	0			
	PHF:	SB	T	1842	1934	92	1935	1840	-94	1840		2591	2600	760		1950	2060
	0.90		R	6	6	0	5	5	-1	5		18	20	15		5	10
		TEV		**2660**	**2793**	**133**	**2790**	**2665**	**-128**	**2665**		**3742**	**3755**	**1090**		**2820**	**3255**

Project: Brookwood IAMP
Job #: ODOT0000-0701
Subject: Turning Movement Volume Development
PM Peak Hour Volumes 4:30 PM - 5:30 PM

Table 5: Turning Movements for 2011 and 2035
PM Peak Hour Volumes 4:30 PM - 5:30 PM

				2011 Existing Conditions								2035 Fatal Flaw				
	Intersection	Direction	Movement	2011 Existing Raw Counts	Annual Growth Factor = 1.00 Seasonal GF = 1.05	Seasonal Growth	Volumes rounded to nearest 5 vehicles	Final Balanced Volumes for Synchro (2011 config)	Balanced and Rounded Volumes Change	Final Balanced Volumes for Synchro (2035 config)		2035 Fatal Flaw NCHRP 255-Link Unbalanced	Final Balanced Volumes for Synchro	2011 - 2035 Volume Growth		Opening Year 2015	Opening Year 2025
1	**Helvetia Rd & Schaff Rd**		L	0	0	0	0	0	0	0		0	0	0			
	3 hr Turning Movement Counts	EB	T	0	0	0	0	0	0	0		0	0	0			
	Count Date: 5/25/2011		R	0	0	0	0	0	0	0		0	0	0			
			L	1	1	0	0	0	-1	0		0	30	30		5	5
	Unsignalized	WB	T	0	0	0	0	0	0	0		0	0	0			
			R	0	0	0	0	0	0	0		0	0	0			
			L	0	0	0	0	0	0	0		0	0	0			
	PM Peak Hour: 4:30 PM-5:30 PM	NB	T	449	471	22	470	450	-21	450		469	470	20		480	550
	PM Peak Hour Used: 4:30 PM-5:30 PM		R	1	1	0	0	0	-1	0		0	210	210		5	25
			L	0	0	0	0	0	0	0		0	0	0			
	PHF:	SB	T	137	144	7	145	130	-14	130		269	270	140		150	210
	0.89		R	0	0	0	0	0	0	0		0	0	0			
		TEV		**588**	**617**	**29**	**615**	**580**	**-37**	**580**		**737**	**980**	**400**		**635**	**790**
2	**Helvetia Rd & Jacobson Rd**		L	1	1	0	0	0	-1	0		0	0	0			
	3 hr Turning Movement Counts	EB	T	0	0	0	0	0	0	0		0	0	0			
	Count Date: 5/25/2011		R	12	13	1	15	15	2	0		0	0	0			
			L	181	190	9	190	170	-20	180		247	275	95		195	230
	Unsignalized	WB	T	1	1	0	0	0	-1	0		0	0	0			
			R	6	6	0	5	5	-1	5		8	10	5		5	5
			L	10	11	1	10	10	-1	0		0	0	0			
	PM Peak Hour: 4:30 PM-5:30 PM	NB	T	453	476	23	475	445	-31	450		646	670	220		480	570
	PM Peak Hour Used: 4:30 PM-5:30 PM		R	505	530	25	530	455	-75	460		498	520	60		470	495
			L	5	5	0	5	5	0	5		8	10	5		5	5
	PHF:	SB	T	130	137	7	135	125	-12	125		262	290	165		150	210
	0.86		R	1	1	0	0	0	-1	0		0	0	0			
		TEV		**1305**	**1370**	**65**	**1365**	**1230**	**-140**	**1225**		**1669**	**1775**	**550**		**1305**	**1520**
3	**Helvetia Rd & WB On-ramp**		L	0	0	0	0	0	0	0		0	0	0			
	16 hr Turning Movement Counts	EB	T	0	0	0	0	0	0	0		0	0	0			
	Count Date: 7/20/2011		R	0	0	0	0	0	0	0		0	0	0			
			L	0	0	0	0	0	0	0		0	0	0			
	Signalized	WB	T	0	0	0	0	0	0	0		0	0	0			
			R	0	0	0	0	0	0	0		0	0	0			
			L	191	191	0	190	0	-191	190		275	290	100		205	245
	PM Peak Hour: 4:30 PM-5:30 PM	NB	T	679	679	0	680	0	-679	910		1145	1190	280		950	1065
	PM Peak Hour Used: 4:30 PM-5:30 PM		R	0	0	0	0	0	0	0		0	0	0			
			L	0	0	0	0	0	0	0		0	0	0			
	PHF:	SB	T	235	235	0	235	0	-235	235		370	430	195		260	335
	0.95		R	77	77	0	75	0	-77	75		133	135	60		85	105
		TEV		**1182**	**1182**	**0**	**1180**	**0**	**-1182**	**1410**		**1923**	**2045**	**635**		**1500**	**1750**
4	**Helvetia Rd & WB Off-ramps**		L	0	0	0	0	0	0	0		0	0	0			
	16 hr Turning Movement Counts	EB	T	0	0	0	0	0	0	0		0	0	0			
	Count Date: 7/20/2011		R	0	0	0	0	0	0	625		730	730	105		640	685
			L	627	627	0	625	625	-2	0		0	0	0			
	Signalized (2011)	WB	T	1	1	0	0	0	-1	0		0	0	0			
	Unsignalized (2035)		R	57	57	0	55	55	-2	55		69	70	15		55	65
			L	191	191	0	190	190	-1	0		0	0	0			
	PM Peak Hour: 4:30 PM-5:30 PM	NB	T	679	679	0	680	855	176	1045		1365	1410	365		1100	1245
	PM Peak Hour Used: 4:30 PM-5:30 PM		R	0	0	0	0	0	0	0		0	0	0			
			L	0	0	0	0	0	0	0		0	0	0			
	PHF:	SB	T	235	235	0	235	235	0	235		370	430	195		260	335
	0.95		R	77	77	0	75	75	-2	0		0	0	0			
		TEV		**1867**	**1867**	**0**	**1860**	**2035**	**168**	**1960**		**2534**	**2640**	**680**		**2060**	**2330**
5	**Brookwood Pkwy & EB Ramps**		L	36	36	0	35	60	24	60		20	20	-40		50	30
	16 hr Turning Movement Counts	EB	T	1	1	0	0	0	-1	0		0	0	0			
	Count Date: 7/20/2011		R	62	62	0	60	60	-2	60		78	80	20		65	70
			L	0	0	0	0	0	0	0		0	0	0			
	Signalized	WB	T	0	0	0	0	0	0	0		0	0	0			
			R	0	0	0	0	0	0	0		0	0	0			
			L	0	0	0	0	0	0	0		0	0	0			
	PM Peak Hour: 4:30 PM-5:30 PM	NB	T	837	837	0	835	985	148	985		1340	1390	405		1050	1215
	PM Peak Hour Used: 4:30 PM-5:30 PM		R	779	779	0	780	780	1	780		945	945	165		805	870
			L	16	16	0	15	15	-1	15		7	5	-10		10	10
	PHF:	SB	T	846	846	0	845	845	-1	845		1156	1155	310		890	1010
	0.95		R	0	0	0	0	0	0	0		0	0	0			
		TEV		**2577**	**2577**	**0**	**2570**	**2745**	**168**	**2745**		**3546**	**3595**	**850**		**2870**	**3215**
6	**Brookwood Pkwy & Meek Rd**		L	3	3	0	5	5	2	5		26	25	20		5	15
	3 hr Turning Movement Counts	EB	T	0	0	0	0	0	0	0		0	0	0			
	Count Date: 5/25/2011		R	14	15	1	15	15	0	15		73	75	60		20	40
			L	2	2	0	0	0	-2	0		0	0	0			
	Unsignalized	WB	T	0	0	0	0	0	0	0		0	0	0			
			R	0	0	0	0	0	0	0		0	0	0			
			L	33	35	2	35	35	0	35		110	110	75		40	70
	PM Peak Hour: 4:30 PM-5:30 PM	NB	T	1763	1851	88	1850	1760	-91	1760		2312	2310	550		1850	2070
	PM Peak Hour Used: 4:30 PM-5:30 PM		R	0	0	0	0	0	0	0		0	0	0			
			L	0	0	0	0	0	0	0		0	0	0			
	PHF:	SB	T	877	921	44	920	890	-31	890		1181	1190	300		935	1050
	0.96		R	15	16	1	15	15	-1	15		47	45	30		20	30
		TEV		**2707**	**2842**	**135**	**2840**	**2720**	**-122**	**2720**		**3749**	**3755**	**1035**		**2870**	**3285**

Appendix C: Synchro/SimTraffic Reports

Year 2011 Existing Conditions

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	5	5	145	5	5	310
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.64	0.64	0.64	0.64	0.64	0.64
Hourly flow rate (vph)	8	8	227	8	8	484
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	730	230			234	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	730	230			234	
tC, single (s)	6.4	6.5			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.6			2.2	
p0 queue free %	98	99			99	
cM capacity (veh/h)	390	738			1345	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	16	234	492
Volume Left	8	0	8
Volume Right	8	8	0
cSH	510	1700	1345
Volume to Capacity	0.03	0.14	0.01
Queue Length 95th (ft)	2	0	0
Control Delay (s)	12.3	0.0	0.2
Lane LOS	B		A
Approach Delay (s)	12.3	0.0	0.2
Approach LOS	B		

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	30.3%	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)	0	0	5	165	0	5	5	145	210	10	305	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
Hourly flow rate (vph)	0	0	6	209	0	6	6	184	266	13	386	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								TWLTL			None	
Median storage veh)								2				
Upstream signal (ft)								305				
pX, platoon unblocked	0.85	0.85		0.85	0.85	0.85				0.85		
vC, conflicting volume	747	873	386	747	741	316	386			449		
vC1, stage 1 conf vol	411	411		329	329							
vC2, stage 2 conf vol	335	462		418	411							
vCu, unblocked vol	617	765	386	617	610	112	386			268		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.5	4.1			4.1		
tC, 2 stage (s)	6.1	5.5		6.1	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.6	2.2			2.2		
p0 queue free %	100	100	99	61	100	99	99			99		
cM capacity (veh/h)	537	467	666	532	516	736	1183			1115		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	6	215	456	399
Volume Left	0	209	6	13
Volume Right	6	6	266	0
cSH	666	536	1183	1115
Volume to Capacity	0.01	0.40	0.01	0.01
Queue Length 95th (ft)	1	48	0	1
Control Delay (s)	10.5	16.1	0.2	0.4
Lane LOS	B	C	A	A
Approach Delay (s)	10.5	16.1	0.2	0.4
Approach LOS	B	C		

Intersection Summary			
Average Delay	3.5		
Intersection Capacity Utilization	45.5%	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 (vph)	0	0	0	1260	0	40	55	320	0	0	450	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				3.6	3.6	3.6	2.0	3.0			3.0	
Lane Util. Factor				0.95	0.95	1.00	1.00	1.00			0.95	
Frt				1.00	1.00	0.85	1.00	1.00			0.99	
Flt Protected				0.95	0.95	1.00	0.95	1.00			1.00	
Satd. Flow (prot)				1681	1681	1615	1421	1863			3581	
Flt Permitted				0.95	0.95	1.00	0.95	1.00			1.00	
Satd. Flow (perm)				1681	1681	1615	1421	1863			3581	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	0	0	0	1355	0	43	59	344	0	0	484	27
RTOR Reduction (vph)	0	0	0	0	0	6	0	0	0	0	5	0
Lane Group Flow (vph)	0	0	0	677	678	37	59	344	0	0	506	0
Heavy Vehicles (%)	0%	0%	0%	2%	0%	0%	27%	2%	0%	0%	0%	0%
Turn Type				Perm		Perm	Prot					
Protected Phases					4		1	6			2	
Permitted Phases				4		4						
Actuated Green, G (s)				37.0	37.0	37.0	4.7	23.0			14.3	
Effective Green, g (s)				38.4	38.4	38.4	6.7	25.0			16.3	
Actuated g/C Ratio				0.55	0.55	0.55	0.10	0.36			0.23	
Clearance Time (s)				5.0	5.0	5.0	4.0	5.0			5.0	
Vehicle Extension (s)				2.3	2.3	2.3	2.3	3.0			5.2	
Lane Grp Cap (vph)				922	922	886	136	665			834	
v/s Ratio Prot							0.04	c0.18			c0.14	
v/s Ratio Perm				0.40	0.40	0.02						
v/c Ratio				0.73	0.74	0.04	0.43	0.52			0.61	
Uniform Delay, d1				11.9	12.0	7.3	29.9	17.7			24.0	
Progression Factor				1.00	1.00	1.00	0.71	0.55			1.00	
Incremental Delay, d2				5.2	5.2	0.1	1.2	2.7			3.3	
Delay (s)				17.1	17.2	7.4	22.5	12.4			27.2	
Level of Service				B	B	A	C	B			C	
Approach Delay (s)		0.0			16.8			13.9			27.2	
Approach LOS		A			B			B			C	

Intersection Summary			
HCM Average Control Delay	18.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	9.6
Intersection Capacity Utilization	87.4%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	60	0	175	0	0	0	0	315	465	40	1670	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.6	3.6					3.0	3.0	2.0	3.0	
Lane Util. Factor		1.00	1.00					1.00	1.00	1.00	0.95	
Frt		1.00	0.85					1.00	0.85	1.00	1.00	
Flt Protected		0.95	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1805	1442					1776	1553	1805	3574	
Flt Permitted		0.95	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1805	1442					1776	1553	1805	3574	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	66	0	192	0	0	0	0	346	511	44	1835	0
RTOR Reduction (vph)	0	0	41	0	0	0	0	0	277	0	0	0
Lane Group Flow (vph)	0	66	151	0	0	0	0	346	234	44	1835	0
Heavy Vehicles (%)	0%	0%	12%	0%	0%	0%	0%	7%	4%	0%	1%	0%
Turn Type	Perm		Perm						Perm	Prot		
Protected Phases		8						6		5	2	
Permitted Phases	8		8						6			
Actuated Green, G (s)		7.0	7.0					30.0	30.0	19.0	53.0	
Effective Green, g (s)		8.4	8.4					32.0	32.0	21.0	55.0	
Actuated g/C Ratio		0.12	0.12					0.46	0.46	0.30	0.79	
Clearance Time (s)		5.0	5.0					5.0	5.0	4.0	5.0	
Vehicle Extension (s)		2.3	2.3					4.7	4.7	2.3	4.7	
Lane Grp Cap (vph)		217	173					812	710	542	2808	
v/s Ratio Prot								0.19		0.02	c0.51	
v/s Ratio Perm		0.04	c0.10						0.15			
v/c Ratio		0.30	0.87					0.43	0.33	0.08	0.65	
Uniform Delay, d1		28.1	30.3					12.8	12.1	17.6	3.3	
Progression Factor		1.00	1.00					1.00	1.00	1.13	0.48	
Incremental Delay, d2		0.5	34.3					1.6	1.2	0.2	0.9	
Delay (s)		28.6	64.6					14.4	13.4	20.1	2.5	
Level of Service		C	E					B	B	C	A	
Approach Delay (s)		55.4			0.0			13.8			2.9	
Approach LOS		E			A			B			A	

Intersection Summary			
HCM Average Control Delay	10.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	6.6
Intersection Capacity Utilization	87.4%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	505	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.8					
Lane Util. Factor	0.95					
Frt	1.00					
Flt Protected	1.00					
Satd. Flow (prot)	3539					
Flt Permitted	1.00					
Satd. Flow (perm)	3539					
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	549	0	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	549	0	0	0	0	0
Turn Type						
Protected Phases	4					
Permitted Phases						
Actuated Green, G (s)	2.2					
Effective Green, g (s)	2.2					
Actuated g/C Ratio	0.09					
Clearance Time (s)	5.8					
Lane Grp Cap (vph)	311					
v/s Ratio Prot	c0.16					
v/s Ratio Perm						
v/c Ratio	1.77					
Uniform Delay, d1	11.4					
Progression Factor	1.00					
Incremental Delay, d2	357.2					
Delay (s)	368.6					
Level of Service	F					
Approach Delay (s)	368.6			0.0	0.0	
Approach LOS	F			A	A	

Intersection Summary			
HCM Average Control Delay	368.6	HCM Level of Service	F
HCM Volume to Capacity ratio	1.76		
Actuated Cycle Length (s)	25.0	Sum of lost time (s)	22.8
Intersection Capacity Utilization	18.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	15	5	20	0	0	0	10	765	5	0	1840	5
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			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
Hourly flow rate (vph)	17	6	22	0	0	0	11	850	6	0	2044	6
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											227	
pX, platoon unblocked	0.74	0.74	0.74	0.74	0.74		0.74					
vC, conflicting volume	2494	2925	1025	1922	2925	428	2050			856		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2320	2899	345	1551	2899	428	1723			856		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	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 %	0	52	95	100	100	100	96			100		
cM capacity (veh/h)	15	11	489	34	11	581	277			793		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	44	0	11	567	289	1022	1028
Volume Left	17	0	11	0	0	0	0
Volume Right	22	0	0	0	6	0	6
cSH	27	1700	277	1700	1700	793	1700
Volume to Capacity	1.65	0.00	0.04	0.33	0.17	0.00	0.60
Queue Length 95th (ft)	133	0	3	0	0	0	0
Control Delay (s)	632.3	0.0	18.6	0.0	0.0	0.0	0.0
Lane LOS	F	A	C				
Approach Delay (s)	632.3	0.0	0.2			0.0	
Approach LOS	F	A					

Intersection Summary				
Average Delay	9.6			
Intersection Capacity Utilization	61.0%	ICU Level of Service	B	
Analysis Period (min)	15			

200: Schaaf Rd & Helvetia Rd Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Total Delay (hr)	0.0	0.0	0.2	0.0	0.0	0.0	0.2
Delay / Veh (s)	5.8	1.5	3.8	1.0	1.5	0.6	1.7
Vehicles Entered	3	6	159	6	6	301	481
Vehicles Exited	3	6	160	6	6	301	482
Hourly Exit Rate	3	6	160	6	6	301	482
Input Volume	5	5	158	5	5	310	488
% of Volume	60	120	101	120	120	97	99
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

210: Groveland Dr & Helvetia Rd Performance by movement

Movement	EBR	WBL	WBR	NBL	NBT	NBR	SBL	SBT	All
Total Delay (hr)	0.0	0.7	0.0	0.0	0.3	0.2	0.0	0.3	1.5
Delay / Veh (s)	11.2	14.1	14.0	6.3	6.6	3.1	3.3	3.2	6.0
Vehicles Entered	4	174	5	7	168	217	9	317	901
Vehicles Exited	4	174	5	7	167	215	9	317	898
Hourly Exit Rate	4	174	5	7	167	215	9	317	898
Input Volume	5	165	5	5	163	210	10	328	891
% of Volume	76	106	95	133	103	103	90	97	101
Denied Entry Before	0	0	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0	0	0

220: US-26 WB Helvetia On-ramp & Helvetia Rd Performance by movement

Movement	WBL	WBR	NBL	NBT	SBT	SBR	All
Total Delay (hr)	8.5	0.3	0.8	1.8	3.5	0.1	15.0
Delay / Veh (s)	24.4	24.7	52.7	19.5	26.4	16.1	24.7
Vehicles Entered	1253	44	54	334	474	25	2184
Vehicles Exited	1253	43	53	336	478	25	2188
Hourly Exit Rate	1253	43	53	336	478	25	2188
Input Volume	1260	40	55	322	474	25	2176
% of Volume	99	108	96	104	101	101	101
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

230: US-26 EB Helvetia Off-ramp & Helvetia Rd/Brookwood Pkwy Performance by movement

Movement	EBL	EBR	NBT	NBR	SBL	SBT	All
Total Delay (hr)	1.1	1.7	1.2	0.3	0.3	2.1	6.7
Delay / Veh (s)	65.5	34.3	13.2	2.6	22.8	4.5	8.8
Vehicles Entered	60	180	326	473	43	1682	2764
Vehicles Exited	62	180	326	473	43	1689	2773
Hourly Exit Rate	62	180	326	473	43	1689	2773
Input Volume	60	175	318	465	40	1682	2740
% of Volume	103	103	103	102	107	100	101
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

231: US-26 EB Helvetia On-ramp & Performance by movement

Movement	EBT	All
Total Delay (hr)	10.3	10.3
Delay / Veh (s)	70.5	70.5
Vehicles Entered	521	521
Vehicles Exited	526	526
Hourly Exit Rate	526	526
Input Volume	513	513
% of Volume	103	103
Denied Entry Before	0	0
Denied Entry After	0	0

240: Meek Rd & Brookwood Pkwy Performance by movement

Movement	EBL	EBT	EBR	NBL	NBT	NBR	SBT	SBR	All
Total Delay (hr)	0.8	0.3	0.9	0.0	1.1	0.0	0.6	0.0	3.7
Delay / Veh (s)	186.2	209.2	127.9	19.7	5.0	1.4	1.2	0.4	5.0
Vehicles Entered	15	7	23	8	779	7	1857	6	2702
Vehicles Exited	15	7	24	8	779	7	1859	6	2705
Hourly Exit Rate	15	7	24	8	779	7	1859	6	2705
Input Volume	15	5	20	10	765	5	1845	5	2671
% of Volume	102	133	122	78	102	133	101	114	101
Denied Entry Before	0	0	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0	0	0

Total Network Performance

Total Delay (hr)	44.5
Delay / Veh (s)	53.5
Vehicles Entered	2981
Vehicles Exited	3003
Hourly Exit Rate	3003
Input Volume	21557
% of Volume	14
Denied Entry Before	0
Denied Entry After	0

Intersection: 200: Schaaf Rd & Helvetia Rd

Movement	WB	SB
Directions Served	LR	LT
Maximum Queue (ft)	52	24
Average Queue (ft)	7	1
95th Queue (ft)	31	13
Link Distance (ft)	1714	562
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 210: Groveland Dr & Helvetia Rd

Movement	EB	WB	NB	SB
Directions Served	LR	LR	LTR	LTR
Maximum Queue (ft)	24	155	74	90
Average Queue (ft)	3	56	5	8
95th Queue (ft)	16	120	37	59
Link Distance (ft)	398	1693	218	1385
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 220: US-26 WB Helvetia On-ramp & Helvetia Rd

Movement	WB	WB	WB	B221	NB	NB	SB	SB
Directions Served	L	LT	R	T	L	T	T	TR
Maximum Queue (ft)	473	454	50	96	167	241	223	227
Average Queue (ft)	268	289	30	3	58	103	111	114
95th Queue (ft)	427	434	57	69	130	194	186	187
Link Distance (ft)	604	604		689		606	218	218
Upstream Blk Time (%)	0	0					1	1
Queuing Penalty (veh)	0	0					3	2
Storage Bay Dist (ft)			25		150			
Storage Blk Time (%)		47	4		1	2		
Queuing Penalty (veh)		19	23		3	1		

Intersection: 230: US-26 EB Helvetia Off-ramp & Helvetia Rd/Brookwood Pkwy

Movement	EB	EB	NB	NB	SB	SB	SB
Directions Served	LT	R	T	R	L	T	T
Maximum Queue (ft)	159	245	181	136	78	116	144
Average Queue (ft)	59	103	114	6	24	45	51
95th Queue (ft)	133	195	185	56	61	100	114
Link Distance (ft)	1138		168	168		606	606
Upstream Blk Time (%)			2	0			
Queuing Penalty (veh)			7	0			
Storage Bay Dist (ft)		300			175		
Storage Blk Time (%)		0					
Queuing Penalty (veh)		0					

Intersection: 231: US-26 EB Helvetia On-ramp &

Movement	EB	EB
Directions Served	T	T
Maximum Queue (ft)	334	344
Average Queue (ft)	177	195
95th Queue (ft)	326	340
Link Distance (ft)	991	991
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 240: Meek Rd & Brookwood Pkwy

Movement	EB	NB	NB	NB	SB
Directions Served	LTR	L	T	TR	TR
Maximum Queue (ft)	224	33	122	23	11
Average Queue (ft)	78	6	9	1	0
95th Queue (ft)	220	26	55	13	8
Link Distance (ft)	603		1910	1910	168
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)		100			
Storage Blk Time (%)			0		
Queuing Penalty (veh)			0		

Network Summary

Network wide Queuing Penalty: 58

HCM Unsignalized Intersection Capacity Analysis
200: Schaaf Rd & Helvetia Rd

10/18/2011

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	0	0	450	0	0	130
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	0	0	484	0	0	140
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	624	484			484	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	624	484			484	
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			100	
cM capacity (veh/h)	453	587			1089	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	0	484	140
Volume Left	0	0	0
Volume Right	0	0	0
cSH	1700	1700	1089
Volume to Capacity	0.00	0.28	0.00
Queue Length 95th (ft)	0	0	0
Control Delay (s)	0.0	0.0	0.0
Lane LOS	A		
Approach Delay (s)	0.0	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	27.0%	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)	0	0	15	170	0	5	10	445	455	5	125	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	0	0	16	187	0	5	11	489	500	5	137	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								TWLTL			None	
Median storage veh)								2				
Upstream signal (ft)								305				
pX, platoon unblocked	0.57	0.57		0.57	0.57	0.57				0.57		
vC, conflicting volume	915	1159	137	926	909	739	137			989		
vC1, stage 1 conf vol	148	148		761	761							
vC2, stage 2 conf vol	766	1011		165	148							
vCu, unblocked vol	467	899	137	487	458	157	137			598		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)	6.1	5.5		6.1	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	98	56	100	99	99			99		
cM capacity (veh/h)	421	253	916	429	400	506	1459			560		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	16	192	1000	143
Volume Left	0	187	11	5
Volume Right	16	5	500	0
cSH	916	431	1459	560
Volume to Capacity	0.02	0.45	0.01	0.01
Queue Length 95th (ft)	1	56	1	1
Control Delay (s)	9.0	19.9	0.2	0.6
Lane LOS	A	C	A	A
Approach Delay (s)	9.0	19.9	0.2	0.6
Approach LOS	A	C		

Intersection Summary			
Average Delay	3.2		
Intersection Capacity Utilization	78.3%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	625	0	55	190	855	0	0	235	75
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				3.6	3.6	3.6	2.0	7.0			3.0	
Lane Util. Factor				0.95	0.95	1.00	1.00	1.00			0.95	
Frt				1.00	1.00	0.85	1.00	1.00			0.96	
Flt Protected				0.95	0.95	1.00	0.95	1.00			1.00	
Satd. Flow (prot)				1715	1715	1615	1787	1881			3479	
Flt Permitted				0.95	0.95	1.00	0.95	1.00			1.00	
Satd. Flow (perm)				1715	1715	1615	1787	1881			3479	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	0	0	0	672	0	59	204	919	0	0	253	81
RTOR Reduction (vph)	0	0	0	0	0	18	0	0	0	0	33	0
Lane Group Flow (vph)	0	0	0	336	336	41	204	919	0	0	301	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	1%	1%	0%	0%	0%	0%
Turn Type				Perm		Perm	Prot					
Protected Phases					4		1	6			2	
Permitted Phases				4		4						
Actuated Green, G (s)				17.0	17.0	17.0	12.7	43.0			26.3	
Effective Green, g (s)				18.4	18.4	18.4	14.7	41.0			28.3	
Actuated g/C Ratio				0.26	0.26	0.26	0.21	0.59			0.40	
Clearance Time (s)				5.0	5.0	5.0	4.0	5.0			5.0	
Vehicle Extension (s)				2.3	2.3	2.3	2.3	3.0			5.2	
Lane Grp Cap (vph)				451	451	425	375	1102			1407	
v/s Ratio Prot							0.11	c0.49			0.09	
v/s Ratio Perm				c0.20	0.20	0.03						
v/c Ratio				0.75	0.75	0.10	0.54	0.83			0.21	
Uniform Delay, d1				23.6	23.6	19.5	24.7	11.7			13.6	
Progression Factor				1.00	1.00	1.00	0.80	1.42			1.00	
Incremental Delay, d2				10.7	10.7	0.4	0.8	5.7			0.3	
Delay (s)				34.3	34.3	20.0	20.5	22.4			13.9	
Level of Service				C	C	B	C	C			B	
Approach Delay (s)		0.0			33.2			22.1			13.9	
Approach LOS		A			C			C			B	

Intersection Summary			
HCM Average Control Delay	24.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	10.6
Intersection Capacity Utilization	71.5%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	60	0	60	0	0	0	0	985	780	15	845	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0					5.0	5.0	4.0	5.0	
Lane Util. Factor		1.00	1.00					1.00	1.00	1.00	0.95	
Frt		1.00	0.85					1.00	0.85	1.00	1.00	
Flt Protected		0.95	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1805	1615					1881	1599	1805	3610	
Flt Permitted		0.95	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1805	1615					1881	1599	1805	3610	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	62	0	62	0	0	0	0	1026	812	16	880	0
RTOR Reduction (vph)	0	0	57	0	0	0	0	0	241	0	0	0
Lane Group Flow (vph)	0	62	5	0	0	0	0	1026	571	16	880	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	1%	1%	0%	0%	0%
Turn Type	Perm		Perm						Perm	Prot		
Protected Phases		8						6		5	2	
Permitted Phases	8		8						6			
Actuated Green, G (s)		5.5	5.5					49.2	49.2	1.3	54.5	
Effective Green, g (s)		5.5	5.5					49.2	49.2	1.3	54.5	
Actuated g/C Ratio		0.08	0.08					0.70	0.70	0.02	0.78	
Clearance Time (s)		5.0	5.0					5.0	5.0	4.0	5.0	
Vehicle Extension (s)		2.3	2.3					4.7	4.7	2.3	4.7	
Lane Grp Cap (vph)		142	127					1322	1124	34	2811	
v/s Ratio Prot								c0.55		0.01	c0.24	
v/s Ratio Perm		0.03	0.00						0.36			
v/c Ratio		0.44	0.04					0.78	0.51	0.47	0.31	
Uniform Delay, d1		30.8	29.8					6.8	4.8	34.0	2.3	
Progression Factor		1.00	1.00					1.00	1.00	1.12	0.38	
Incremental Delay, d2		1.3	0.1					4.5	1.6	4.7	0.2	
Delay (s)		32.0	29.9					11.3	6.4	42.9	1.1	
Level of Service		C	C					B	A	D	A	
Approach Delay (s)		31.0			0.0			9.2			1.8	
Approach LOS		C			A			A			A	

Intersection Summary			
HCM Average Control Delay	7.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	71.5%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑					
Volume (vph)	795	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5					
Lane Util. Factor	0.95					
Frt	1.00					
Flt Protected	1.00					
Satd. Flow (prot)	3610					
Flt Permitted	1.00					
Satd. Flow (perm)	3610					
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	864	0	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	864	0	0	0	0	0
Heavy Vehicles (%)	0%	1%	0%	0%	0%	0%
Turn Type						
Protected Phases	4					
Permitted Phases						
Actuated Green, G (s)	2.5					
Effective Green, g (s)	2.5					
Actuated g/C Ratio	0.14					
Clearance Time (s)	4.5					
Lane Grp Cap (vph)	501					
v/s Ratio Prot	c0.24					
v/s Ratio Perm						
v/c Ratio	1.72					
Uniform Delay, d1	7.8					
Progression Factor	1.00					
Incremental Delay, d2	334.4					
Delay (s)	342.1					
Level of Service	F					
Approach Delay (s)	342.1			0.0	0.0	
Approach LOS	F			A	A	

Intersection Summary			
HCM Average Control Delay	342.1	HCM Level of Service	F
HCM Volume to Capacity ratio	1.72		
Actuated Cycle Length (s)	18.0	Sum of lost time (s)	15.5
Intersection Capacity Utilization	25.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	5	0	15	0	0	0	35	1760	0	0	890	15
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	5	0	16	0	0	0	37	1872	0	0	947	16
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											227	
pX, platoon unblocked	0.93	0.93	0.93	0.93	0.93		0.93					
vC, conflicting volume	1965	2902	481	2436	2910	936	963			1872		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1885	2894	285	2392	2903	936	804			1872		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	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 %	87	100	98	100	100	100	95			100		
cM capacity (veh/h)	40	14	666	16	14	270	769			326		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	21	0	37	1248	624	473	489
Volume Left	5	0	37	0	0	0	0
Volume Right	16	0	0	0	0	0	16
cSH	134	1700	769	1700	1700	326	1700
Volume to Capacity	0.16	0.00	0.05	0.73	0.37	0.00	0.29
Queue Length 95th (ft)	14	0	4	0	0	0	0
Control Delay (s)	36.8	0.0	9.9	0.0	0.0	0.0	0.0
Lane LOS	E	A	A				
Approach Delay (s)	36.8	0.0	0.2			0.0	
Approach LOS	E	A					

Intersection Summary				
Average Delay	0.4			
Intersection Capacity Utilization	58.7%	ICU Level of Service	B	
Analysis Period (min)	15			

200: Schaaf Rd & Helvetia Rd Performance by movement

Movement	NBT	SBT	All
Total Delay (hr)	0.7	0.0	0.7
Delay / Veh (s)	5.3	0.2	4.1
Vehicles Entered	449	140	589
Vehicles Exited	451	139	590
Hourly Exit Rate	451	139	590
Input Volume	453	130	583
% of Volume	100	107	101
Denied Entry Before	0	0	0
Denied Entry After	0	0	0

210: Groveland Dr & Helvetia Rd Performance by movement

Movement	EBR	WBL	WBR	NBL	NBT	NBR	SBL	SBT	All
Total Delay (hr)	0.0	1.6	0.0	0.0	1.2	0.6	0.0	0.1	3.6
Delay / Veh (s)	2.4	34.0	19.6	7.5	9.7	4.9	19.7	2.0	10.4
Vehicles Entered	15	168	5	11	451	438	6	134	1228
Vehicles Exited	15	168	5	11	451	440	6	133	1229
Hourly Exit Rate	15	168	5	11	451	440	6	133	1229
Input Volume	15	170	5	10	452	455	5	126	1238
% of Volume	98	99	100	107	100	97	120	106	99
Denied Entry Before	0	0	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0	0	0

220: US-26 WB Helvetia On-ramp & Helvetia Rd Performance by movement

Movement	WBL	WBR	NBL	NBT	SBT	SBR	All
Total Delay (hr)	11.2	1.0	2.2	7.2	0.9	0.2	22.7
Delay / Veh (s)	63.6	66.2	41.3	30.7	13.3	7.2	39.9
Vehicles Entered	631	55	190	852	242	77	2047
Vehicles Exited	638	57	189	845	240	77	2046
Hourly Exit Rate	638	57	189	845	240	77	2046
Input Volume	625	55	190	864	238	75	2046
% of Volume	102	103	100	98	101	103	100
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

230: US-26 EB Helvetia Off-ramp & Helvetia Rd/Brookwood Pkwy Performance by movement

Movement	EBL	EBR	NBT	NBR	SBL	SBT	All
Total Delay (hr)	0.8	0.2	1.9	0.8	0.1	0.9	4.8
Delay / Veh (s)	52.3	11.5	7.0	3.6	32.5	3.9	6.2
Vehicles Entered	55	60	990	779	14	869	2767
Vehicles Exited	55	61	990	778	14	865	2763
Hourly Exit Rate	55	61	990	778	14	865	2763
Input Volume	60	60	994	780	15	852	2762
% of Volume	92	102	100	100	92	102	100
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

231: US-26 EB Helvetia On-ramp & Performance by movement

Movement	EBT	All
Total Delay (hr)	21.9	21.9
Delay / Veh (s)	99.1	99.1
Vehicles Entered	804	804
Vehicles Exited	786	786
Hourly Exit Rate	786	786
Input Volume	806	806
% of Volume	98	98
Denied Entry Before	0	0
Denied Entry After	0	0

240: Meek Rd & Brookwood Pkwy Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Total Delay (hr)	0.6	1.5	0.1	5.9	0.3	0.0	8.3
Delay / Veh (s)	663.7	356.6	14.1	12.1	1.0	0.4	11.0
Vehicles Entered	4	17	35	1759	907	17	2739
Vehicles Exited	2	13	35	1755	906	17	2728
Hourly Exit Rate	2	13	35	1755	906	17	2728
Input Volume	5	15	35	1760	894	15	2725
% of Volume	40	85	101	100	101	111	100
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

Total Network Performance

Total Delay (hr)	68.6
Delay / Veh (s)	82.7
Vehicles Entered	3010
Vehicles Exited	2971
Hourly Exit Rate	2971
Input Volume	21876
% of Volume	14
Denied Entry Before	0
Denied Entry After	0

Intersection: 200: Schaaf Rd & Helvetia Rd

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

Intersection: 210: Groveland Dr & Helvetia Rd

Movement	EB	WB	NB	SB
Directions Served	LR	LR	LTR	LTR
Maximum Queue (ft)	27	200	92	76
Average Queue (ft)	9	92	8	9
95th Queue (ft)	27	173	52	42
Link Distance (ft)	1815	1693	218	1385
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 220: US-26 WB Helvetia On-ramp & Helvetia Rd

Movement	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	LT	R	L	T	T	TR
Maximum Queue (ft)	454	489	50	324	626	113	131
Average Queue (ft)	264	277	36	158	415	55	61
95th Queue (ft)	430	445	60	309	678	99	109
Link Distance (ft)	604	604			606	218	218
Upstream Blk Time (%)					3		
Queuing Penalty (veh)					32		
Storage Bay Dist (ft)			25	150			
Storage Blk Time (%)		74	19	4	24		
Queuing Penalty (veh)		41	60	36	45		

Intersection: 230: US-26 EB Helvetia Off-ramp & Helvetia Rd/Brookwood Pkwy

Movement	EB	EB	NB	NB	SB	SB	SB
Directions Served	LT	R	T	R	L	T	T
Maximum Queue (ft)	113	68	192	105	58	105	124
Average Queue (ft)	49	24	128	5	11	24	37
95th Queue (ft)	97	50	222	50	36	76	106
Link Distance (ft)	1138		168	168		606	606
Upstream Blk Time (%)			6	0			
Queuing Penalty (veh)			49	1			
Storage Bay Dist (ft)		300			175		
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 231: US-26 EB Helvetia On-ramp &

Movement	EB	EB
Directions Served	T	T
Maximum Queue (ft)	556	597
Average Queue (ft)	350	374
95th Queue (ft)	657	695
Link Distance (ft)	991	991
Upstream Blk Time (%)		1
Queuing Penalty (veh)		3
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 240: Meek Rd & Brookwood Pkwy

Movement	EB	NB	NB	NB	SB
Directions Served	LR	L	T	TR	TR
Maximum Queue (ft)	195	121	513	311	5
Average Queue (ft)	66	19	98	23	0
95th Queue (ft)	235	72	358	183	3
Link Distance (ft)	603		1910	1910	168
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)		100			
Storage Blk Time (%)		0	5		
Queuing Penalty (veh)		0	2		

Network Summary

Network wide Queuing Penalty: 269

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/13/2011
Analysis time period:	AM Peak
Freeway/Dir of Travel:	US 26 Eastbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2011
Description: Eastbound	Off-ramp to Brookwood

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	1875	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	180	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	1875		180			vph
Peak-hour factor, PHF	0.88		0.86			
Peak 15-min volume, v15	533		52			v
Trucks and buses	4		4			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.980	0.980	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2173	213	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2173 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2173	4600	No
$v_{FO} = v_F - v_R$	1960	4600	No
v_R	213	2000	No
$v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3 \text{ or } av34}$ > 2700 pc/h?		No	
Is $v_{3 \text{ or } av34}$ > 1.5 $v_{12}/2$		No	
If yes, v_{12A} = 2173		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	2173	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 9.4 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	D_S = 0.447	
Space mean speed in ramp influence area,	S_R = 52.0	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 52.0	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/14/2011
Analysis time period:	AM Peak Period
Freeway/Dir of Travel:	US 26 Eastbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2011
Description: Eastbound	On-ramp from Brookwood

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	1695	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	475	vph
Length of first accel/decel lane	410	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1695	475		vph
Peak-hour factor, PHF	0.88	0.86		
Peak 15-min volume, v15	482	138		v
Trucks and buses	4	4		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.980	0.980	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	1965	563	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 1965 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2528	4600	No
$v_{3\ or\ av34}$	0 pc/h	(Equation 25-4 or 25-5)	
Is $v_{3\ or\ av34}$ > 2700 pc/h?		No	
Is $v_{3\ or\ av34}$ > 1.5 v_{12}/2		No	
If yes, v_{12A} = 1965		(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	1965	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 22.4 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	M_S = 0.341	
Space mean speed in ramp influence area,	S_R = 53.9	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 53.9	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/13/2011
Analysis time period:	AM Peak
Freeway/Dir of Travel:	US 26 Westbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2011
Description:	Westbound Off-ramp to Brookwood

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2300	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	1300	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2300		1300			vph
Peak-hour factor, PHF	0.91		0.82			
Peak 15-min volume, v15	632		396			v
Trucks and buses	4		4			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.980	0.980	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2578	1617	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2578 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2578	4600	No
$v_{FO} = v_F - v_R$	961	4600	No
v_R	1617	2000	No
$v_{3\ or\ av34}$ $v_{3\ or\ av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3\ or\ av34}$ $v_{3\ or\ av34}$ > 2700 pc/h?		No	
Is $v_{3\ or\ av34}$ $v_{3\ or\ av34}$ > 1.5 v_{12} /2		No	
If yes, v_{12A} = 2578		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	2578	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 12.9 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	D_S = 0.574	
Space mean speed in ramp influence area,	S_R = 49.7	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 49.7	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/14/2011
Analysis time period:	AM Peak Period
Freeway/Dir of Travel:	US 26 Westbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2011
Description: Westbound	On-ramp from Brookwood

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	1000	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	55	vph
Length of first accel/decel lane	410	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1000	55		vph
Peak-hour factor, PHF	0.91	0.82		
Peak 15-min volume, v15	275	17		v
Trucks and buses	4	4		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.980	0.980	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	1121	68	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 1121 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	1189	4600	No
$v_{3\ or\ av34}$	0 pc/h	(Equation 25-4 or 25-5)	
Is $v_{3\ or\ av34}$ > 2700 pc/h?		No	
Is $v_{3\ or\ av34}$ > 1.5 v_{12}/2		No	
If yes, v_{12A} = 1121		(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	1121	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 12.1 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	M_S = 0.305	
Space mean speed in ramp influence area,	S_R = 54.5	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 54.5	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/13/2011
Analysis time period:	PM Peak
Freeway/Dir of Travel:	US 26 Eastbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2011
Description: Eastbound	Off-ramp to Brookwood

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	1635	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	130	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	1635		130			vph
Peak-hour factor, PHF	0.92		0.96			
Peak 15-min volume, v15	444		34			v
Trucks and buses	1		1			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.995	0.995	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	1786	136	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 1786 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	1786	4600	No
$v_{FO} = v_F - v_R$	1650	4600	No
v_R	136	2000	No
$v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3 \text{ or } av34}$ > 2700 pc/h?		No	
Is $v_{3 \text{ or } av34}$ > 1.5 v_{12}/2		No	
If yes, v_{12A} = 1786		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	1786	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 6.1 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	D_S = 0.440	
Space mean speed in ramp influence area,	S_R = 52.1	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 52.1	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/14/2011
Analysis time period:	PM Peak Period
Freeway/Dir of Travel:	US 26 Eastbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2011
Description: Eastbound	On-Ramp from Brookwood

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	1505	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	800	vph
Length of first accel/decel lane	410	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1505	800		vph
Peak-hour factor, PHF	0.92	0.96		
Peak 15-min volume, v15	409	208		v
Trucks and buses	1	1		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.995	0.995	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	1644	838	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 1644 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2482	4600	No
$v_{3 or av34}$	0 pc/h	(Equation 25-4 or 25-5)	
Is $v_{3 or av34}$ > 2700 pc/h?		No	
Is $v_{3 or av34}$ > 1.5 v_{12}/2		No	
If yes, v_{12A} = 1644		(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	1644	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A$ = 21.9 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	M_S = 0.339	
Space mean speed in ramp influence area,	S_R = 53.9	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 53.9	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/13/2011
Analysis time period:	PM Peak
Freeway/Dir of Travel:	US 26 Westbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2011
Description:	Westbound Off-ramp to Brookwood

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2525	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	725	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2525		725			vph
Peak-hour factor, PHF	0.93		0.93			
Peak 15-min volume, v15	679		195			v
Trucks and buses	1		3			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.995	0.985	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2729	791	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2729 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2729	4600	No
$v_{FO} = v_F - v_R$	1938	4600	No
v_R	791	2000	No
$v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3 \text{ or } av34} > 2700$ pc/h?		No	
Is $v_{3 \text{ or } av34} > 1.5\, v_{12}/2$		No	
If yes, v_{12A} = 2729		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	2729	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 14.2 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	D_S = 0.499	
Space mean speed in ramp influence area,	S_R = 51.0	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 51.0	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/14/2011
Analysis time period:	PM Peak Period
Freeway/Dir of Travel:	US 26 Westbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2011
Description: Westbound	On-ramp from Brookwood

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	1800	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	280	vph
Length of first accel/decel lane	410	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1800	280		vph
Peak-hour factor, PHF	0.93	0.93		
Peak 15-min volume, v15	484	75		v
Trucks and buses	1	3		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.995	0.985	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	1945	306	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 1945 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2251	4600	No
$v_{3 or av34}$	0 pc/h	(Equation 25-4 or 25-5)	
Is $v_{3 or av34}$ > 2700 pc/h?		No	
Is $v_{3 or av34}$ > 1.5 v_{12}/2		No	
If yes, v_{12A} = 1945		(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	1945	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A$ = 20.3 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	M_S = 0.329	
Space mean speed in ramp influence area,	S_R = 54.1	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 54.1	mph

Year 2015 No-Build

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	5	5	175	10	5	365
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.64	0.64	0.64	0.64	0.64	0.64
Hourly flow rate (vph)	8	8	273	16	8	570
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	867	281			289	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	867	281			289	
tC, single (s)	6.4	6.5			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.6			2.2	
p0 queue free %	98	99			99	
cM capacity (veh/h)	324	689			1284	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	16	289	578
Volume Left	8	0	8
Volume Right	8	16	0
cSH	441	1700	1284
Volume to Capacity	0.04	0.17	0.01
Queue Length 95th (ft)	3	0	0
Control Delay (s)	13.5	0.0	0.2
Lane LOS	B		A
Approach Delay (s)	13.5	0.0	0.2
Approach LOS	B		

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	33.2%	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)	0	0	0	135	0	5	5	180	235	10	360	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
Hourly flow rate (vph)	0	0	0	171	0	6	6	228	297	13	456	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								TWLTL			None	
Median storage veh)								2				
Upstream signal (ft)								305				
pX, platoon unblocked	0.87	0.87		0.87	0.87	0.87				0.87		
vC, conflicting volume	877	1019	456	870	870	377	456			525		
vC1, stage 1 conf vol	481	481		389	389							
vC2, stage 2 conf vol	396	538		481	481							
vCu, unblocked vol	784	948	456	777	777	210	456			381		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.5	4.1			4.1		
tC, 2 stage (s)	6.1	5.5		6.1	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.6	2.2			2.2		
p0 queue free %	100	100	100	64	100	99	99			99		
cM capacity (veh/h)	477	419	609	479	468	660	1116			1035		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	0	177	532	468
Volume Left	0	171	6	13
Volume Right	0	6	297	0
cSH	1700	484	1116	1035
Volume to Capacity	0.00	0.37	0.01	0.01
Queue Length 95th (ft)	0	42	0	1
Control Delay (s)	0.0	16.7	0.2	0.4
Lane LOS	A	C	A	A
Approach Delay (s)	0.0	16.7	0.2	0.4
Approach LOS	A	C		

Intersection Summary			
Average Delay	2.7		
Intersection Capacity Utilization	40.7%	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 (vph)	0	0	0	1335	0	45	35	375	0	0	470	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				3.6	3.6	3.6	2.0	3.0			3.0	
Lane Util. Factor				0.95	0.95	1.00	1.00	1.00			0.95	
Frt				1.00	1.00	0.85	1.00	1.00			0.99	
Flt Protected				0.95	0.95	1.00	0.95	1.00			1.00	
Satd. Flow (prot)				1681	1681	1615	1421	1863			3583	
Flt Permitted				0.95	0.95	1.00	0.95	1.00			1.00	
Satd. Flow (perm)				1681	1681	1615	1421	1863			3583	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	0	0	0	1435	0	48	38	403	0	0	505	27
RTOR Reduction (vph)	0	0	0	0	0	7	0	0	0	0	5	0
Lane Group Flow (vph)	0	0	0	717	718	41	38	403	0	0	527	0
Heavy Vehicles (%)	0%	0%	0%	2%	0%	0%	27%	2%	0%	0%	0%	0%
Turn Type				Perm		Perm	Prot					
Protected Phases					4		1	6			2	
Permitted Phases				4		4						
Actuated Green, G (s)				24.0	24.0	24.0	2.8	36.0			29.2	
Effective Green, g (s)				25.4	25.4	25.4	4.8	38.0			31.2	
Actuated g/C Ratio				0.36	0.36	0.36	0.07	0.54			0.45	
Clearance Time (s)				5.0	5.0	5.0	4.0	5.0			5.0	
Vehicle Extension (s)				2.3	2.3	2.3	2.3	3.0			5.2	
Lane Grp Cap (vph)				610	610	586	97	1011			1597	
v/s Ratio Prot							0.03	c0.22			0.15	
v/s Ratio Perm				0.43	0.43	0.03						
v/c Ratio				1.18	1.18	0.07	0.39	0.40			0.33	
Uniform Delay, d1				22.3	22.3	14.6	31.2	9.3			12.6	
Progression Factor				1.00	1.00	1.00	0.84	0.50			1.00	
Incremental Delay, d2				95.3	96.0	0.0	1.5	1.1			0.6	
Delay (s)				117.6	118.3	14.6	27.6	5.8			13.2	
Level of Service				F	F	B	C	A			B	
Approach Delay (s)		0.0			114.6			7.7			13.2	
Approach LOS		A			F			A			B	

Intersection Summary			
HCM Average Control Delay	73.4	HCM Level of Service	E
HCM Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	6.6
Intersection Capacity Utilization	91.3%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	65	0	190	0	0	0	0	345	470	40	1765	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.6	3.6					3.0	3.0	2.0	3.0	
Lane Util. Factor		1.00	1.00					1.00	1.00	1.00	0.95	
Frt		1.00	0.85					1.00	0.85	1.00	1.00	
Flt Protected		0.95	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1805	1442					1776	1553	1805	3574	
Flt Permitted		0.95	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1805	1442					1776	1553	1805	3574	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	71	0	209	0	0	0	0	379	516	44	1940	0
RTOR Reduction (vph)	0	0	10	0	0	0	0	0	220	0	0	0
Lane Group Flow (vph)	0	71	199	0	0	0	0	379	296	44	1940	0
Heavy Vehicles (%)	0%	0%	12%	0%	0%	0%	0%	7%	4%	0%	1%	0%
Turn Type	Perm		Perm						Perm	Prot		
Protected Phases		8						6		5	2	
Permitted Phases	8		8						6			
Actuated Green, G (s)		14.1	14.1					38.2	38.2	3.7	45.9	
Effective Green, g (s)		15.5	15.5					40.2	40.2	5.7	47.9	
Actuated g/C Ratio		0.22	0.22					0.57	0.57	0.08	0.68	
Clearance Time (s)		5.0	5.0					5.0	5.0	4.0	5.0	
Vehicle Extension (s)		2.3	2.3					4.7	4.7	2.3	4.7	
Lane Grp Cap (vph)		400	319					1020	892	147	2446	
v/s Ratio Prot								0.21		0.02	c0.54	
v/s Ratio Perm		0.04	c0.14						0.19			
v/c Ratio		0.18	0.62					0.37	0.33	0.30	0.79	
Uniform Delay, d1		22.1	24.6					8.1	7.8	30.3	7.6	
Progression Factor		1.00	1.00					1.00	1.00	1.25	0.74	
Incremental Delay, d2		0.1	3.0					1.0	1.0	0.2	1.0	
Delay (s)		22.2	27.7					9.1	8.8	38.0	6.6	
Level of Service		C	C					A	A	D	A	
Approach Delay (s)		26.3			0.0			9.0			7.3	
Approach LOS		C			A			A			A	

Intersection Summary			
HCM Average Control Delay	9.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	6.6
Intersection Capacity Utilization	91.3%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	510	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0					
Lane Util. Factor	0.95					
Frt	1.00					
Flt Protected	1.00					
Satd. Flow (prot)	3539					
Flt Permitted	1.00					
Satd. Flow (perm)	3539					
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	554	0	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	554	0	0	0	0	0
Turn Type						
Protected Phases	4					
Permitted Phases						
Actuated Green, G (s)	20.0					
Effective Green, g (s)	20.0					
Actuated g/C Ratio	1.00					
Clearance Time (s)	4.0					
Lane Grp Cap (vph)	3539					
v/s Ratio Prot	c0.16					
v/s Ratio Perm						
v/c Ratio	0.16					
Uniform Delay, d1	0.0					
Progression Factor	1.00					
Incremental Delay, d2	0.1					
Delay (s)	0.1					
Level of Service	A					
Approach Delay (s)	0.1			0.0	0.0	
Approach LOS	A			A	A	

Intersection Summary			
HCM Average Control Delay	0.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.16		
Actuated Cycle Length (s)	20.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	17.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	20	0	25	0	0	0	10	795	0	0	1950	5
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			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
Hourly flow rate (vph)	22	0	28	0	0	0	11	883	0	0	2167	6
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											227	
pX, platoon unblocked	0.58	0.58	0.58	0.58	0.58		0.58					
vC, conflicting volume	2633	3075	1086	2017	3078	442	2172			883		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2364	3130	0	1294	3135	442	1564			883		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	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 %	0	100	96	100	100	100	95			100		
cM capacity (veh/h)	11	6	629	65	6	569	247			774		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	50	0	11	589	294	1083	1089
Volume Left	22	0	11	0	0	0	0
Volume Right	28	0	0	0	0	0	6
cSH	23	1700	247	1700	1700	774	1700
Volume to Capacity	2.14	0.00	0.05	0.35	0.17	0.00	0.64
Queue Length 95th (ft)	157	0	4	0	0	0	0
Control Delay (s)	875.9	0.0	20.3	0.0	0.0	0.0	0.0
Lane LOS	F	A	C				
Approach Delay (s)	875.9	0.0	0.3			0.0	
Approach LOS	F	A					

Intersection Summary			
Average Delay	14.1		
Intersection Capacity Utilization	64.1%	ICU Level of Service	C
Analysis Period (min)	15		

200: Schaaf Rd & Helvetia Rd Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Total Delay (hr)	0.0	0.0	0.2	0.0	0.0	0.1	0.3
Delay / Veh (s)	4.9	0.9	4.0	1.8	0.9	0.6	1.8
Vehicles Entered	4	4	187	11	6	369	581
Vehicles Exited	4	5	185	11	6	369	580
Hourly Exit Rate	4	5	185	11	6	369	580
Input Volume	5	5	193	10	5	365	583
% of Volume	80	100	96	110	120	101	99
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

210: Groveland Dr & Helvetia Rd Performance by movement

Movement	WBL	WBR	NBL	NBT	NBR	SBL	SBT	All
Total Delay (hr)	0.6	0.0	0.0	0.4	0.2	0.0	0.3	1.5
Delay / Veh (s)	15.5	8.2	5.0	7.0	3.0	6.0	3.0	5.6
Vehicles Entered	138	6	4	198	237	10	390	983
Vehicles Exited	138	6	4	199	238	11	391	987
Hourly Exit Rate	138	6	4	199	238	11	391	987
Input Volume	135	5	5	201	235	10	387	978
% of Volume	102	114	76	99	101	110	101	101
Denied Entry Before	0	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0	0

220: US-26 WB Helvetia On-ramp & Helvetia Rd Performance by movement

Movement	WBL	WBR	NBL	NBT	SBT	SBR	All
Total Delay (hr)	15.6	0.5	0.4	2.7	3.0	0.1	22.3
Delay / Veh (s)	41.3	40.7	40.2	25.4	21.3	14.4	34.2
Vehicles Entered	1362	48	34	374	501	26	2345
Vehicles Exited	1353	47	34	379	503	27	2343
Hourly Exit Rate	1353	47	34	379	503	27	2343
Input Volume	1335	45	35	383	494	25	2317
% of Volume	101	104	97	99	102	109	101
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

230: US-26 EB Helvetia Off-ramp & Helvetia Rd/Brookwood Pkwy Performance by movement

Movement	EBL	EBR	NBT	NBR	SBL	SBT	All
Total Delay (hr)	1.3	3.0	0.3	0.3	0.6	2.4	7.9
Delay / Veh (s)	73.2	56.8	3.6	2.6	47.6	4.9	9.8
Vehicles Entered	62	188	344	471	42	1808	2915
Vehicles Exited	62	190	342	472	43	1810	2919
Hourly Exit Rate	62	190	342	472	43	1810	2919
Input Volume	65	190	349	470	40	1778	2893
% of Volume	95	100	98	100	107	102	101
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

231: US-26 EB Helvetia On-ramp & Performance by movement

Movement	EBT	All
Total Delay (hr)	0.8	0.8
Delay / Veh (s)	5.4	5.4
Vehicles Entered	521	521
Vehicles Exited	520	520
Hourly Exit Rate	520	520
Input Volume	518	518
% of Volume	100	100
Denied Entry Before	0	0
Denied Entry After	0	0

240: Meek Rd & Brookwood Pkwy Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Total Delay (hr)	2.6	2.3	0.1	0.9	0.7	0.0	6.5
Delay / Veh (s)	403.4	328.5	20.8	4.2	1.3	0.2	8.3
Vehicles Entered	23	25	8	791	1987	4	2838
Vehicles Exited	23	25	9	788	1986	4	2835
Hourly Exit Rate	23	25	9	788	1986	4	2835
Input Volume	20	25	10	795	1956	5	2812
% of Volume	116	100	88	99	102	76	101
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

Total Network Performance

Total Delay (hr)	52.4
Delay / Veh (s)	59.5
Vehicles Entered	3162
Vehicles Exited	3172
Hourly Exit Rate	3172
Input Volume	22829
% of Volume	14
Denied Entry Before	0
Denied Entry After	1

Intersection: 200: Schaaf Rd & Helvetia Rd

Movement	WB	SB
Directions Served	LR	LT
Maximum Queue (ft)	33	17
Average Queue (ft)	7	1
95th Queue (ft)	26	7
Link Distance (ft)	1714	562
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 210: Groveland Dr & Helvetia Rd

Movement	WB	NB	SB
Directions Served	LR	LTR	LTR
Maximum Queue (ft)	168	35	105
Average Queue (ft)	50	2	10
95th Queue (ft)	114	15	56
Link Distance (ft)	1693	218	1385
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 220: US-26 WB Helvetia On-ramp & Helvetia Rd

Movement	WB	WB	WB	B221	NB	NB	SB	SB
Directions Served	L	LT	R	T	L	T	T	TR
Maximum Queue (ft)	629	648	50	610	115	303	208	214
Average Queue (ft)	424	444	29	50	36	168	105	108
95th Queue (ft)	616	632	57	391	86	265	173	178
Link Distance (ft)	604	604		4837		606	218	218
Upstream Blk Time (%)	1	1					0	0
Queuing Penalty (veh)	0	0					0	0
Storage Bay Dist (ft)			25		150			
Storage Blk Time (%)		52	4		0	10		
Queuing Penalty (veh)		23	30		0	3		

Intersection: 230: US-26 EB Helvetia Off-ramp & Helvetia Rd/Brookwood Pkwy

Movement	EB	EB	NB	SB	SB	SB
Directions Served	LT	R	T	L	T	T
Maximum Queue (ft)	367	323	130	104	155	159
Average Queue (ft)	93	137	46	35	53	58
95th Queue (ft)	278	279	106	78	120	127
Link Distance (ft)	1138		168		606	606
Upstream Blk Time (%)			0			
Queuing Penalty (veh)			0			
Storage Bay Dist (ft)		300		175		
Storage Blk Time (%)	0	4			0	
Queuing Penalty (veh)	0	3			0	

Intersection: 231: US-26 EB Helvetia On-ramp &

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

Intersection: 240: Meek Rd & Brookwood Pkwy

Movement	EB	NB	NB	NB
Directions Served	LR	L	T	TR
Maximum Queue (ft)	331	43	17	23
Average Queue (ft)	153	8	1	1
95th Queue (ft)	333	31	12	11
Link Distance (ft)	603		1910	1910
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)		100		
Storage Blk Time (%)			0	
Queuing Penalty (veh)			0	

Network Summary

Network wide Queuing Penalty: 60

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	5	0	480	5	0	150
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	5	0	516	5	0	161
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	680	519			522	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	680	519			522	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	100			100	
cM capacity (veh/h)	420	561			1055	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	5	522	161
Volume Left	5	0	0
Volume Right	0	5	0
cSH	420	1700	1055
Volume to Capacity	0.01	0.31	0.00
Queue Length 95th (ft)	1	0	0
Control Delay (s)	13.7	0.0	0.0
Lane LOS	B		
Approach Delay (s)	13.7	0.0	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	35.6%	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)	0	0	0	195	0	5	0	480	470	5	150	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	0	0	0	214	0	5	0	527	516	5	165	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								TWLTL			None	
Median storage veh)								2				
Upstream signal (ft)								305				
pX, platoon unblocked	0.53	0.53		0.53	0.53	0.53				0.53		
vC, conflicting volume	967	1220	165	962	962	786	165			1044		
vC1, stage 1 conf vol	176	176		786	786							
vC2, stage 2 conf vol	791	1044		176	176							
vCu, unblocked vol	494	971	165	483	483	152	165			639		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)	6.1	5.5		6.1	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	50	100	99	100			99		
cM capacity (veh/h)	414	237	885	426	390	477	1426			506		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	0	220	1044	170
Volume Left	0	214	0	5
Volume Right	0	5	516	0
cSH	1700	427	1426	506
Volume to Capacity	0.00	0.51	0.00	0.01
Queue Length 95th (ft)	0	72	0	1
Control Delay (s)	0.0	22.0	0.0	0.5
Lane LOS	A	C		A
Approach Delay (s)	0.0	22.0	0.0	0.5
Approach LOS	A	C		

Intersection Summary			
Average Delay	3.4		
Intersection Capacity Utilization	71.8%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	640	0	55	205	895	0	0	260	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				3.6	3.6	3.6	2.0	7.0			3.0	
Lane Util. Factor				0.95	0.95	1.00	1.00	1.00			0.95	
Frt				1.00	1.00	0.85	1.00	1.00			0.96	
Flt Protected				0.95	0.95	1.00	0.95	1.00			1.00	
Satd. Flow (prot)				1715	1715	1615	1787	1881			3477	
Flt Permitted				0.95	0.95	1.00	0.95	1.00			1.00	
Satd. Flow (perm)				1715	1715	1615	1787	1881			3477	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	0	0	0	688	0	59	220	962	0	0	280	91
RTOR Reduction (vph)	0	0	0	0	0	18	0	0	0	0	34	0
Lane Group Flow (vph)	0	0	0	344	344	41	220	962	0	0	337	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	1%	1%	0%	0%	0%	0%
Turn Type				Perm		Perm	Prot					
Protected Phases					4		1	6			2	
Permitted Phases				4		4						
Actuated Green, G (s)				15.9	15.9	15.9	13.3	44.1			26.8	
Effective Green, g (s)				17.3	17.3	17.3	15.3	42.1			28.8	
Actuated g/C Ratio				0.25	0.25	0.25	0.22	0.60			0.41	
Clearance Time (s)				5.0	5.0	5.0	4.0	5.0			5.0	
Vehicle Extension (s)				2.3	2.3	2.3	2.3	3.0			5.2	
Lane Grp Cap (vph)				424	424	399	391	1131			1431	
v/s Ratio Prot							0.12	c0.51			0.10	
v/s Ratio Perm				c0.20	0.20	0.03						
v/c Ratio				0.81	0.81	0.10	0.56	0.85			0.24	
Uniform Delay, d1				24.8	24.8	20.4	24.4	11.4			13.4	
Progression Factor				1.00	1.00	1.00	0.78	1.45			1.00	
Incremental Delay, d2				10.8	10.8	0.1	0.9	5.9			0.4	
Delay (s)				35.7	35.7	20.4	19.9	22.3			13.8	
Level of Service				D	D	C	B	C			B	
Approach Delay (s)		0.0			34.5			21.9			13.8	
Approach LOS		A			C			C			B	

Intersection Summary			
HCM Average Control Delay	24.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	10.6
Intersection Capacity Utilization	74.0%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	50	0	65	0	0	0	0	1050	805	10	890	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0					5.0	5.0	4.0	5.0	
Lane Util. Factor		1.00	1.00					1.00	1.00	1.00	0.95	
Frt		1.00	0.85					1.00	0.85	1.00	1.00	
Flt Protected		0.95	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1805	1615					1881	1599	1805	3610	
Flt Permitted		0.95	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1805	1615					1881	1599	1805	3610	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	52	0	68	0	0	0	0	1094	839	10	927	0
RTOR Reduction (vph)	0	0	63	0	0	0	0	0	246	0	0	0
Lane Group Flow (vph)	0	52	5	0	0	0	0	1094	593	10	927	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	1%	1%	0%	0%	0%
Turn Type	Perm		Perm						Perm	Prot		
Protected Phases		8						6		5	2	
Permitted Phases	8		8						6			
Actuated Green, G (s)		5.3	5.3					49.5	49.5	1.2	54.7	
Effective Green, g (s)		5.3	5.3					49.5	49.5	1.2	54.7	
Actuated g/C Ratio		0.08	0.08					0.71	0.71	0.02	0.78	
Clearance Time (s)		5.0	5.0					5.0	5.0	4.0	5.0	
Vehicle Extension (s)		2.3	2.3					4.7	4.7	2.3	4.7	
Lane Grp Cap (vph)		137	122					1330	1131	31	2821	
v/s Ratio Prot								c0.58		0.01	c0.26	
v/s Ratio Perm		0.03	0.00						0.37			
v/c Ratio		0.38	0.04					0.82	0.52	0.32	0.33	
Uniform Delay, d1		30.8	30.0					7.2	4.8	34.0	2.2	
Progression Factor		1.00	1.00					1.00	1.00	1.08	0.36	
Incremental Delay, d2		1.0	0.1					5.8	1.7	2.8	0.2	
Delay (s)		31.8	30.1					13.0	6.5	39.5	1.1	
Level of Service		C	C					B	A	D	A	
Approach Delay (s)		30.8			0.0			10.2			1.5	
Approach LOS		C			A			B			A	

Intersection Summary			
HCM Average Control Delay	8.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	74.0%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑					
Volume (vph)	815	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5					
Lane Util. Factor	0.95					
Frt	1.00					
Flt Protected	1.00					
Satd. Flow (prot)	3610					
Flt Permitted	1.00					
Satd. Flow (perm)	3610					
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	886	0	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	886	0	0	0	0	0
Heavy Vehicles (%)	0%	1%	0%	0%	0%	0%
Turn Type						
Protected Phases	4					
Permitted Phases						
Actuated Green, G (s)	2.5					
Effective Green, g (s)	2.5					
Actuated g/C Ratio	0.14					
Clearance Time (s)	4.5					
Lane Grp Cap (vph)	501					
v/s Ratio Prot	c0.25					
v/s Ratio Perm						
v/c Ratio	1.77					
Uniform Delay, d1	7.8					
Progression Factor	1.00					
Incremental Delay, d2	353.9					
Delay (s)	361.6					
Level of Service	F					
Approach Delay (s)	361.6			0.0	0.0	
Approach LOS	F			A	A	

Intersection Summary			
HCM Average Control Delay	361.6	HCM Level of Service	F
HCM Volume to Capacity ratio	1.77		
Actuated Cycle Length (s)	18.0	Sum of lost time (s)	15.5
Intersection Capacity Utilization	26.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	5	0	20	0	0	0	40	1850	0	0	935	20
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	5	0	21	0	0	0	43	1968	0	0	995	21
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											227	
pX, platoon unblocked	0.92	0.92	0.92	0.92	0.92		0.92					
vC, conflicting volume	2074	3059	508	2572	3069	984	1016			1968		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1997	3063	300	2536	3075	984	850			1968		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	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 %	83	100	97	100	100	100	94			100		
cM capacity (veh/h)	32	11	648	12	11	251	735			299		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	27	0	43	1312	656	497	519
Volume Left	5	0	43	0	0	0	0
Volume Right	21	0	0	0	0	0	21
cSH	134	1700	735	1700	1700	299	1700
Volume to Capacity	0.20	0.00	0.06	0.77	0.39	0.00	0.31
Queue Length 95th (ft)	18	0	5	0	0	0	0
Control Delay (s)	38.4	0.0	10.2	0.0	0.0	0.0	0.0
Lane LOS	E	A	B				
Approach Delay (s)	38.4	0.0	0.2			0.0	
Approach LOS	E	A					

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	61.1%	ICU Level of Service	B
Analysis Period (min)	15		

200: Schaaf Rd & Helvetia Rd Performance by movement

Movement	WBL	NBT	NBR	SBT	All
Total Delay (hr)	0.0	0.7	0.0	0.0	0.8
Delay / Veh (s)	4.5	5.5	5.3	0.2	4.3
Vehicles Entered	6	474	5	146	631
Vehicles Exited	6	478	5	146	635
Hourly Exit Rate	6	478	5	146	635
Input Volume	5	483	5	150	642
% of Volume	120	99	100	97	99
Denied Entry Before	0	0	0	0	0
Denied Entry After	0	0	0	0	0

210: Groveland Dr & Helvetia Rd Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Total Delay (hr)	3.8	0.1	1.3	0.7	0.0	0.1	6.0
Delay / Veh (s)	69.8	55.0	10.1	5.2	19.5	1.9	16.5
Vehicles Entered	194	7	475	484	4	149	1313
Vehicles Exited	194	7	474	483	4	149	1311
Hourly Exit Rate	194	7	474	483	4	149	1311
Input Volume	195	5	487	470	5	151	1313
% of Volume	99	140	97	103	80	99	100
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

220: US-26 WB Helvetia On-ramp & Helvetia Rd Performance by movement

Movement	WBL	WBR	NBL	NBT	SBT	SBR	All
Total Delay (hr)	10.7	1.1	2.7	9.1	0.9	0.1	24.6
Delay / Veh (s)	61.3	66.1	49.8	36.2	11.9	6.3	41.6
Vehicles Entered	627	57	195	907	262	82	2130
Vehicles Exited	630	58	197	907	260	82	2134
Hourly Exit Rate	630	58	197	907	260	82	2134
Input Volume	640	55	205	904	263	85	2153
% of Volume	98	105	96	100	99	96	99
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

230: US-26 EB Helvetia Off-ramp & Helvetia Rd/Brookwood Pkwy Performance by movement

Movement	EBL	EBR	NBT	NBR	SBL	SBT	All
Total Delay (hr)	1.3	0.2	2.9	1.3	0.1	0.8	6.6
Delay / Veh (s)	98.4	12.0	10.0	5.9	35.5	3.0	8.2
Vehicles Entered	47	62	1054	812	9	887	2871
Vehicles Exited	47	62	1055	812	9	891	2876
Hourly Exit Rate	47	62	1055	812	9	891	2876
Input Volume	50	65	1060	805	10	898	2888
% of Volume	94	95	100	101	90	99	100
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	1	0	0	0	1

231: US-26 EB Helvetia On-ramp & Performance by movement

Movement	EBT	All
Total Delay (hr)	39.4	39.4
Delay / Veh (s)	175.3	175.3
Vehicles Entered	830	830
Vehicles Exited	788	788
Hourly Exit Rate	788	788
Input Volume	826	826
% of Volume	95	95
Denied Entry Before	0	0
Denied Entry After	1	1

240: Meek Rd & Brookwood Pkwy Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Total Delay (hr)	1.0	4.5	0.4	17.3	0.2	0.0	23.5
Delay / Veh (s)	1219.6	907.5	36.6	33.4	0.7	0.2	29.4
Vehicles Entered	4	21	42	1874	930	19	2890
Vehicles Exited	3	15	42	1855	929	19	2863
Hourly Exit Rate	3	15	42	1855	929	19	2863
Input Volume	5	20	40	1850	940	20	2876
% of Volume	60	74	105	100	99	94	100
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

Total Network Performance

Total Delay (hr)	107.4
Delay / Veh (s)	124.5
Vehicles Entered	3135
Vehicles Exited	3079
Hourly Exit Rate	3079
Input Volume	23011
% of Volume	13
Denied Entry Before	1
Denied Entry After	2

Intersection: 200: Schaaf Rd & Helvetia Rd

Movement	WB
Directions Served	LR
Maximum Queue (ft)	27
Average Queue (ft)	5
95th Queue (ft)	21
Link Distance (ft)	1714
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 210: Groveland Dr & Helvetia Rd

Movement	WB	NB	SB
Directions Served	LR	LTR	LTR
Maximum Queue (ft)	414	38	79
Average Queue (ft)	162	2	6
95th Queue (ft)	336	14	35
Link Distance (ft)	1693	218	1385
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 220: US-26 WB Helvetia On-ramp & Helvetia Rd

Movement	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	LT	R	L	T	T	TR
Maximum Queue (ft)	424	431	50	325	631	123	135
Average Queue (ft)	252	270	36	177	517	54	63
95th Queue (ft)	403	417	60	350	760	98	110
Link Distance (ft)	604	604			606	218	218
Upstream Blk Time (%)					7		
Queuing Penalty (veh)					79		
Storage Bay Dist (ft)			25	150			
Storage Blk Time (%)		74	23	6	27		
Queuing Penalty (veh)		41	74	53	56		

Intersection: 230: US-26 EB Helvetia Off-ramp & Helvetia Rd/Brookwood Pkwy

Movement	EB	EB	NB	NB	SB	SB	SB
Directions Served	LT	R	T	R	L	T	T
Maximum Queue (ft)	168	59	222	143	36	50	48
Average Queue (ft)	60	24	157	54	7	7	11
95th Queue (ft)	132	48	251	198	26	31	39
Link Distance (ft)	1138		168	168		606	606
Upstream Blk Time (%)			13	5			
Queuing Penalty (veh)			117	48			
Storage Bay Dist (ft)		300			175		
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 231: US-26 EB Helvetia On-ramp &

Movement	EB	EB
Directions Served	T	T
Maximum Queue (ft)	886	988
Average Queue (ft)	608	664
95th Queue (ft)	1060	1190
Link Distance (ft)	991	991
Upstream Blk Time (%)		15
Queuing Penalty (veh)		61
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 240: Meek Rd & Brookwood Pkwy

Movement	EB	NB	NB	NB	SB
Directions Served	LR	L	T	TR	TR
Maximum Queue (ft)	403	198	1208	1117	14
Average Queue (ft)	158	32	458	363	0
95th Queue (ft)	388	120	1300	1168	7
Link Distance (ft)	603		1910	1910	168
Upstream Blk Time (%)			0		
Queuing Penalty (veh)			0		
Storage Bay Dist (ft)		100			
Storage Blk Time (%)			14		
Queuing Penalty (veh)			5		

Network Summary

Network wide Queuing Penalty: 535

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/13/2011
Analysis time period:	AM Peak
Freeway/Dir of Travel:	US 26 Eastbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2015
Description: Eastbound	Off-ramp to Brookwood

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	1990	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	210	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	1990		210			vph
Peak-hour factor, PHF	0.95		0.95			
Peak 15-min volume, v15	524		55			v
Trucks and buses	4		4			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.980	0.980	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2137	225	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2137 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2137	4600	No
$v_{FO} = v_F - v_R$	1912	4600	No
v_R	225	2000	No
$v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3 \text{ or } av34} > 2700$ pc/h?		No	
Is $v_{3 \text{ or } av34} > 1.5\, v_{12}/2$		No	
If yes, v_{12A} = 2137		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	2137	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 9.1 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	D_S = 0.448	
Space mean speed in ramp influence area,	S_R = 51.9	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 51.9	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/14/2011
Analysis time period:	AM Peak Period
Freeway/Dir of Travel:	US 26 Eastbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2015
Description: Eastbound	On-ramp from Brookwood

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	1775	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	490	vph
Length of first accel/decel lane	410	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1775	490		vph
Peak-hour factor, PHF	0.95	0.95		
Peak 15-min volume, v15	467	129		v
Trucks and buses	4	4		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.980	0.980	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	1906	526	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 1906 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2432	4600	No
$v_{3 or av34}$	0 pc/h	(Equation 25-4 or 25-5)	
Is $v_{3 or av34}$ > 2700 pc/h?		No	
Is $v_{3 or av34}$ > 1.5 v_{12}/2		No	
If yes, v_{12A} = 1906		(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	1906	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 21.6 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	M_S = 0.337	
Space mean speed in ramp influence area,	S_R = 53.9	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 53.9	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/13/2011
Analysis time period:	AM Peak
Freeway/Dir of Travel:	US 26 Westbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2015
Description:	Westbound Off-ramp to Brookwood - No-build

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	1215	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	1385	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	1215		1385			vph
Peak-hour factor, PHF	0.95		0.95			
Peak 15-min volume, v15	320		364			v
Trucks and buses	4		4			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.980	0.980	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	1305	1487	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 1305 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	1305	4600	No
$v_{FO} = v_F - v_R$	-182	4600	No
v_R	1487	2000	No
$v_{3\ or\ av34}$ v_{av34}	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3\ or\ av34}$ v_{av34} > 2700 pc/h?		No	
Is $v_{3\ or\ av34}$ v_{av34} > 1.5 v_{12} /2		No	
If yes, v_{12A} = 1305		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	1305	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 2.0 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	D_S = 0.562	
Space mean speed in ramp influence area,	S_R = 49.9	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 49.9	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/14/2011
Analysis time period:	AM Peak Period
Freeway/Dir of Travel:	US 26 Westbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2015
Description: Westbound	On-ramp from Brookwood

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	1125	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	60	vph
Length of first accel/decel lane	410	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1125	60		vph
Peak-hour factor, PHF	0.95	0.95		
Peak 15-min volume, v15	296	16		v
Trucks and buses	4	4		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.980	0.980	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	1208	64	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 1208 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	1272	4600	No
$v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-4 or 25-5)	
Is $v_{3 \text{ or } av34}$ > 2700 pc/h?		No	
Is $v_{3 \text{ or } av34}$ > 1.5 v_{12}/2		No	
If yes, v_{12A} = 1208		(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	1208	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 12.8 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	M_S = 0.306	
Space mean speed in ramp influence area,	S_R = 54.5	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 54.5	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/13/2011
Analysis time period:	PM Peak
Freeway/Dir of Travel:	US 26 Eastbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2015
Description: Eastbound	Off-ramp to Brookwood

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	1805	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	130	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	1805		130			vph
Peak-hour factor, PHF	0.95		0.95			
Peak 15-min volume, v15	475		34			v
Trucks and buses	1		1			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.995	0.995	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	1910	138	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 1910 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	1910	4600	No
$v_{FO} = v_F - v_R$	1772	4600	No
v_R	138	2000	No
$v_{3\ or\ av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3\ or\ av34}$ > 2700 pc/h?		No	
Is $v_{3\ or\ av34}$ > 1.5 $v_{12}/2$		No	
If yes, v_{12A} = 1910		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	1910	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 7.2 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	D_S = 0.440	
Space mean speed in ramp influence area,	S_R = 52.1	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 52.1	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/14/2011
Analysis time period:	PM Peak Period
Freeway/Dir of Travel:	US 26 Eastbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2015
Description: Eastbound	On-ramp from Brookwood

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	1675	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	800	vph
Length of first accel/decel lane	410	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1675	800		vph
Peak-hour factor, PHF	0.95	0.95		
Peak 15-min volume, v15	441	211		v
Trucks and buses	1	1		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.995	0.995	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	1772	846	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 1772 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2618	4600	No
$v_{3 or av34}$	0 pc/h	(Equation 25-4 or 25-5)	
Is $v_{3 or av34}$ > 2700 pc/h?		No	
Is $v_{3 or av34}$ > 1.5 v_{12}/2		No	
If yes, v_{12A} = 1772		(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	1772	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A$ = 22.9 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	M_S = 0.346	
Space mean speed in ramp influence area,	S_R = 53.8	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 53.8	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/13/2011
Analysis time period:	PM Peak
Freeway/Dir of Travel:	US 26 Westbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2015
Description:	Westbound Off-Ramp to Brookwood - No-Build

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2690	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	745	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2690		745			vph
Peak-hour factor, PHF	0.95		0.95			
Peak 15-min volume, v15	708		196			v
Trucks and buses	1		3			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.995	0.985	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2846	796	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2846 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2846	4600	No
$v_{FO} = v_F - v_R$	2050	4600	No
v_R	796	2000	No
$v_{3\ or\ av34}$ v_{av34}	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3\ or\ av34}$ v_{av34} > 2700 pc/h?		No	
Is $v_{3\ or\ av34}$ v_{av34} > 1.5 v_{12} /2		No	
If yes, v_{12A} = 2846		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	2846	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 15.2 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	D_S = 0.500	
Space mean speed in ramp influence area,	S_R = 51.0	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 51.0	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/14/2011
Analysis time period:	PM Peak Period
Freeway/Dir of Travel:	US 26 Westbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2015
Description: Westbound	On-Ramp from Brookwood

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	1945	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	300	vph
Length of first accel/decel lane	410	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1945	300		vph
Peak-hour factor, PHF	0.95	0.95		
Peak 15-min volume, v15	512	79		v
Trucks and buses	1	3		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.995	0.985	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2058	321	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2058 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2379	4600	No
$v_{3 or av34}$	0 pc/h	(Equation 25-4 or 25-5)	
Is $v_{3 or av34}$ > 2700 pc/h?		No	
Is $v_{3 or av34}$ > 1.5 v_{12}/2		No	
If yes, v_{12A} = 2058		(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	2058	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A$ = 21.3 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	M_S = 0.334	
Space mean speed in ramp influence area,	S_R = 54.0	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 54.0	mph

Year 2035 No-Build

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	45	10	165	205	45	410
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.64	0.64	0.64	0.64	0.64	0.64
Hourly flow rate (vph)	70	16	258	320	70	641
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1199	418			578	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1199	418			578	
tC, single (s)	6.4	6.5			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.6			2.2	
p0 queue free %	63	97			93	
cM capacity (veh/h)	192	574			1006	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	86	578	711
Volume Left	70	0	70
Volume Right	16	320	0
cSH	219	1700	1006
Volume to Capacity	0.39	0.34	0.07
Queue Length 95th (ft)	44	0	6
Control Delay (s)	31.7	0.0	1.8
Lane LOS	D		A
Approach Delay (s)	31.7	0.0	1.8
Approach LOS	D		

Intersection Summary			
Average Delay	2.9		
Intersection Capacity Utilization	58.6%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	0	155	0	5	5	365	275	15	440	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
Hourly flow rate (vph)	0	0	0	196	0	6	6	462	348	19	557	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								TWLTL			None	
Median storage veh)								2				
Upstream signal (ft)								305				
pX, platoon unblocked	0.70	0.70		0.70	0.70	0.70				0.70		
vC, conflicting volume	1250	1418	557	1244	1244	636	557			810		
vC1, stage 1 conf vol	595	595		649	649							
vC2, stage 2 conf vol	655	823		595	595							
vCu, unblocked vol	1141	1382	557	1132	1132	261	557			511		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.5	4.1			4.1		
tC, 2 stage (s)	6.1	5.5		6.1	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.6	2.2			2.2		
p0 queue free %	100	100	100	45	100	99	99			97		
cM capacity (veh/h)	351	290	534	358	354	494	1024			743		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	0	203	816	576
Volume Left	0	196	6	19
Volume Right	0	6	348	0
cSH	1700	361	1024	743
Volume to Capacity	0.00	0.56	0.01	0.03
Queue Length 95th (ft)	0	82	0	2
Control Delay (s)	0.0	27.0	0.2	0.7
Lane LOS	A	D	A	A
Approach Delay (s)	0.0	27.0	0.2	0.7
Approach LOS	A	D		

Intersection Summary			
Average Delay	3.8		
Intersection Capacity Utilization	53.7%	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 (vph)	0	0	0	1795	0	100	60	545	0	0	565	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				3.6	3.6	3.6	2.0	3.0			3.0	
Lane Util. Factor				0.95	0.95	1.00	1.00	1.00			0.95	
Frt				1.00	1.00	0.85	1.00	1.00			0.99	
Flt Protected				0.95	0.95	1.00	0.95	1.00			1.00	
Satd. Flow (prot)				1681	1681	1615	1421	1863			3583	
Flt Permitted				0.95	0.95	1.00	0.95	1.00			1.00	
Satd. Flow (perm)				1681	1681	1615	1421	1863			3583	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	0	0	0	1930	0	108	65	586	0	0	608	32
RTOR Reduction (vph)	0	0	0	0	0	12	0	0	0	0	5	0
Lane Group Flow (vph)	0	0	0	965	965	96	65	586	0	0	635	0
Heavy Vehicles (%)	0%	0%	0%	2%	0%	0%	27%	2%	0%	0%	0%	0%
Turn Type				Perm		Perm	Prot					
Protected Phases					4		1	6			2	
Permitted Phases				4		4						
Actuated Green, G (s)				37.0	37.0	37.0	4.8	23.0			14.2	
Effective Green, g (s)				38.4	38.4	38.4	6.8	25.0			16.2	
Actuated g/C Ratio				0.55	0.55	0.55	0.10	0.36			0.23	
Clearance Time (s)				5.0	5.0	5.0	4.0	5.0			5.0	
Vehicle Extension (s)				2.3	2.3	2.3	2.3	3.0			5.2	
Lane Grp Cap (vph)				922	922	886	138	665			829	
v/s Ratio Prot							0.05	c0.31			0.18	
v/s Ratio Perm				c0.57	0.57	0.06						
v/c Ratio				1.05	1.05	0.11	0.47	0.88			0.77	
Uniform Delay, d1				15.8	15.8	7.6	29.9	21.1			25.1	
Progression Factor				1.00	1.00	1.00	0.68	0.52			1.00	
Incremental Delay, d2				42.6	42.6	0.2	1.1	12.1			6.7	
Delay (s)				58.4	58.4	7.8	21.5	23.0			31.8	
Level of Service				E	E	A	C	C			C	
Approach Delay (s)		0.0			55.7			22.9			31.8	
Approach LOS		A			E			C			C	

Intersection Summary			
HCM Average Control Delay	44.7	HCM Level of Service	D
HCM Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	6.6
Intersection Capacity Utilization	114.3%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	85	0	275	0	0	0	0	520	505	35	2325	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		3.6	3.6					3.0	3.0	2.0	3.0	
Lane Util. Factor		1.00	1.00					1.00	1.00	1.00	0.95	
Frt		1.00	0.85					1.00	0.85	1.00	1.00	
Flt Protected		0.95	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1805	1442					1776	1553	1805	3574	
Flt Permitted		0.95	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1805	1442					1776	1553	1805	3574	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	93	0	302	0	0	0	0	571	555	38	2555	0
RTOR Reduction (vph)	0	0	11	0	0	0	0	0	301	0	0	0
Lane Group Flow (vph)	0	93	291	0	0	0	0	571	254	38	2555	0
Heavy Vehicles (%)	0%	0%	12%	0%	0%	0%	0%	7%	4%	0%	1%	0%
Turn Type	Perm		Perm						Perm	Prot		
Protected Phases		8						6		5	2	
Permitted Phases	8		8						6			
Actuated Green, G (s)		7.0	7.0					30.0	30.0	19.0	53.0	
Effective Green, g (s)		8.4	8.4					32.0	32.0	21.0	55.0	
Actuated g/C Ratio		0.12	0.12					0.46	0.46	0.30	0.79	
Clearance Time (s)		5.0	5.0					5.0	5.0	4.0	5.0	
Vehicle Extension (s)		2.3	2.3					4.7	4.7	2.3	4.7	
Lane Grp Cap (vph)		217	173					812	710	542	2808	
v/s Ratio Prot								0.32		0.02	c0.71	
v/s Ratio Perm		0.05	c0.20						0.16			
v/c Ratio		0.43	1.68					0.70	0.36	0.07	0.91	
Uniform Delay, d1		28.6	30.8					15.2	12.3	17.5	5.6	
Progression Factor		1.00	1.00					1.00	1.00	1.18	0.43	
Incremental Delay, d2		0.8	329.6					5.1	1.4	0.1	2.1	
Delay (s)		29.4	360.4					20.3	13.7	20.7	4.5	
Level of Service		C	F					C	B	C	A	
Approach Delay (s)		282.5			0.0			17.0			4.7	
Approach LOS		F			A			B			A	

Intersection Summary			
HCM Average Control Delay	34.8	HCM Level of Service	C
HCM Volume to Capacity ratio	1.01		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	6.6
Intersection Capacity Utilization	114.3%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑					
Volume (vph)	540	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0					
Lane Util. Factor	0.95					
Frt	1.00					
Flt Protected	1.00					
Satd. Flow (prot)	3539					
Flt Permitted	1.00					
Satd. Flow (perm)	3539					
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	587	0	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	587	0	0	0	0	0
Turn Type						
Protected Phases	4					
Permitted Phases						
Actuated Green, G (s)	20.0					
Effective Green, g (s)	20.0					
Actuated g/C Ratio	1.00					
Clearance Time (s)	4.0					
Lane Grp Cap (vph)	3539					
v/s Ratio Prot	c0.17					
v/s Ratio Perm						
v/c Ratio	0.17					
Uniform Delay, d1	0.0					
Progression Factor	1.00					
Incremental Delay, d2	0.1					
Delay (s)	0.1					
Level of Service	A					
Approach Delay (s)	0.1			0.0	0.0	
Approach LOS	A			A	A	

Intersection Summary			
HCM Average Control Delay	0.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.17		
Actuated Cycle Length (s)	20.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	18.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	50	0	80	0	0	0	35	975	0	0	2580	20
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			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
Hourly flow rate (vph)	56	0	89	0	0	0	39	1083	0	0	2867	22
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											227	
pX, platoon unblocked	0.23	0.23	0.23	0.23	0.23		0.23					
vC, conflicting volume	3497	4039	1444	2683	4050	542	2889			1083		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	5204	7606	0	1596	7655	542	2507			1083		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	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 %	0	100	64	100	100	100	6			100		
cM capacity (veh/h)	0	0	246	2	0	490	41			651		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	144	0	39	722	361	1433	1456
Volume Left	56	0	39	0	0	0	0
Volume Right	89	0	0	0	0	0	22
cSH	0	1700	41	1700	1700	651	1700
Volume to Capacity	Err	0.00	0.94	0.42	0.21	0.00	0.86
Queue Length 95th (ft)	Err	0	91	0	0	0	0
Control Delay (s)	Err	0.0	269.4	0.0	0.0	0.0	0.0
Lane LOS	F	A	F				
Approach Delay (s)	Err	0.0	9.3			0.0	
Approach LOS	F	A					

Intersection Summary				
Average Delay	350.1			
Intersection Capacity Utilization	86.3%	ICU Level of Service	E	
Analysis Period (min)	15			

200: Schaaf Rd & Helvetia Rd Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Total Delay (hr)	0.4	0.1	0.5	0.2	0.1	0.6	2.0
Delay / Veh (s)	31.5	19.0	5.8	3.9	10.4	5.5	6.7
Vehicles Entered	42	11	342	198	44	416	1053
Vehicles Exited	43	11	340	199	44	416	1053
Hourly Exit Rate	43	11	340	199	44	416	1053
Input Volume	45	10	366	205	45	410	1082
% of Volume	95	110	93	97	97	101	97
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

210: Groveland Dr & Helvetia Rd Performance by movement

Movement	WBL	WBR	NBL	NBT	NBR	SBL	SBT	All
Total Delay (hr)	2.4	0.1	0.0	0.7	0.2	0.0	1.0	4.6
Delay / Veh (s)	61.9	43.6	9.3	7.3	3.6	11.3	7.5	13.1
Vehicles Entered	141	8	3	364	246	14	477	1253
Vehicles Exited	141	8	3	364	247	14	477	1254
Hourly Exit Rate	141	8	3	364	247	14	477	1254
Input Volume	155	5	5	396	275	15	474	1325
% of Volume	91	152	57	92	90	92	101	95
Denied Entry Before	0	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0	0

220: US-26 WB Helvetia On-ramp & Helvetia Rd Performance by movement

Movement	WBL	WBR	NBL	NBT	SBT	SBR	All
Total Delay (hr)	22.3	1.3	0.9	7.0	5.9	0.2	37.6
Delay / Veh (s)	55.7	58.2	54.2	49.6	36.0	25.5	50.0
Vehicles Entered	1444	82	58	508	590	27	2709
Vehicles Exited	1436	82	57	512	592	27	2706
Hourly Exit Rate	1436	82	57	512	592	27	2706
Input Volume	1795	100	60	554	594	30	3132
% of Volume	80	82	95	92	100	91	86
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

230: US-26 EB Helvetia Off-ramp & Helvetia Rd/Brookwood Pkwy Performance by movement

Movement	EBL	EBR	NBT	NBR	SBL	SBT	All
Total Delay (hr)	9.9	36.6	2.5	0.4	0.2	3.4	53.0
Delay / Veh (s)	476.2	547.2	17.9	2.7	24.5	6.1	57.5
Vehicles Entered	77	251	495	488	33	1984	3328
Vehicles Exited	73	231	491	488	33	1984	3300
Hourly Exit Rate	73	231	491	488	33	1984	3300
Input Volume	85	275	528	505	35	2342	3770
% of Volume	86	84	93	97	94	85	88
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	11	31	0	0	0	0	42

231: US-26 EB Helvetia On-ramp & Performance by movement

Movement	EBT	All
Total Delay (hr)	13.6	13.6
Delay / Veh (s)	93.4	93.4
Vehicles Entered	531	531
Vehicles Exited	518	518
Hourly Exit Rate	518	518
Input Volume	550	550
% of Volume	94	94
Denied Entry Before	0	0
Denied Entry After	0	0

240: Meek Rd & Brookwood Pkwy Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Total Delay (hr)	31.0	47.2	0.4	2.0	1.1	0.0	81.7
Delay / Veh (s)	15951.1	14157.5	42.6	7.5	1.8	0.4	91.0
Vehicles Entered	7	12	35	972	2192	19	3237
Vehicles Exited	6	11	35	967	2190	19	3228
Hourly Exit Rate	6	11	35	967	2190	19	3228
Input Volume	50	80	35	975	2589	20	3749
% of Volume	12	14	99	99	85	96	86
Denied Entry Before	1	2	0	0	0	0	3
Denied Entry After	42	68	0	0	0	0	110

Total Network Performance

Total Delay (hr)	475.5
Delay / Veh (s)	439.0
Vehicles Entered	3955
Vehicles Exited	3837
Hourly Exit Rate	3837
Input Volume	30579
% of Volume	13
Denied Entry Before	38
Denied Entry After	503

Intersection: 200: Schaaf Rd & Helvetia Rd

Movement	WB	NB	SB
Directions Served	LR	TR	LT
Maximum Queue (ft)	156	42	446
Average Queue (ft)	39	2	47
95th Queue (ft)	110	20	224
Link Distance (ft)	1714	1385	562
Upstream Blk Time (%)			0
Queuing Penalty (veh)			0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 210: Groveland Dr & Helvetia Rd

Movement	WB	NB	SB
Directions Served	LR	LTR	LTR
Maximum Queue (ft)	350	101	256
Average Queue (ft)	109	5	38
95th Queue (ft)	309	46	152
Link Distance (ft)	1693	218	1385
Upstream Blk Time (%)		0	
Queuing Penalty (veh)		1	
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 220: US-26 WB Helvetia On-ramp & Helvetia Rd

Movement	WB	WB	WB	B221	NB	NB	SB	SB
Directions Served	L	LT	R	T	L	T	T	TR
Maximum Queue (ft)	679	680	50	6229	324	630	261	257
Average Queue (ft)	600	607	37	816	84	348	165	164
95th Queue (ft)	670	674	55	3894	234	672	257	256
Link Distance (ft)	604	604		6815		606	218	218
Upstream Blk Time (%)	2	3		1		3	6	6
Queuing Penalty (veh)	0	0		0		19	20	18
Storage Bay Dist (ft)			25		150			
Storage Blk Time (%)		49	10		0	33		
Queuing Penalty (veh)		49	92		1	20		

Intersection: 230: US-26 EB Helvetia Off-ramp & Helvetia Rd/Brookwood Pkwy

Movement	EB	EB	NB	NB	SB	SB	SB
Directions Served	LT	R	T	R	L	T	T
Maximum Queue (ft)	1193	325	198	161	69	171	183
Average Queue (ft)	943	320	156	11	21	68	78
95th Queue (ft)	1518	355	214	82	55	135	155
Link Distance (ft)	1138		168	168		606	606
Upstream Blk Time (%)	43		11	0			
Queuing Penalty (veh)	0		58	1			
Storage Bay Dist (ft)		300			175		
Storage Blk Time (%)	2	71				0	
Queuing Penalty (veh)	5	60				0	

Intersection: 231: US-26 EB Helvetia On-ramp &

Movement	EB	EB
Directions Served	T	T
Maximum Queue (ft)	416	424
Average Queue (ft)	226	245
95th Queue (ft)	478	497
Link Distance (ft)	991	991
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 240: Meek Rd & Brookwood Pkwy

Movement	EB	NB	NB	NB	SB
Directions Served	LR	L	T	TR	TR
Maximum Queue (ft)	622	91	199	127	13
Average Queue (ft)	607	33	61	5	1
95th Queue (ft)	631	73	166	49	7
Link Distance (ft)	603		1910	1910	168
Upstream Blk Time (%)	97				
Queuing Penalty (veh)	0				
Storage Bay Dist (ft)		100			
Storage Blk Time (%)		1	3		
Queuing Penalty (veh)		3	1		

Network Summary

Network wide Queuing Penalty: 348

HCM Unsignalized Intersection Capacity Analysis
200: Schaaf Rd & Helvetia Rd

10/21/2011

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	30	0	470	210	0	270
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	32	0	505	226	0	290
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	909	618			731	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	909	618			731	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	90	100			100	
cM capacity (veh/h)	308	493			882	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	32	731	290
Volume Left	32	0	0
Volume Right	0	226	0
cSH	308	1700	882
Volume to Capacity	0.10	0.43	0.00
Queue Length 95th (ft)	9	0	0
Control Delay (s)	18.1	0.0	0.0
Lane LOS	C		
Approach Delay (s)	18.1	0.0	0.0
Approach LOS	C		

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	47.5%	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)	0	0	0	275	0	10	0	670	520	10	290	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	0	0	0	302	0	11	0	736	571	11	319	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								TWLTL			None	
Median storage veh)								2				
Upstream signal (ft)								305				
pX, platoon unblocked	0.42	0.42		0.42	0.42	0.42				0.42		
vC, conflicting volume	1374	1648	319	1363	1363	1022	319			1308		
vC1, stage 1 conf vol	341	341		1022	1022							
vC2, stage 2 conf vol	1033	1308		341	341							
vCu, unblocked vol	1197	1856	319	1171	1171	354	319			1039		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)	6.1	5.5		6.1	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	0	100	96	100			96		
cM capacity (veh/h)	230	114	727	253	243	290	1253			282		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	0	313	1308	330
Volume Left	0	302	0	11
Volume Right	0	11	571	0
cSH	1700	254	1253	282
Volume to Capacity	0.00	1.23	0.00	0.04
Queue Length 95th (ft)	0	378	0	3
Control Delay (s)	0.0	173.8	0.0	1.5
Lane LOS	A	F		A
Approach Delay (s)	0.0	173.8	0.0	1.5
Approach LOS	A	F		

Intersection Summary			
Average Delay	28.2		
Intersection Capacity Utilization	89.5%	ICU Level of Service	E
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	730	0	70	290	1120	0	0	430	135
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				3.6	3.6	3.6	2.0	7.0			3.0	
Lane Util. Factor				0.95	0.95	1.00	1.00	1.00			0.95	
Frt				1.00	1.00	0.85	1.00	1.00			0.96	
Flt Protected				0.95	0.95	1.00	0.95	1.00			1.00	
Satd. Flow (prot)				1715	1715	1615	1787	1881			3481	
Flt Permitted				0.95	0.95	1.00	0.95	1.00			1.00	
Satd. Flow (perm)				1715	1715	1615	1787	1881			3481	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	0	0	0	785	0	75	312	1204	0	0	462	145
RTOR Reduction (vph)	0	0	0	0	0	20	0	0	0	0	36	0
Lane Group Flow (vph)	0	0	0	392	393	55	312	1204	0	0	571	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	1%	1%	0%	0%	0%	0%
Turn Type				Perm		Perm	Prot					
Protected Phases					4		1	6			2	
Permitted Phases				4		4						
Actuated Green, G (s)				17.0	17.0	17.0	16.9	43.0			22.1	
Effective Green, g (s)				18.4	18.4	18.4	18.9	41.0			24.1	
Actuated g/C Ratio				0.26	0.26	0.26	0.27	0.59			0.34	
Clearance Time (s)				5.0	5.0	5.0	4.0	5.0			5.0	
Vehicle Extension (s)				2.3	2.3	2.3	2.3	3.0			5.2	
Lane Grp Cap (vph)				451	451	425	482	1102			1198	
v/s Ratio Prot							0.17	c0.64			0.16	
v/s Ratio Perm				0.23	0.23	0.03						
v/c Ratio				0.87	0.87	0.13	0.65	1.09			0.48	
Uniform Delay, d1				24.7	24.7	19.7	22.6	14.5			18.0	
Progression Factor				1.00	1.00	1.00	0.68	1.34			1.00	
Incremental Delay, d2				19.8	20.1	0.6	0.9	47.7			1.4	
Delay (s)				44.5	44.7	20.3	16.3	67.2			19.4	
Level of Service				D	D	C	B	E			B	
Approach Delay (s)		0.0			42.5			56.7			19.4	
Approach LOS		A			D			E			B	

Intersection Summary			
HCM Average Control Delay	45.0	HCM Level of Service	D
HCM Volume to Capacity ratio	1.02		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	10.6
Intersection Capacity Utilization	91.5%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	0	80	0	0	0	0	1390	945	5	1155	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0					5.0	5.0	4.0	5.0	
Lane Util. Factor		1.00	1.00					1.00	1.00	1.00	0.95	
Frt		1.00	0.85					1.00	0.85	1.00	1.00	
Flt Protected		0.95	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1805	1615					1881	1599	1805	3610	
Flt Permitted		0.95	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1805	1615					1881	1599	1805	3610	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	21	0	83	0	0	0	0	1448	984	5	1203	0
RTOR Reduction (vph)	0	0	78	0	0	0	0	0	229	0	0	0
Lane Group Flow (vph)	0	21	5	0	0	0	0	1448	755	5	1203	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	1%	1%	0%	0%	0%
Turn Type	Perm		Perm						Perm	Prot		
Protected Phases		8						6		5	2	
Permitted Phases	8		8						6			
Actuated Green, G (s)		4.6	4.6					50.3	50.3	1.1	55.4	
Effective Green, g (s)		4.6	4.6					50.3	50.3	1.1	55.4	
Actuated g/C Ratio		0.07	0.07					0.72	0.72	0.02	0.79	
Clearance Time (s)		5.0	5.0					5.0	5.0	4.0	5.0	
Vehicle Extension (s)		2.3	2.3					4.7	4.7	2.3	4.7	
Lane Grp Cap (vph)		119	106					1352	1149	28	2857	
v/s Ratio Prot								c0.77		0.00	c0.33	
v/s Ratio Perm		0.01	0.00						0.47			
v/c Ratio		0.18	0.05					1.07	0.66	0.18	0.42	
Uniform Delay, d1		30.9	30.7					9.9	5.2	34.0	2.3	
Progression Factor		1.00	1.00					1.00	1.00	1.27	0.12	
Incremental Delay, d2		0.4	0.1					45.9	2.9	1.2	0.3	
Delay (s)		31.3	30.8					55.8	8.2	44.3	0.6	
Level of Service		C	C					E	A	D	A	
Approach Delay (s)		30.9			0.0			36.5			0.8	
Approach LOS		C			A			D			A	

Intersection Summary			
HCM Average Control Delay	24.8	HCM Level of Service	C
HCM Volume to Capacity ratio	1.01		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	91.5%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑					
Volume (vph)	950	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5					
Lane Util. Factor	0.95					
Frt	1.00					
Flt Protected	1.00					
Satd. Flow (prot)	3610					
Flt Permitted	1.00					
Satd. Flow (perm)	3610					
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1033	0	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	1033	0	0	0	0	0
Heavy Vehicles (%)	0%	1%	0%	0%	0%	0%
Turn Type						
Protected Phases	4					
Permitted Phases						
Actuated Green, G (s)	2.5					
Effective Green, g (s)	2.5					
Actuated g/C Ratio	0.14					
Clearance Time (s)	4.5					
Lane Grp Cap (vph)	501					
v/s Ratio Prot	c0.29					
v/s Ratio Perm						
v/c Ratio	2.06					
Uniform Delay, d1	7.8					
Progression Factor	1.00					
Incremental Delay, d2	484.7					
Delay (s)	492.5					
Level of Service	F					
Approach Delay (s)	492.5			0.0	0.0	
Approach LOS	F			A	A	

Intersection Summary			
HCM Average Control Delay	492.5	HCM Level of Service	F
HCM Volume to Capacity ratio	2.06		
Actuated Cycle Length (s)	18.0	Sum of lost time (s)	15.5
Intersection Capacity Utilization	30.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	25	0	75	0	0	0	110	2310	0	0	1190	45
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	27	0	80	0	0	0	117	2457	0	0	1266	48
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											227	
pX, platoon unblocked	0.89	0.89	0.89	0.89	0.89		0.89					
vC, conflicting volume	2753	3981	657	3404	4005	1229	1314			2457		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2722	4103	368	3454	4129	1229	1106			2457		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	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 %	0	100	86	100	100	100	79			100		
cM capacity (veh/h)	8	2	565	2	2	173	569			192		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	106	0	117	1638	819	633	681
Volume Left	27	0	117	0	0	0	0
Volume Right	80	0	0	0	0	0	48
cSH	29	1700	569	1700	1700	192	1700
Volume to Capacity	3.66	0.00	0.21	0.96	0.48	0.00	0.40
Queue Length 95th (ft)	Err	0	19	0	0	0	0
Control Delay (s)	Err	0.0	13.0	0.0	0.0	0.0	0.0
Lane LOS	F	A	B				
Approach Delay (s)	Err	0.0	0.6			0.0	
Approach LOS	F	A					

Intersection Summary			
Average Delay	266.7		
Intersection Capacity Utilization	104.1%	ICU Level of Service	G
Analysis Period (min)	15		

200: Schaaf Rd & Helvetia Rd Performance by movement

Movement	WBL	NBT	NBR	SBT	All
Total Delay (hr)	0.1	1.0	0.3	0.0	1.5
Delay / Veh (s)	6.3	7.5	5.5	0.4	4.9
Vehicles Entered	38	495	214	331	1078
Vehicles Exited	38	494	214	330	1076
Hourly Exit Rate	30	395	171	264	861
Input Volume	30	471	209	268	978
% of Volume	103	84	82	98	88
Denied Entry Before	0	0	0	0	0
Denied Entry After	0	0	0	0	0

210: Groveland Dr & Helvetia Rd Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Total Delay (hr)	89.2	4.0	1.9	0.7	0.1	0.5	96.4
Delay / Veh (s)	1305.9	1441.8	9.7	5.0	24.9	4.8	186.9
Vehicles Entered	268	11	699	531	14	356	1879
Vehicles Exited	225	10	702	533	14	353	1837
Hourly Exit Rate	180	8	562	426	11	282	1470
Input Volume	273	10	674	517	10	289	1774
% of Volume	66	78	83	83	110	98	83
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	61	3	0	0	0	0	64

220: US-26 WB Helvetia On-ramp & Helvetia Rd Performance by movement

Movement	WBL	WBR	NBL	NBT	SBT	SBR	All
Total Delay (hr)	38.4	3.6	4.4	15.0	1.6	0.3	63.4
Delay / Veh (s)	162.9	166.4	57.2	46.8	13.2	6.7	77.4
Vehicles Entered	857	79	281	1159	449	135	2960
Vehicles Exited	840	78	280	1152	448	135	2933
Hourly Exit Rate	672	62	224	922	358	108	2346
Input Volume	727	69	289	1127	433	135	2779
% of Volume	92	90	78	82	83	80	84
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

230: US-26 EB Helvetia Off-ramp & Helvetia Rd/Brookwood Pkwy Performance by movement

Movement	EBL	EBR	NBT	NBR	SBL	SBT	All
Total Delay (hr)	1.3	0.4	6.8	1.8	0.1	1.2	11.5
Delay / Veh (s)	174.6	13.1	17.3	6.5	39.6	3.3	10.9
Vehicles Entered	26	102	1413	966	5	1294	3806
Vehicles Exited	27	101	1412	967	6	1282	3795
Hourly Exit Rate	22	81	1130	774	5	1026	3036
Input Volume	20	80	1397	942	5	1160	3604
% of Volume	107	101	81	82	96	88	84
Denied Entry Before	0	0	1	1	0	0	2
Denied Entry After	0	0	4	2	0	0	6

231: US-26 EB Helvetia On-ramp & Performance by movement

Movement	EBT	All
Total Delay (hr)	25.6	25.6
Delay / Veh (s)	93.9	93.9
Vehicles Entered	984	984
Vehicles Exited	980	980
Hourly Exit Rate	784	784
Input Volume	958	958
% of Volume	82	82
Denied Entry Before	0	0
Denied Entry After	0	0

240: Meek Rd & Brookwood Pkwy Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Total Delay (hr)	23.3	77.0	5.1	82.0	0.3	0.0	187.8
Delay / Veh (s)	277	133.8	158.8	124.8	0.9	0.4	175.1
Vehicles Entered	1	2	116	2365	1328	51	3863
Vehicles Exited	0	1	115	2364	1328	51	3859
Hourly Exit Rate	0	1	92	1891	1062	41	3087
Input Volume	25	74	110	2300	1192	45	3746
% of Volume	0	1	84	82	89	91	82
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	26	92	0	0	0	0	118

Total Network Performance

Total Delay (hr)	797.0
Delay / Veh (s)	659.8
Vehicles Entered	4509
Vehicles Exited	4191
Hourly Exit Rate	3353
Input Volume	29629
% of Volume	11
Denied Entry Before	3
Denied Entry After	573

Intersection: 200: Schaaf Rd & Helvetia Rd

Movement	WB
Directions Served	LR
Maximum Queue (ft)	38
Average Queue (ft)	17
95th Queue (ft)	40
Link Distance (ft)	1714
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 210: Groveland Dr & Helvetia Rd

Movement	WB	NB	SB
Directions Served	LR	LTR	LTR
Maximum Queue (ft)	1716	31	212
Average Queue (ft)	1503	1	26
95th Queue (ft)	2095	13	110
Link Distance (ft)	1693	218	1385
Upstream Blk Time (%)	59		
Queuing Penalty (veh)	0		
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 220: US-26 WB Helvetia On-ramp & Helvetia Rd

Movement	WB	WB	WB	B221	NB	NB	SB	SB
Directions Served	L	LT	R	T	L	T	T	TR
Maximum Queue (ft)	680	680	50	3147	325	632	168	166
Average Queue (ft)	583	593	38	1205	201	612	77	87
95th Queue (ft)	819	825	59	3129	359	691	132	141
Link Distance (ft)	604	604		8100		606	218	218
Upstream Blk Time (%)	23	28				16		0
Queuing Penalty (veh)	0	0				223		0
Storage Bay Dist (ft)			25		150			
Storage Blk Time (%)		75	25		7	32		
Queuing Penalty (veh)		52	90		82	92		

Intersection: 230: US-26 EB Helvetia Off-ramp & Helvetia Rd/Brookwood Pkwy

Movement	EB	EB	NB	NB	SB	SB	SB
Directions Served	LT	R	T	R	L	T	T
Maximum Queue (ft)	133	63	187	135	26	61	62
Average Queue (ft)	41	30	180	5	4	3	5
95th Queue (ft)	100	54	189	59	18	23	30
Link Distance (ft)	1138		168	168		606	606
Upstream Blk Time (%)			20	0			
Queuing Penalty (veh)			237	1			
Storage Bay Dist (ft)		300			175		
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 231: US-26 EB Helvetia On-ramp &

Movement	EB	EB
Directions Served	T	T
Maximum Queue (ft)	603	621
Average Queue (ft)	335	355
95th Queue (ft)	606	626
Link Distance (ft)	991	991
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 240: Meek Rd & Brookwood Pkwy

Movement	EB	NB	NB	NB	B250	B250	B260	B260	B270	B270	SB	SB
Directions Served	LR	L	T	TR	T	T	T	T	T	T	LT	TR
Maximum Queue (ft)	614	200	1989	1993	1213	1211	1105	1111	1372	1369	6	34
Average Queue (ft)	603	72	1971	1957	1125	1115	924	921	1056	1052	0	2
95th Queue (ft)	620	180	2097	2148	1536	1549	1552	1549	1966	1968	4	15
Link Distance (ft)	603		1910	1910	1134	1134	1030	1030	1348	1348	168	168
Upstream Blk Time (%)	98		32	25	30	26	28	27	26	27		
Queuing Penalty (veh)	0		0	0	0	0	0	0	0	0		
Storage Bay Dist (ft)		100										
Storage Blk Time (%)		0	25									
Queuing Penalty (veh)		3	28									

Network Summary

Network wide Queuing Penalty: 808

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/13/2011
Analysis time period:	AM Peak
Freeway/Dir of Travel:	US 26 Eastbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2035
Description: Eastbound	Off-ramp to Brookwood

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2660	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	435	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2660		435			vph
Peak-hour factor, PHF	0.95		0.95			
Peak 15-min volume, v15	700		114			v
Trucks and buses	4		4			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.980	0.980	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2856	467	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2856 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2856	4600	No
$v_{FO} = v_F - v_R$	2389	4600	No
v_R	467	2000	No
$v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3 \text{ or } av34}$ > 2700 pc/h?		No	
Is $v_{3 \text{ or } av34}$ > 1.5 $v_{12}/2$		No	
If yes, v_{12A} = 2856		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	2856	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 15.3 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	D_S = 0.470	
Space mean speed in ramp influence area,	S_R = 51.5	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 51.5	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/13/2011
Analysis time period:	AM Peak
Freeway/Dir of Travel:	US 26 Eastbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2035
Description: Eastbound	Off-ramp to Brookwood

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2660	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	435	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2660		435			vph
Peak-hour factor, PHF	0.95		0.95			
Peak 15-min volume, v15	700		114			v
Trucks and buses	4		4			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.980	0.980	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2856	467	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2856 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2856	4600	No
$v_{FO} = v_F - v_R$	2389	4600	No
v_R	467	2000	No
$v_{3\ or\ av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3\ or\ av34}$ > 2700 pc/h?		No	
Is $v_{3\ or\ av34}$ > 1.5 $v_{12}/2$		No	
If yes, v_{12A} = 2856		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	2856	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 15.3 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	D_S = 0.470	
Space mean speed in ramp influence area,	S_R = 51.5	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 51.5	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/13/2011
Analysis time period:	AM Peak
Freeway/Dir of Travel:	US 26 Westbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2035
Description:	Westbound Off-ramp to Brookwood - No-Build

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3925	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	1890	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3925		1890			vph
Peak-hour factor, PHF	0.95		0.95			
Peak 15-min volume, v15	1033		497			v
Trucks and buses	4		4			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.980	0.980	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4214	2029	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 4214 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	4214	4600	No
$v_{FO} = v_F - v_R$	2185	4600	No
v_R	2029	2000	Yes
$v_{3\ or\ av34} = v_{av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3\ or\ av34} > 2700$ pc/h?		No	
Is $v_{3\ or\ av34} > 1.5\ v_{12}/2$		No	
If yes, v_{12A} = 4214		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	4214	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 27.0 pc/mi/ln

Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable,	D_S = 0.611	
Space mean speed in ramp influence area,	S_R = 49.0	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 49.0	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/14/2011
Analysis time period:	AM Peak Period
Freeway/Dir of Travel:	US 26 Westbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2035
Description: Westbound	On-ramp from Brookwood

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2035	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	90	vph
Length of first accel/decel lane	410	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2035	90		vph
Peak-hour factor, PHF	0.95	0.95		
Peak 15-min volume, v15	536	24		v
Trucks and buses	4	4		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.980	0.980	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2185	97	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2185 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2282	4600	No
$v_{3 or av34}$	0 pc/h	(Equation 25-4 or 25-5)	
Is $v_{3 or av34}$ > 2700 pc/h?		No	
Is $v_{3 or av34}$ > 1.5 v_{12}/2		No	
If yes, v_{12A} = 2185		(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	2185	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 20.7 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	M_S = 0.331	
Space mean speed in ramp influence area,	S_R = 54.1	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 54.1	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/13/2011
Analysis time period:	PM Peak
Freeway/Dir of Travel:	US 26 Eastbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2035
Description:	Eastbound - Off-ramp to Brookwood

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2975	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	130	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2975		130			vph
Peak-hour factor, PHF	0.95		0.95			
Peak 15-min volume, v15	783		34			v
Trucks and buses	1		1			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.995	0.995	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3147	138	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3147 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3147	4600	No
$v_{FO} = v_F - v_R$	3009	4600	No
v_R	138	2000	No
$v_{3 \text{ or } av34}$ $v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3 \text{ or } av34}$ $v_{3 \text{ or } av34}$ > 2700 pc/h?		No	
Is $v_{3 \text{ or } av34}$ $v_{3 \text{ or } av34}$ > 1.5 v_{12} /2		No	
If yes, v_{12A} = 3147		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	3147	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 17.8 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	D_S = 0.440	
Space mean speed in ramp influence area,	S_R = 52.1	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 52.1	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/14/2011
Analysis time period:	PM Peak Period
Freeway/Dir of Travel:	US 26 Eastbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2035
Description: Eastbound	On-ramp from Brookwood

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2845	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	800	vph
Length of first accel/decel lane	410	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2845	800		vph
Peak-hour factor, PHF	0.95	0.95		
Peak 15-min volume, v15	749	211		v
Trucks and buses	1	1		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.995	0.995	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3010	846	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 3010 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	3856	4600	No
$v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-4 or 25-5)	
Is $v_{3 \text{ or } av34}$ > 2700 pc/h?		No	
Is $v_{3 \text{ or } av34}$ > 1.5 v_{12}/2		No	
If yes, v_{12A} = 3010		(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	3010	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 32.6 pc/mi/ln

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable,	M_S = 0.477	
Space mean speed in ramp influence area,	S_R = 51.4	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 51.4	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/13/2011
Analysis time period:	PM Peak
Freeway/Dir of Travel:	US 26 Westbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2035
Description:	Westbound Off-ramp to Brookwood - No-build

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3700	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	845	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3700		845			vph
Peak-hour factor, PHF	0.95		0.95			
Peak 15-min volume, v15	974		222			v
Trucks and buses	1		3			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.995	0.985	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3914	903	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3914 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3914	4600	No
$v_{FO} = v_F - v_R$	3011	4600	No
v_R	903	2000	No
v_3 or v_{av34}	0 pc/h	(Equation 25-15 or 25-16)	
Is v_3 or v_{av34} > 2700 pc/h?		No	
Is v_3 or v_{av34} > 1.5 v_{12}/2		No	
If yes, v_{12A} = 3914		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	3914	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 24.4 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	D_S = 0.509	
Space mean speed in ramp influence area,	S_R = 50.8	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 50.8	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/14/2011
Analysis time period:	PM Peak Period
Freeway/Dir of Travel:	US 26 Westbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2035
Description: Westbound	On-ramp from Brookwood

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2855	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	425	vph
Length of first accel/decel lane	410	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2855	425		vph
Peak-hour factor, PHF	0.95	0.95		
Peak 15-min volume, v15	751	112		v
Trucks and buses	1	3		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.995	0.985	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3020	454	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 3020 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	3474	4600	No
v_{3} or v_{av34}	0 pc/h	(Equation 25-4 or 25-5)	

Is v_{3} or v_{av34} > 2700 pc/h? No

Is v_{3} or v_{av34} > 1.5 v_{12}/2 No

If yes, v_{12A} = 3020 (Equation 25-8)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	3020	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 29.8 pc/mi/ln

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable,	M_S = 0.418	
Space mean speed in ramp influence area,	S_R = 52.5	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 52.5	mph

Year 2015 Phase 1

HCM Unsignalized Intersection Capacity Analysis
200: Schaff Rd & Helvetia Rd

9/26/2011

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	5	5	175	10	5	365
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	6	6	194	11	6	406
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	617	200			206	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	617	200			206	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	99			100	
cM capacity (veh/h)	453	843			1372	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	11	206	411
Volume Left	6	0	6
Volume Right	6	11	0
cSH	590	1700	1372
Volume to Capacity	0.02	0.12	0.00
Queue Length 95th (ft)	1	0	0
Control Delay (s)	11.2	0.0	0.1
Lane LOS	B		A
Approach Delay (s)	11.2	0.0	0.1
Approach LOS	B		

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	33.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	135	5	180	240	10	360
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	150	6	200	267	11	400
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			937			
pX, platoon unblocked						
vC, conflicting volume	622	200			467	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	622	200			467	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	66	99			99	
cM capacity (veh/h)	447	843			1100	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	156	200	267	411
Volume Left	150	0	0	11
Volume Right	6	0	267	0
cSH	455	1700	1700	1100
Volume to Capacity	0.34	0.12	0.16	0.01
Queue Length 95th (ft)	37	0	0	1
Control Delay (s)	17.0	0.0	0.0	0.3
Lane LOS	C			A
Approach Delay (s)	17.0	0.0		0.3
Approach LOS	C			

Intersection Summary			
Average Delay	2.7		
Intersection Capacity Utilization	41.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR	SBR2	SEL	SER
Lane Configurations									
Volume (vph)	0	1335	35	420	470	0	25	0	0
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		3.0	2.0	2.0	3.0				
Lane Util. Factor		*1.00	1.00	0.95	0.95				
Frt		0.85	1.00	1.00	0.99				
Flt Protected		1.00	0.95	1.00	1.00				
Satd. Flow (prot)		2917	1309	3260	3267				
Flt Permitted		1.00	0.95	1.00	1.00				
Satd. Flow (perm)		2917	1309	3260	3267				
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	0	1362	36	429	480	0	26	0	0
RTOR Reduction (vph)	0	73	0	0	5	0	0	0	0
Lane Group Flow (vph)	0	1289	36	429	501	0	0	0	0
Heavy Vehicles (%)	2%	2%	27%	2%	1%	2%	1%	0%	0%
Turn Type		custom	Prot						
Protected Phases		8	3	3 6	2				
Permitted Phases									
Actuated Green, G (s)		60.8	61.8	90.0	19.2				
Effective Green, g (s)		62.8	63.8	87.0	21.2				
Actuated g/C Ratio		0.70	0.71	0.97	0.24				
Clearance Time (s)		5.0	4.0		5.0				
Vehicle Extension (s)		5.2	2.3		5.2				
Lane Grp Cap (vph)		2035	928	3151	770				
v/s Ratio Prot		c0.44	0.03	0.13	c0.15				
v/s Ratio Perm									
v/c Ratio		0.63	0.04	0.14	0.65				
Uniform Delay, d1		7.4	3.9	0.1	31.1				
Progression Factor		1.00	0.70	1.00	1.00				
Incremental Delay, d2		1.5	0.0	0.0	2.8				
Delay (s)		8.9	2.8	0.1	33.8				
Level of Service		A	A	A	C				
Approach Delay (s)	8.9			0.3	33.8			0.0	
Approach LOS	A			A	C			A	

Intersection Summary			
HCM Average Control Delay	12.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	72.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Volume (veh/h)	410	0	0	1805	0	45
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	418	0	0	1842	0	46
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	706			298		
pX, platoon unblocked					0.87	
vC, conflicting volume			418		1339	209
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			418		1092	209
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	94
cM capacity (veh/h)			1152		185	803

Direction, Lane #	NB 1	NB 2	SB 1	SB 2	NW 1
Volume Total	209	209	921	921	46
Volume Left	0	0	0	0	0
Volume Right	0	0	0	0	46
cSH	1700	1700	1700	1700	803
Volume to Capacity	0.12	0.12	0.54	0.54	0.06
Queue Length 95th (ft)	0	0	0	0	5
Control Delay (s)	0.0	0.0	0.0	0.0	9.8
Lane LOS					A
Approach Delay (s)	0.0		0.0		9.8
Approach LOS					A

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	68.2%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	65	0	190	0	0	0	0	345	470	40	1765	0
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		3.0	3.0					3.0	3.0	2.0	3.0	
Lane Util. Factor		0.95	0.95					0.95	1.00	1.00	0.95	
Frt		0.92	0.85					1.00	0.85	1.00	1.00	
Flt Protected		0.98	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1413	1262					3137	1430	1662	3260	
Flt Permitted		0.98	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1413	1262					3137	1430	1662	3260	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	66	0	194	0	0	0	0	352	480	41	1801	0
RTOR Reduction (vph)	0	28	28	0	0	0	0	0	140	0	0	0
Lane Group Flow (vph)	0	106	98	0	0	0	0	352	340	41	1801	0
Heavy Vehicles (%)	0%	0%	12%	0%	0%	0%	0%	6%	4%	0%	2%	0%
Turn Type	Perm		Perm						Perm	Prot		
Protected Phases		8						6		5	2	
Permitted Phases	8		8						6			
Actuated Green, G (s)		10.4	10.4					61.8	61.8	3.8	69.6	
Effective Green, g (s)		12.4	12.4					63.8	63.8	5.8	71.6	
Actuated g/C Ratio		0.14	0.14					0.71	0.71	0.06	0.80	
Clearance Time (s)		5.0	5.0					5.0	5.0	4.0	5.0	
Vehicle Extension (s)		2.3	2.3					4.7	4.7	2.3	4.7	
Lane Grp Cap (vph)		195	174					2224	1014	107	2594	
v/s Ratio Prot								0.11		0.02	c0.55	
v/s Ratio Perm		0.08	c0.08						0.24			
v/c Ratio		0.55	0.57					0.16	0.34	0.38	0.69	
Uniform Delay, d1		36.2	36.3					4.3	5.0	40.4	4.2	
Progression Factor		1.00	1.00					1.00	1.00	1.08	0.67	
Incremental Delay, d2		2.1	3.0					0.2	0.9	1.0	1.2	
Delay (s)		38.3	39.3					4.4	5.9	44.8	4.0	
Level of Service		D	D					A	A	D	A	
Approach Delay (s)		38.8			0.0			5.3			5.0	
Approach LOS		D			A			A			A	

Intersection Summary			
HCM Average Control Delay	8.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	68.2%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	510	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0					
Lane Util. Factor	0.95					
Frt	1.00					
Flt Protected	1.00					
Satd. Flow (prot)	3471					
Flt Permitted	1.00					
Satd. Flow (perm)	3471					
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	554	0	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	554	0	0	0	0	0
Heavy Vehicles (%)	4%	0%	0%	0%	0%	0%
Turn Type						
Protected Phases	2					
Permitted Phases						
Actuated Green, G (s)	2.2					
Effective Green, g (s)	2.2					
Actuated g/C Ratio	0.18					
Clearance Time (s)	2.0					
Vehicle Extension (s)	3.0					
Lane Grp Cap (vph)	636					
v/s Ratio Prot	c0.16					
v/s Ratio Perm						
v/c Ratio	0.87					
Uniform Delay, d1	4.8					
Progression Factor	1.00					
Incremental Delay, d2	12.5					
Delay (s)	17.2					
Level of Service	B					
Approach Delay (s)	17.2			0.0	0.0	
Approach LOS	B			A	A	

Intersection Summary			
HCM Average Control Delay	17.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	12.0	Sum of lost time (s)	9.8
Intersection Capacity Utilization	17.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	20	0	25	0	0	0	10	795	0	0	1950	5
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	20	0	26	0	0	0	10	811	0	0	1990	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											189	
pX, platoon unblocked	0.73	0.73	0.73	0.73	0.73		0.73					
vC, conflicting volume	2283	2824	997	1852	2827	270	1995			811		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2023	2760	271	1436	2764	270	1630			811		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	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 %	18	100	95	100	100	100	97			100		
cM capacity (veh/h)	25	14	538	65	14	734	296			824		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2
Volume Total	46	0	10	324	324	162	995	1000
Volume Left	20	0	10	0	0	0	0	0
Volume Right	26	0	0	0	0	0	0	5
cSH	53	1700	296	1700	1700	1700	824	1700
Volume to Capacity	0.87	0.00	0.03	0.19	0.19	0.10	0.00	0.59
Queue Length 95th (ft)	94	0	3	0	0	0	0	0
Control Delay (s)	209.6	0.0	17.6	0.0	0.0	0.0	0.0	0.0
Lane LOS	F	A	C					
Approach Delay (s)	209.6	0.0	0.2				0.0	
Approach LOS	F	A						

Intersection Summary			
Average Delay	3.4		
Intersection Capacity Utilization	64.1%	ICU Level of Service	C
Analysis Period (min)	15		

6: Exit Ramp #1 & Performance by movement

Movement	WBT	All
Total Delay (hr)	1.9	1.9
Delay / Veh (s)	5.1	5.1
Vehicles Entered	1324	1324
Vehicles Exited	1324	1324
Hourly Exit Rate	1324	1324
Input Volume	1335	1335
% of Volume	99	99
Denied Entry Before	0	0
Denied Entry After	0	0

200: Schaff Rd & Helvetia Rd Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Total Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Delay / Veh (s)	7.1	2.3	0.6	0.1	1.8	0.5	0.6
Vehicles Entered	4	5	179	11	4	375	578
Vehicles Exited	4	5	179	11	4	376	579
Hourly Exit Rate	4	5	179	11	4	376	579
Input Volume	5	5	176	10	5	365	566
% of Volume	76	95	102	107	76	103	102
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

210: Jacobson Rd & Helvetia Rd Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Total Delay (hr)	0.4	0.0	0.2	0.3	0.0	0.1	0.9
Delay / Veh (s)	10.3	5.2	2.9	4.5	3.2	0.8	3.5
Vehicles Entered	130	6	193	240	12	370	951
Vehicles Exited	130	5	194	239	12	370	950
Hourly Exit Rate	130	5	194	239	12	370	950
Input Volume	135	5	190	240	10	361	941
% of Volume	96	95	102	100	117	102	101
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

215: Loop Ramp #1 & Helvetia Rd Performance by movement

Movement	EBT	EBR	NBL	NBT	SBT	SBR2	All
Total Delay (hr)	0.0	3.1	0.2	1.5	2.7	0.1	7.6
Delay / Veh (s)	0.4	8.5	26.6	12.6	20.0	13.8	11.9
Vehicles Entered	23	1329	30	427	490	20	2319
Vehicles Exited	23	1329	30	428	491	21	2322
Hourly Exit Rate	23	1329	30	428	491	21	2322
Input Volume	22	1335	35	427	481	25	2326
% of Volume	103	100	85	100	102	83	100
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

220: Helvetia Rd/Brookwood Pkwy #1 & WB-NB Helvetia Performance by movement

Movement	NBT	SBT	NWT	NWR	All
Total Delay (hr)	0.2	0.7	0.0	0.1	0.9
Delay / Veh (s)	1.7	1.4	1.0	4.5	1.5
Vehicles Entered	406	1824	3	48	2281
Vehicles Exited	406	1825	3	49	2283
Hourly Exit Rate	406	1825	3	49	2283
Input Volume	414	1819	2	45	2280
% of Volume	98	100	200	108	100
Denied Entry Before	0	0	0	0	0
Denied Entry After	0	0	0	0	0

224: Exit Ramp #1 & WB-NB Helvetia Performance by movement

Movement	WBT	WBR	All
Total Delay (hr)	1.6	0.1	1.7
Delay / Veh (s)	4.4	5.0	4.4
Vehicles Entered	1327	48	1375
Vehicles Exited	1324	48	1372
Hourly Exit Rate	1324	48	1372
Input Volume	1335	45	1380
% of Volume	99	106	99
Denied Entry Before	0	0	0
Denied Entry After	0	0	0

230: US-26 EB Helvetia Off-ramp & Helvetia Rd/Brookwood Pkwy #1 Performance by movement

Movement	EBL	EBR	NBT	NBR	SBL	SBT	All
Total Delay (hr)	1.8	2.4	0.3	0.3	0.7	3.1	8.7
Delay / Veh (s)	107.2	44.5	3.1	2.5	62.9	6.3	10.8
Vehicles Entered	62	197	341	469	40	1790	2899
Vehicles Exited	62	196	342	469	41	1791	2901
Hourly Exit Rate	62	196	342	469	41	1791	2901
Input Volume	65	190	346	470	40	1782	2894
% of Volume	95	103	99	100	102	100	100
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

231: US-26 EB Helvetia On-ramp & Performance by movement

Movement	EBT	All
Total Delay (hr)	2.1	2.1
Delay / Veh (s)	14.7	14.7
Vehicles Entered	519	519
Vehicles Exited	519	519
Hourly Exit Rate	519	519
Input Volume	520	520
% of Volume	100	100
Denied Entry Before	0	0
Denied Entry After	0	0

240: Meek Rd & Brookwood Pkwy Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Total Delay (hr)	0.7	0.4	0.1	0.9	0.8	0.0	2.8
Delay / Veh (s)	142.2	61.7	29.5	3.9	1.4	3.0	3.6
Vehicles Entered	18	24	10	793	1984	6	2835
Vehicles Exited	18	24	10	792	1984	6	2834
Hourly Exit Rate	18	24	10	792	1984	6	2834
Input Volume	20	25	10	795	1969	5	2825
% of Volume	90	95	100	100	101	120	100
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

Total Network Performance

Total Delay (hr)	36.9
Delay / Veh (s)	42.4
Vehicles Entered	3127
Vehicles Exited	3128
Hourly Exit Rate	3128
Input Volume	29911
% of Volume	10
Denied Entry Before	0
Denied Entry After	0

Intersection: 6: Exit Ramp #1 &

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

Intersection: 200: Schaff Rd & Helvetia Rd

Movement	WB	SB
Directions Served	LR	LT
Maximum Queue (ft)	37	13
Average Queue (ft)	7	1
95th Queue (ft)	28	10
Link Distance (ft)	549	349
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 210: Jacobson Rd & Helvetia Rd

Movement	WB	NB	SB
Directions Served	LR	R	LT
Maximum Queue (ft)	106	5	110
Average Queue (ft)	53	0	7
95th Queue (ft)	93	4	44
Link Distance (ft)	396	883	410
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 215: Loop Ramp #1 & Helvetia Rd

Movement	EB	EB	NB	NB	NB	SB	SB
Directions Served	R	R	L	T	T	T	T>
Maximum Queue (ft)	222	238	104	183	189	179	186
Average Queue (ft)	136	157	31	79	69	89	104
95th Queue (ft)	202	228	79	150	144	142	161
Link Distance (ft)	926	926		243	243	883	
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)			200				415
Storage Blk Time (%)				0			
Queuing Penalty (veh)				0			

Intersection: 220: Helvetia Rd/Brookwood Pkwy #1 & WB-NB Helvetia

Movement	NW
Directions Served	R
Maximum Queue (ft)	45
Average Queue (ft)	26
95th Queue (ft)	47
Link Distance (ft)	1359
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 224: Exit Ramp #1 & WB-NB Helvetia

Movement	WB	WB
Directions Served	T	TR
Maximum Queue (ft)	109	161
Average Queue (ft)	6	11
95th Queue (ft)	53	78
Link Distance (ft)	1944	1944
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 230: US-26 EB Helvetia Off-ramp & Helvetia Rd/Brookwood Pkwy #1

Movement	EB	EB	NB	NB	NB	SB	SB	SB
Directions Served	LR	R	T	T	R	L	T	T
Maximum Queue (ft)	242	228	99	99	96	99	265	319
Average Queue (ft)	136	120	27	25	9	39	96	135
95th Queue (ft)	226	204	73	71	64	86	220	284
Link Distance (ft)	1144		133	133	133		638	638
Upstream Blk Time (%)			0	0	0			
Queuing Penalty (veh)			0	0	0			
Storage Bay Dist (ft)		300				175		
Storage Blk Time (%)	0	0					1	
Queuing Penalty (veh)	0	0					0	

Intersection: 231: US-26 EB Helvetia On-ramp &

Movement	EB	EB
Directions Served	T	T
Maximum Queue (ft)	93	118
Average Queue (ft)	42	62
95th Queue (ft)	79	95
Link Distance (ft)	960	960
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 240: Meek Rd & Brookwood Pkwy

Movement	EB	NB	NB	SB
Directions Served	LR	L	TR	TR
Maximum Queue (ft)	134	41	13	7
Average Queue (ft)	53	10	1	0
95th Queue (ft)	122	34	7	5
Link Distance (ft)	603			133
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)		100	200	
Storage Blk Time (%)		0		
Queuing Penalty (veh)		0		

Network Summary

Network wide Queuing Penalty: 1

HCM Unsignalized Intersection Capacity Analysis
200: Schaff Rd & Helvetia Rd

10/18/2011

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	5	0	480	5	0	150
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	5	0	516	5	0	161
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	680	519			522	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	680	519			522	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	100			100	
cM capacity (veh/h)	420	561			1055	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	5	522	161
Volume Left	5	0	0
Volume Right	0	5	0
cSH	420	1700	1055
Volume to Capacity	0.01	0.31	0.00
Queue Length 95th (ft)	1	0	0
Control Delay (s)	13.7	0.0	0.0
Lane LOS	B		
Approach Delay (s)	13.7	0.0	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	35.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	195	5	480	470	5	150
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	217	6	533	522	6	167
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			937			
pX, platoon unblocked						
vC, conflicting volume	711	533			1056	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	711	533			1056	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	46	99			99	
cM capacity (veh/h)	398	550			667	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	222	533	522	172
Volume Left	217	0	0	6
Volume Right	6	0	522	0
cSH	400	1700	1700	667
Volume to Capacity	0.56	0.31	0.31	0.01
Queue Length 95th (ft)	82	0	0	1
Control Delay (s)	24.6	0.0	0.0	0.4
Lane LOS	C			A
Approach Delay (s)	24.6	0.0		0.4
Approach LOS	C			

Intersection Summary			
Average Delay	3.8		
Intersection Capacity Utilization	43.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR	SBR2	SEL	SER
Lane Configurations									
Volume (vph)	0	640	205	950	260	0	85	0	0
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		3.0	2.0	2.0	3.0				
Lane Util. Factor		*1.00	1.00	0.95	0.95				
Frt		0.85	1.00	1.00	0.96				
Flt Protected		1.00	0.95	1.00	1.00				
Satd. Flow (prot)		2975	1646	3292	3203				
Flt Permitted		1.00	0.95	1.00	1.00				
Satd. Flow (perm)		2975	1646	3292	3203				
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	0	688	220	1022	280	0	91	0	0
RTOR Reduction (vph)	0	329	0	0	57	0	0	0	0
Lane Group Flow (vph)	0	359	220	1022	314	0	0	0	0
Heavy Vehicles (%)	0%	0%	1%	1%	0%	0%	0%	0%	0%
Turn Type		custom	Prot						
Protected Phases		8	3	3 6	2				
Permitted Phases									
Actuated Green, G (s)		26.7	27.7	55.0	18.3				
Effective Green, g (s)		28.7	29.7	52.0	20.3				
Actuated g/C Ratio		0.52	0.54	0.95	0.37				
Clearance Time (s)		5.0	4.0		5.0				
Vehicle Extension (s)		5.2	2.3		5.2				
Lane Grp Cap (vph)		1552	889	3112	1182				
v/s Ratio Prot		0.12	0.13	c0.31	0.10				
v/s Ratio Perm									
v/c Ratio		0.23	0.25	0.33	0.27				
Uniform Delay, d1		7.2	6.7	0.1	12.1				
Progression Factor		1.00	0.93	1.00	1.00				
Incremental Delay, d2		0.3	0.1	0.0	0.3				
Delay (s)		7.5	6.4	0.2	12.4				
Level of Service		A	A	A	B				
Approach Delay (s)	7.5			1.3	12.4			0.0	
Approach LOS	A			A	B			A	

Intersection Summary			
HCM Average Control Delay	4.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	55.0	Sum of lost time (s)	2.0
Intersection Capacity Utilization	41.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Volume (veh/h)	1100	0	0	900	0	55
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	1183	0	0	968	0	59
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	706			298		
pX, platoon unblocked			0.91		0.92	0.91
vC, conflicting volume			1183		1667	591
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1002		1437	352
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	90
cM capacity (veh/h)			636		116	591

Direction, Lane #	NB 1	NB 2	SB 1	SB 2	NW 1
Volume Total	591	591	484	484	59
Volume Left	0	0	0	0	0
Volume Right	0	0	0	0	59
cSH	1700	1700	1700	1700	591
Volume to Capacity	0.35	0.35	0.28	0.28	0.10
Queue Length 95th (ft)	0	0	0	0	8
Control Delay (s)	0.0	0.0	0.0	0.0	11.8
Lane LOS					B
Approach Delay (s)	0.0		0.0		11.8
Approach LOS					B

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	71.9%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	50	0	65	0	0	0	0	1050	805	10	890	0
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		3.0	3.0					3.0	3.0	2.0	3.0	
Lane Util. Factor		0.95	0.95					0.95	1.00	1.00	0.95	
Frt		0.97	0.85					1.00	0.85	1.00	1.00	
Flt Protected		0.96	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1555	1413					3292	1473	1662	3325	
Flt Permitted		0.96	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1555	1413					3292	1473	1662	3325	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	52	0	68	0	0	0	0	1094	839	10	927	0
RTOR Reduction (vph)	0	8	52	0	0	0	0	0	162	0	0	0
Lane Group Flow (vph)	0	55	5	0	0	0	0	1094	677	10	927	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	1%	1%	0%	0%	0%
Turn Type	Perm		Perm						Perm	Prot		
Protected Phases		8						6		5	2	
Permitted Phases	8		8						6			
Actuated Green, G (s)		8.5	8.5					86.7	86.7	0.8	91.5	
Effective Green, g (s)		10.5	10.5					88.7	88.7	2.8	93.5	
Actuated g/C Ratio		0.10	0.10					0.81	0.81	0.03	0.85	
Clearance Time (s)		5.0	5.0					5.0	5.0	4.0	5.0	
Vehicle Extension (s)		2.3	2.3					4.7	4.7	2.3	4.7	
Lane Grp Cap (vph)		148	135					2655	1188	42	2826	
v/s Ratio Prot								0.33		0.01	c0.28	
v/s Ratio Perm		0.04	0.00						c0.46			
v/c Ratio		0.37	0.04					0.41	0.57	0.24	0.33	
Uniform Delay, d1		46.7	45.2					3.1	3.8	52.6	1.7	
Progression Factor		1.00	1.00					1.00	1.00	1.01	0.77	
Incremental Delay, d2		0.9	0.1					0.5	2.0	1.6	0.3	
Delay (s)		47.6	45.2					3.6	5.8	54.9	1.6	
Level of Service		D	D					A	A	D	A	
Approach Delay (s)		46.5			0.0			4.5			2.2	
Approach LOS		D			A			A			A	

Intersection Summary			
HCM Average Control Delay	5.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	71.9%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	815	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5					
Lane Util. Factor	0.95					
Frt	1.00					
Flt Protected	1.00					
Satd. Flow (prot)	3471					
Flt Permitted	1.00					
Satd. Flow (perm)	3471					
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	886	0	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	886	0	0	0	0	0
Heavy Vehicles (%)	4%	0%	0%	0%	0%	0%
Turn Type						
Protected Phases	4					
Permitted Phases						
Actuated Green, G (s)	2.5					
Effective Green, g (s)	2.5					
Actuated g/C Ratio	0.14					
Clearance Time (s)	4.5					
Lane Grp Cap (vph)	482					
v/s Ratio Prot	c0.26					
v/s Ratio Perm						
v/c Ratio	1.84					
Uniform Delay, d1	7.8					
Progression Factor	1.00					
Incremental Delay, d2	385.2					
Delay (s)	392.9					
Level of Service	F					
Approach Delay (s)	392.9			0.0	0.0	
Approach LOS	F			A	A	

Intersection Summary			
HCM Average Control Delay	392.9	HCM Level of Service	F
HCM Volume to Capacity ratio	1.84		
Actuated Cycle Length (s)	18.0	Sum of lost time (s)	15.5
Intersection Capacity Utilization	26.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	5	0	20	0	0	0	40	1850	0	0	935	20
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	5	0	21	0	0	0	43	1968	0	0	995	21
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											189	
pX, platoon unblocked	0.94	0.94	0.94	0.94	0.94		0.94					
vC, conflicting volume	1746	3059	508	2572	3069	656	1016			1968		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1671	3062	358	2546	3073	656	897			1968		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	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 %	91	100	96	100	100	100	94			100		
cM capacity (veh/h)	58	11	608	12	11	413	722			299		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2
Volume Total	27	0	43	787	787	394	497	519
Volume Left	5	0	43	0	0	0	0	0
Volume Right	21	0	0	0	0	0	0	21
cSH	209	1700	722	1700	1700	1700	299	1700
Volume to Capacity	0.13	0.00	0.06	0.46	0.46	0.23	0.00	0.31
Queue Length 95th (ft)	11	0	5	0	0	0	0	0
Control Delay (s)	24.7	0.0	10.3	0.0	0.0	0.0	0.0	0.0
Lane LOS	C	A	B					
Approach Delay (s)	24.7	0.0	0.2				0.0	
Approach LOS	C	A						

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	45.7%	ICU Level of Service	A
Analysis Period (min)	15		

200: Schaff Rd & Helvetia Rd Performance by movement

Movement	WBL	NBT	NBR	SBT	All
Total Delay (hr)	0.0	0.1	0.0	0.0	0.1
Delay / Veh (s)	6.6	0.6	0.1	0.2	0.6
Vehicles Entered	4	480	5	140	629
Vehicles Exited	5	480	5	140	630
Hourly Exit Rate	5	480	5	140	630
Input Volume	5	484	5	150	644
% of Volume	100	99	100	93	98
Denied Entry Before	0	0	0	0	0
Denied Entry After	0	0	0	0	0

210: Jacobson Rd & Helvetia Rd Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Total Delay (hr)	0.8	0.0	0.3	0.8	0.0	0.0	2.0
Delay / Veh (s)	14.6	12.2	2.6	5.8	10.2	0.8	5.4
Vehicles Entered	199	5	484	467	5	142	1302
Vehicles Exited	198	5	484	467	5	141	1300
Hourly Exit Rate	198	5	484	467	5	141	1300
Input Volume	195	5	489	470	5	151	1316
% of Volume	101	95	99	99	95	93	99
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

215: Loop Ramp #1 & Helvetia Rd Performance by movement

Movement	EBT	EBR	NBL	NBT	SBT	SBR2	All
Total Delay (hr)	0.0	0.7	1.0	1.9	1.1	0.2	4.8
Delay / Veh (s)	0.1	3.8	18.5	7.1	14.8	8.9	8.2
Vehicles Entered	12	645	197	940	266	77	2137
Vehicles Exited	12	644	197	940	266	77	2136
Hourly Exit Rate	12	644	197	940	266	77	2136
Input Volume	12	640	205	950	264	85	2157
% of Volume	96	101	96	99	101	91	99
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

220: Helvetia Rd/Brookwood Pkwy #1 & WB-NB Helvetia Performance by movement

Movement	NBT	SBT	NWT	NWR	All
Total Delay (hr)	0.7	0.3	0.0	0.2	1.2
Delay / Veh (s)	2.4	1.2	0.0	10.6	2.1
Vehicles Entered	1089	906	2	54	2051
Vehicles Exited	1091	904	2	54	2051
Hourly Exit Rate	1091	904	2	54	2051
Input Volume	1110	900	1	55	2066
% of Volume	98	100	200	98	99
Denied Entry Before	0	0	0	0	0
Denied Entry After	0	0	0	0	0

224: Exit Ramp #1 & WB-NB Helvetia Performance by movement

Movement	WBT	WBR	All
Total Delay (hr)	0.3	0.0	0.3
Delay / Veh (s)	1.6	1.5	1.6
Vehicles Entered	644	55	699
Vehicles Exited	645	55	700
Hourly Exit Rate	645	55	700
Input Volume	640	55	694
% of Volume	101	100	101
Denied Entry Before	0	0	0
Denied Entry After	0	0	0

230: US-26 EB Helvetia Off-ramp & Helvetia Rd/Brookwood Pkwy #1 Performance by movement

Movement	EBL	EBR	NBT	NBR	SBL	SBT	All
Total Delay (hr)	0.8	0.2	0.6	1.0	0.1	0.5	3.3
Delay / Veh (s)	56.4	8.9	2.1	4.6	48.4	2.0	4.1
Vehicles Entered	52	64	1040	819	10	902	2887
Vehicles Exited	52	65	1037	819	10	901	2884
Hourly Exit Rate	52	65	1037	819	10	901	2884
Input Volume	50	65	1060	805	10	898	2888
% of Volume	105	100	98	102	100	100	100
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

231: US-26 EB Helvetia On-ramp & Performance by movement

Movement	EBT	All
Total Delay (hr)	44.8	44.8
Delay / Veh (s)	196.5	196.5
Vehicles Entered	843	843
Vehicles Exited	800	800
Hourly Exit Rate	800	800
Input Volume	842	842
% of Volume	95	95
Denied Entry Before	0	0
Denied Entry After	14	14

240: Meek Rd & Brookwood Pkwy Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Total Delay (hr)	0.1	0.1	0.1	4.4	0.2	0.0	4.9
Delay / Veh (s)	75.1	13.7	6.7	8.5	0.7	0.4	6.1
Vehicles Entered	6	21	42	1849	944	23	2885
Vehicles Exited	6	21	43	1843	944	23	2880
Hourly Exit Rate	6	21	43	1843	944	23	2880
Input Volume	5	20	40	1850	940	20	2876
% of Volume	120	104	108	100	100	114	100
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

Total Network Performance

Total Delay (hr)	70.5
Delay / Veh (s)	80.9
Vehicles Entered	3162
Vehicles Exited	3115
Hourly Exit Rate	3115
Input Volume	27788
% of Volume	11
Denied Entry Before	0
Denied Entry After	14

Intersection: 200: Schaff Rd & Helvetia Rd

Movement	WB
Directions Served	LR
Maximum Queue (ft)	35
Average Queue (ft)	4
95th Queue (ft)	22
Link Distance (ft)	549
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 210: Jacobson Rd & Helvetia Rd

Movement	WB	NB	SB
Directions Served	LR	R	LT
Maximum Queue (ft)	175	16	48
Average Queue (ft)	79	1	5
95th Queue (ft)	146	10	31
Link Distance (ft)	396	883	410
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 215: Loop Ramp #1 & Helvetia Rd

Movement	EB	EB	NB	NB	NB	SB	SB
Directions Served	R	R	L	T	T	T	T>
Maximum Queue (ft)	94	97	217	310	298	102	120
Average Queue (ft)	50	55	103	109	92	51	66
95th Queue (ft)	79	85	192	269	235	90	105
Link Distance (ft)	926	926		243	243	883	
Upstream Blk Time (%)			0	1	0		
Queuing Penalty (veh)			0	5	3		
Storage Bay Dist (ft)			200				415
Storage Blk Time (%)			1	2			
Queuing Penalty (veh)			3	4			

Intersection: 220: Helvetia Rd/Brookwood Pkwy #1 & WB-NB Helvetia

Movement	NB	NB	NW
Directions Served	T	T	R
Maximum Queue (ft)	60	19	66
Average Queue (ft)	2	1	31
95th Queue (ft)	24	15	55
Link Distance (ft)	638	638	1445
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 224: Exit Ramp #1 & WB-NB Helvetia

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

Intersection: 230: US-26 EB Helvetia Off-ramp & Helvetia Rd/Brookwood Pkwy #1

Movement	EB	EB	NB	NB	NB	SB	SB	SB
Directions Served	LR	R	T	T	R	L	T	T
Maximum Queue (ft)	125	61	138	126	173	51	81	109
Average Queue (ft)	59	30	49	38	46	10	19	39
95th Queue (ft)	107	56	124	99	173	36	58	91
Link Distance (ft)	1144		133	133	133		638	638
Upstream Blk Time (%)			1	0	5			
Queuing Penalty (veh)			3	1	33			
Storage Bay Dist (ft)		300				175		
Storage Blk Time (%)								
Queuing Penalty (veh)								

Intersection: 231: US-26 EB Helvetia On-ramp &

Movement	EB	EB
Directions Served	T	T
Maximum Queue (ft)	873	1033
Average Queue (ft)	613	668
95th Queue (ft)	1012	1148
Link Distance (ft)	960	960
Upstream Blk Time (%)		12
Queuing Penalty (veh)		50
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 240: Meek Rd & Brookwood Pkwy

Movement	EB	NB	NB	NB	NB	B251	B251	B2	B3	SB
Directions Served	LR	L	T	T	TR	T	T	T	T	TR
Maximum Queue (ft)	78	60	322	397	160	60	106	25	12	16
Average Queue (ft)	24	21	44	82	47	5	10	1	1	1
95th Queue (ft)	62	50	274	391	193	60	102	15	10	7
Link Distance (ft)	603		620	620		1281	1281	1111	1032	133
Upstream Blk Time (%)			0	2						
Queuing Penalty (veh)			0	0						
Storage Bay Dist (ft)		100			200					
Storage Blk Time (%)		0	0		6					
Queuing Penalty (veh)		0	0		36					

Network Summary

Network wide Queuing Penalty: 137

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/13/2011
Analysis time period:	AM Peak
Freeway/Dir of Travel:	US 26 Eastbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2015
Description: Eastbound	Off-ramp to Brookwood

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	1990	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	210	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	1990		210			vph
Peak-hour factor, PHF	0.95		0.95			
Peak 15-min volume, v15	524		55			v
Trucks and buses	4		4			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.980	0.980	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2137	225	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2137 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2137	4600	No
$v_{FO} = v_F - v_R$	1912	4600	No
v_R	225	2000	No
$v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3 \text{ or } av34}$ > 2700 pc/h?		No	
Is $v_{3 \text{ or } av34}$ > 1.5 $v_{12}/2$		No	
If yes, v_{12A} = 2137		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	2137	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 9.1 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	D_S = 0.448	
Space mean speed in ramp influence area,	S_R = 51.9	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 51.9	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/14/2011
Analysis time period:	AM Peak Period
Freeway/Dir of Travel:	US 26 Eastbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2015
Description: Eastbound	On-ramp from Brookwood

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	1775	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	490	vph
Length of first accel/decel lane	410	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1775	490		vph
Peak-hour factor, PHF	0.95	0.95		
Peak 15-min volume, v15	467	129		v
Trucks and buses	4	4		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.980	0.980	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	1906	526	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 1906 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2432	4600	No
$v_{3 or av34}$	0 pc/h	(Equation 25-4 or 25-5)	
Is $v_{3 or av34}$ > 2700 pc/h?		No	
Is $v_{3 or av34}$ > 1.5 v_{12}/2		No	
If yes, v_{12A} = 1906		(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	1906	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A$ = 21.6 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	M_S = 0.337	
Space mean speed in ramp influence area,	S_R = 53.9	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 53.9	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/13/2011
Analysis time period:	AM Peak
Freeway/Dir of Travel:	US 26 Westbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2015
Description:	Westbound 1-lane Off-ramp to Northbound Helvetia

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2515	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	45	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2515		45			vph
Peak-hour factor, PHF	0.95		0.95			
Peak 15-min volume, v15	662		12			v
Trucks and buses	4		4			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.980	0.980	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2700	48	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2700 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2700	4600	No
$v_{FO} = v_F - v_R$	2652	4600	No
v_R	48	2000	No
$v_{3\ or\ av34} = v_{3\ or\ av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3\ or\ av34} > 2700$ pc/h?		No	
Is $v_{3\ or\ av34} > 1.5\ v_{12}/2$		No	
If yes, v_{12A} = 2700		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	2700	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 14.0 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	D_S = 0.432	
Space mean speed in ramp influence area,	S_R = 52.2	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 52.2	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/13/2011
Analysis time period:	AM Peak
Freeway/Dir of Travel:	US 26 Westbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2015
Description:	Westbound 1-lane Off-ramp to Southbound Brookwood

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2515	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	1335	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2515		1335			vph
Peak-hour factor, PHF	0.95		0.95			
Peak 15-min volume, v15	662		351			v
Trucks and buses	4		4			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.980	0.980	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2700	1433	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2700 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2700	4600	No
$v_{FO} = v_F - v_R$	1267	4600	No
v_R	1433	2000	No
$v_{3 \text{ or } av34}$ $v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3 \text{ or } av34}$ $v_{3 \text{ or } av34}$ > 2700 pc/h?		No	
Is $v_{3 \text{ or } av34}$ $v_{3 \text{ or } av34}$ > 1.5 v_{12} /2		No	
If yes, v_{12A} = 2700		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	2700	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 14.0 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	D_S = 0.557	
Space mean speed in ramp influence area,	S_R = 50.0	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 50.0	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/14/2011
Analysis time period:	AM Peak Period
Freeway/Dir of Travel:	US 26 Westbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2015
Description: Westbound	On-ramp from Brookwood

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	1125	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	60	vph
Length of first accel/decel lane	410	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1125	60		vph
Peak-hour factor, PHF	0.95	0.95		
Peak 15-min volume, v15	296	16		v
Trucks and buses	4	4		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.980	0.980	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	1208	64	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 1208 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	1272	4600	No
$v_{3\ or\ av34}$	0 pc/h	(Equation 25-4 or 25-5)	
Is $v_{3\ or\ av34}$ > 2700 pc/h?		No	
Is $v_{3\ or\ av34}$ > 1.5 v_{12}/2		No	
If yes, v_{12A} = 1208		(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	1208	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 12.8 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	M_S = 0.306	
Space mean speed in ramp influence area,	S_R = 54.5	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 54.5	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/13/2011
Analysis time period:	PM Peak
Freeway/Dir of Travel:	US 26 Eastbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2015
Description: Eastbound	Off-ramp to Brookwood

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	1805	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	130	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	1805		130			vph
Peak-hour factor, PHF	0.95		0.95			
Peak 15-min volume, v15	475		34			v
Trucks and buses	1		1			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.995	0.995	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	1910	138	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 1910 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	1910	4600	No
$v_{FO} = v_F - v_R$	1772	4600	No
v_R	138	2000	No
$v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3 \text{ or } av34} > 2700$ pc/h?		No	
Is $v_{3 \text{ or } av34} > 1.5\, v_{12}/2$		No	
If yes, v_{12A} = 1910		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	1910	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 7.2 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	D_S = 0.440	
Space mean speed in ramp influence area,	S_R = 52.1	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 52.1	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/14/2011
Analysis time period:	PM Peak Period
Freeway/Dir of Travel:	US 26 Eastbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2015
Description: Eastbound	On-ramp from Brookwood

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	1675	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	800	vph
Length of first accel/decel lane	410	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1675	800		vph
Peak-hour factor, PHF	0.95	0.95		
Peak 15-min volume, v15	441	211		v
Trucks and buses	1	1		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.995	0.995	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	1772	846	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 1772 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2618	4600	No
v_{3} or v_{av34}	0 pc/h	(Equation 25-4 or 25-5)	
Is v_{3} or v_{av34} > 2700 pc/h?		No	
Is v_{3} or v_{av34} > 1.5 v_{12}/2		No	
If yes, v_{12A} = 1772		(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	1772	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 22.9 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	M_S = 0.346	
Space mean speed in ramp influence area,	S_R = 53.8	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 53.8	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/13/2011
Analysis time period:	PM Peak
Freeway/Dir of Travel:	US 26 Westbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2015
Description:	Westbound 1-lane Off-ramp to Northbound Helvetia

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2690	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	60	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2690		60			vph
Peak-hour factor, PHF	0.95		0.95			
Peak 15-min volume, v15	708		16			v
Trucks and buses	1		3			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.995	0.985	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2846	64	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2846 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2846	4600	No
$v_{FO} = v_F - v_R$	2782	4600	No
v_R	64	2000	No
$v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3 \text{ or } av34} > 2700$ pc/h?		No	
Is $v_{3 \text{ or } av34} > 1.5\, v_{12}/2$		No	
If yes, v_{12A} = 2846		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	2846	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 15.2 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	D_S = 0.434	
Space mean speed in ramp influence area,	S_R = 52.2	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 52.2	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/13/2011
Analysis time period:	PM Peak
Freeway/Dir of Travel:	US 26 Westbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2015
Description:	Westbound 1-lane Off-ramp to Southbound Brookwood

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2690	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	645	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2690		645			vph
Peak-hour factor, PHF	0.95		0.95			
Peak 15-min volume, v15	708		170			v
Trucks and buses	1		3			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.995	0.985	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2846	689	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2846 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2846	4600	No
$v_{FO} = v_F - v_R$	2157	4600	No
v_R	689	2000	No
$v_{3\ or\ av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3\ or\ av34}$ > 2700 pc/h?		No	
Is $v_{3\ or\ av34}$ > 1.5 v_{12}/2		No	
If yes, v_{12A} = 2846		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	2846	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 15.2 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	D_S = 0.490	
Space mean speed in ramp influence area,	S_R = 51.2	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 51.2	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/14/2011
Analysis time period:	PM Peak Period
Freeway/Dir of Travel:	US 26 Westbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2015
Description: Westbound	On-Ramp from Brookwood

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	1945	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	300	vph
Length of first accel/decel lane	410	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1945	300		vph
Peak-hour factor, PHF	0.95	0.95		
Peak 15-min volume, v15	512	79		v
Trucks and buses	1	3		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.995	0.985	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2058	321	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2058 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2379	4600	No
$v_{3 or av34}$	0 pc/h	(Equation 25-4 or 25-5)	
Is $v_{3 or av34}$ > 2700 pc/h?		No	
Is $v_{3 or av34}$ > 1.5 v_{12}/2		No	
If yes, v_{12A} = 2058		(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	2058	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 21.3 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	M_S = 0.334	
Space mean speed in ramp influence area,	S_R = 54.0	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 54.0	mph

Year 2025 Phase 1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	20	5	210	45	20	385
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	22	6	233	50	22	428
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	731	258			283	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	731	258			283	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	94	99			98	
cM capacity (veh/h)	384	783			1285	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	28	283	450
Volume Left	22	0	22
Volume Right	6	50	0
cSH	427	1700	1285
Volume to Capacity	0.06	0.17	0.02
Queue Length 95th (ft)	5	0	1
Control Delay (s)	14.0	0.0	0.6
Lane LOS	B		A
Approach Delay (s)	14.0	0.0	0.6
Approach LOS	B		

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	46.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	165	5	250	265	15	390
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	183	6	278	294	17	433
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			937			
pX, platoon unblocked						
vC, conflicting volume	744	278			572	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	744	278			572	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	51	99			98	
cM capacity (veh/h)	377	763			1006	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	189	278	294	450
Volume Left	183	0	0	17
Volume Right	6	0	294	0
cSH	383	1700	1700	1006
Volume to Capacity	0.49	0.16	0.17	0.02
Queue Length 95th (ft)	66	0	0	1
Control Delay (s)	23.2	0.0	0.0	0.5
Lane LOS	C			A
Approach Delay (s)	23.2	0.0		0.5
Approach LOS	C			

Intersection Summary			
Average Delay	3.8		
Intersection Capacity Utilization	48.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR	SBR2	SEL	SER
Lane Configurations									
Volume (vph)	0	1550	45	515	525	0	30	0	0
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		3.0	2.0	2.0	3.0				
Lane Util. Factor		*1.00	1.00	0.95	0.95				
Frt		0.85	1.00	1.00	0.99				
Flt Protected		1.00	0.95	1.00	1.00				
Satd. Flow (prot)		2917	1309	3260	3265				
Flt Permitted		1.00	0.95	1.00	1.00				
Satd. Flow (perm)		2917	1309	3260	3265				
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	0	1582	46	526	536	0	31	0	0
RTOR Reduction (vph)	0	155	0	0	8	0	0	0	0
Lane Group Flow (vph)	0	1427	46	526	559	0	0	0	0
Heavy Vehicles (%)	2%	2%	27%	2%	1%	2%	1%	0%	0%
Turn Type		custom	Prot						
Protected Phases		8	3	3 6	2				
Permitted Phases									
Actuated Green, G (s)		33.4	34.4	60.0	16.6				
Effective Green, g (s)		35.4	36.4	57.0	18.6				
Actuated g/C Ratio		0.59	0.61	0.95	0.31				
Clearance Time (s)		5.0	4.0		5.0				
Vehicle Extension (s)		5.2	2.3		5.2				
Lane Grp Cap (vph)		1721	794	3097	1012				
v/s Ratio Prot		c0.49	0.04	0.16	c0.17				
v/s Ratio Perm									
v/c Ratio		0.83	0.06	0.17	0.55				
Uniform Delay, d1		9.9	4.8	0.1	17.2				
Progression Factor		1.00	0.80	1.00	1.00				
Incremental Delay, d2		4.8	0.0	0.0	1.2				
Delay (s)		14.7	3.9	0.1	18.4				
Level of Service		B	A	A	B				
Approach Delay (s)	14.7			0.4	18.4			0.0	
Approach LOS	B			A	B			A	

Intersection Summary			
HCM Average Control Delay	12.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	82.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Volume (veh/h)	495	0	0	2075	0	65
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	505	0	0	2117	0	66
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	706			298		
pX, platoon unblocked			0.99		0.88	0.99
vC, conflicting volume			505		1564	253
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			482		1313	227
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	91
cM capacity (veh/h)			1081		134	775

Direction, Lane #	NB 1	NB 2	SB 1	SB 2	NW 1
Volume Total	253	253	1059	1059	66
Volume Left	0	0	0	0	0
Volume Right	0	0	0	0	66
cSH	1700	1700	1700	1700	775
Volume to Capacity	0.15	0.15	0.62	0.62	0.09
Queue Length 95th (ft)	0	0	0	0	7
Control Delay (s)	0.0	0.0	0.0	0.0	10.1
Lane LOS					B
Approach Delay (s)	0.0		0.0		10.1
Approach LOS					B

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	78.2%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	75	0	230	0	0	0	0	420	490	35	2040	0
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		3.0	3.0					3.0	3.0	2.0	3.0	
Lane Util. Factor		0.95	0.95					0.95	1.00	1.00	0.95	
Frt		0.92	0.85					1.00	0.85	1.00	1.00	
Flt Protected		0.98	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1410	1262					3137	1430	1662	3260	
Flt Permitted		0.98	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1410	1262					3137	1430	1662	3260	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	77	0	235	0	0	0	0	429	500	36	2082	0
RTOR Reduction (vph)	0	22	22	0	0	0	0	0	126	0	0	0
Lane Group Flow (vph)	0	137	131	0	0	0	0	429	374	36	2082	0
Heavy Vehicles (%)	0%	0%	12%	0%	0%	0%	0%	6%	4%	0%	2%	0%
Turn Type	Perm		Perm						Perm	Prot		
Protected Phases		8						6		5	2	
Permitted Phases	8		8						6			
Actuated Green, G (s)		14.3	14.3					87.7	87.7	4.0	95.7	
Effective Green, g (s)		16.3	16.3					89.7	89.7	6.0	97.7	
Actuated g/C Ratio		0.14	0.14					0.75	0.75	0.05	0.81	
Clearance Time (s)		5.0	5.0					5.0	5.0	4.0	5.0	
Vehicle Extension (s)		2.3	2.3					4.7	4.7	2.3	4.7	
Lane Grp Cap (vph)		192	171					2345	1069	83	2654	
v/s Ratio Prot								0.14		0.02	c0.64	
v/s Ratio Perm		0.10	c0.10						0.26			
v/c Ratio		0.71	0.76					0.18	0.35	0.43	0.78	
Uniform Delay, d1		49.6	50.0					4.4	5.2	55.4	5.7	
Progression Factor		1.00	1.00					1.00	1.00	0.97	0.79	
Incremental Delay, d2		10.5	17.0					0.2	0.9	1.4	1.6	
Delay (s)		60.1	67.0					4.6	6.1	55.2	6.1	
Level of Service		E	E					A	A	E	A	
Approach Delay (s)		63.5			0.0			5.4			6.9	
Approach LOS		E			A			A			A	

Intersection Summary			
HCM Average Control Delay	11.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	78.2%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑					
Volume (vph)	525	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0					
Lane Util. Factor	0.95					
Frt	1.00					
Flt Protected	1.00					
Satd. Flow (prot)	3471					
Flt Permitted	1.00					
Satd. Flow (perm)	3471					
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	571	0	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	571	0	0	0	0	0
Heavy Vehicles (%)	4%	0%	0%	0%	0%	0%
Turn Type						
Protected Phases	2					
Permitted Phases						
Actuated Green, G (s)	2.2					
Effective Green, g (s)	2.2					
Actuated g/C Ratio	0.18					
Clearance Time (s)	2.0					
Vehicle Extension (s)	3.0					
Lane Grp Cap (vph)	642					
v/s Ratio Prot	c0.16					
v/s Ratio Perm						
v/c Ratio	0.89					
Uniform Delay, d1	4.7					
Progression Factor	1.00					
Incremental Delay, d2	14.2					
Delay (s)	18.9					
Level of Service	B					
Approach Delay (s)	18.9			0.0	0.0	
Approach LOS	B			A	A	

Intersection Summary			
HCM Average Control Delay	18.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	11.9	Sum of lost time (s)	9.7
Intersection Capacity Utilization	17.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
240: Meek Rd & Brookwood Pkwy

10/18/2011

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	30	0	45	0	0	0	20	880	0	0	2260	10
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	31	0	46	0	0	0	20	898	0	0	2306	10
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											189	
pX, platoon unblocked	0.19	0.19	0.19	0.19	0.19		0.19					
vC, conflicting volume	2651	3250	1158	2138	3255	299	2316			898		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1211	4282	0	0	4309	299	0			898		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	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 %	0	100	78	100	100	100	94			100		
cM capacity (veh/h)	26	0	213	150	0	703	319			765		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2
Volume Total	77	0	20	359	359	180	1153	1163
Volume Left	31	0	20	0	0	0	0	0
Volume Right	46	0	0	0	0	0	0	10
cSH	55	1700	319	1700	1700	1700	765	1700
Volume to Capacity	1.39	0.00	0.06	0.21	0.21	0.11	0.00	0.68
Queue Length 95th (ft)	172	0	5	0	0	0	0	0
Control Delay (s)	380.0	0.0	17.1	0.0	0.0	0.0	0.0	0.0
Lane LOS	F	A	C					
Approach Delay (s)	380.0	0.0	0.4				0.0	
Approach LOS	F	A						

Intersection Summary			
Average Delay	8.9		
Intersection Capacity Utilization	73.9%	ICU Level of Service	D
Analysis Period (min)	15		

6: Exit Ramp #1 & Performance by movement

Movement	WBT	All
Total Delay (hr)	5.2	5.2
Delay / Veh (s)	12.0	12.0
Vehicles Entered	1553	1553
Vehicles Exited	1554	1554
Hourly Exit Rate	1554	1554
Input Volume	1550	1550
% of Volume	100	100
Denied Entry Before	0	0
Denied Entry After	0	0

200: Schaff Rd & Helvetia Rd Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Total Delay (hr)	0.0	0.0	0.1	0.0	0.0	0.1	0.2
Delay / Veh (s)	7.7	3.1	1.3	0.4	2.2	0.8	1.2
Vehicles Entered	20	5	214	49	19	378	685
Vehicles Exited	20	5	214	49	19	379	686
Hourly Exit Rate	20	5	214	49	19	379	686
Input Volume	20	5	211	45	20	385	686
% of Volume	101	95	102	109	96	98	100
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

210: Jacobson Rd & Helvetia Rd Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Total Delay (hr)	0.8	0.0	0.2	0.3	0.0	0.1	1.5
Delay / Veh (s)	17.3	11.4	2.6	4.1	6.1	1.3	4.8
Vehicles Entered	163	7	267	254	14	385	1090
Vehicles Exited	164	7	268	255	14	384	1092
Hourly Exit Rate	164	7	268	255	14	384	1092
Input Volume	165	5	262	265	15	390	1102
% of Volume	99	133	102	96	95	98	99
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

215: Loop Ramp #1 & Helvetia Rd Performance by movement

Movement	EBT	EBR	NBL	NBT	SBT	SBR2	All
Total Delay (hr)	0.0	5.0	0.3	1.6	2.8	0.1	9.9
Delay / Veh (s)	0.4	11.7	23.6	11.3	19.2	14.0	13.2
Vehicles Entered	29	1548	42	517	531	31	2698
Vehicles Exited	29	1550	42	516	532	31	2700
Hourly Exit Rate	29	1550	42	516	532	31	2700
Input Volume	26	1550	45	522	538	30	2711
% of Volume	113	100	93	99	99	102	100
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

220: Helvetia Rd/Brookwood Pkwy #1 & WB-NB Helvetia Performance by movement

Movement	NBT	SBT	NWT	NWR	All
Total Delay (hr)	0.3	0.8	0.0	0.2	1.3
Delay / Veh (s)	1.9	1.4	7.1	8.8	1.7
Vehicles Entered	490	2080	3	64	2637
Vehicles Exited	489	2080	3	64	2636
Hourly Exit Rate	489	2080	3	64	2636
Input Volume	500	2090	2	65	2657
% of Volume	98	100	150	98	99
Denied Entry Before	0	0	0	0	0
Denied Entry After	0	0	0	0	0

224: Exit Ramp #1 & WB-NB Helvetia Performance by movement

Movement	WBT	WBR	All
Total Delay (hr)	12.7	0.7	13.5
Delay / Veh (s)	29.5	41.6	30.0
Vehicles Entered	1550	64	1614
Vehicles Exited	1553	64	1617
Hourly Exit Rate	1553	64	1617
Input Volume	1550	65	1615
% of Volume	100	98	100
Denied Entry Before	0	0	0
Denied Entry After	0	0	0

230: US-26 EB Helvetia Off-ramp & Helvetia Rd/Brookwood Pkwy #1 Performance by movement

Movement	EBL	EBR	NBT	NBR	SBL	SBT	All
Total Delay (hr)	1.5	3.0	0.5	0.3	0.6	4.8	10.6
Delay / Veh (s)	74.8	49.6	4.1	2.5	63.3	8.4	11.7
Vehicles Entered	69	216	415	487	34	2054	3275
Vehicles Exited	71	215	415	487	33	2055	3276
Hourly Exit Rate	71	215	415	487	33	2055	3276
Input Volume	75	230	420	490	35	2060	3310
% of Volume	95	94	99	99	94	100	99
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

231: US-26 EB Helvetia On-ramp & Performance by movement

Movement	EBT	All
Total Delay (hr)	2.1	2.1
Delay / Veh (s)	14.5	14.5
Vehicles Entered	529	529
Vehicles Exited	529	529
Hourly Exit Rate	529	529
Input Volume	535	535
% of Volume	99	99
Denied Entry Before	0	0
Denied Entry After	0	0

240: Meek Rd & Brookwood Pkwy Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Total Delay (hr)	11.4	13.0	0.3	1.0	1.1	0.0	26.7
Delay / Veh (s)	1858.6	1730.8	41.6	3.9	1.8	0.5	29.8
Vehicles Entered	26	31	23	885	2264	11	3240
Vehicles Exited	18	23	23	883	2263	11	3221
Hourly Exit Rate	18	23	23	883	2263	11	3221
Input Volume	30	45	20	880	2284	10	3269
% of Volume	60	51	115	100	99	110	99
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	5	12	0	0	0	0	17

Total Network Performance

Total Delay (hr)	84.6
Delay / Veh (s)	85.0
Vehicles Entered	3587
Vehicles Exited	3576
Hourly Exit Rate	3576
Input Volume	34611
% of Volume	10
Denied Entry Before	0
Denied Entry After	17

Intersection: 6: Exit Ramp #1 &

Movement	WB
Directions Served	T
Maximum Queue (ft)	254
Average Queue (ft)	9
95th Queue (ft)	134
Link Distance (ft)	472
Upstream Blk Time (%)	0
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 200: Schaff Rd & Helvetia Rd

Movement	WB	SB
Directions Served	LR	LT
Maximum Queue (ft)	47	86
Average Queue (ft)	18	7
95th Queue (ft)	44	40
Link Distance (ft)	549	349
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 210: Jacobson Rd & Helvetia Rd

Movement	WB	NB	SB
Directions Served	LR	R	LT
Maximum Queue (ft)	216	16	111
Average Queue (ft)	76	1	13
95th Queue (ft)	150	8	59
Link Distance (ft)	396	883	410
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 215: Loop Ramp #1 & Helvetia Rd

Movement	EB	EB	NB	NB	NB	SB	SB
Directions Served	R	R	L	T	T	T	T>
Maximum Queue (ft)	283	306	110	209	179	189	190
Average Queue (ft)	169	204	40	85	74	92	107
95th Queue (ft)	248	288	91	166	151	147	160
Link Distance (ft)	926	926		243	243	883	
Upstream Blk Time (%)				0	0		
Queuing Penalty (veh)				0	0		
Storage Bay Dist (ft)			200				415
Storage Blk Time (%)				0			
Queuing Penalty (veh)				0			

Intersection: 220: Helvetia Rd/Brookwood Pkwy #1 & WB-NB Helvetia

Movement	NB	NW
Directions Served	T	R
Maximum Queue (ft)	7	49
Average Queue (ft)	0	29
95th Queue (ft)	5	46
Link Distance (ft)	638	1359
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 224: Exit Ramp #1 & WB-NB Helvetia

Movement	WB	WB	B1	B1
Directions Served	T	TR	T	T
Maximum Queue (ft)	686	793	63	63
Average Queue (ft)	189	266	2	2
95th Queue (ft)	557	684	46	46
Link Distance (ft)	1944	1944	297	297
Upstream Blk Time (%)			0	0
Queuing Penalty (veh)			0	0
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 230: US-26 EB Helvetia Off-ramp & Helvetia Rd/Brookwood Pkwy #1

Movement	EB	EB	NB	NB	NB	SB	SB	SB
Directions Served	LR	R	T	T	R	L	T	T
Maximum Queue (ft)	239	220	124	116	30	95	326	378
Average Queue (ft)	137	132	42	38	2	35	133	186
95th Queue (ft)	210	205	96	89	20	82	262	323
Link Distance (ft)	1144		133	133	133		638	638
Upstream Blk Time (%)			0	0				
Queuing Penalty (veh)			0	0				
Storage Bay Dist (ft)		300				175		
Storage Blk Time (%)							2	
Queuing Penalty (veh)							1	

Intersection: 231: US-26 EB Helvetia On-ramp &

Movement	EB	EB
Directions Served	T	T
Maximum Queue (ft)	93	127
Average Queue (ft)	40	62
95th Queue (ft)	75	98
Link Distance (ft)	960	960
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 240: Meek Rd & Brookwood Pkwy

Movement	EB	NB	NB	SB
Directions Served	LR	L	T	TR
Maximum Queue (ft)	622	83	13	13
Average Queue (ft)	525	24	0	1
95th Queue (ft)	743	61	7	8
Link Distance (ft)	603		620	133
Upstream Blk Time (%)	53			
Queuing Penalty (veh)	0			
Storage Bay Dist (ft)		100		
Storage Blk Time (%)		0		
Queuing Penalty (veh)		0		

Network Summary

Network wide Queuing Penalty: 2

HCM Unsignalized Intersection Capacity Analysis
200: Schaff Rd & Helvetia Rd

10/18/2011

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	5	0	550	25	0	210
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	5	0	591	27	0	226
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	831	605			618	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	831	605			618	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	98	100			100	
cM capacity (veh/h)	342	501			972	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	5	618	226
Volume Left	5	0	0
Volume Right	0	27	0
cSH	342	1700	972
Volume to Capacity	0.02	0.36	0.00
Queue Length 95th (ft)	1	0	0
Control Delay (s)	15.7	0.0	0.0
Lane LOS	C		
Approach Delay (s)	15.7	0.0	0.0
Approach LOS	C		

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	40.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	230	5	570	495	5	210
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	256	6	633	550	6	233
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			937			
pX, platoon unblocked						
vC, conflicting volume	878	633			1183	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	878	633			1183	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	19	99			99	
cM capacity (veh/h)	317	483			597	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	261	633	550	239
Volume Left	256	0	0	6
Volume Right	6	0	550	0
cSH	319	1700	1700	597
Volume to Capacity	0.82	0.37	0.32	0.01
Queue Length 95th (ft)	173	0	0	1
Control Delay (s)	51.7	0.0	0.0	0.4
Lane LOS	F			A
Approach Delay (s)	51.7	0.0		0.4
Approach LOS	F			

Intersection Summary			
Average Delay	8.1		
Intersection Capacity Utilization	49.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR	SBR2	SEL	SER
Lane Configurations									
Volume (vph)	0	685	245	1065	335	0	105	0	0
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		3.0	2.0	2.0	3.0				
Lane Util. Factor		*1.00	1.00	0.95	0.95				
Frt		0.85	1.00	1.00	0.96				
Flt Protected		1.00	0.95	1.00	1.00				
Satd. Flow (prot)		2975	1646	3292	3206				
Flt Permitted		1.00	0.95	1.00	1.00				
Satd. Flow (perm)		2975	1646	3292	3206				
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	0	737	263	1145	360	0	113	0	0
RTOR Reduction (vph)	0	382	0	0	61	0	0	0	0
Lane Group Flow (vph)	0	355	263	1145	412	0	0	0	0
Heavy Vehicles (%)	0%	0%	1%	1%	0%	0%	0%	0%	0%
Turn Type		custom	Prot						
Protected Phases		8	3	3 6	2				
Permitted Phases									
Actuated Green, G (s)		24.5	25.5	55.0	20.5				
Effective Green, g (s)		26.5	27.5	52.0	22.5				
Actuated g/C Ratio		0.48	0.50	0.95	0.41				
Clearance Time (s)		5.0	4.0		5.0				
Vehicle Extension (s)		5.2	2.3		5.2				
Lane Grp Cap (vph)		1433	823	3112	1312				
v/s Ratio Prot		0.12	0.16	c0.35	0.13				
v/s Ratio Perm									
v/c Ratio		0.25	0.32	0.37	0.31				
Uniform Delay, d1		8.4	8.2	0.1	11.0				
Progression Factor		1.00	0.97	1.00	1.00				
Incremental Delay, d2		0.4	0.1	0.0	0.3				
Delay (s)		8.8	8.0	0.2	11.3				
Level of Service		A	A	A	B				
Approach Delay (s)	8.8			1.6	11.3			0.0	
Approach LOS	A			A	B			A	

Intersection Summary			
HCM Average Control Delay	5.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	55.0	Sum of lost time (s)	2.0
Intersection Capacity Utilization	46.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Volume (veh/h)	1245	0	0	1020	0	65
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	1339	0	0	1097	0	70
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	706			298		
pX, platoon unblocked			0.88		0.91	0.88
vC, conflicting volume			1339		1887	669
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1122		1540	365
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	88
cM capacity (veh/h)			557		98	564

Direction, Lane #	NB 1	NB 2	SB 1	SB 2	NW 1
Volume Total	669	669	548	548	70
Volume Left	0	0	0	0	0
Volume Right	0	0	0	0	70
cSH	1700	1700	1700	1700	564
Volume to Capacity	0.39	0.39	0.32	0.32	0.12
Queue Length 95th (ft)	0	0	0	0	11
Control Delay (s)	0.0	0.0	0.0	0.0	12.3
Lane LOS					B
Approach Delay (s)	0.0		0.0		12.3
Approach LOS					B

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	75.2%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	30	0	70	0	0	0	0	1215	870	10	1010	0
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		3.0	3.0					3.0	3.0	2.0	3.0	
Lane Util. Factor		0.95	0.95					0.95	1.00	1.00	0.95	
Frt		0.94	0.85					1.00	0.85	1.00	1.00	
Flt Protected		0.97	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1513	1413					3292	1473	1662	3325	
Flt Permitted		0.97	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1513	1413					3292	1473	1662	3325	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	31	0	73	0	0	0	0	1266	906	10	1052	0
RTOR Reduction (vph)	0	21	46	0	0	0	0	0	167	0	0	0
Lane Group Flow (vph)	0	33	4	0	0	0	0	1266	739	10	1052	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	1%	1%	0%	0%	0%
Turn Type	Perm		Perm						Perm	Prot		
Protected Phases		8						6		5	2	
Permitted Phases	8		8						6			
Actuated Green, G (s)		7.5	7.5					87.7	87.7	0.8	92.5	
Effective Green, g (s)		9.5	9.5					89.7	89.7	2.8	94.5	
Actuated g/C Ratio		0.09	0.09					0.82	0.82	0.03	0.86	
Clearance Time (s)		5.0	5.0					5.0	5.0	4.0	5.0	
Vehicle Extension (s)		2.3	2.3					4.7	4.7	2.3	4.7	
Lane Grp Cap (vph)		131	122					2684	1201	42	2856	
v/s Ratio Prot								0.38		0.01	c0.32	
v/s Ratio Perm		0.02	0.00						c0.50			
v/c Ratio		0.25	0.04					0.47	0.62	0.24	0.37	
Uniform Delay, d1		46.9	46.1					3.0	3.8	52.6	1.6	
Progression Factor		1.00	1.00					1.00	1.00	1.03	0.90	
Incremental Delay, d2		0.6	0.1					0.6	2.4	1.6	0.3	
Delay (s)		47.5	46.1					3.6	6.1	55.6	1.8	
Level of Service		D	D					A	A	E	A	
Approach Delay (s)		46.8			0.0			4.7			2.3	
Approach LOS		D			A			A			A	

Intersection Summary			
HCM Average Control Delay	5.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	75.2%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑					
Volume (vph)	880	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5					
Lane Util. Factor	0.95					
Frt	1.00					
Flt Protected	1.00					
Satd. Flow (prot)	3471					
Flt Permitted	1.00					
Satd. Flow (perm)	3471					
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	957	0	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	957	0	0	0	0	0
Heavy Vehicles (%)	4%	0%	0%	0%	0%	0%
Turn Type						
Protected Phases	4					
Permitted Phases						
Actuated Green, G (s)	2.5					
Effective Green, g (s)	2.5					
Actuated g/C Ratio	0.14					
Clearance Time (s)	4.5					
Lane Grp Cap (vph)	482					
v/s Ratio Prot	c0.28					
v/s Ratio Perm						
v/c Ratio	1.99					
Uniform Delay, d1	7.8					
Progression Factor	1.00					
Incremental Delay, d2	450.9					
Delay (s)	458.6					
Level of Service	F					
Approach Delay (s)	458.6			0.0	0.0	
Approach LOS	F			A	A	

Intersection Summary			
HCM Average Control Delay	458.6	HCM Level of Service	F
HCM Volume to Capacity ratio	1.99		
Actuated Cycle Length (s)	18.0	Sum of lost time (s)	15.5
Intersection Capacity Utilization	28.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	15	0	40	0	0	0	70	2070	0	0	1050	30
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	16	0	43	0	0	0	74	2202	0	0	1117	32
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											189	
pX, platoon unblocked	0.94	0.94	0.94	0.94	0.94		0.94					
vC, conflicting volume	2016	3484	574	2952	3500	734	1149			2202		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1948	3518	407	2949	3535	734	1021			2202		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	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 %	53	100	92	100	100	100	88			100		
cM capacity (veh/h)	34	5	561	5	5	367	643			242		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2
Volume Total	59	0	74	881	881	440	559	590
Volume Left	16	0	74	0	0	0	0	0
Volume Right	43	0	0	0	0	0	0	32
cSH	107	1700	643	1700	1700	1700	242	1700
Volume to Capacity	0.55	0.00	0.12	0.52	0.52	0.26	0.00	0.35
Queue Length 95th (ft)	64	0	10	0	0	0	0	0
Control Delay (s)	73.7	0.0	11.3	0.0	0.0	0.0	0.0	0.0
Lane LOS	F	A	B					
Approach Delay (s)	73.7	0.0	0.4				0.0	
Approach LOS	F	A						

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	68.2%	ICU Level of Service	C
Analysis Period (min)	15		

200: Schaff Rd & Helvetia Rd Performance by movement

Movement	WBL	NBT	NBR	SBT	All
Total Delay (hr)	0.0	0.1	0.0	0.0	0.2
Delay / Veh (s)	11.0	0.9	0.2	0.3	0.8
Vehicles Entered	6	543	23	205	777
Vehicles Exited	6	541	23	206	776
Hourly Exit Rate	6	541	23	206	776
Input Volume	5	555	25	210	795
% of Volume	120	97	93	98	98
Denied Entry Before	0	0	0	0	0
Denied Entry After	0	0	0	0	0

210: Jacobson Rd & Helvetia Rd Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Total Delay (hr)	1.7	0.0	0.4	0.7	0.0	0.1	2.8
Delay / Veh (s)	26.2	23.6	2.4	4.8	9.0	1.0	6.7
Vehicles Entered	229	6	566	487	5	208	1501
Vehicles Exited	228	6	566	486	5	209	1500
Hourly Exit Rate	228	6	566	486	5	209	1500
Input Volume	230	5	580	495	5	212	1528
% of Volume	99	114	98	98	95	99	98
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

215: Loop Ramp #1 & Helvetia Rd Performance by movement

Movement	EBT	EBR	NBL	NBT	SBT	SBR2	All
Total Delay (hr)	0.0	0.9	1.2	1.4	1.3	0.3	5.0
Delay / Veh (s)	0.1	4.6	17.6	5.0	13.5	9.3	7.5
Vehicles Entered	11	679	237	1042	336	104	2409
Vehicles Exited	11	676	237	1043	338	103	2408
Hourly Exit Rate	11	676	237	1043	338	103	2408
Input Volume	14	685	245	1065	341	105	2454
% of Volume	81	99	97	98	99	98	98
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

220: Helvetia Rd/Brookwood Pkwy #1 & WB-NB Helvetia Performance by movement

Movement	NBT	SBT	NWT	NWR	All
Total Delay (hr)	0.9	0.4	0.0	0.2	1.4
Delay / Veh (s)	2.6	1.3	0.0	11.8	2.3
Vehicles Entered	1224	1009	1	64	2298
Vehicles Exited	1226	1009	1	64	2300
Hourly Exit Rate	1226	1009	1	64	2300
Input Volume	1256	1020	1	65	2342
% of Volume	98	99	100	99	98
Denied Entry Before	0	0	0	0	0
Denied Entry After	0	0	0	0	0

224: Exit Ramp #1 & WB-NB Helvetia Performance by movement

Movement	WBT	WBR	All
Total Delay (hr)	0.3	0.0	0.4
Delay / Veh (s)	1.8	2.0	1.8
Vehicles Entered	682	64	746
Vehicles Exited	679	65	744
Hourly Exit Rate	679	65	744
Input Volume	685	65	750
% of Volume	99	100	99
Denied Entry Before	0	0	0
Denied Entry After	0	0	0

230: US-26 EB Helvetia Off-ramp & Helvetia Rd/Brookwood Pkwy #1 Performance by movement

Movement	EBL	EBR	NBT	NBR	SBL	SBT	All
Total Delay (hr)	0.4	0.2	0.7	1.7	0.1	0.5	3.7
Delay / Veh (s)	58.2	11.7	2.1	7.3	52.2	1.9	4.2
Vehicles Entered	27	68	1198	821	10	1007	3131
Vehicles Exited	27	67	1197	820	10	1009	3130
Hourly Exit Rate	27	67	1197	820	10	1009	3130
Input Volume	30	70	1226	870	10	1019	3226
% of Volume	89	96	98	94	100	99	97
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

231: US-26 EB Helvetia On-ramp & Performance by movement

Movement	EBT	All
Total Delay (hr)	62.2	62.2
Delay / Veh (s)	274.6	274.2
Vehicles Entered	834	834
Vehicles Exited	800	800
Hourly Exit Rate	800	800
Input Volume	909	909
% of Volume	88	88
Denied Entry Before	0	0
Denied Entry After	24	24

240: Meek Rd & Brookwood Pkwy Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Total Delay (hr)	1.7	3.9	0.2	12.7	0.2	0.0	18.7
Delay / Veh (s)	472.0	377.8	9.4	22.8	0.7	0.5	21.1
Vehicles Entered	14	38	69	2013	1045	28	3207
Vehicles Exited	12	36	69	1997	1044	28	3186
Hourly Exit Rate	12	36	69	1997	1044	28	3186
Input Volume	15	40	70	2070	1056	30	3282
% of Volume	79	90	98	96	99	94	97
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	1	0	0	0	0	1

Total Network Performance

Total Delay (hr)	128.6
Delay / Veh (s)	132.7
Vehicles Entered	3548
Vehicles Exited	3434
Hourly Exit Rate	3434
Input Volume	31378
% of Volume	11
Denied Entry Before	1
Denied Entry After	35

Intersection: 200: Schaff Rd & Helvetia Rd

Movement	WB
Directions Served	LR
Maximum Queue (ft)	37
Average Queue (ft)	6
95th Queue (ft)	26
Link Distance (ft)	549
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 210: Jacobson Rd & Helvetia Rd

Movement	WB	NB	SB
Directions Served	LR	R	LT
Maximum Queue (ft)	298	21	88
Average Queue (ft)	113	1	6
95th Queue (ft)	225	10	40
Link Distance (ft)	396	883	410
Upstream Blk Time (%)	0		
Queuing Penalty (veh)	0		
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 215: Loop Ramp #1 & Helvetia Rd

Movement	EB	EB	NB	NB	NB	SB	SB
Directions Served	R	R	L	T	T	T	T>
Maximum Queue (ft)	121	141	224	305	274	114	142
Average Queue (ft)	57	63	118	100	79	56	79
95th Queue (ft)	94	104	216	278	219	95	123
Link Distance (ft)	926	926		243	243	883	
Upstream Blk Time (%)			0	2	0		
Queuing Penalty (veh)			0	10	3		
Storage Bay Dist (ft)			200				415
Storage Blk Time (%)			1	2			
Queuing Penalty (veh)			6	4			

Intersection: 220: Helvetia Rd/Brookwood Pkwy #1 & WB-NB Helvetia

Movement	NB	NB	NW
Directions Served	T	T	R
Maximum Queue (ft)	78	32	93
Average Queue (ft)	5	1	35
95th Queue (ft)	42	23	69
Link Distance (ft)	638	638	1445
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 224: Exit Ramp #1 & WB-NB Helvetia

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

Intersection: 230: US-26 EB Helvetia Off-ramp & Helvetia Rd/Brookwood Pkwy #1

Movement	EB	EB	NB	NB	NB	SB	SB	SB
Directions Served	LR	R	T	T	R	L	T	T
Maximum Queue (ft)	86	66	135	121	209	38	113	126
Average Queue (ft)	39	30	49	34	118	10	18	35
95th Queue (ft)	80	56	123	95	254	32	68	95
Link Distance (ft)	1144		133	133	133		638	638
Upstream Blk Time (%)			1	0	17			
Queuing Penalty (veh)			4	2	117			
Storage Bay Dist (ft)		300				175		
Storage Blk Time (%)								
Queuing Penalty (veh)								

Intersection: 231: US-26 EB Helvetia On-ramp &

Movement	EB	EB
Directions Served	T	T
Maximum Queue (ft)	877	1055
Average Queue (ft)	770	891
95th Queue (ft)	1041	1270
Link Distance (ft)	960	960
Upstream Blk Time (%)		37
Queuing Penalty (veh)		164
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 240: Meek Rd & Brookwood Pkwy

Movement	EB	NB	NB	NB	NB	B251	B251	B2	B2	B3	B3	SB
Directions Served	LR	L	T	T	TR	T	T	T	T	T	T	TR
Maximum Queue (ft)	283	84	622	709	225	1286	1328	610	648	426	248	10
Average Queue (ft)	144	32	105	418	150	473	517	183	199	76	71	0
95th Queue (ft)	455	67	449	963	322	1380	1444	817	844	508	483	5
Link Distance (ft)	603		620	620		1281	1281	1111	1111	1032	1032	133
Upstream Blk Time (%)	11		0	26		1	7	2	3	1	1	
Queuing Penalty (veh)	0		0	0		0	0	0	0	0	0	
Storage Bay Dist (ft)		100			200							
Storage Blk Time (%)		0	0	0	30							
Queuing Penalty (veh)		0	0	1	209							

Network Summary

Network wide Queuing Penalty: 519

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/13/2011
Analysis time period:	AM Peak
Freeway/Dir of Travel:	US 26 Eastbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2025
Description: Eastbound	Off-ramp to Brookwood

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2300	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	305	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2300		305			vph
Peak-hour factor, PHF	0.95		0.95			
Peak 15-min volume, v15	605		80			v
Trucks and buses	4		4			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.980	0.980	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2469	327	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2469 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2469	4600	No
$v_{FO} = v_F - v_R$	2142	4600	No
v_R	327	2000	No
$v_{3 \text{ or } av34}$ $v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3 \text{ or } av34}$ $v_{3 \text{ or } av34}$ > 2700 pc/h?		No	
Is $v_{3 \text{ or } av34}$ $v_{3 \text{ or } av34}$ > 1.5 v_{12} /2		No	
If yes, v_{12A} = 2469		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	2469	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 12.0 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	D_S = 0.457	
Space mean speed in ramp influence area,	S_R = 51.8	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 51.8	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/14/2011
Analysis time period:	AM Peak Period
Freeway/Dir of Travel:	US 26 Eastbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2025
Description: Eastbound	On-ramp from Brookwood

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	1985	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	530	vph
Length of first accel/decel lane	410	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1985	530		vph
Peak-hour factor, PHF	0.95	0.95		
Peak 15-min volume, v15	522	139		v
Trucks and buses	4	4		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.980	0.980	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2131	569	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2131 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2700	4600	No
$v_{3\ or\ av34}$	0 pc/h	(Equation 25-4 or 25-5)	

Is $v_{3\ or\ av34}$ > 2700 pc/h? No

Is $v_{3\ or\ av34}$ > 1.5 v_{12}/2 No

If yes, v_{12A} = 2131 (Equation 25-8)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	2131	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 23.7 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	M_S = 0.350	
Space mean speed in ramp influence area,	S_R = 53.7	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 53.7	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/13/2011
Analysis time period:	AM Peak
Freeway/Dir of Travel:	US 26 Westbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2025
Description:	Westbound 1-lane Off-ramp to Northbound Helvetia

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3140	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	65	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3140		65			vph
Peak-hour factor, PHF	0.95		0.95			
Peak 15-min volume, v15	826		17			v
Trucks and buses	4		4			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.980	0.980	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3371	70	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3371 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3371	4600	No
$v_{FO} = v_F - v_R$	3301	4600	No
v_R	70	2000	No
$v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3 \text{ or } av34} > 2700$ pc/h?		No	
Is $v_{3 \text{ or } av34} > 1.5\, v_{12}/2$		No	
If yes, v_{12A} = 3371		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	3371	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 19.7 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	D_S = 0.434	
Space mean speed in ramp influence area,	S_R = 52.2	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 52.2	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/13/2011
Analysis time period:	AM Peak
Freeway/Dir of Travel:	US 26 Westbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2025
Description:	Westbound 1-lane Off-ramp to Southbound Brookwood

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3140	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	1550	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3140		1550			vph
Peak-hour factor, PHF	0.95		0.95			
Peak 15-min volume, v15	826		408			v
Trucks and buses	4		4			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.980	0.980	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3371	1664	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3371 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3371	4600	No
$v_{FO} = v_F - v_R$	1707	4600	No
v_R	1664	2000	No
$v_{3\ or\ av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3\ or\ av34}$ > 2700 pc/h?		No	
Is $v_{3\ or\ av34}$ > 1.5 v_{12}/2		No	
If yes, v_{12A} = 3371		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	3371	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 19.7 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	D_S = 0.578	
Space mean speed in ramp influence area,	S_R = 49.6	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 49.6	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/14/2011
Analysis time period:	AM Peak Period
Freeway/Dir of Travel:	US 26 Westbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2025
Description: Westbound	On-ramp from Brookwood

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	1515	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	75	vph
Length of first accel/decel lane	410	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1515	75		vph
Peak-hour factor, PHF	0.95	0.95		
Peak 15-min volume, v15	399	20		v
Trucks and buses	4	4		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.980	0.980	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	1627	81	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 1627 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	1708	4600	No
$v_{3\ or\ av34}$	0 pc/h	(Equation 25-4 or 25-5)	
Is $v_{3\ or\ av34}$ > 2700 pc/h?		No	
Is $v_{3\ or\ av34}$ > 1.5 v_{12}/2		No	
If yes, v_{12A} = 1627		(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	1627	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 16.2 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	M_S = 0.314	
Space mean speed in ramp influence area,	S_R = 54.4	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 54.4	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/13/2011
Analysis time period:	PM Peak
Freeway/Dir of Travel:	US 26 Eastbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2025
Description: Eastbound	Off-ramp to Brookwood

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2320	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	100	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2320		100			vph
Peak-hour factor, PHF	0.95		0.95			
Peak 15-min volume, v15	611		26			v
Trucks and buses	1		1			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.995	0.995	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2454	106	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2454 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2454	4600	No
$v_{FO} = v_F - v_R$	2348	4600	No
v_R	106	2000	No
$v_{3\ or\ av34}$ $v_{3\ or\ av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3\ or\ av34}$ $v_{3\ or\ av34}$ > 2700 pc/h?		No	
Is $v_{3\ or\ av34}$ $v_{3\ or\ av34}$ > 1.5 v_{12} /2		No	
If yes, v_{12A} = 2454		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	2454	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 11.9 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	D_S = 0.438	
Space mean speed in ramp influence area,	S_R = 52.1	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 52.1	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/14/2011
Analysis time period:	PM Peak Period
Freeway/Dir of Travel:	US 26 Eastbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2025
Description: Eastbound	On-ramp from Brookwood

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2180	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	800	vph
Length of first accel/decel lane	410	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2180	800		vph
Peak-hour factor, PHF	0.95	0.95		
Peak 15-min volume, v15	574	211		v
Trucks and buses	1	1		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.995	0.995	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2306	846	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2306 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	3152	4600	No
$v_{3\ or\ av34}$	0 pc/h	(Equation 25-4 or 25-5)	
Is $v_{3\ or\ av34}$ > 2700 pc/h?		No	
Is $v_{3\ or\ av34}$ > 1.5 v_{12}/2		No	
If yes, v_{12A} = 2306		(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	2306	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 27.1 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	M_S = 0.383	
Space mean speed in ramp influence area,	S_R = 53.1	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 53.1	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/13/2011
Analysis time period:	PM Peak
Freeway/Dir of Travel:	US 26 Westbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2025
Description:	Westbound 1-lane Off-ramp to Northbound Helvetia

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3155	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	65	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3155		65			vph
Peak-hour factor, PHF	0.95		0.95			
Peak 15-min volume, v15	830		17			v
Trucks and buses	1		3			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.995	0.985	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3338	69	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3338 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3338	4600	No
$v_{FO} = v_F - v_R$	3269	4600	No
v_R	69	2000	No
$v_{3\ or\ av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3\ or\ av34}$ > 2700 pc/h?		No	
Is $v_{3\ or\ av34}$ > 1.5 $v_{12}/2$		No	
If yes, v_{12A} = 3338		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	3338	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 19.5 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	D_S = 0.434	
Space mean speed in ramp influence area,	S_R = 52.2	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 52.2	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/13/2011
Analysis time period:	PM Peak
Freeway/Dir of Travel:	US 26 Westbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2025
Description:	Westbound 1-lane Off-ramp to Southbound Brookwood

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2690	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	645	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2690		645			vph
Peak-hour factor, PHF	0.95		0.95			
Peak 15-min volume, v15	708		170			v
Trucks and buses	1		3			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.995	0.985	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2846	689	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2846 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2846	4600	No
$v_{FO} = v_F - v_R$	2157	4600	No
v_R	689	2000	No
$v_{3\ or\ av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3\ or\ av34}$ > 2700 pc/h?		No	
Is $v_{3\ or\ av34}$ > 1.5 $v_{12}/2$		No	
If yes, v_{12A} = 2846		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	2846	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 15.2 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	D_S = 0.490	
Space mean speed in ramp influence area,	S_R = 51.2	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 51.2	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/14/2011
Analysis time period:	PM Peak Period
Freeway/Dir of Travel:	US 26 Westbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2025
Description: Westbound	On-ramp from Brookwood

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2355	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	350	vph
Length of first accel/decel lane	410	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2355	350		vph
Peak-hour factor, PHF	0.95	0.95		
Peak 15-min volume, v15	620	92		v
Trucks and buses	1	3		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.995	0.985	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2491	374	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2491 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2865	4600	No
$v_{3 or av34}$	0 pc/h	(Equation 25-4 or 25-5)	
Is $v_{3 or av34}$ > 2700 pc/h?		No	
Is $v_{3 or av34}$ > 1.5 v_{12}/2		No	
If yes, v_{12A} = 2491		(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	2491	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A$ = 25.1 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	M_S = 0.361	
Space mean speed in ramp influence area,	S_R = 53.5	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 53.5	mph

Year 2025 Phase 2A

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	20	5	210	45	20	385
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	22	6	233	50	22	428
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	731	258			283	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	731	258			283	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	94	99			98	
cM capacity (veh/h)	384	783			1285	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	28	283	450
Volume Left	22	0	22
Volume Right	6	50	0
cSH	427	1700	1285
Volume to Capacity	0.06	0.17	0.02
Queue Length 95th (ft)	5	0	1
Control Delay (s)	14.0	0.0	0.6
Lane LOS	B		A
Approach Delay (s)	14.0	0.0	0.6
Approach LOS	B		

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	46.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	165	5	250	265	15	390
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	183	6	278	294	17	433
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			937			
pX, platoon unblocked						
vC, conflicting volume	744	278			572	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	744	278			572	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	51	99			98	
cM capacity (veh/h)	377	763			1006	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	189	278	294	450
Volume Left	183	0	0	17
Volume Right	6	0	294	0
cSH	383	1700	1700	1006
Volume to Capacity	0.49	0.16	0.17	0.02
Queue Length 95th (ft)	66	0	0	1
Control Delay (s)	23.2	0.0	0.0	0.5
Lane LOS	C			A
Approach Delay (s)	23.2	0.0		0.5
Approach LOS	C			

Intersection Summary			
Average Delay	3.8		
Intersection Capacity Utilization	48.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR	SBR2	SEL	SER
Lane Configurations									
Volume (vph)	0	1550	45	515	525	0	30	0	0
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		3.0	2.0	2.0	3.0				
Lane Util. Factor		*1.00	1.00	0.95	0.95				
Frt		0.85	1.00	1.00	0.99				
Flt Protected		1.00	0.95	1.00	1.00				
Satd. Flow (prot)		2917	1309	3260	3265				
Flt Permitted		1.00	0.95	1.00	1.00				
Satd. Flow (perm)		2917	1309	3260	3265				
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	0	1582	46	526	536	0	31	0	0
RTOR Reduction (vph)	0	103	0	0	6	0	0	0	0
Lane Group Flow (vph)	0	1479	46	526	561	0	0	0	0
Heavy Vehicles (%)	2%	2%	27%	2%	1%	2%	1%	0%	0%
Turn Type		custom	Prot						
Protected Phases		8	3	3 6	2				
Permitted Phases									
Actuated Green, G (s)		42.1	43.1	70.0	17.9				
Effective Green, g (s)		44.1	45.1	67.0	19.9				
Actuated g/C Ratio		0.63	0.64	0.96	0.28				
Clearance Time (s)		5.0	4.0		5.0				
Vehicle Extension (s)		5.2	2.3		5.2				
Lane Grp Cap (vph)		1838	843	3120	928				
v/s Ratio Prot		c0.51	0.04	0.16	c0.17				
v/s Ratio Perm									
v/c Ratio		0.80	0.05	0.17	0.60				
Uniform Delay, d1		9.7	4.6	0.1	21.6				
Progression Factor		1.00	0.61	1.00	1.00				
Incremental Delay, d2		3.9	0.0	0.0	1.7				
Delay (s)		13.6	2.8	0.1	23.4				
Level of Service		B	A	A	C				
Approach Delay (s)	13.6			0.3	23.4			0.0	
Approach LOS	B			A	C			A	

Intersection Summary			
HCM Average Control Delay	12.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	82.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Volume (veh/h)	495	0	0	2075	0	65
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	505	0	0	2117	0	66
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	706			298		
pX, platoon unblocked			0.97		0.97	0.97
vC, conflicting volume			505		1211	253
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			415		907	154
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	92
cM capacity (veh/h)			1114		270	841

Direction, Lane #	NB 1	NB 2	SB 1	SB 2	SB 3	NW 1
Volume Total	253	253	706	706	706	66
Volume Left	0	0	0	0	0	0
Volume Right	0	0	0	0	0	66
cSH	1700	1700	1700	1700	1700	841
Volume to Capacity	0.15	0.15	0.42	0.42	0.42	0.08
Queue Length 95th (ft)	0	0	0	0	0	6
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	9.6
Lane LOS						A
Approach Delay (s)	0.0		0.0			9.6
Approach LOS						A

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	59.8%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	75	0	230	0	0	0	0	420	490	35	2040	0
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		3.0	3.0					3.0	3.0	2.0	3.0	
Lane Util. Factor		0.95	0.95					0.95	1.00	1.00	0.91	
Frt		0.92	0.85					1.00	0.85	1.00	1.00	
Flt Protected		0.98	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1410	1262					3137	1430	1662	4684	
Flt Permitted		0.98	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1410	1262					3137	1430	1662	4684	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	77	0	235	0	0	0	0	429	500	36	2082	0
RTOR Reduction (vph)	0	7	7	0	0	0	0	0	257	0	0	0
Lane Group Flow (vph)	0	152	146	0	0	0	0	429	243	36	2082	0
Heavy Vehicles (%)	0%	0%	12%	0%	0%	0%	0%	6%	4%	0%	2%	0%
Turn Type	Perm		Perm						Perm	Prot		
Protected Phases		8						6		5	2	
Permitted Phases	8		8						6			
Actuated Green, G (s)		11.2	11.2					32.0	32.0	12.8	48.8	
Effective Green, g (s)		13.2	13.2					34.0	34.0	14.8	50.8	
Actuated g/C Ratio		0.19	0.19					0.49	0.49	0.21	0.73	
Clearance Time (s)		5.0	5.0					5.0	5.0	4.0	5.0	
Vehicle Extension (s)		2.3	2.3					4.7	4.7	2.3	4.7	
Lane Grp Cap (vph)		266	238					1524	695	351	3399	
v/s Ratio Prot								0.14		0.02	c0.44	
v/s Ratio Perm		0.11	c0.12						0.17			
v/c Ratio		0.57	0.61					0.28	0.35	0.10	0.61	
Uniform Delay, d1		25.8	26.1					10.7	11.1	22.2	4.7	
Progression Factor		1.00	1.00					1.00	1.00	0.95	1.09	
Incremental Delay, d2		2.2	3.7					0.5	1.4	0.4	0.5	
Delay (s)		28.0	29.7					11.2	12.5	21.5	5.7	
Level of Service		C	C					B	B	C	A	
Approach Delay (s)		28.8			0.0			11.9			6.0	
Approach LOS		C			A			B			A	

Intersection Summary			
HCM Average Control Delay	9.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	59.8%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑					
Volume (vph)	525	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.8					
Lane Util. Factor	0.95					
Frt	1.00					
Flt Protected	1.00					
Satd. Flow (prot)	3471					
Flt Permitted	1.00					
Satd. Flow (perm)	3471					
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	571	0	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	571	0	0	0	0	0
Heavy Vehicles (%)	4%	0%	0%	0%	0%	0%
Turn Type						
Protected Phases	4					
Permitted Phases						
Actuated Green, G (s)	2.2					
Effective Green, g (s)	2.2					
Actuated g/C Ratio	0.09					
Clearance Time (s)	5.8					
Lane Grp Cap (vph)	305					
v/s Ratio Prot	c0.16					
v/s Ratio Perm						
v/c Ratio	1.87					
Uniform Delay, d1	11.4					
Progression Factor	1.00					
Incremental Delay, d2	404.7					
Delay (s)	416.1					
Level of Service	F					
Approach Delay (s)	416.1			0.0	0.0	
Approach LOS	F			A	A	

Intersection Summary			
HCM Average Control Delay	416.1	HCM Level of Service	F
HCM Volume to Capacity ratio	1.87		
Actuated Cycle Length (s)	25.0	Sum of lost time (s)	22.8
Intersection Capacity Utilization	19.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	30	0	45	0	0	0	20	880	0	0	2260	10
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	31	0	46	0	0	0	20	898	0	0	2306	10
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											189	
pX, platoon unblocked	0.78	0.78	0.78	0.78	0.78		0.78					
vC, conflicting volume	2651	3250	774	1753	3255	299	2316			898		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2131	2898	0	980	2904	299	1701			898		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	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 %	0	100	95	100	100	100	93			100		
cM capacity (veh/h)	21	12	851	145	12	703	296			765		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3
Volume Total	77	0	20	359	359	180	577	1153	587
Volume Left	31	0	20	0	0	0	0	0	0
Volume Right	46	0	0	0	0	0	0	0	10
cSH	51	1700	296	1700	1700	1700	765	1700	1700
Volume to Capacity	1.49	0.00	0.07	0.21	0.21	0.11	0.00	0.68	0.35
Queue Length 95th (ft)	179	0	6	0	0	0	0	0	0
Control Delay (s)	429.9	0.0	18.1	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	F	A	C						
Approach Delay (s)	429.9	0.0	0.4				0.0		
Approach LOS	F	A							

Intersection Summary			
Average Delay	10.0		
Intersection Capacity Utilization	55.0%	ICU Level of Service	A
Analysis Period (min)	15		

6: Exit Ramp #1 & Performance by movement

Movement	WBT	All
Total Delay (hr)	4.4	4.4
Delay / Veh (s)	10.3	10.4
Vehicles Entered	1547	1547
Vehicles Exited	1545	1545
Hourly Exit Rate	1545	1545
Input Volume	1550	1550
% of Volume	100	100
Denied Entry Before	0	0
Denied Entry After	0	0

200: Schaff Rd & Helvetia Rd Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Total Delay (hr)	0.0	0.0	0.1	0.0	0.0	0.1	0.2
Delay / Veh (s)	8.3	3.1	1.4	0.4	2.2	0.7	1.2
Vehicles Entered	19	7	203	44	19	377	669
Vehicles Exited	19	7	205	44	19	377	671
Hourly Exit Rate	19	7	205	44	19	377	671
Input Volume	20	5	211	45	20	385	686
% of Volume	96	133	97	98	96	98	98
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

210: Jacobson Rd & Helvetia Rd Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Total Delay (hr)	0.7	0.0	0.2	0.4	0.0	0.2	1.5
Delay / Veh (s)	14.7	15.6	3.1	5.2	8.0	1.6	4.9
Vehicles Entered	161	5	255	272	14	382	1089
Vehicles Exited	162	5	255	276	14	383	1095
Hourly Exit Rate	162	5	255	276	14	383	1095
Input Volume	165	5	262	265	15	390	1102
% of Volume	98	95	98	104	95	98	99
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

215: Loop Ramp #1 & Helvetia Rd Performance by movement

Movement	EBT	EBR	NBL	NBT	SBT	SBR2	All
Total Delay (hr)	0.0	2.6	0.3	1.9	3.5	0.1	8.5
Delay / Veh (s)	0.4	6.0	24.0	13.2	23.9	17.1	11.3
Vehicles Entered	28	1549	49	531	529	27	2713
Vehicles Exited	28	1549	48	525	526	27	2703
Hourly Exit Rate	28	1549	48	525	526	27	2703
Input Volume	26	1550	45	522	538	30	2711
% of Volume	109	100	106	100	98	89	100
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

220: Helvetia Rd/Brookwood Pkwy #1 & WB-NB Helvetia Performance by movement

Movement	NBT	SBT	NWT	NWR	All
Total Delay (hr)	0.5	0.7	0.0	0.2	1.3
Delay / Veh (s)	3.3	1.2	5.8	10.1	1.8
Vehicles Entered	522	2078	2	55	2657
Vehicles Exited	523	2079	2	55	2659
Hourly Exit Rate	523	2079	2	55	2659
Input Volume	500	2090	2	65	2657
% of Volume	105	99	100	84	100
Denied Entry Before	0	0	0	0	0
Denied Entry After	0	0	0	0	0

224: Exit Ramp #1 & WB-NB Helvetia Performance by movement

Movement	WBT	WBR	All
Total Delay (hr)	21.9	1.3	23.2
Delay / Veh (s)	50.5	82.0	51.6
Vehicles Entered	1571	58	1629
Vehicles Exited	1547	56	1603
Hourly Exit Rate	1547	56	1603
Input Volume	1550	65	1615
% of Volume	100	86	99
Denied Entry Before	0	0	0
Denied Entry After	0	0	0

230: US-26 EB Helvetia Off-ramp & Helvetia Rd/Brookwood Pkwy #1 Performance by movement

Movement	EBL	EBR	NBT	NBR	SBL	SBT	All
Total Delay (hr)	1.0	1.7	1.2	0.3	0.2	2.8	7.2
Delay / Veh (s)	44.9	27.0	9.9	2.5	24.0	4.9	7.9
Vehicles Entered	77	227	442	474	35	2050	3305
Vehicles Exited	76	228	441	474	34	2046	3299
Hourly Exit Rate	76	228	441	474	34	2046	3299
Input Volume	75	230	420	490	35	2060	3310
% of Volume	102	99	105	97	96	99	100
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

231: US-26 EB Helvetia On-ramp & Performance by movement

Movement	EBT	All
Total Delay (hr)	12.9	12.9
Delay / Veh (s)	90.0	90.2
Vehicles Entered	518	518
Vehicles Exited	513	513
Hourly Exit Rate	513	513
Input Volume	535	535
% of Volume	96	96
Denied Entry Before	0	0
Denied Entry After	0	0

240: Meek Rd & Brookwood Pkwy Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Total Delay (hr)	4.7	5.7	0.1	0.9	0.8	0.0	12.2
Delay / Veh (s)	608.1	513.6	23.9	3.6	1.2	0.4	13.5
Vehicles Entered	30	43	18	888	2270	9	3258
Vehicles Exited	27	37	18	888	2271	9	3250
Hourly Exit Rate	27	37	18	888	2271	9	3250
Input Volume	30	45	20	880	2284	10	3269
% of Volume	89	82	90	101	99	90	99
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

Total Network Performance

Total Delay (hr)	82.5
Delay / Veh (s)	82.2
Vehicles Entered	3635
Vehicles Exited	3587
Hourly Exit Rate	3587
Input Volume	34611
% of Volume	10
Denied Entry Before	0
Denied Entry After	0

Intersection: 6: Exit Ramp #1 &

Movement	WB
Directions Served	T
Maximum Queue (ft)	368
Average Queue (ft)	13
95th Queue (ft)	157
Link Distance (ft)	381
Upstream Blk Time (%)	0
Queuing Penalty (veh)	1
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 200: Schaff Rd & Helvetia Rd

Movement	WB	SB
Directions Served	LR	LT
Maximum Queue (ft)	46	60
Average Queue (ft)	18	5
95th Queue (ft)	45	30
Link Distance (ft)	549	349
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 210: Jacobson Rd & Helvetia Rd

Movement	WB	NB	SB
Directions Served	LR	R	LT
Maximum Queue (ft)	203	22	162
Average Queue (ft)	68	1	16
95th Queue (ft)	137	12	86
Link Distance (ft)	396	883	410
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 215: Loop Ramp #1 & Helvetia Rd

Movement	EB	EB	NB	NB	NB	SB	SB
Directions Served	R	R	L	T	T	T	T>
Maximum Queue (ft)	211	170	153	268	222	196	207
Average Queue (ft)	115	78	47	121	104	118	125
95th Queue (ft)	179	124	113	223	192	180	185
Link Distance (ft)	914	914		244	244	883	
Upstream Blk Time (%)				0	0		
Queuing Penalty (veh)				1	0		
Storage Bay Dist (ft)			200				415
Storage Blk Time (%)			0	1			
Queuing Penalty (veh)			0	0			

Intersection: 220: Helvetia Rd/Brookwood Pkwy #1 & WB-NB Helvetia

Movement	NB	NW
Directions Served	T	R
Maximum Queue (ft)	10	60
Average Queue (ft)	1	30
95th Queue (ft)	9	52
Link Distance (ft)	633	1359
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 224: Exit Ramp #1 & WB-NB Helvetia

Movement	WB	WB	B1	B1
Directions Served	T	TR	T	T
Maximum Queue (ft)	974	1081	123	120
Average Queue (ft)	379	529	4	4
95th Queue (ft)	981	1145	63	62
Link Distance (ft)	1944	1944	297	297
Upstream Blk Time (%)			0	0
Queuing Penalty (veh)			0	0
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 230: US-26 EB Helvetia Off-ramp & Helvetia Rd/Brookwood Pkwy #1

Movement	EB	EB	NB	NB	NB	SB	SB	SB	SB
Directions Served	LR	R	T	T	R	L	T	T	T
Maximum Queue (ft)	188	188	151	140	71	79	130	157	189
Average Queue (ft)	104	98	79	68	3	22	45	73	111
95th Queue (ft)	168	164	133	115	34	57	100	141	181
Link Distance (ft)	1130		136	136	136		633	633	633
Upstream Blk Time (%)			1	0	0				
Queuing Penalty (veh)			3	1	0				
Storage Bay Dist (ft)		300				175			
Storage Blk Time (%)							0		
Queuing Penalty (veh)							0		

Intersection: 231: US-26 EB Helvetia On-ramp &

Movement	EB	EB
Directions Served	T	T
Maximum Queue (ft)	402	421
Average Queue (ft)	220	236
95th Queue (ft)	464	474
Link Distance (ft)	960	960
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 240: Meek Rd & Brookwood Pkwy

Movement	EB	NB	NB	NB	NB	SB
Directions Served	LR	L	T	T	TR	T
Maximum Queue (ft)	462	57	54	17	6	11
Average Queue (ft)	307	15	2	1	0	0
95th Queue (ft)	623	45	23	8	4	8
Link Distance (ft)	591		620	620		136
Upstream Blk Time (%)	7					
Queuing Penalty (veh)	0					
Storage Bay Dist (ft)		100			600	
Storage Blk Time (%)			0			
Queuing Penalty (veh)			0			

Network Summary

Network wide Queuing Penalty: 7

HCM Unsignalized Intersection Capacity Analysis
200: Schaff Rd & Helvetia Rd

10/22/2011

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	5	0	550	25	0	210
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	5	0	591	27	0	226
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	831	605			618	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	831	605			618	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	98	100			100	
cM capacity (veh/h)	342	501			972	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	5	618	226
Volume Left	5	0	0
Volume Right	0	27	0
cSH	342	1700	972
Volume to Capacity	0.02	0.36	0.00
Queue Length 95th (ft)	1	0	0
Control Delay (s)	15.7	0.0	0.0
Lane LOS	C		
Approach Delay (s)	15.7	0.0	0.0
Approach LOS	C		

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	40.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	230	5	570	495	5	210
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	256	6	633	550	6	233
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			937			
pX, platoon unblocked						
vC, conflicting volume	878	633			1183	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	878	633			1183	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	19	99			99	
cM capacity (veh/h)	317	483			597	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	261	633	550	239
Volume Left	256	0	0	6
Volume Right	6	0	550	0
cSH	319	1700	1700	597
Volume to Capacity	0.82	0.37	0.32	0.01
Queue Length 95th (ft)	173	0	0	1
Control Delay (s)	51.7	0.0	0.0	0.4
Lane LOS	F			A
Approach Delay (s)	51.7	0.0		0.4
Approach LOS	F			

Intersection Summary			
Average Delay	8.1		
Intersection Capacity Utilization	49.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR	SBR2	SEL	SER
Lane Configurations									
Volume (vph)	0	685	245	1065	335	0	105	0	0
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		3.0	2.0	2.0	3.0				
Lane Util. Factor		*1.00	1.00	0.95	0.95				
Frt		0.85	1.00	1.00	0.96				
Flt Protected		1.00	0.95	1.00	1.00				
Satd. Flow (prot)		2975	1646	3292	3206				
Flt Permitted		1.00	0.95	1.00	1.00				
Satd. Flow (perm)		2975	1646	3292	3206				
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	0	737	263	1145	360	0	113	0	0
RTOR Reduction (vph)	0	382	0	0	61	0	0	0	0
Lane Group Flow (vph)	0	355	263	1145	412	0	0	0	0
Heavy Vehicles (%)	0%	0%	1%	1%	0%	0%	0%	0%	0%
Turn Type		custom	Prot						
Protected Phases		8	3	3 6	2				
Permitted Phases									
Actuated Green, G (s)		24.5	25.5	55.0	20.5				
Effective Green, g (s)		26.5	27.5	52.0	22.5				
Actuated g/C Ratio		0.48	0.50	0.95	0.41				
Clearance Time (s)		5.0	4.0		5.0				
Vehicle Extension (s)		5.2	2.3		5.2				
Lane Grp Cap (vph)		1433	823	3112	1312				
v/s Ratio Prot		0.12	0.16	c0.35	0.13				
v/s Ratio Perm									
v/c Ratio		0.25	0.32	0.37	0.31				
Uniform Delay, d1		8.4	8.2	0.1	11.0				
Progression Factor		1.00	1.01	1.00	1.00				
Incremental Delay, d2		0.4	0.1	0.0	0.3				
Delay (s)		8.8	8.4	0.2	11.3				
Level of Service		A	A	A	B				
Approach Delay (s)	8.8			1.7	11.3			0.0	
Approach LOS	A			A	B			A	

Intersection Summary			
HCM Average Control Delay	5.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	55.0	Sum of lost time (s)	2.0
Intersection Capacity Utilization	46.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Volume (veh/h)	1245	0	0	1020	0	65
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	1339	0	0	1097	0	70
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	706			298		
pX, platoon unblocked			0.88		0.88	0.88
vC, conflicting volume			1339		1704	669
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1122		1535	365
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	88
cM capacity (veh/h)			557		96	564

Direction, Lane #	NB 1	NB 2	SB 1	SB 2	SB 3	NW 1
Volume Total	669	669	366	366	366	70
Volume Left	0	0	0	0	0	0
Volume Right	0	0	0	0	0	70
cSH	1700	1700	1700	1700	1700	564
Volume to Capacity	0.39	0.39	0.22	0.22	0.22	0.12
Queue Length 95th (ft)	0	0	0	0	0	11
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	12.3
Lane LOS						B
Approach Delay (s)	0.0		0.0			12.3
Approach LOS						B

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	75.2%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	30	0	70	0	0	0	0	1215	870	10	1010	0
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		3.0	3.0					3.0	3.0	2.0	3.0	
Lane Util. Factor		0.95	0.95					0.95	1.00	1.00	0.91	
Frt		0.94	0.85					1.00	0.85	1.00	1.00	
Flt Protected		0.97	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1513	1413					3292	1473	1662	4778	
Flt Permitted		0.97	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1513	1413					3292	1473	1662	4778	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	31	0	73	0	0	0	0	1266	906	10	1052	0
RTOR Reduction (vph)	0	21	46	0	0	0	0	0	167	0	0	0
Lane Group Flow (vph)	0	33	4	0	0	0	0	1266	739	10	1052	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	1%	1%	0%	0%	0%
Turn Type	Perm		Perm						Perm	Prot		
Protected Phases		8						6		5	2	
Permitted Phases	8		8						6			
Actuated Green, G (s)		7.5	7.5					87.7	87.7	0.8	92.5	
Effective Green, g (s)		9.5	9.5					89.7	89.7	2.8	94.5	
Actuated g/C Ratio		0.09	0.09					0.82	0.82	0.03	0.86	
Clearance Time (s)		5.0	5.0					5.0	5.0	4.0	5.0	
Vehicle Extension (s)		2.3	2.3					4.7	4.7	2.3	4.7	
Lane Grp Cap (vph)		131	122					2684	1201	42	4105	
v/s Ratio Prot								0.38		0.01	c0.22	
v/s Ratio Perm		0.02	0.00						c0.50			
v/c Ratio		0.25	0.04					0.47	0.62	0.24	0.26	
Uniform Delay, d1		46.9	46.1					3.0	3.8	52.6	1.4	
Progression Factor		1.00	1.00					1.00	1.00	1.01	0.92	
Incremental Delay, d2		0.6	0.1					0.6	2.4	1.6	0.1	
Delay (s)		47.5	46.1					3.6	6.1	54.7	1.4	
Level of Service		D	D					A	A	D	A	
Approach Delay (s)		46.8			0.0			4.7			1.9	
Approach LOS		D			A			A			A	

Intersection Summary			
HCM Average Control Delay	5.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	75.2%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑					
Volume (vph)	880	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5					
Lane Util. Factor	0.95					
Frt	1.00					
Flt Protected	1.00					
Satd. Flow (prot)	3471					
Flt Permitted	1.00					
Satd. Flow (perm)	3471					
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	957	0	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	957	0	0	0	0	0
Heavy Vehicles (%)	4%	0%	0%	0%	0%	0%
Turn Type						
Protected Phases	4					
Permitted Phases						
Actuated Green, G (s)	2.5					
Effective Green, g (s)	2.5					
Actuated g/C Ratio	0.14					
Clearance Time (s)	4.5					
Lane Grp Cap (vph)	482					
v/s Ratio Prot	c0.28					
v/s Ratio Perm						
v/c Ratio	1.99					
Uniform Delay, d1	7.8					
Progression Factor	1.00					
Incremental Delay, d2	450.9					
Delay (s)	458.6					
Level of Service	F					
Approach Delay (s)	458.6			0.0	0.0	
Approach LOS	F			A	A	

Intersection Summary			
HCM Average Control Delay	458.6	HCM Level of Service	F
HCM Volume to Capacity ratio	1.99		
Actuated Cycle Length (s)	18.0	Sum of lost time (s)	15.5
Intersection Capacity Utilization	28.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	15	0	40	0	0	0	70	2070	0	0	1050	30
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	16	0	43	0	0	0	74	2202	0	0	1117	32
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											189	
pX, platoon unblocked	0.96	0.96	0.96	0.96	0.96		0.96					
vC, conflicting volume	2016	3484	388	2766	3500	734	1149			2202		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1924	3446	236	2702	3463	734	1025			2202		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	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 %	56	100	94	100	100	100	89			100		
cM capacity (veh/h)	36	6	744	9	6	367	661			242		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3
Volume Total	59	0	74	881	881	440	279	559	311
Volume Left	16	0	74	0	0	0	0	0	0
Volume Right	43	0	0	0	0	0	0	0	32
cSH	118	1700	661	1700	1700	1700	242	1700	1700
Volume to Capacity	0.50	0.00	0.11	0.52	0.52	0.26	0.00	0.33	0.18
Queue Length 95th (ft)	57	0	9	0	0	0	0	0	0
Control Delay (s)	62.3	0.0	11.1	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	F	A	B						
Approach Delay (s)	62.3	0.0	0.4				0.0		
Approach LOS	F	A							

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	68.2%	ICU Level of Service	C
Analysis Period (min)	15		

200: Schaff Rd & Helvetia Rd Performance by movement

Movement	WBL	NBT	NBR	SBT	All
Total Delay (hr)	0.0	0.2	0.0	0.0	0.2
Delay / Veh (s)	9.3	1.0	0.1	0.3	0.8
Vehicles Entered	4	578	24	209	815
Vehicles Exited	4	578	24	209	815
Hourly Exit Rate	4	578	24	209	815
Input Volume	5	555	25	210	795
% of Volume	80	104	97	99	103
Denied Entry Before	0	0	0	0	0
Denied Entry After	0	0	0	0	0

210: Jacobson Rd & Helvetia Rd Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Total Delay (hr)	2.4	0.1	0.3	0.5	0.0	0.0	3.4
Delay / Veh (s)	36.5	45.6	2.1	4.0	12.6	0.8	7.9
Vehicles Entered	236	5	599	486	3	212	1541
Vehicles Exited	233	5	600	487	3	211	1539
Hourly Exit Rate	233	5	600	487	3	211	1539
Input Volume	230	5	580	495	5	212	1528
% of Volume	101	95	103	98	57	100	101
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

215: Loop Ramp #1 & Helvetia Rd Performance by movement

Movement	EBT	EBR	NBL	NBT	SBT	SBR2	All
Total Delay (hr)	0.0	0.7	1.1	1.1	1.1	0.2	4.3
Delay / Veh (s)	0.1	3.6	16.9	3.8	11.9	8.6	6.3
Vehicles Entered	15	693	240	1071	346	102	2467
Vehicles Exited	15	693	240	1075	345	103	2471
Hourly Exit Rate	15	693	240	1075	345	103	2471
Input Volume	14	685	245	1065	341	105	2454
% of Volume	111	101	98	101	101	98	101
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

220: Helvetia Rd/Brookwood Pkwy #1 & WB-NB Helvetia Performance by movement

Movement	NBT	SBT	NWT	NWR	All
Total Delay (hr)	1.0	0.3	0.0	0.2	1.5
Delay / Veh (s)	2.7	1.2	0.0	10.4	2.2
Vehicles Entered	1259	1034	1	61	2355
Vehicles Exited	1261	1035	1	61	2358
Hourly Exit Rate	1261	1035	1	61	2358
Input Volume	1256	1020	1	65	2342
% of Volume	100	101	100	94	101
Denied Entry Before	0	0	0	0	0
Denied Entry After	0	0	0	0	0

224: Exit Ramp #1 & WB-NB Helvetia Performance by movement

Movement	WBT	WBR	All
Total Delay (hr)	0.4	0.0	0.4
Delay / Veh (s)	1.8	1.8	1.8
Vehicles Entered	695	62	757
Vehicles Exited	695	62	757
Hourly Exit Rate	695	62	757
Input Volume	685	65	750
% of Volume	101	95	101
Denied Entry Before	0	0	0
Denied Entry After	0	0	0

230: US-26 EB Helvetia Off-ramp & Helvetia Rd/Brookwood Pkwy #1 Performance by movement

Movement	EBL	EBR	NBT	NBR	SBL	SBT	All
Total Delay (hr)	0.5	0.2	0.7	1.6	0.1	0.5	3.6
Delay / Veh (s)	51.6	10.3	2.2	6.8	41.3	1.8	4.1
Vehicles Entered	32	70	1229	819	12	1032	3194
Vehicles Exited	32	71	1227	818	12	1031	3191
Hourly Exit Rate	32	71	1227	818	12	1031	3191
Input Volume	30	70	1226	870	10	1019	3226
% of Volume	106	101	100	94	120	101	99
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

231: US-26 EB Helvetia On-ramp & Performance by movement

Movement	EBT	All
Total Delay (hr)	58.8	58.8
Delay / Veh (s)	259.0	259.0
Vehicles Entered	833	833
Vehicles Exited	802	802
Hourly Exit Rate	802	802
Input Volume	909	909
% of Volume	88	88
Denied Entry Before	1	1
Denied Entry After	24	24

240: Meek Rd & Brookwood Pkwy Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Total Delay (hr)	0.4	0.5	0.2	11.0	0.2	0.0	12.3
Delay / Veh (s)	106.9	37.9	10.7	19.5	0.7	0.4	13.6
Vehicles Entered	15	44	71	2040	1068	30	3268
Vehicles Exited	15	45	72	2022	1067	30	3251
Hourly Exit Rate	15	45	72	2022	1067	30	3251
Input Volume	15	40	70	2070	1056	30	3282
% of Volume	98	112	102	98	101	101	99
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

Total Network Performance

Total Delay (hr)	105.1
Delay / Veh (s)	106.5
Vehicles Entered	3591
Vehicles Exited	3519
Hourly Exit Rate	3519
Input Volume	31378
% of Volume	11
Denied Entry Before	1
Denied Entry After	24

Intersection: 200: Schaff Rd & Helvetia Rd

Movement	WB
Directions Served	LR
Maximum Queue (ft)	32
Average Queue (ft)	4
95th Queue (ft)	21
Link Distance (ft)	549
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 210: Jacobson Rd & Helvetia Rd

Movement	WB	B211	NB	SB
Directions Served	LR	T	R	LT
Maximum Queue (ft)	336	28	10	71
Average Queue (ft)	139	2	0	4
95th Queue (ft)	285	30	5	35
Link Distance (ft)	396	948	883	410
Upstream Blk Time (%)	2			
Queuing Penalty (veh)	0			
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 215: Loop Ramp #1 & Helvetia Rd

Movement	EB	EB	NB	NB	NB	SB	SB
Directions Served	R	R	L	T	T	T	T>
Maximum Queue (ft)	83	66	223	274	248	120	151
Average Queue (ft)	43	46	116	74	57	54	73
95th Queue (ft)	71	68	210	224	183	97	123
Link Distance (ft)	914	914		244	244	883	
Upstream Blk Time (%)			0	1	0		
Queuing Penalty (veh)			0	4	1		
Storage Bay Dist (ft)			200				415
Storage Blk Time (%)			1	1			
Queuing Penalty (veh)			4	2			

Intersection: 220: Helvetia Rd/Brookwood Pkwy #1 & WB-NB Helvetia

Movement	NB	NB	NW
Directions Served	T	T	R
Maximum Queue (ft)	59	36	98
Average Queue (ft)	2	1	35
95th Queue (ft)	33	26	70
Link Distance (ft)	633	633	1445
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 224: Exit Ramp #1 & WB-NB Helvetia

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

Intersection: 230: US-26 EB Helvetia Off-ramp & Helvetia Rd/Brookwood Pkwy #1

Movement	EB	EB	NB	NB	NB	SB	SB	SB	SB
Directions Served	LR	R	T	T	R	L	T	T	T
Maximum Queue (ft)	116	66	165	149	210	51	52	102	110
Average Queue (ft)	42	31	52	41	110	10	5	16	30
95th Queue (ft)	90	56	129	108	257	32	27	56	79
Link Distance (ft)	1130		136	136	136		633	633	633
Upstream Blk Time (%)			1	0	14				
Queuing Penalty (veh)			5	2	98				
Storage Bay Dist (ft)		300				175			
Storage Blk Time (%)									
Queuing Penalty (veh)									

Intersection: 231: US-26 EB Helvetia On-ramp &

Movement	EB	EB
Directions Served	T	T
Maximum Queue (ft)	878	1060
Average Queue (ft)	753	862
95th Queue (ft)	1044	1263
Link Distance (ft)	960	960
Upstream Blk Time (%)		34
Queuing Penalty (veh)		147
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 240: Meek Rd & Brookwood Pkwy

Movement	EB	NB	NB	NB	NB	B251	B251	B2	B2	B3	B3	SB
Directions Served	LR	L	T	T	TR	T	T	T	T	T	T	TR
Maximum Queue (ft)	177	90	150	707	612	1149	1187	149	193	11	23	26
Average Queue (ft)	56	33	9	350	337	356	400	26	38	1	2	1
95th Queue (ft)	127	71	95	921	822	1137	1217	173	209	8	17	11
Link Distance (ft)	591		620	620		1281	1281	1111	1111	1032	1032	136
Upstream Blk Time (%)			0	17	9	0	3					
Queuing Penalty (veh)			0	0	0	0	0					
Storage Bay Dist (ft)		100			600							
Storage Blk Time (%)		0		4	21							
Queuing Penalty (veh)		1		28	145							

Network Summary

Network wide Queuing Penalty: 437

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/13/2011
Analysis time period:	AM Peak
Freeway/Dir of Travel:	US 26 Eastbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2025
Description: Eastbound	Off-ramp to Brookwood

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2300	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	305	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2300		305			vph
Peak-hour factor, PHF	0.95		0.95			
Peak 15-min volume, v15	605		80			v
Trucks and buses	4		4			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.980	0.980	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2469	327	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2469 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2469	4600	No
$v_{FO} = v_F - v_R$	2142	4600	No
v_R	327	2000	No
$v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3 \text{ or } av34} > 2700$ pc/h?		No	
Is $v_{3 \text{ or } av34} > 1.5\, v_{12}/2$		No	
If yes, v_{12A} = 2469		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	2469	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 12.0 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	D_S = 0.457	
Space mean speed in ramp influence area,	S_R = 51.8	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 51.8	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/14/2011
Analysis time period:	AM Peak Period
Freeway/Dir of Travel:	US 26 Eastbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2025
Description: Eastbound	On-ramp from Brookwood

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	1985	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	530	vph
Length of first accel/decel lane	410	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1985	530		vph
Peak-hour factor, PHF	0.95	0.95		
Peak 15-min volume, v15	522	139		v
Trucks and buses	4	4		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.980	0.980	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2131	569	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2131 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2700	4600	No
$v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-4 or 25-5)	
Is $v_{3 \text{ or } av34}$ > 2700 pc/h?		No	
Is $v_{3 \text{ or } av34}$ > 1.5 v_{12}/2		No	
If yes, v_{12A} = 2131		(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	2131	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 23.7 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	M_S = 0.350	
Space mean speed in ramp influence area,	S_R = 53.7	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 53.7	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/13/2011
Analysis time period:	AM Peak
Freeway/Dir of Travel:	US 26 Westbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2025
Description:	Westbound 1-lane Off-ramp to Northbound Helvetia

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3140	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	65	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3140		65			vph
Peak-hour factor, PHF	0.95		0.95			
Peak 15-min volume, v15	826		17			v
Trucks and buses	4		4			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.980	0.980	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3371	70	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3371 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3371	4600	No
$v_{FO} = v_F - v_R$	3301	4600	No
v_R	70	2000	No
$v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3 \text{ or } av34} > 2700$ pc/h?		No	
Is $v_{3 \text{ or } av34} > 1.5\, v_{12}/2$		No	
If yes, v_{12A} = 3371		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	3371	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 19.7 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	D_S = 0.434	
Space mean speed in ramp influence area,	S_R = 52.2	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 52.2	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/13/2011
Analysis time period:	AM Peak
Freeway/Dir of Travel:	US 26 Westbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2025
Description:	Westbound 1-lane Off-ramp to Southbound Brookwood

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3140	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	1550	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3140		1550			vph
Peak-hour factor, PHF	0.95		0.95			
Peak 15-min volume, v15	826		408			v
Trucks and buses	4		4			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.980	0.980	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3371	1664	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3371 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3371	4600	No
$v_{FO} = v_F - v_R$	1707	4600	No
v_R	1664	2000	No
$v_{3\ or\ av34}$ v_{av34}	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3\ or\ av34}$ v_{av34} > 2700 pc/h?		No	
Is $v_{3\ or\ av34}$ v_{av34} > 1.5 v_{12} /2		No	
If yes, v_{12A} = 3371		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	3371	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 19.7 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	D_S = 0.578	
Space mean speed in ramp influence area,	S_R = 49.6	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 49.6	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/14/2011
Analysis time period:	AM Peak Period
Freeway/Dir of Travel:	US 26 Westbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2025
Description: Westbound	On-ramp from Brookwood

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	1515	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	75	vph
Length of first accel/decel lane	410	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1515	75		vph
Peak-hour factor, PHF	0.95	0.95		
Peak 15-min volume, v15	399	20		v
Trucks and buses	4	4		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.980	0.980	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	1627	81	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 1627 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	1708	4600	No
$v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-4 or 25-5)	
Is $v_{3 \text{ or } av34}$ > 2700 pc/h?		No	
Is $v_{3 \text{ or } av34}$ > 1.5 v_{12}/2		No	
If yes, v_{12A} = 1627		(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	1627	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 16.2 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	M_S = 0.314	
Space mean speed in ramp influence area,	S_R = 54.4	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 54.4	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/13/2011
Analysis time period:	PM Peak
Freeway/Dir of Travel:	US 26 Eastbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2025
Description: Eastbound	Off-ramp to Brookwood

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2320	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	100	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2320		100			vph
Peak-hour factor, PHF	0.95		0.95			
Peak 15-min volume, v15	611		26			v
Trucks and buses	1		1			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.995	0.995	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2454	106	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2454 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2454	4600	No
$v_{FO} = v_F - v_R$	2348	4600	No
v_R	106	2000	No
$v_{3\ or\ av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3\ or\ av34}$ > 2700 pc/h?		No	
Is $v_{3\ or\ av34}$ > 1.5 v_{12}/2		No	
If yes, v_{12A} = 2454		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	2454	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 11.9 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	D_S = 0.438	
Space mean speed in ramp influence area,	S_R = 52.1	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 52.1	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/14/2011
Analysis time period:	PM Peak Period
Freeway/Dir of Travel:	US 26 Eastbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2025
Description: Eastbound	On-ramp from Brookwood

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2180	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	800	vph
Length of first accel/decel lane	410	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2180	800		vph
Peak-hour factor, PHF	0.95	0.95		
Peak 15-min volume, v15	574	211		v
Trucks and buses	1	1		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.995	0.995	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2306	846	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2306 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	3152	4600	No
$v_{3\ or\ av34}$	0 pc/h	(Equation 25-4 or 25-5)	
Is $v_{3\ or\ av34}$ > 2700 pc/h?		No	
Is $v_{3\ or\ av34}$ > 1.5 v_{12}/2		No	
If yes, v_{12A} = 2306		(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	2306	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 27.1 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	M_S = 0.383	
Space mean speed in ramp influence area,	S_R = 53.1	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 53.1	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/13/2011
Analysis time period:	PM Peak
Freeway/Dir of Travel:	US 26 Westbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2025
Description:	Westbound 1-lane Off-ramp to Northbound Helvetia

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3155	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	65	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3155		65			vph
Peak-hour factor, PHF	0.95		0.95			
Peak 15-min volume, v15	830		17			v
Trucks and buses	1		3			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.995	0.985	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3338	69	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3338 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3338	4600	No
$v_{FO} = v_F - v_R$	3269	4600	No
v_R	69	2000	No
$v_{3\ or\ av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3\ or\ av34}$ > 2700 pc/h?		No	
Is $v_{3\ or\ av34}$ > 1.5 v_{12}/2		No	
If yes, v_{12A} = 3338		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	3338	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 19.5 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	D_S = 0.434	
Space mean speed in ramp influence area,	S_R = 52.2	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 52.2	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/13/2011
Analysis time period:	PM Peak
Freeway/Dir of Travel:	US 26 Westbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2025
Description:	Westbound 1-lane Off-ramp to Southbound Brookwood

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2690	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	645	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2690		645			vph
Peak-hour factor, PHF	0.95		0.95			
Peak 15-min volume, v15	708		170			v
Trucks and buses	1		3			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.995	0.985	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2846	689	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2846 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2846	4600	No
$v_{FO} = v_F - v_R$	2157	4600	No
v_R	689	2000	No
$v_{3\ or\ av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3\ or\ av34} > 2700$ pc/h?		No	
Is $v_{3\ or\ av34} > 1.5\ v_{12}/2$		No	
If yes, v_{12A} = 2846		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	2846	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 15.2 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	D_S = 0.490	
Space mean speed in ramp influence area,	S_R = 51.2	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 51.2	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/14/2011
Analysis time period:	PM Peak Period
Freeway/Dir of Travel:	US 26 Westbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2025
Description: Westbound	On-ramp from Brookwood

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2355	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	350	vph
Length of first accel/decel lane	410	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2355	350		vph
Peak-hour factor, PHF	0.95	0.95		
Peak 15-min volume, v15	620	92		v
Trucks and buses	1	3		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.995	0.985	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2491	374	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2491 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2865	4600	No
$v_{3 or av34}$	0 pc/h	(Equation 25-4 or 25-5)	
Is $v_{3 or av34}$ > 2700 pc/h?		No	
Is $v_{3 or av34}$ > 1.5 v_{12}/2		No	
If yes, v_{12A} = 2491		(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	2491	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 25.1 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	M_S = 0.361	
Space mean speed in ramp influence area,	S_R = 53.5	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 53.5	mph

Year 2025 Phase 2B

HCM Unsignalized Intersection Capacity Analysis
200: Schaff Rd & Helvetia Rd

10/19/2011

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	20	5	210	45	20	385
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	22	6	233	50	22	428
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	731	258			283	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	731	258			283	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	94	99			98	
cM capacity (veh/h)	384	783			1285	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	28	283	450
Volume Left	22	0	22
Volume Right	6	50	0
cSH	427	1700	1285
Volume to Capacity	0.06	0.17	0.02
Queue Length 95th (ft)	5	0	1
Control Delay (s)	14.0	0.0	0.6
Lane LOS	B		A
Approach Delay (s)	14.0	0.0	0.6
Approach LOS	B		

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	46.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	165	5	250	265	15	390
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	183	6	278	294	17	433
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			937			
pX, platoon unblocked						
vC, conflicting volume	744	278			572	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	744	278			572	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	51	99			98	
cM capacity (veh/h)	377	763			1006	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	189	278	294	450
Volume Left	183	0	0	17
Volume Right	6	0	294	0
cSH	383	1700	1700	1006
Volume to Capacity	0.49	0.16	0.17	0.02
Queue Length 95th (ft)	66	0	0	1
Control Delay (s)	23.2	0.0	0.0	0.5
Lane LOS	C			A
Approach Delay (s)	23.2	0.0		0.5
Approach LOS	C			

Intersection Summary			
Average Delay	3.8		
Intersection Capacity Utilization	48.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR	SBR2	SEL	SER
Lane Configurations									
Volume (vph)	0	1550	45	515	525	0	30	0	0
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		3.0	2.0	2.0	3.0				
Lane Util. Factor		*1.00	1.00	0.95	0.95				
Frt		0.85	1.00	1.00	0.99				
Flt Protected		1.00	0.95	1.00	1.00				
Satd. Flow (prot)		2917	1309	3260	3265				
Flt Permitted		1.00	0.95	1.00	1.00				
Satd. Flow (perm)		2917	1309	3260	3265				
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	0	1582	46	526	536	0	31	0	0
RTOR Reduction (vph)	0	155	0	0	8	0	0	0	0
Lane Group Flow (vph)	0	1427	46	526	559	0	0	0	0
Heavy Vehicles (%)	2%	2%	27%	2%	1%	2%	1%	0%	0%
Turn Type		custom	Prot						
Protected Phases		8	3	3 6	2				
Permitted Phases									
Actuated Green, G (s)		33.4	34.4	60.0	16.6				
Effective Green, g (s)		35.4	36.4	57.0	18.6				
Actuated g/C Ratio		0.59	0.61	0.95	0.31				
Clearance Time (s)		5.0	4.0		5.0				
Vehicle Extension (s)		5.2	2.3		5.2				
Lane Grp Cap (vph)		1721	794	3097	1012				
v/s Ratio Prot		c0.49	0.04	0.16	c0.17				
v/s Ratio Perm									
v/c Ratio		0.83	0.06	0.17	0.55				
Uniform Delay, d1		9.9	4.8	0.1	17.2				
Progression Factor		1.00	0.80	1.00	1.00				
Incremental Delay, d2		4.8	0.0	0.0	1.2				
Delay (s)		14.7	3.9	0.1	18.4				
Level of Service		B	A	A	B				
Approach Delay (s)	14.7			0.4	18.4			0.0	
Approach LOS	B			A	B			A	

Intersection Summary			
HCM Average Control Delay	12.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	82.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Volume (veh/h)	495	0	0	2075	0	65
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	505	0	0	2117	0	66
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	706			298		
pX, platoon unblocked			0.99		0.88	0.99
vC, conflicting volume			505		1564	253
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			482		1313	227
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	91
cM capacity (veh/h)			1081		134	775

Direction, Lane #	NB 1	NB 2	SB 1	SB 2	NW 1
Volume Total	253	253	1059	1059	66
Volume Left	0	0	0	0	0
Volume Right	0	0	0	0	66
cSH	1700	1700	1700	1700	775
Volume to Capacity	0.15	0.15	0.62	0.62	0.09
Queue Length 95th (ft)	0	0	0	0	7
Control Delay (s)	0.0	0.0	0.0	0.0	10.1
Lane LOS					B
Approach Delay (s)	0.0		0.0		10.1
Approach LOS					B

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	78.2%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	75	0	230	0	0	0	0	420	490	35	2040	0
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		3.0	3.0					3.0	3.0	2.0	3.0	
Lane Util. Factor		0.95	0.95					0.95	1.00	1.00	0.95	
Frt		0.92	0.85					1.00	0.85	1.00	1.00	
Flt Protected		0.98	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1410	1262					3137	1430	1662	3260	
Flt Permitted		0.98	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1410	1262					3137	1430	1662	3260	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	77	0	235	0	0	0	0	429	500	36	2082	0
RTOR Reduction (vph)	0	22	22	0	0	0	0	0	126	0	0	0
Lane Group Flow (vph)	0	137	131	0	0	0	0	429	374	36	2082	0
Heavy Vehicles (%)	0%	0%	12%	0%	0%	0%	0%	6%	4%	0%	2%	0%
Turn Type	Perm		Perm						Perm	Prot		
Protected Phases		8						6		5	2	
Permitted Phases	8		8						6			
Actuated Green, G (s)		14.3	14.3					87.7	87.7	4.0	95.7	
Effective Green, g (s)		16.3	16.3					89.7	89.7	6.0	97.7	
Actuated g/C Ratio		0.14	0.14					0.75	0.75	0.05	0.81	
Clearance Time (s)		5.0	5.0					5.0	5.0	4.0	5.0	
Vehicle Extension (s)		2.3	2.3					4.7	4.7	2.3	4.7	
Lane Grp Cap (vph)		192	171					2345	1069	83	2654	
v/s Ratio Prot								0.14		0.02	c0.64	
v/s Ratio Perm		0.10	c0.10						0.26			
v/c Ratio		0.71	0.76					0.18	0.35	0.43	0.78	
Uniform Delay, d1		49.6	50.0					4.4	5.2	55.4	5.7	
Progression Factor		1.00	1.00					1.00	1.00	0.97	0.79	
Incremental Delay, d2		10.5	17.0					0.2	0.9	1.4	1.6	
Delay (s)		60.1	67.0					4.6	6.1	55.2	6.1	
Level of Service		E	E					A	A	E	A	
Approach Delay (s)		63.5			0.0			5.4			6.9	
Approach LOS		E			A			A			A	

Intersection Summary			
HCM Average Control Delay	11.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	78.2%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	525	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0					
Lane Util. Factor	0.95					
Frt	1.00					
Flt Protected	1.00					
Satd. Flow (prot)	3471					
Flt Permitted	1.00					
Satd. Flow (perm)	3471					
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	571	0	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	571	0	0	0	0	0
Heavy Vehicles (%)	4%	0%	0%	0%	0%	0%
Turn Type						
Protected Phases	2					
Permitted Phases						
Actuated Green, G (s)	2.2					
Effective Green, g (s)	2.2					
Actuated g/C Ratio	0.18					
Clearance Time (s)	2.0					
Vehicle Extension (s)	3.0					
Lane Grp Cap (vph)	642					
v/s Ratio Prot	c0.16					
v/s Ratio Perm						
v/c Ratio	0.89					
Uniform Delay, d1	4.7					
Progression Factor	1.00					
Incremental Delay, d2	14.2					
Delay (s)	18.9					
Level of Service	B					
Approach Delay (s)	18.9			0.0	0.0	
Approach LOS	B			A	A	

Intersection Summary			
HCM Average Control Delay	18.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	11.9	Sum of lost time (s)	9.7
Intersection Capacity Utilization	17.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	30	0	45	0	0	0	20	880	0	0	2260	10
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	31	0	46	0	0	0	20	898	0	0	2306	10
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											189	
pX, platoon unblocked	0.19	0.19	0.19	0.19	0.19		0.19					
vC, conflicting volume	2651	3250	1158	2138	3255	299	2316			898		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1211	4282	0	0	4309	299	0			898		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	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 %	0	100	78	100	100	100	94			100		
cM capacity (veh/h)	26	0	213	150	0	703	319			765		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2
Volume Total	77	0	20	359	359	180	1153	1163
Volume Left	31	0	20	0	0	0	0	0
Volume Right	46	0	0	0	0	0	0	10
cSH	55	1700	319	1700	1700	1700	765	1700
Volume to Capacity	1.39	0.00	0.06	0.21	0.21	0.11	0.00	0.68
Queue Length 95th (ft)	172	0	5	0	0	0	0	0
Control Delay (s)	380.0	0.0	17.1	0.0	0.0	0.0	0.0	0.0
Lane LOS	F	A	C					
Approach Delay (s)	380.0	0.0	0.4				0.0	
Approach LOS	F	A						

Intersection Summary			
Average Delay	8.9		
Intersection Capacity Utilization	73.9%	ICU Level of Service	D
Analysis Period (min)	15		

200: Schaff Rd & Helvetia Rd Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Total Delay (hr)	0.0	0.0	0.1	0.0	0.0	0.1	0.2
Delay / Veh (s)	8.0	2.5	1.2	0.3	2.2	0.8	1.2
Vehicles Entered	21	6	204	40	19	392	682
Vehicles Exited	21	6	203	39	19	392	680
Hourly Exit Rate	21	6	203	39	19	392	680
Input Volume	20	5	211	45	20	385	686
% of Volume	106	114	96	87	96	102	99
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

210: Jacobson Rd & Helvetia Rd Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Total Delay (hr)	0.6	0.0	0.2	0.3	0.0	0.1	1.3
Delay / Veh (s)	13.6	9.2	2.8	4.6	5.4	1.0	4.2
Vehicles Entered	163	6	248	266	10	403	1096
Vehicles Exited	162	6	247	268	10	403	1096
Hourly Exit Rate	162	6	247	268	10	403	1096
Input Volume	165	5	262	265	15	390	1102
% of Volume	98	114	94	101	68	103	100
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

215: Loop Ramp #1 & Helvetia Rd Performance by movement

Movement	EBT	EBR	NBL	NBT	SBT	SBR2	All
Total Delay (hr)	0.0	6.4	0.3	1.7	2.9	0.1	11.4
Delay / Veh (s)	1.1	14.9	26.1	11.9	18.8	14.1	15.1
Vehicles Entered	23	1562	41	509	548	30	2713
Vehicles Exited	23	1561	41	510	549	31	2715
Hourly Exit Rate	23	1561	41	510	549	31	2715
Input Volume	26	1550	45	522	538	30	2711
% of Volume	89	101	91	98	102	102	100
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

220: Helvetia Rd/Brookwood Pkwy #1 & WB-NB Helvetia Performance by movement

Movement	NBT	SBT	NWT	NWR	All
Total Delay (hr)	0.3	0.9	0.0	0.1	1.3
Delay / Veh (s)	2.0	1.6	0.1	4.3	1.7
Vehicles Entered	484	2112	3	63	2662
Vehicles Exited	484	2112	3	64	2663
Hourly Exit Rate	484	2112	3	64	2663
Input Volume	500	2090	2	65	2657
% of Volume	97	101	150	98	100
Denied Entry Before	0	0	0	0	0
Denied Entry After	0	0	0	0	0

224: Exit Ramp #1 & WB-NB Helvetia Performance by movement

Movement	WBT	WBR	All
Total Delay (hr)	0.8	0.1	0.9
Delay / Veh (s)	1.9	3.1	2.0
Vehicles Entered	1559	65	1624
Vehicles Exited	1559	64	1623
Hourly Exit Rate	1559	64	1623
Input Volume	1550	65	1615
% of Volume	101	98	100
Denied Entry Before	0	0	0
Denied Entry After	0	0	0

230: US-26 EB Helvetia Off-ramp & Helvetia Rd/Brookwood Pkwy #1 Performance by movement

Movement	EBL	EBR	NBT	NBR	SBL	SBT	All
Total Delay (hr)	1.5	3.5	0.5	0.3	0.6	6.0	12.5
Delay / Veh (s)	74.5	52.9	4.7	2.5	66.4	10.4	13.5
Vehicles Entered	70	236	407	486	33	2085	3317
Vehicles Exited	72	235	407	486	34	2084	3318
Hourly Exit Rate	72	235	407	486	34	2084	3318
Input Volume	75	230	420	490	35	2060	3310
% of Volume	96	102	97	99	96	101	100
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

231: US-26 EB Helvetia On-ramp & Performance by movement

Movement	EBT	All
Total Delay (hr)	2.2	2.2
Delay / Veh (s)	14.7	14.7
Vehicles Entered	532	532
Vehicles Exited	533	533
Hourly Exit Rate	533	533
Input Volume	535	535
% of Volume	100	100
Denied Entry Before	0	0
Denied Entry After	0	0

240: Meek Rd & Brookwood Pkwy Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Total Delay (hr)	11.0	14.6	0.2	0.9	1.3	0.0	28.0
Delay / Veh (s)	1805.4	1806.3	45.8	3.9	2.0	0.6	30.9
Vehicles Entered	26	33	16	874	2311	12	3272
Vehicles Exited	19	26	16	874	2312	12	3259
Hourly Exit Rate	19	26	16	874	2312	12	3259
Input Volume	30	45	20	880	2284	10	3269
% of Volume	63	57	80	99	101	120	100
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	6	8	0	0	1	0	15

Total Network Performance

Total Delay (hr)	70.5
Delay / Veh (s)	70.1
Vehicles Entered	3625
Vehicles Exited	3613
Hourly Exit Rate	3613
Input Volume	34611
% of Volume	10
Denied Entry Before	0
Denied Entry After	15

Intersection: 200: Schaff Rd & Helvetia Rd

Movement	WB	SB
Directions Served	LR	LT
Maximum Queue (ft)	62	57
Average Queue (ft)	21	3
95th Queue (ft)	51	27
Link Distance (ft)	549	349
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 210: Jacobson Rd & Helvetia Rd

Movement	WB	NB	SB
Directions Served	LR	R	LT
Maximum Queue (ft)	149	21	64
Average Queue (ft)	67	1	8
95th Queue (ft)	115	13	45
Link Distance (ft)	396	883	410
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 215: Loop Ramp #1 & Helvetia Rd

Movement	EB	EB	NB	NB	NB	SB	SB
Directions Served	R	R	L	T	T	T	T>
Maximum Queue (ft)	432	448	118	221	210	163	182
Average Queue (ft)	217	259	39	89	81	97	113
95th Queue (ft)	361	393	86	178	175	151	167
Link Distance (ft)	926	926		243	243	883	
Upstream Blk Time (%)				0	0		
Queuing Penalty (veh)				0	0		
Storage Bay Dist (ft)			200				415
Storage Blk Time (%)			0	0			
Queuing Penalty (veh)			0	0			

Intersection: 220: Helvetia Rd/Brookwood Pkwy #1 & WB-NB Helvetia

Movement	NW
Directions Served	R
Maximum Queue (ft)	60
Average Queue (ft)	30
95th Queue (ft)	47
Link Distance (ft)	1346
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 224: Exit Ramp #1 & WB-NB Helvetia

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

Intersection: 230: US-26 EB Helvetia Off-ramp & Helvetia Rd/Brookwood Pkwy #1

Movement	EB	EB	NB	NB	NB	SB	SB	SB
Directions Served	LR	R	T	T	R	L	T	T
Maximum Queue (ft)	270	259	110	124	86	91	440	480
Average Queue (ft)	157	147	48	44	4	35	163	220
95th Queue (ft)	230	227	102	97	38	74	339	402
Link Distance (ft)	1144		133	133	133		638	638
Upstream Blk Time (%)			0	0	0			0
Queuing Penalty (veh)			0	0	0			0
Storage Bay Dist (ft)		300				175		
Storage Blk Time (%)	0	0					3	
Queuing Penalty (veh)	0	0					1	

Intersection: 231: US-26 EB Helvetia On-ramp &

Movement	EB	EB
Directions Served	T	T
Maximum Queue (ft)	79	101
Average Queue (ft)	42	60
95th Queue (ft)	72	89
Link Distance (ft)	960	960
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 240: Meek Rd & Brookwood Pkwy

Movement	EB	NB	NB	NB	NB	SB	SB
Directions Served	LR	L	T	T	TR	LT	TR
Maximum Queue (ft)	622	59	23	18	6	7	10
Average Queue (ft)	546	17	1	1	0	0	0
95th Queue (ft)	756	47	21	8	5	5	4
Link Distance (ft)	603		620	620		133	133
Upstream Blk Time (%)	61						
Queuing Penalty (veh)	0						
Storage Bay Dist (ft)		100			200		
Storage Blk Time (%)		0	0				
Queuing Penalty (veh)		0	0				

Network Summary

Network wide Queuing Penalty: 3

HCM Unsignalized Intersection Capacity Analysis
200: Schaff Rd & Helvetia Rd

10/19/2011

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	5	0	550	25	0	210
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	5	0	591	27	0	226
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	831	605			618	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	831	605			618	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	98	100			100	
cM capacity (veh/h)	342	501			972	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	5	618	226
Volume Left	5	0	0
Volume Right	0	27	0
cSH	342	1700	972
Volume to Capacity	0.02	0.36	0.00
Queue Length 95th (ft)	1	0	0
Control Delay (s)	15.7	0.0	0.0
Lane LOS	C		
Approach Delay (s)	15.7	0.0	0.0
Approach LOS	C		

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	40.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	230	5	570	495	5	210
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	256	6	633	550	6	233
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			937			
pX, platoon unblocked						
vC, conflicting volume	878	633			1183	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	878	633			1183	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	19	99			99	
cM capacity (veh/h)	317	483			597	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	261	633	550	239
Volume Left	256	0	0	6
Volume Right	6	0	550	0
cSH	319	1700	1700	597
Volume to Capacity	0.82	0.37	0.32	0.01
Queue Length 95th (ft)	173	0	0	1
Control Delay (s)	51.7	0.0	0.0	0.4
Lane LOS	F			A
Approach Delay (s)	51.7	0.0		0.4
Approach LOS	F			

Intersection Summary			
Average Delay	8.1		
Intersection Capacity Utilization	49.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR	SBR2	SEL	SER
Lane Configurations									
Volume (vph)	0	685	245	1065	335	0	105	0	0
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		3.0	2.0	2.0	3.0				
Lane Util. Factor		*1.00	1.00	0.95	0.95				
Frt		0.85	1.00	1.00	0.96				
Flt Protected		1.00	0.95	1.00	1.00				
Satd. Flow (prot)		2975	1646	3292	3206				
Flt Permitted		1.00	0.95	1.00	1.00				
Satd. Flow (perm)		2975	1646	3292	3206				
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	0	737	263	1145	360	0	113	0	0
RTOR Reduction (vph)	0	382	0	0	61	0	0	0	0
Lane Group Flow (vph)	0	355	263	1145	412	0	0	0	0
Heavy Vehicles (%)	0%	0%	1%	1%	0%	0%	0%	0%	0%
Turn Type		custom	Prot						
Protected Phases		8	3	3 6	2				
Permitted Phases									
Actuated Green, G (s)		24.5	25.5	55.0	20.5				
Effective Green, g (s)		26.5	27.5	52.0	22.5				
Actuated g/C Ratio		0.48	0.50	0.95	0.41				
Clearance Time (s)		5.0	4.0		5.0				
Vehicle Extension (s)		5.2	2.3		5.2				
Lane Grp Cap (vph)		1433	823	3112	1312				
v/s Ratio Prot		0.12	0.16	c0.35	0.13				
v/s Ratio Perm									
v/c Ratio		0.25	0.32	0.37	0.31				
Uniform Delay, d1		8.4	8.2	0.1	11.0				
Progression Factor		1.00	0.97	1.00	1.00				
Incremental Delay, d2		0.4	0.1	0.0	0.3				
Delay (s)		8.8	8.0	0.2	11.3				
Level of Service		A	A	A	B				
Approach Delay (s)	8.8			1.6	11.3			0.0	
Approach LOS	A			A	B			A	

Intersection Summary			
HCM Average Control Delay	5.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	55.0	Sum of lost time (s)	2.0
Intersection Capacity Utilization	46.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Volume (veh/h)	1245	0	0	1020	0	65
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	1339	0	0	1097	0	70
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	706			298		
pX, platoon unblocked			0.88		0.91	0.88
vC, conflicting volume			1339		1887	669
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1122		1540	365
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	88
cM capacity (veh/h)			557		98	564

Direction, Lane #	NB 1	NB 2	SB 1	SB 2	NW 1
Volume Total	669	669	548	548	70
Volume Left	0	0	0	0	0
Volume Right	0	0	0	0	70
cSH	1700	1700	1700	1700	564
Volume to Capacity	0.39	0.39	0.32	0.32	0.12
Queue Length 95th (ft)	0	0	0	0	11
Control Delay (s)	0.0	0.0	0.0	0.0	12.3
Lane LOS					B
Approach Delay (s)	0.0		0.0		12.3
Approach LOS					B

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	75.2%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	30	0	70	0	0	0	0	1215	870	10	1010	0
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		3.0	3.0					3.0	3.0	2.0	3.0	
Lane Util. Factor		0.95	0.95					0.95	1.00	1.00	0.95	
Frt		0.94	0.85					1.00	0.85	1.00	1.00	
Flt Protected		0.97	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1513	1413					3292	1473	1662	3325	
Flt Permitted		0.97	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1513	1413					3292	1473	1662	3325	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	31	0	73	0	0	0	0	1266	906	10	1052	0
RTOR Reduction (vph)	0	21	46	0	0	0	0	0	167	0	0	0
Lane Group Flow (vph)	0	33	4	0	0	0	0	1266	739	10	1052	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	1%	1%	0%	0%	0%
Turn Type	Perm		Perm						Perm	Prot		
Protected Phases		8						6		5	2	
Permitted Phases	8		8						6			
Actuated Green, G (s)		7.5	7.5					87.7	87.7	0.8	92.5	
Effective Green, g (s)		9.5	9.5					89.7	89.7	2.8	94.5	
Actuated g/C Ratio		0.09	0.09					0.82	0.82	0.03	0.86	
Clearance Time (s)		5.0	5.0					5.0	5.0	4.0	5.0	
Vehicle Extension (s)		2.3	2.3					4.7	4.7	2.3	4.7	
Lane Grp Cap (vph)		131	122					2684	1201	42	2856	
v/s Ratio Prot								0.38		0.01	c0.32	
v/s Ratio Perm		0.02	0.00						c0.50			
v/c Ratio		0.25	0.04					0.47	0.62	0.24	0.37	
Uniform Delay, d1		46.9	46.1					3.0	3.8	52.6	1.6	
Progression Factor		1.00	1.00					1.00	1.00	1.03	0.90	
Incremental Delay, d2		0.6	0.1					0.6	2.4	1.6	0.3	
Delay (s)		47.5	46.1					3.6	6.1	55.6	1.8	
Level of Service		D	D					A	A	E	A	
Approach Delay (s)		46.8			0.0			4.7			2.3	
Approach LOS		D			A			A			A	

Intersection Summary			
HCM Average Control Delay	5.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	75.2%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑					
Volume (vph)	880	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5					
Lane Util. Factor	0.95					
Frt	1.00					
Flt Protected	1.00					
Satd. Flow (prot)	3471					
Flt Permitted	1.00					
Satd. Flow (perm)	3471					
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	957	0	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	957	0	0	0	0	0
Heavy Vehicles (%)	4%	0%	0%	0%	0%	0%
Turn Type						
Protected Phases	4					
Permitted Phases						
Actuated Green, G (s)	2.5					
Effective Green, g (s)	2.5					
Actuated g/C Ratio	0.14					
Clearance Time (s)	4.5					
Lane Grp Cap (vph)	482					
v/s Ratio Prot	c0.28					
v/s Ratio Perm						
v/c Ratio	1.99					
Uniform Delay, d1	7.8					
Progression Factor	1.00					
Incremental Delay, d2	450.9					
Delay (s)	458.6					
Level of Service	F					
Approach Delay (s)	458.6			0.0	0.0	
Approach LOS	F			A	A	

Intersection Summary			
HCM Average Control Delay	458.6	HCM Level of Service	F
HCM Volume to Capacity ratio	1.99		
Actuated Cycle Length (s)	18.0	Sum of lost time (s)	15.5
Intersection Capacity Utilization	28.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	15	0	40	0	0	0	70	2070	0	0	1050	30
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	16	0	43	0	0	0	74	2202	0	0	1117	32
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											189	
pX, platoon unblocked	0.94	0.94	0.94	0.94	0.94		0.94					
vC, conflicting volume	2016	3484	574	2952	3500	734	1149			2202		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1948	3518	407	2949	3535	734	1021			2202		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	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 %	53	100	92	100	100	100	88			100		
cM capacity (veh/h)	34	5	561	5	5	367	643			242		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2
Volume Total	59	0	74	881	881	440	559	590
Volume Left	16	0	74	0	0	0	0	0
Volume Right	43	0	0	0	0	0	0	32
cSH	107	1700	643	1700	1700	1700	242	1700
Volume to Capacity	0.55	0.00	0.12	0.52	0.52	0.26	0.00	0.35
Queue Length 95th (ft)	64	0	10	0	0	0	0	0
Control Delay (s)	73.7	0.0	11.3	0.0	0.0	0.0	0.0	0.0
Lane LOS	F	A	B					
Approach Delay (s)	73.7	0.0	0.4				0.0	
Approach LOS	F	A						

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	68.2%	ICU Level of Service	C
Analysis Period (min)	15		

200: Schaff Rd & Helvetia Rd Performance by movement

Movement	WBL	NBT	NBR	SBT	All
Total Delay (hr)	0.0	0.1	0.0	0.0	0.2
Delay / Veh (s)	8.8	0.9	0.3	0.3	0.8
Vehicles Entered	7	536	23	214	780
Vehicles Exited	7	534	23	214	778
Hourly Exit Rate	7	534	23	214	778
Input Volume	5	555	25	210	795
% of Volume	140	96	93	102	98
Denied Entry Before	0	0	0	0	0
Denied Entry After	0	0	0	0	0

210: Jacobson Rd & Helvetia Rd Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Total Delay (hr)	1.8	0.0	0.3	0.6	0.0	0.1	2.8
Delay / Veh (s)	28.3	14.0	2.2	4.4	17.4	1.1	6.9
Vehicles Entered	232	5	564	469	4	220	1494
Vehicles Exited	230	5	562	466	4	220	1487
Hourly Exit Rate	230	5	562	466	4	220	1487
Input Volume	230	5	580	495	5	212	1528
% of Volume	100	95	97	94	76	104	97
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

215: Loop Ramp #1 & Helvetia Rd Performance by movement

Movement	EBT	EBR	NBL	NBT	SBT	SBR2	All
Total Delay (hr)	0.0	0.9	1.1	1.4	1.3	0.3	5.1
Delay / Veh (s)	0.1	4.8	17.2	4.8	13.8	10.1	7.5
Vehicles Entered	13	698	236	1022	342	112	2423
Vehicles Exited	13	698	237	1023	343	112	2426
Hourly Exit Rate	13	698	237	1023	343	112	2426
Input Volume	14	685	245	1065	341	105	2454
% of Volume	96	102	97	96	101	107	99
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

220: Helvetia Rd/Brookwood Pkwy #1 & WB-NB Helvetia Performance by movement

Movement	NBT	SBT	NWT	NWR	All
Total Delay (hr)	0.8	0.4	0.0	0.2	1.4
Delay / Veh (s)	2.5	1.3	0.3	12.1	2.2
Vehicles Entered	1201	1036	1	64	2302
Vehicles Exited	1204	1034	1	64	2303
Hourly Exit Rate	1204	1034	1	64	2303
Input Volume	1256	1020	1	65	2342
% of Volume	96	101	100	99	98
Denied Entry Before	0	0	0	0	0
Denied Entry After	0	0	0	0	0

224: Exit Ramp #1 & WB-NB Helvetia Performance by movement

Movement	WBT	WBR	All
Total Delay (hr)	0.1	0.0	0.2
Delay / Veh (s)	0.7	1.5	0.8
Vehicles Entered	696	64	760
Vehicles Exited	695	65	760
Hourly Exit Rate	695	65	760
Input Volume	685	65	750
% of Volume	101	100	101
Denied Entry Before	0	0	0
Denied Entry After	0	0	0

230: US-26 EB Helvetia Off-ramp & Helvetia Rd/Brookwood Pkwy #1 Performance by movement

Movement	EBL	EBR	NBT	NBR	SBL	SBT	All
Total Delay (hr)	0.5	0.2	0.7	1.7	0.2	0.6	3.9
Delay / Veh (s)	60.9	11.9	2.1	7.3	51.5	2.2	4.5
Vehicles Entered	30	73	1177	826	12	1029	3147
Vehicles Exited	30	73	1174	825	12	1028	3142
Hourly Exit Rate	30	73	1174	825	12	1028	3142
Input Volume	30	70	1226	870	10	1019	3226
% of Volume	99	104	96	95	120	101	97
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

231: US-26 EB Helvetia On-ramp & Performance by movement

Movement	EBT	All
Total Delay (hr)	56.7	56.7
Delay / Veh (s)	248.3	248.6
Vehicles Entered	842	842
Vehicles Exited	802	802
Hourly Exit Rate	802	802
Input Volume	909	909
% of Volume	88	88
Denied Entry Before	0	0
Denied Entry After	21	21

240: Meek Rd & Brookwood Pkwy Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Total Delay (hr)	0.7	1.1	0.2	12.4	0.2	0.0	14.6
Delay / Veh (s)	227.8	104.9	9.0	22.3	0.8	0.3	16.4
Vehicles Entered	11	40	70	1999	1068	31	3219
Vehicles Exited	11	39	70	1983	1066	31	3200
Hourly Exit Rate	11	39	70	1983	1066	31	3200
Input Volume	15	40	70	2070	1056	30	3282
% of Volume	72	98	100	96	101	104	98
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

Total Network Performance

Total Delay (hr)	110.2
Delay / Veh (s)	113.1
Vehicles Entered	3568
Vehicles Exited	3451
Hourly Exit Rate	3451
Input Volume	31378
% of Volume	11
Denied Entry Before	0
Denied Entry After	21

Intersection: 200: Schaff Rd & Helvetia Rd

Movement	WB
Directions Served	LR
Maximum Queue (ft)	32
Average Queue (ft)	6
95th Queue (ft)	26
Link Distance (ft)	549
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 210: Jacobson Rd & Helvetia Rd

Movement	WB	NB	SB
Directions Served	LR	R	LT
Maximum Queue (ft)	312	21	102
Average Queue (ft)	121	1	8
95th Queue (ft)	238	9	47
Link Distance (ft)	396	883	410
Upstream Blk Time (%)	0		
Queuing Penalty (veh)	0		
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 215: Loop Ramp #1 & Helvetia Rd

Movement	EB	EB	NB	NB	NB	SB	SB
Directions Served	R	R	L	T	T	T	T>
Maximum Queue (ft)	126	143	223	303	228	117	141
Average Queue (ft)	58	69	114	85	67	58	84
95th Queue (ft)	99	112	203	253	197	97	130
Link Distance (ft)	926	926		243	243	883	
Upstream Blk Time (%)			0	1	0		
Queuing Penalty (veh)			0	7	0		
Storage Bay Dist (ft)			200				415
Storage Blk Time (%)			1	1			
Queuing Penalty (veh)			3	3			

Intersection: 220: Helvetia Rd/Brookwood Pkwy #1 & WB-NB Helvetia

Movement	NB	NW
Directions Served	T	R
Maximum Queue (ft)	48	84
Average Queue (ft)	4	35
95th Queue (ft)	30	65
Link Distance (ft)	638	1346
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 224: Exit Ramp #1 & WB-NB Helvetia

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

Intersection: 230: US-26 EB Helvetia Off-ramp & Helvetia Rd/Brookwood Pkwy #1

Movement	EB	EB	NB	NB	NB	SB	SB	SB
Directions Served	LR	R	T	T	R	L	T	T
Maximum Queue (ft)	97	70	147	128	208	54	117	121
Average Queue (ft)	42	34	51	36	118	11	22	38
95th Queue (ft)	84	59	128	98	258	39	70	96
Link Distance (ft)	1144		133	133	133		638	638
Upstream Blk Time (%)			1	0	16			
Queuing Penalty (veh)			6	1	113			
Storage Bay Dist (ft)		300				175		
Storage Blk Time (%)								
Queuing Penalty (veh)								

Intersection: 231: US-26 EB Helvetia On-ramp &

Movement	EB	EB
Directions Served	T	T
Maximum Queue (ft)	898	1067
Average Queue (ft)	750	867
95th Queue (ft)	1107	1327
Link Distance (ft)	960	960
Upstream Blk Time (%)		36
Queuing Penalty (veh)		159
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 240: Meek Rd & Brookwood Pkwy

Movement	EB	NB	NB	NB	NB	B251	B251	B2	B2	B3	B3	SB
Directions Served	LR	L	T	T	TR	T	T	T	T	T	T	TR
Maximum Queue (ft)	216	79	616	703	225	1127	1180	607	624	177	197	10
Average Queue (ft)	78	31	109	404	146	409	445	99	115	11	13	0
95th Queue (ft)	200	63	462	943	318	1273	1329	547	602	137	146	5
Link Distance (ft)	603		620	620		1281	1281	1111	1111	1032	1032	133
Upstream Blk Time (%)			0	24		1	5	0	1			
Queuing Penalty (veh)			0	0		0	0	0	0			
Storage Bay Dist (ft)		100			200							
Storage Blk Time (%)		0	0	0	30							
Queuing Penalty (veh)		0	0	0	205							

Network Summary

Network wide Queuing Penalty: 498

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/13/2011
Analysis time period:	AM Peak
Freeway/Dir of Travel:	US 26 Eastbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2025
Description: Eastbound	Off-ramp to Brookwood

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2300	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	305	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2300		305			vph
Peak-hour factor, PHF	0.95		0.95			
Peak 15-min volume, v15	605		80			v
Trucks and buses	4		4			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.980	0.980	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2469	327	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2469 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2469	4600	No
$v_{FO} = v_F - v_R$	2142	4600	No
v_R	327	2000	No
$v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3 \text{ or } av34} > 2700$ pc/h?		No	
Is $v_{3 \text{ or } av34} > 1.5\, v_{12}/2$		No	
If yes, v_{12A} = 2469		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	2469	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 12.0 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	D_S = 0.457	
Space mean speed in ramp influence area,	S_R = 51.8	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 51.8	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/14/2011
Analysis time period:	AM Peak Period
Freeway/Dir of Travel:	US 26 Eastbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2025
Description: Eastbound	On-ramp from Brookwood

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	1985	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	530	vph
Length of first accel/decel lane	410	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1985	530		vph
Peak-hour factor, PHF	0.95	0.95		
Peak 15-min volume, v15	522	139		v
Trucks and buses	4	4		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.980	0.980	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2131	569	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2131 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2700	4600	No
v_3 or v_{av34}	0 pc/h	(Equation 25-4 or 25-5)	
Is v_3 or v_{av34} > 2700 pc/h?		No	
Is v_3 or v_{av34} > 1.5 v_{12}/2		No	
If yes, v_{12A} = 2131		(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	2131	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 23.7 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	M_S = 0.350	
Space mean speed in ramp influence area,	S_R = 53.7	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 53.7	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/13/2011
Analysis time period:	AM Peak
Freeway/Dir of Travel:	US 26 Westbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2025
Description:	Westbound 1-lane Off-ramp to Northbound Helvetia

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3140	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	65	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3140		65			vph
Peak-hour factor, PHF	0.95		0.95			
Peak 15-min volume, v15	826		17			v
Trucks and buses	4		4			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.980	0.980	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3371	70	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3371 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3371	4600	No
$v_{FO} = v_F - v_R$	3301	4600	No
v_R	70	2000	No
$v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3 \text{ or } av34} > 2700$ pc/h?		No	
Is $v_{3 \text{ or } av34} > 1.5\, v_{12}/2$		No	
If yes, v_{12A} = 3371		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	3371	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 19.7 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	D_S = 0.434	
Space mean speed in ramp influence area,	S_R = 52.2	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 52.2	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/13/2011
Analysis time period:	AM Peak
Freeway/Dir of Travel:	US 26 Westbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2025
Description:	Westbound 2-lane Off-ramp to Southbound Brookwood

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3140	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	1550	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane	0	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3140		1550			vph
Peak-hour factor, PHF	0.95		0.95			
Peak 15-min volume, v15	826		408			v
Trucks and buses	4		4			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.980	0.980	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3371	1664	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3371 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3371	4600	No
$v_{FO} = v_F - v_R$	1707	4600	No
v_R	1664	3800	No
$v_{3\ or\ av34}$ v_{av34}	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3\ or\ av34}$ v_{av34} > 2700 pc/h?		No	
Is $v_{3\ or\ av34}$ v_{av34} > 1.5 v_{12} /2		No	
If yes, v_{12A} = 3371		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	3371	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 6.2 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	D_S = 0.578	
Space mean speed in ramp influence area,	S_R = 49.6	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 49.6	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/14/2011
Analysis time period:	AM Peak Period
Freeway/Dir of Travel:	US 26 Westbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2025
Description: Westbound	On-ramp from Brookwood

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	1515	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	75	vph
Length of first accel/decel lane	410	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1515	75		vph
Peak-hour factor, PHF	0.95	0.95		
Peak 15-min volume, v15	399	20		v
Trucks and buses	4	4		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.980	0.980	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	1627	81	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 1627 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	1708	4600	No
$v_{3 or av34}$	0 pc/h	(Equation 25-4 or 25-5)	
Is $v_{3 or av34}$ > 2700 pc/h?		No	
Is $v_{3 or av34}$ > 1.5 v_{12}/2		No	
If yes, v_{12A} = 1627		(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	1627	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 16.2 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	M_S = 0.314	
Space mean speed in ramp influence area,	S_R = 54.4	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 54.4	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/13/2011
Analysis time period:	PM Peak
Freeway/Dir of Travel:	US 26 Eastbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2025
Description: Eastbound	Off-ramp to Brookwood

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2320	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	100	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2320		100			vph
Peak-hour factor, PHF	0.95		0.95			
Peak 15-min volume, v15	611		26			v
Trucks and buses	1		1			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.995	0.995	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2454	106	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2454 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2454	4600	No
$v_{FO} = v_F - v_R$	2348	4600	No
v_R	106	2000	No
$v_{3\ or\ av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3\ or\ av34} > 2700$ pc/h?		No	
Is $v_{3\ or\ av34} > 1.5\ v_{12}/2$		No	
If yes, v_{12A} = 2454		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	2454	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 11.9 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	D_S = 0.438	
Space mean speed in ramp influence area,	S_R = 52.1	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 52.1	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/14/2011
Analysis time period:	PM Peak Period
Freeway/Dir of Travel:	US 26 Eastbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2025
Description: Eastbound	On-ramp from Brookwood

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2180	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	800	vph
Length of first accel/decel lane	410	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2180	800		vph
Peak-hour factor, PHF	0.95	0.95		
Peak 15-min volume, v15	574	211		v
Trucks and buses	1	1		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.995	0.995	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2306	846	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2306 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	3152	4600	No
$v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-4 or 25-5)	
Is $v_{3 \text{ or } av34}$ > 2700 pc/h?		No	
Is $v_{3 \text{ or } av34}$ > 1.5 v_{12}/2		No	
If yes, v_{12A} = 2306		(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	2306	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 27.1 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	M_S = 0.383	
Space mean speed in ramp influence area,	S_R = 53.1	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 53.1	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/13/2011
Analysis time period:	PM Peak
Freeway/Dir of Travel:	US 26 Westbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2025
Description:	Westbound 1-lane Off-ramp to Northbound Helvetia

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3155	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	65	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3155		65			vph
Peak-hour factor, PHF	0.95		0.95			
Peak 15-min volume, v15	830		17			v
Trucks and buses	1		3			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.995	0.985	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3338	69	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3338 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3338	4600	No
$v_{FO} = v_F - v_R$	3269	4600	No
v_R	69	2000	No
$v_{3\ or\ av34}$ $v_{3\ or\ av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3\ or\ av34}$ $v_{3\ or\ av34}$ > 2700 pc/h?		No	
Is $v_{3\ or\ av34}$ $v_{3\ or\ av34}$ > 1.5 v_{12} /2		No	
If yes, v_{12A} = 3338		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	3338	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 19.5 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	D_S = 0.434	
Space mean speed in ramp influence area,	S_R = 52.2	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 52.2	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/13/2011
Analysis time period:	PM Peak
Freeway/Dir of Travel:	US 26 Westbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2025
Description:	Westbound 2-lane Off-ramp to Southbound Brookwood

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3155	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	685	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane	0	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3155		685			vph
Peak-hour factor, PHF	0.95		0.95			
Peak 15-min volume, v15	830		180			v
Trucks and buses	1		3			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.995	0.985	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3338	732	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3338 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3338	4600	No
$v_{FO} = v_F - v_R$	2606	4600	No
v_R	732	3800	No
$v_{3\ or\ av34}$ v_{av34}	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3\ or\ av34}$ v_{av34} > 2700 pc/h?		No	
Is $v_{3\ or\ av34}$ v_{av34} > 1.5 v_{12} /2		No	
If yes, v_{12A} = 3338		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	3338	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 6.0 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	D_S = 0.494	
Space mean speed in ramp influence area,	S_R = 51.1	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 51.1	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/14/2011
Analysis time period:	PM Peak Period
Freeway/Dir of Travel:	US 26 Westbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2025
Description: Westbound	On-ramp from Brookwood

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2355	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	350	vph
Length of first accel/decel lane	410	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2355	350		vph
Peak-hour factor, PHF	0.95	0.95		
Peak 15-min volume, v15	620	92		v
Trucks and buses	1	3		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.995	0.985	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2491	374	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2491 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2865	4600	No
$v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-4 or 25-5)	
Is $v_{3 \text{ or } av34}$ > 2700 pc/h?		No	
Is $v_{3 \text{ or } av34}$ > 1.5 v_{12}/2		No	
If yes, v_{12A} = 2491		(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	2491	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 25.1 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	M_S = 0.361	
Space mean speed in ramp influence area,	S_R = 53.5	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 53.5	mph

Year 2035 Phase 2B

HCM Unsignalized Intersection Capacity Analysis
200: Schaff Rd & Helvetia Rd

10/19/2011

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	45	10	165	205	45	410
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	50	11	183	228	50	456
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	853	297			411	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	853	297			411	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	84	99			96	
cM capacity (veh/h)	317	745			1153	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	61	411	506
Volume Left	50	0	50
Volume Right	11	228	0
cSH	354	1700	1153
Volume to Capacity	0.17	0.24	0.04
Queue Length 95th (ft)	15	0	3
Control Delay (s)	17.3	0.0	1.3
Lane LOS	C		A
Approach Delay (s)	17.3	0.0	1.3
Approach LOS	C		

Intersection Summary			
Average Delay	1.7		
Intersection Capacity Utilization	58.6%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	155	5	365	275	15	440
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	172	6	406	306	17	489
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			937			
pX, platoon unblocked						
vC, conflicting volume	928	406			711	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	928	406			711	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	41	99			98	
cM capacity (veh/h)	293	647			893	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	178	406	306	506
Volume Left	172	0	0	17
Volume Right	6	0	306	0
cSH	298	1700	1700	893
Volume to Capacity	0.60	0.24	0.18	0.02
Queue Length 95th (ft)	89	0	0	1
Control Delay (s)	33.4	0.0	0.0	0.5
Lane LOS	D			A
Approach Delay (s)	33.4	0.0		0.5
Approach LOS	D			

Intersection Summary			
Average Delay	4.5		
Intersection Capacity Utilization	50.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR	SBR2	SEL	SER
Lane Configurations									
Volume (vph)	0	1795	60	640	565	0	30	0	0
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		3.0	2.0	2.0	3.0				
Lane Util. Factor		*1.00	1.00	0.95	0.95				
Frt		0.85	1.00	1.00	0.99				
Flt Protected		1.00	0.95	1.00	1.00				
Satd. Flow (prot)		2917	1309	3260	3267				
Flt Permitted		1.00	0.95	1.00	1.00				
Satd. Flow (perm)		2917	1309	3260	3267				
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	0	1832	61	653	577	0	31	0	0
RTOR Reduction (vph)	0	138	0	0	7	0	0	0	0
Lane Group Flow (vph)	0	1694	61	653	601	0	0	0	0
Heavy Vehicles (%)	2%	2%	27%	2%	1%	2%	1%	0%	0%
Turn Type		custom	Prot						
Protected Phases		8	3	3 6	2				
Permitted Phases									
Actuated Green, G (s)		32.7	33.7	60.0	17.3				
Effective Green, g (s)		34.7	35.7	57.0	19.3				
Actuated g/C Ratio		0.58	0.60	0.95	0.32				
Clearance Time (s)		5.0	4.0		5.0				
Vehicle Extension (s)		5.2	2.3		5.2				
Lane Grp Cap (vph)		1687	779	3097	1051				
v/s Ratio Prot		c0.58	0.05	0.20	c0.18				
v/s Ratio Perm									
v/c Ratio		1.00	0.08	0.21	0.57				
Uniform Delay, d1		12.6	5.2	0.1	16.9				
Progression Factor		1.00	0.73	1.00	1.00				
Incremental Delay, d2		22.9	0.0	0.0	1.3				
Delay (s)		35.5	3.8	0.1	18.2				
Level of Service		D	A	A	B				
Approach Delay (s)	35.5			0.4	18.2			0.0	
Approach LOS	D			A	B			A	

Intersection Summary			
HCM Average Control Delay	24.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	92.8%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Volume (veh/h)	600	0	0	2360	0	100
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	612	0	0	2408	0	102
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	706			298		
pX, platoon unblocked			0.96		0.88	0.96
vC, conflicting volume			612		1816	306
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			508		1443	188
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	87
cM capacity (veh/h)			1023		111	793

Direction, Lane #	NB 1	NB 2	SB 1	SB 2	NW 1
Volume Total	306	306	1204	1204	102
Volume Left	0	0	0	0	0
Volume Right	0	0	0	0	102
cSH	1700	1700	1700	1700	793
Volume to Capacity	0.18	0.18	0.71	0.71	0.13
Queue Length 95th (ft)	0	0	0	0	11
Control Delay (s)	0.0	0.0	0.0	0.0	10.2
Lane LOS					B
Approach Delay (s)	0.0		0.0		10.2
Approach LOS					B

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	88.8%	ICU Level of Service	E
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	85	0	275	0	0	0	0	515	505	35	2325	0
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		3.0	3.0					3.0	3.0	2.0	3.0	
Lane Util. Factor		0.95	0.95					0.95	1.00	1.00	0.95	
Frt		0.92	0.85					1.00	0.85	1.00	1.00	
Flt Protected		0.98	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1403	1262					3137	1430	1662	3260	
Flt Permitted		0.98	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1403	1262					3137	1430	1662	3260	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	87	0	281	0	0	0	0	526	515	36	2372	0
RTOR Reduction (vph)	0	13	13	0	0	0	0	0	163	0	0	0
Lane Group Flow (vph)	0	175	167	0	0	0	0	526	352	36	2372	0
Heavy Vehicles (%)	0%	0%	12%	0%	0%	0%	0%	6%	4%	0%	2%	0%
Turn Type	Perm		Perm						Perm	Prot		
Protected Phases		8						6		5	2	
Permitted Phases	8		8						6			
Actuated Green, G (s)		17.6	17.6					80.0	80.0	8.4	92.4	
Effective Green, g (s)		19.6	19.6					82.0	82.0	10.4	94.4	
Actuated g/C Ratio		0.16	0.16					0.68	0.68	0.09	0.79	
Clearance Time (s)		5.0	5.0					5.0	5.0	4.0	5.0	
Vehicle Extension (s)		2.3	2.3					4.7	4.7	2.3	4.7	
Lane Grp Cap (vph)		229	206					2144	977	144	2565	
v/s Ratio Prot								0.17		0.02	c0.73	
v/s Ratio Perm		0.13	c0.13						0.25			
v/c Ratio		0.77	0.81					0.25	0.36	0.25	0.92	
Uniform Delay, d1		48.0	48.4					7.2	8.0	51.2	10.0	
Progression Factor		1.00	1.00					1.00	1.00	0.99	0.78	
Incremental Delay, d2		13.3	20.5					0.3	1.0	1.9	3.6	
Delay (s)		61.3	68.9					7.5	9.0	52.4	11.4	
Level of Service		E	E					A	A	D	B	
Approach Delay (s)		65.0			0.0			8.2			12.0	
Approach LOS		E			A			A			B	

Intersection Summary			
HCM Average Control Delay	16.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	88.8%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑					
Volume (vph)	540	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.8					
Lane Util. Factor	0.95					
Frt	1.00					
Flt Protected	1.00					
Satd. Flow (prot)	3471					
Flt Permitted	1.00					
Satd. Flow (perm)	3471					
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	587	0	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	587	0	0	0	0	0
Heavy Vehicles (%)	4%	0%	0%	0%	0%	0%
Turn Type						
Protected Phases	4					
Permitted Phases						
Actuated Green, G (s)	2.2					
Effective Green, g (s)	2.2					
Actuated g/C Ratio	0.09					
Clearance Time (s)	5.8					
Lane Grp Cap (vph)	305					
v/s Ratio Prot	c0.17					
v/s Ratio Perm						
v/c Ratio	1.92					
Uniform Delay, d1	11.4					
Progression Factor	1.00					
Incremental Delay, d2	428.0					
Delay (s)	439.4					
Level of Service	F					
Approach Delay (s)	439.4			0.0	0.0	
Approach LOS	F			A	A	

Intersection Summary			
HCM Average Control Delay	439.4	HCM Level of Service	F
HCM Volume to Capacity ratio	1.92		
Actuated Cycle Length (s)	25.0	Sum of lost time (s)	22.8
Intersection Capacity Utilization	19.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	50	0	80	0	0	0	35	970	0	0	2580	20
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	51	0	82	0	0	0	36	990	0	0	2633	20
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											189	
pX, platoon unblocked	0.22	0.22	0.22	0.22	0.22		0.22					
vC, conflicting volume	3044	3704	1327	2459	3714	330	2653			990		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	3200	6184	0	554	6230	330	1431			990		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	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 %	0	100	66	100	100	100	66			100		
cM capacity (veh/h)	1	0	241	45	0	672	106			706		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2
Volume Total	133	0	36	396	396	198	1316	1337
Volume Left	51	0	36	0	0	0	0	0
Volume Right	82	0	0	0	0	0	0	20
cSH	2	1700	106	1700	1700	1700	706	1700
Volume to Capacity	73.54	0.00	0.34	0.23	0.23	0.12	0.00	0.79
Queue Length 95th (ft)	Err	0	33	0	0	0	0	0
Control Delay (s)	Err	0.0	55.1	0.0	0.0	0.0	0.0	0.0
Lane LOS	F	A	F					
Approach Delay (s)	Err	0.0	1.9				0.0	
Approach LOS	F	A						

Intersection Summary			
Average Delay	348.5		
Intersection Capacity Utilization	86.3%	ICU Level of Service	E
Analysis Period (min)	15		

200: Schaff Rd & Helvetia Rd Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Total Delay (hr)	0.2	0.0	0.2	0.1	0.1	0.2	0.8
Delay / Veh (s)	12.9	4.2	4.4	1.9	6.4	2.2	3.4
Vehicles Entered	45	10	165	201	47	403	871
Vehicles Exited	45	9	165	201	47	403	870
Hourly Exit Rate	45	9	165	201	47	403	870
Input Volume	45	10	166	205	45	410	880
% of Volume	101	88	100	98	105	98	99
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

210: Jacobson Rd & Helvetia Rd Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Total Delay (hr)	0.9	0.0	0.4	0.3	0.0	0.2	1.9
Delay / Veh (s)	21.5	14.8	3.7	4.5	9.2	1.8	5.5
Vehicles Entered	153	6	371	272	11	437	1250
Vehicles Exited	154	6	374	270	11	436	1251
Hourly Exit Rate	154	6	374	270	11	436	1251
Input Volume	155	5	380	275	15	440	1270
% of Volume	100	114	98	98	75	99	98
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

215: Loop Ramp #1 & Helvetia Rd Performance by movement

Movement	EBT	EBR	NBL	NBT	SBT	SBR2	All
Total Delay (hr)	0.1	17.6	0.4	2.4	3.0	0.1	23.6
Delay / Veh (s)	6.9	35.6	24.6	13.5	19.1	15.8	27.3
Vehicles Entered	30	1776	62	637	570	31	3106
Vehicles Exited	30	1784	63	638	571	31	3117
Hourly Exit Rate	30	1784	63	638	571	31	3117
Input Volume	30	1795	60	648	578	30	3141
% of Volume	101	99	105	99	99	102	99
Denied Entry Before	0	4	0	0	0	0	4
Denied Entry After	0	0	0	0	0	0	0

220: Helvetia Rd/Brookwood Pkwy #1 & WB-NB Helvetia Performance by movement

Movement	NBT	SBT	NWT	NWR	All
Total Delay (hr)	0.5	1.4	0.0	0.2	2.0
Delay / Veh (s)	2.8	2.1	0.0	5.8	2.4
Vehicles Entered	588	2356	2	105	3051
Vehicles Exited	590	2357	2	106	3055
Hourly Exit Rate	590	2357	2	106	3055
Input Volume	604	2379	3	100	3086
% of Volume	98	99	62	106	99
Denied Entry Before	0	0	0	0	0
Denied Entry After	0	0	0	0	0

224: Exit Ramp #1 & WB-NB Helvetia Performance by movement

Movement	WBT	WBR	All
Total Delay (hr)	1.4	0.1	1.5
Delay / Veh (s)	2.8	3.9	2.9
Vehicles Entered	1769	104	1873
Vehicles Exited	1767	105	1872
Hourly Exit Rate	1767	105	1872
Input Volume	1795	100	1895
% of Volume	98	105	99
Denied Entry Before	0	0	0
Denied Entry After	0	0	0

230: US-26 EB Helvetia Off-ramp & Helvetia Rd/Brookwood Pkwy #1 Performance by movement

Movement	EBL	EBR	NBT	NBR	SBL	SBT	All
Total Delay (hr)	1.7	4.5	0.9	0.3	0.7	12.0	20.0
Delay / Veh (s)	68.1	57.3	6.4	2.4	68.4	18.5	19.4
Vehicles Entered	90	281	499	489	38	2324	3721
Vehicles Exited	88	279	499	489	38	2323	3716
Hourly Exit Rate	88	279	499	489	38	2323	3716
Input Volume	85	275	518	505	35	2348	3766
% of Volume	104	101	96	97	108	99	99
Denied Entry Before	0	0	0	0	0	2	2
Denied Entry After	0	0	0	0	0	2	2

231: US-26 EB Helvetia On-ramp & Performance by movement

Movement	EBT	All
Total Delay (hr)	23.0	23.0
Delay / Veh (s)	155.1	155.1
Vehicles Entered	541	541
Vehicles Exited	525	525
Hourly Exit Rate	525	525
Input Volume	550	550
% of Volume	95	95
Denied Entry Before	0	0
Denied Entry After	1	1

240: Meek Rd & Brookwood Pkwy Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Total Delay (hr)	30.8	48.5	1.1	0.9	1.9	0.0	83.2
Delay / Veh (s)	22148.2	19398.2	118.9	3.4	2.6	1.1	82.4
Vehicles Entered	5	9	34	980	2588	20	3636
Vehicles Exited	5	9	34	980	2588	20	3636
Hourly Exit Rate	5	9	34	980	2588	20	3636
Input Volume	50	80	35	970	2608	20	3763
% of Volume	10	11	96	101	99	100	97
Denied Entry Before	0	3	0	0	1	0	4
Denied Entry After	47	70	0	0	0	0	117

Total Network Performance

Total Delay (hr)	173.3
Delay / Veh (s)	152.2
Vehicles Entered	4107
Vehicles Exited	4092
Hourly Exit Rate	4092
Input Volume	37995
% of Volume	11
Denied Entry Before	10
Denied Entry After	120

Intersection: 200: Schaff Rd & Helvetia Rd

Movement	WB	NB	SB
Directions Served	LR	TR	LT
Maximum Queue (ft)	69	22	238
Average Queue (ft)	32	1	38
95th Queue (ft)	58	11	137
Link Distance (ft)	549	410	349
Upstream Blk Time (%)			0
Queuing Penalty (veh)			0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 210: Jacobson Rd & Helvetia Rd

Movement	WB	NB	SB
Directions Served	LR	R	LT
Maximum Queue (ft)	182	21	181
Average Queue (ft)	78	1	13
95th Queue (ft)	147	8	87
Link Distance (ft)	396	883	410
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 215: Loop Ramp #1 & Helvetia Rd

Movement	EB	EB	B223	B223	NB	NB	NB	SB	SB
Directions Served	R	R	T	T	L	T	T	T	T>
Maximum Queue (ft)	909	942	50	64	187	294	252	171	212
Average Queue (ft)	450	509	2	2	58	127	99	98	120
95th Queue (ft)	782	830	26	30	131	250	208	155	183
Link Distance (ft)	926	926	1406	1406		243	243	883	
Upstream Blk Time (%)	0	0			0	1	0		
Queuing Penalty (veh)	2	4			0	4	1		
Storage Bay Dist (ft)					200				415
Storage Blk Time (%)					0	2			
Queuing Penalty (veh)					0	1			

Intersection: 220: Helvetia Rd/Brookwood Pkwy #1 & WB-NB Helvetia

Movement	NB	SB	SB	NW
Directions Served	T	T	T	R
Maximum Queue (ft)	22	36	68	65
Average Queue (ft)	1	2	3	36
95th Queue (ft)	11	24	33	58
Link Distance (ft)	638	243	243	1346
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 224: Exit Ramp #1 & WB-NB Helvetia

Movement	B1	B1
Directions Served	T	T
Maximum Queue (ft)	63	62
Average Queue (ft)	2	2
95th Queue (ft)	45	45
Link Distance (ft)	297	297
Upstream Blk Time (%)	0	0
Queuing Penalty (veh)	0	0
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 230: US-26 EB Helvetia Off-ramp & Helvetia Rd/Brookwood Pkwy #1

Movement	EB	EB	NB	NB	NB	SB	SB	SB
Directions Served	LR	R	T	T	R	L	T	T
Maximum Queue (ft)	315	278	145	126	21	252	638	651
Average Queue (ft)	188	179	69	59	1	46	309	368
95th Queue (ft)	272	257	132	118	15	133	582	617
Link Distance (ft)	1144		133	133	133		638	638
Upstream Blk Time (%)			1	0			0	0
Queuing Penalty (veh)			4	2			5	5
Storage Bay Dist (ft)		300				175		
Storage Blk Time (%)	0	0				0	8	
Queuing Penalty (veh)	0	0				2	3	

Intersection: 231: US-26 EB Helvetia On-ramp &

Movement	EB	EB
Directions Served	T	T
Maximum Queue (ft)	613	614
Average Queue (ft)	364	380
95th Queue (ft)	709	722
Link Distance (ft)	956	956
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 240: Meek Rd & Brookwood Pkwy

Movement	EB	NB	NB	NB	SB	SB
Directions Served	LR	L	T	T	LT	TR
Maximum Queue (ft)	616	130	47	18	32	39
Average Queue (ft)	603	55	3	1	2	4
95th Queue (ft)	622	133	23	13	14	25
Link Distance (ft)	603		620	620	133	133
Upstream Blk Time (%)	98					
Queuing Penalty (veh)	0					
Storage Bay Dist (ft)		100				
Storage Blk Time (%)		11				
Queuing Penalty (veh)		34				

Network Summary

Network wide Queuing Penalty: 67

HCM Unsignalized Intersection Capacity Analysis
200: Schaff Rd & Helvetia Rd

10/19/2011

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	30	0	470	210	0	270
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	32	0	505	226	0	290
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	909	618			731	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	909	618			731	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	90	100			100	
cM capacity (veh/h)	308	493			882	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	32	731	290
Volume Left	32	0	0
Volume Right	0	226	0
cSH	308	1700	882
Volume to Capacity	0.10	0.43	0.00
Queue Length 95th (ft)	9	0	0
Control Delay (s)	18.1	0.0	0.0
Lane LOS	C		
Approach Delay (s)	18.1	0.0	0.0
Approach LOS	C		

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	47.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	275	10	670	520	10	290
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	306	11	744	578	11	322
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			937			
pX, platoon unblocked						
vC, conflicting volume	1089	744			1322	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1089	744			1322	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	0	97			98	
cM capacity (veh/h)	235	418			529	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	317	744	578	333
Volume Left	306	0	0	11
Volume Right	11	0	578	0
cSH	238	1700	1700	529
Volume to Capacity	1.33	0.44	0.34	0.02
Queue Length 95th (ft)	421	0	0	2
Control Delay (s)	214.9	0.0	0.0	0.7
Lane LOS	F			A
Approach Delay (s)	214.9	0.0		0.7
Approach LOS	F			

Intersection Summary			
Average Delay	34.6		
Intersection Capacity Utilization	57.8%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR	SBR2	SEL	SER
Lane Configurations									
Volume (vph)	0	730	290	1190	430	0	135	0	0
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		3.0	2.0	2.0	3.0				
Lane Util. Factor		*1.00	1.00	0.95	0.95				
Frt		0.85	1.00	1.00	0.96				
Flt Protected		1.00	0.95	1.00	1.00				
Satd. Flow (prot)		2975	1646	3292	3206				
Flt Permitted		1.00	0.95	1.00	1.00				
Satd. Flow (perm)		2975	1646	3292	3206				
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	0	785	312	1280	462	0	145	0	0
RTOR Reduction (vph)	0	294	0	0	54	0	0	0	0
Lane Group Flow (vph)	0	491	312	1280	553	0	0	0	0
Heavy Vehicles (%)	0%	0%	1%	1%	0%	0%	0%	0%	0%
Turn Type		custom	Prot						
Protected Phases		8	3	3 6	2				
Permitted Phases									
Actuated Green, G (s)		27.3	28.3	60.0	22.7				
Effective Green, g (s)		29.3	30.3	57.0	24.7				
Actuated g/C Ratio		0.49	0.51	0.95	0.41				
Clearance Time (s)		5.0	4.0		5.0				
Vehicle Extension (s)		5.2	2.3		5.2				
Lane Grp Cap (vph)		1453	831	3127	1320				
v/s Ratio Prot		0.17	0.19	c0.39	0.17				
v/s Ratio Perm									
v/c Ratio		0.34	0.38	0.41	0.42				
Uniform Delay, d1		9.4	9.1	0.1	12.6				
Progression Factor		1.00	1.06	1.00	1.00				
Incremental Delay, d2		0.6	0.1	0.0	0.5				
Delay (s)		10.0	9.7	0.2	13.0				
Level of Service		B	A	A	B				
Approach Delay (s)	10.0			2.0	13.0			0.0	
Approach LOS	B			A	B			A	

Intersection Summary			
HCM Average Control Delay	6.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	2.0
Intersection Capacity Utilization	52.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Volume (veh/h)	1410	0	0	1160	0	70
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	1516	0	0	1247	0	75
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	706			298		
pX, platoon unblocked			0.86		0.91	0.86
vC, conflicting volume			1516		2140	758
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1276		1607	395
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	86
cM capacity (veh/h)			474		89	525

Direction, Lane #	NB 1	NB 2	SB 1	SB 2	NW 1
Volume Total	758	758	624	624	75
Volume Left	0	0	0	0	0
Volume Right	0	0	0	0	75
cSH	1700	1700	1700	1700	525
Volume to Capacity	0.45	0.45	0.37	0.37	0.14
Queue Length 95th (ft)	0	0	0	0	12
Control Delay (s)	0.0	0.0	0.0	0.0	13.0
Lane LOS					B
Approach Delay (s)	0.0		0.0		13.0
Approach LOS					B

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	80.2%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	0	80	0	0	0	0	1390	945	5	1155	0
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		3.0	3.0					3.0	3.0	2.0	3.0	
Lane Util. Factor		0.95	0.95					0.95	1.00	1.00	0.95	
Frt		0.91	0.85					1.00	0.85	1.00	1.00	
Flt Protected		0.98	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1483	1413					3292	1473	1662	3325	
Flt Permitted		0.98	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1483	1413					3292	1473	1662	3325	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	21	0	83	0	0	0	0	1448	984	5	1203	0
RTOR Reduction (vph)	0	30	47	0	0	0	0	0	165	0	0	0
Lane Group Flow (vph)	0	23	4	0	0	0	0	1448	819	5	1203	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	1%	1%	0%	0%	0%
Turn Type	Perm		Perm						Perm	Prot		
Protected Phases		8						6		5	2	
Permitted Phases	8		8						6			
Actuated Green, G (s)		7.3	7.3					97.9	97.9	0.8	102.7	
Effective Green, g (s)		9.3	9.3					99.9	99.9	2.8	104.7	
Actuated g/C Ratio		0.08	0.08					0.83	0.83	0.02	0.87	
Clearance Time (s)		5.0	5.0					5.0	5.0	4.0	5.0	
Vehicle Extension (s)		2.3	2.3					4.7	4.7	2.3	4.7	
Lane Grp Cap (vph)		115	110					2741	1226	39	2901	
v/s Ratio Prot								0.44		0.00	c0.36	
v/s Ratio Perm		0.02	0.00						c0.56			
v/c Ratio		0.20	0.04					0.53	0.67	0.13	0.41	
Uniform Delay, d1		51.9	51.2					3.0	3.8	57.4	1.5	
Progression Factor		1.00	1.00					1.00	1.00	0.99	1.07	
Incremental Delay, d2		0.5	0.1					0.7	2.9	0.8	0.4	
Delay (s)		52.4	51.3					3.7	6.7	57.5	2.0	
Level of Service		D	D					A	A	E	A	
Approach Delay (s)		51.8			0.0			4.9			2.3	
Approach LOS		D			A			A			A	

Intersection Summary			
HCM Average Control Delay	5.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	80.2%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑					
Volume (vph)	950	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5					
Lane Util. Factor	0.95					
Frt	1.00					
Flt Protected	1.00					
Satd. Flow (prot)	3471					
Flt Permitted	1.00					
Satd. Flow (perm)	3471					
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1033	0	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	1033	0	0	0	0	0
Heavy Vehicles (%)	4%	0%	0%	0%	0%	0%
Turn Type						
Protected Phases	4					
Permitted Phases						
Actuated Green, G (s)	2.5					
Effective Green, g (s)	2.5					
Actuated g/C Ratio	0.14					
Clearance Time (s)	4.5					
Lane Grp Cap (vph)	482					
v/s Ratio Prot	c0.30					
v/s Ratio Perm						
v/c Ratio	2.14					
Uniform Delay, d1	7.8					
Progression Factor	1.00					
Incremental Delay, d2	521.3					
Delay (s)	529.1					
Level of Service	F					
Approach Delay (s)	529.1			0.0	0.0	
Approach LOS	F			A	A	

Intersection Summary			
HCM Average Control Delay	529.1	HCM Level of Service	F
HCM Volume to Capacity ratio	2.14		
Actuated Cycle Length (s)	18.0	Sum of lost time (s)	15.5
Intersection Capacity Utilization	30.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	25	0	75	0	0	0	110	2310	0	0	1190	45
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	27	0	80	0	0	0	117	2457	0	0	1266	48
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											189	
pX, platoon unblocked	0.93	0.93	0.93	0.93	0.93		0.93					
vC, conflicting volume	2343	3981	657	3404	4005	819	1314			2457		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2291	4059	473	3436	4084	819	1181			2457		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	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 %	0	100	84	100	100	100	79			100		
cM capacity (veh/h)	17	2	504	2	2	323	555			192		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2
Volume Total	106	0	117	983	983	491	633	681
Volume Left	27	0	117	0	0	0	0	0
Volume Right	80	0	0	0	0	0	0	48
cSH	61	1700	555	1700	1700	1700	192	1700
Volume to Capacity	1.74	0.00	0.21	0.58	0.58	0.29	0.00	0.40
Queue Length 95th (ft)	243	0	20	0	0	0	0	0
Control Delay (s)	500.6	0.0	13.2	0.0	0.0	0.0	0.0	0.0
Lane LOS	F	A	B					
Approach Delay (s)	500.6	0.0	0.6				0.0	
Approach LOS	F	A						

Intersection Summary			
Average Delay	13.7		
Intersection Capacity Utilization	95.0%	ICU Level of Service	F
Analysis Period (min)	15		

200: Schaff Rd & Helvetia Rd Performance by movement

Movement	WBL	NBT	NBR	SBT	All
Total Delay (hr)	0.1	0.5	0.1	0.0	0.7
Delay / Veh (s)	10.6	4.1	1.5	0.3	2.7
HC Emissions (g)	0	7	1	11	19
CO Emissions (g)	20	395	55	890	1360
NOx Emissions (g)	2	35	5	38	79
Vehicles Entered	33	464	201	278	976
Vehicles Exited	33	462	201	278	974
Hourly Exit Rate	33	462	201	278	974
Input Volume	30	476	210	270	986
% of Volume	111	97	96	103	99
Denied Entry Before	0	0	0	0	0
Denied Entry After	0	0	0	0	0

210: Jacobson Rd & Helvetia Rd Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Total Delay (hr)	11.4	0.4	0.5	0.5	0.1	0.2	12.9
Delay / Veh (s)	143.0	116.9	2.5	3.7	18.0	2.2	26.5
HC Emissions (g)	5	0	34	18	0	7	63
CO Emissions (g)	269	8	1979	741	7	391	3395
NOx Emissions (g)	23	1	151	62	1	35	274
Vehicles Entered	289	11	659	486	11	303	1759
Vehicles Exited	283	11	658	485	11	302	1750
Hourly Exit Rate	283	11	658	485	11	302	1750
Input Volume	275	10	682	520	10	292	1790
% of Volume	103	107	96	93	107	103	98
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

215: Loop Ramp #1 & Helvetia Rd Performance by movement

Movement	EBT	EBR	NBL	NBT	SBT	SBR2	All
Total Delay (hr)	0.0	1.0	1.1	1.2	1.8	0.4	5.5
Delay / Veh (s)	0.1	4.9	15.1	3.7	14.4	10.4	7.2
HC Emissions (g)	8	13	3	29	35	8	96
CO Emissions (g)	118	279	83	1735	2300	597	5112
NOx Emissions (g)	21	41	10	118	129	32	351
Vehicles Entered	13	733	269	1134	452	137	2738
Vehicles Exited	13	734	271	1135	454	139	2746
Hourly Exit Rate	13	734	271	1135	454	139	2746
Input Volume	14	730	290	1191	437	135	2798
% of Volume	90	101	93	95	104	103	98
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

220: Helvetia Rd/Brookwood Pkwy #1 & WB-NB Helvetia Performance by movement

Movement	NBT	SBT	NWT	NWR	All
Total Delay (hr)	0.9	0.5	0.0	0.2	1.6
Delay / Veh (s)	2.5	1.4	0.0	10.5	2.2
HC Emissions (g)	58	69	1	2	131
CO Emissions (g)	2758	5410	22	81	8271
NOx Emissions (g)	236	254	4	14	507
Vehicles Entered	1340	1180	2	71	2593
Vehicles Exited	1341	1181	2	70	2594
Hourly Exit Rate	1341	1181	2	70	2594
Input Volume	1422	1160	1	70	2653
% of Volume	94	102	160	100	98
Denied Entry Before	0	0	0	0	0
Denied Entry After	0	0	0	0	0

224: Exit Ramp #1 & WB-NB Helvetia Performance by movement

Movement	WBT	WBR	All
Total Delay (hr)	0.1	0.0	0.2
Delay / Veh (s)	0.7	1.6	0.8
HC Emissions (g)	210	18	228
CO Emissions (g)	11567	1006	12573
NOx Emissions (g)	731	65	796
Vehicles Entered	732	71	803
Vehicles Exited	731	71	802
Hourly Exit Rate	731	71	802
Input Volume	730	70	800
% of Volume	100	101	100
Denied Entry Before	0	0	0
Denied Entry After	0	0	0

230: US-26 EB Helvetia Off-ramp & Helvetia Rd/Brookwood Pkwy #1 Performance by movement

Movement	EBL	EBR	NBT	NBR	SBL	SBT	All
Total Delay (hr)	0.2	0.3	0.6	1.8	0.0	0.7	3.6
Delay / Veh (s)	42.1	11.2	1.7	7.5	44.4	2.0	3.7
HC Emissions (g)	1	3	16	3	0	48	71
CO Emissions (g)	27	141	759	104	11	3532	4575
NOx Emissions (g)	2	12	56	13	1	214	298
Vehicles Entered	18	85	1323	847	4	1187	3464
Vehicles Exited	18	85	1323	847	4	1187	3464
Hourly Exit Rate	18	85	1323	847	4	1187	3464
Input Volume	20	80	1403	945	5	1165	3618
% of Volume	89	106	94	90	80	102	96
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

231: US-26 EB Helvetia On-ramp & Performance by movement

Movement	EBT	All
Total Delay (hr)	73.6	73.6
Delay / Veh (s)	316.6	316.6
HC Emissions (g)	400	400
CO Emissions (g)	6499	6499
NOx Emissions (g)	492	492
Vehicles Entered	855	855
Vehicles Exited	819	819
Hourly Exit Rate	819	819
Input Volume	982	982
% of Volume	83	83
Denied Entry Before	0	0
Denied Entry After	30	30

240: Meek Rd & Brookwood Pkwy Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Total Delay (hr)	5.6	15.8	0.5	14.1	0.3	0.0	36.3
Delay / Veh (s)	1006.6	836.9	13.4	23.7	0.9	0.5	36.1
HC Emissions (g)	1	2	5	159	28	0	195
CO Emissions (g)	93	276	402	10367	2216	8	13363
NOx Emissions (g)	3	10	20	551	112	1	698
Vehicles Entered	22	75	123	2153	1220	48	3641
Vehicles Exited	18	62	121	2138	1219	48	3606
Hourly Exit Rate	18	62	121	2138	1219	48	3606
Input Volume	25	75	110	2310	1197	45	3762
% of Volume	73	83	110	93	102	107	96
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	3	7	0	0	0	0	10

Total Network Performance

Total Delay (hr)	191.7
Delay / Veh (s)	172.5
HC Emissions (g)	2073
CO Emissions (g)	90432
NOx Emissions (g)	6568
Vehicles Entered	4091
Vehicles Exited	3905
Hourly Exit Rate	3905
Input Volume	35613
% of Volume	11
Denied Entry Before	1
Denied Entry After	70

Intersection: 200: Schaff Rd & Helvetia Rd

Movement	WB
Directions Served	LR
Maximum Queue (ft)	61
Average Queue (ft)	20
95th Queue (ft)	46
Link Distance (ft)	549
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 210: Jacobson Rd & Helvetia Rd

Movement	WB	B211	NB	SB
Directions Served	LR	T	R	LT
Maximum Queue (ft)	445	568	18	122
Average Queue (ft)	339	218	1	20
95th Queue (ft)	571	682	9	80
Link Distance (ft)	396	948	883	410
Upstream Blk Time (%)	44	1		
Queuing Penalty (veh)	0	0		
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 215: Loop Ramp #1 & Helvetia Rd

Movement	EB	EB	NB	NB	NB	SB	SB
Directions Served	R	R	L	T	T	T	T>
Maximum Queue (ft)	105	112	219	281	231	125	156
Average Queue (ft)	54	61	100	60	46	66	85
95th Queue (ft)	87	96	189	207	160	101	128
Link Distance (ft)	926	926		243	243	883	
Upstream Blk Time (%)			0	1	0		
Queuing Penalty (veh)			0	5	1		
Storage Bay Dist (ft)			200				415
Storage Blk Time (%)			1	1			
Queuing Penalty (veh)			5	3			

Intersection: 220: Helvetia Rd/Brookwood Pkwy #1 & WB-NB Helvetia

Movement	NB	NB	NW
Directions Served	T	T	R
Maximum Queue (ft)	44	28	73
Average Queue (ft)	2	1	32
95th Queue (ft)	27	16	58
Link Distance (ft)	638	638	1346
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 224: Exit Ramp #1 & WB-NB Helvetia

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

Intersection: 230: US-26 EB Helvetia Off-ramp & Helvetia Rd/Brookwood Pkwy #1

Movement	EB	EB	NB	NB	NB	SB	SB	SB
Directions Served	LR	R	T	T	R	L	T	T
Maximum Queue (ft)	61	53	142	129	204	22	81	103
Average Queue (ft)	29	29	40	24	119	3	11	25
95th Queue (ft)	55	52	104	79	247	15	43	69
Link Distance (ft)	1144		133	133	133		638	638
Upstream Blk Time (%)			0	0	18			
Queuing Penalty (veh)			2	2	143			
Storage Bay Dist (ft)		300				175		
Storage Blk Time (%)								
Queuing Penalty (veh)								

Intersection: 231: US-26 EB Helvetia On-ramp &

Movement	EB	EB
Directions Served	T	T
Maximum Queue (ft)	877	1050
Average Queue (ft)	786	915
95th Queue (ft)	1085	1302
Link Distance (ft)	956	956
Upstream Blk Time (%)		46
Queuing Penalty (veh)		217
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 240: Meek Rd & Brookwood Pkwy

Movement	EB	NB	NB	NB	NB	B251	B251	B2	B2	B3	B3	SB
Directions Served	LR	L	T	T	TR	T	T	T	T	T	T	TR
Maximum Queue (ft)	544	100	177	707	613	1369	1345	1105	1113	920	923	22
Average Queue (ft)	401	47	2	382	387	629	646	280	298	131	135	2
95th Queue (ft)	775	84	20	947	845	1653	1681	1031	1055	660	669	11
Link Distance (ft)	603		620	620		1281	1281	1111	1111	1032	1032	133
Upstream Blk Time (%)	43			25	11	3	12	4	6	3	3	
Queuing Penalty (veh)	0			0	0	0	0	0	0	0	0	
Storage Bay Dist (ft)		100			600							
Storage Blk Time (%)		1	0	3	29							
Queuing Penalty (veh)		6	0	24	216							

Network Summary

Network wide Queuing Penalty: 624

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/13/2011
Analysis time period:	AM Peak
Freeway/Dir of Travel:	US 26 Eastbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2035
Description: Eastbound	Off-ramp to Brookwood

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2660	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	435	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2660		435			vph
Peak-hour factor, PHF	0.95		0.95			
Peak 15-min volume, v15	700		114			v
Trucks and buses	4		4			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.980	0.980	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2856	467	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2856 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2856	4600	No
$v_{FO} = v_F - v_R$	2389	4600	No
v_R	467	2000	No
$v_{3 \text{ or } av34}$ $v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3 \text{ or } av34}$ $v_{3 \text{ or } av34}$ > 2700 pc/h?		No	
Is $v_{3 \text{ or } av34}$ $v_{3 \text{ or } av34}$ > 1.5 v_{12} /2		No	
If yes, v_{12A} = 2856		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	2856	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 15.3 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	D_S = 0.470	
Space mean speed in ramp influence area,	S_R = 51.5	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 51.5	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/13/2011
Analysis time period:	AM Peak
Freeway/Dir of Travel:	US 26 Eastbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2035
Description: Eastbound	Off-ramp to Brookwood

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2660	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	435	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2660		435			vph
Peak-hour factor, PHF	0.95		0.95			
Peak 15-min volume, v15	700		114			v
Trucks and buses	4		4			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.980	0.980	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2856	467	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2856 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2856	4600	No
$v_{FO} = v_F - v_R$	2389	4600	No
v_R	467	2000	No
$v_{3 \text{ or } av34}$ $v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3 \text{ or } av34}$ $v_{3 \text{ or } av34}$ > 2700 pc/h?		No	
Is $v_{3 \text{ or } av34}$ $v_{3 \text{ or } av34}$ > 1.5 v_{12} /2		No	
If yes, v_{12A} = 2856		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	2856	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 15.3 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	D_S = 0.470	
Space mean speed in ramp influence area,	S_R = 51.5	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 51.5	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/13/2011
Analysis time period:	AM Peak
Freeway/Dir of Travel:	US 26 Eastbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2035
Description: Eastbound	Off-ramp to Brookwood

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2660	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	435	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2660		435			vph
Peak-hour factor, PHF	0.95		0.95			
Peak 15-min volume, v15	700		114			v
Trucks and buses	4		4			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.980	0.980	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2856	467	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2856 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2856	4600	No
$v_{FO} = v_F - v_R$	2389	4600	No
v_R	467	2000	No
$v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3 \text{ or } av34}$ > 2700 pc/h?		No	
Is $v_{3 \text{ or } av34}$ > 1.5 v_{12}/2		No	
If yes, v_{12A} = 2856		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	2856	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 15.3 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	D_S = 0.470	
Space mean speed in ramp influence area,	S_R = 51.5	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 51.5	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/13/2011
Analysis time period:	AM Peak
Freeway/Dir of Travel:	US 26 Westbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2035
Description:	Westbound 2-lane Off-ramp to Southbound Brookwood

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3925	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	1795	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane	0	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3925		1795			vph
Peak-hour factor, PHF	0.95		0.95			
Peak 15-min volume, v15	1033		472			v
Trucks and buses	4		4			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.980	0.980	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4214	1927	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 4214 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	4214	4600	No
$v_{FO} = v_F - v_R$	2287	4600	No
v_R	1927	3800	No
$v_{3\ or\ av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3\ or\ av34}$ > 2700 pc/h?		No	
Is $v_{3\ or\ av34}$ > 1.5 v_{12}/2		No	
If yes, v_{12A} = 4214		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	4214	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 13.5 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	D_S = 0.601	
Space mean speed in ramp influence area,	S_R = 49.2	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 49.2	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/14/2011
Analysis time period:	AM Peak Period
Freeway/Dir of Travel:	US 26 Westbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2035
Description: Westbound	On-ramp from Brookwood

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2035	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	90	vph
Length of first accel/decel lane	410	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2035	90		vph
Peak-hour factor, PHF	0.95	0.95		
Peak 15-min volume, v15	536	24		v
Trucks and buses	4	4		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.980	0.980	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2185	97	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2185 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2282	4600	No
v_3 or v_{av34}	0 pc/h	(Equation 25-4 or 25-5)	
Is v_3 or v_{av34} > 2700 pc/h?		No	
Is v_3 or v_{av34} > 1.5 v_{12}/2		No	
If yes, v_{12A} = 2185		(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	2185	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 20.7 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	M_S = 0.331	
Space mean speed in ramp influence area,	S_R = 54.1	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 54.1	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/13/2011
Analysis time period:	PM Peak
Freeway/Dir of Travel:	US 26 Eastbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2035
Description:	Eastbound - Off-ramp to Brookwood

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2975	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	130	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2975		130			vph
Peak-hour factor, PHF	0.95		0.95			
Peak 15-min volume, v15	783		34			v
Trucks and buses	1		1			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.995	0.995	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3147	138	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3147 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3147	4600	No
$v_{FO} = v_F - v_R$	3009	4600	No
v_R	138	2000	No
$v_{3 \text{ or } av34}$ $v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3 \text{ or } av34}$ $v_{3 \text{ or } av34}$ > 2700 pc/h?		No	
Is $v_{3 \text{ or } av34}$ $v_{3 \text{ or } av34}$ > 1.5 v_{12} /2		No	
If yes, v_{12A} = 3147		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	3147	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 17.8 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	D_S = 0.440	
Space mean speed in ramp influence area,	S_R = 52.1	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 52.1	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/14/2011
Analysis time period:	PM Peak Period
Freeway/Dir of Travel:	US 26 Eastbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2035
Description: Eastbound	On-ramp from Brookwood

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2845	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	800	vph
Length of first accel/decel lane	410	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2845	800		vph
Peak-hour factor, PHF	0.95	0.95		
Peak 15-min volume, v15	749	211		v
Trucks and buses	1	1		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.995	0.995	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3010	846	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 3010 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	3856	4600	No
$v_{3\ or\ av34}$	0 pc/h	(Equation 25-4 or 25-5)	
Is $v_{3\ or\ av34}$ > 2700 pc/h?		No	
Is $v_{3\ or\ av34}$ > 1.5 v_{12}/2		No	
If yes, v_{12A} = 3010		(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	3010	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 32.6 pc/mi/ln

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable,	M_S = 0.477	
Space mean speed in ramp influence area,	S_R = 51.4	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 51.4	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/13/2011
Analysis time period:	PM Peak
Freeway/Dir of Travel:	US 26 Westbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2035
Description:	Westbound 1-lane Off-ramp to Northbound Helvetia

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3700	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	100	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3700		100			vph
Peak-hour factor, PHF	0.95		0.95			
Peak 15-min volume, v15	974		26			v
Trucks and buses	1		3			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.995	0.985	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3914	107	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3914 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3914	4600	No
$v_{FO} = v_F - v_R$	3807	4600	No
v_R	107	2000	No
$v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3 \text{ or } av34} > 2700$ pc/h?		No	
Is $v_{3 \text{ or } av34} > 1.5\, v_{12}/2$		No	
If yes, v_{12A} = 3914		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	3914	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 24.4 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	D_S = 0.438	
Space mean speed in ramp influence area,	S_R = 52.1	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 52.1	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/13/2011
Analysis time period:	PM Peak
Freeway/Dir of Travel:	US 26 Westbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2035
Description:	Westbound 2-lane Off-ramp to Southbound Brookwood

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3600	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	745	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane	0	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3600		745			vph
Peak-hour factor, PHF	0.95		0.95			
Peak 15-min volume, v15	947		196			v
Trucks and buses	1		3			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.995	0.985	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3808	796	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3808 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3808	4600	No
$v_{FO} = v_F - v_R$	3012	4600	No
v_R	796	3800	No
$v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3 \text{ or } av34} > 2700$ pc/h?		No	
Is $v_{3 \text{ or } av34} > 1.5\, v_{12}/2$		No	
If yes, v_{12A} = 3808		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	3808	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 10.0+ pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	D_S = 0.500	
Space mean speed in ramp influence area,	S_R = 51.0	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 51.0	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/14/2011
Analysis time period:	PM Peak Period
Freeway/Dir of Travel:	US 26 Westbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2035
Description: Westbound	On-ramp from Brookwood

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2855	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	425	vph
Length of first accel/decel lane	410	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2855	425		vph
Peak-hour factor, PHF	0.95	0.95		
Peak 15-min volume, v15	751	112		v
Trucks and buses	1	3		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.995	0.985	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3020	454	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 3020 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	3474	4600	No
v_{3} or v_{av34}	0 pc/h	(Equation 25-4 or 25-5)	
Is v_{3} or v_{av34} > 2700 pc/h?		No	
Is v_{3} or v_{av34} > 1.5 v_{12}/2		No	
If yes, v_{12A} = 3020		(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	3020	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 29.8 pc/mi/ln

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable,	M_S = 0.418	
Space mean speed in ramp influence area,	S_R = 52.5	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 52.5	mph

Year 2035 Phase 3

HCM Unsignalized Intersection Capacity Analysis
200: Schaff Rd & Helvetia Rd

9/28/2011

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	45	10	165	205	45	410
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	50	11	183	228	50	456
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	853	297			411	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	853	297			411	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	84	99			96	
cM capacity (veh/h)	317	745			1153	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	61	411	506
Volume Left	50	0	50
Volume Right	11	228	0
cSH	354	1700	1153
Volume to Capacity	0.17	0.24	0.04
Queue Length 95th (ft)	15	0	3
Control Delay (s)	17.3	0.0	1.3
Lane LOS	C		A
Approach Delay (s)	17.3	0.0	1.3
Approach LOS	C		

Intersection Summary			
Average Delay	1.7		
Intersection Capacity Utilization	58.6%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	155	5	365	275	15	440
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	172	6	406	306	17	489
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			937			
pX, platoon unblocked						
vC, conflicting volume	928	406			711	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	928	406			711	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	41	99			98	
cM capacity (veh/h)	293	647			893	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	178	406	306	506
Volume Left	172	0	0	17
Volume Right	6	0	306	0
cSH	298	1700	1700	893
Volume to Capacity	0.60	0.24	0.18	0.02
Queue Length 95th (ft)	89	0	0	1
Control Delay (s)	33.4	0.0	0.0	0.5
Lane LOS	D			A
Approach Delay (s)	33.4	0.0		0.5
Approach LOS	D			

Intersection Summary			
Average Delay	4.5		
Intersection Capacity Utilization	50.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR	SBR2	SEL	SER
Lane Configurations									
Volume (vph)	0	1795	60	640	565	0	30	0	0
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		3.0	2.0	2.0	3.0				
Lane Util. Factor		*1.00	1.00	0.95	0.95				
Frt		0.85	1.00	1.00	0.99				
Flt Protected		1.00	0.95	1.00	1.00				
Satd. Flow (prot)		2917	1309	3260	3267				
Flt Permitted		1.00	0.95	1.00	1.00				
Satd. Flow (perm)		2917	1309	3260	3267				
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	0	1832	61	653	577	0	31	0	0
RTOR Reduction (vph)	0	58	0	0	5	0	0	0	0
Lane Group Flow (vph)	0	1774	61	653	603	0	0	0	0
Heavy Vehicles (%)	2%	2%	27%	2%	1%	2%	1%	0%	0%
Turn Type		custom	Prot						
Protected Phases		8	3	3 6	2				
Permitted Phases									
Actuated Green, G (s)		50.4	51.4	80.0	19.6				
Effective Green, g (s)		52.4	53.4	77.0	21.6				
Actuated g/C Ratio		0.65	0.67	0.96	0.27				
Clearance Time (s)		5.0	4.0		5.0				
Vehicle Extension (s)		5.2	2.3		5.2				
Lane Grp Cap (vph)		1911	874	3138	882				
v/s Ratio Prot		c0.61	0.05	0.20	c0.18				
v/s Ratio Perm									
v/c Ratio		0.93	0.07	0.21	0.68				
Uniform Delay, d1		12.1	4.6	0.1	26.1				
Progression Factor		1.00	0.60	1.00	1.00				
Incremental Delay, d2		9.4	0.0	0.0	2.9				
Delay (s)		21.6	2.8	0.1	29.1				
Level of Service		C	A	A	C				
Approach Delay (s)	21.6			0.3	29.1			0.0	
Approach LOS	C			A	C			A	

Intersection Summary			
HCM Average Control Delay	18.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	92.8%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Volume (veh/h)	600	0	0	2360	0	100
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	612	0	0	2408	0	102
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	706			298		
pX, platoon unblocked			0.94		0.94	0.94
vC, conflicting volume			612		1415	306
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			469		920	144
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	88
cM capacity (veh/h)			1041		259	833

Direction, Lane #	NB 1	NB 2	SB 1	SB 2	SB 3	NW 1
Volume Total	306	306	803	803	803	102
Volume Left	0	0	0	0	0	0
Volume Right	0	0	0	0	0	102
cSH	1700	1700	1700	1700	1700	833
Volume to Capacity	0.18	0.18	0.47	0.47	0.47	0.12
Queue Length 95th (ft)	0	0	0	0	0	10
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	9.9
Lane LOS						A
Approach Delay (s)	0.0		0.0			9.9
Approach LOS						A

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	67.8%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	85	0	275	0	0	0	0	515	505	35	2325	0
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		3.0	3.0					3.0	3.0	2.0	3.0	
Lane Util. Factor		0.95	0.95					0.95	1.00	1.00	0.91	
Frt		0.92	0.85					1.00	0.85	1.00	1.00	
Flt Protected		0.98	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1403	1262					3137	1430	1662	4684	
Flt Permitted		0.98	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1403	1262					3137	1430	1662	4684	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	87	0	281	0	0	0	0	526	515	36	2372	0
RTOR Reduction (vph)	0	6	6	0	0	0	0	0	232	0	0	0
Lane Group Flow (vph)	0	182	174	0	0	0	0	526	283	36	2372	0
Heavy Vehicles (%)	0%	0%	12%	0%	0%	0%	0%	6%	4%	0%	2%	0%
Turn Type	Perm		Perm						Perm	Prot		
Protected Phases		8						6		5	2	
Permitted Phases	8		8						6			
Actuated Green, G (s)		14.3	14.3					42.0	42.0	9.7	55.7	
Effective Green, g (s)		16.3	16.3					44.0	44.0	11.7	57.7	
Actuated g/C Ratio		0.20	0.20					0.55	0.55	0.15	0.72	
Clearance Time (s)		5.0	5.0					5.0	5.0	4.0	5.0	
Vehicle Extension (s)		2.3	2.3					4.7	4.7	2.3	4.7	
Lane Grp Cap (vph)		286	257					1725	787	243	3378	
v/s Ratio Prot								0.17		0.02	c0.51	
v/s Ratio Perm		0.13	c0.14						0.20			
v/c Ratio		0.64	0.68					0.30	0.36	0.15	0.70	
Uniform Delay, d1		29.1	29.4					9.7	10.1	29.8	6.3	
Progression Factor		1.00	1.00					1.00	1.00	0.96	1.06	
Incremental Delay, d2		3.8	6.0					0.5	1.3	0.6	0.6	
Delay (s)		32.9	35.4					10.2	11.4	29.1	7.3	
Level of Service		C	D					B	B	C	A	
Approach Delay (s)		34.2			0.0			10.8			7.6	
Approach LOS		C			A			B			A	

Intersection Summary			
HCM Average Control Delay	11.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	67.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑					
Volume (vph)	540	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.8					
Lane Util. Factor	0.95					
Frt	1.00					
Flt Protected	1.00					
Satd. Flow (prot)	3471					
Flt Permitted	1.00					
Satd. Flow (perm)	3471					
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	587	0	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	587	0	0	0	0	0
Heavy Vehicles (%)	4%	0%	0%	0%	0%	0%
Turn Type						
Protected Phases	4					
Permitted Phases						
Actuated Green, G (s)	2.2					
Effective Green, g (s)	2.2					
Actuated g/C Ratio	0.09					
Clearance Time (s)	5.8					
Lane Grp Cap (vph)	305					
v/s Ratio Prot	c0.17					
v/s Ratio Perm						
v/c Ratio	1.92					
Uniform Delay, d1	11.4					
Progression Factor	1.00					
Incremental Delay, d2	428.0					
Delay (s)	439.4					
Level of Service	F					
Approach Delay (s)	439.4			0.0	0.0	
Approach LOS	F			A	A	

Intersection Summary			
HCM Average Control Delay	439.4	HCM Level of Service	F
HCM Volume to Capacity ratio	1.92		
Actuated Cycle Length (s)	25.0	Sum of lost time (s)	22.8
Intersection Capacity Utilization	19.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	50	0	80	0	0	0	35	970	0	0	2580	20
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	51	0	82	0	0	0	36	990	0	0	2633	20
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											189	
pX, platoon unblocked	0.71	0.71	0.71	0.71	0.71		0.71					
vC, conflicting volume	3044	3704	888	2020	3714	330	2653			990		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2449	3379	0	1007	3393	330	1898			990		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	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 %	0	100	89	100	100	100	84			100		
cM capacity (veh/h)	10	5	774	110	5	672	226			706		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3
Volume Total	133	0	36	396	396	198	658	1316	679
Volume Left	51	0	36	0	0	0	0	0	0
Volume Right	82	0	0	0	0	0	0	0	20
cSH	26	1700	226	1700	1700	1700	706	1700	1700
Volume to Capacity	5.09	0.00	0.16	0.23	0.23	0.12	0.00	0.77	0.40
Queue Length 95th (ft)	Err	0	14	0	0	0	0	0	0
Control Delay (s)	Err	0.0	23.9	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	F	A	C						
Approach Delay (s)	Err	0.0	0.8				0.0		
Approach LOS	F	A							

Intersection Summary			
Average Delay	348.2		
Intersection Capacity Utilization	64.6%	ICU Level of Service	C
Analysis Period (min)	15		

200: Schaff Rd & Helvetia Rd Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Total Delay (hr)	0.2	0.0	0.2	0.1	0.1	0.2	0.8
Delay / Veh (s)	13.5	3.3	4.8	1.8	6.1	1.9	3.2
Vehicles Entered	42	12	169	199	47	410	879
Vehicles Exited	42	12	169	199	47	410	879
Hourly Exit Rate	42	12	169	199	47	410	879
Input Volume	45	10	166	205	45	410	880
% of Volume	94	117	102	97	105	100	100
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

210: Jacobson Rd & Helvetia Rd Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Total Delay (hr)	1.1	0.0	0.4	0.4	0.0	0.2	2.1
Delay / Veh (s)	25.8	19.0	3.8	4.7	7.7	1.8	6.0
Vehicles Entered	150	5	378	273	14	438	1258
Vehicles Exited	149	5	378	273	14	437	1256
Hourly Exit Rate	149	5	378	273	14	437	1256
Input Volume	155	5	380	275	15	440	1270
% of Volume	96	95	100	99	95	99	99
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

215: Loop Ramp #1 & Helvetia Rd Performance by movement

Movement	EBT	EBR	NBL	NBT	SBT	SBR2	All
Total Delay (hr)	0.0	5.0	0.4	2.9	5.1	0.2	13.7
Delay / Veh (s)	1.3	10.0	25.9	16.4	32.0	24.8	15.7
Vehicles Entered	29	1798	60	641	570	30	3128
Vehicles Exited	29	1802	59	642	571	30	3133
Hourly Exit Rate	29	1802	59	642	571	30	3133
Input Volume	30	1795	60	648	578	30	3141
% of Volume	97	100	98	99	99	99	100
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

220: Helvetia Rd/Brookwood Pkwy #1 & WB-NB Helvetia Performance by movement

Movement	NBT	SBT	NWT	NWR	All
Total Delay (hr)	0.6	0.9	0.0	0.2	1.6
Delay / Veh (s)	3.5	1.3	0.1	6.0	1.9
Vehicles Entered	587	2376	2	110	3075
Vehicles Exited	588	2377	2	110	3077
Hourly Exit Rate	588	2377	2	110	3077
Input Volume	604	2379	3	100	3086
% of Volume	97	100	62	110	100
Denied Entry Before	0	0	0	0	0
Denied Entry After	0	0	0	0	0

224: Exit Ramp #1 & WB-NB Helvetia Performance by movement

Movement	WBT	WBR	All
Total Delay (hr)	1.5	0.1	1.6
Delay / Veh (s)	3.0	4.5	3.0
Vehicles Entered	1795	107	1902
Vehicles Exited	1792	107	1899
Hourly Exit Rate	1792	107	1899
Input Volume	1795	100	1895
% of Volume	100	107	100
Denied Entry Before	0	0	0
Denied Entry After	0	0	0

230: US-26 EB Helvetia Off-ramp & Helvetia Rd/Brookwood Pkwy #1 Performance by movement

Movement	EBL	EBR	NBT	NBR	SBL	SBT	All
Total Delay (hr)	0.8	2.3	1.2	0.3	0.3	4.4	9.4
Delay / Veh (s)	37.0	31.2	8.4	2.5	31.6	6.7	9.1
Vehicles Entered	82	270	505	486	36	2343	3722
Vehicles Exited	82	269	503	487	36	2345	3722
Hourly Exit Rate	82	269	503	487	36	2345	3722
Input Volume	85	275	518	505	35	2348	3766
% of Volume	97	98	97	96	102	100	99
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

231: US-26 EB Helvetia On-ramp & Performance by movement

Movement	EBT	All
Total Delay (hr)	16.0	16.0
Delay / Veh (s)	109.0	109.0
Vehicles Entered	534	534
Vehicles Exited	525	525
Hourly Exit Rate	525	525
Input Volume	550	550
% of Volume	95	95
Denied Entry Before	0	0
Denied Entry After	0	0

240: Meek Rd & Brookwood Pkwy Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Total Delay (hr)	21.9	34.1	0.3	0.9	1.1	0.0	58.4
Delay / Veh (s)	3936.5	3841.1	37.0	3.5	1.6	0.7	57.3
Vehicles Entered	21	36	33	967	2597	21	3675
Vehicles Exited	19	29	33	969	2597	21	3668
Hourly Exit Rate	19	29	33	969	2597	21	3668
Input Volume	50	80	35	970	2608	20	3763
% of Volume	38	36	94	100	100	105	97
Denied Entry Before	0	1	0	0	0	0	1
Denied Entry After	28	43	0	0	0	0	71

Total Network Performance

Total Delay (hr)	116.5
Delay / Veh (s)	101.7
Vehicles Entered	4133
Vehicles Exited	4114
Hourly Exit Rate	4114
Input Volume	37995
% of Volume	11
Denied Entry Before	2
Denied Entry After	72

Intersection: 200: Schaff Rd & Helvetia Rd

Movement	WB	NB	SB
Directions Served	LR	TR	LT
Maximum Queue (ft)	72	21	208
Average Queue (ft)	30	1	36
95th Queue (ft)	59	10	136
Link Distance (ft)	549	410	349
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 210: Jacobson Rd & Helvetia Rd

Movement	WB	NB	SB
Directions Served	LR	R	LT
Maximum Queue (ft)	223	10	165
Average Queue (ft)	82	0	15
95th Queue (ft)	170	5	86
Link Distance (ft)	396	883	410
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 215: Loop Ramp #1 & Helvetia Rd

Movement	EB	EB	NB	NB	NB	SB	SB
Directions Served	R	R	L	T	T	T	T>
Maximum Queue (ft)	376	351	203	305	266	287	304
Average Queue (ft)	191	157	60	161	134	152	161
95th Queue (ft)	315	283	145	283	246	242	256
Link Distance (ft)	914	914		244	244	883	
Upstream Blk Time (%)			0	2	1		
Queuing Penalty (veh)			0	7	2		
Storage Bay Dist (ft)			200				415
Storage Blk Time (%)			0	5			
Queuing Penalty (veh)			0	3			

Intersection: 220: Helvetia Rd/Brookwood Pkwy #1 & WB-NB Helvetia

Movement	NB	NW
Directions Served	T	R
Maximum Queue (ft)	40	89
Average Queue (ft)	2	39
95th Queue (ft)	18	67
Link Distance (ft)	633	1346
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 224: Exit Ramp #1 & WB-NB Helvetia

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

Intersection: 230: US-26 EB Helvetia Off-ramp & Helvetia Rd/Brookwood Pkwy #1

Movement	EB	EB	NB	NB	NB	SB	SB	SB	SB
Directions Served	LR	R	T	T	R	L	T	T	T
Maximum Queue (ft)	210	198	146	137	61	81	136	214	274
Average Queue (ft)	119	113	83	67	3	23	60	105	157
95th Queue (ft)	182	174	142	125	31	57	117	193	245
Link Distance (ft)	1130		136	136	136		633	633	633
Upstream Blk Time (%)			1	0	0				
Queuing Penalty (veh)			3	1	0				
Storage Bay Dist (ft)		300				175			
Storage Blk Time (%)							0		
Queuing Penalty (veh)							0		

Intersection: 231: US-26 EB Helvetia On-ramp &

Movement	EB	EB
Directions Served	T	T
Maximum Queue (ft)	464	475
Average Queue (ft)	265	283
95th Queue (ft)	501	517
Link Distance (ft)	956	956
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 240: Meek Rd & Brookwood Pkwy

Movement	EB	NB	NB	NB	SB	SB	SB
Directions Served	LR	L	T	T	LT	T	TR
Maximum Queue (ft)	610	93	54	18	6	21	26
Average Queue (ft)	591	29	2	1	0	1	2
95th Queue (ft)	692	71	22	10	4	10	13
Link Distance (ft)	591		620	620	136	136	136
Upstream Blk Time (%)	90						
Queuing Penalty (veh)	0						
Storage Bay Dist (ft)		100					
Storage Blk Time (%)		1	0				
Queuing Penalty (veh)		3	0				

Network Summary

Network wide Queuing Penalty: 19

HCM Unsignalized Intersection Capacity Analysis
200: Schaff Rd & Helvetia Rd

10/21/2011

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	30	0	470	210	0	270
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	32	0	505	226	0	290
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	909	618			731	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	909	618			731	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	90	100			100	
cM capacity (veh/h)	308	493			882	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	32	731	290
Volume Left	32	0	0
Volume Right	0	226	0
cSH	308	1700	882
Volume to Capacity	0.10	0.43	0.00
Queue Length 95th (ft)	9	0	0
Control Delay (s)	18.1	0.0	0.0
Lane LOS	C		
Approach Delay (s)	18.1	0.0	0.0
Approach LOS	C		

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	47.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	275	10	670	520	10	290
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	306	11	744	578	11	322
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)			937			
pX, platoon unblocked						
vC, conflicting volume	1089	744			1322	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1089	744			1322	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	0	97			98	
cM capacity (veh/h)	235	418			529	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	317	744	578	333
Volume Left	306	0	0	11
Volume Right	11	0	578	0
cSH	238	1700	1700	529
Volume to Capacity	1.33	0.44	0.34	0.02
Queue Length 95th (ft)	421	0	0	2
Control Delay (s)	214.9	0.0	0.0	0.7
Lane LOS	F			A
Approach Delay (s)	214.9	0.0		0.7
Approach LOS	F			

Intersection Summary			
Average Delay	34.6		
Intersection Capacity Utilization	57.8%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR	SBR2	SEL	SER
Lane Configurations									
Volume (vph)	0	730	290	1190	430	0	135	0	0
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		3.0	2.0	2.0	3.0				
Lane Util. Factor		*1.00	1.00	0.95	0.95				
Frt		0.85	1.00	1.00	0.96				
Flt Protected		1.00	0.95	1.00	1.00				
Satd. Flow (prot)		2975	1646	3292	3206				
Flt Permitted		1.00	0.95	1.00	1.00				
Satd. Flow (perm)		2975	1646	3292	3206				
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	0	785	312	1280	462	0	145	0	0
RTOR Reduction (vph)	0	294	0	0	54	0	0	0	0
Lane Group Flow (vph)	0	491	312	1280	553	0	0	0	0
Heavy Vehicles (%)	0%	0%	1%	1%	0%	0%	0%	0%	0%
Turn Type		custom	Prot						
Protected Phases		8	3	3 6	2				
Permitted Phases									
Actuated Green, G (s)		27.3	28.3	60.0	22.7				
Effective Green, g (s)		29.3	30.3	57.0	24.7				
Actuated g/C Ratio		0.49	0.51	0.95	0.41				
Clearance Time (s)		5.0	4.0		5.0				
Vehicle Extension (s)		5.2	2.3		5.2				
Lane Grp Cap (vph)		1453	831	3127	1320				
v/s Ratio Prot		0.17	0.19	c0.39	0.17				
v/s Ratio Perm									
v/c Ratio		0.34	0.38	0.41	0.42				
Uniform Delay, d1		9.4	9.1	0.1	12.6				
Progression Factor		1.00	1.06	1.00	1.00				
Incremental Delay, d2		0.6	0.1	0.0	0.5				
Delay (s)		10.0	9.7	0.2	13.0				
Level of Service		B	A	A	B				
Approach Delay (s)	10.0			2.0	13.0			0.0	
Approach LOS	B			A	B			A	

Intersection Summary			
HCM Average Control Delay	6.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	2.0
Intersection Capacity Utilization	52.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Volume (veh/h)	1410	0	0	1160	0	70
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	1516	0	0	1247	0	75
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	706			298		
pX, platoon unblocked			0.86		0.86	0.86
vC, conflicting volume			1516		1932	758
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1276		1759	395
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	86
cM capacity (veh/h)			474		67	525

Direction, Lane #	NB 1	NB 2	SB 1	SB 2	SB 3	NW 1
Volume Total	758	758	416	416	416	75
Volume Left	0	0	0	0	0	0
Volume Right	0	0	0	0	0	75
cSH	1700	1700	1700	1700	1700	525
Volume to Capacity	0.45	0.45	0.24	0.24	0.24	0.14
Queue Length 95th (ft)	0	0	0	0	0	12
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	13.0
Lane LOS						B
Approach Delay (s)	0.0		0.0			13.0
Approach LOS						B

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	80.2%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	0	80	0	0	0	0	1390	945	5	1155	0
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		3.0	3.0					3.0	3.0	2.0	3.0	
Lane Util. Factor		0.95	0.95					0.95	1.00	1.00	0.91	
Frt		0.91	0.85					1.00	0.85	1.00	1.00	
Flt Protected		0.98	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1483	1413					3292	1473	1662	4778	
Flt Permitted		0.98	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1483	1413					3292	1473	1662	4778	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	21	0	83	0	0	0	0	1448	984	5	1203	0
RTOR Reduction (vph)	0	30	47	0	0	0	0	0	165	0	0	0
Lane Group Flow (vph)	0	23	4	0	0	0	0	1448	819	5	1203	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	1%	1%	0%	0%	0%
Turn Type	Perm		Perm						Perm	Prot		
Protected Phases		8						6		5	2	
Permitted Phases	8		8						6			
Actuated Green, G (s)		7.3	7.3					97.9	97.9	0.8	102.7	
Effective Green, g (s)		9.3	9.3					99.9	99.9	2.8	104.7	
Actuated g/C Ratio		0.08	0.08					0.83	0.83	0.02	0.87	
Clearance Time (s)		5.0	5.0					5.0	5.0	4.0	5.0	
Vehicle Extension (s)		2.3	2.3					4.7	4.7	2.3	4.7	
Lane Grp Cap (vph)		115	110					2741	1226	39	4169	
v/s Ratio Prot								0.44		0.00	c0.25	
v/s Ratio Perm		0.02	0.00						c0.56			
v/c Ratio		0.20	0.04					0.53	0.67	0.13	0.29	
Uniform Delay, d1		51.9	51.2					3.0	3.8	57.4	1.3	
Progression Factor		1.00	1.00					1.00	1.00	0.99	1.05	
Incremental Delay, d2		0.5	0.1					0.7	2.9	0.8	0.2	
Delay (s)		52.4	51.3					3.7	6.7	57.5	1.5	
Level of Service		D	D					A	A	E	A	
Approach Delay (s)		51.8			0.0			4.9			1.8	
Approach LOS		D			A			A			A	

Intersection Summary			
HCM Average Control Delay	5.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	80.2%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑					
Volume (vph)	950	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5					
Lane Util. Factor	0.95					
Frt	1.00					
Flt Protected	1.00					
Satd. Flow (prot)	3471					
Flt Permitted	1.00					
Satd. Flow (perm)	3471					
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1033	0	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	1033	0	0	0	0	0
Heavy Vehicles (%)	4%	0%	0%	0%	0%	0%
Turn Type						
Protected Phases	4					
Permitted Phases						
Actuated Green, G (s)	2.5					
Effective Green, g (s)	2.5					
Actuated g/C Ratio	0.07					
Clearance Time (s)	4.5					
Vehicle Extension (s)	3.0					
Lane Grp Cap (vph)	248					
v/s Ratio Prot	c0.30					
v/s Ratio Perm						
v/c Ratio	4.17					
Uniform Delay, d1	16.2					
Progression Factor	1.00					
Incremental Delay, d2	1433.9					
Delay (s)	1450.1					
Level of Service	F					
Approach Delay (s)	1450.1			0.0	0.0	
Approach LOS	F			A	A	

Intersection Summary			
HCM Average Control Delay	1450.1	HCM Level of Service	F
HCM Volume to Capacity ratio	4.17		
Actuated Cycle Length (s)	35.0	Sum of lost time (s)	32.5
Intersection Capacity Utilization	30.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	25	0	75	0	0	0	110	2310	0	0	1190	45
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	27	0	80	0	0	0	117	2457	0	0	1266	48
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											189	
pX, platoon unblocked	0.96	0.96	0.96	0.96	0.96		0.96					
vC, conflicting volume	2343	3981	446	3193	4005	819	1314			2457		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2254	3960	278	3139	3985	819	1182			2457		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	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 %	0	100	89	100	100	100	80			100		
cM capacity (veh/h)	19	2	696	3	2	323	574			192		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3
Volume Total	106	0	117	983	983	491	316	633	364
Volume Left	27	0	117	0	0	0	0	0	0
Volume Right	80	0	0	0	0	0	0	0	48
cSH	69	1700	574	1700	1700	1700	192	1700	1700
Volume to Capacity	1.53	0.00	0.20	0.58	0.58	0.29	0.00	0.37	0.21
Queue Length 95th (ft)	226	0	19	0	0	0	0	0	0
Control Delay (s)	400.0	0.0	12.9	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	F	A	B						
Approach Delay (s)	400.0	0.0	0.6				0.0		
Approach LOS	F	A							

Intersection Summary			
Average Delay	11.0		
Intersection Capacity Utilization	84.6%	ICU Level of Service	E
Analysis Period (min)	15		

200: Schaff Rd & Helvetia Rd Performance by movement

Movement	WBL	NBT	NBR	SBT	All
Total Delay (hr)	0.1	0.5	0.1	0.0	0.7
Delay / Veh (s)	12.8	3.9	1.5	0.4	2.7
Vehicles Entered	27	448	187	268	930
Vehicles Exited	28	449	187	268	932
Hourly Exit Rate	28	449	187	268	932
Input Volume	30	476	210	270	986
% of Volume	94	94	89	99	95
Denied Entry Before	0	0	0	0	0
Denied Entry After	0	0	0	0	0

210: Jacobson Rd & Helvetia Rd Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Total Delay (hr)	10.5	0.4	0.4	0.5	0.0	0.1	12.0
Delay / Veh (s)	141.3	157.3	2.3	3.9	12.3	1.6	25.8
Vehicles Entered	272	10	629	472	10	287	1680
Vehicles Exited	265	10	630	474	10	288	1677
Hourly Exit Rate	265	10	630	474	10	288	1677
Input Volume	275	10	682	520	10	292	1790
% of Volume	96	98	92	91	98	99	94
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

215: Loop Ramp #1 & Helvetia Rd Performance by movement

Movement	EBT	EBR	NBL	NBT	SBT	SBR2	All
Total Delay (hr)	0.0	0.7	1.2	1.1	1.6	0.4	5.0
Delay / Veh (s)	0.1	3.7	16.5	3.6	13.3	11.0	6.8
Vehicles Entered	12	714	264	1094	425	132	2641
Vehicles Exited	12	714	264	1093	426	131	2640
Hourly Exit Rate	12	714	264	1093	426	131	2640
Input Volume	14	730	290	1191	437	135	2798
% of Volume	83	98	91	92	97	97	94
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

220: Helvetia Rd/Brookwood Pkwy #1 & WB-NB Helvetia Performance by movement

Movement	NBT	SBT	NWT	NWR	All
Total Delay (hr)	1.0	0.4	0.0	0.3	1.7
Delay / Veh (s)	2.8	1.3	0.0	13.7	2.5
Vehicles Entered	1287	1132	1	78	2498
Vehicles Exited	1289	1133	1	78	2501
Hourly Exit Rate	1289	1133	1	78	2501
Input Volume	1422	1160	1	70	2653
% of Volume	91	98	80	112	94
Denied Entry Before	0	0	0	0	0
Denied Entry After	0	0	0	0	0

224: Exit Ramp #1 & WB-NB Helvetia Performance by movement

Movement	WBT	WBR	All
Total Delay (hr)	0.1	0.0	0.2
Delay / Veh (s)	0.7	1.4	0.7
Vehicles Entered	715	77	792
Vehicles Exited	715	78	793
Hourly Exit Rate	715	78	793
Input Volume	730	70	800
% of Volume	98	111	99
Denied Entry Before	0	0	0
Denied Entry After	0	0	0

230: US-26 EB Helvetia Off-ramp & Helvetia Rd/Brookwood Pkwy #1 Performance by movement

Movement	EBL	EBR	NBT	NBR	SBL	SBT	All
Total Delay (hr)	0.3	0.3	0.7	1.9	0.1	0.6	3.7
Delay / Veh (s)	50.5	11.4	1.9	8.3	49.8	1.9	4.1
Vehicles Entered	17	82	1267	824	5	1135	3330
Vehicles Exited	18	82	1267	823	4	1135	3329
Hourly Exit Rate	18	82	1267	823	4	1135	3329
Input Volume	20	80	1403	945	5	1165	3618
% of Volume	89	102	90	87	80	97	92
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

231: US-26 EB Helvetia On-ramp & Performance by movement

Movement	EBT	All
Total Delay (hr)	69.4	69.4
Delay / Veh (s)	305.9	306.3
Vehicles Entered	829	829
Vehicles Exited	805	805
Hourly Exit Rate	805	805
Input Volume	982	982
% of Volume	82	82
Denied Entry Before	0	0
Denied Entry After	29	29

240: Meek Rd & Brookwood Pkwy Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Total Delay (hr)	5.4	16.6	0.3	14.6	0.3	0.0	37.2
Delay / Veh (s)	970.7	878.3	12.0	25.5	0.8	0.4	38.7
Vehicles Entered	21	72	92	2069	1174	43	3471
Vehicles Exited	20	64	92	2057	1174	43	3450
Hourly Exit Rate	20	64	92	2057	1174	43	3450
Input Volume	25	75	110	2310	1197	45	3762
% of Volume	81	86	83	89	98	96	92
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	1	3	0	0	0	0	4

Total Network Performance

Total Delay (hr)	238.5
Delay / Veh (s)	223.6
Vehicles Entered	3921
Vehicles Exited	3761
Hourly Exit Rate	3761
Input Volume	35613
% of Volume	11
Denied Entry Before	0
Denied Entry After	177

Intersection: 200: Schaff Rd & Helvetia Rd

Movement	WB
Directions Served	LR
Maximum Queue (ft)	57
Average Queue (ft)	21
95th Queue (ft)	49
Link Distance (ft)	549
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 210: Jacobson Rd & Helvetia Rd

Movement	WB	B211	NB	SB
Directions Served	LR	T	R	LT
Maximum Queue (ft)	480	591	21	126
Average Queue (ft)	371	187	1	15
95th Queue (ft)	585	609	10	68
Link Distance (ft)	396	948	883	410
Upstream Blk Time (%)	48	0		
Queuing Penalty (veh)	0	0		
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 215: Loop Ramp #1 & Helvetia Rd

Movement	EB	EB	NB	NB	NB	SB	SB
Directions Served	R	R	L	T	T	T	T>
Maximum Queue (ft)	88	68	224	305	282	141	156
Average Queue (ft)	44	47	117	65	49	69	90
95th Queue (ft)	76	70	211	235	185	115	143
Link Distance (ft)	914	914		244	244	883	
Upstream Blk Time (%)			0	1	1		
Queuing Penalty (veh)			0	10	5		
Storage Bay Dist (ft)			200				415
Storage Blk Time (%)			2	2			
Queuing Penalty (veh)			9	5			

Intersection: 220: Helvetia Rd/Brookwood Pkwy #1 & WB-NB Helvetia

Movement	NB	NB	NW
Directions Served	T	T	R
Maximum Queue (ft)	141	41	94
Average Queue (ft)	9	2	41
95th Queue (ft)	68	20	80
Link Distance (ft)	633	633	1346
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 224: Exit Ramp #1 & WB-NB Helvetia

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

Intersection: 230: US-26 EB Helvetia Off-ramp & Helvetia Rd/Brookwood Pkwy #1

Movement	EB	EB	NB	NB	NB	SB	SB	SB	SB
Directions Served	LR	R	T	T	R	L	T	T	T
Maximum Queue (ft)	75	71	150	142	214	27	62	66	109
Average Queue (ft)	34	34	48	34	151	4	8	12	32
95th Queue (ft)	66	60	118	96	269	17	37	42	85
Link Distance (ft)	1130		136	136	136		633	633	633
Upstream Blk Time (%)			0	0	21				
Queuing Penalty (veh)			3	2	161				
Storage Bay Dist (ft)		300				175			
Storage Blk Time (%)									
Queuing Penalty (veh)									

Intersection: 231: US-26 EB Helvetia On-ramp &

Movement	EB	EB
Directions Served	T	T
Maximum Queue (ft)	875	1069
Average Queue (ft)	837	981
95th Queue (ft)	968	1201
Link Distance (ft)	956	956
Upstream Blk Time (%)		47
Queuing Penalty (veh)		224
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 240: Meek Rd & Brookwood Pkwy

Movement	EB	NB	NB	NB	NB	B251	B251	B2	B2	B3	B3	SB
Directions Served	LR	L	T	T	TR	T	T	T	T	T	T	LT
Maximum Queue (ft)	610	90	175	709	612	1352	1361	1183	1183	1064	1057	7
Average Queue (ft)	476	42	3	488	469	821	849	574	594	427	445	0
95th Queue (ft)	750	77	27	1009	870	1826	1857	1515	1519	1252	1276	5
Link Distance (ft)	591		620	620		1281	1281	1111	1111	1032	1032	136
Upstream Blk Time (%)	48		0	29	13	4	16	10	13	10	12	
Queuing Penalty (veh)	0		0	0	0	0	0	0	0	0	0	
Storage Bay Dist (ft)		100			600							
Storage Blk Time (%)		0	0	8	31							
Queuing Penalty (veh)		0	0	63	242							

Intersection: 240: Meek Rd & Brookwood Pkwy

Movement	SB
Directions Served	TR
Maximum Queue (ft)	22
Average Queue (ft)	2
95th Queue (ft)	12
Link Distance (ft)	136
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Network Summary

Network wide Queuing Penalty: 723

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/13/2011
Analysis time period:	AM Peak
Freeway/Dir of Travel:	US 26 Eastbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2035
Description: Eastbound	Off-ramp to Brookwood

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2660	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	435	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2660		435			vph
Peak-hour factor, PHF	0.95		0.95			
Peak 15-min volume, v15	700		114			v
Trucks and buses	4		4			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.980	0.980	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2856	467	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2856 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2856	4600	No
$v_{FO} = v_F - v_R$	2389	4600	No
v_R	467	2000	No
$v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3 \text{ or } av34}$ > 2700 pc/h?		No	
Is $v_{3 \text{ or } av34}$ > 1.5 $v_{12}/2$		No	
If yes, v_{12A} = 2856		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	2856	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 15.3 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	D_S = 0.470	
Space mean speed in ramp influence area,	S_R = 51.5	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 51.5	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/13/2011
Analysis time period:	AM Peak
Freeway/Dir of Travel:	US 26 Eastbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2035
Description: Eastbound	Off-ramp to Brookwood

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2660	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	435	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2660		435			vph
Peak-hour factor, PHF	0.95		0.95			
Peak 15-min volume, v15	700		114			v
Trucks and buses	4		4			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.980	0.980	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2856	467	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2856 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2856	4600	No
$v_{FO} = v_F - v_R$	2389	4600	No
v_R	467	2000	No
$v_{3 \text{ or } av34}$ $v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3 \text{ or } av34}$ $v_{3 \text{ or } av34}$ > 2700 pc/h?		No	
Is $v_{3 \text{ or } av34}$ $v_{3 \text{ or } av34}$ > 1.5 v_{12} /2		No	
If yes, v_{12A} = 2856		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	2856	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 15.3 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	D_S = 0.470	
Space mean speed in ramp influence area,	S_R = 51.5	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 51.5	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/13/2011
Analysis time period:	AM Peak
Freeway/Dir of Travel:	US 26 Eastbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2035
Description: Eastbound	Off-ramp to Brookwood

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2660	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	435	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2660		435			vph
Peak-hour factor, PHF	0.95		0.95			
Peak 15-min volume, v15	700		114			v
Trucks and buses	4		4			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.980	0.980	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2856	467	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2856 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2856	4600	No
$v_{FO} = v_F - v_R$	2389	4600	No
v_R	467	2000	No
$v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3 \text{ or } av34}$ > 2700 pc/h?		No	
Is $v_{3 \text{ or } av34}$ > 1.5 v_{12}/2		No	
If yes, v_{12A} = 2856		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	2856	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 15.3 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	D_S = 0.470	
Space mean speed in ramp influence area,	S_R = 51.5	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 51.5	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/13/2011
Analysis time period:	AM Peak
Freeway/Dir of Travel:	US 26 Westbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2035
Description:	Westbound 2-lane Off-ramp to Southbound Brookwood

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3925	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	1795	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane	0	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3925		1795			vph
Peak-hour factor, PHF	0.95		0.95			
Peak 15-min volume, v15	1033		472			v
Trucks and buses	4		4			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.980	0.980	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	4214	1927	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 4214 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	4214	4600	No
$v_{FO} = v_F - v_R$	2287	4600	No
v_R	1927	3800	No
$v_{3\ or\ av34}$ v_{av34}	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3\ or\ av34}$ v_{av34} > 2700 pc/h?		No	
Is $v_{3\ or\ av34}$ v_{av34} > 1.5 v_{12}/2		No	
If yes, v_{12A} = 4214		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	4214	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 13.5 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	D_S = 0.601	
Space mean speed in ramp influence area,	S_R = 49.2	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 49.2	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/14/2011
Analysis time period:	AM Peak Period
Freeway/Dir of Travel:	US 26 Westbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2035
Description: Westbound	On-ramp from Brookwood

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2035	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	90	vph
Length of first accel/decel lane	410	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2035	90		vph
Peak-hour factor, PHF	0.95	0.95		
Peak 15-min volume, v15	536	24		v
Trucks and buses	4	4		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.980	0.980	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	2185	97	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2185 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2282	4600	No
v_3 or v_{av34}	0 pc/h	(Equation 25-4 or 25-5)	
Is v_3 or v_{av34} > 2700 pc/h?		No	
Is v_3 or v_{av34} > 1.5 v_{12}/2		No	
If yes, v_{12A} = 2185		(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	2185	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 20.7 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	M_S = 0.331	
Space mean speed in ramp influence area,	S_R = 54.1	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 54.1	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/13/2011
Analysis time period:	PM Peak
Freeway/Dir of Travel:	US 26 Eastbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2035
Description:	Eastbound - Off-ramp to Brookwood

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2975	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	130	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	2975		130			vph
Peak-hour factor, PHF	0.95		0.95			
Peak 15-min volume, v15	783		34			v
Trucks and buses	1		1			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.995	0.995	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3147	138	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3147 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3147	4600	No
$v_{FO} = v_F - v_R$	3009	4600	No
v_R	138	2000	No
$v_{3\ or\ av34}$ $v_{3\ or\ av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3\ or\ av34}$ $v_{3\ or\ av34}$ > 2700 pc/h?		No	
Is $v_{3\ or\ av34}$ $v_{3\ or\ av34}$ > 1.5 v_{12} /2		No	
If yes, v_{12A} = 3147		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	3147	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 17.8 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	D_S = 0.440	
Space mean speed in ramp influence area,	S_R = 52.1	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 52.1	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/14/2011
Analysis time period:	PM Peak Period
Freeway/Dir of Travel:	US 26 Eastbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2035
Description: Eastbound	On-ramp from Brookwood

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2845	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	800	vph
Length of first accel/decel lane	410	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2845	800		vph
Peak-hour factor, PHF	0.95	0.95		
Peak 15-min volume, v15	749	211		v
Trucks and buses	1	1		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.995	0.995	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3010	846	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 3010 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	3856	4600	No
$v_{3\ or\ av34}$	0 pc/h	(Equation 25-4 or 25-5)	
Is $v_{3\ or\ av34}$ > 2700 pc/h?		No	
Is $v_{3\ or\ av34}$ > 1.5 v_{12}/2		No	
If yes, v_{12A} = 3010		(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	3010	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 32.6 pc/mi/ln

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable,	M_S = 0.477	
Space mean speed in ramp influence area,	S_R = 51.4	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 51.4	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/13/2011
Analysis time period:	PM Peak
Freeway/Dir of Travel:	US 26 Westbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2035
Description:	Westbound 1-lane Off-ramp to Northbound Helvetia

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3700	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	100	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3700		100			vph
Peak-hour factor, PHF	0.95		0.95			
Peak 15-min volume, v15	974		26			v
Trucks and buses	1		3			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.995	0.985	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3914	107	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3914 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3914	4600	No
$v_{FO} = v_F - v_R$	3807	4600	No
v_R	107	2000	No
$v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3 \text{ or } av34} > 2700$ pc/h?		No	
Is $v_{3 \text{ or } av34} > 1.5\, v_{12}/2$		No	
If yes, v_{12A} = 3914		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	3914	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 24.4 pc/mi/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,	D_S = 0.438	
Space mean speed in ramp influence area,	S_R = 52.1	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 52.1	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/13/2011
Analysis time period:	PM Peak
Freeway/Dir of Travel:	US 26 Westbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2035
Description:	Westbound 2-lane Off-ramp to Southbound Brookwood

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	3600	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	745	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane	0	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	3600		745			vph
Peak-hour factor, PHF	0.95		0.95			
Peak 15-min volume, v15	947		196			v
Trucks and buses	1		3			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	mi	0.00	mi		mi
Trucks and buses PCE, ET	1.5		1.5			
Recreational vehicle PCE, ER	1.2		1.2			

Heavy vehicle adjustment, fHV	0.995	0.985	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3808	796	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 3808 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3808	4600	No
$v_{FO} = v_F - v_R$	3012	4600	No
v_R	796	3800	No
$v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3 \text{ or } av34} > 2700$ pc/h?		No	
Is $v_{3 \text{ or } av34} > 1.5\, v_{12}/2$		No	
If yes, v_{12A} = 3808		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	3808	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 10.0+ pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	D_S = 0.500	
Space mean speed in ramp influence area,	S_R = 51.0	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 51.0	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	Josh Anderson
Agency/Co.:	David Evans & Associates, Inc.
Date performed:	10/14/2011
Analysis time period:	PM Peak Period
Freeway/Dir of Travel:	US 26 Westbound
Junction:	Brookwood Interchange
Jurisdiction:	ODOT
Analysis Year:	2035
Description: Westbound	On-ramp from Brookwood

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	60.0	mph
Volume on freeway	2855	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	425	vph
Length of first accel/decel lane	410	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2855	425		vph
Peak-hour factor, PHF	0.95	0.95		
Peak 15-min volume, v15	751	112		v
Trucks and buses	1	3		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.995	0.985	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	3020	454	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 3020 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	3474	4600	No
$v_{3\ or\ av34}$	0 pc/h	(Equation 25-4 or 25-5)	
Is $v_{3\ or\ av34}$ > 2700 pc/h?		No	
Is $v_{3\ or\ av34}$ > 1.5 v_{12}/2		No	
If yes, v_{12A} = 3020		(Equation 25-8)	

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	3020	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 29.8 pc/mi/ln

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable,	M_S = 0.418	
Space mean speed in ramp influence area,	S_R = 52.5	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 52.5	mph

Appendix D:
Raw Crash Data

US-26 SPIS Sites
July 22, 2011
Brookwood Boulevard IAMP - JTA specific analysis

Route	Start_MP	End_MP	ADT	Total_Crashes	Fatal	Inj A	Inj B	Inj C	PDO	City	County	Percentile	SPIS_Score	Hwy	Rdwy	SPIS_Group
US-26	59.43	59.52	42100	3	0	0	1	0	2		WASHINGTON	0	9.67	47	1	443900
US-26	59.44	59.53	42100	3	0	0	1	0	2		WASHINGTON	0	9.67	47	1	443900
US-26	59.45	59.54	42100	3	0	0	1	0	2		WASHINGTON	0	9.67	47	1	443900
US-26	59.46	59.55	42100	3	0	0	1	0	2		WASHINGTON	0	9.67	47	1	443900
US-26	59.47	59.56	42100	3	0	0	1	0	2		WASHINGTON	0	9.67	47	1	443900
US-26	59.79	59.88	42100	3	0	0	1	0	2		WASHINGTON	0	9.67	47	1	443901
US-26	59.80	59.89	42100	3	0	0	1	0	2		WASHINGTON	0	9.67	47	1	443901
US-26	59.81	59.90	42100	3	0	0	1	0	2		WASHINGTON	0	9.67	47	1	443901
US-26	59.82	59.91	42100	3	0	0	1	0	2		WASHINGTON	0	9.67	47	1	443901
US-26	59.83	59.92	42100	3	0	0	1	0	2		WASHINGTON	0	9.67	47	1	443901
US-26	60.76	60.85	42100	3	0	0	1	2	0		WASHINGTON	15	12.67	47	1	443902
US-26	60.77	60.86	42100	3	0	0	1	2	0		WASHINGTON	15	12.67	47	1	443902
US-26	61.83	62.00	55000	3	0	0	1	0	2		WASHINGTON	25	14.43	47	1	443985
US-26	61.84	62.01	55000	3	0	0	1	0	2		WASHINGTON	25	14.43	47	1	443985
US-26	61.85	62.02	55000	3	0	0	1	0	2		WASHINGTON	25	14.43	47	1	443985
US-26	61.94	62.03	55000	3	0	0	1	0	2		WASHINGTON	25	14.43	47	1	443985
US-26	61.95	62.04	55000	3	0	0	1	0	2		WASHINGTON	25	14.43	47	1	443985
US-26	61.96	62.05	55000	3	0	0	1	0	2		WASHINGTON	25	14.43	47	1	443985
US-26	61.97	62.06	55000	3	0	0	1	0	2		WASHINGTON	25	14.43	47	1	443985
US-26	61.98	62.07	55000	3	0	0	1	0	2		WASHINGTON	25	14.43	47	1	443985
US-26	61.99	62.08	55000	3	0	0	1	0	2		WASHINGTON	30	14.95	47	1	443985
US-26	62.01	62.10	55000	3	0	0	0	2	1		WASHINGTON	5	10.99	47	1	443903
US-26	62.02	62.11	55000	3	0	0	0	2	1		WASHINGTON	5	10.99	47	1	443903
US-26	62.03	62.12	55000	4	0	0	0	2	2		WASHINGTON	15	12.46	47	1	443903
US-26	62.04	62.13	55000	4	0	0	0	2	2		WASHINGTON	15	12.46	47	1	443903
US-26	62.05	62.14	55000	4	0	0	0	2	2		WASHINGTON	15	12.46	47	1	443903
US-26	62.06	62.15	55000	4	0	0	0	2	2		WASHINGTON	15	12.46	47	1	443903
US-26	62.07	62.16	55000	4	0	0	0	2	2		WASHINGTON	15	12.46	47	1	443903
US-26	62.08	62.17	55000	4	0	0	0	2	2		WASHINGTON	15	12.46	47	1	443903
US-26	62.09	62.18	55000	3	0	0	0	1	2		WASHINGTON	0	9.49	47	1	443903
US-26	62.10	62.19	55000	3	0	0	0	1	2		WASHINGTON	0	9.49	47	1	443903
US-26	62.35	62.44	55000	3	0	0	0	1	2		WASHINGTON	0	9.49	47	1	443904
US-26	62.36	62.45	55000	5	0	0	0	3	2		WASHINGTON	30	15.22	47	1	443904
US-26	62.37	62.46	55000	5	0	0	0	3	2		WASHINGTON	30	15.22	47	1	443904
US-26	62.38	62.47	55000	6	0	0	0	3	3		WASHINGTON	35	16.34	47	1	443904
US-26	62.39	62.48	55000	8	0	1	0	4	3		WASHINGTON	85	36.28	47	1	443904
US-26	62.40	62.49	55000	8	0	1	0	4	3		WASHINGTON	85	36.28	47	1	443904
US-26	62.41	62.50	55000	8	0	1	0	4	3		WASHINGTON	85	36.28	47	1	443904
US-26	62.42	62.51	55000	9	0	1	0	4	4		WASHINGTON	85	37.14	47	1	443904
US-26	62.43	62.52	55000	9	0	1	0	4	4		WASHINGTON	85	37.14	47	1	443904
US-26	62.44	62.53	55000	9	0	1	0	4	4		WASHINGTON	85	37.14	47	1	443904
US-26	62.45	62.54	55000	6	0	1	0	3	2		WASHINGTON	80	32.84	47	1	443904
US-26	62.46	62.55	55000	5	0	1	1	1	2		WASHINGTON	75	30.22	47	1	443904
US-26	62.47	62.56	74500	5	0	1	1	1	2		WASHINGTON	75	29.98	47	1	443904
US-26	62.48	62.57	74500	4	0	1	1	1	1		WASHINGTON	70	28.77	47	1	443904
US-26	62.66	62.75	74500	3	0	0	0	1	2		WASHINGTON	0	9.34	47	1	443905
US-26	62.67	62.76	74500	3	0	0	0	1	2		WASHINGTON	0	9.34	47	1	443905
US-26	62.68	62.77	74500	3	0	0	0	1	2		WASHINGTON	0	9.34	47	1	443905
US-26	62.69	62.78	74500	3	0	0	0	1	2		WASHINGTON	0	9.34	47	1	443905
US-26	62.70	62.79	74500	3	0	0	0	1	2		WASHINGTON	0	9.34	47	1	443905
US-26	62.71	62.80	74500	3	0	0	0	1	2		WASHINGTON	0	9.34	47	1	443905
US-26	62.88	62.97	74500	1	1	0	0	0	0		WASHINGTON	50	20.27	47	1	443906
US-26	62.89	62.98	74500	1	1	0	0	0	0		WASHINGTON	50	20.27	47	1	443906
US-26	62.90	62.99	74500	1	1	0	0	0	0		WASHINGTON	50	20.27	47	1	443906
US-26	62.91	63.00	74500	2	1	0	0	0	1		WASHINGTON	55	22.59	47	1	443906
US-26	62.92	63.01	74500	3	1	0	1	0	1		WASHINGTON	65	25.84	47	1	443906
US-26	62.93	63.02	74500	3	1	0	1	0	1		WASHINGTON	65	25.84	47	1	443906
US-26	62.94	63.03	74500	3	1	0	1	0	1		WASHINGTON	65	25.84	47	1	443906
US-26	62.95	63.04	74500	3	1	0	1	0	1		WASHINGTON	65	25.84	47	1	443906
US-26	62.96	63.05	74500	3	1	0	1	0	1		WASHINGTON	65	25.84	47	1	443906
US-26	62.97	63.06	74500	3	1	0	1	0	1		WASHINGTON	65	25.84	47	1	443906

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
CRASH SUMMARIES BY YEAR BY COLLISION TYPE

Sunset Hwy Mainline MP 60 to MP 62 + Entire Interchange of Helvetia Road & Shute Road/ AKA 242nd Ave (Request #110408)
January 1, 2005 Through December 31, 2009

COLLISION TYPE	FATAL CRASHES	NON-FATAL CRASHES	PROPERTY DAMAGE ONLY	TOTAL CRASHES	PEOPLE KILLED	PEOPLE INJURED	TRUCKS	DRY SURF	WET SURF	DAY	DARK	INTER-SECTION	INTER-SECTION RELATED	OFF-ROAD
YEAR: 2009														
FIXED / OTHER OBJECT	0	1	0	1	0	1	0	0	1	1	0	0	0	1
REAR-END	0	2	0	2	0	4	0	2	0	1	1	1	0	0
TURNING MOVEMENTS	0	0	1	1	0	0	0	0	1	1	0	1	0	0
2009 TOTAL	0	3	1	4	0	5	0	2	2	3	1	2	0	1
YEAR: 2008														
FIXED / OTHER OBJECT	0	2	1	3	0	2	0	1	2	2	1	2	0	3
NON-COLLISION	0	1	0	1	0	1	0	1	0	1	0	1	0	0
REAR-END	0	3	1	4	0	3	0	4	0	4	0	1	0	0
2008 TOTAL	0	6	2	8	0	6	0	6	2	7	1	4	0	3
YEAR: 2007														
FIXED / OTHER OBJECT	0	1	0	1	0	1	0	0	1	0	1	0	0	1
REAR-END	0	1	2	3	0	1	0	2	1	1	2	0	0	0
SIDESWIPE - OVERTAKING	0	0	1	1	0	0	1	1	0	1	0	0	0	0
TURNING MOVEMENTS	0	0	1	1	0	0	0	0	1	1	0	1	0	0
2007 TOTAL	0	2	4	6	0	2	1	3	3	3	3	1	0	1
YEAR: 2006														
FIXED / OTHER OBJECT	0	0	1	1	0	0	0	0	1	0	1	0	0	1
REAR-END	0	4	4	8	0	8	0	6	2	6	2	2	0	0
SIDESWIPE - OVERTAKING	0	1	0	1	0	1	1	1	0	1	0	0	0	0
TURNING MOVEMENTS	0	0	2	2	0	0	0	2	0	2	0	2	0	0
2006 TOTAL	0	5	7	12	0	9	1	9	3	9	3	4	0	1
YEAR: 2005														
FIXED / OTHER OBJECT	0	0	2	2	0	0	1	1	1	1	1	0	0	1
REAR-END	0	5	3	8	0	10	0	7	1	7	1	1	0	0
SIDESWIPE - OVERTAKING	0	1	0	1	0	1	0	0	1	0	1	0	0	0
2005 TOTAL	0	6	5	11	0	11	1	8	3	8	3	1	0	1
FINAL TOTAL	0	22	19	41	0	33	3	28	13	30	11	12	0	7

Note: Legislative changes to DMV's vehicle crash reporting requirements, effective 01/01/2004, may result in fewer property damage only crashes being eligible for inclusion in the Statewide Crash Data File.

047 SUNSET

Sunset Hwy Mainline MP 60 to MP 62 + Entire Interchange of Helvetia Road & Shute Road/ AKA 242nd Ave (Request #110408)
January 1, 2005 Through December 31, 2009

SER# INVEST	SPED	ALCS	DRUG	SCHL	WORK	DATE DAY TIME	COUNTY CITY URBAN AREA	RD# COMPNT MLG MILEPNT	FC TYP	CONN # FIRST SECOND	STREET STREET	RD CHAR DIRECT LOCTN	INT-TYP (MEDIAN) LEGS (#LANES)	INT-REL TRAF-CNTL	OFFRD RNDBT DRVWY	WTHR SURF LIGHT	CRASH TYP COLL TYP SVRTY	V#	SPCL USE TRLR QTY OWNER VEH TYPE	MOVE FROM TO	P#	PRTC TYPE	INJ SVRTY	AGE	SEX	LICNS RES	PED LOC	ERROR	ACTN	EVENT	CAUSE
06432	N	N	N			10/27/2006	WASHINGTON	1	02			STRGHT		N	N	CLR	S-STRGHT	01	NONE 9	STRGHT										012	13
NO RPT						Fri		0	0			UN	(DIVMD)	ONE-WAY	N	DRY	REAR		PRVTE	W E									000		00
						3P		60.06				03			N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	00	F	OR-Y		042	025		16
													(04)													OR>25					
																		02	NONE 1	STRGHT											
																			PRVTE	W E									000	012	00
																			PSNGR CAR		01	DRVR	NONE	34	M	OR-Y		000	000		00
																										OR<25					
01303	Y	N	N	N	N	03/04/2006	WASHINGTON	2	02			STRGHT		N	N	RAIN	S-STRGHT	01	NONE 0	STRGHT											27,07,01
CITY						Sat		0	0			W	(DIVMD)	ONE-WAY	N	WET	REAR		PRVTE	SE NW									000		00
						11P		60.06				03			N	DARK	INJ		PSNGR CAR		01	DRVR	NONE	27	M	OR-Y		042,043,047	038		27
													(04)													OR<25					
																		02	NONE 0	STRGHT											
																			PRVTE	SE NW									006		00
																			PSNGR CAR		01	DRVR	INJC	26	M	OR-Y		000	000		00
																										OR>25					
06089	N	N	N			10/07/2005	WASHINGTON	1	02			STRGHT		N	N	UNK	S-1STOP	01	UNKN 9	STRGHT											07
NO RPT						Fri		0	0			UN	(DIVMD)	ONE-WAY	N	WET	REAR		UNKN	NW SE									000		00
						6A		60.56				04			N	DARK	PDO		PSNGR CAR		01	DRVR	NONE	00	M	UNK		026	000		07
													(04)													UNK					
																		02	NONE 0	STOP											
																			PRVTE	NW SE									011		00
																			PSNGR CAR		01	DRVR	NONE	52	M	OR-Y		000	000		00
																										OR<25					
02965	Y	N	N	N	N	05/30/2005	WASHINGTON	1	02			STRGHT		N	N	CLD	S-STRGHT	01	NONE 0	STRGHT										010	01,07
STATE						Mon		0	0			W	(DIVMD)	ONE-WAY	N	DRY	REAR		PRVTE	E W									000		00
						10A		60.61				04			N	DAY	INJ		PSNGR CAR		01	DRVR	NONE	42	F	OR-Y		042,052,043	025		01,07
													(04)													OR<25					
																		02	NONE 1	STRGHT											
																			PRVTE	E W									000	010	00
																			PSNGR CAR		01	DRVR	INJC	17	M	OR-Y		000	000		00
																										OR<25					
																					02	PSNG	INJC	17	M			000	000		00
04936	N	N	N			08/19/2005	WASHINGTON	2	02			STRGHT		N	N	CLR	S-1STOP	01	NONE	STRGHT											07
NONE						Fri		0	0			UN	(DIVMD)	UNKNOWN	N	DRY	REAR		PRVTE	E W									000		00
						3P		60.67				03			N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	00	M	OTH-Y		026	000		07
													(04)													N-RES					
																		02	NONE	STOP											
																			PRVTE	E W									011		00
																			PSNGR CAR		01	DRVR	NONE	47	M	OR-Y		000	000		00
																										OR<25					

047 SUNSET Sunset Hwy Mainline MP 60 to MP 62 + Entire Interchange of Helvetia Road & Shute Road/ AKA 242nd Ave (Request #110408)
January 1, 2005 Through December 31, 2009

SER# INVEST	SPED	ALCS	DRUG	SCHL	WORK	DATE DAY TIME	COUNTY CITY URBAN AREA	RD# COMPNT MLG MILEPNT	FC TYP	CONN # FIRST SECOND	STREET STREET	RD CHAR DIRECT LOCTN	INT-TYP (MEDIAN) LEGS (#LANES)	INT-REL TRAF-CNTL	OFFRD RNDBT DRVWY	WTHR SURF LIGHT	CRASH TYP COLL TYP SVRTY	V#	SPCL USE TRLR QTY OWNER VEH TYPE	MOVE FROM TO	P#	PRTC TYPE	INJ SVRTY	AGE	SEX	LICNS RES	PED LOC	ERROR	ACTN	EVENT	CAUSE
01514	Y	N	N	N	N	03/19/2008	WASHINGTON	1	02			STRGHT		N	Y	CLD	FIX OBJ	01	NONE 0	STRGHT										079,010,093	27,30
COUNTY						Wed		0	0			UN	(DIVMD)	ONE-WAY	N	DRY	FIX		PRVTE	W E									000	079,010	00
						3P		60.77				01			N	DAY	INJ		PSNGR CAR		01	DRVR	INJB	41	M	OR-Y		016,050,081	038		27,30
													(04)													OR<25					
04208	N	N	N			08/28/2009	WASHINGTON	2	02			STRGHT		N	Y	RAIN	FIX OBJ	01	NONE 0	STRGHT										079,092	26
NO RPT						Fri		0	0			UN	(DIVMD)	ONE-WAY	N	WET	FIX		PRVTE	E W									007	079,092	26
						4P		60.81				03			N	DAY	INJ		PSNGR CAR		01	DRVR	INJC	22	M	OTH-Y		080,081,083	088		26
													(04)													N-RES					
02200	N	N	N			04/20/2009	WASHINGTON	1	02			STRGHT		N	N	CLR	S-1STOP	01	NONE 0	STRGHT										013	07
NO RPT						Mon		0	0			UN	(DIVMD)	ONE-WAY	N	DRY	REAR		PRVTE	W E									000		00
						4P		60.85				04			N	DAY	INJ		PSNGR CAR		01	DRVR	NONE	65	M	OR-Y		026	000		07
													(04)													OR<25					
																		02	NONE 0	STOP											
																			PRVTE	W E									011	013	00
																			PSNGR CAR		01	DRVR	INJC	58	M	OR-Y		000	000		00
																										OR<25					
																		03	NONE 0	STOP											
																			PRVTE	W E									022		00
																			PSNGR CAR		01	DRVR	NONE	26	M	OR-Y		000	000		00
																										OR<25					
03366	N	N	N			06/19/2005	WASHINGTON	1	02			STRGHT		N	N	CLR	S-STRGHT	01	NONE 0	STRGHT										012	07
NONE						Sun		0	0			W	(DIVMD)	ONE-WAY	N	DRY	REAR		RENTL	W E									000		00
						3P		60.85				03			N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	27	M	OTH-Y		042	000		07
													(04)													N-RES					
																		02	NONE 1	STRGHT											
																			PRVTE	W E									000	012	00
																			PSNGR CAR		01	DRVR	NONE	54	M	OR-Y		000	000		00
																										OR<25					
08111	Y	N	N			12/26/2007	WASHINGTON	2	02			STRGHT		N	Y	CLR	FIX OBJ	01	NONE 0	STRGHT										079,124	01
NO RPT						Wed		0	0			UN	(DIVMD)	ONE-WAY	N	ICE	FIX		PRVTE	E W									000	079,124	00
						5A		61.00				06			N	DARK	INJ		PSNGR CAR		01	DRVR	INJB	33	M	OTH-Y		047,080	017		01
													(04)													N-RES					
04196	N	N	N		Y	07/22/2005	WASHINGTON	2	02			STRGHT		N	N	CLD	S-1STOP	01	NONE 0	STRGHT											07
STATE						Fri		0	0			E	(DIVMD)	ONE-WAY	N	DRY	REAR		PRVTE	SE NW									000		00
						2P		61.02				03			N	DAY	INJ		PSNGR CAR		01	DRVR	INJA	75	F	OR-Y		026	000		07
													(04)													OR>25					
																		02	NONE 0	STOP											
																			PRVTE	SE NW									011		00
																			PSNGR CAR		01	DRVR	INJC	48	M	OR-Y		000	000		00
																										OR<25					
																					02	PSNG	INJC	45	F			000	000		00

047 SUNSET Sunset Hwy Mainline MP 60 to MP 62 + Entire Interchange of Helvetia Road & Shute Road/ AKA 242nd Ave (Request #110408)
January 1, 2005 Through December 31, 2009

SER# INVEST	SPED	ALCS	DRUG	SCHL	WORK	DATE DAY TIME	COUNTY CITY URBAN AREA	RD# COMPNT MLG MILEPNT	FC TYP	CONN # FIRST STREET SECOND STREET	RD CHAR DIRECT LOCTN	INT-TYP (MEDIAN) LEGS (#LANES)	INT-REL TRAF-CNTL	OFFRD RNDBT DRVWY	WTHR SURF LIGHT	CRASH TYP COLL TYP SVRTY	V#	SPCL USE TRLR QTY OWNER VEH TYPE	MOVE FROM TO	P#	PRTC TYPE	INJ SVRTY	AGE	SEX	LICNS RES	PED LOC	ERROR	ACTN	EVENT	CAUSE
04756	N	N	N		Y	08/15/2005	WASHINGTON	2	02		STRGHT		N	N	CLR	S-1STOP	01	NONE 0	STRGHT											27
STATE						Mon		0	0		E	(DIVMD)	ONE-WAY	N	DRY	REAR		PRVTE	SE NW									000		00
						11A		61.04			04			N	DAY	INJ		PSNGR CAR		01	DRVR	INJB	39	F	OR-Y		026,016	038		27
												(04)													OR>25					
																	02	NONE 0	STOP											
																		PRVTE	SE NW									011		00
																		PSNGR CAR		01	DRVR	INJC	49	M	OTH-Y		000	000		00
																									N-RES					
04534	N	N	N	N	N	08/06/2007	WASHINGTON	2	12		STRGHT		N	N	CLD	S-STRGHT	01	NONE 0	STRGHT											13
CITY						Mon	HILLSBORO	0	0	SUNSET HY	E	(DIVMD)	ONE-WAY	N	DRY	SS-O		PRVTE	E W									000		00
						9A	PORTLAND UA	61.29		WB EX SHUTE RD C4	04			N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	59	M	OTH-Y		045	000		13
												(05)													N-RES					
																	02	NONE 0	STRGHT											
																		PRVTE	E W									000		00
																		TRUCK		01	DRVR	NONE	34	F	OR-Y		000	000		00
																									OR>25					
02939	N	Y	N	N	N	05/21/2006	WASHINGTON	1	12		STRGHT		N	N	RAIN	S-STRGHT	01	NONE 0	STRGHT										079,058	07,33
STATE						Sun	HILLSBORO	0	0	SUNSET HY	UN	(DIVMD)	ONE-WAY	N	WET	REAR		PRVTE	W E									001	079,058	00
						4P	PORTLAND UA	61.55		EB EF 242ND AVE C3	03			N	DAY	INJ		PSNGR CAR		01	DRVR	NONE	55	F	OTH-Y		051,042	088		07,33
												(04)													N-RES					
																	02	NONE 0	STRGHT											
																		PRVTE	W E									006		00
																		PSNGR CAR		01	DRVR	INJC	17	F	OR-Y		000	000		00
																									OR<25					
																				02	PSNG	INJC	41	F			000	000		00
																				03	PSNG	INJC	18	M			000	000		00
02358	N	N	N			04/29/2005	WASHINGTON	1	12		STRGHT		N	N	CLR	S-1STOP	01	NONE 0	STRGHT										013	07
NONE						Fri	HILLSBORO	0	0	SUNSET HY	E	(DIVMD)	L-GRN-SIG	N	DRY	REAR		PRVTE	W E									000		00
						3P	PORTLAND UA	61.97		EB EX 185TH AVE C1	06			N	DAY	INJ		PSNGR CAR		01	DRVR	NONE	37	M	OTH-Y		026	000		07
												(04)													N-RES					
																	02	NONE 0	STOP											
																		PRVTE	W E									011	013	00
																		PSNGR CAR		01	DRVR	INJC	45	F	OR-Y		000	000		00
																									OR<25					
																				02	PSNG	INJC	10	F			000	000		00
																	03	NONE 0	STOP											
																		PRVTE	W E									011		00
																		PSNGR CAR		01	DRVR	NONE	41	M	OR-Y		000	000		00
																									OR<25					
02438	N	N	N			04/28/2006	WASHINGTON	1	12		STRGHT		N	N	CLR	S-STRGHT	01	NONE 1	STRGHT										079	13
NO RPT						Fri	HILLSBORO	0	0	SUNSET HY	W	(DIVMD)	ONE-WAY	N	DRY	SS-O		PRVTE	W E									000		00
						2P	PORTLAND UA	62.00		WB EF CORNLS PAS C5	04			N	DAY	INJ		SEMI TOW		01	DRVR	NONE	49	M	OR-Y		045	000		13
												(04)													OR>25					

047 SUNSET Sunset Hwy Mainline MP 60 to MP 62 + Entire Interchange of Helvetia Road & Shute Road/ AKA 242nd Ave (Request #110408)
January 1, 2005 Through December 31, 2009

SER# INVEST	SPEED	ALCOHOL	DRUG	SCHOOL	WORK	DATE DAY TIME	COUNTY CITY URBAN AREA	RD# FC COMPNT MLG TYP MILEPNT	CONN # FIRST STREET SECOND STREET	RD CHAR DIRECT LOCTN	INT-TYP (MEDIAN) LEGS (#LANES)	INT-REL TRAF-CNTL	OFFRD RNDBT DRVWY	WTHR SURF LIGHT	CRASH TYP COLL TYP SVRTY	V#	SPCL USE TRLR QTY OWNER VEH TYPE	MOVE FROM TO	P#	PRTC TYPE	INJ SVRTY	AGE	SEX	LICNS RES	PED LOC	ERROR	ACTN	EVENT	CAUSE
																02	NONE 0 PRVTE PSNGR CAR	STRGHT W E	01	DRVR	INJC	35	F	OR-Y OR<25	000	000	079	00 00
05059 NONE	N	N	N			08/31/2006 Thu 6P	WASHINGTON HILLSBORO PORTLAND UA	1 12 0 0 62.00	SUNSET HY EB EX CORNLS PASS	STRGHT NW 03	N (DIVMD) (04)	ONE-WAY	N CLR N DRY N DAY	S-STRGHT REAR PDO	01	NONE 9 RENTL PSNGR CAR	STRGHT NW SE	01	DRVR	NONE	00	M	OTH-Y N-RES	042	000	000		07 00 07
																02	NONE 0 RENTL PSNGR CAR	STRGHT NW SE	01	DRVR	NONE	56	M	OR-Y OR<25	000	000		00 00
02321 NONE	Y	N	N			04/21/2006 Fri 3A	WASHINGTON	1 09 6 0 60.85	1	STRGHT UN 01	N (NONE) (02)	ONE-WAY	Y CLD N WET N DARK	FIX OBJ FIX PDO	01	NONE PRVTE PSNGR CAR	STRGHT W E	01	DRVR	NONE	27	M	OR-Y OR<25	047,081	000 017	046 045		01 00 01
02203 NONE	N	N	N			04/21/2005 Thu 6P	WASHINGTON	1 09 6 0 60.90	1	STRGHT UN 03	N (NONE) (02)	L-GRN-SIG	N CLR N DRY N DAY	OTH OBJ FIX PDO	01	NONE 1 UNKN SEMI TOW	STRGHT NW SE	01	DRVR	NONE	00	U	UNK UNK	017	000	028 028		10 00 10
																02	NONE 0 PRVTE PSNGR CAR	STRGHT NW SE	01	DRVR	NONE	36	F	OR-Y OR<25	000	000		00 00
02400 CITY	N	N	N	N	N	05/06/2008 Tue 8A	WASHINGTON	1 09 6 0 60.90	1	STRGHT UN 03	N (NONE) (01)	ONE-WAY	N CLD N DRY N DAY	S-1STOP REAR INJ	01	NONE 0 PRVTE PSNGR CAR	STRGHT W E	01	DRVR	INJB	32	M	OR-Y OR<25	043,026	001 000		07 00 07
																02	NONE 0 PRVTE PSNGR CAR	STOP W E	01	DRVR	NONE	62	M	OTH-Y N-RES	000	011 000		00 00
07447 CITY	N	N	N	N	N	12/06/2007 Thu 5P	WASHINGTON PORTLAND UA	1 16 6 0 61.04	2	STRGHT UN 03	N (NONE) (04)	NONE	N CLD N WET N DLIT	S-1STOP REAR INJ	01	NONE 0 PRVTE PSNGR CAR	STRGHT S N	01	DRVR	NONE	34	F	OR-Y OR<25	026	000 000		07 00 07
																02	NONE 0 PRVTE PSNGR CAR	STOP S N	01	DRVR	INJC	52	F	OR-Y OR<25	000	011 000		00 00
03260 CITY	N	N	N	N	N	06/06/2006 Tue 5P	WASHINGTON HILLSBORO PORTLAND UA	1 16 6 0 61.05	2 NW 242ND AVE EB EF 242ND AVE C3	GRADE S 03	N (RSDMD) (04)	ONE-WAY	N CLR N DRY N DAY	S-1STOP REAR PDO	01	NONE 0 RENTL PSNGR CAR	STRGHT S N	01	DRVR	NONE	66	F	OTH-Y N-RES	026,043	001 000	013		07 00 07

047 SUNSET Sunset Hwy Mainline MP 60 to MP 62 + Entire Interchange of Helvetia Road & Shute Road/ AKA 242nd Ave (Request #110408)
January 1, 2005 Through December 31, 2009

SER# INVEST	SPEED	DARK	SALC	SUCL	WHGT	OTHR	DATE DAY TIME	COUNTY CITY URBAN AREA	RD# COMPNT MLG MILEPNT	FC TYP	CONN # FIRST STREET SECOND STREET	RD CHAR DIRECT LOCTN	INT-TYP (MEDIAN) LEGS (#LANES)	INT-REL TRAF-CNTL	OFFRD RNDBT DRVWY	WTHR SURF LIGHT	CRASH TYP COLL TYP SVRTY	V#	SPCL USE TRLR QTY OWNER VEH TYPE	MOVE FROM TO	P#	PRTC TYPE	INJ SVRTY	AGE	SEX	LICNS RES	PED LOC	ERROR	ACTN	EVENT	CAUSE
																		02	NONE 0 PRVTE PSNGR CAR	STOP S N	01	DRVR	NONE	25	M	OR-Y OR<25	000	011 000	013	00 00
																		03	NONE 0 PRVTE PSNGR CAR	STOP S N	01	DRVR	NONE	40	M	OR-Y OR<25	000	022 000		00 00
06958 CITY	N	N	N	N	N		11/13/2007 Tue 5P	WASHINGTON HILLSBORO PORTLAND UA	1 6 61.06	16 0	2 NW 242ND AVE NW MEEK RD	GRADE N 03	(NONE) (02)	N NONE	N N N	CLR DRY DLIT	S-1STOP REAR PDO	01	NONE 0 PRVTE PSNGR CAR	STRGHT S N	01	DRVR	NONE	25	M	OR-Y OR<25	016,026,052	000 038	013	27,32 00 27,32
																		02	NONE 0 PRVTE PSNGR CAR	STOP S N	01	DRVR	NONE	37	M	OR-Y OR<25	000	011 000	013	00 00
																		03	NONE 0 PRVTE PSNGR CAR	STOP S N	01	DRVR	NONE	34	M	OTH-Y OR<25	000	022 000	013	00 00
																		04	UNKN 9 UNKN PSNGR CAR	STOP S N	01	DRVR	NONE	00	M	UNK UNK	000	022 000		00 00
03611 NO RPT	N	N	N				07/08/2008 Tue 8A	WASHINGTON HILLSBORO PORTLAND UA	1 6 61.07	16 0	2 NW 242ND AVE NW MEEK RD	STRGHT N 03	(NONE) (02)	N UNKNOWN	N N N	CLR DRY DAY	S-1STOP REAR PDO	01	NONE 0 PRVTE PSNGR CAR	STRGHT S N	01	DRVR	NONE	36	F	OR-Y OR<25	026	000 000		07 00 07
																		02	NONE 0 PRVTE PSNGR CAR	STOP S N	01	DRVR	NONE	49	M	OR-Y OR<25	000	011 000		00 00
03414 CITY	N	N	N	N	N		06/29/2008 Sun 8P	WASHINGTON HILLSBORO PORTLAND UA	1 6 61.08	19 0	3 NW SHUTE RD EB EF SHUTE RD C3	INTER E 06	CROSS 2	N YIELD	Y N N	CLD WET DUSK	FIX OBJ FIX PDO	01	NONE 0 PRVTE PSNGR CAR	TURN-R S E	01	DRVR	NONE	17	M	OR-Y OR<25	080,081	007 017	043,092,040 043,040,092	26 26 26
01342 NONE	N	N	N				03/14/2005 Mon 9A	WASHINGTON HILLSBORO PORTLAND UA	1 6 61.09	12 0	1 NW 242ND AVE EB EX 242ND AVE C1	INTER CN 02	CROSS 1	N STOP SIGN	N N N	CLR DRY DAY	S-1TURN REAR INJ	01	NONE 0 PRVTE PSNGR CAR	TURN-L NW N	01	DRVR	INJC	49	F	OR-Y OR<25	042	000 000	092	07 00 07
																		02	NONE 0 PRVTE PSNGR CAR	TURN-L NW N	01	DRVR	NONE	37	M	OR-Y OR>25	000	013 000	092	00 00

047 SUNSET Sunset Hwy Mainline MP 60 to MP 62 + Entire Interchange of Helvetia Road & Shute Road/ AKA 242nd Ave (Request #110408)
January 1, 2005 Through December 31, 2009

SER# INVEST	SPED	ALCS	DRUG	SCHL	WORK	DATE DAY TIME	COUNTY CITY URBAN AREA	RD# COMPNT MLG MILEPNT	FC TYP	CONN # FIRST STREET SECOND STREET	RD CHAR DIRECT LOCTN	INT-TYP (MEDIAN) LEGS (#LANES)	INT-REL TRAF-CNTL	OFFRD RNDBT DRVWY	WTHR SURF LIGHT	CRASH TYP COLL TYP SVRTY	V#	SPCL USE TRLR QTY OWNER VEH TYPE	MOVE FROM TO	P#	PRTC TYPE	INJ SVRTY	AGE	SEX	LICNS RES	PED LOC	ERROR	ACTN	EVENT	CAUSE
01716	N	N	N			03/27/2006	WASHINGTON	1	16	2	INTER	CROSS	N		N CLR	S-STRGHT	01	NONE 0	STRGHT										013	27
NO RPT						Mon	HILLSBORO	6	0	NW 242ND AVE	CN		TRF SIGNAL		N DRY	REAR		PRVTE	N S								000		00
						7A	PORTLAND UA	61.09		EB EX 242ND AVE C1	06	1			N DAY	INJ		PSNGR CAR		01	DRVR	INJB	21	F	OR-Y	042	038		27
																									OR<25					
																	02	NONE 0	STRGHT											
																		PRVTE	N S								006	013	00
																		PSNGR CAR		01	DRVR	INJB	54	M	OR-Y	000	000		00
																									OR<25					
																	03	NONE 0	STRGHT											
																		PRVTE	N S								022		00
																		PSNGR CAR		01	DRVR	NONE	40	M	OR-Y	000	000		00
																									OR<25					
03986	Y	N	N	N	N	07/30/2008	WASHINGTON	1	19	3	INTER	CROSS	N		N CLD	OVERTURN	01	NONE 0	TURN-R										124	01
CITY						Wed	HILLSBORO	6	0	NW SHUTE RD	E		ONE-WAY		N DRY	NCOL		PRVTE	S E								000	124	00
						9A	PORTLAND UA	61.09		EB EF SHUTE RD C3	05	1			N DAY	INJ		MTRCYCLE		01	DRVR	INJB	25	M	OR-Y	047,080	017		01
																									OR<25					
06449	N	N	N	N	N	11/24/2008	WASHINGTON	1	16	2	GRADE		N		N CLR	S-1STOP	01	NONE 0	STRGHT										013	07
COUNTY						Mon	HILLSBORO	6	0	NW SHUTE RD	N	(NONE)	NONE		N DRY	REAR		PRVTE	N S								001		00
						8A	PORTLAND UA	61.10		EB EX SHUTE RD C1	05				N DAY	INJ		PSNGR CAR		01	DRVR	NONE	46	M	OR-Y	026	000		07
												(03)													OR<25					
																	02	NONE 0	STOP											
																		PRVTE	N S								011	013	00
																		PSNGR CAR		01	DRVR	NONE	36	F	OR-Y	000	000		00
																									OR<25					
																	03	NONE 0	STOP											
																		PRVTE	N S								022		00
																		PSNGR CAR		01	DRVR	INJC	18	F	OR-Y	000	000		00
																									OR<25					
05486	Y	N	N	N	N	09/19/2007	WASHINGTON	1	19	3	STRGHT		N		N CLR	S-1STOP	01	NONE	STRGHT											01
CITY						Wed	HILLSBORO	6	0	EB EF SHUTE RD C3	NE	(NONE)	ONE-WAY		N DRY	REAR		PRVTE	SW NE								000		00
						7A	PORTLAND UA	61.15		SUNSET HY	04				N DAY	PDO		PSNGR CAR		01	DRVR	NONE	23	F	OR-Y	026,047	026		01
												(02)													OR<25					
																	02	NONE	STOP											
																		PRVTE	SW NE								011		00
																		PSNGR CAR		01	DRVR	NONE	20	M	OR-Y	000	000		00
																									OR<25					
05360	Y	N	N	Y	Y	09/12/2006	WASHINGTON	1	19	2	INTER	CROSS	N		N CLR	S-1STOP	01	NONE	STRGHT											01
NO RPT						Tue	HILLSBORO	6	0	NW 242ND AVE	N		TRF SIGNAL		N DRY	REAR		PRVTE	N S								001		00
						7A	PORTLAND UA	61.21		WB EF 242ND AVE C5	06	2			N DAY	PDO		PSNGR CAR		01	DRVR	NONE	17	M	OR-Y	026,047	000		01
																									OR<25					
																	02	NONE	STOP											
																		PRVTE	N S								011		00
																		PSNGR CAR		01	DRVR	NONE	49	M	OR-Y	000	000		00
																									OR<25					

047 SUNSET Sunset Hwy Mainline MP 60 to MP 62 + Entire Interchange of Helvetia Road & Shute Road/ AKA 242nd Ave (Request #110408)
January 1, 2005 Through December 31, 2009

SER# INVEST	SPED	ALCS	DRSWLK	DATE DAY TIME	COUNTY CITY URBAN AREA	RD# FC COMPNT MLG TYP MILEPNT	CONN # FIRST STREET SECOND STREET	RD CHAR DIRECT LOCTN	INT-TYP (MEDIAN) LEGS (#LANES)	INT-REL TRAF-CNTL	OFFRD RNDBT DRVWY	WTHR SURF LIGHT	CRASH TYP COLL TYP SVRTY	V#	SPCL USE TRLR QTY OWNER VEH TYPE	MOVE FROM TO	P#	PRTC TYPE	INJ SVRTY	AGE	SEX	LICNS RES	PED LOC	ERROR	ACTN	EVENT	CAUSE
02777	N	N	N	05/20/2007	WASHINGTON	1 16	2	INTER	CROSS	N	N	RAIN	O-1TURN	01	NONE 0	TURN-L											02
NONE				Sun	HILLSBORO	6 0	NW 242ND AVE	CN		TRF SIGNAL	N	WET	TURN		PRVTE	S W									000		00
				9A	PORTLAND UA	61.21	WB EF SHUTE RD C5	01	2		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	25	M	OR-Y		004,028	000		02
																						OR<25					
														02	NONE 0	STRGHT											
															PRVTE	N S									000		00
															PSNGR CAR		01	DRVR	NONE	55	M	OR-Y		000	000		00
																						OR<25					
92754	Y	N	N	05/23/2008	WASHINGTON	1 16	2	INTER	CROSS	N	Y	RAIN	FIX OBJ	01	NONE 0	TURN-L										047	01,08
COUNTY				Fri	HILLSBORO	6 0	NW SHUTE RD	S		TRF SIGNAL	N	WET	FIX		PRVTE	SE S									000	047	00
				12P	PORTLAND UA	61.22	WB EX SHUTE RD C4	05	2		N	DAY	INJ		PSNGR CAR		01	DRVR	INJB	62	F	OR-Y		047,001	017		01,08
																						OR<25					
04903	N	N	N	09/14/2008	WASHINGTON	1 16	2	INTER	CROSS	N	N	CLR	S-1STOP	01	NONE 0	STRGHT											27
COUNTY				Sun	HILLSBORO	6 0	NW SHUTE RD	S		TRF SIGNAL	N	DRY	REAR		PRVTE	S N									000		00
				2P	PORTLAND UA	61.22	WB EX SHUTE RD C4	06	2		N	DAY	INJ		PSNGR CAR		01	DRVR	NONE	24	M	OR-Y		016,026	038		27
																						OR<25					
														02	NONE 0	STOP											
															PRVTE	S N									011		00
															PSNGR CAR		01	DRVR	INJB	23	F	OR-Y		000	000		00
																						OR>25					
																	02	PSNG	NO<5	01	M			000	000		00
00260	N	N	N	01/14/2009	WASHINGTON	1 16	2	INTER	CROSS	N	N	CLR	S-1STOP	01	NONE 0	STRGHT										013	07
COUNTY				Wed	HILLSBORO	6 0	NW SHUTE RD	S		TRF SIGNAL	N	DRY	REAR		PRVTE	S N									000		00
				5P	PORTLAND UA	61.22	WB EX SHUTE RD C4	06	1		N	DLIT	INJ		PSNGR CAR		01	DRVR	INJC	51	M	OR-Y		026	000		07
																						OR<25					
														02	NONE 0	STOP											
															PRVTE	S N									011	013	00
															PSNGR CAR		01	DRVR	NONE	30	F	OR-Y		000	000		00
																						OR<25					
														03	NONE 0	STOP											
															PRVTE	S N									022	013	00
															PSNGR CAR		01	DRVR	INJC	40	F	OR-Y		000	000		00
																						OR<25					
														04	NONE 0	STOP											
															PRVTE	S N									022		00
															PSNGR CAR		01	DRVR	INJC	44	M	OR-Y		000	000		00
																						OR<25					
07041	N	N	N	11/16/2006	WASHINGTON	1 16	2	INTER	CROSS	N	N	CLR	ANGL-OTH	01	NONE	STRGHT											04
NO RPT				Thu	BEAVERTON	6 0	05242 UNKNOWN NAME	CN		TRF SIGNAL	N	DRY	TURN		PRVTE	S N									000		00
				1P	PORTLAND UA	61.22	WB EXTO CEDAR HILLS	02	2		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	34	M	OR-Y		097	000		00
																						OR<25					

047 SUNSET Sunset Hwy Mainline MP 60 to MP 62 + Entire Interchange of Helvetia Road & Shute Road/ AKA 242nd Ave (Request #110408)
January 1, 2005 Through December 31, 2009

SER# INVEST	SPED	DALCS	RSUGHL	WOORK	DATE DAY TIME	COUNTY CITY URBAN AREA	RD# COMPNT MLG MILEPNT	FC TYP	CONN # FIRST STREET SECOND STREET	RD CHAR DIRECT LOCTN	INT-TYP (MEDIAN) LEGS (#LANES)	INT-REL TRAF-CNTL	OFFRD RNDBT DRVWY	WTHR SURF LIGHT	CRASH TYP COLL TYP SVRTY	V#	SPCL USE TRLR QTY OWNER VEH TYPE	MOVE FROM TO	P#	PRTC TYPE	INJ SVRTY	AGE	SEX	LICNS RES	PED LOC	ERROR	ACTN	EVENT	CAUSE
																02	NONE PRVTE PSNGR CAR	TURN-L SE S	01	DRVR	NONE	30	M	OR-Y OR<25	000	000		00 00
06045 NONE	N	N	N	Y	Y	10/11/2006 Wed 9A	WASHINGTON HILLSBORO PORTLAND UA	1 6 61.22	16 0	2 NW 242ND AVE WB EX 242ND AVE C4	INTER CN 03	CROSS 2	N ONE-WAY	N CLR N DRY N DAY	S-1TURN TURN PDO	01	NONE PRVTE PSNGR CAR	STRGHT SE NW	01	DRVR	NONE	00	M	OR-Y OR<25	003	000 000		14 00 14
																02	NONE PRVTE PSNGR CAR	TURN-L SE S	01	DRVR	NONE	69	M	OR-Y OR<25	000	000 000		00 00
01303 STATE	N	N	N	N	N	03/17/2009 Tue 11A	WASHINGTON HILLSBORO PORTLAND UA	1 6 61.22	16 0	2 NW SHUTE RD WB EX SHUTE RD C4	INTER CN 03	CROSS 1	N L-GRN-SIG	N RAIN N WET N DAY	S-1TURN TURN PDO	01	NONE 0 PRVTE PSNGR CAR	STRGHT SE NW	01	DRVR	NONE	33	M	OR-Y OR<25	003	000 000		14 00 14
																02	NONE 0 PRVTE PSNGR CAR	TURN-L SE S	01	DRVR	NONE	23	F	OTH-Y OR<25	000	000 000		00 00
01308 NO RPT	N	N	N			03/04/2006 Sat 10P	WASHINGTON HILLSBORO PORTLAND UA	1 6 61.24	19 0	4 WB EX 242ND AVE C4 SUNSET HY	STRGHT N 03	(NONE) (02)	N ONE-WAY	N CLR N DRY N DLIT	S-STRGHT REAR INJ	01	NONE 0 PRVTE PSNGR CAR	STRGHT SE NW	01	DRVR	NONE	27	M	OR-Y OR<25	042,016	000 038	010	27 00 27
																			02	PSNG	NO<5	04	F		000	000		00
																02	NONE 0 PRVTE PSNGR CAR	STRGHT SE NW	01	DRVR	INJB	41	M	OR-Y OR<25	000	006 000	010	00 00
																			02	PSNG	INJB	41	F		000	000		00
07814 NONE	N	N	N			12/13/2005 Tue 6A	WASHINGTON HILLSBORO PORTLAND UA	2 6 61.25	19 0	4 WB EX 242ND AVE C4 SUNSET HY	STRGHT W 04	(NONE) (02)	N ONE-WAY	N RAIN N WET N DARK	S-STRGHT SS-O INJ	01	NONE 0 PRVTE PSNGR CAR	STRGHT SE NW	01	DRVR	NONE	44	M	OTH-Y N-RES	045	031 088		13 00 13
																02	NONE 0 PRVTE PSNGR CAR	STRGHT SE NW	01	DRVR	INJC	60	M	OR-Y OR<25	000	000 000		00 00
00329 NONE	Y	N	N			01/15/2005 Sat 7A	WASHINGTON HILLSBORO PORTLAND UA	1 6 61.33	19 0	3 EB EF 242ND AVE C3 SUNSET HY	STRGHT SW 01	(NONE) (02)	N ONE-WAY	Y SLT N WET N DAWN	FIX OBJ FIX PDO	01	NONE PRVTE PSNGR CAR	STRGHT SW NE	01	DRVR	NONE	18	F	OR-Y OR<25	047,081	000 017	054 054	01 00 01

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
CRASH SUMMARIES BY YEAR BY COLLISION TYPE

Brookwood Pky/Helvetia Rd (AKA 242nd) Bet Schaff Rd & Huffman Rd + 265' @ All Intersections (Request #110408)
January 1, 2005 Through December 31, 2009

COLLISION TYPE	FATAL CRASHES	NON-FATAL CRASHES	PROPERTY DAMAGE ONLY	TOTAL CRASHES	PEOPLE KILLED	PEOPLE INJURED	TRUCKS	DRY SURF	WET SURF	DAY	DARK	INTER-SECTION	INTER-SECTION RELATED	OFF-ROAD
YEAR: 2009														
ANGLE	0	1	0	1	0	1	0	0	1	1	0	1	0	0
REAR-END	0	1	0	1	0	3	0	1	0	0	1	1	0	0
TURNING MOVEMENTS	0	0	1	1	0	0	0	0	1	1	0	1	0	0
2009 TOTAL	0	2	1	3	0	4	0	1	2	2	1	3	0	0
YEAR: 2008														
FIXED / OTHER OBJECT	0	1	1	2	0	1	0	0	2	1	1	2	0	2
NON-COLLISION	0	1	0	1	0	1	0	1	0	1	0	1	0	0
REAR-END	0	2	1	3	0	2	0	3	0	3	0	1	0	0
2008 TOTAL	0	4	2	6	0	4	0	4	2	5	1	4	0	2
YEAR: 2007														
REAR-END	0	2	2	4	0	2	0	3	1	1	3	1	0	0
TURNING MOVEMENTS	0	0	1	1	0	0	0	0	1	1	0	1	0	0
2007 TOTAL	0	2	3	5	0	2	0	3	2	2	3	2	0	0
YEAR: 2006														
REAR-END	0	2	2	4	0	3	0	3	1	3	1	3	0	0
TURNING MOVEMENTS	0	1	3	4	0	1	0	3	1	2	2	4	0	0
2006 TOTAL	0	3	5	8	0	4	0	6	2	5	3	7	0	0
YEAR: 2005														
MISCELLANEOUS	0	1	0	1	0	1	0	1	0	1	0	0	0	0
2005 TOTAL	0	1	0	1	0	1	0	1	0	1	0	0	0	0
FINAL TOTAL	0	12	11	23	0	15	0	15	8	15	8	16	0	2

Note: Legislative changes to DMV's vehicle crash reporting requirements, effective 01/01/2004, may result in fewer property damage only crashes being eligible for inclusion in the Statewide Crash Data File.

TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
CONTINUOUS SYSTEM CRASH LISTING

047 SUNSET

Brookwood Pky/Helvetia Rd (AKA 242nd) Bet Schaff Rd & Huffman Rd + 265' @ All Intersections (Request #110408)
January 1, 2005 Through December 31, 2009

SER# INVEST	SPED	ALCS	DRUG	SCHL	WORK	DATE DAY TIME	COUNTY CITY URBAN AREA	RD# COMPNT MLG MILEPNT	FC TYP	CONN # FIRST STREET SECOND STREET	RD CHAR DIRECT LOCTN	INT-TYP (MEDIAN) LEGS (#LANES)	INT-REL TRAF-CNTL	OFFRD RNDBT DRVWY	WTHR SURF LIGHT	CRASH TYP COLL TYP SVRTY	V#	VEH TYPE	SPCL USE TRLR QTY OWNER	MOVE FROM TO	P#	PRTC TYPE	INJ SVRTY	AGE	SEX	LICNS RES	PED LOC	ERROR	ACTN	EVENT	CAUSE
07447	N	N	N	N	N	12/06/2007	WASHINGTON	1	16	2	STRGHT		N	N	CLD	S-1STOP	01	NONE	0	STRGHT											07
CITY						Thu		6	0		UN	(NONE)	NONE	N	WET	REAR		PRVTE		S N											00
						5P	PORTLAND UA	61.04			03			N	DLIT	INJ		PSNGR CAR			01	DRVR	NONE	34	F	OR-Y		026	000		07
												(04)														OR<25					
																	02	NONE	0	STOP											
																		PRVTE		S N									011		00
																		PSNGR CAR			01	DRVR	INJC	52	F	OR-Y		000	000		00
																										OR<25					
03260	N	N	N	N	N	06/06/2006	WASHINGTON	1	16	2	GRADE		N	N	CLR	S-1STOP	01	NONE	0	STRGHT										013	07
CITY						Tue	HILLSBORO	6	0	NW 242ND AVE	S	(RSDMD)	ONE-WAY	N	DRY	REAR		RENTL		S N									001		00
						5P	PORTLAND UA	61.05		EB EF 242ND AVE C3	03			N	DAY	PDO		PSNGR CAR			01	DRVR	NONE	66	F	OTH-Y		026,043	000		07
												(04)														N-RES					
																	02	NONE	0	STOP											
																		PRVTE		S N									011	013	00
																		PSNGR CAR			01	DRVR	NONE	25	M	OR-Y		000	000		00
																										OR<25					
																	03	NONE	0	STOP											
																		PRVTE		S N									022		00
																		PSNGR CAR			01	DRVR	NONE	40	M	OR-Y		000	000		00
																										OR<25					
06958	N	N	N	N	N	11/13/2007	WASHINGTON	1	16	2	GRADE		N	N	CLR	S-1STOP	01	NONE	0	STRGHT										013	27,32
CITY						Tue	HILLSBORO	6	0	NW 242ND AVE	N	(NONE)	NONE	N	DRY	REAR		PRVTE		S N									000		00
						5P	PORTLAND UA	61.06		NW MEEK RD	03			N	DLIT	PDO		PSNGR CAR			01	DRVR	NONE	25	M	OR-Y		016,026,052	038		27,32
												(02)														OR<25					
																	02	NONE	0	STOP											
																		PRVTE		S N									011	013	00
																		PSNGR CAR			01	DRVR	NONE	37	M	OR-Y		000	000		00
																										OR<25					
																	03	NONE	0	STOP											
																		PRVTE		S N									022	013	00
																		PSNGR CAR			01	DRVR	NONE	34	M	OTH-Y		000	000		00
																										OR<25					
																	04	UNKN	9	STOP											
																		UNKN		S N									022		00
																		PSNGR CAR			01	DRVR	NONE	00	M	UNK		000	000		00
																										UNK					
03611	N	N	N			07/08/2008	WASHINGTON	1	16	2	STRGHT		N	N	CLR	S-1STOP	01	NONE	0	STRGHT											07
NO RPT						Tue	HILLSBORO	6	0	NW 242ND AVE	N	(NONE)	UNKNOWN	N	DRY	REAR		PRVTE		S N									000		00
						8A	PORTLAND UA	61.07		NW MEEK RD	03			N	DAY	PDO		PSNGR CAR			01	DRVR	NONE	36	F	OR-Y		026	000		07
												(02)														OR<25					
																	02	NONE	0	STOP											
																		PRVTE		S N									011		00
																		PSNGR CAR			01	DRVR	NONE	49	M	OR-Y		000	000		00
																										OR<25					

SER# INVEST	SPED	ALCS	DRUG	SCHL	WORK	DATE DAY TIME	COUNTY CITY URBAN AREA	RD# COMPNT MLG MILEPNT	FC TYP	CONN # FIRST STREET SECOND STREET	RD CHAR DIRECT LOCTN	INT-TYP (MEDIAN) LEGS (#LANES)	INT-REL TRAF-CNTL	OFFRD RNDBT DRVWY	WTHR SURF LIGHT	CRASH TYP COLL TYP SVRTY	V#	SPCL USE TRLR QTY OWNER VEH TYPE	MOVE FROM TO	P#	PRTC TYPE	INJ SVRTY	AGE	SEX	LICNS RES	PED LOC	ERROR	ACTN	EVENT	CAUSE
03414	N	N	N	N	N	06/29/2008	WASHINGTON	1	19	3	INTER	CROSS	N	Y	CLD	FIX OBJ	01	NONE 0	TURN-R										043,092,040	26
CITY						Sun	HILLSBORO	6	0	NW SHUTE RD	E		YIELD	N	WET	FIX		PRVTE	S E								007	043,040,092	26
						8P	PORTLAND UA	61.08		EB EF SHUTE RD C3	06	2		N	DUSK	PDO		PSNGR CAR		01	DRVR	NONE	17	M	OR-Y OR<25	080,081	017		26
01716	N	N	N			03/27/2006	WASHINGTON	1	16	2	INTER	CROSS	N	N	CLR	S-STRGHT	01	NONE 0	STRGHT										013	27
NO RPT						Mon	HILLSBORO	6	0	NW 242ND AVE	CN		TRF SIGNAL	N	DRY	REAR		PRVTE	N S								000		00
						7A	PORTLAND UA	61.09		EB EX 242ND AVE C1	06	1		N	DAY	INJ		PSNGR CAR		01	DRVR	INJB	21	F	OR-Y OR<25	042	038		27
																	02	NONE 0	STRGHT											
																		PRVTE	N S								006	013	00
																		PSNGR CAR		01	DRVR	INJB	54	M	OR-Y OR<25	000	000		00
																	03	NONE 0	STRGHT											
																		PRVTE	N S								022		00
																		PSNGR CAR		01	DRVR	NONE	40	M	OR-Y OR<25	000	000		00
03986	Y	N	N	N	N	07/30/2008	WASHINGTON	1	19	3	INTER	CROSS	N	N	CLD	OVERTURN	01	NONE 0	TURN-R										124	01
CITY						Wed	HILLSBORO	6	0	NW SHUTE RD	E		ONE-WAY	N	DRY	NCOL		PRVTE	S E								000	124	00
						9A	PORTLAND UA	61.09		EB EF SHUTE RD C3	05	1		N	DAY	INJ		MTRCYCLE		01	DRVR	INJB	25	M	OR-Y OR<25	047,080	017		01
06449	N	N	N	N	N	11/24/2008	WASHINGTON	1	16	2	GRADE		N	N	CLR	S-1STOP	01	NONE 0	STRGHT										013	07
COUNTY						Mon	HILLSBORO	6	0	NW SHUTE RD	N	(NONE)	NONE	N	DRY	REAR		PRVTE	N S								001		00
						8A	PORTLAND UA	61.10		EB EX SHUTE RD C1	05	(03)		N	DAY	INJ		PSNGR CAR		01	DRVR	NONE	46	M	OR-Y OR<25	026	000		07
																	02	NONE 0	STOP											
																		PRVTE	N S								011	013	00
																		PSNGR CAR		01	DRVR	NONE	36	F	OR-Y OR<25	000	000		00
																	03	NONE 0	STOP											
																		PRVTE	N S								022		00
																		PSNGR CAR		01	DRVR	INJC	18	F	OR-Y OR<25	000	000		00
05360	Y	N	N	Y	Y	09/12/2006	WASHINGTON	1	19	2	INTER	CROSS	N	N	CLR	S-1STOP	01	NONE	STRGHT											01
NO RPT						Tue	HILLSBORO	6	0	NW 242ND AVE	N		TRF SIGNAL	N	DRY	REAR		PRVTE	N S								001		00
						7A	PORTLAND UA	61.21		WB EF 242ND AVE C5	06	2		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	17	M	OR-Y OR<25	026,047	000		01
																	02	NONE	STOP											
																		PRVTE	N S								011		00
																		PSNGR CAR		01	DRVR	NONE	49	M	OR-Y OR<25	000	000		00
02777	N	N	N			05/20/2007	WASHINGTON	1	16	2	INTER	CROSS	N	N	RAIN	O-1TURN	01	NONE 0	TURN-L											02
NONE						Sun	HILLSBORO	6	0	NW 242ND AVE	CN		TRF SIGNAL	N	WET	TURN		PRVTE	S W								000		00
						9A	PORTLAND UA	61.21		WB EF SHUTE RD C5	01	2		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	25	M	OR-Y OR<25	004,028	000		02

SER# INVEST	SPEED	ALCOHOL	DRUG	SCHOOL	WORK	DATE DAY TIME	COUNTY CITY URBAN AREA	RD# COMPNT MLG MILEPNT	FC TYP	CONN # FIRST STREET SECOND STREET	RD CHAR DIRECT LOCTN	INT-TYP (MEDIAN) LEGS (#LANES)	INT-REL TRAF-CNTL	OFFRD RNDBT DRVWY	WTHR SURF LIGHT	CRASH TYP COLL TYP SVRTY	V#	SPCL USE TRLR QTY OWNER VEH TYPE	MOVE FROM TO	P#	PRTC TYPE	INJ SVRTY	AGE	SEX	LICNS RES	PED LOC	ERROR	ACTN	EVENT	CAUSE
																	02	NONE 0 PRVTE PSNGR CAR	STRGHT N S	01	DRVR	NONE	55	M	OR-Y OR<25	000	000		00 00
92754 COUNTY	Y	N	N	N	N	05/23/2008 Fri 12P	WASHINGTON HILLSBORO PORTLAND UA	1 6 61.22	16 0	2 NW SHUTE RD WB EX SHUTE RD C4	INTER S 05	CROSS 2	N TRF SIGNAL	Y N N	RAIN WET DAY	FIX OBJ FIX INJ	01	NONE 0 PRVTE PSNGR CAR	TURN-L SE S	01	DRVR	INJB	62	F	OR-Y OR<25	047,001	000 017	047 047		01,08 00 01,08
04903 COUNTY	N	N	N	N	N	09/14/2008 Sun 2P	WASHINGTON HILLSBORO PORTLAND UA	1 6 61.22	16 0	2 NW SHUTE RD WB EX SHUTE RD C4	INTER S 06	CROSS 2	N TRF SIGNAL	N N N	CLR DRY DAY	S-1STOP REAR INJ	01	NONE 0 PRVTE PSNGR CAR	STRGHT S N	01	DRVR	NONE	24	M	OR-Y OR<25	016,026	000 038			27 00 27
																	02	NONE 0 PRVTE PSNGR CAR	STOP S N	01	DRVR	INJB	23	F	OR-Y OR>25	000	011 000			00 00
																				02	PSNG	NO<5	01	M		000	000			00
00260 COUNTY	N	N	N	N	N	01/14/2009 Wed 5P	WASHINGTON HILLSBORO PORTLAND UA	1 6 61.22	16 0	2 NW SHUTE RD WB EX SHUTE RD C4	INTER S 06	CROSS 1	N TRF SIGNAL	N N N	CLR DRY DLIT	S-1STOP REAR INJ	01	NONE 0 PRVTE PSNGR CAR	STRGHT S N	01	DRVR	INJC	51	M	OR-Y OR<25	026	000	013		07 00 07
																	02	NONE 0 PRVTE PSNGR CAR	STOP S N	01	DRVR	NONE	30	F	OR-Y OR<25	000	011 000	013		00 00
																	03	NONE 0 PRVTE PSNGR CAR	STOP S N	01	DRVR	INJC	40	F	OR-Y OR<25	000	022 000	013		00 00
																	04	NONE 0 PRVTE PSNGR CAR	STOP S N	01	DRVR	INJC	44	M	OR-Y OR<25	000	022 000			00 00
07041 NO RPT	N	N	N	Y	Y	11/16/2006 Thu 1P	WASHINGTON BEAVERTON PORTLAND UA	1 6 61.22	16 0	2 05242 UNKNOWN NAME WB EXTO CEDAR HILLS	INTER CN 02	CROSS 2	N TRF SIGNAL	N N N	CLR DRY DAY	ANGL-OTH TURN PDO	01	NONE PRVTE PSNGR CAR	STRGHT S N	01	DRVR	NONE	34	M	OR-Y OR<25	097	000 000			04 00 00
																	02	NONE PRVTE PSNGR CAR	TURN-L SE S	01	DRVR	NONE	30	M	OR-Y OR<25	000	000 000			00 00

SER# INVEST	SPED	ALCS	DRUG	SCHL	WORK	DATE DAY TIME	COUNTY CITY URBAN AREA	RD# COMPNT MLG MILEPNT	FC TYP	CONN # FIRST STREET SECOND STREET	RD CHAR DIRECT LOCTN	INT-TYP (MEDIAN) LEGS (#LANES)	INT-REL TRAF-CNTL	OFFRD RNDBT DRVWY	WTHR SURF LIGHT	CRASH TYP COLL TYP SVRTY	V#	SPCL USE TRLR QTY OWNER VEH TYPE	MOVE FROM TO	P#	PRTC TYPE	INJ SVRTY	AGE	SEX	LICNS RES	PED LOC	ERROR	ACTN	EVENT	CAUSE
06045	N	N	N	Y	Y	10/11/2006	WASHINGTON	1	16	2	INTER	CROSS	N	N	CLR	S-1TURN	01	NONE	STRGHT											14
NONE						Wed	HILLSBORO	6	0	NW 242ND AVE	CN		ONE-WAY	N	DRY	TURN		PRVTE	SE NW									000		00
						9A	PORTLAND UA	61.22		WB EX 242ND AVE C4	03	2		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	00	M	OR-Y	003		000		14
																									OR<25					
																	02	NONE	TURN-L											
																		PRVTE	SE S									000		00
																		PSNGR CAR		01	DRVR	NONE	69	M	OR-Y	000		000		00
																									OR<25					
01303	N	N	N	N	N	03/17/2009	WASHINGTON	1	16	2	INTER	CROSS	N	N	RAIN	S-1TURN	01	NONE 0	STRGHT											14
STATE						Tue	HILLSBORO	6	0	NW SHUTE RD	CN		L-GRN-SIG	N	WET	TURN		PRVTE	SE NW									000		00
						11A	PORTLAND UA	61.22		WB EX SHUTE RD C4	03	1		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	33	M	OR-Y	003		000		14
																									OR<25					
																	02	NONE 0	TURN-L											
																		PRVTE	SE S									000		00
																		PSNGR CAR		01	DRVR	NONE	23	F	OTH-Y	000		000		00
																									OR<25					
04568	N	N	N			08/09/2007	WASHINGTON	1	19	4	STRGHT		N	N	CLR	S-1STOP	01	NONE 0	STRGHT											07
NONE						Thu	HILLSBORO	6	0	WB EX SHUTE RD C4	SE	(NONE)	ONE-WAY	N	DRY	REAR		PRVTE	SE NW									000		00
						4P	PORTLAND UA	61.49		NW 242ND AVE	04			N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	25	F	OR-Y	026		000		07
												(02)													OR<25					
																	02	NONE 0	STOP											
																		PRVTE	SE NW									011		00
																		PSNGR CAR		01	DRVR	NONE	19	M	OR-Y	000		000		00
																									OR>25					
00758	N	N	N			02/04/2007	WASHINGTON	1	19	4	INTER	CROSS	N	N	CLR	S-1STOP	01	NONE 0	STRGHT											07
NONE						Sun	HILLSBORO	6	0	NW 242ND AVE	SE		ONE-WAY	N	DRY	REAR		PRVTE	SE NW									000		00
						8P	PORTLAND UA	61.50		WB EX SHUTE RD C4	05	2		N	DLIT	INJ		PSNGR CAR		01	DRVR	NONE	45	M	OR-Y	026		000		07
																									OR<25					
																	02	NONE 0	STOP											
																		PRVTE	SE NW									012		00
																		PSNGR CAR		01	DRVR	INJC	57	F	OR-Y	000		000		00
																									OR<25					
00303	N	N	N			01/13/2006	WASHINGTON	1	19	4	INTER	CROSS	N	N	RAIN	S-1STOP	01	NONE 0	STRGHT											07
NO RPT						Fri	HILLSBORO	6	0	NW 242ND AVE	CN		TRF SIGNAL	N	WET	REAR		PRVTE	SE NW									001		00
						7A	PORTLAND UA	61.50		WB EX 242ND AVE C4	06	2		N	DAWN	INJ		PSNGR CAR		01	DRVR	INJC	59	F	OR-Y	026		000		07
																									OR<25					
																	02	NONE 0	STOP											
																		PRVTE	SE NW									011		00
																		PSNGR CAR		01	DRVR	NONE	30	M	OR-Y	000		000		00
																									OR<25					

TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT

COUNTY ROAD CRASH LISTING

WASHINGTON COUNTY

Brookwood Pky/Helvetia Rd (AKA 242nd) Bet Schaff Rd & Huffman Rd + 265' @ All Intersections (Request #110408)

January 1, 2005 Through December 31, 2009

SER# INVEST	SPEC	ALC	DRUG	SCHL	WORK	DATE DAY TIME	MILEPNT DIST FROM INTERSECT	COUNTY FIRST SECOND	ROADS STREET STREET	RD CHAR DIRECT LOCTN	INT-TYP (MEDIAN) LEGS (#LANES)	INT-REL TRAF-CONTL	OFF-RD RNDBT DRVWY	WTHR SURF LIGHT	CRASH TYP COLL TYP SVRTY	V#	SPCL USE TRLR QTY OWNER VEH TYPE	MOVE FROM TO	P#	PRTC TYPE	INJ SVRTY	AGE	SEX	LICNS RES	PED LOC	ERROR	ACTN	EVENT	CAUSE
00510	N	N	N			1/25/2006		NW HELVETIA RD		INTER	CROSS	N	N	RAIN	ANGL-OTH	01	NONE 0	STRGHT											02
NO RPT						Wed	0	NW JACOBSON RD		CN		STOP SIGN	N	WET	TURN		PRVTE	S N									000		00
						5P				02	0		N	DARK	PDO		PSNGR CAR		01	DRVR	NONE	20	F	OR-Y		000	000		00
																								OR<25					
																02	NONE 0	TURN-L											
																	PRVTE	E S									015		00
																	PSNGR CAR		01	DRVR	NONE	21	M	OR-Y		028,014	088		02
																								OR<25					
05386	N	N	N	N	N	9/11/2006		NW HELVETIA RD		INTER	3-LEG	N	N	CLR	ANGL-OTH	01	NONE	STRGHT											02
CITY						Mon	0	NW JACOBSON RD		CN		STOP SIGN	N	DRY	TURN		PRVTE	S N									000		00
						9P				02	0		N	DLIT	INJ		MTRCYCLE		01	DRVR	INJA	45	M	OR-Y		000	000		00
																								OR<25					
																02	NONE	TURN-L											
																	PRVTE	E S									015		00
																	PSNGR CAR		01	DRVR	NONE	63	F	OR-Y		028	000		02
																								OR<25					
05878	N	N	N	N	N	11/20/2009		NW HELVETIA RD		INTER	3-LEG	N	N	CLR	ANGL-OTH	01	NONE 0	STRGHT											02
COUNTY						Fri	0	NW JACOBSON RD		CN		STOP SIGN	N	WET	ANGL		PRVTE	S N									000		00
						4P				02	0		N	DAY	INJ		PSNGR CAR		01	DRVR	NONE	45	M	OR-Y		000	000		00
																								OR<25					
																02	NONE	STRGHT											
																	PRVTE	E W									000		00
																	PSNGR CAR		01	DRVR	NONE	18	M	UNK		028	000		02
																								OR>25					
																			02	PSNG	INJC	51	F			000	000		00
89102	N	N	N	N	N	8/15/2005		NW HELVETIA RD		STRGHT		N	N	CLR	ANIMAL	01	NONE 0	STRGHT										034	12
COUNTY						Mon	1	NW SCHAFF RD		S	(NONE)	UNKNOWN	N	DRY	OTH		PRVTE	N S									088	034	00
						8A				03			N	DAY	INJ		MTRCYCLE		01	DRVR	INJB	56	M	OR-Y		080	017		12
											(02)													OR<25					