

The results of WSA's assessment of traffic and toll revenue characteristics of the proposed LBJ Managed Lanes (MLs) are presented in this chapter. As discussed in Chapter 1, Alternatives 2 and 6 were selected as the preferred project configuration. Alternative 2 was chosen as the "interim" project configuration and carries an opening date of January 1, 2012. Alternative 6, the "ultimate" project configuration has an assumed opening date of January 1, 2015. Findings for these alternatives are summarized in this report; other scenarios were provided under separate cover.

The proposed number of MLs and access locations under these two project configurations are as discussed in Chapter 1 and illustrated in Figures 1-8 and 1-9. Alternative 2 was evaluated at three designated year levels (2012, 2015 and 2025), with Alternative 6 assuming two select year levels (2015 and 2025). Both Alternatives were examined under two specific operating scenarios, All Pay and HOV 3+ Free.

Table 5-1
Proposed LBJ Managed Lanes Evaluation Assumptions
Preferred Project Configurations

Alternative 2			
Year	Time Period	Operating Scenario	
2012	AM Peak	All Pay	HOV 3+ Free
2012	AM Shoulder	All Pay	HOV 3+ Free
2012	Midday	All Pay	HOV 3+ Free
2012	PM Pre Shoulder	All Pay	HOV 3+ Free
2012	PM Shoulder	All Pay	HOV 3+ Free
2012	PM Post Shoulder	All Pay	HOV 3+ Free
2015	AM Peak	All Pay	HOV 3+ Free
2015	AM Shoulder	All Pay	HOV 3+ Free
2015	Midday	All Pay	HOV 3+ Free
2015	PM Pre Shoulder	All Pay	HOV 3+ Free
2015	PM Shoulder	All Pay	HOV 3+ Free
2015	PM Post Shoulder	All Pay	HOV 3+ Free
2025	AM Peak	All Pay	HOV 3+ Free
2025	AM Shoulder	All Pay	HOV 3+ Free
2025	Midday	All Pay	HOV 3+ Free
2025	PM Pre Shoulder	All Pay	HOV 3+ Free
2025	PM Shoulder	All Pay	HOV 3+ Free
2025	PM Post Shoulder	All Pay	HOV 3+ Free
Alternative 6			
Year	Time Period	Operating Scenario	
2015	AM Peak	All Pay	HOV 3+ Free
2015	AM Shoulder	All Pay	HOV 3+ Free
2015	Midday	All Pay	HOV 3+ Free
2015	PM Pre Shoulder	All Pay	HOV 3+ Free
2015	PM Shoulder	All Pay	HOV 3+ Free
2015	PM Post Shoulder	All Pay	HOV 3+ Free
2025	AM Peak	All Pay	HOV 3+ Free
2025	AM Shoulder	All Pay	HOV 3+ Free
2025	Midday	All Pay	HOV 3+ Free
2025	PM Pre Shoulder	All Pay	HOV 3+ Free
2025	PM Shoulder	All Pay	HOV 3+ Free
2025	PM Post Shoulder	All Pay	HOV 3+ Free

These evaluations were further subdivided into six unique time periods as indicated in Table 5-1.

TxDOT has identified Alternative 2 as the "Interim" scenario, and Alternative 6 as the "Ultimate" project configuration. Obviously, this implies that project configuration will shift from Alternative 2 to Alternative 6 at some point; based on current planning this may be as early as 2015.

However, for purposes of this analysis, each of these two alternatives have been discretely evaluated as if the configuration remains in place over the full 40-year projection forecast. This approach was chosen since initial financing of the project may relate only to one alternative or the other; hence it was important to include revenue forecasts for that condition assuming it remained in place for the full anticipated bond term.

In practice, anticipated revenue would simply shift from those forecasts for Alternative 2 to those forecasts for Alternative 6 at the time of the actual conversion.

We also note that no attempt has been made to adjust the revenues under the interim configuration to reflect any possible construction impacts as the ultimate configuration is developed. For purposes of this analysis it is assumed that the ultimate expansion of the managed lane facility will be done in a manner which will continue to allow uninterrupted free-flow conditions in the managed lane during the construction process this is a reasonable assumption. Where there maybe some minor construction impacts in the managed lanes, it is likely that construction impacts in the general purpose lanes would be more significant, given the relative levels of background congestion, and this would actually encourage higher levels of use in the managed lanes during the construction process.

Basic Assumptions

The traffic and toll revenue estimates for the two preferred project configurations of the LBJ MLs facility are predicated on the following basic assumptions: which are believed to be reasonable for purposes of this study.

1. The reversible sections of the MLs facility are assumed to operate in the WB direction between 6:00 a.m. to 1:00 p.m. and in the EB direction between 3:00 p.m. to 4:00 a.m. The reversible section will be closed between 1:00 to 3:00 p.m. and 4:00 a.m. to 6:00 a.m. to facilitate reversing operating directions;
2. The proposed MLs are assumed to open to traffic on January 1, 2012 under Alternative 2 and January 1, 2015 under Alternative 6;
3. The configurations, vehicle types and operating speeds of the MLs, including the proposed access locations and per mile toll rates will be as described in this report;

4. Commercial vehicles/trucks with more than two-axles will be prohibited from using the Managed Lanes;
5. Tolls will be collected via Electronic Toll Collection (ETC) equipment, which will be available to all motorists using the LBJ MLs. Electronic tolls will be assessed based on distance traveled with an assumed minimal toll equal to a minimum distance of five-miles of travel on the MLs. Cash will not be accepted. ETC operations are assumed to be actively monitored and strictly enforced to minimize potential revenue loss due to toll evasion. No adjustments have been made to toll revenue estimates included in this report for toll evasion;
6. Estimates of annual toll revenue included in this report have been adjusted to reflect "ramp-up" during the first three years of operation;
7. Transportation improvements as detailed in NCTCOG's latest Mobility 2025 Plan will be implemented; no other competing routes or capacity improvements will be implemented within the forecast period and no additional general purpose lane capacity will be provided along the LBJ.
8. The proposed LBJ Managed Lanes will be well maintained, efficiently operated and effectively signed and promoted to encourage maximum usage;
9. For modeling purposes, inflation has been normally assumed to average 2.5 percent per year for the forecast period;
10. Economic growth in the study corridor will generally follow the independent economic assessment described in this document;
11. Motor fuel will remain in adequate supply and increases in price will not substantially exceed overall inflation over the long term. It is noted that the modeling work in this study was performed in 2004 and therefore does not reflect any impacts due to the recent fuel prices increases.
12. No local, regional, or national emergency will arise which would abnormally restrict the use of motor vehicles.

Any significant departure from the above basic assumptions could materially affect estimated traffic and toll revenue for the proposed LBJ Managed Lanes facility.

Toll Rate/Operations Profiles

By their very nature, there is a high degree of sensitivity and trade-off between traffic and revenue in the MLs vs. operating conditions in the outside lanes. In general, as toll rates in the MLs are reduced, a higher share of the "eligible traffic" on the freeway facility will choose to use the MLs. As the share of that traffic in the Managed Lanes increases, operating speeds on the GP lanes can be assumed to improve and congestion decreases. However, as congestion decreases in the GP lanes, the "value" associated with using the MLs tends to decrease, resulting in a lower share choosing

the MLs. This is the nature of the delicate equilibrium between the operating conditions in the GP lanes, the MLs, and the price associated with the use of the priced lanes. Depending on policy considerations, it was necessary to look at toll revenue maximization, utilization rates in the MLs and operational impacts in both the general purpose and MLs in selecting optimum pricing strategies and rate levels.

To depict these trade-offs, toll rate/operations profiles were developed for the a.m. peak, a.m. shoulder, midday, p.m. peak and p.m. shoulder conditions for the two preferred LBJ ML alternatives under All pay and HOV 3+ Free operating scenarios. This analysis was conducted at opening-year 2012 and future-year 2015 and 2025 levels for Alternative 2 and opening-year 2015 and future-year 2025 levels for Alternative 6.

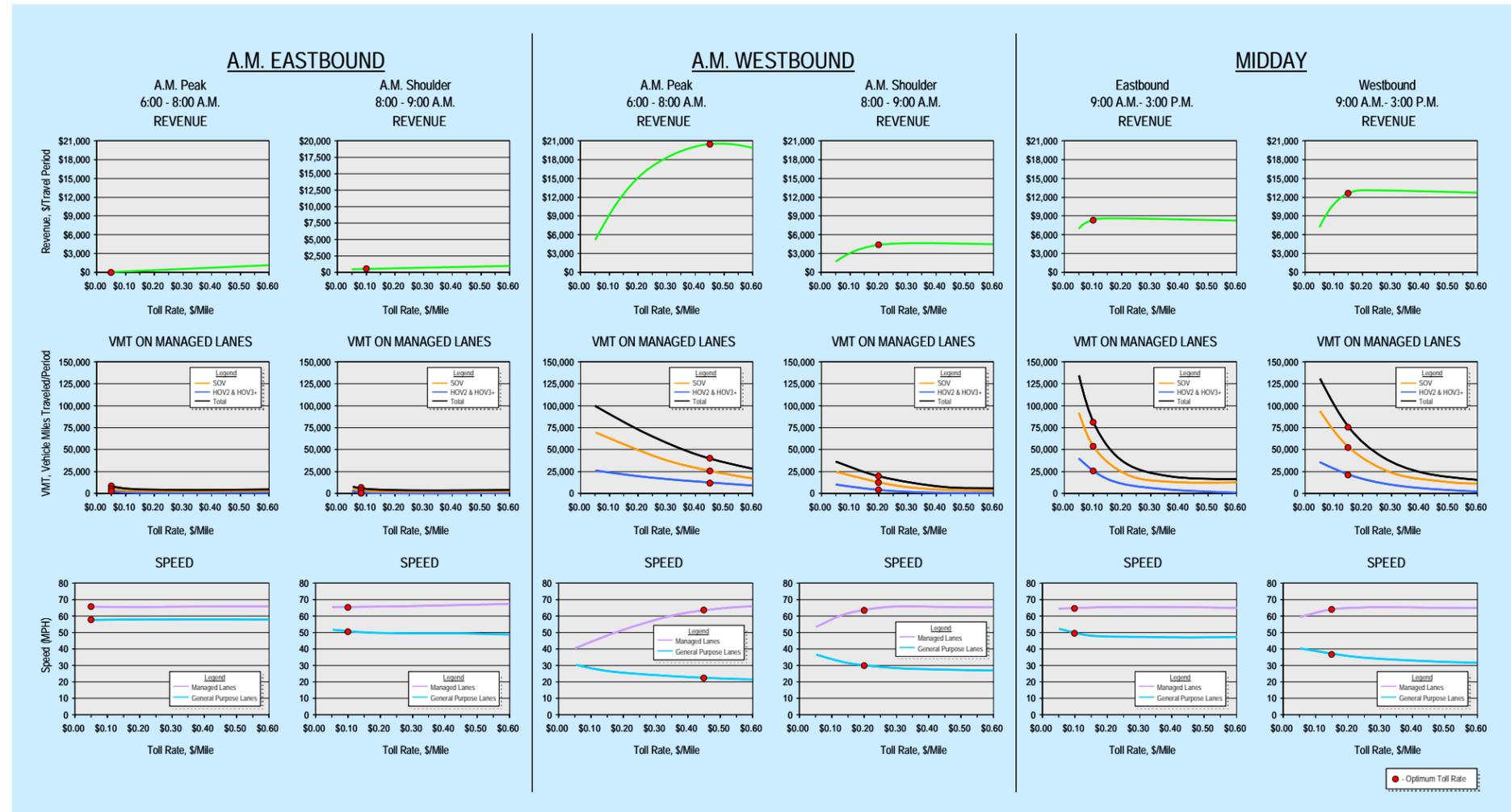
The toll rate/operations profiles were based on the results of a toll sensitivity analysis conducted for each alternative. As described previously in Chapter 4, for each analysis year, and each time interval (e.g., am peak, pm peak, etc.) a range of alternate per mile toll rates were tested. In general, rates tested range from \$0.05 to \$0.60 per mile, to determine rates which will deliver optimum revenue and ensure free flow operations in the managed lanes facilities. In computing estimated traffic and revenue, an optimum rate was selected for each time period, in each travel direction, for each operating scenario.

Several illustrations that follow provide toll sensitivity curves for Alternatives 2 and 6 by the 2 operating scenarios under the 12 per-mile toll rates tested. Vehicles were assessed tolls based on miles traveled and under each rate tested assigned a minimum toll that was equivalent to a five mile trip. In other words, if a vehicle traveled five miles or less assuming per-mile rates of \$0.10 or \$0.20 per mile, the minimum toll assessed would be \$0.50 and \$1.00, respectively. Toll sensitivity is arrayed by direction, time period and operating scenario and indicates the optimum toll rate utilized to evaluate each of the Alternatives.

For each period and travel direction, curves are also provided showing estimated vehicle miles of travel in the managed lanes. This is broken out between SOV and HOV and total vehicle components. The vehicle miles of travel reflect the entire length of each of the respective alternatives, and not average traffic at any one location. As toll rates increase, vehicle miles of travel in the managed lanes would tend to decrease.

The third measure presented in each set of curves shows average operating speeds in both the managed lanes and the adjacent sections of the general purpose lanes. This was intended to show the operational tradeoffs between revenue, optimal distribution of demand and operating conditions on the LBJ Corridor.

From a financial standpoint, optimal rates would be those which would generate maximum revenue. However, since demand management is a key criteria in the establishment of the managed lanes, it is also important to set prices at levels which would ensure free flow conditions in the managed lanes. At the same time, of course, toll rates which attract lower traffic levels to the managed lanes result in higher traffic levels in the general purpose lanes, and slightly degraded travel speeds. In general, optimum toll rates were selected based on revenue maximization, except



2012 TOLL RATE / OPERATIONS PROFILE
A.M. Peak / Midday Weekday Period, Alternative 2 - All Pay

Figure 5-1

where needed unless different rates were needed to maintain free-flow conditions in the managed lanes.

Alternative 2 All Pay – Figure 5-1 depicts the LBJ MLs travel characteristics for the eastbound and westbound AM Weekday Peak, Shoulder and Midday Periods in 2012 under the “All Pay” operating scenario. For the AM Peak Period the optimum per mile toll rates are shown to be \$0.05 in the eastbound direction and \$0.45 per mile in the westbound direction. This variance in per mile toll rates is driven by the higher levels of demand in the WB direction, typically considered the AM peak direction along the LBJ Corridor.

It should be noted that the toll rate operations profiles shown in Figure 5-1, and all subsequent figures, represent conditions on a typical weekday, within the hours shown for each period. Weekend conditions would obviously be significantly differ-

ent; weekend day traffic and revenue is estimated as a nominal proportion of weekday conditions.

Figure 5-1 also shows estimated VMT on the managed lanes at various possible toll rates. It is clear that there is relatively limited demand for the lanes in the eastbound direction during the morning peak period. Much higher demands shown in the westbound direction, based on generally recurring directional splits on the LBJ Freeway. It can be seen that the total VMT in the two hour am peak period westbound would be as high as 100,000 at relatively low toll rates, but this would produce unacceptable operating speeds, and significantly less than optimized toll revenue. At the selected optimal toll rate of \$0.45 per mile, the two hour VMT is reduced to less than 50,000 but operating speeds in the managed lanes would be increased to more than 60 mph.

Overall average travel speeds in the GP lanes and ML facility with respect to the varying per mile toll rate assumptions are illustrated in Figure 5-1. Under AM peak

period conditions recognizing optimum per mile rates eastbound average travel speeds equal approximately 58 mph in the GP lanes and 65 mph in the MLs. In the westbound direction assuming optimum per mile rates, average travel speed in the MLs are similar to those in the eastbound direction. However, in the GP lanes average travel speeds are reduced to approximately 24 mph. Again, this can be attributed to the high levels of demand in the GP lanes wishing to travel westbound on a typical weekday during the AM peak period.

Figure 5-1 also presents similar information under AM shoulder and Midday operating conditions. Optimum tolls between 9:00 a.m and 3:00 p.m were selected at about \$0.15 per mile.

Figure 5-2 illustrates the LBJ MLs traffic characteristics for the eastbound and westbound PM peak and PM shoulder periods for Alternative 2 in 2012 under the All Pay operating scenario. The optimum per mile toll rate for the eastbound direction during the PM peak period (4:00 – 6:00 p.m.) equals \$0.35. During the PM pre-shoulder and post-shoulder periods optimum per mile toll rates are \$0.50 and \$0.30, respectively. These eastbound PM pre-shoulder, peak and post shoulder per mile rates generate typical weekday period toll revenues of approximately \$13,300, \$17,300 and \$7,600, respectively. Optimum per mile rates under PM peak westbound travel conditions equal \$0.10 during all three operating periods. The westbound direction is typically the off-peak travel direction during the PM peak therefore overall demand in the GP lanes is much less than in the PM peak eastbound direction, thus the lower per mile toll rate.

VMT distributions between SOVs and HOVs are comparable to those indicated during the AM peak periods. Assuming optimum per mile toll rates average speed performance in the MLs are similar to the AM period. Average speeds in the GP lanes in the PM peak travel direction (EB) are similar to the average speeds in the AM peak travel direction (WB). However, GP lane average speeds in the off-peak direction are generally lower than the AM off-peak direction. This is due to the fact that during PM peak travel periods even the off-peak PM direction carries greater demand levels than in the AM off-peak direction.

Alternative 2 HOV 3+ Free – Figure 5-3 depicts the LBJ MLs travel characteristics for the eastbound and westbound AM weekday peak, shoulder and midday periods in 2012 under the HOV 3+ Free operating scenario. For the AM peak period the optimum per mile toll rates are shown to be \$0.05 in the eastbound direction and \$0.45 per mile in the westbound direction. These are identical to those reported under the All Pay operating scenario. These optimum per mile toll rates produce period toll revenue of approximately \$19,400 in the westbound direction, during the AM peak period for a typical weekday. These toll revenues are slightly less than those under the All Pay scenario. This is mainly due to the ability of HOV 3+ vehicles to travel toll free in the LBJ Managed Lanes.

Figure 5-3 also presents the VMT variations in the MLs. The VMT produced during the AM peak period under the optimum per mile toll rates, total approximately 8,400 in the eastbound direction. Of this amount, 7,600 is generated by SOV and HOV 2 vehicles and 800 by HOV 3+ vehicles. Total VMT WB equals 45,720 under the opti-

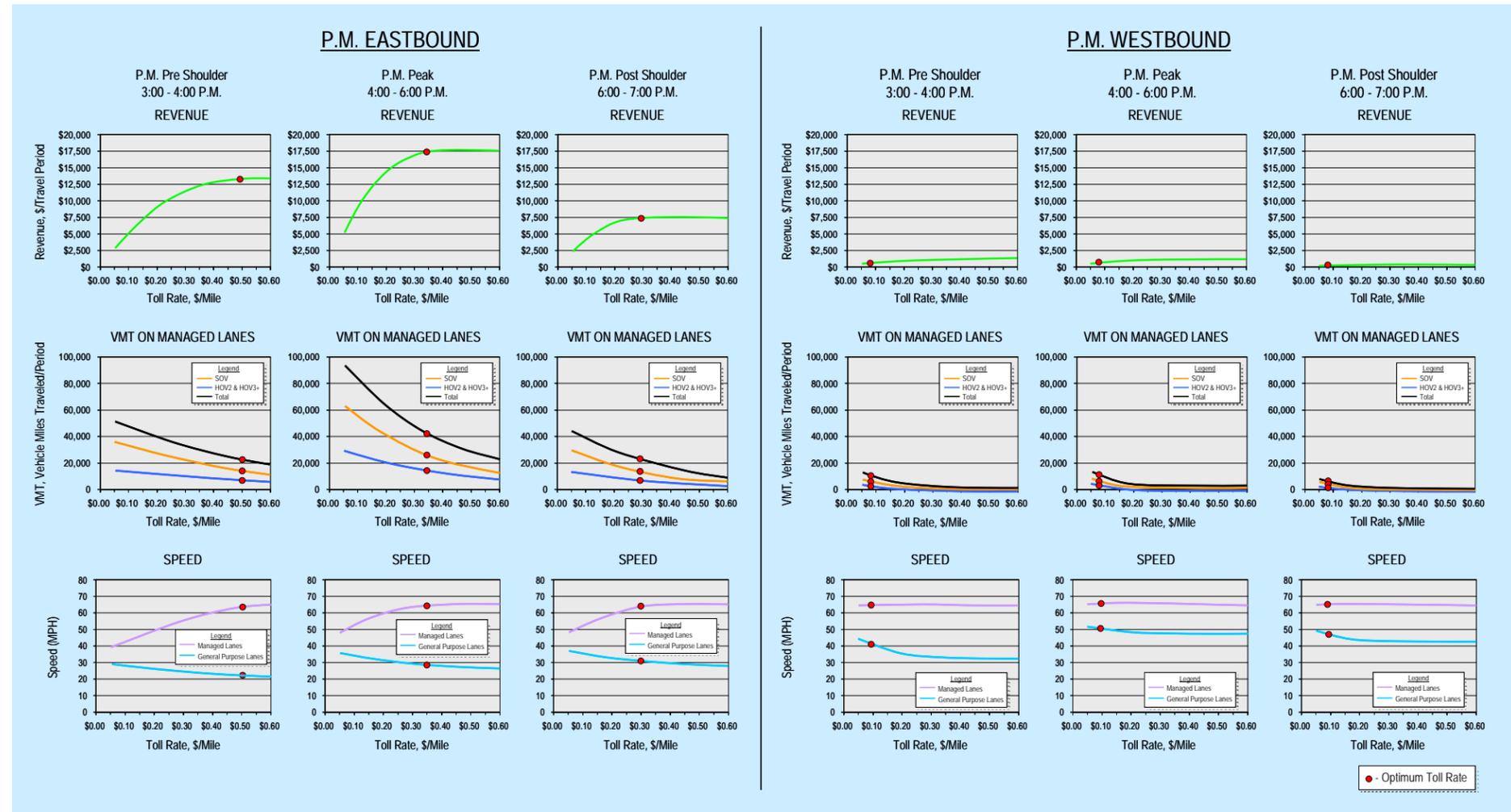


Figure 5-2

2012 TOLL RATE / OPERATIONS PROFILE
P.M. Weekday Peak Period Alternative 2 - All Pay

imum per mile toll rate, 40,760 by SOV and HOV 2 travelers and by HOV 3+ vehicles. When compared to the All Pay scenario, these VMT are somewhat higher. This can be attributed to the fact that additional HOV 3+ vehicles are attracted into the MLs because they are able to travel toll free.

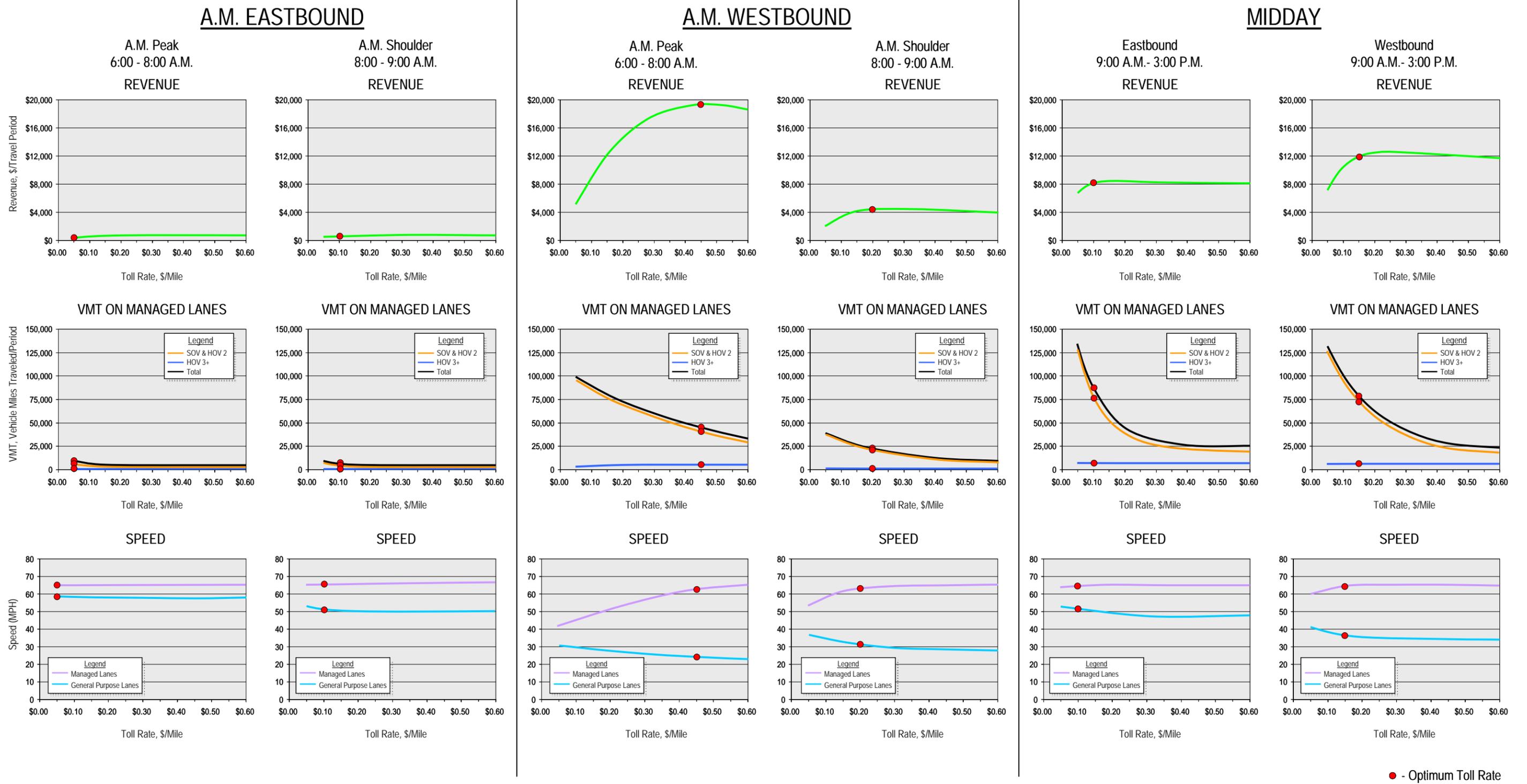
Overall average travel speeds in the GP lanes and ML facility under the HOV 3+ Free scenario for Alternative 2 are presented in Figure 5-3. As indicated in both the eastbound and westbound travel directions operating speeds assuming the optimum toll rates are very similar to those experienced under the All Pay scenario. Operating speeds remain fairly static between the two because HOV 3+ vehicles make-up a small percentage of overall demand in the corridor therefore impacts on travel speeds are negligible.

Figure 5-4 graphically illustrates the LBJ Managed Lanes traffic characteristics for the eastbound and westbound PM peak and PM shoulder periods for Alternative 2 in

2012 under the HOV 3+ Free operating scenario. As indicated when comparing HOV 3+ Free and "All pay" AM and Midday conditions optimum per mile toll rates for the PM All Pay and HOV 3+ Free operating scenarios are very similar. HOV 3+ Free PM total VMTs are somewhat higher than those under "All Pay" conditions with overall travel speeds being reported as almost identical.

Figures 5-5 through 5-8 present similar LBJ MLs traffic characteristic information illustratively under Alternative 2 at 2015 year levels. Once again results are summarized for AM peak, AM shoulder, Midday, PM pre-shoulder, PM peak and PM post-shoulder conditions under All Pay and HOV 3+ Free operating scenarios.

Figures 5-9 through 5-12 depict 2025 Alternative 2 LBJ MLs traffic characteristic data under the All Pay and HOV 3+ Free operating scenarios. Data is arrayed by the same time segments outlined above. It is important to note that when reviewing the

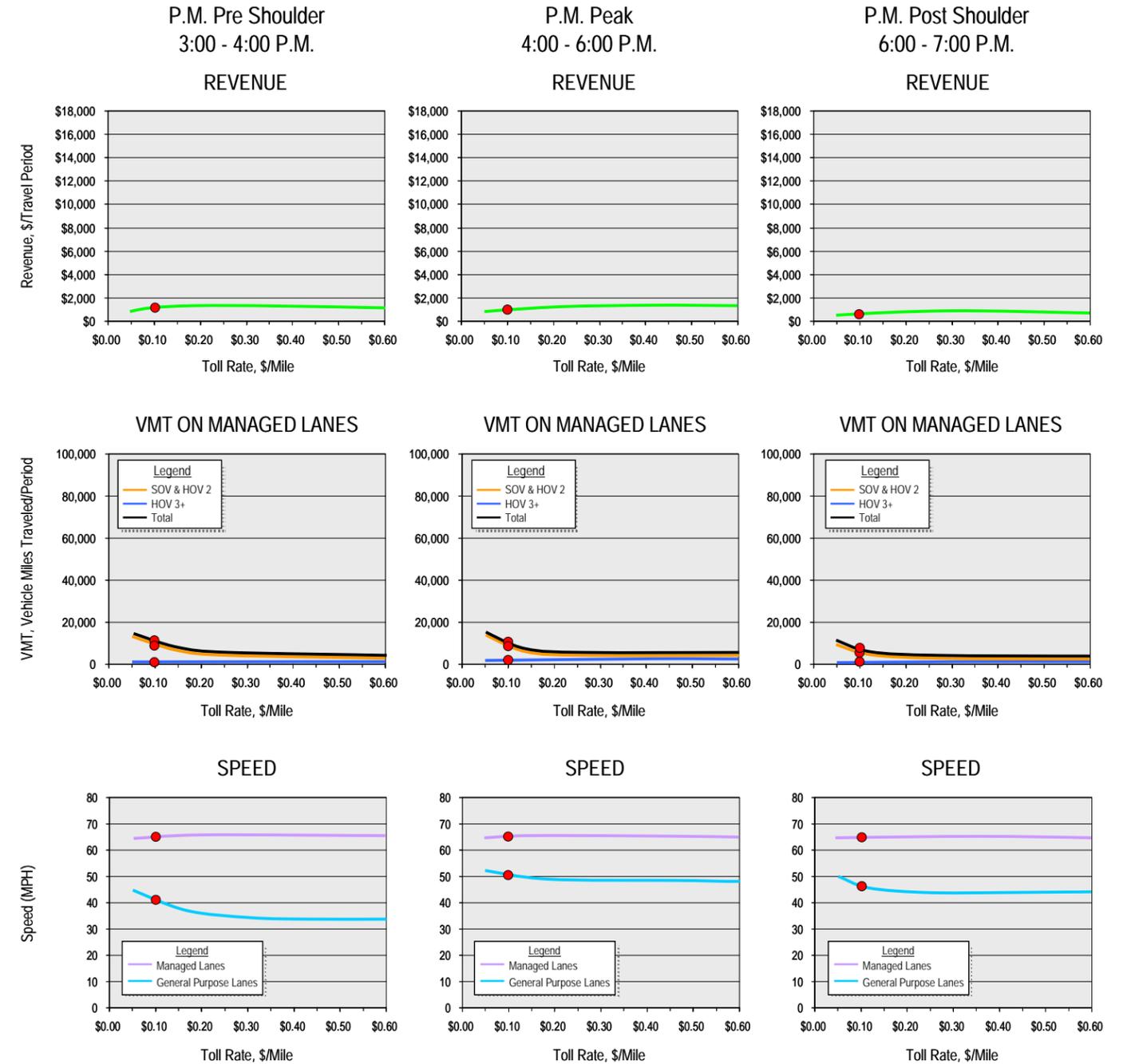
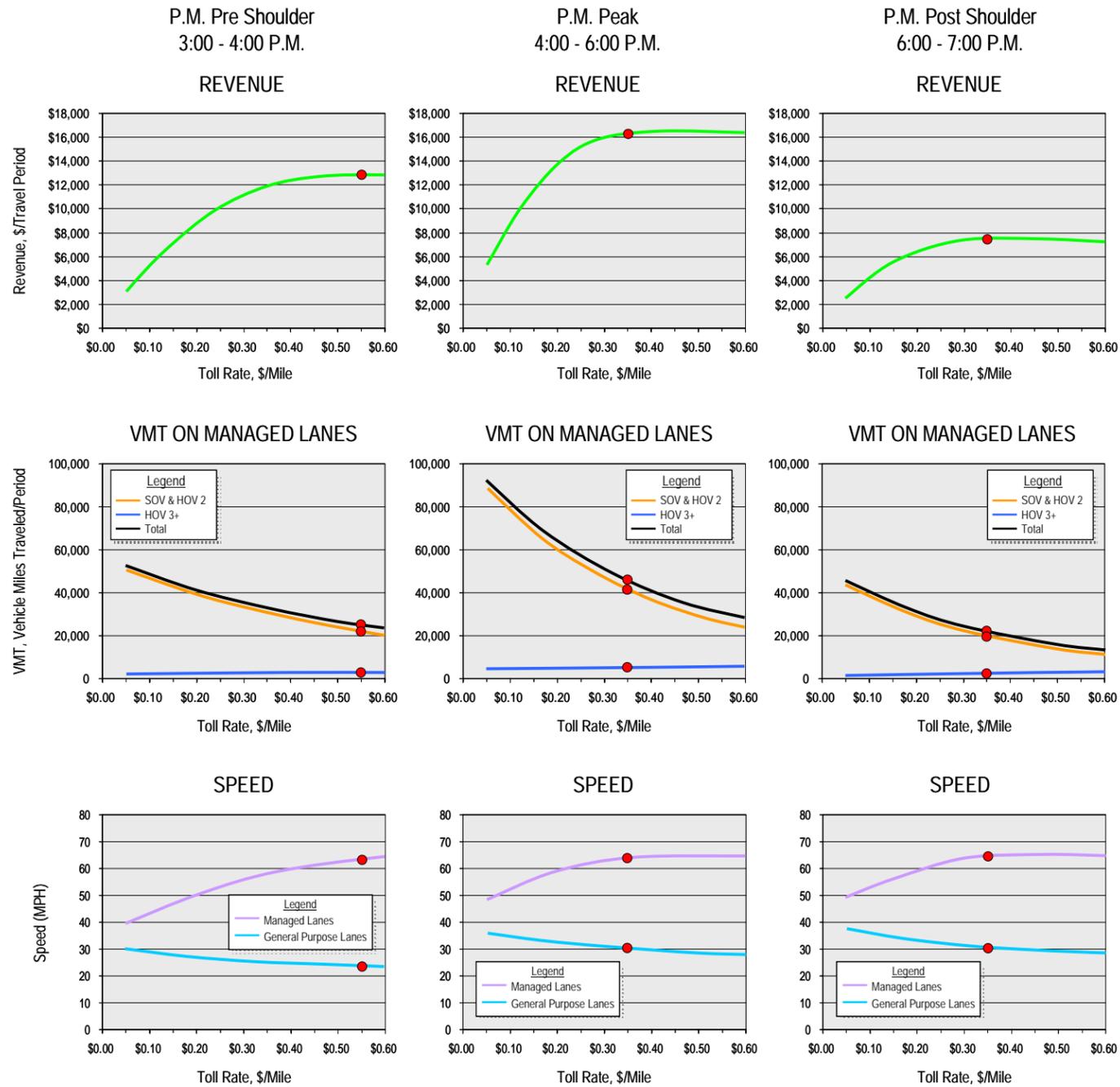


2012 TOLL RATE / OPERATIONS PROFILE
A.M. Peak / Midday Weekday Period, Alternative 2 - HOV 3+ Free

Figure 5-3

P.M. EASTBOUND

P.M. WESTBOUND



● - Optimum Toll Rate

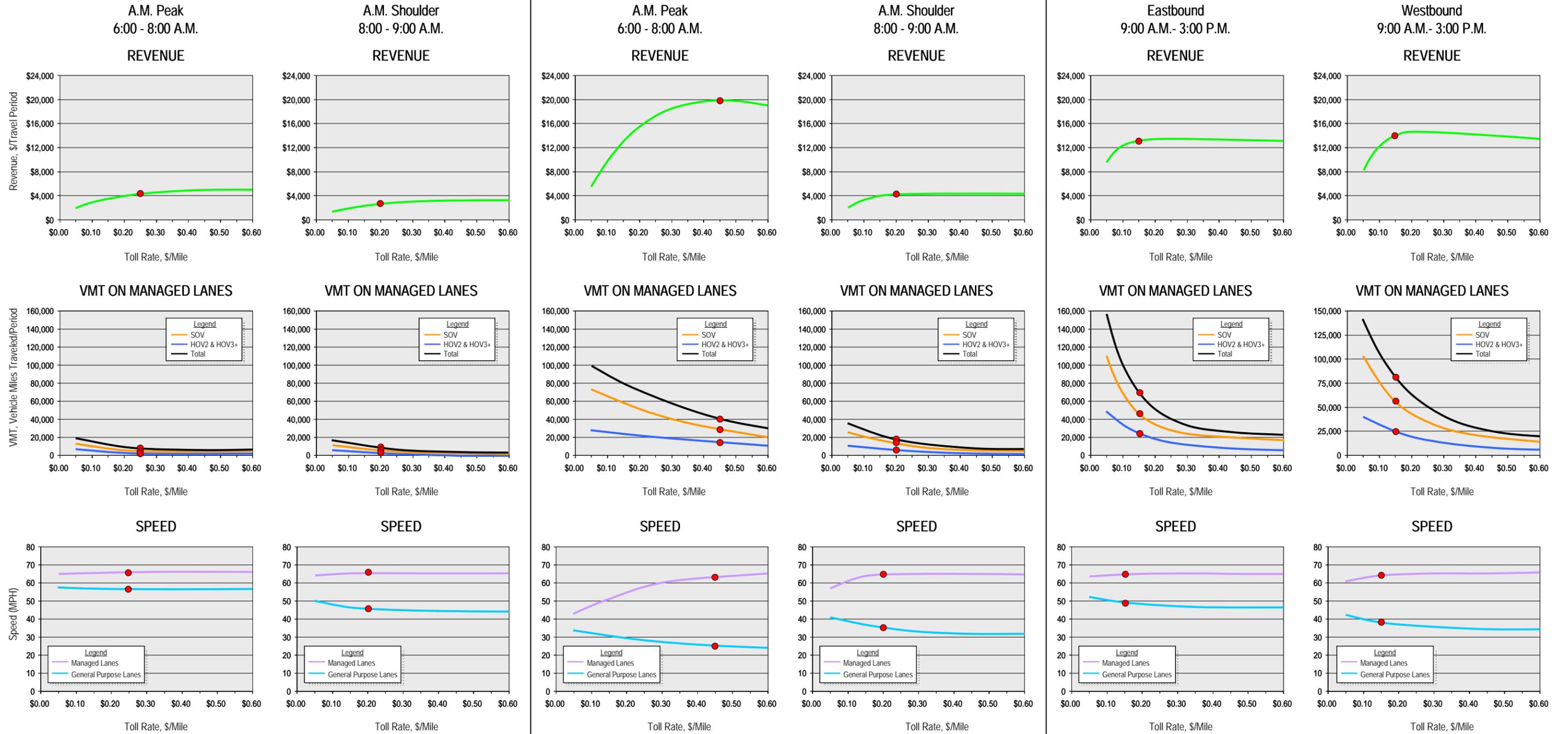
2012 TOLL RATE / OPERATIONS PROFILE
P.M. Weekday Peak Period, Alternative 2 - HOV 3+ Free

Figure 5-4

A.M. EASTBOUND

A.M. WESTBOUND

MIDDAY



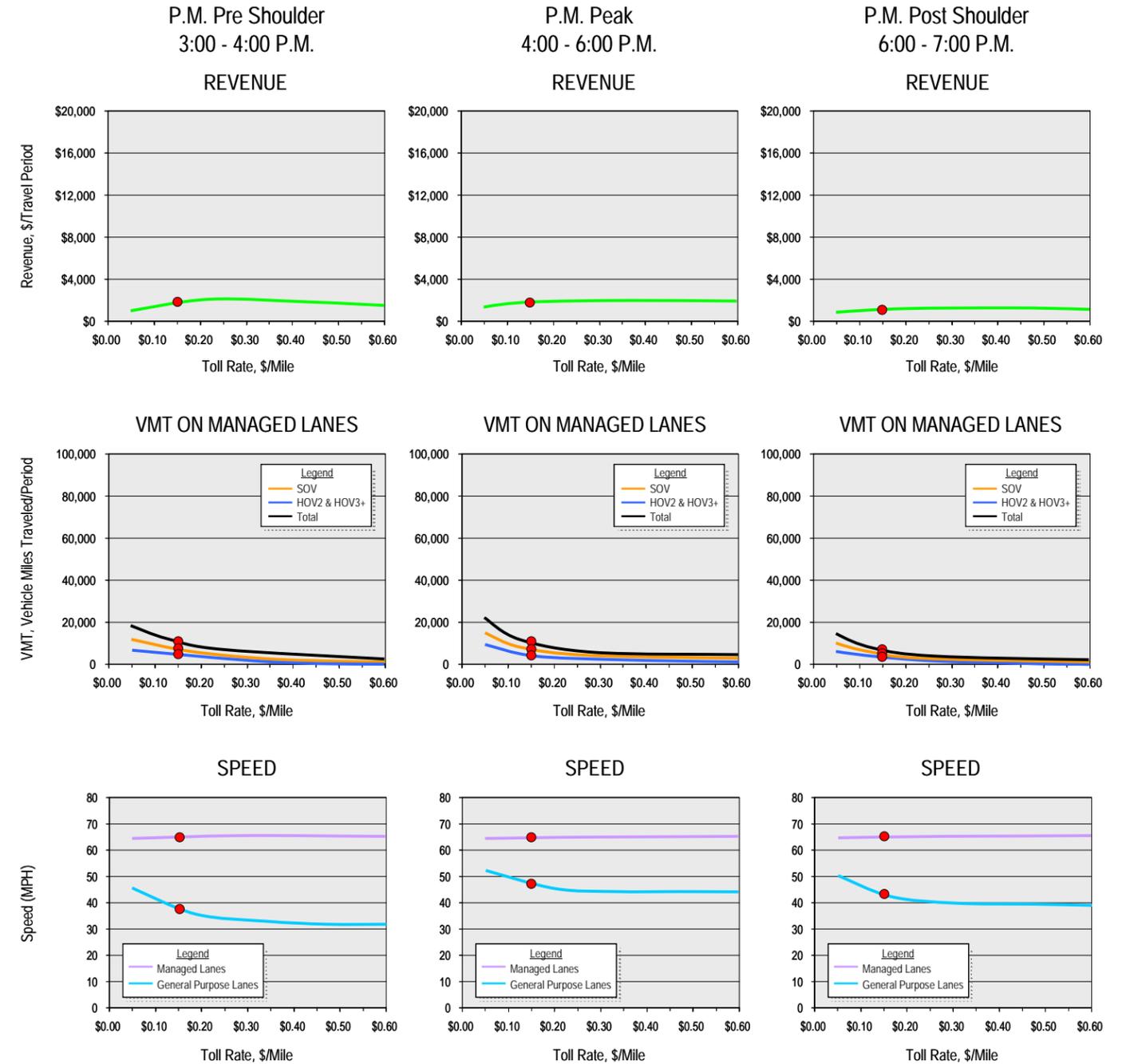
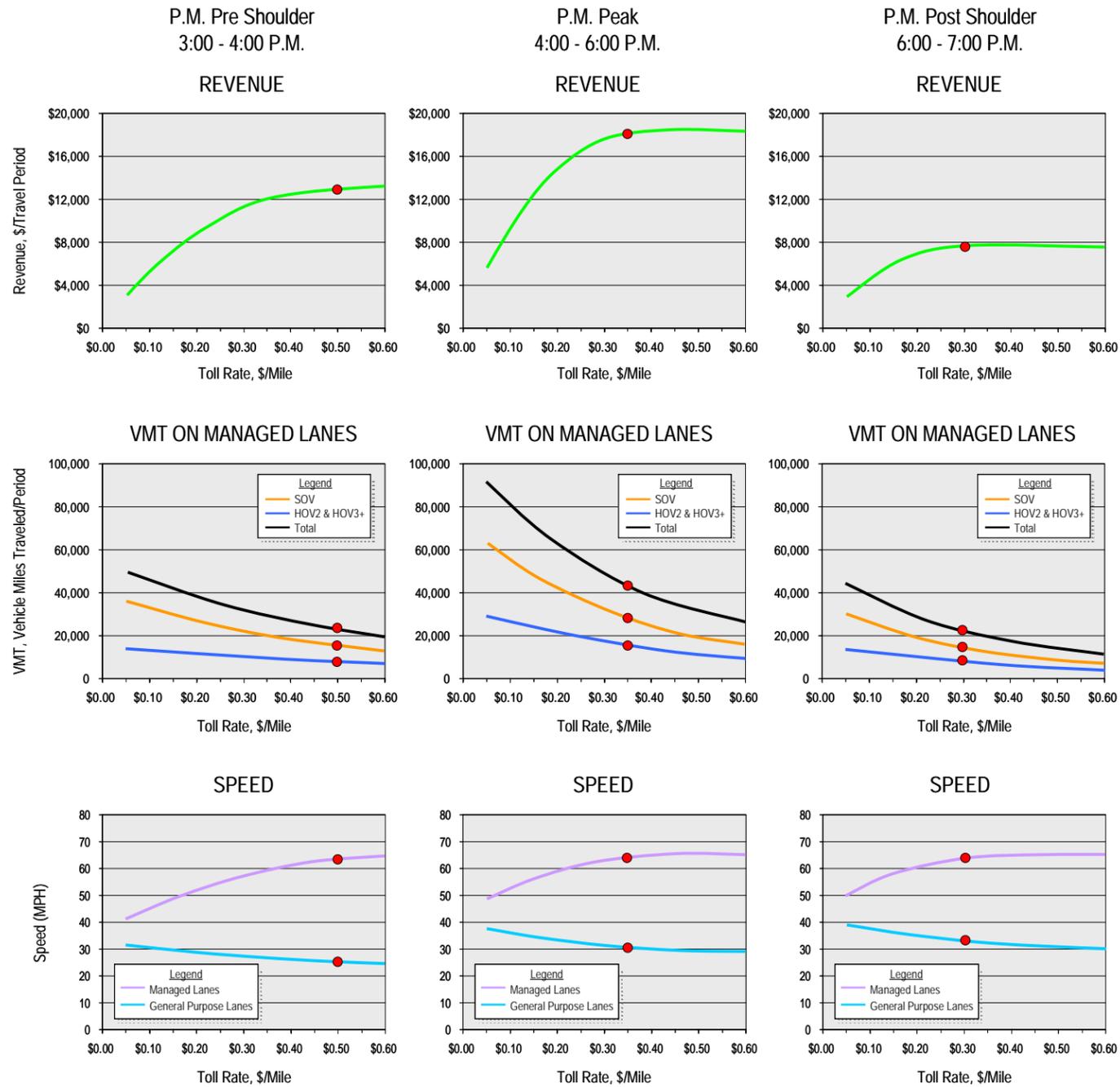
● - Optimum Toll Rate

2015 TOLL RATE / OPERATIONS PROFILE
A.M. Peak / Midday Weekday Period, Alternative 2 - All Pay

Figure 5-5

P.M. EASTBOUND

P.M. WESTBOUND



● - Optimum Toll Rate

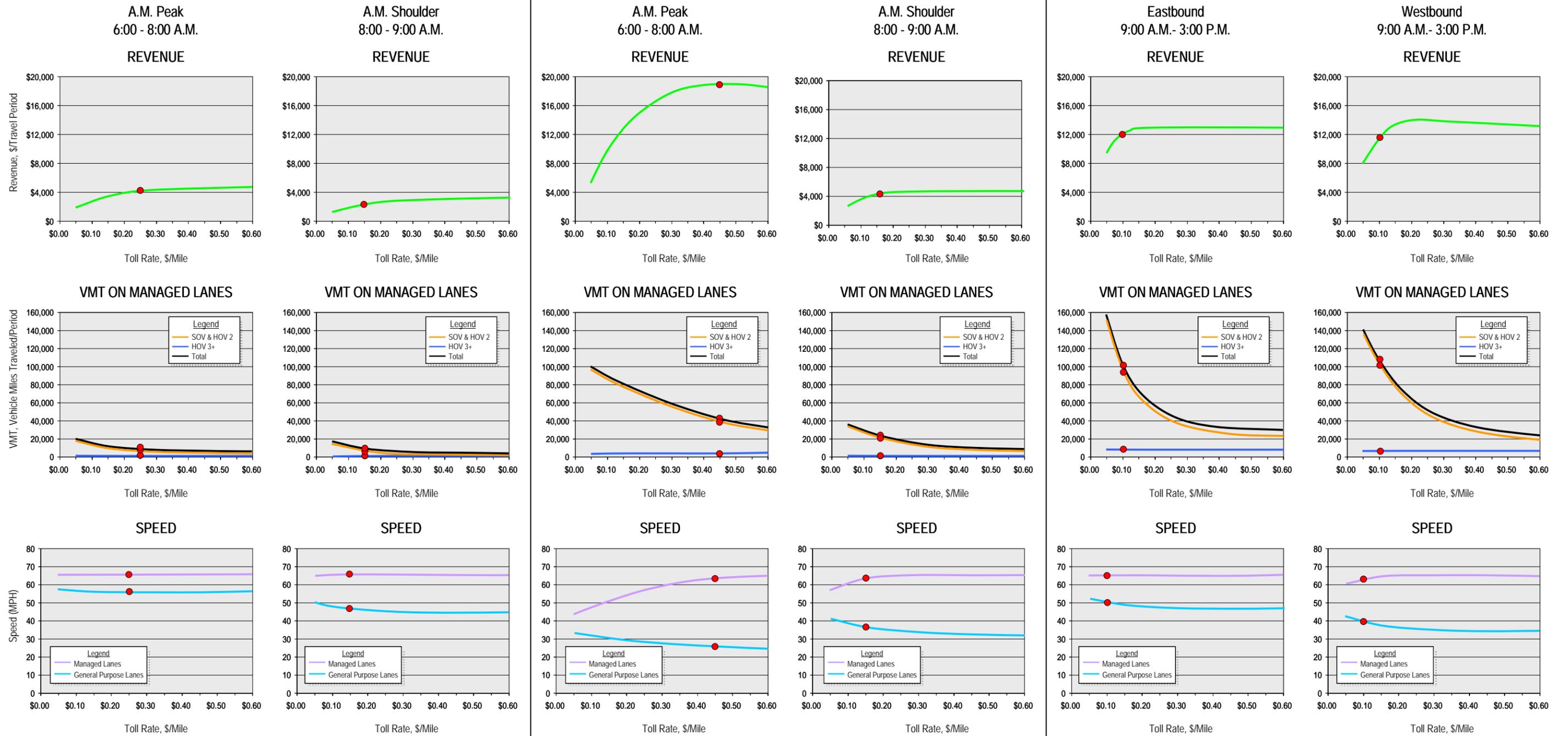
2015 TOLL RATE / OPERATIONS PROFILE
P.M. Weekday Peak Period, Alternative 2 - All Pay

Figure 5-6

A.M. EASTBOUND

A.M. WESTBOUND

MIDDAY



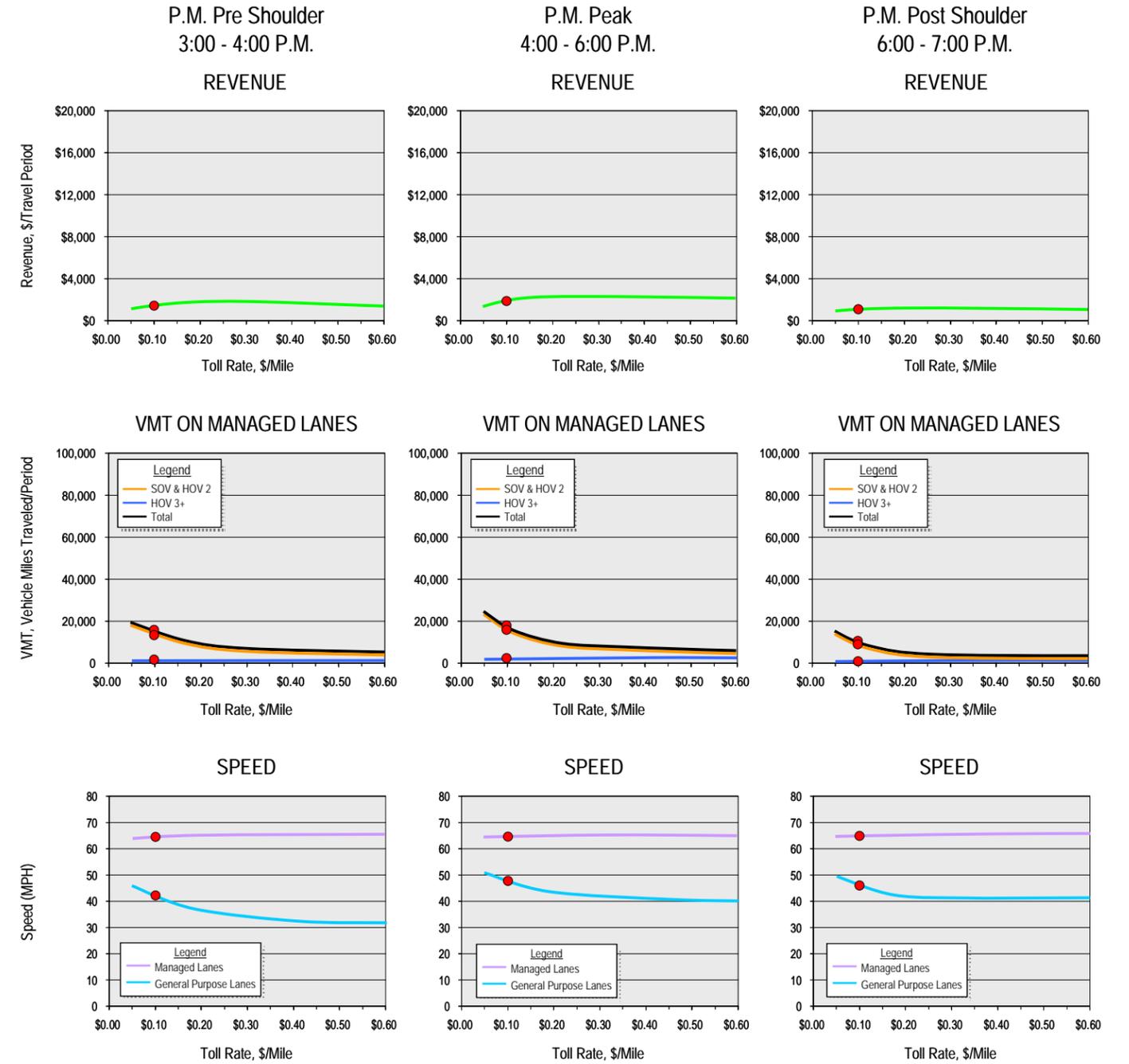
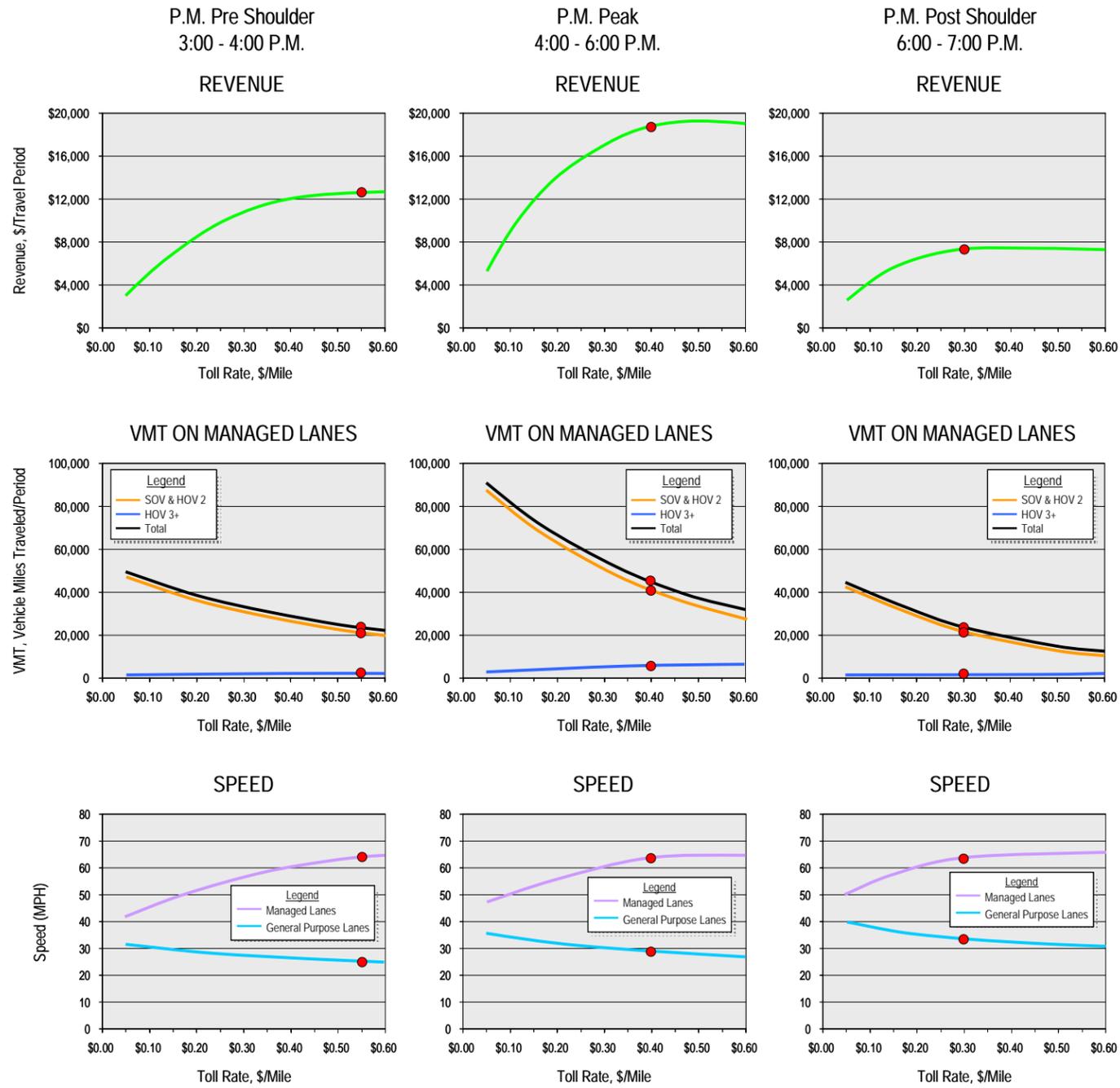
● - Optimum Toll Rate

2015 TOLL RATE / OPERATIONS PROFILE
A.M. Peak / Midday Weekday Period, Alternative 2 - HOV 3+ Free

Figure 5-7

P.M. EASTBOUND

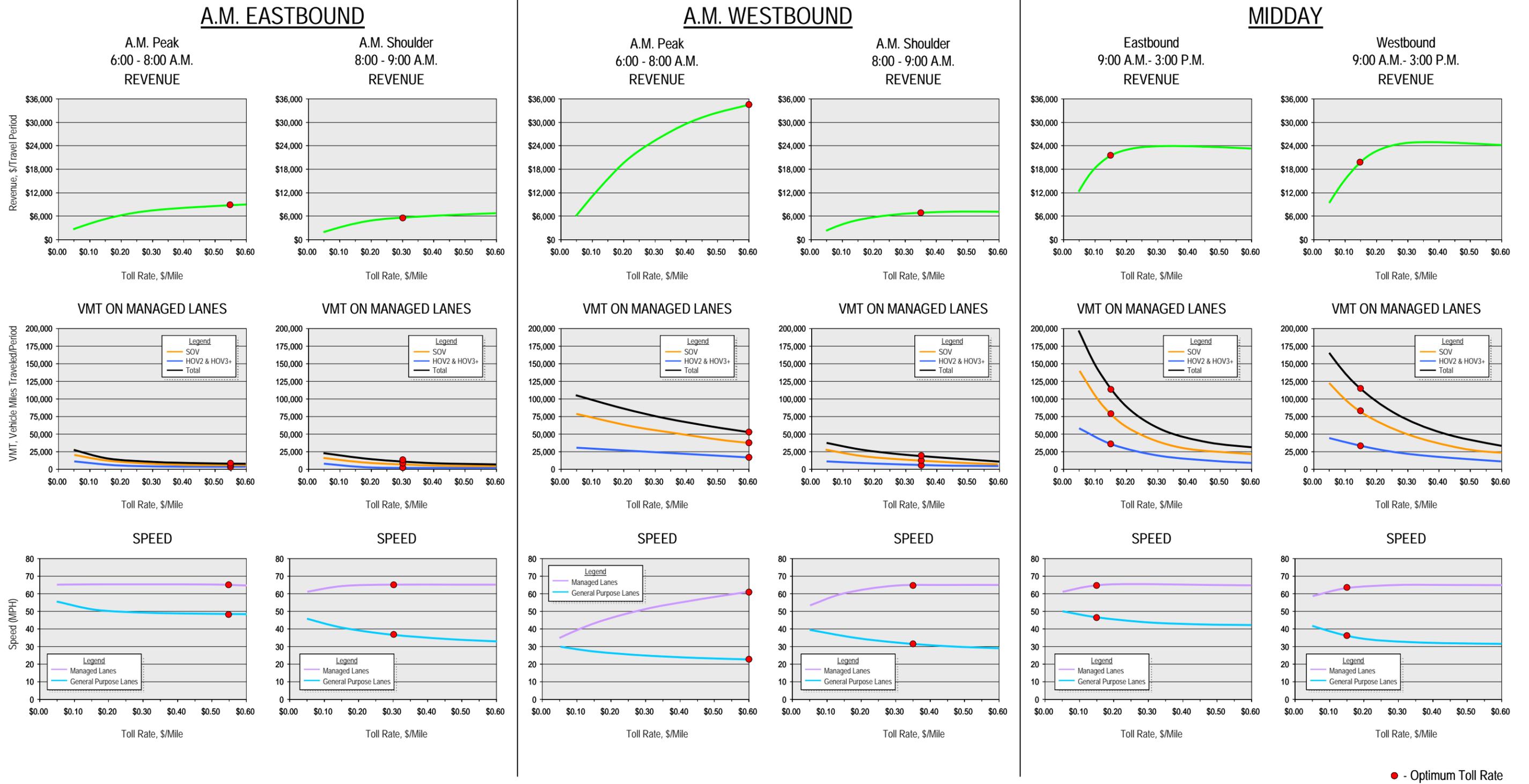
P.M. WESTBOUND



● - Optimum Toll Rate

2015 TOLL RATE / OPERATIONS PROFILE
P.M. Weekday Peak Period, Alternative 2 - HOV 3+ Free

Figure 5-8

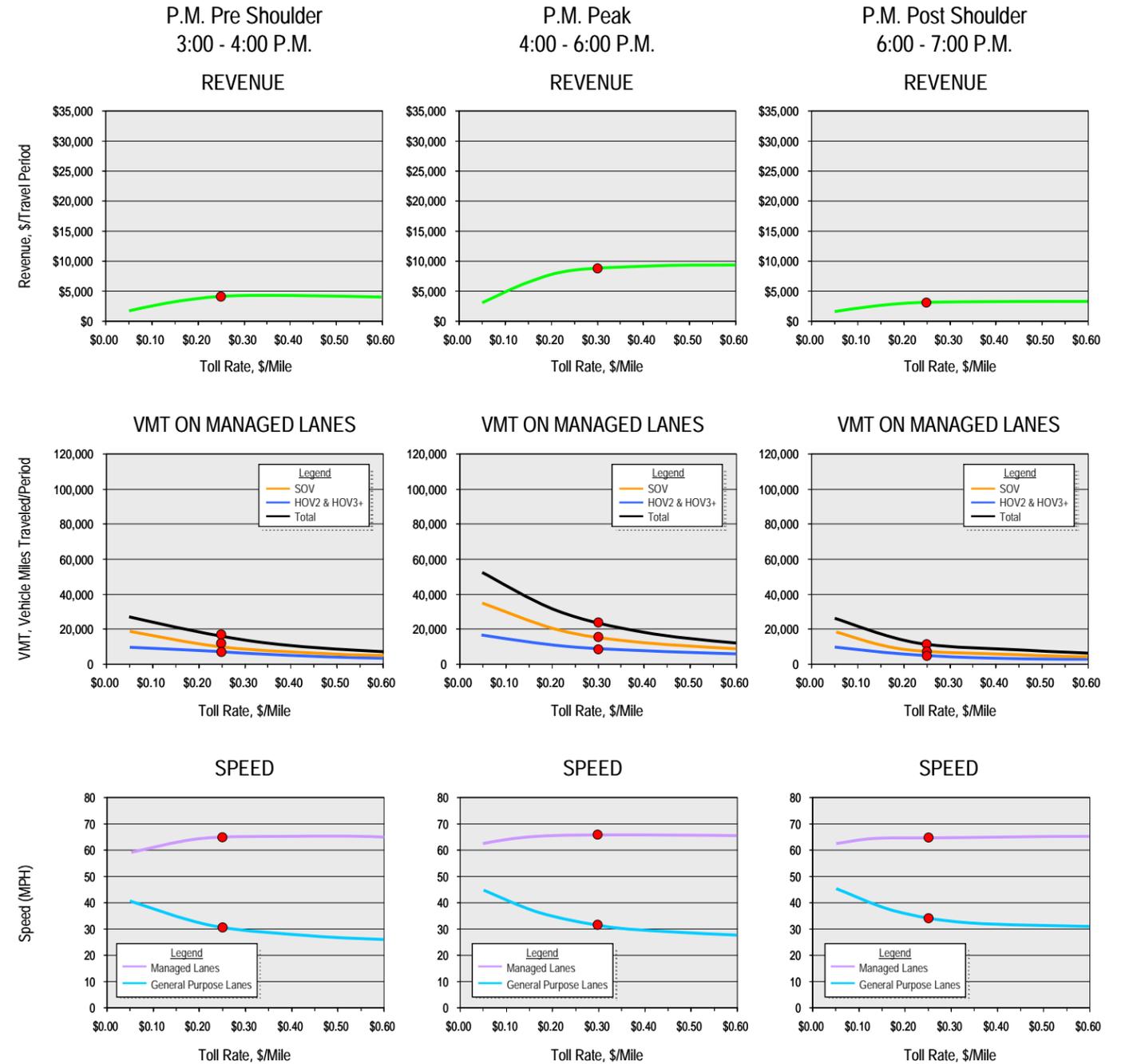
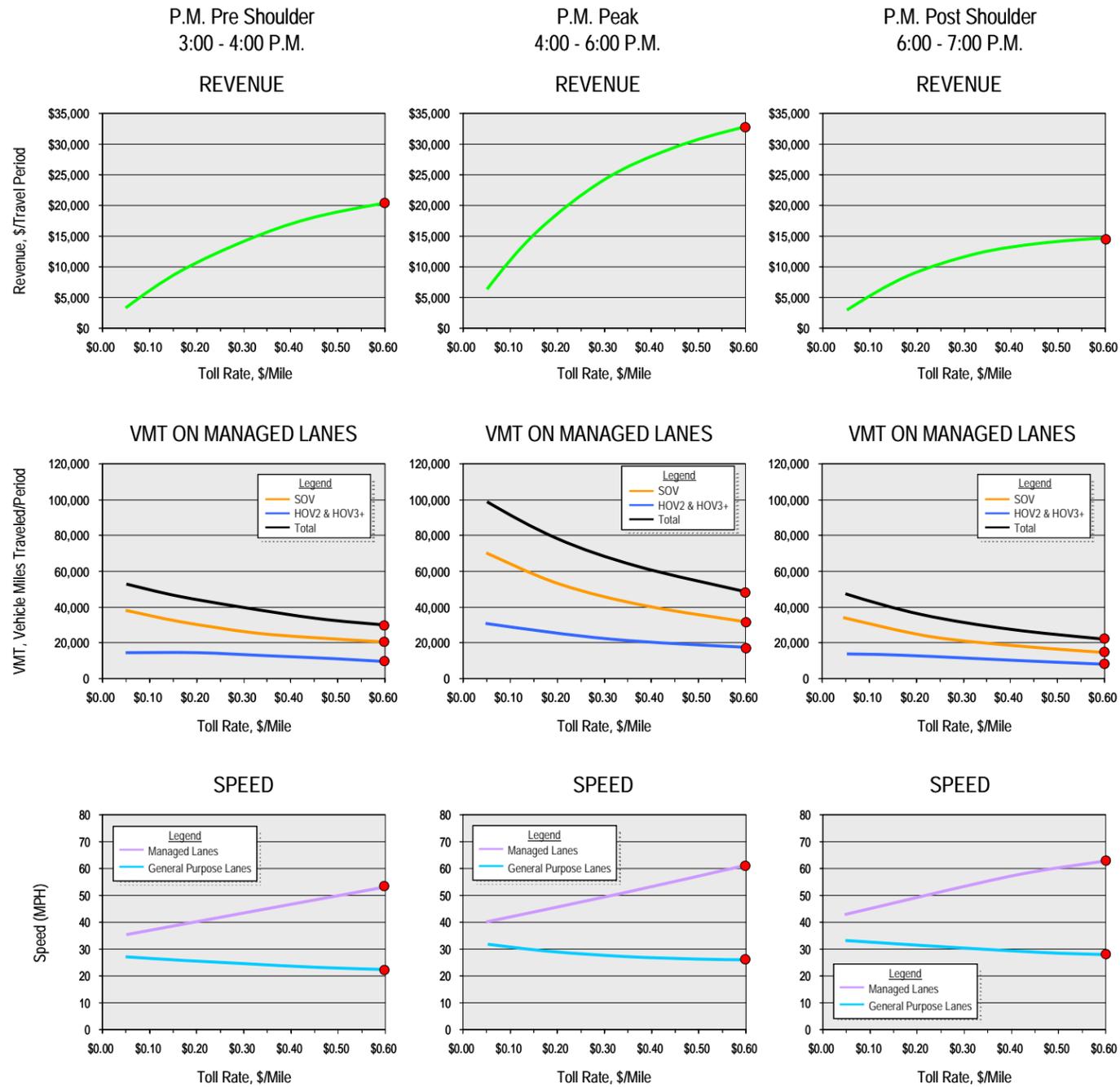


2025 TOLL RATE / OPERATIONS PROFILE
 A.M. Peak / Midday Weekday Period, Alternative 2 - All Pay

Figure 5-9

P.M. EASTBOUND

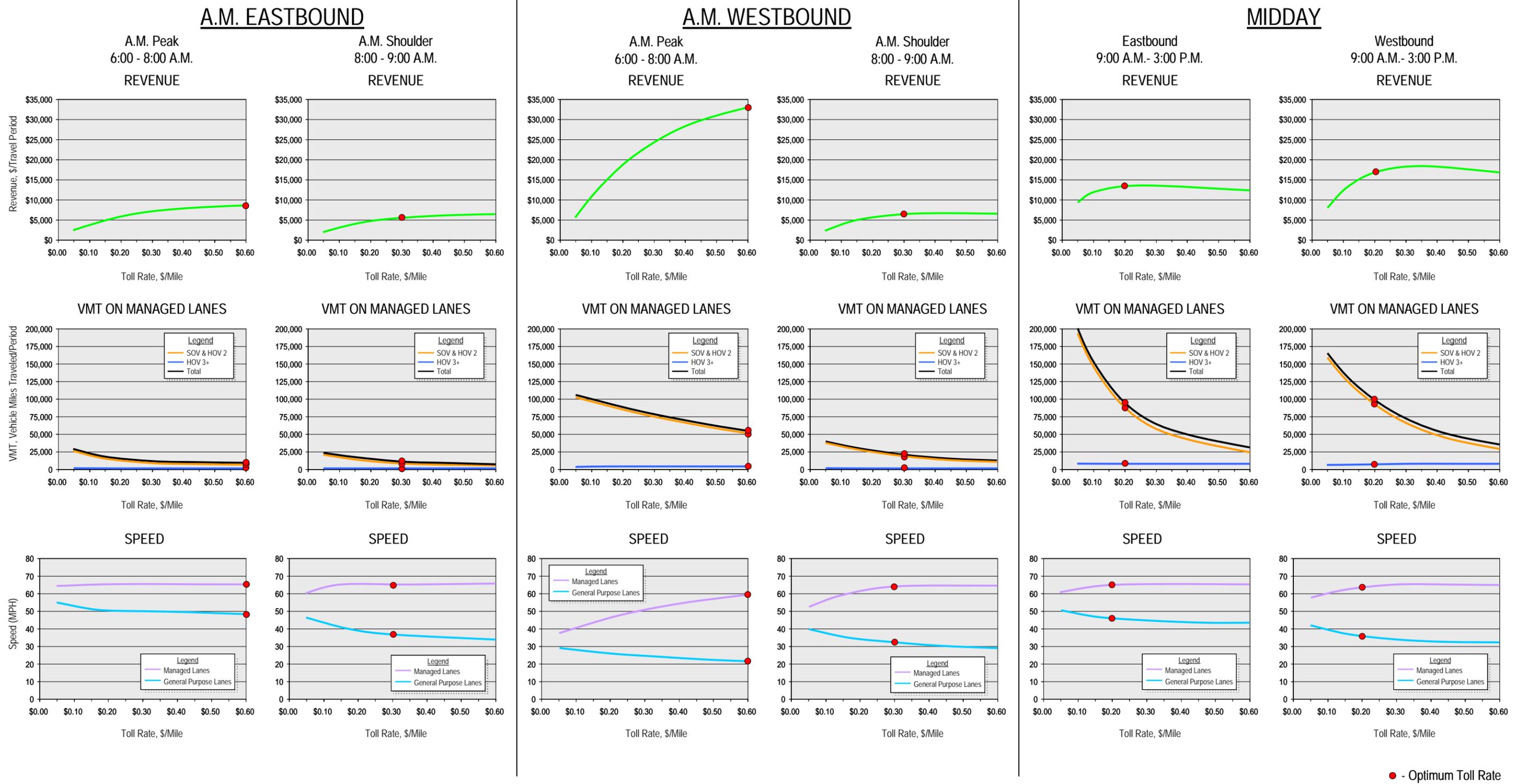
P.M. WESTBOUND



● - Optimum Toll Rate

2025 TOLL RATE / OPERATIONS PROFILE
P.M. Weekday Peak Period, Alternative 2 - All Pay

Figure 5-10

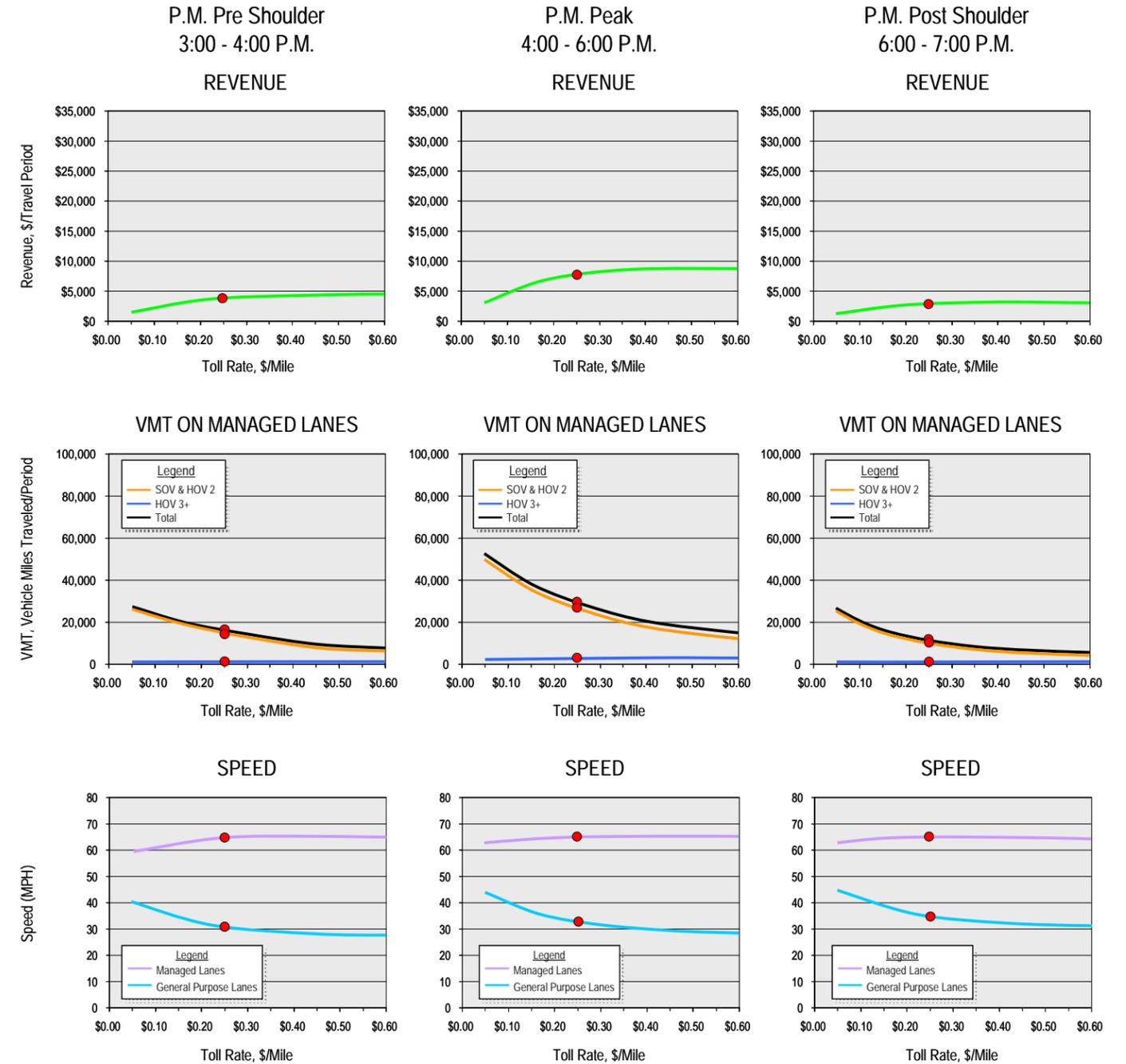
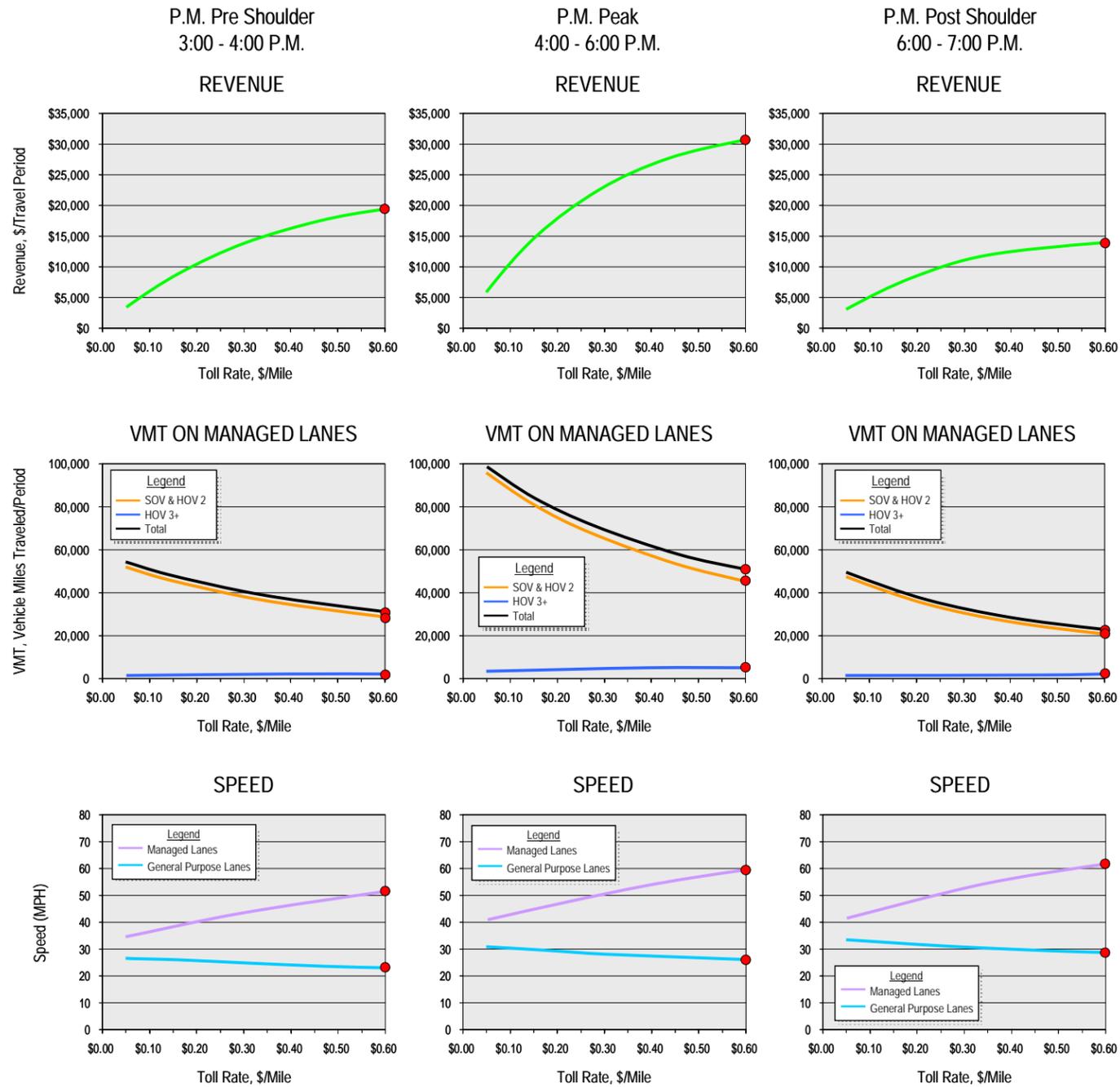


2025 TOLL RATE / OPERATIONS PROFILE
A.M. Peak / Midday Weekday Period, Alternative 2 - HOV 3+ Free

Figure 5-11

P.M. EASTBOUND

P.M. WESTBOUND



● - Optimum Toll Rate

2025 TOLL RATE / OPERATIONS PROFILE
P.M. Weekday Peak Period, Alternative 2 - HOV 3+ Free

Figure 5-12

2025 results during peak travel periods optimum per mile toll rates reach the highest levels tested. It was necessary to assess these high per mile rates in order to manage the high levels of demand in the MLs which occur in the peak AM and PM travel directions. In certain cases it was necessary to assess even higher rates to manage demand on the single-lane sections of Alternative 2. Rather than allowing the single-lane sections to drive toll rate-setting for the entire facility differential toll rates were employed along different sections of the facility. For example, during the PM peak period in the EB travel direction, a per mile toll rate of \$0.60 was assessed in the higher capacity ML segments west of Forest Lane, while in the single lane sections east of Forest Lane a per mile toll rate of \$1.10 was utilized. By assessing differential per mile rates it was possible to manage demand in the lower capacity single lane section while allowing optimum usage of the two and three lane sections of the project during these peak periods.

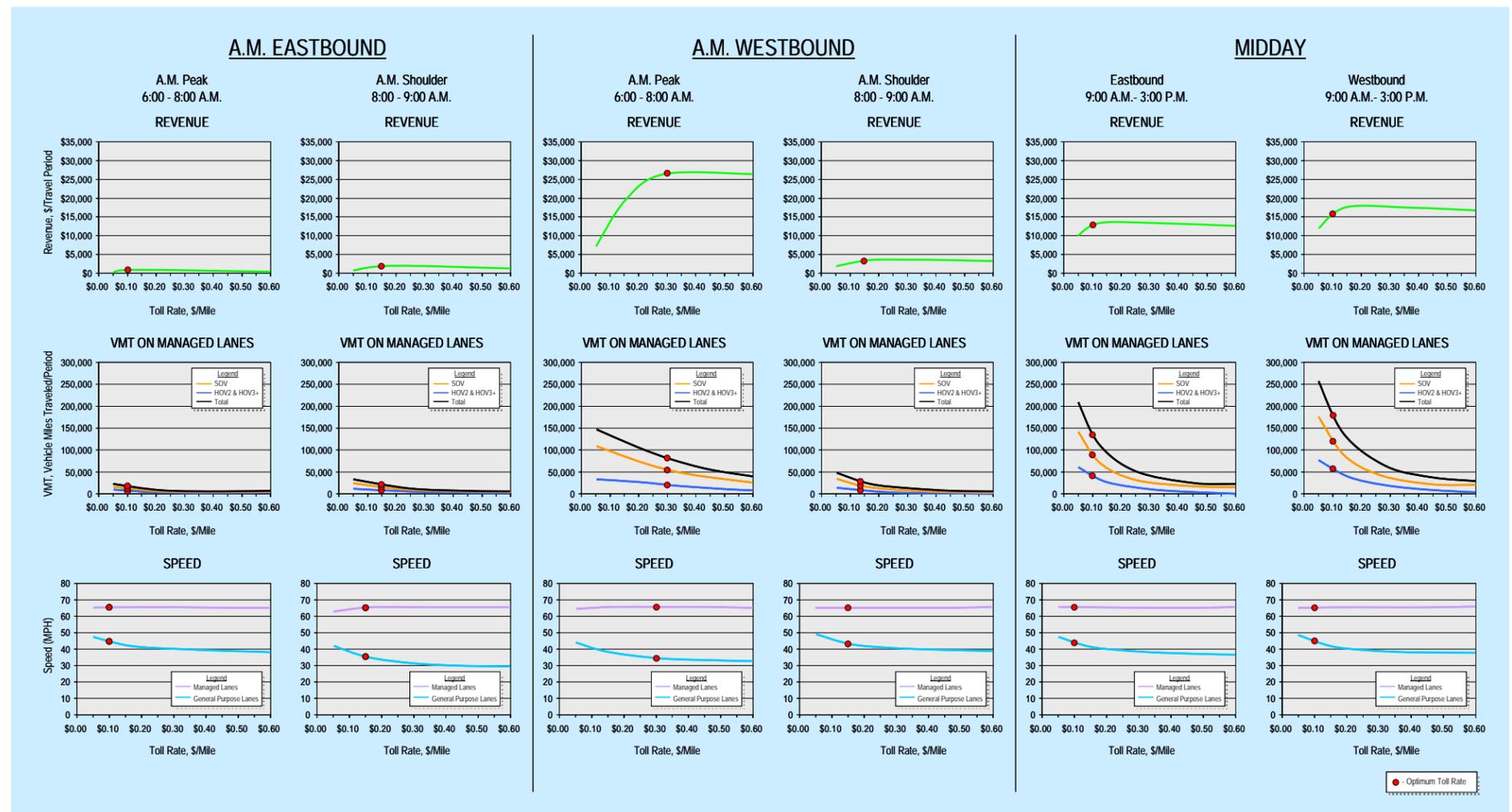
Alternative 6 – Information regarding optimum toll rates, VMT and average travel speeds for the LBJ MLs under the Alternative 6 project configuration are depicted in Figures 5-13 through 5-20. This represents the full ultimate Managed Lanes configuration as identified by TxDOT. The results are disaggregated by All Pay and HOV 3+ Free operating scenarios and summarized for the same travel periods as outlined under Alternative 2. Data is presented for Alternative 6 opening 2015 and future-year 2025.

Optimal toll rates in the morning peak westbound direction under Alternative 6 are shown at \$0.30 per mile, in 2015. This compared with an optimum rate of \$0.45 under Alternative 2. The primary difference relates to the total amount of capacity available in the managed lanes, and a significantly improved interchange configuration with IH 35 at the west end of the corridor. Notwithstanding the lower optimal toll rates, higher period revenues are shown, reflecting the dynamic nature of the facility in which there is significantly greater capacity for traffic, even though lower toll rates are used. Operating speeds are estimated at greater than 60 mph in managed lanes for all toll rates, in both directions, for the morning peak.

In the afternoon peak conditions, the optimum toll was also found to be \$0.35 per mile, estimated to produce almost \$35,000 per weekday in this two hour period. This is a comparable rate to the Alternative 2 configuration, but considerably higher revenue and VMT.

The affect of the increased capacity on the managed lanes is also clearly shown in the estimate of VMT. At optimal toll levels under Alternative 6, PM peak eastbound VMT reaches almost 100,000 in this two hour period, as compared with less than 50,000 at similar toll rates under Alternative 2.

It should be noted that at no time do optimum per mile toll rates reach the highest per mile toll rates tested. This is mainly due to the additional capacity available along the eastern section of the LBJ Managed Lanes under Alternative 6 as compared with the interim configuration under Alternative 2. This additional capacity provides the opportunity to manage demand utilizing lower per mile rates than those assessed under Alternative 2.

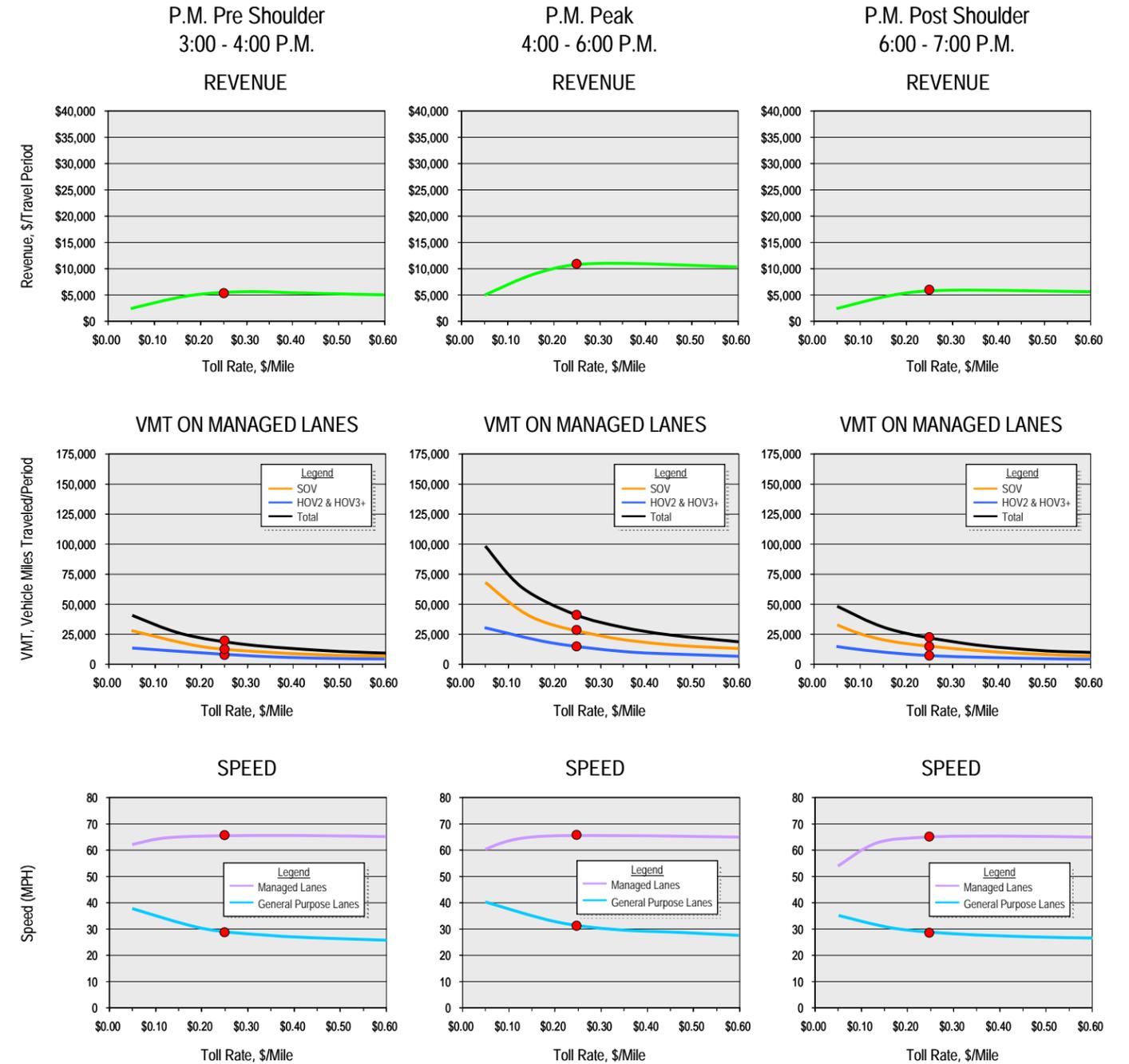
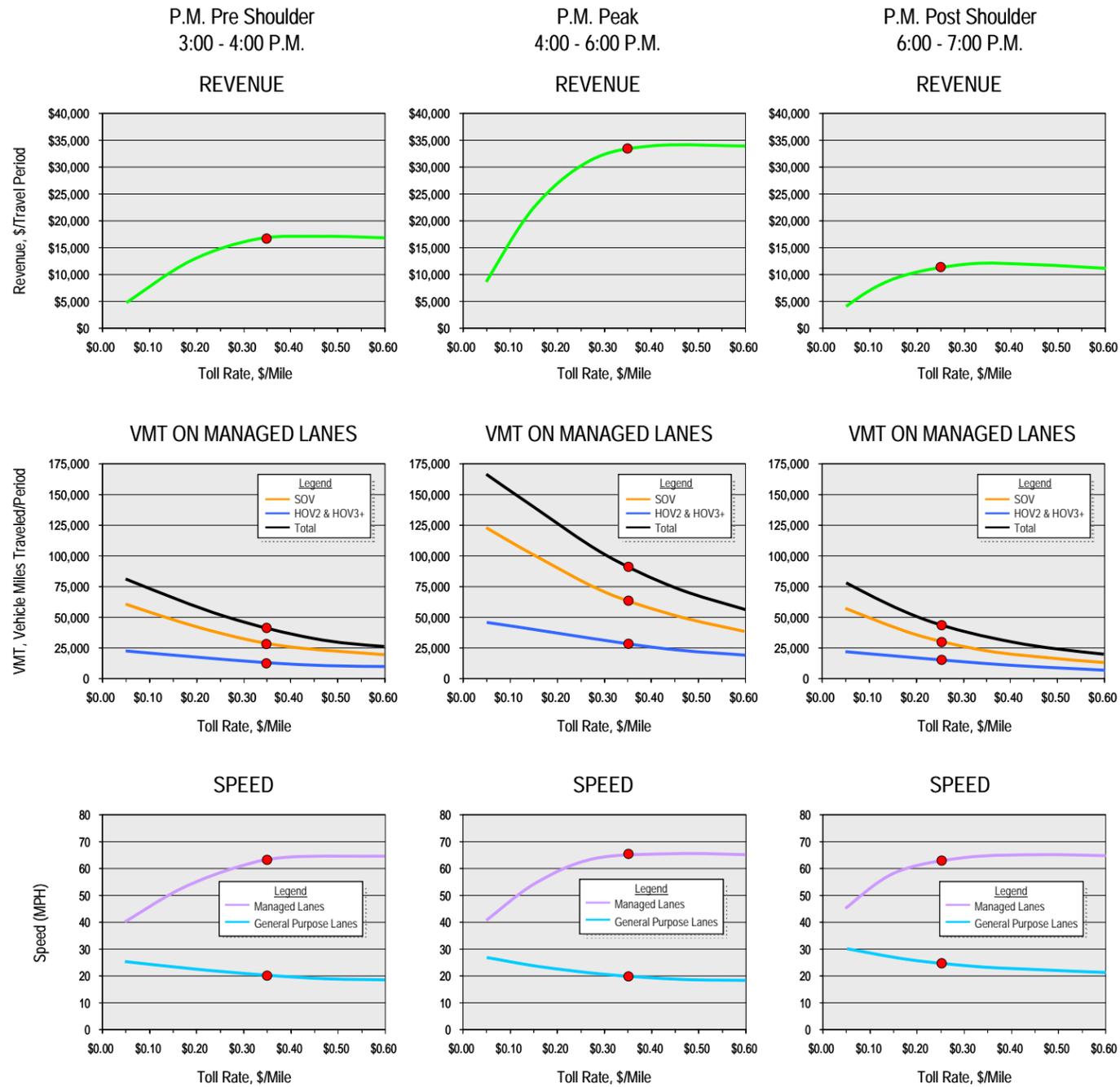


2015 TOLL RATE / OPERATIONS PROFILE
A.M. Peak / Midday Weekday Period, Alternative 6 - All Pay

Figure 5-13

P.M. EASTBOUND

P.M. WESTBOUND



● - Optimum Toll Rate

2015 TOLL RATE / OPERATIONS PROFILE
P.M. Weekday Peak Period, Alternative 6 - All Pay

Figure 5-14

A.M. EASTBOUND

A.M. WESTBOUND

MIDDAY

A.M. Peak
6:00 - 8:00 A.M.

A.M. Shoulder
8:00 - 9:00 A.M.

A.M. Peak
6:00 - 8:00 A.M.

A.M. Shoulder
8:00 - 9:00 A.M.

Eastbound
9:00 A.M. - 3:00 P.M.

Westbound
9:00 A.M. - 3:00 P.M.

REVENUE

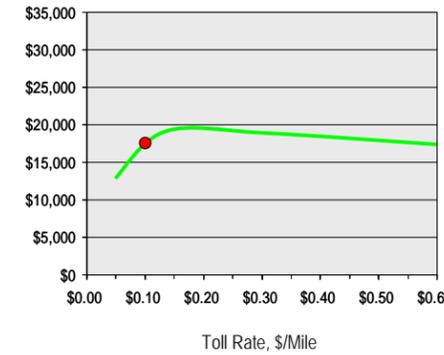
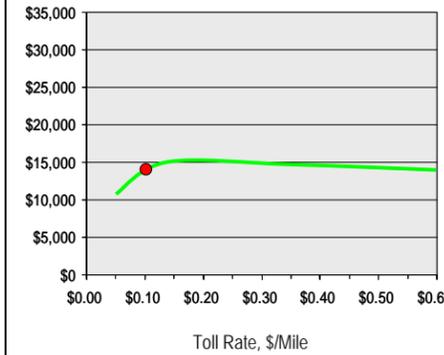
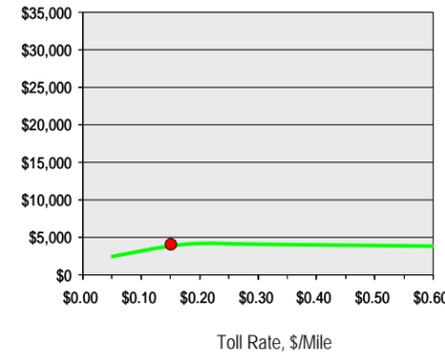
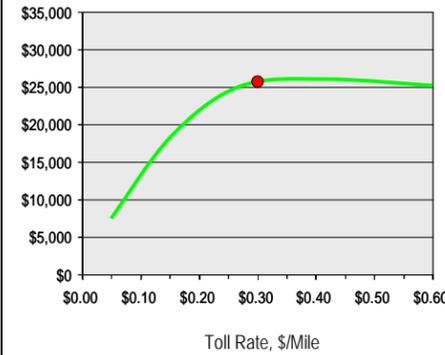
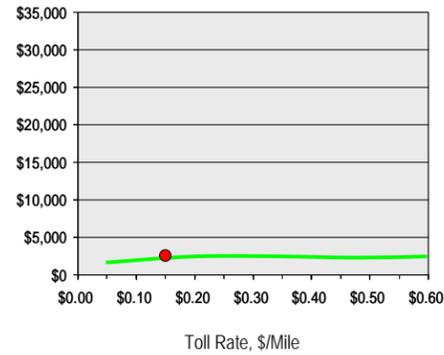
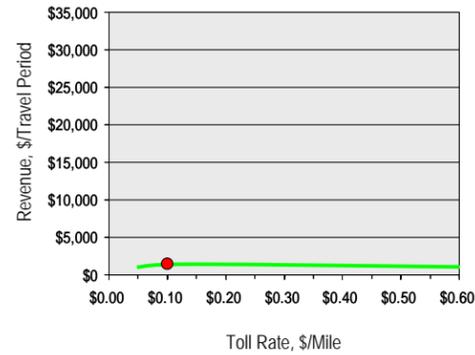
REVENUE

REVENUE

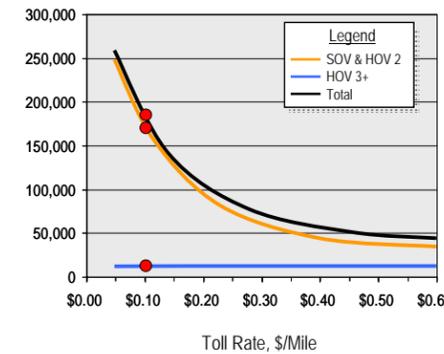
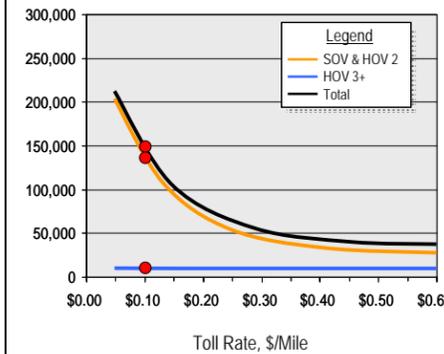
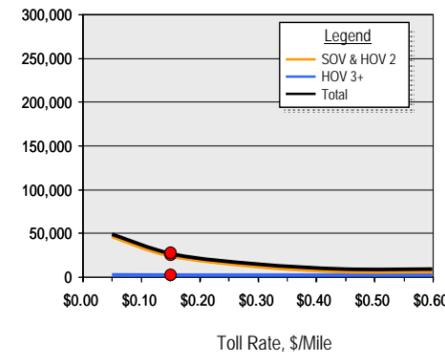
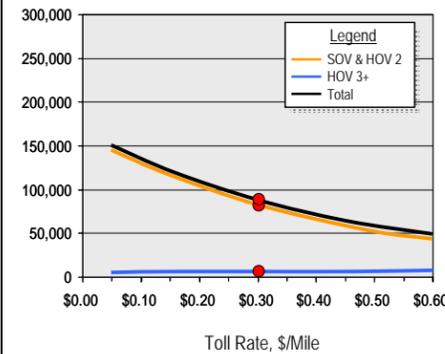
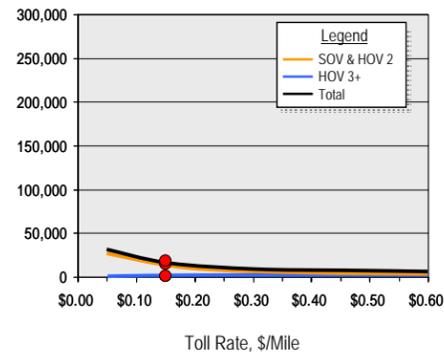
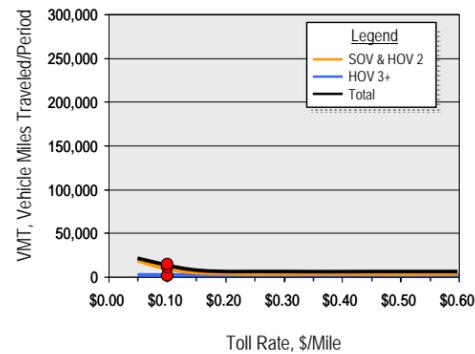
REVENUE

REVENUE

REVENUE



VMT ON MANAGED LANES



SPEED

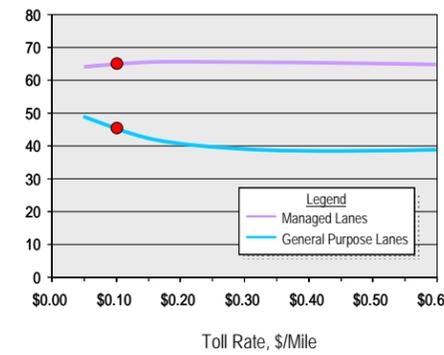
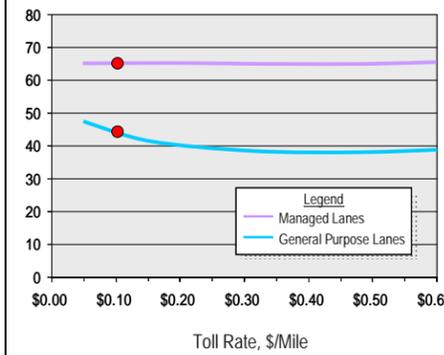
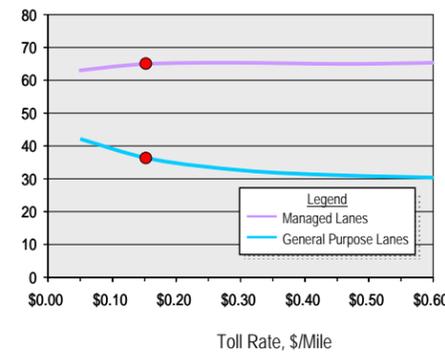
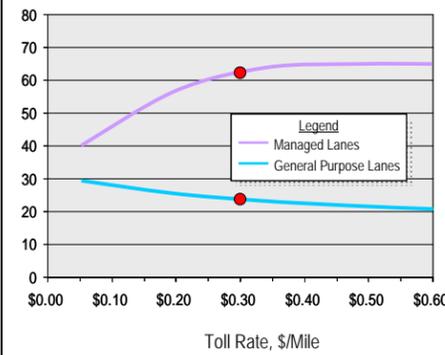
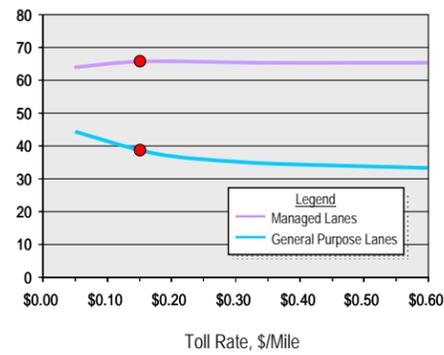
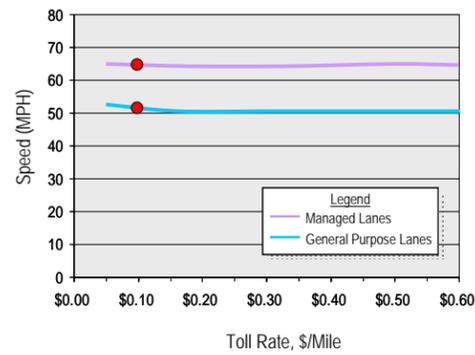
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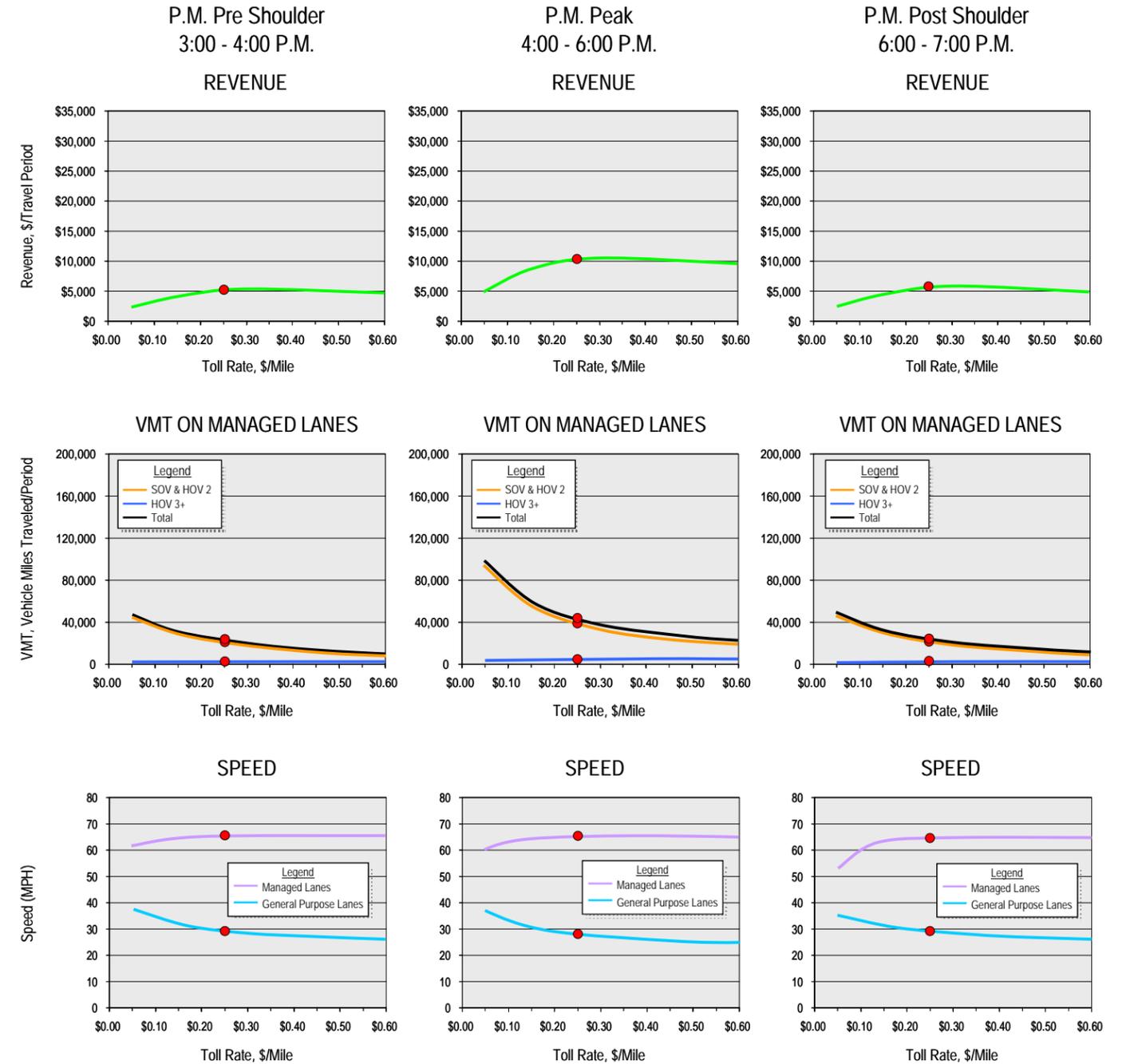
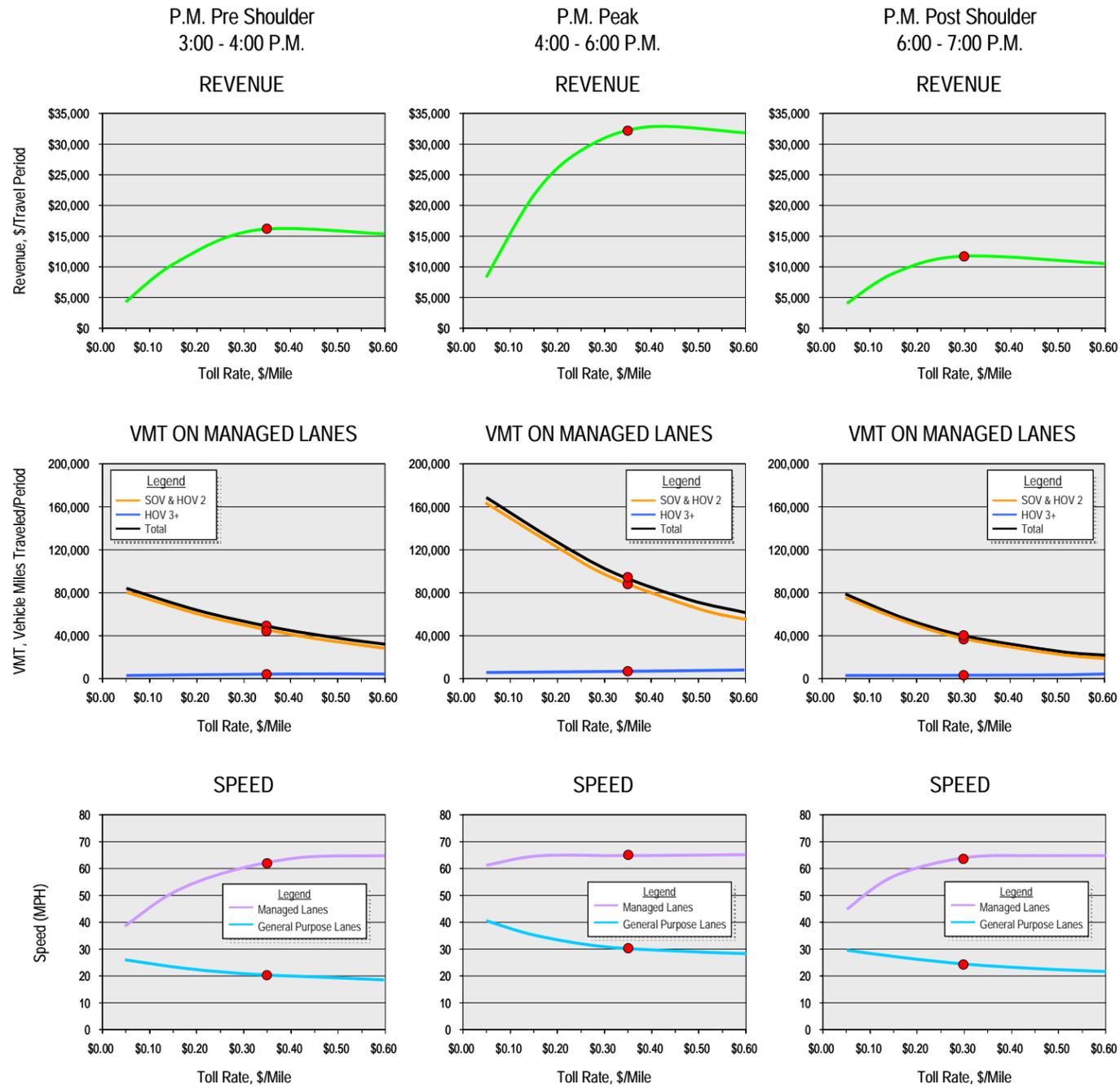
● - Optimum Toll Rate

2015 TOLL RATE / OPERATIONS PROFILE
A.M. Peak / Midday Weekday Period, Alternative 6 - HOV 3+ Free

Figure 5-15

P.M. EASTBOUND

P.M. WESTBOUND



● - Optimum Toll Rate

2015 TOLL RATE / OPERATIONS PROFILE
P.M. Weekday Peak Period, Alternative 6 - HOV 3+ Free

Figure 5-16

A.M. EASTBOUND

A.M. WESTBOUND

MIDDAY

A.M. Peak
6:00 - 8:00 A.M.

A.M. Shoulder
8:00 - 9:00 A.M.

A.M. Peak
6:00 - 8:00 A.M.

A.M. Shoulder
8:00 - 9:00 A.M.

Eastbound
9:00 A.M. - 3:00 P.M.

Westbound
9:00 A.M. - 3:00 P.M.

REVENUE

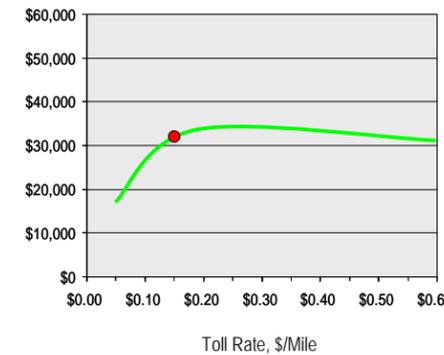
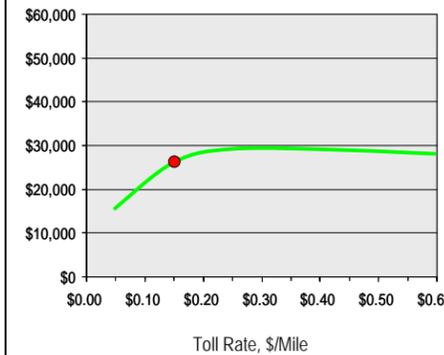
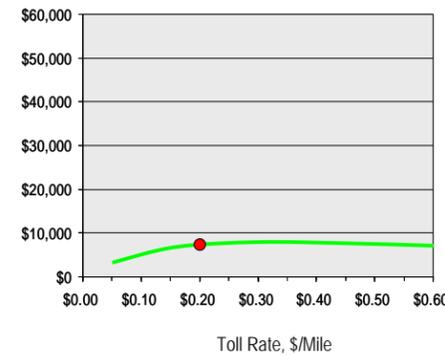
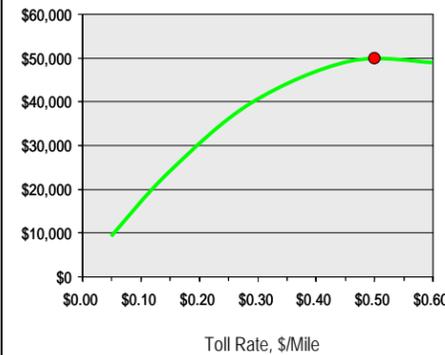
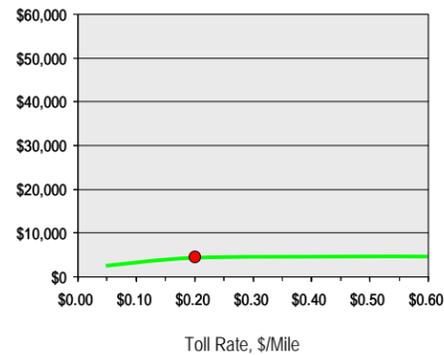
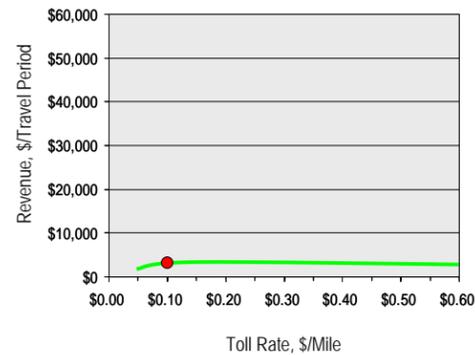
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REVENUE

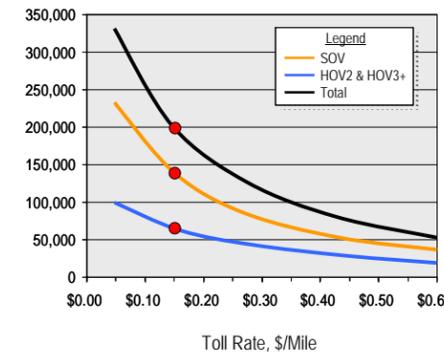
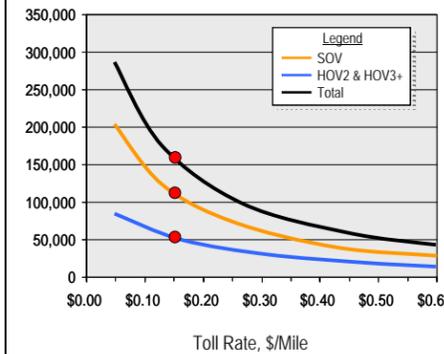
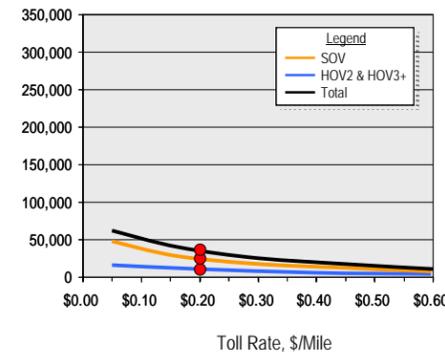
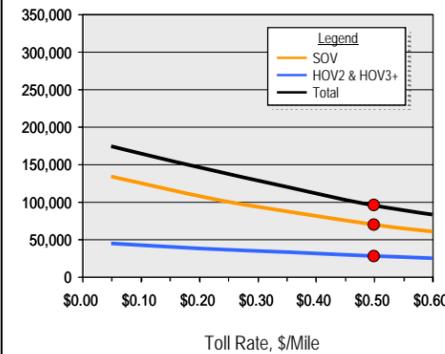
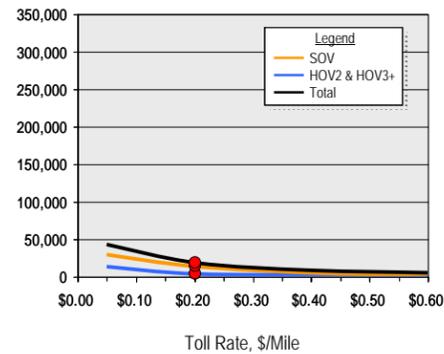
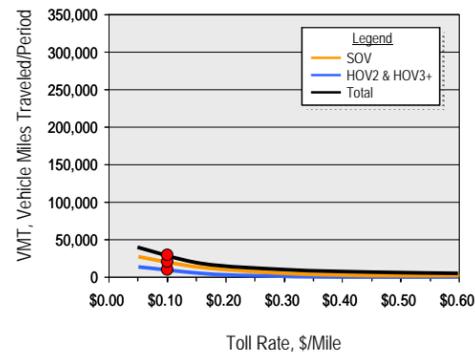
REVENUE

REVENUE

REVENUE



VMT ON MANAGED LANES



SPEED

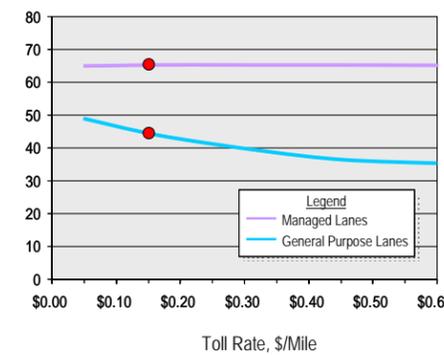
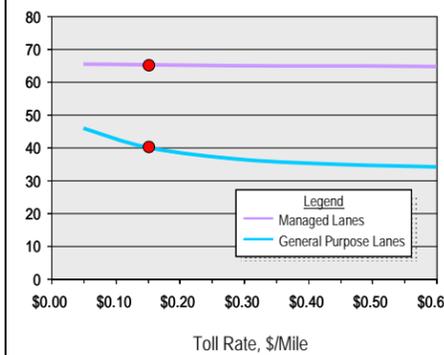
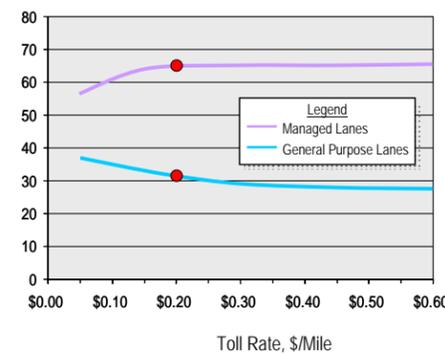
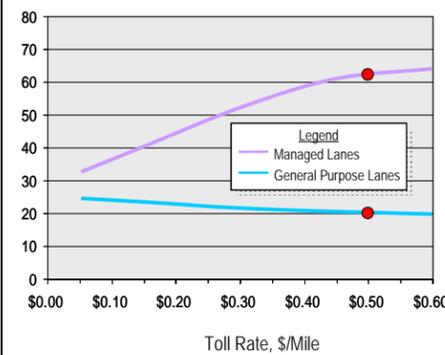
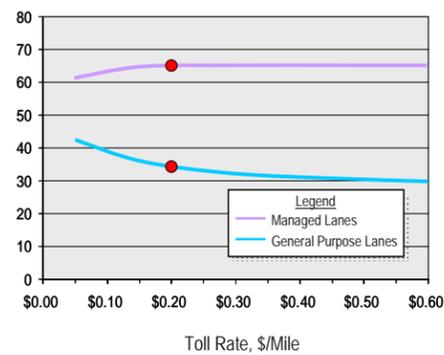
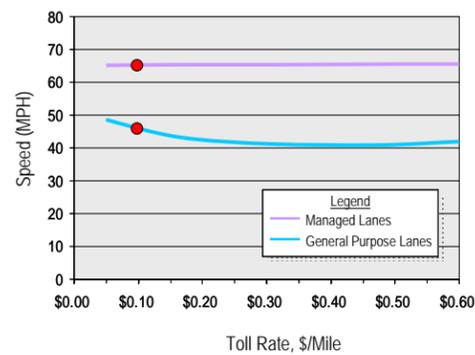
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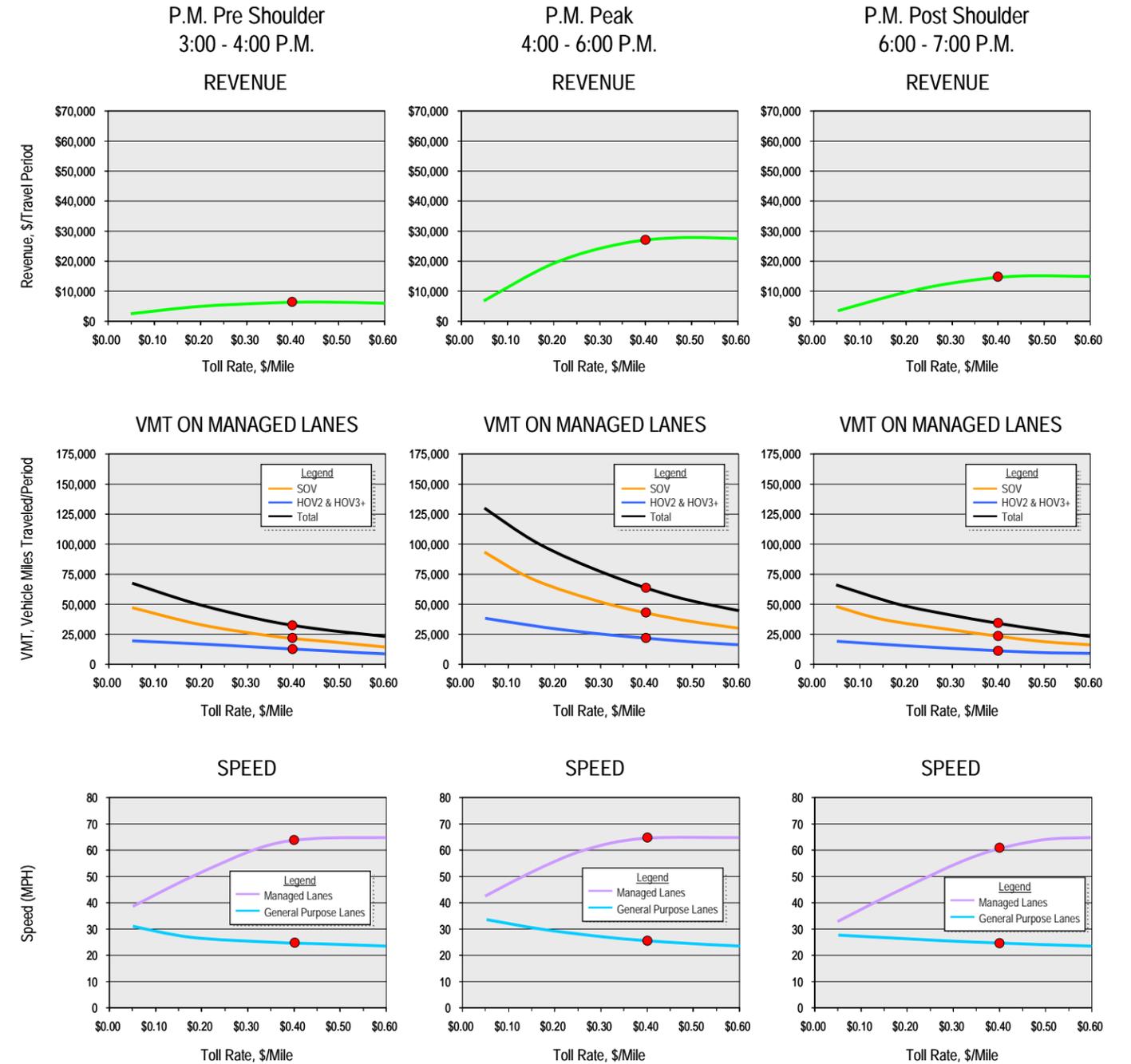
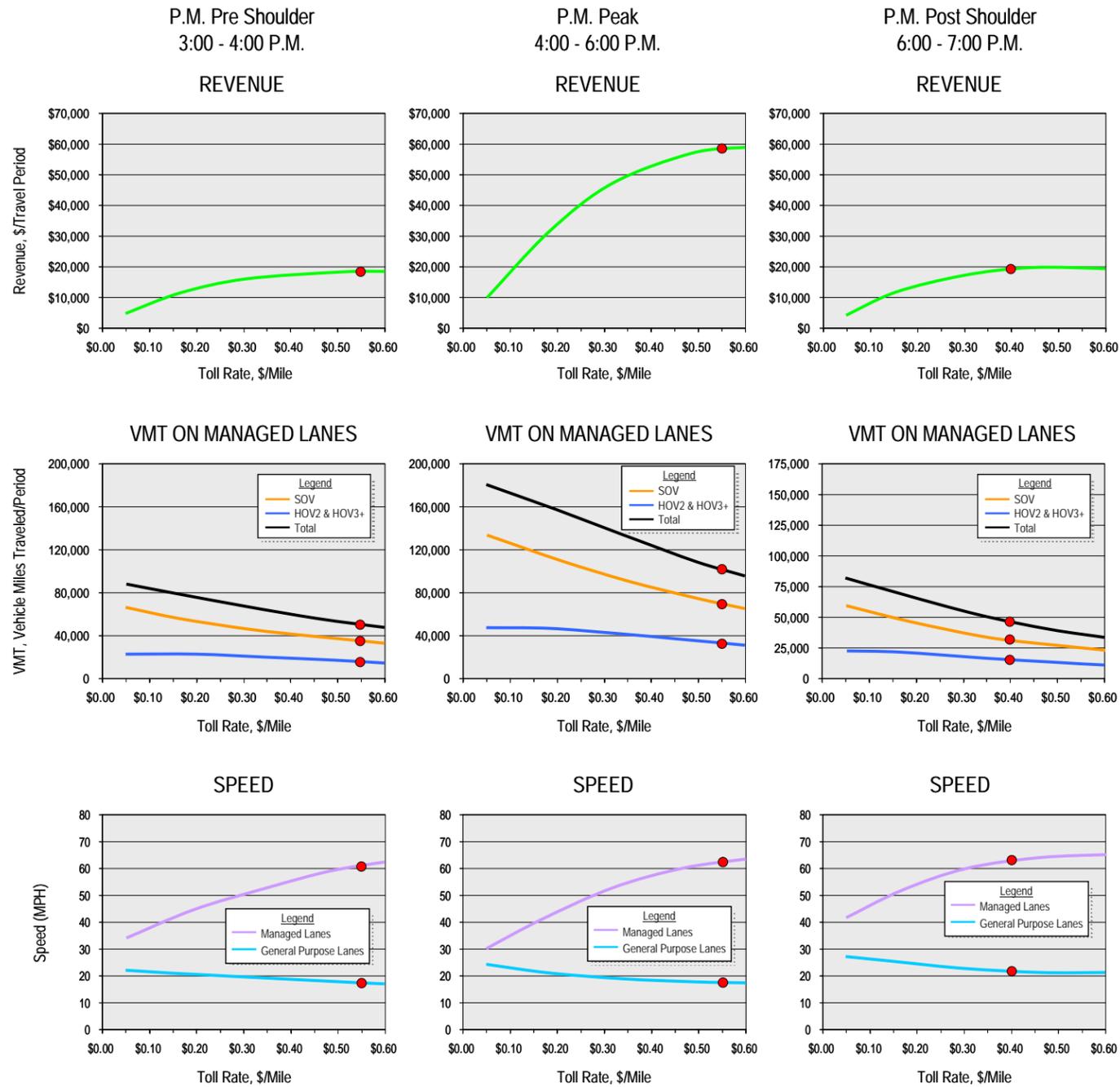
● - Optimum Toll Rate

2025 TOLL RATE / OPERATIONS PROFILE
A.M. Peak / Midday Weekday Period, Alternative 6 - All Pay

Figure 5-17

P.M. EASTBOUND

P.M. WESTBOUND



● - Optimum Toll Rate

2025 TOLL RATE / OPERATIONS PROFILE
P.M. Weekday Peak Period, Alternative 6 - All Pay

Figure 5-18

A.M. EASTBOUND

A.M. WESTBOUND

MIDDAY

A.M. Peak
6:00 - 8:00 A.M.

A.M. Shoulder
8:00 - 9:00 A.M.

A.M. Peak
6:00 - 8:00 A.M.

A.M. Shoulder
8:00 - 9:00 A.M.

Eastbound
9:00 A.M. - 3:00 P.M.

Westbound
9:00 A.M. - 3:00 P.M.

REVENUE

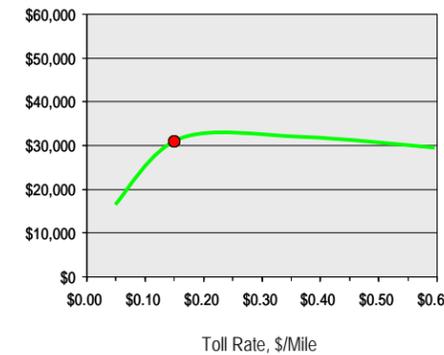
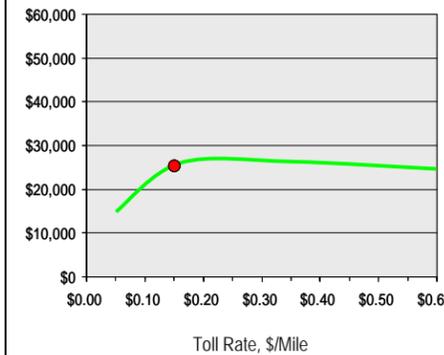
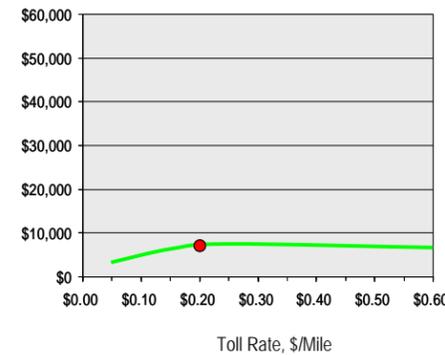
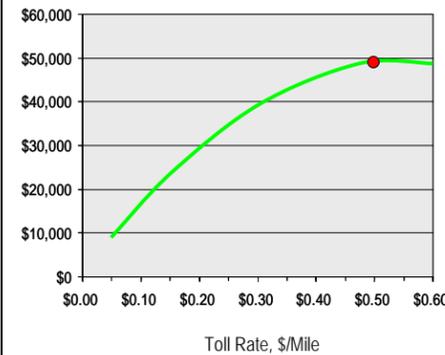
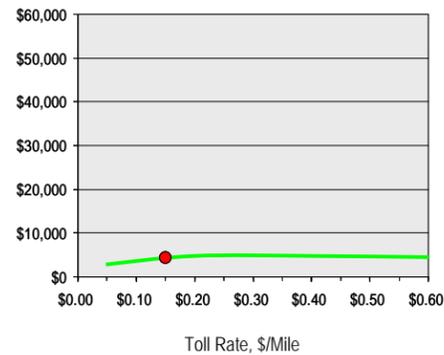
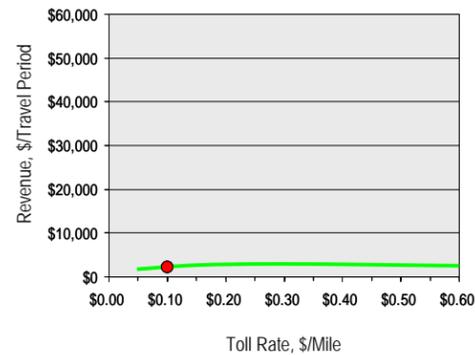
REVENUE

REVENUE

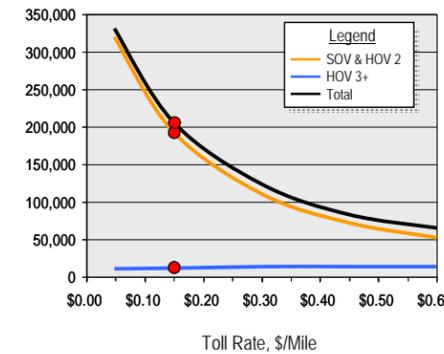
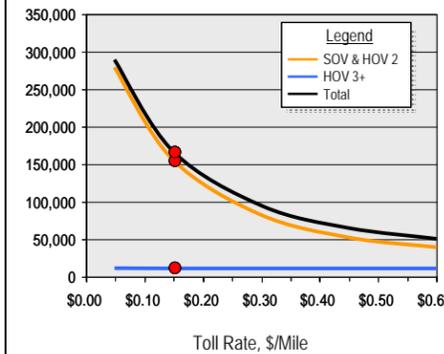
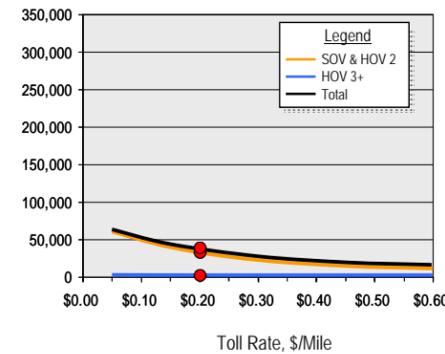
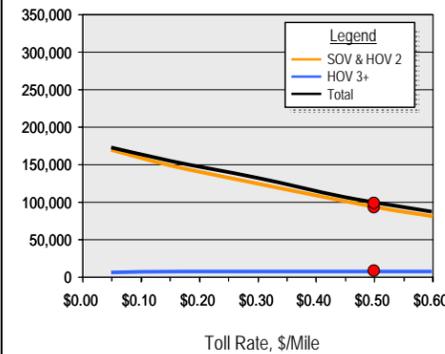
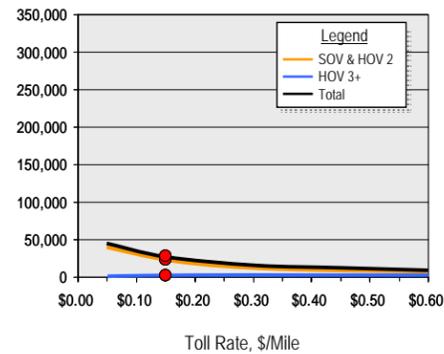
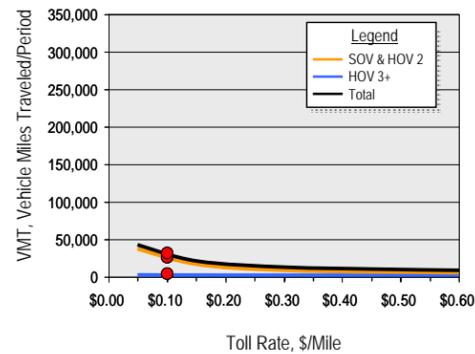
REVENUE

REVENUE

REVENUE



VMT ON MANAGED LANES



SPEED

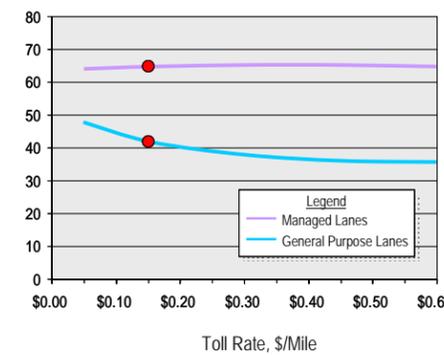
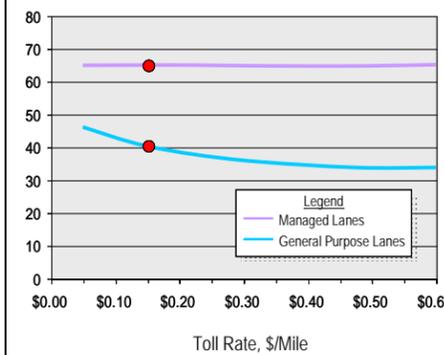
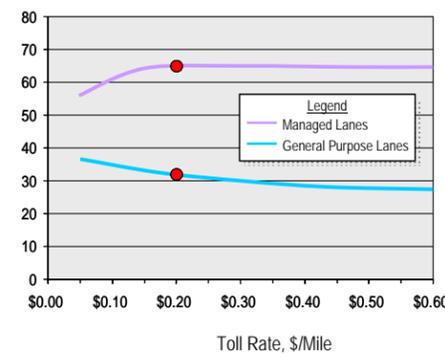
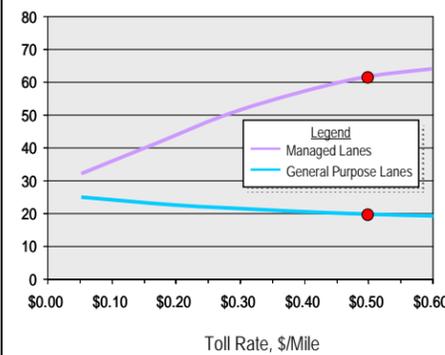
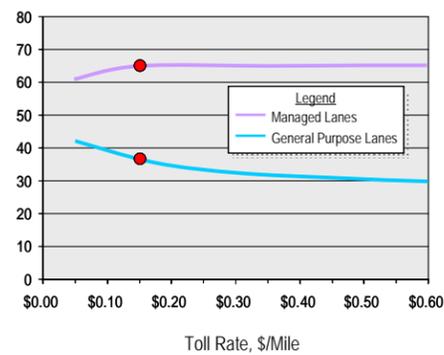
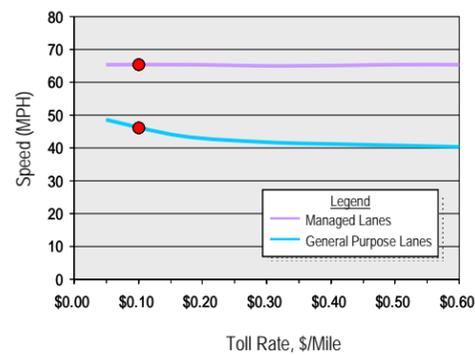
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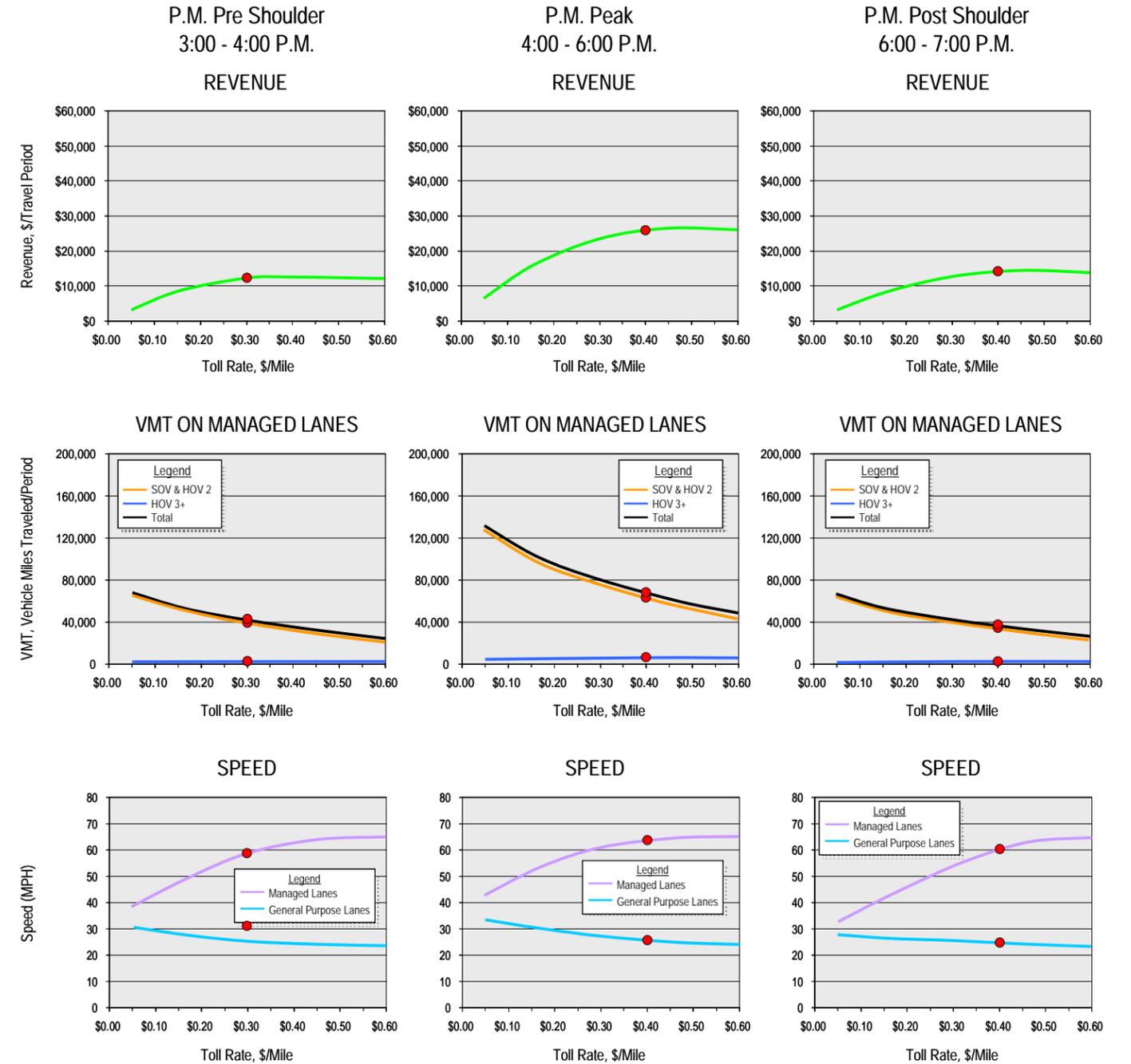
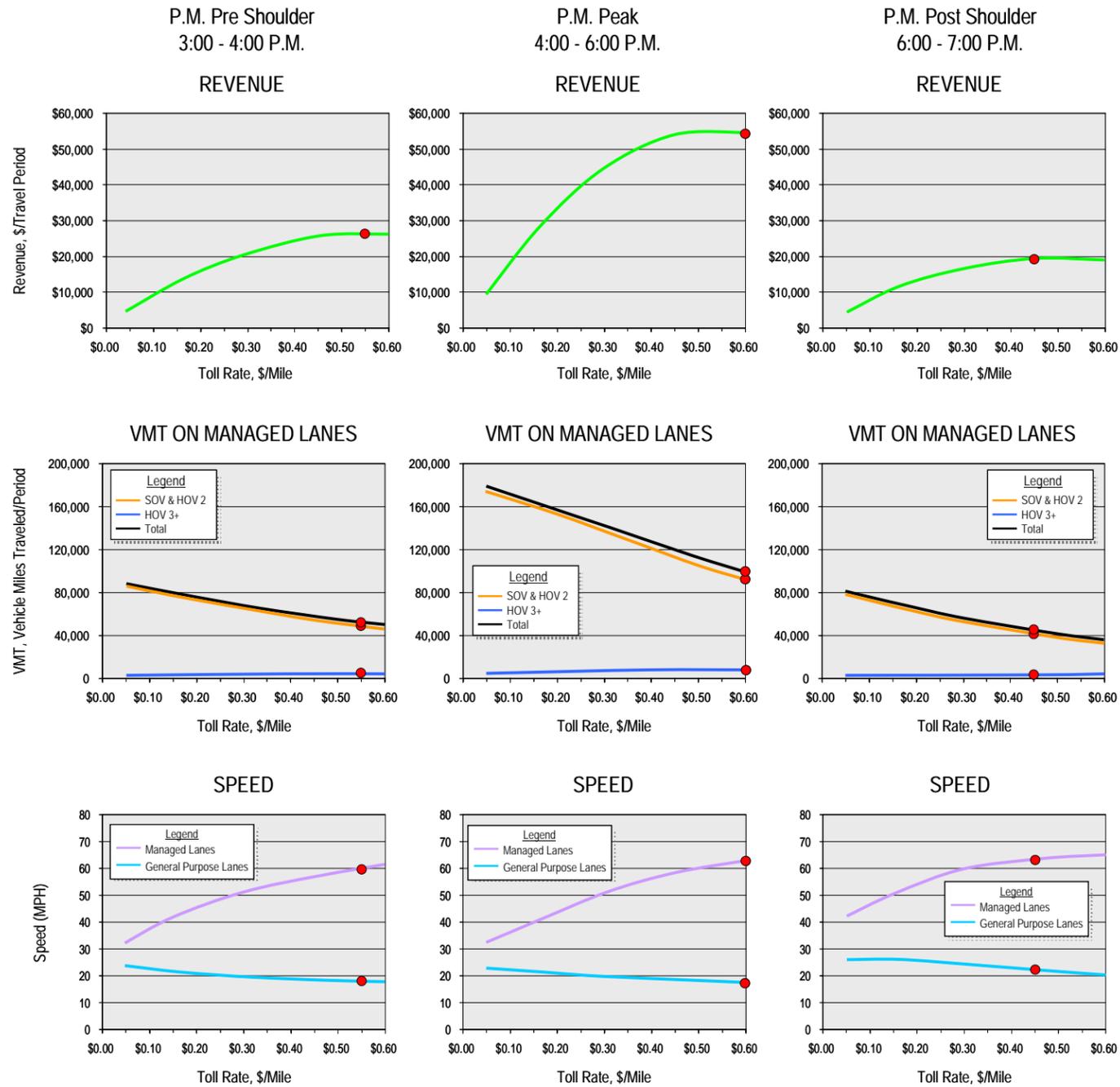
● - Optimum Toll Rate

2025 TOLL RATE / OPERATIONS PROFILE
A.M. Peak / Midday Weekday Period, Alternative 6 - HOV 3+ Free

Figure 5-19

P.M. EASTBOUND

P.M. WESTBOUND



● - Optimum Toll Rate

2025 TOLL RATE / OPERATIONS PROFILE
P.M. Weekday Peak Period, Alternative 6 - HOV 3+ Free

Figure 5-20

Optimum Per Mile Toll Rates

Optimum per mile toll rates for Alternative 2 and Alternative 6 under the All Pay and HOV 3+ Free operating scenarios are shown in Tables 5-2 and 5-3. Optimum per mile rates are arrayed by year (opening-year 2012, and future-years 2015, 2020 and 2025 for Alternative 2), (opening year 2015 and future years 2020 and 2025 for Alternative 6), direction and time period.

**Table 5-2
Comparison of Per Mile Toll Rates
Alternative 2**

ALL PAY			HOV 3+ FREE		
2012	Eastbound	Westbound	2012	Eastbound	Westbound
AM1	0.05	0.45	AM1	0.05	0.45
AM2	0.10	0.20	AM2	0.10	0.20
MD1	0.10	0.15	MD1	0.10	0.15
MD2	0.10	0.15	MD2	0.10	0.15
PM1	0.50	0.10	PM1	0.55	0.10
PM2	0.35	0.10	PM2	0.35	0.10
PM3	0.30	0.10	PM3	0.35	0.10
2015	Eastbound	Westbound	2015	Eastbound	Westbound
AM1	0.25	0.45	AM1	0.25	0.45
AM2	0.20	0.20	AM2	0.15	0.15
MD1	0.15	0.15	MD1	0.10	0.10
MD2	0.15	0.15	MD2	0.10	0.10
PM1	0.50	0.15	PM1	0.55	0.10
PM2	0.35	0.15	PM2	0.40	0.10
PM3	0.30	0.15	PM3	0.30	0.10
2020	Eastbound	Westbound	2020	Eastbound	Westbound
AM1	0.45	0.55	AM1	0.40	0.60
AM2	0.25	0.25	AM2	0.25	0.25
MD1	0.15	0.15	MD1	0.15	0.15
MD2	0.15	0.15	MD2	0.15	0.15
PM1	0.60/0.75	0.20	PM1	0.60/0.85	0.15
PM2	0.60	0.20	PM2	0.60/0.65	0.25
PM3	0.45	0.15	PM3	0.45	0.10
2025	Eastbound	Westbound	2025	Eastbound	Westbound
AM1	0.55	0.60/0.75	AM1	0.60	0.60/0.85
AM2	0.30	0.35	AM2	0.30	0.30
MD1	0.20	0.25	MD1	0.25	0.25
MD2	0.15	0.15	MD2	0.20	0.20
PM1	0.60/1.10	0.25	PM1	0.60/1.10	0.25
PM2	0.60/0.80	0.30	PM2	0.60/0.85	0.25
PM3	0.60/0.70	0.25	PM3	0.60	0.25

native 6), direction and time period.

Alternative 2 – As shown in Table 5-2 under both the All Pay and HOV 3+ Free operating scenarios optimum per mile toll rates are very similar. At 2012 levels optimum rates range from a low of \$0.05 per mile to a high of \$0.50 per mile under the All Pay condition and \$0.05 per mile and \$0.55 per mile under the HOV 3+ Free condition. Similar patterns are reflected at 2015 levels.

By 2020, as shown in Table 5-2 it was necessary to introduce variable per mile toll rates during selected travel periods to more effectively manage demand along the single lane sections of the LBJ MLs. These same trends continued into 2025 and based on increased levels of demand along the LBJ MLs additional travel periods were affected.

Alternative 6 – Table 5-3 presents optimum per mile toll rates for Alternative 6 under

**Table 5-3
Comparison of Per Mile Toll Rates
Alternative 6**

ALL PAY			HOV 3+ FREE		
2015	Eastbound	Westbound	2015	Eastbound	Westbound
AM1	0.10	0.30	AM1	0.10	0.30
AM2	0.15	0.15	AM2	0.15	0.15
MD1	0.10	0.10	MD1	0.10	0.10
MD2	0.10	0.10	MD2	0.10	0.10
PM1	0.35	0.25	PM1	0.35	0.25
PM2	0.35	0.25	PM2	0.35	0.25
PM3	0.25	0.25	PM3	0.30	0.25
2020	Eastbound	Westbound	2020	Eastbound	Westbound
AM1	0.10	0.40	AM1	0.10	0.45
AM2	0.15	0.15	AM2	0.15	0.15
MD1	0.15	0.15	MD1	0.10	0.10
MD2	0.15	0.15	MD2	0.10	0.10
PM1	0.45	0.30	PM1	0.45	0.30
PM2	0.50	0.35	PM2	0.55	0.35
PM3	0.35	0.35	PM3	0.35	0.30
2025	Eastbound	Westbound	2025	Eastbound	Westbound
AM1	0.10	0.50	AM1	0.10	0.50
AM2	0.20	0.20	AM2	0.15	0.20
MD1	0.15	0.15	MD1	0.15	0.15
MD2	0.15	0.15	MD2	0.15	0.15
PM1	0.55	0.40	PM1	0.55	0.30
PM2	0.55	0.40	PM2	0.60	0.40
PM3	0.40	0.40	PM3	0.45	0.40

the All Pay and HOV 3+ Free operating scenarios for opening-year 2015 and future-years 2020 and 2025. Once again, optimum per mile rates are very similar when comparing the two operating scenarios. As shown in Table 5-3 optimum per mile rates during 2015 range between \$0.10 and \$0.35 per mile under both operating conditions.

During 2020 per mile rates under the All Pay option range between \$0.10 and \$0.50 and \$0.10 and \$0.55 per mile recognizing the HOV 3+ Free option. Similar ranges of optimum per mile rates are indicated at 2025 levels. It is important to note that it was not necessary to employ differential per mile toll rates in the future-year under Alternative 6 due to the additional capacity provided by this preferred project alternative.

Estimated Weekday Managed Lane Traffic

Estimate of average weekday traffic on the LBJ MLs for Alternative 2 and Alternative 6 are presented in Figures 5-21 through 5-30. Estimated average weekday traffic for Alternative 2 are shown at opening-year 2012 and future-year 2015 and 2025 levels under the All Pay and HOV 3+ Free operating scenarios. Alternative 6 average weekday traffic estimates are provided for opening-year 2015 and future-year 2025 levels under both the All Pay and HOV 3+ Free operating conditions.

Traffic along selected mainline segments of the LBJ MLs are shown by travel period as defined below:

- A.M. Peak period - 6:00-8:00 a.m.
- A.M. Shoulder period – 8:00-9:00 a.m.
- Midday period – 9:00 a.m.-3:00 p.m.
- P.M. Pre-peak Shoulder period – 3:00-4:00 p.m.
- P.M. Peak period – 4:00-6:00 p.m.
- P.M. Post-Peak Shoulder period – 6:00-7:00 p.m.; and
- Daily

These mainline Managed Lane traffic volumes are arrayed by SOV, HOV 2, HOV 3+ and Total vehicles for each of the periods defined above. Estimates of average weekday traffic are also shown at the ML ingress/egress locations as well as along the general purpose lane mainline and ramp locations at daily traffic levels.

Alternative 2 – Estimates of average weekday traffic for Alternative 2 at opening-year 2012 levels under the All Pay operating scenario are presented in Figure 5-21. ML traffic entering/exiting the tunnel section east of Webb Chapel is estimated at 32,600 vehicles per day (VPD), 16,300 westbound and 16,300 eastbound. The distribution from the 32,600 vehicles would be 21,900 SOVs, 10,400 HOV 2s and 500 HOV 3+s. Managed Lanes average weekday traffic along the segment east of US 75 is forecast at 29,400 VPD during 2012. SOVs would comprise 20,600 VPD, HOV 2s 8,500 and HOV 3+s 500 VPD. The reversible mainline ML segment between Plano and Jupiter Roads would generate 11,700 daily vehicles, of which 7,900 would be SOVs, 3,600 HOV 2s and 300 HOV 3+s.

Figure 5-22 provides Alternative 2 estimates of opening-year 2012 average weekday

traffic under the HOV 3+ Free operating scenario. When compared to 2012 All Pay estimates, average weekday traffic estimates under the HOV 3+ Free scenario are slightly higher along these same mainline segments. This is due to the fact that HOV 3+ vehicles are allowed to travel toll-free thus making the LBJ MLs more attractive to HOV 3+ vehicles.

Similar patterns can be seen in Figures 5-23 and 5-24 when comparing Alternative 2 All Pay and HOV 3+ Free operating conditions at future-year 2015 levels.

Figure 5-25 illustrates the Alternative 2 estimated average weekday traffic volumes for future-year 2025 under the All Pay operating scenario. By 2025 average weekday traffic utilizing the ML tunnel section east of Webb Chapel is expected to reach 54,400 VPD, significantly higher than estimated in 2012. Single occupant vehicles would comprise 36,500 VPD, HOV 2s 16,800 and HOV 3+s 1,200 VPD. Along the ML segment east of US 75 estimated average weekday traffic is forecast at 34,200 VPD, 16.3 percent higher than 2012 traffic estimates. This smaller percent growth can be attributed to the need to assess higher per mile toll rates in the EB travel direction in order to sufficiently manage demand along the single lane ML segments east of Forest Lane during P.M. peak periods. This same phenomenon is experienced on the single reversible lane section located between Plano and Jupiter Roads. In 2025 average weekday ML traffic is expected to reach 12,700 VPD, which translates to an 8.5 percent increase over 2012 levels. These same patterns are reflected in Figure 5-26 when reviewing 2025 traffic levels for 2025 under the HOV 3+ Free operating scenario.

Compared to traditional toll facilities, the rate of estimated traffic growth on the LBJ Managed Lanes in its first three years of operations would appear to be quite high. In practice, this is actually typical of Managed Lanes facilities, such as those proposed for the LBJ freeway. At the very opening during the initial year of operation, it can be expected for traffic levels in the tolled lanes to be relatively low, if motorists would typically opt for the toll-free lanes except under congestion conditions. However, at the outset of operation, the Managed Lanes would represent the vast majority of a capacity available for future growth, at least in peak periods. Hence, while total traffic in the corridor may be growing at a more modest rate, the growth in the managed lanes would typically be experienced at a rate much higher.

Alternative 6 – Opening-year 2015 estimated average weekday traffic levels for Alternative 6 recognizing the All Pay operating scenario are shown in Figure 5-27. Estimates of traffic utilizing the tunnel section is expected to reach 62,000 VPD in 2015. This equates to an almost 47 percent increase over those forecasted under Alternative 2 during 2015. This increase relates directly to Luna Road as well as ultimate project configuration assumed in the vicinity of the IH 635/IH 35E Interchange under Alternative 6.

VPD along the ML segment east of US 75 is forecasted at 34,300 on an average weekday for Alternative 6 during 2015. SOVs comprise 24,700 VPD, HOV 2s 9,200 and HOV 3+s 500 VPD. Daily traffic levels are almost 18 percent greater than those estimated under Alternative 2.

The segment of the MLs between Plano and Jupiter Roads is expected to reach

24,200 VPD during opening-year 2015 under Alternative 6 assuming the All Pay operating conditions as shown in Figure 5-27. This is more than double the traffic forecasted during the same time period under Alternative 2. This substantial increase reflects the additional capacity provided under Alternative 6. Under the Alternative 6 project configuration two MLs in each travel direction are provided while under the Alternative 2 project configuration only a single reversible lane is provided along this same segment.

When comparing the All Pay (Figure 5-27) and HOV 3+ Free (Figure 5-28) operating scenarios for Alternative 6 at opening-year 2015 levels, estimates of average week

day traffic are very similar. As was the case under Alternative 2, HOV 3+ Free average weekday traffic estimates are slightly higher than those assuming the All Pay operating conditions.

Figure 5-29 presents estimated weekday traffic volumes at future-year 2025 levels under the Alternative 6 All Pay operating option. Vehicles using the tunnel section east of Webb Chapel are expected to reach 75,800 VPD during future-year 2025. The distribution would be 51,500 SOVs, 22,500 HOV 2s and 1,800 HOV 3+s. This translates to daily traffic levels 22.2 percent higher than those experienced during opening-year 2015.

Alternative 6 All Pay traffic volumes along the segment east of US 75 is forecasted at 42,300 VPD during 2025 and 31,300 VPD along the ML section between Plano and Jupiter Roads as shown in Figure 5-29. These equate to increases over 2015 traffic levels at 23.3 and 29.3 percent, respectively.

Estimated 2025 average weekday traffic volumes for Alternative 6 under the HOV 3+ Free operating scenario are shown in Figure 5-30. Again the estimates of traffic are very similar to those forecast under the All Pay option, with overall traffic being slightly higher under the HOV 3+ Free operating condition.

Managed Lanes Traffic Share

A summary of the estimated MLs traffic share of the total LBJ travel demand in 2015 and 2025 is provided in Table 5-4. The percents were calculated along a screenline east of the DNT and represent volumes for the optimum per mile toll rates as shown in Tables 5-2 and 5-3. The total traffic is presented for Alternatives 2 and 6 and is distributed by vehicle category including SOVs, HOV 2 and HOV 3+s. The traffic volumes shown in Table 5-4 do not include the traffic volumes for the shoulder periods, midday or night periods. It is important to note that the managed lane traffic share shown in Table 5-4 fluctuates on different segments of the LBJ corridor.

During 2015 Alternative 2 Managed Lanes would carry an estimated 11.3 percent of travel demand in the LBJ Corridor during the morning peak and 9.7 percent during the afternoon period under the All pay operating scenario. As shown in Table 5-4, by 2025 AM peak MLs utilization increases to 12.3 percent, with PM peak ML usage increasing to 12.6 percent under the All Pay operating condition.

The relatively small increase in the managed lane share at this location, under Alter-

native 2, is primarily due the fact that this alternative features considerable less capacity than the ultimate configuration Alternative 6. Because of this, pricing strategies would need to be introduced to maintain free-flow conditions on Alternative 2, which would tend to inhibit significant growth in corridor share, particularly in the eastern portions of the project configuration. There is more growth in the corridor share under Alternative 2 between 2012 and 2015, but longer term traffic growth (i.e. thru 2025) is more constrained under the interim alternative.

It is also interesting to note that under an All pay condition, the managed lanes in the morning peak period would accommodate about 9.1 percent of single occupant traffic and about 20 percent of car pool traffic. Since all these vehicles would be required to pay a toll under this particular operating scenario, the difference in corridor share is largely attributable to the assumed higher value of time which would be expected of multi-occupant vehicles, based on the assumptions that at least a portion of these vehicles could spread the cost of tolls among the multiple passengers.

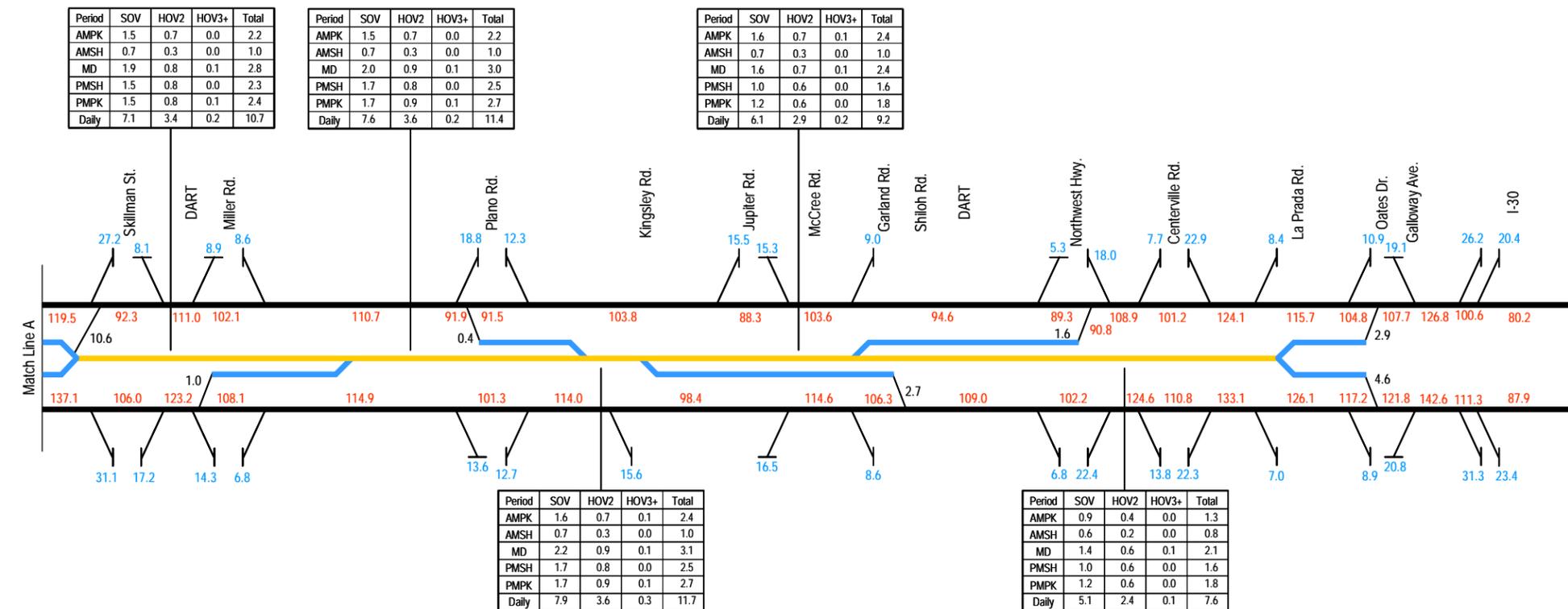
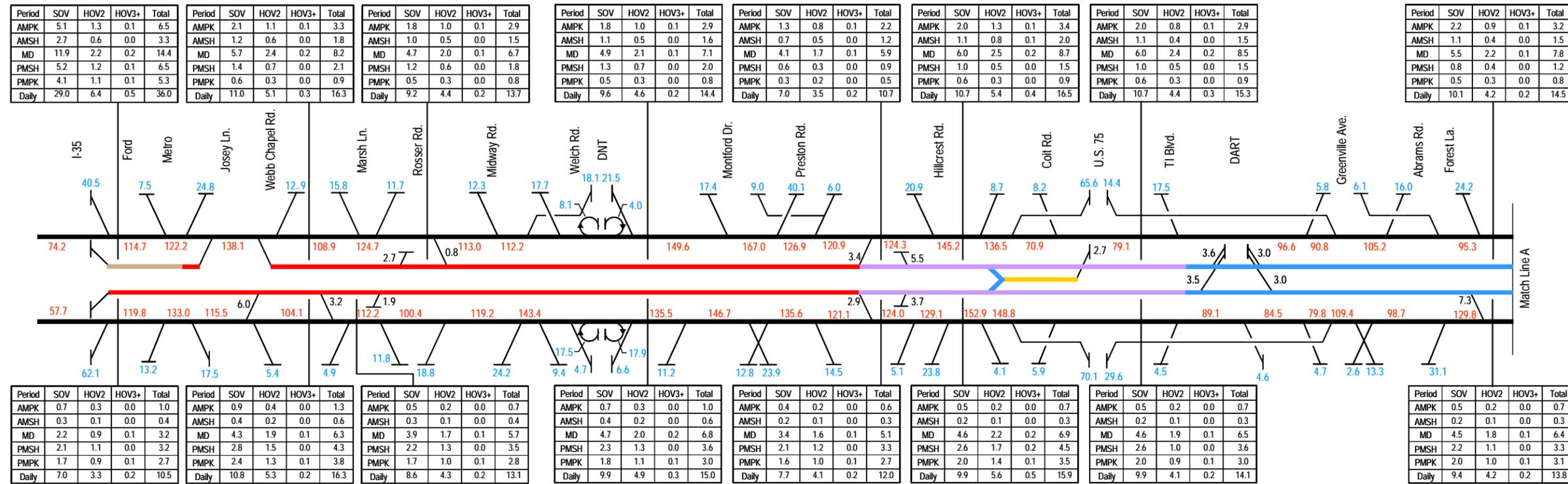
Assuming the HOV 3+ Free option 12.0 percent of LBJ corridor travel demand would utilize the MLs during the AM peak and 7.8 percent during the PM peak period as shown in Table 5-4. These ML utilization levels would increase to 12.3 and 13.8 percent, respectively, for the AM and PM peak travel periods by 2025 under the Alternative 2 HOV 3+ Free operating scenario. As indicated in Table 5-4, HOV 3+ vehicle percentage increase substantially assuming HOV 3+ Free operating options due to their ability to travel toll free under this operating scenario.

Specifically, when HOV 3 traffic is allowed in for free, in the am peak period the managed lanes would accommodate 71.4 percent of the totally HOV 3 demand, as compared to 20 percent of HOV 3s were required to pay. The reason this is not 100 percent lies in the fact that the managed lanes will have restricted points of access, and not all vehicles with three or more occupants would be making movements which could conveniently use the managed lanes for a viable alternative. By allowing more HOV 3 traffic into the lanes, on a toll free basis, the share of single occupant vehicle traffic captured is shown to be slightly reduced.

As shown in Table 5-4 the MLs traffic share of the total LBJ travel demand increases greatly under the Alternative 6 project configuration. This is due to the fact that Alternative 6 assumes an ultimate configuration that provides a longer facility with increased capacity in the MLs.

Under the All Pay operating scenario as depicted in Table 5-4 LBJ MLs would carry 17.3 percent of total corridor demand during the morning peak period and 24.8 percent in afternoon peak travel period. By 2025 these utilization rates are expected to increase to 23.2 and 25.2 percent, respectively, for Alternative 6. Alternative 6 HOV 3+ Free ML usage levels are also presented in Table 5-4. As shown, during 2015 of the total demand traveling in the LBJ corridor during the AM peak period 23.2 percent would choose the MLs. During the PM peak period 25.2 percent would choose to travel in the MLs. Similar ML utilization levels are indicated at 2025 levels. Again HOV 3+ levels are much greater under the HOV 3+ Free operating scenario.

In reviewing the relative changes in corridor share within Table 5-4, it is important to



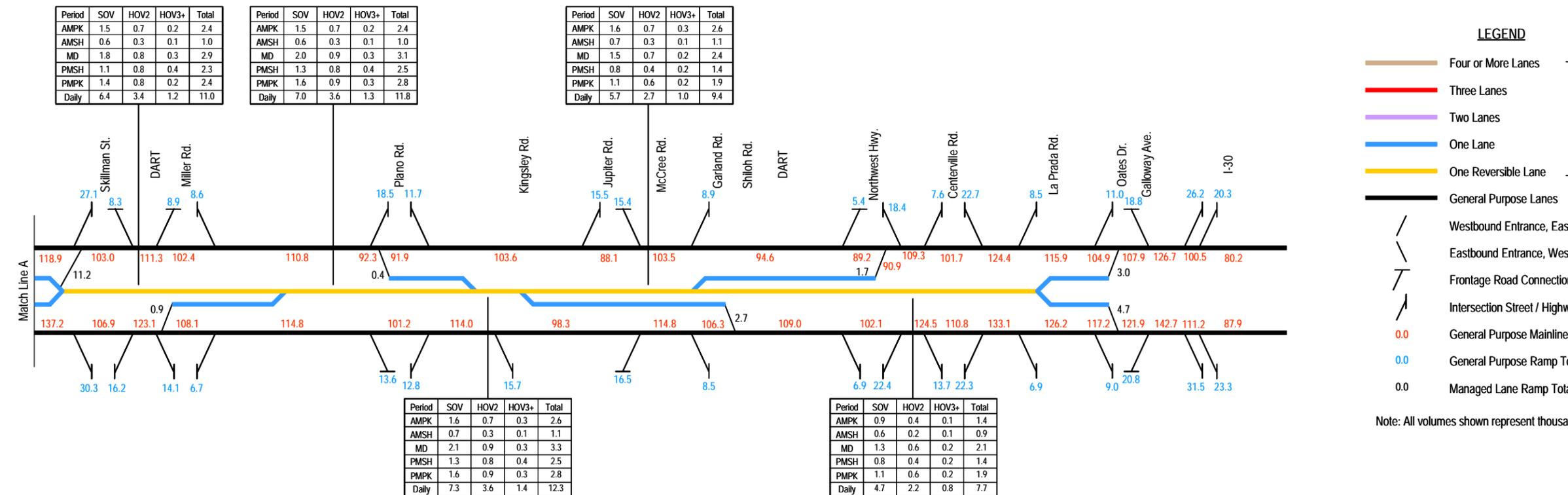
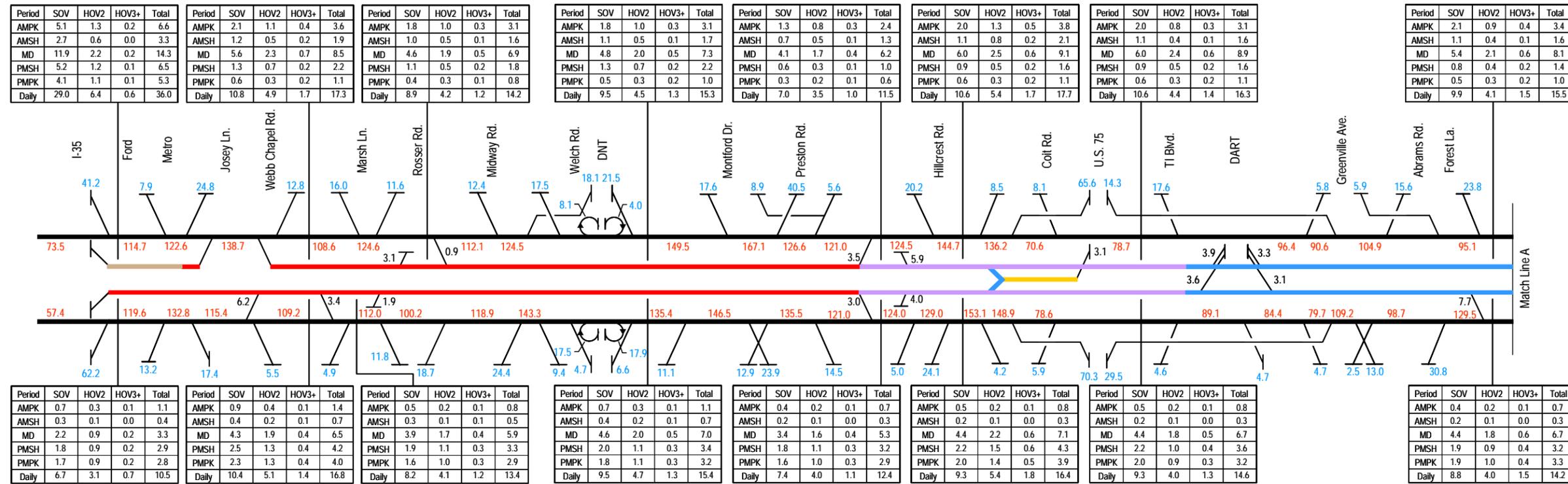
LEGEND

- Four or More Lanes
- Three Lanes
- Two Lanes
- One Lane
- One Reversible Lane
- General Purpose Lanes
- Westbound Entrance, Eastbound Exit
- Eastbound Entrance, Westbound Exit
- Frontage Road Connection
- Intersection Street / Highway Connection
- 0.0 General Purpose Mainline Total Daily Volumes
- 0.0 General Purpose Ramp Total Daily Volumes
- 0.0 Managed Lane Ramp Total Daily Volumes

Note: All volumes shown represent thousands of vehicles.

2012 ESTIMATED AVERAGE WEEKDAY TRAFFIC VOLUMES, Alternative 2 - All Pay

Figure 5-21



LEGEND

- Four or More Lanes
- Three Lanes
- Two Lanes
- One Lane
- One Reversible Lane
- General Purpose Lanes

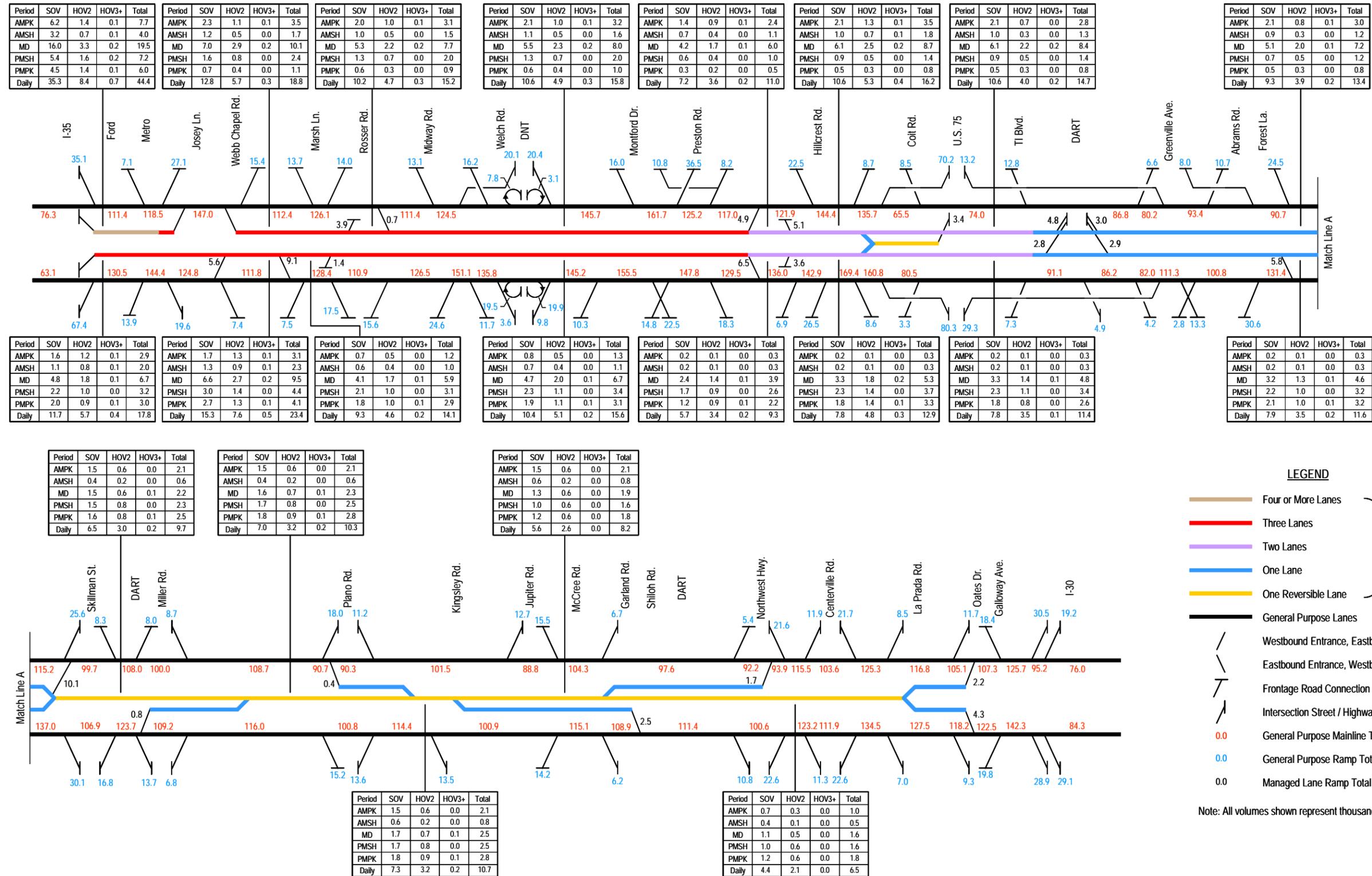
Managed Lanes

-
-
-
-
- 0.0 General Purpose Mainline Total Daily Volumes
- 0.0 General Purpose Ramp Total Daily Volumes
- 0.0 Managed Lane Ramp Total Daily Volumes

Note: All volumes shown represent thousands of vehicles.

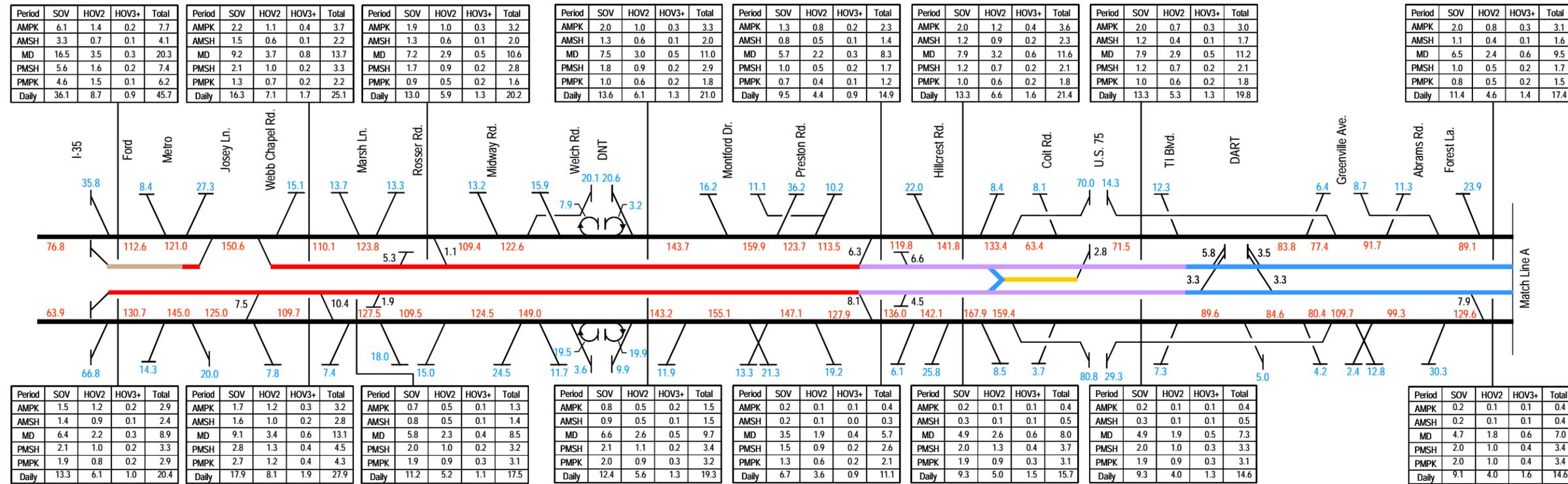
2012 ESTIMATED AVERAGE WEEKDAY TRAFFIC VOLUMES, Alternative 2 - HOV 3+ Free

Figure 5-22



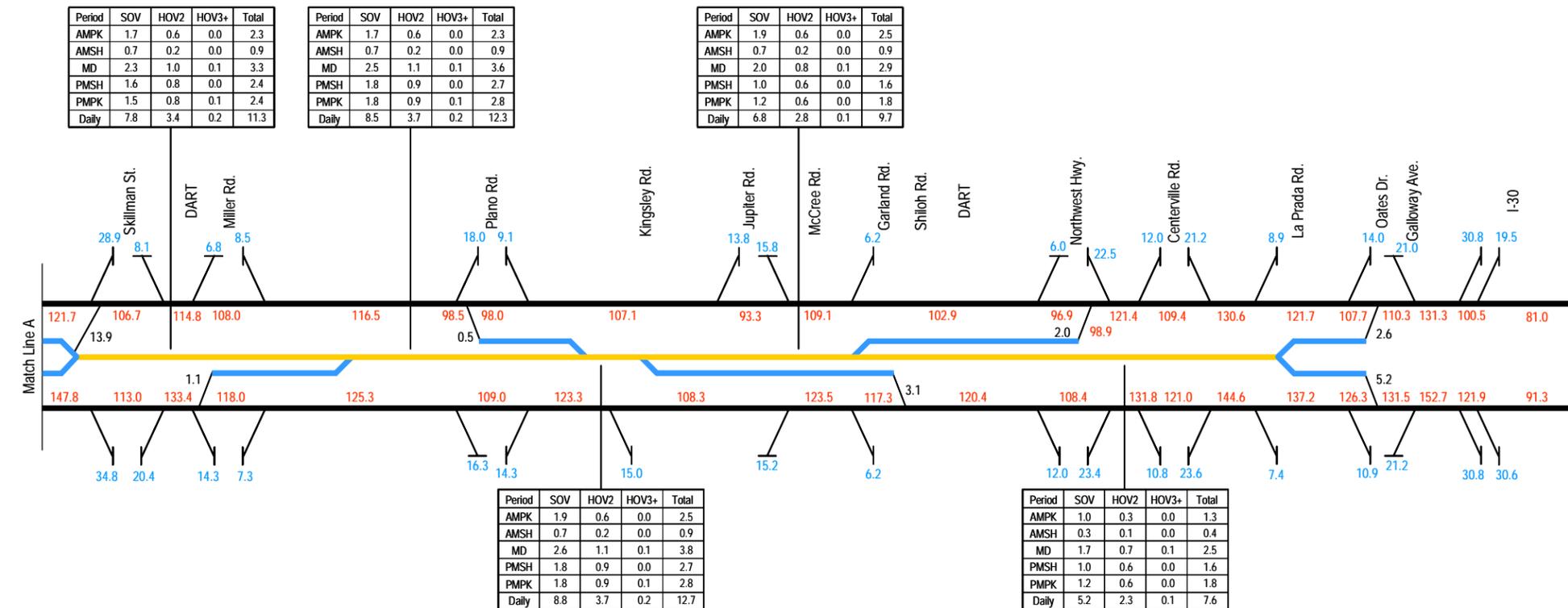
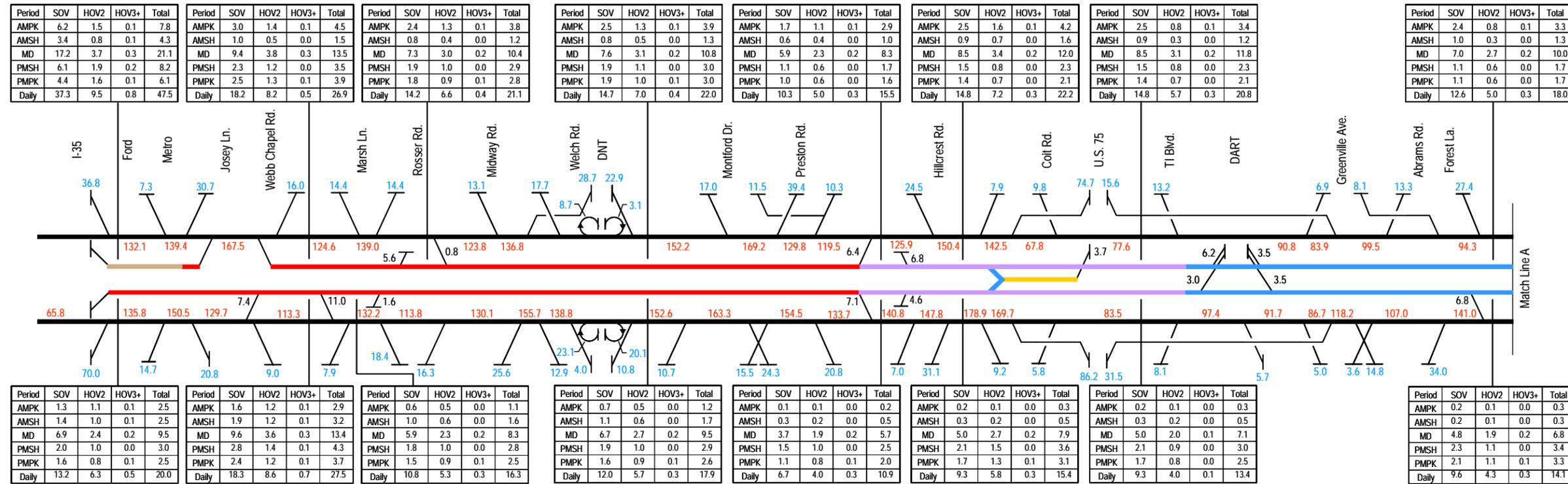
2015 ESTIMATED AVERAGE WEEKDAY TRAFFIC VOLUMES, Alternative 2 - All Pay

Figure 5-23



2015 ESTIMATED AVERAGE WEEKDAY TRAFFIC VOLUMES, Alternative 2 - HOV 3+ Free

Figure 5-24



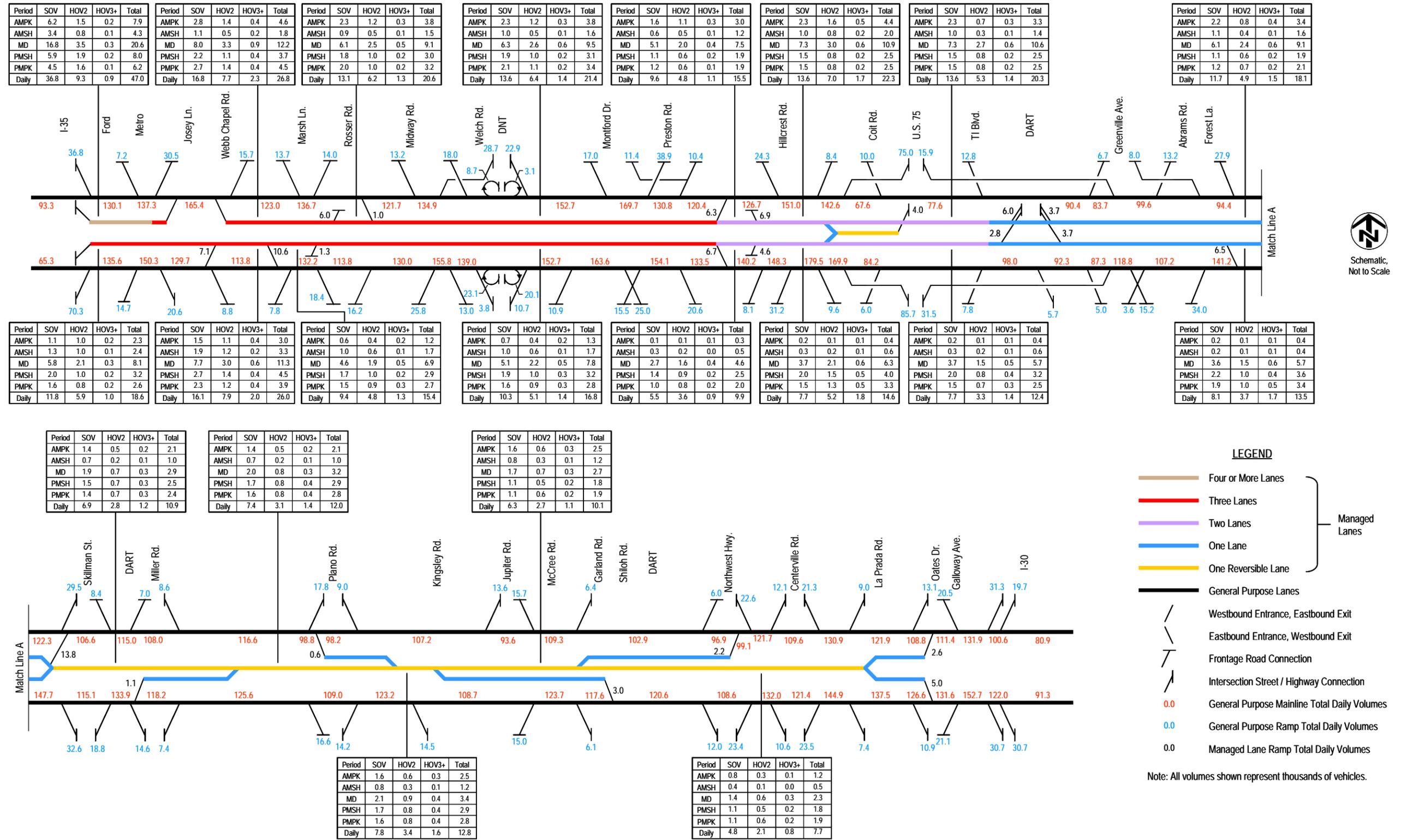
LEGEND

- Four or More Lanes
- Three Lanes
- Two Lanes
- One Lane
- One Reversible Lane
- General Purpose Lanes
- / Westbound Entrance, Eastbound Exit
- \ Eastbound Entrance, Westbound Exit
- T Frontage Road Connection
- / Intersection Street / Highway Connection
- 0.0 General Purpose Mainline Total Daily Volumes
- 0.0 General Purpose Ramp Total Daily Volumes
- 0.0 Managed Lane Ramp Total Daily Volumes

Note: All volumes shown represent thousands of vehicles.

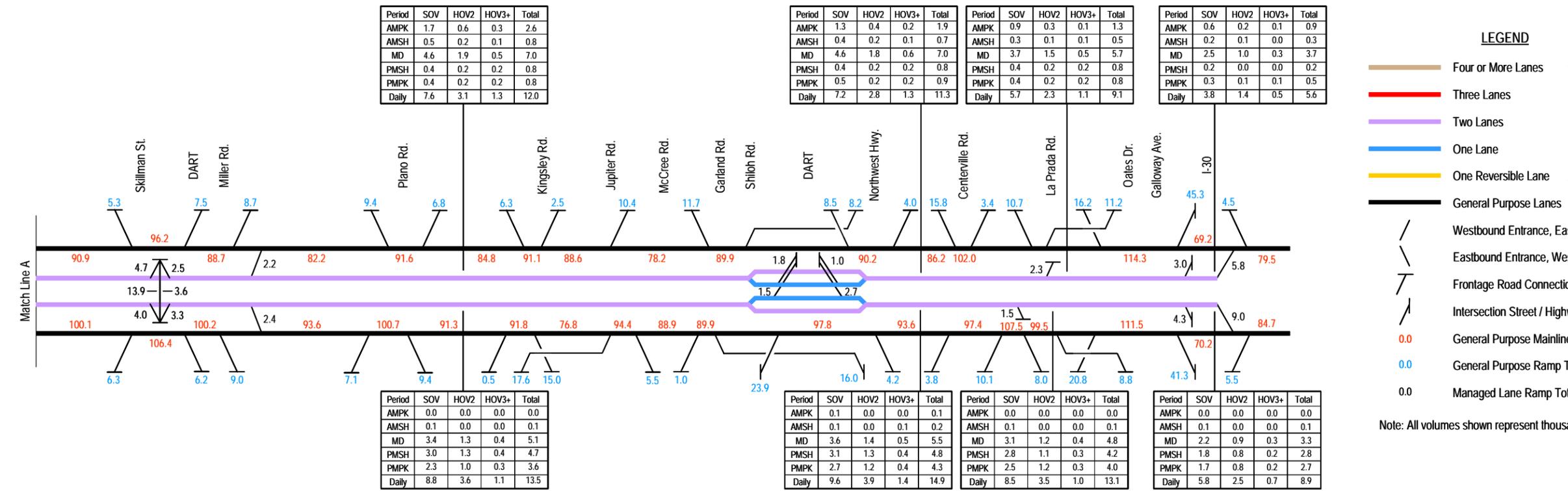
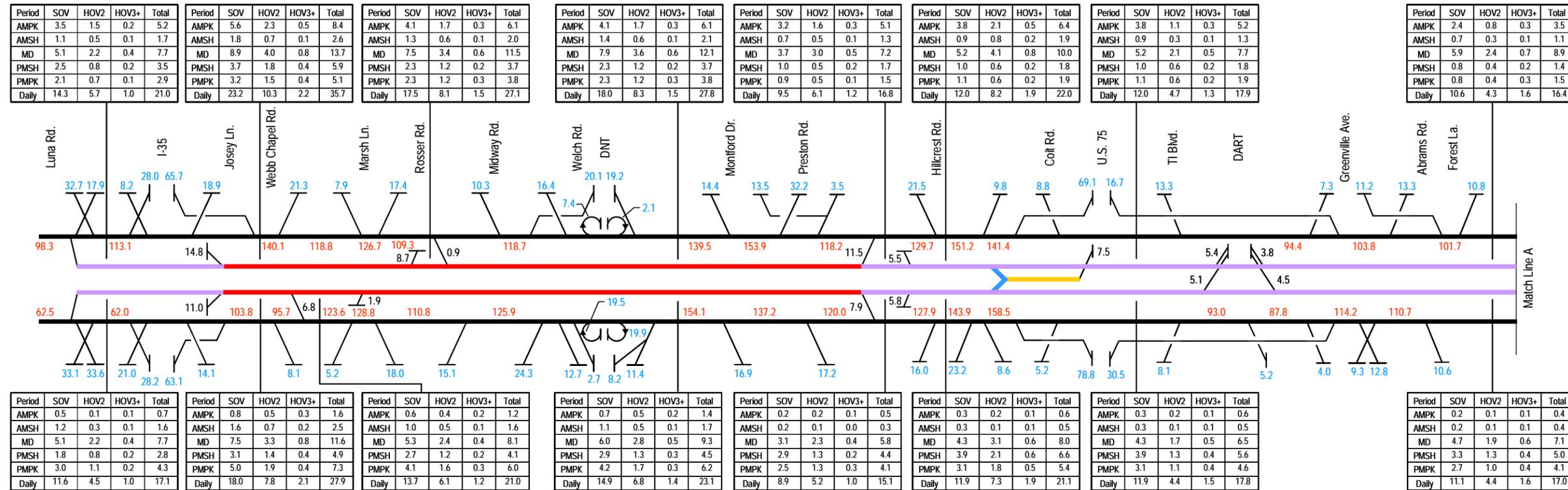
2025 ESTIMATED AVERAGE WEEKDAY TRAFFIC VOLUMES, Alternative 2 - All Pay

Figure 5-25



2025 ESTIMATED AVERAGE WEEKDAY TRAFFIC VOLUMES, Alternative 2 - HOV 3+ Free

Figure 5-26



LEGEND

- Four or More Lanes
- Two Lanes
- One Lane
- One Reversible Lane
- General Purpose Lanes

Managed Lanes

- Three Lanes
- Two Lanes
- One Lane
- One Reversible Lane

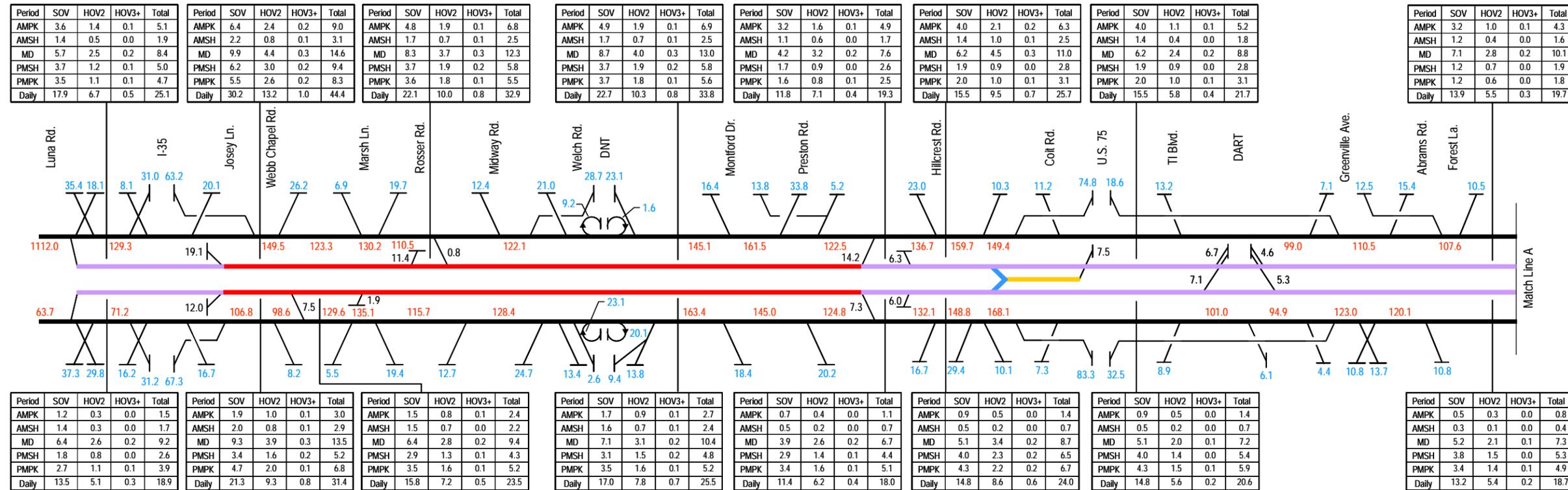
/ Westbound Entrance, Eastbound Exit
 \ Eastbound Entrance, Westbound Exit
 / Frontage Road Connection
 \ Intersection Street / Highway Connection
 0.0 General Purpose Mainline Total Daily Volumes
 0.0 General Purpose Ramp Total Daily Volumes
 0.0 Managed Lane Ramp Total Daily Volumes

Note: All volumes shown represent thousands of vehicles.

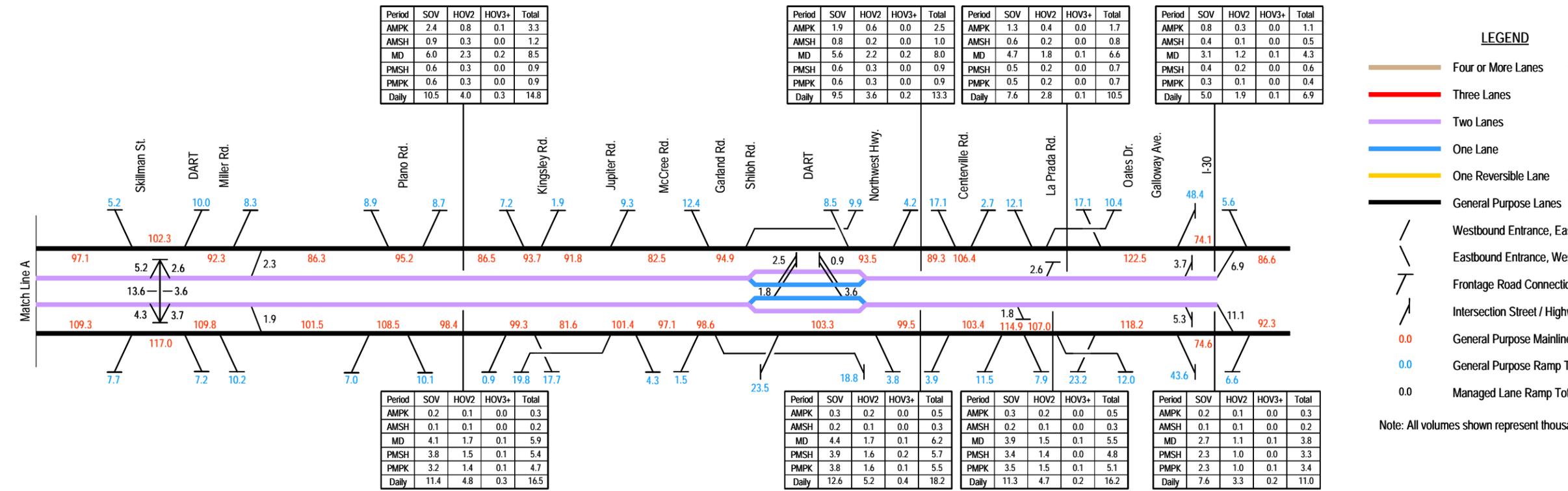


2015 ESTIMATED WEEKDAY TRAFFIC VOLUMES, Alternative 6 - HOV 3+ Free

Figure 5-28



Schematic, Not to Scale



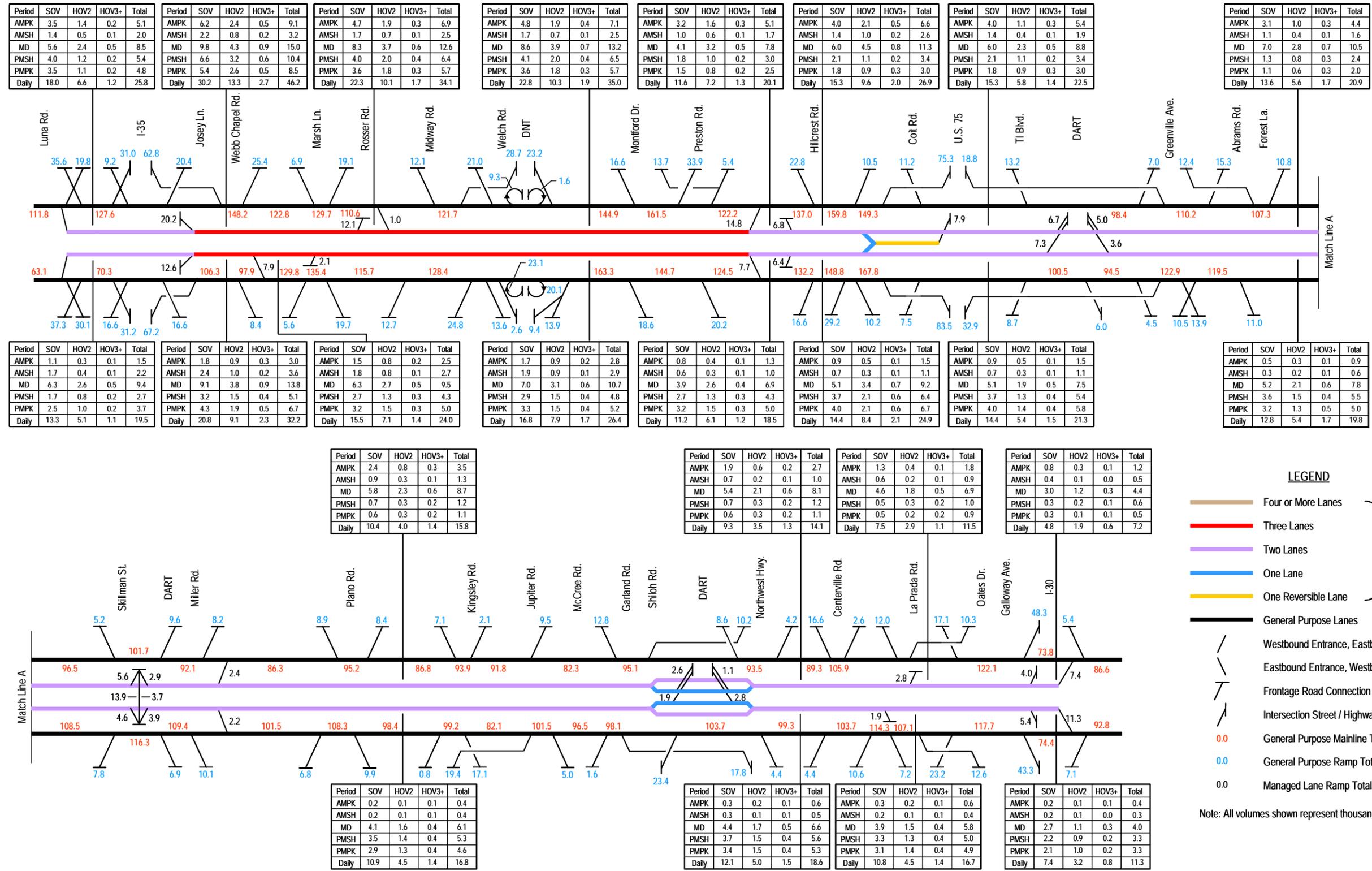
LEGEND

- Four or More Lanes
- Three Lanes
- Two Lanes
- One Lane
- One Reversible Lane
- General Purpose Lanes
- Westbound Entrance, Eastbound Exit
- Eastbound Entrance, Westbound Exit
- Frontage Road Connection
- Intersection Street / Highway Connection
- 0.0 General Purpose Mainline Total Daily Volumes
- 0.0 General Purpose Ramp Total Daily Volumes
- 0.0 Managed Lane Ramp Total Daily Volumes

Note: All volumes shown represent thousands of vehicles.

2025 ESTIMATED WEEKDAY TRAFFIC VOLUMES, Alternative 6 - All Pay

Figure 5-29




 Schematic,
 Not to Scale

2025 ESTIMATED WEEKDAY TRAFFIC VOLUMES, Alternative 6 - HOV 3+ Free

Figure 5-30

Table 5-4
Managed Lane Share Comparison
Alternatives 2 & 6

Alternative 2 - 2015 Peak Periods							Alternative 2 - 2025 Peak Periods						
Period	Operating Scenario	Vehicle Category	General Purpose Lanes Volume	Managed Lanes Volume	Total Volume	Percent in Managed Lanes	Period	Operating Scenario	Vehicle Category	General Purpose Lanes Volume	Managed Lanes Volume	Total Volume	Percent in Managed Lanes
AM	All Pay	SOV	29,000	2,900	31,900	9.1%	AM	All Pay	SOV	29,600	3,200	32,800	9.8%
		HOV 2	6,000	1,500	7,500	20.0%			HOV 2	6,300	1,800	8,100	22.2%
		HOV 3+	400	100	500	20.0%			HOV 3+	400	100	500	20.0%
		Total	35,400	4,500	39,900	11.3%			Total	36,300	5,100	41,400	12.3%
PM	All Pay	SOV	29,700	2,500	32,200	7.8%	PM	All Pay	SOV	30,300	3,500	33,800	10.4%
		HOV 2	8,000	1,500	9,500	15.8%			HOV 2	8,100	1,900	10,000	19.0%
		HOV 3+	600	100	700	14.3%			HOV 3+	600	200	800	25.0%
		Total	38,300	4,100	42,400	9.7%			Total	39,000	5,600	44,600	12.6%
AM	HOV 3+ Free	SOV	29,100	2,800	31,900	8.8%	AM	HOV 3+ Free	SOV	29,800	3,000	32,800	9.1%
		HOV 2	6,000	1,500	7,500	20.0%			HOV 2	6,400	1,600	8,000	20.0%
		HOV 3+	200	500	700	71.4%			HOV 3+	200	500	700	71.4%
		Total	35,300	4,800	40,100	12.0%			Total	36,400	5,100	41,500	12.3%
PM	HOV 3+ Free	SOV	29,200	1,200	30,400	3.9%	PM	HOV 3+ Free	SOV	30,300	3,700	34,000	10.9%
		HOV 2	8,000	1,500	9,500	15.8%			HOV 2	8,100	2,000	10,100	19.8%
		HOV 3+	400	500	900	55.6%			HOV 3+	400	500	900	55.6%
		Total	37,600	3,200	40,800	7.8%			Total	38,800	6,200	45,000	13.8%
Alternative 6 - 2015 Peak Periods							Alternative 6 - 2025 Peak Periods						
Period	Operating Scenario	Vehicle Category	General Purpose Lanes Volume	Managed Lanes Volume	Total Volume	Percent in Managed Lanes	Period	Operating Scenario	Vehicle Category	General Purpose Lanes Volume	Managed Lanes Volume	Total Volume	Percent in Managed Lanes
AM	All Pay	SOV	28,100	4,900	33,000	14.8%	AM	All Pay	SOV	26,200	6,600	32,800	20.1%
		HOV 2	5,900	2,200	8,100	27.2%			HOV 2	5,200	2,800	8,000	35.0%
		HOV 3+	500	100	600	16.7%			HOV 3+	400	200	600	33.3%
		Total	34,500	7,200	41,700	17.3%			Total	31,800	9,600	41,400	23.2%
PM	All Pay	SOV	23,600	6,600	30,200	21.9%	PM	All Pay	SOV	25,400	7,200	32,600	22.1%
		HOV 2	5,400	2,900	8,300	34.9%			HOV 2	6,200	3,400	9,600	35.4%
		HOV 3+	400	200	600	33.3%			HOV 3+	400	200	600	33.3%
		Total	29,400	9,700	39,100	24.8%			Total	32,000	10,800	42,800	25.2%
AM	HOV 3+ Free	SOV	28,300	4,800	33,100	14.5%	AM	HOV 3+ Free	SOV	26,500	6,500	33,000	19.7%
		HOV 2	5,900	2,200	8,100	27.2%			HOV 2	5,400	2,800	8,200	34.1%
		HOV 3+	200	500	700	71.4%			HOV 3+	200	600	800	75.0%
		Total	34,400	7,500	41,900	17.9%			Total	32,100	9,900	42,000	23.6%
PM	HOV 3+ Free	SOV	23,600	6,500	30,100	21.6%	PM	HOV 3+ Free	SOV	25,700	6,900	32,600	21.2%
		HOV 2	5,400	2,900	8,300	34.9%			HOV 2	6,300	3,300	9,600	34.4%
		HOV 3+	200	600	800	75.0%			HOV 3+	300	700	1,000	70.0%
		Total	29,200	10,000	39,200	25.5%			Total	32,300	10,900	43,200	25.2%

Note: Comparison based on a location on the LBJ just east of the Dallas North Tollway.

recognize that changes in optimum toll rates between scenarios, travel directions and individual years, can significantly influence the share of traffic in the managed lanes. As noted previously, in most cases rates were selected to optimize revenue, so long as free-flow conditions were maintained. However, this pattern in "real" rate increases over time does tend to result in fluctuation in traffic levels within the managed lanes, given the sensitive equilibrium balance between toll charges, congestion levels and the distribution of traffic between free and tolled lanes. This situation tends to be exacerbated under Alternative 2, the interim configuration, due to constrained managed lane capacity in later years, when significant toll rate changes are needed to continue to manage demand. The patterns tend to be more stable under Alternative

6, which offers more managed lane capacity and permits a more stable pattern of toll rate increases over the life of the forecast period.

Estimated Average Weekday Transactions And Annual Toll Revenue

Estimates of average weekday transactions and annual toll revenues for Alternative 2 and Alternative 6 under All Pay and HOV 3+ Free operating scenarios are presented in Tables 5-5 and 5-6. Daily transactions are shown by time period, direction and total, and disaggregated into toll free and tolled transactions. Daily levels of toll revenue are presented by time period, direction and total. Total daily transactions and toll revenues have also been expanded to reflect annual levels. Estimates of annual toll

revenue have not been adjusted to reflect ramp-up in these tables.

Alternative 2 – Average weekday transactions and annual toll revenues for Alternative 2 under the All Pay and HOV 3+ Free operating scenarios at opening-year 2012 and future-years 2015 and 2025 are presented in Table 5-5. At opening-year 2012 levels the LBJ MLs are expected to generate more than 38,900 transactions daily under the All Pay scenario and more than 41,200 under the HOV 3+ Free operating option. These daily transaction levels are estimated to produce annual toll revenues of approximately \$24.7 and \$23.7 million, respectively.

Table 5-5
Estimated Average Weekday Transactions and Annual Toll Revenue
Alternative 2

Time Period	Year 2012																							
	All Pay						HOV3+Free																	
	Eastbound			Westbound			Both Directions			Eastbound			Westbound			Both Directions								
	Total	Free	Tolled	Average Toll	Revenue	Total	Free	Tolled	Average Toll	Revenue	Total Daily Transactions	Revenue	Total	Free	Tolled	Average Toll	Revenue	Total	Free	Tolled	Average Toll	Revenue	Total Daily Transactions	Revenue
AM1 (6-8)	1,700	0	1,700	\$0.31	\$520	5,430	0	5,430	\$3.69	\$20,020	7,130	\$20,540	1,820	160	1,660	\$0.31	\$510	6,030	790	5,240	\$3.70	\$19,370	7,850	\$19,880
AM2 (8-9)	770	0	770	0.62	480	3,030	0	3,030	1.55	4,690	3,800	5,170	860	80	780	0.62	480	3,180	280	2,900	1.55	4,490	4,040	4,970
MD (9-15)	10,020	0	10,020	0.76	7,620	12,610	0	12,610	1.07	13,550	22,630	21,170	10,460	880	9,580	0.76	7,280	13,300	1,190	12,110	1.08	13,070	23,760	20,350
PM1 (15-16)	3,280	0	3,280	4.06	13,330	1,800	0	1,800	0.64	1,160	5,080	14,490	3,250	420	2,830	4.47	12,660	1,920	200	1,720	0.65	1,110	5,170	13,770
PM2 (16-18)	6,210	0	6,210	2.79	17,300	1,530	0	1,530	0.63	960	7,740	18,260	6,770	910	5,860	2.78	16,280	1,800	350	1,450	0.62	900	8,570	17,180
PM3 (18-19)	3,160	0	3,160	2.42	7,660	1,000	0	1,000	0.63	630	4,160	8,290	3,060	400	2,660	2.82	7,510	1,080	130	950	0.63	600	4,140	8,110
	25,140	0	25,140		\$46,910	25,400	0	25,400		\$41,010	50,540	\$87,920	26,220	2,850	23,370		\$44,720	27,310	2,940	24,370		\$39,540	53,530	\$84,260
Total Annual	0	7,065,000				0	7,138,000			Total Annual	14,202,000	\$24,706,000	801,000	6,567,000				826,000	6,848,000			Total Annual	15,042,000	\$23,678,000
Daily average	0	19,356				0	19,556			Daily average	38,910	\$67,688	2,195	17,992				2,263	18,762			Daily average	41,211	\$64,871
Time Period	Year 2015																							
	All Pay						HOV3+Free																	
	Eastbound			Westbound			Both Directions			Eastbound			Westbound			Both Directions								
	Total	Free	Tolled	Average Toll	Revenue	Total	Free	Tolled	Average Toll	Revenue	Total Daily Transactions	Revenue	Total	Free	Tolled	Average Toll	Revenue	Total	Free	Tolled	Average Toll	Revenue	Total Daily Transactions	Revenue
AM1 (6-8)	3,230	0	3,230	\$1.30	\$4,210	5,640	0	5,640	\$3.51	\$19,820	8,870	\$24,030	3,430	320	3,110	\$1.31	\$4,060	6,060	750	5,310	\$3.53	\$18,740	9,490	\$22,800
AM2 (8-9)	2,400	0	2,400	1.06	2,550	2,870	0	2,870	1.46	4,190	5,270	6,740	3,020	210	2,810	0.80	2,260	3,660	240	3,420	1.10	3,770	6,680	6,030
MD (9-15)	12,380	0	12,380	0.97	11,960	14,430	0	14,430	1.02	14,730	26,810	26,690	17,690	1,020	16,670	0.66	10,970	19,380	1,250	18,130	0.68	12,340	37,070	23,310
PM1 (15-16)	3,340	0	3,340	3.90	13,010	1,910	0	1,910	0.96	1,830	5,250	14,840	3,330	390	2,940	4.26	12,520	2,510	200	2,310	0.64	1,480	5,840	14,000
PM2 (16-18)	6,840	0	6,840	2.63	17,960	1,730	0	1,730	0.92	1,600	8,570	19,560	6,890	810	6,080	3.08	18,720	3,150	390	2,760	0.64	1,780	10,040	20,500
PM3 (18-19)	3,320	0	3,320	2.27	7,540	1,160	0	1,160	0.94	1,090	4,480	8,630	3,620	380	3,240	2.26	7,320	1,720	180	1,540	0.64	990	5,340	8,310
	31,510	0	31,510		\$57,230	27,740	0	27,740		\$43,260	59,250	\$100,490	37,980	3,130	34,850		\$55,850	36,480	3,010	33,470		\$39,100	74,460	\$94,950
Total Annual	0	8,855,000				0	7,795,000			Total Annual	16,650,000	\$28,239,000	880,000	9,793,000				846,000	9,405,000			Total Annual	20,924,000	\$26,682,000
Daily average	0	24,260				0	21,356			Daily average	45,616	\$77,367	2,411	26,830				2,318	25,767			Daily average	57,326	\$73,101
Time Period	Year 2025																							
	All Pay						HOV3+Free																	
	Eastbound			Westbound			Both Directions			Eastbound			Westbound			Both Directions								
	Total	Free	Tolled	Average Toll	Revenue	Total	Free	Tolled	Average Toll	Revenue	Total Daily Transactions	Revenue	Total	Free	Tolled	Average Toll	Revenue	Total	Free	Tolled	Average Toll	Revenue	Total Daily Transactions	Revenue
AM1 (6-8)	3,050	0	3,050	\$2.88	\$8,780	6,950	0	6,950	\$5.04	\$35,010	10,000	\$43,790	3,150	420	2,730	\$3.15	\$8,600	7,340	900	6,440	\$5.18	\$33,390	10,490	\$41,990
AM2 (8-9)	3,380	0	3,380	1.63	5,500	2,640	0	2,640	2.58	6,800	6,020	12,300	3,490	260	3,230	1.63	5,260	3,180	260	2,920	2.21	6,450	6,670	11,710
MD (9-15)	17,780	0	17,780	1.12	19,950	19,400	0	19,400	1.14	22,160	37,180	42,110	12,110	1,200	10,910	1.43	15,640	14,750	1,310	13,440	1.48	19,840	26,860	35,480
PM1 (15-16)	4,050	0	4,050	5.40	21,850	2,420	0	2,420	1.64	3,980	6,470	25,830	4,260	360	3,900	5.34	20,830	2,600	270	2,330	1.64	3,820	6,860	24,650
PM2 (16-18)	6,530	0	6,530	5.08	33,170	4,580	0	4,580	1.90	8,720	11,110	41,890	7,080	1,020	6,060	5.16	31,280	5,450	560	4,890	1.59	7,780	12,530	39,060
PM3 (18-19)	3,000	0	3,000	4.86	14,590	1,920	0	1,9																

Table 5-6
Estimated Average Weekday Transactions and Annual Toll Revenue
Alternative 6

Time Period	Year 2015											Year 2025																																	
	All Pay						HOV3+Free					All Pay						HOV3+Free																											
	Eastbound			Westbound			Both Directions		Eastbound			Westbound		Both Directions		Eastbound			Westbound			Both Directions																							
	Daily Transactions			Daily Transactions			Total Daily Transactions		Daily Transactions			Daily Transactions		Total Daily Transactions		Daily Transactions			Daily Transactions			Total Daily Transactions																							
	Toll	Free	Tolled	Average Toll	Revenue	Total	Free	Tolled	Average Toll	Revenue	Total	Free	Tolled	Average Toll	Revenue	Total	Free	Tolled	Average Toll	Revenue	Total	Free	Tolled	Average Toll	Revenue																				
AM1 (6-8)	1,760	0	1,760	\$0.66	\$1,160	10,050	0	10,050	\$2.64	\$26,510	11,810	\$27,670	2,060	370	1,690	\$0.66	\$1,110	10,530	830	9,700	\$2.64	\$25,560	12,590	\$26,670	2,630	200	2,430	0.98	2,390	3,440	3,240	1.19	3,850	6,070	6,240										
AM2 (8-9)	2,530	0	2,530	0.98	2,490	3,320	0	3,320	1.19	3,960	5,850	6,450	2,630	200	2,430	0.98	2,390	3,440	200	3,240	1.19	3,850	6,070	6,240	17,490	1,420	16,070	0.84	13,500	21,880	1,610	20,270	0.86	17,350	39,370	30,850									
MD (9-15)	16,690	0	16,690	0.84	13,990	21,040	0	21,040	0.85	17,980	37,730	31,970	5,480	440	5,040	3.22	16,230	2,970	270	2,700	1.81	4,900	8,450	21,130	11,800	1,020	10,780	2.98	32,130	5,920	610	5,310	1.87	9,950	17,720	42,080									
PM1 (15-16)	5,250	0	5,250	3.21	16,850	2,820	0	2,820	1.82	5,140	8,070	21,990	4,620	370	4,250	2.74	11,650	3,280	270	3,010	1.80	5,410	7,900	17,060	42,450	0	42,450	\$79,350	45,850	0	45,850	\$69,430	88,300	\$148,780	44,080	3,820	40,260	\$77,010	48,020	3,790	44,230	\$67,020	92,100	\$144,030	
PM2 (16-18)	11,180	0	11,180	2.98	33,340	5,550	0	5,550	1.86	10,350	16,730	43,690	11,800	1,020	10,780	2.98	32,130	5,920	610	5,310	1.87	9,950	17,720	42,080	42,450	0	42,450	\$79,350	45,850	0	45,850	\$69,430	88,300	\$148,780	44,080	3,820	40,260	\$77,010	48,020	3,790	44,230	\$67,020	92,100	\$144,030	
PM3 (18-19)	5,040	0	5,040	2.29	11,520	3,070	0	3,070	1.79	5,490	8,110	17,010	4,620	370	4,250	2.74	11,650	3,280	270	3,010	1.80	5,410	7,900	17,060	42,450	0	42,450	\$79,350	45,850	0	45,850	\$69,430	88,300	\$148,780	44,080	3,820	40,260	\$77,010	48,020	3,790	44,230	\$67,020	92,100	\$144,030	
Total Annual	0	11,929,000	0	12,884,000	Total Annual	24,813,000	\$41,809,000	1,073,000	11,313,000	1,065,000	12,429,000	Total Annual	25,881,000	\$40,474,000	2,918	34,052	Total Annual	25,881,000	\$40,474,000	70,907	\$110,888	25,881,000	\$40,474,000	70,907	\$110,888	42,450	0	42,450	\$79,350	45,850	0	45,850	\$69,430	88,300	\$148,780	44,080	3,820	40,260	\$77,010	48,020	3,790	44,230	\$67,020	92,100	\$144,030
Daily average	0	32,682	0	35,299	Total Annual	24,813,000	\$41,809,000	1,073,000	11,313,000	1,065,000	12,429,000	Total Annual	25,881,000	\$40,474,000	2,918	34,052	Total Annual	25,881,000	\$40,474,000	70,907	\$110,888	25,881,000	\$40,474,000	70,907	\$110,888	42,450	0	42,450	\$79,350	45,850	0	45,850	\$69,430	88,300	\$148,780	44,080	3,820	40,260	\$77,010	48,020	3,790	44,230	\$67,020	92,100	\$144,030

NOTE: Revenues do not consider effects of ramp-up of demand.

In calculating traffic and revenue facility, it is critical to do so by travel direction and time of day since, significantly different toll rates are soon to be in effect in each of these periods. Transactions and revenue are calculated for each of the six analysis periods by direction, to arrive at a total estimate of weekday transactions and revenue.

Transactions and revenue are then "annualized" by assuming an equivalent 281 weekdays per year. Given the nature, of managed lanes, the vast majority of traffic and revenue occurs on weekdays. While weekends were not specifically modeled as part, of this study, they were assumed to represent are traffic and transactions and revenue on weekday periods were assumed to represent no more than 20-25 percent of the typical weekday. In addition, in computing the annualized factor, a small additional amount of 1-2 percent of transactions of revenue was assumed to cover the night period on weekdays which was not modeled.

By 2025 average daily transactions are forecasted to increase to almost 58,300 assuming the All Pay option and almost 53,100 under the HOV 3+ Free operating scenario. This translates to an increase of approximately 50 and 29 percent, respectively, over 2012 operating conditions. These 2025 transaction levels are expected to generate annual toll revenues of more than \$51.6 million under the All Pay scenario and almost \$47.8 million under the HOV 3+ Free scenario. These 2025 annual toll revenue estimates equate to more than a doubling of annual toll revenues when com-

pared to those generated at 2012 levels.

Alternative 6 – Average weekday transactions and annual toll revenues for Alternative 6 under the All Pay and HOV 3+ Free operating scenarios at opening-year 2015 and future-year 2025 are presented in Table 5-6. As shown in Table 5-6 at opening-year 2015 levels the LBJ MLs are expected to generate almost 68.0 thousand transactions daily under the All Pay scenario and almost 71.0 thousand under the HOV 3+ Free operating option. These daily transaction levels are estimated to produce annual toll revenues of approximately \$41.8 and \$40.5 million, respectively.

By 2025 daily transactions are forecasted to increase to more than 82.9 thousand assuming the All Pay option and almost 87.2 thousand under the HOV 3+ Free operating scenario. This translates to an increase of approximately 22 and 23 percent, respectively, over 2015 operating conditions. These 2025 transaction levels are expected to generate annual toll revenues of almost \$79.2 million under the All Pay scenario and more than \$76.9 million under the HOV 3+ Free scenario. These 2025 annual toll revenue estimates are almost double the annual toll revenues generated at opening-year 2015 levels, due to significant increases in toll rates required to manage demand.

Estimated Annual Toll Revenue

Estimated annual toll revenue for Alternatives 2 and 6 under the All Pay and HOV 3+

Table 5-7
Estimated Annual Toll Revenue Comparison By Project Alternative (1)

Year	(thousands)			
	Alternative 2		Alternative 6	
	All Pay	HOV 3+Free	All Pay	HOV 3+Free
2012	\$15,071	\$14,444	-	-
2013	21,001	20,032	-	-
2014	25,523	24,230	-	-
2015	28,239	26,682	\$25,503	\$24,689
2016	30,439	28,691	37,090	35,770
2017	32,811	30,850	47,044	45,197
2018	35,368	33,173	54,321	51,991
2019	38,124	35,670	59,275	56,517
2020	41,095	38,355	64,680	61,437
2021	43,010	40,060	67,347	64,259
2022	45,015	41,841	70,124	67,211
2023	47,113	43,701	73,015	70,298
2024	49,309	45,644	76,026	73,527
2025	51,607	47,673	79,161	76,904
2026	53,413	49,342	81,932	79,596
2027	55,283	51,069	84,799	82,381
2028	57,218	52,856	87,767	85,265
2029	59,220	54,706	90,839	88,249
2030	61,293	56,621	94,018	91,338
2031	63,438	58,602	97,309	94,535
2032	65,659	60,653	100,715	97,843
2033	67,957	62,776	104,240	101,268
2034	70,335	64,973	107,888	104,812
2035	72,797	67,247	111,664	108,481
2036	75,345	69,601	115,573	112,278
2037	77,982	72,037	119,618	116,207
2038	80,711	74,558	123,804	120,274
2039	83,536	77,168	128,137	124,484
2040	86,460	79,869	132,622	128,841

Note: All revenues are in future year dollars.
(1) Annual toll revenues have been adjusted to reflect ramp-up during the first three years of operation.

Free operating options are presented in Table 5-7. Alternative 2 annual toll revenues are shown from opening-year 2012 through 2040 and Alternative 6 from opening-year 2015 through 2040. The toll revenue is in future-year dollars and has been adjusted to reflect ramp-up during the first three years of operation. Annual toll revenue from 2025 to 2040 were calculated using a 3.5 percent annual rate of growth, 2.5 to reflect inflation and 1.0 to reflect traffic growth.

The annual toll revenue generated by the LBJ MLs for Alternative 2 ranges from \$15.1 million in 2012 to \$86.5 million in 2040 under the All Pay operating scenario. Under the HOV 3+ Free operating condition annual revenue would increase from about \$14.4 million in 2012 to almost \$80 million in 2040..

Alternative 6 annual toll revenue estimates range between \$25.5 million in opening-

year 2015 to \$132.6 million in 2040 under the All Pay operating scenario. Opening year (2015) revenue is estimated at \$24.7 million increasing to almost \$129 million by 2040 if vehicles with three or more occupants are allowed toll free access. As indicated in Table 5-7 annual toll revenues under the HOV 3+ Free operating scenario are slightly less than those generated under the All Pay condition for both LBJ ML preferred alternatives. This can of course be attributed to the ability of HOV 3+ vehicles to travel toll free under the HOV 3+ Free option.

Current accepted professional practices and procedures were used in the development of these traffic and revenue estimates. However, as with any forecast of the future, it should be assumed that there will be differences between forecast and an actual results caused by events and circumstances beyond the control of the forecasters. These differences could be material. For example, traffic and revenue estimates in this report are based heavily on future socioeconomic growth projections for the LBJ Corridor. There is always uncertainty regarding the specific nature and timing of future development.

It also should be recognized that traffic and toll revenue forecasts in this document are intended to reflect the overall estimated long-term trend. Actual experience in any given year may vary due to economic conditions or other factors. Finally, ultimate utilization of the LBJ Managed Lanes will be influenced significantly by technology, signing and other promotional activities. This is also largely outside the control of the forecasters.