

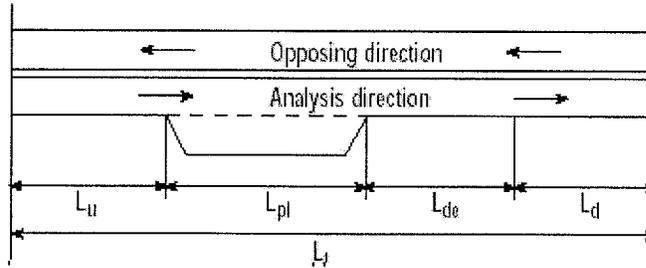
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET WITH PASSING LANE WORKSHEET

General Information		Site Information	
Analyst	MKP	Highway of Travel	Foresthill Road - Eastbound
Agency or Company	MRO Engineers, Inc.	From/To	Todd Valley W to Owl Hill Ct
Date Performed	10/22/07	Jurisdiction	Placer County
Analysis Time Period	AM Peak Hour	Analysis Year	Year 2030 Without Forest Ranch

Project Description: *Foresthill Divide Community Plan*

Input Data

Class I highway Class II highway



Total length of analysis segment, L_1 (mi)	1.2
Length of two-lane highway upstream of the passing lane, L_u (mi)	0.1
Length of passing lane including tapers, L_{pl} (mi)	1.0
Average travel speed, ATS_d (from Directional Two-Lane Highway Segment Worksheet)	46.0
Percent time-spent-following, $PTSF_d$ (from Directional Two-Lane Highway Segment Worksheet)	77.1
Level of service, LOS_d (from Directional Two-Lane Highway Segment Worksheet)	D

Average Travel Speed	
Downstream length of two-lane highway within effective length of passing lane for average travel speed, L_{de} (mi) (Exhibit 20-23)	1.70
Length of two-lane highway downstream of effective length of the passing lane for avg travel speed, L_d (mi) $L_d = L_r - (L_u + L_{pl} + L_{de})$	-1.60
Adj. factor for the effect of passing lane on average speed, f_{pl} (Exhibit 20-24)	1.11
Average travel speed including passing lane ² , $ATS_{pl} = (ATS_d * L_1) / (L_u + L_d + (L_{pl}/f_{pl}) + (2L_{de}/(1+f_{pl})))$	50.5

Percent Time-Spent-Following	
Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, L_{de} (mi) (Exhibit 20-23)	5.06
Length of two-lane highway downstream of effective length of the passing lane for percent-time-following, L_d (mi) $L_d = L_r - (L_u + L_{pl} + L_{de})$	-4.96
Adj. factor for the effect of passing lane on percent time-spent-following, f_{pl} (Exhibit 20-24)	0.62
Percent time-spent-following including passing lane ³ , $PTSF_{pl}(\%)$ $PTSF_{pl} = PTSF_d [L_u + L_d + f_{pl}L_{pl} + ((1+f_{pl})/2)L_{de}] / L_1$	50.2

Level of Service and Other Performance Measures ⁴	
Level of service including passing lane LOS_{pl} (Exhibit 20-3 or 20-4)	C
Peak 15-min total travel time, TT_{15} (veh-h) $TT_{15} = VMT_{15}/ATS_{pl}$	4.4

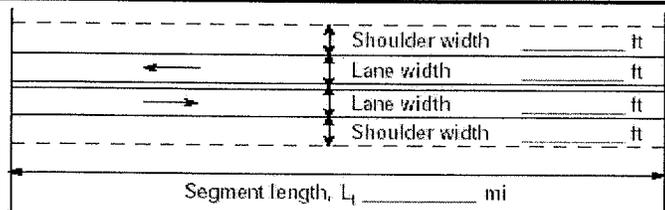
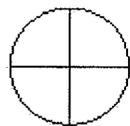
Notes

1. If $LOS_d = F$, passing lane analysis cannot be performed.
2. If $L_d < 0$, use alternative Equation 20-22.
3. If $L_d < 0$, use alternative Equation 20-20.
4. v/c, VMT_{15} and VMT_{60} are calculated on Directional Two-Lane Highway Segment Worksheet.

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	MKP	Highway / Direction of Travel	Foresthill Road - Westbound
Agency or Company	MRO Engineers, Inc.	From/To	Todd Valley W to Owl Hill Ct.
Date Performed	10/22/07	Jurisdiction	Placer County
Analysis Time Period	AM Peak Hour	Analysis Year	Year 2030 Without Forest Ranch

Project Description: Foresthill Divide Community Plan

 <p style="text-align: center;">Segment length, L_1 _____ mi</p>	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p>Show North Arrow</p> </div> <div> <input checked="" type="checkbox"/> Class I highway <input type="checkbox"/> Class II highway <input type="checkbox"/> Terrain <input type="checkbox"/> Level <input type="checkbox"/> Rolling Grade Length 1.20 mi Up/down -3.0 Peak-hour factor, PHF 0.79 No-passing zone 100% % Trucks and Buses, P_T 2% % Recreational vehicles, P_R 2% Access points/ mi 4 </div> </div>
---	---

Analysis direction vol., V_d 494veh/h
 Opposing direction vol., V_o 436veh/h

Average Travel Speed		
	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-9 or 20-15)	1.1	5.0
Passenger-car equivalents for RVs, E_R (Exhibit 20-9 or 20-17)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.998	0.927
Grade adjustment factor f_G (Exhibit 20-7 or 20-13)	1.00	1.00
Directional flow rate ² , v_i (pc/h) $v_i=V_i/(PHF \cdot f_{HV} \cdot f_G)$	627	598
Free-Flow Speed from Field Measurement	Estimated Free-Flow Speed	
Field measured speed ³ , S_{FM} mi/h	Base free-flow speed ³ , $BFFS_{FM}$	60.0 mi/h
Observed volume ⁴ , V_i veh/h	Adj. for lane width and shoulder width ³ , f_{LS} (Exh 20-5)	0.0 mi/h
Free-flow speed, FFS_d $FFS=S_{FM}+0.00776(V_i/f_{HV})$ mi/h	Adj. for access points ⁵ , f_A (Exhibit 20-5)	1.0 mi/h
Adjustment for no-passing zones, f_{np} (Exhibit 20-19) 2.0 mi/h	Free-flow speed, FFS_d ($FFS=BFFS \cdot f_{LS} \cdot f_A$)	59.0 mi/h
	Average travel speed, $ATS=FFS \cdot 0.00776 v_o \cdot f_{np}$	47.5 mi/h

Percent Time-Spent-Following		
	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-10 or 20-16)	1.0	1.0
Passenger-car equivalents for RVs, E_R (Exhibit 20-10 or 20-16)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	1.000	1.000
Grade adjustment factor, f_G (Exhibit 20-8 or 20-14)	1.00	0.93
Directional flow rate ² , v_i (pc/h)= $V_i/(PHF \cdot f_{HV} \cdot f_G)$	625	591
Base percent time-spent-following ⁴ , $BPTSF(\%)=100(1-e^{-v_i \cdot d})$		59.1
Adj. for no-passing zone, f_{np} (Exhibit. 20-20)		33.9
Percent time-spent-following, $PTSF(\%)=BPTSF+f_{np}$		76.5

Level of Service and Other Performance Measures	
Level of service, LOS (Exhibit 20-3 or 20-4)	D
Volume to capacity ratio, $v/c=V_p/1,700$	0.37
Peak 15-min veh-miles of travel, VMT_{15} (veh- mi)= $0.25L_d(V/PHF)$	188
Peak-hour vehicle-miles of travel, VMT_{60} (veh- mi)= $V \cdot L_1$	593
Peak 15-min total travel time, TT_{15} (veh-h)= VMT_{15}/ATS	4.0

Notes

1. If the highway is extended segment (level) or rolling terrain, $f_G=1.0$.
2. If v_i (V_d or v_o) $\geq 1,700$ pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only.
4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET WITH PASSING LANE WORKSHEET

General Information	Site Information
Analyst Agency or Company Date Performed Analysis Time Period	MKP MRO Engineers, Inc. 10/22/07 AM Peak Hour
Project Description: <i>Foresthill Divide Community Plan</i>	Highway of Travel From/To Jurisdiction Analysis Year
	<i>Foresthill Road - Westbound Todd Valley W to Owl Hill Ct. Placer County Year 2030 Without Forest Ranch</i>

Input Data

Class I highway Class II highway

Total length of analysis segment, L_t (mi)	1.2
Length of two-lane highway upstream of the passing lane, L_u (mi)	1.2
Length of passing lane including tapers, L_{pl} (mi)	0.0
Average travel speed, ATS_d (from Directional Two-Lane Highway Segment Worksheet)	47.5
Percent time-spent-following, $PTSF_d$ (from Directional Two-Lane Highway Segment Worksheet)	76.5
Level of service ¹ , LOS_d (from Directional Two-Lane Highway Segment Worksheet)	D

Average Travel Speed

Downstream length of two-lane highway within effective length of passing lane for average travel speed, L_{de} (mi) (Exhibit 20-23)	1.70
Length of two-lane highway downstream of effective length of the passing lane for avg travel speed, L_d (mi) $L_d = L_t - (L_u + L_{pl} + L_{de})$	-1.70
Adj. factor for the effect of passing lane on average speed, f_{pl} (Exhibit 20-24)	1.11
Average travel speed including passing lane ² , $ATS_{pl} = (ATS_d * L_t) / (L_u + L_d + (L_{pl}/f_{pl}) + (2L_{de}/(1+f_{pl})))$	

Percent Time-Spent-Following

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, L_{de} (mi) (Exhibit 20-23)	6.30
Length of two-lane highway downstream of effective length of the passing lane for percent-time-following, L_d (mi) $L_d = L_t - (L_u + L_{pl} + L_{de})$	-6.30
Adj. factor for the effect of passing lane on percent time-spent-following, f_{pl} (Exhibit 20-24)	0.62
Percent time-spent-following including passing lane ³ , $PTSF_{pl}(\%)$ $PTSF_{pl} = PTSF_d [L_u + L_d + f_{pl}L_{pl} + ((1+f_{pl})/2)L_{de}] / L_t$	76.5

Level of Service and Other Performance Measures⁴

Level of service including passing lane LOS_{pl} (Exhibit 20-3 or 20-4)	
Peak 15-min total travel time, TT_{15} (veh-h) $TT_{15} = VMT_{15} / ATS_{pl}$	

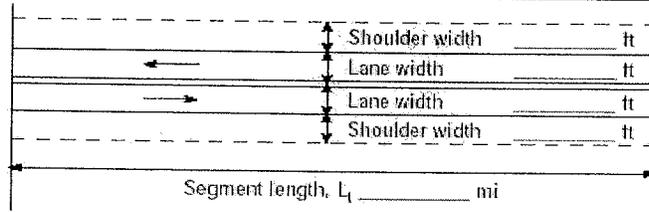
- Notes**
1. If $LOS_d = F$, passing lane analysis cannot be performed.
 2. If $L_d < 0$, use alternative Equation 20-22.
 3. If $L_d < 0$, use alternative Equation 20-20.
 4. v/c, VMT_{15} and VMT_{60} are calculated on Directional Two-Lane Highway Segment Worksheet.

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	MKL	Highway / Direction of Travel	Foresthill Road - Eastbound
Agency or Company	MRO Engineers, Inc.	From/To	Bridge to Spring Garden Road
Date Performed	2/27/07	Jurisdiction	Placer County
Analysis Time Period	PM Peak Hour	Analysis Year	Year 2030 Without Forest Ranch

Project Description: Foresthill Divide Community Plan

Input Data



<input checked="" type="checkbox"/> Class I highway	<input type="checkbox"/> Class II highway
Terrain <input type="checkbox"/> Level <input type="checkbox"/> Rolling	
Grade Length 4.00 mi	Up/down 3.0
Peak-hour factor, PHF 0.88	
No-passing zone 55%	
% Trucks and Buses, P_T 1%	
% Recreational vehicles, P_R 2%	
Access points/ mi 2	

Analysis direction vol., V_d 899veh/h
 Opposing direction vol., V_o 341veh/h

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-9 or 20-15)	5.7	1.2
Passenger-car equivalents for RVs, E_R (Exhibit 20-9 or 20-17)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.955	0.998
Grade adjustment factor f_G (Exhibit 20-7 or 20-13)	0.95	1.00
Directional flow rate ² , $v_i(\text{pc/h}) v_i=V_i/(PHF \cdot f_{HV} \cdot f_G)$	1126	388
Free-Flow Speed from Field Measurement	Estimated Free-Flow Speed	
Field measured speed ³ , S_{FM} mi/h	Base free-flow speed ³ , $BFFS_{FM}$ 60.0 mi/h	
Observed volume ³ , V_f veh/h	Adj. for lane width and shoulder width ³ , f_{LS} (Exh 20-5) 0.0 mi/h	
Free-flow speed, $FFS_d FFS=S_{FM}+0.00776(V_f/f_{HV})$ mi/h	Adj. for access points ³ , f_A (Exhibit 20-5) 0.5 mi/h	
Adjustment for no-passing zones, f_{np} (Exhibit 20-19) 2.4 mi/h	Free-flow speed, $FFS_d (FSS=BFFS \cdot f_{LS} \cdot f_A)$ 59.5 mi/h	
	Average travel speed, $ATS=FFS \cdot 0.00776 v_p \cdot f_{np}$ 45.3 mi/h	

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-10 or 20-16)	1.0	1.1
Passenger-car equivalents for RVs, E_R (Exhibit 20-10 or 20-16)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	1.000	0.999
Grade adjustment factor ¹ , f_G (Exhibit 20-8 or 20-14)	0.97	1.00
Directional flow rate ² , $v_i(\text{pc/h})=V_i/(PHF \cdot f_{HV} \cdot f_G)$	1053	388
Base percent time-spent-following ⁴ , $BPTSF(\%)=100(1-e^{-av_d^b})$	74.2	
Adj. for no-passing zone, f_{np} (Exhibit. 20-20)	18.3	
Percent time-spent-following, $PTSF(\%)=BPTSF+f_{np}$	87.5	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 or 20-4)	E
Volume to capacity ratio, $v/c=V_p/1,700$	0.66
Peak 15-min veh-miles of travel, $VMT_{15}(\text{veh} \cdot \text{mi})=0.25L_1(V/PHF)$	2758
Peak-hour vehicle-miles of travel, $VMT_{60}(\text{veh} \cdot \text{mi})=V \cdot L_1$	9709
Peak 15-min total travel time, $TT_{15}(\text{veh} \cdot \text{h})=VMT_{15}/ATS$	60.9

Notes

1. If the highway is extended segment (level) or rolling terrain, $f_G=1.0$.
2. If $v_i(V_d \text{ or } v_o) \geq 1,700 \text{ pc/h}$, terminate analysis--the LOS is F.
3. For the analysis direction only.
4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

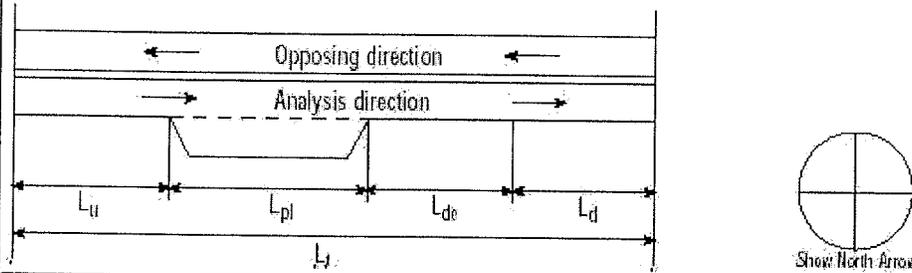
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET WITH PASSING LANE WORKSHEET

General Information		Site Information	
Analyst	MKL	Highway of Travel	Foresthill Road - Eastbound
Agency or Company	MRO Engineers, Inc.	From/To	Bridge to Spring Garden Road
Date Performed	2/27/07	Jurisdiction	Placer County
Analysis Time Period	PM Peak Hour	Analysis Year	Year 2030 Without Forest Ranch

Project Description: *Foresthill Divide Community Plan*

Input Data

Class I highway Class II highway



Total length of analysis segment, L_t (mi)	10.8
Length of two-lane highway upstream of the passing lane, L_u (mi)	3.0
Length of passing lane including tapers, L_{pl} (mi)	4.9
Average travel speed, ATS_d (from Directional Two-Lane Highway Segment Worksheet)	45.3
Percent time-spent-following, $PTSF_d$ (from Directional Two-Lane Highway Segment Worksheet)	87.5
Level of service ¹ , LOS_d (from Directional Two-Lane Highway Segment Worksheet)	E

Average Travel Speed

Downstream length of two-lane highway within effective length of passing lane for average travel speed, L_{de} (mi) (Exhibit 20-23)	1.70
Length of two-lane highway downstream of effective length of the passing lane for avg travel speed, L_d (mi) $L_d = L_t - (L_u + L_{pl} + L_{de})$	1.20
Adj. factor for the effect of passing lane on average speed, f_{pl} (Exhibit 20-24)	1.11
Average travel speed including passing lane ² , $ATS_{pl} = (ATS_d * L_t) / (L_u + L_d + (L_{pl}/f_{pl}) + (2L_{de}/(1+f_{pl})))$	47.9

Percent Time Spent Following

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, L_{de} (mi) (Exhibit 20-23)	3.60
Length of two-lane highway downstream of effective length of the passing lane for percent-time-following, L_d (mi) $L_d = L_t - (L_u + L_{pl} + L_{de})$	-0.70
Adj. factor for the effect of passing lane on percent time-spent-following, f_{pl} (Exhibit 20-24)	0.62
Percent time-spent-following including passing lane ³ , $PTSF_{pl}(\%)$ $PTSF_{pl} = PTSF_d [L_u + L_d + f_{pl}L_{pl} + ((1+f_{pl})/2)L_{de}] / L_t$	67.1

Level of Service and Other Performance Measures⁴

Level of service including passing lane LOS_{pl} (Exhibit 20-3 or 20-4)	D
Peak 15-min total travel time, TT_{15} (veh-h) $TT_{15} = VMT_{15} / ATS_{pl}$	57.6

Notes

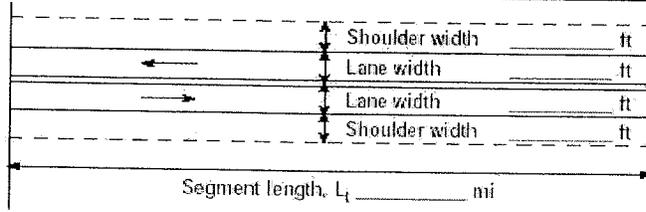
1. If $LOS_d = F$, passing lane analysis cannot be performed.
2. If $L_d < 0$, use alternative Equation 20-22.
3. If $L_d < 0$, use alternative Equation 20-20.
4. v/c, VMT_{15} and VMT_{60} are calculated on Directional Two-Lane Highway Segment Worksheet.

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	MKL	Highway / Direction of Travel	Foresthill Road - Westbound
Agency or Company	MRO Engineers, Inc.	From/To	Bridge to Spring Garden Road
Date Performed	2/27/07	Jurisdiction	Placer County
Analysis Time Period	PM Peak Hour	Analysis Year	Year 2030 Without Forest Ranch

Project Description: *Foresthill Divide Community Plan*

Input Data



<input checked="" type="checkbox"/> Class I highway	<input type="checkbox"/> Class II highway
Terrain <input type="checkbox"/> Level <input checked="" type="checkbox"/> Rolling	
Grade Length 4.00 mi	Up/down -3.0
Peak-hour factor, PHF 0.76	
No-passing zone 88%	
% Trucks and Buses, P _T 4%	
% Recreational vehicles, P _R 2%	
Access points/ mi 2	

Analysis direction vol., V_d 341veh/h
 Opposing direction vol., V_o 899veh/h

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E _T (Exhibit 20-9 or 20-15)	1.2	5.7
Passenger-car equivalents for RVs, E _R (Exhibit 20-9 or 20-17)	1.0	1.0
Heavy-vehicle adjustment factor, f _{HV} =1/(1+P _T (E _T -1)+P _R (E _R -1))	0.992	0.842
Grade adjustment factor ¹ , f _G (Exhibit 20-7 or 20-13)	1.00	0.95
Directional flow rate ² , v _i (pc/h) v _i =V _i /(PHF*f _{HV} *f _G)	452	1479
Free-Flow Speed from Field Measurement	Estimated Free-Flow Speed	
Field measured speed ³ , S _{FM} mi/h	Base free-flow speed ³ , BFFS _{FM} 60.0 mi/h	
Observed volume ³ , V _f veh/h	Adj. for lane width and shoulder width ³ , f _{LS} (Exh 20-5) 0.0 mi/h	
Free-flow speed, FFS _d FFS=S _{FM} +0.00776(V _f /f _{HV}) mi/h	Adj. for access points ³ , f _A (Exhibit 20-5) 0.5 mi/h	
Adjustment for no-passing zones, f _{np} (Exhibit 20-19) 0.8 mi/h	Free-flow speed, FFS _d (FFS=BFFS-f _{LS} -f _A) 59.5 mi/h	
	Average travel speed, ATS=FFS-0.00776V _p -f _{np} 43.7 mi/h	

Percent Time Spent Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E _T (Exhibit 20-10 or 20-16)	1.1	1.0
Passenger-car equivalents for RVs, E _R (Exhibit 20-10 or 20-16)	1.0	1.0
Heavy-vehicle adjustment factor, f _{HV} =1/(1+P _T (E _T -1)+P _R (E _R -1))	0.996	1.000
Grade adjustment factor ¹ , f _G (Exhibit 20-8 or 20-14)	1.00	0.97
Directional flow rate ² , v _i (pc/h)=V _i /(PHF*f _{HV} *f _G)	450	1219
Base percent time-spent-following ⁴ , BPTSF(%)=100(1-e ^{-av_d})	56.7	
Adj. for no-passing zone, f _{np} (Exhibit 20-20)	22.4	
Percent time-spent-following, PTSF(%)=BPTSF+f _{np}	62.8	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 or 20-4)	D
Volume to capacity ratio, v/c=V _p /1,700	0.27
Peak 15-min veh-miles of travel, VMT ₁₅ (veh-mi)=0.25L _t (V/PHF)	1211
Peak-hour vehicle-miles of travel, VMT ₆₀ (veh-mi)=V*L _t	3683
Peak 15-min total travel time, TT ₁₅ (veh-h)=VMT ₁₅ /ATS	27.7

Notes

1. If the highway is extended segment (level) or rolling terrain, f_G=1.0.
2. If v_i(V_d or V_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only.
4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

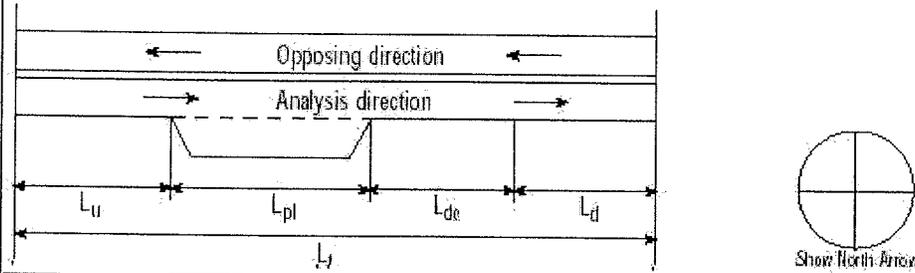
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET WITH PASSING LANE WORKSHEET

General Information		Site Information	
Analyst	MKL	Highway of Travel	Foresthill Road - Westbound
Agency or Company	MRO Engineers, Inc.	From/To	Bridge to Spring Garden Road
Date Performed	2/27/07	Jurisdiction	Placer County
Analysis Time Period	PM Peak Hour	Analysis Year	Year 2030 Without Forest Ranch

Project Description: Foresthill Divide Community Plan

Input Data

Class I highway Class II highway



Total length of analysis segment, L_t (mi)	10.8
Length of two-lane highway upstream of the passing lane, L_u (mi)	4.8
Length of passing lane including tapers, L_{pl} (mi)	1.3
Average travel speed, ATS_d (from Directional Two-Lane Highway Segment Worksheet)	43.7
Percent time-spent-following, $PTSF_d$ (from Directional Two-Lane Highway Segment Worksheet)	62.8
Level of service ¹ , LOS_d (from Directional Two-Lane Highway Segment Worksheet)	D

Average Travel Speed

Downstream length of two-lane highway within effective length of passing lane for average travel speed, L_{de} (mi) (Exhibit 20-23)	1.70
Length of two-lane highway downstream of effective length of the passing lane for avg travel speed, L_d (mi) $L_d = L_t - (L_u + L_{pl} + L_{de})$	3.00
Adj. factor for the effect of passing lane on average speed, f_{pl} (Exhibit 20-24)	1.10
Average travel speed including passing lane ² , $ATS_{pl} = (ATS_d * L_t) / (L_u + L_d + (L_{pl}/f_{pl}) + (2L_{de}/(1+f_{pl})))$	44.6

Percent Time Spent Following

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, L_{de} (mi) (Exhibit 20-23)	7.70
Length of two-lane highway downstream of effective length of the passing lane for percent-time-following, L_d (mi) $L_d = L_t - (L_u + L_{pl} + L_{de})$	-3.00
Adj. factor for the effect of passing lane on percent time-spent-following, f_{pl} (Exhibit 20-24)	0.61
Percent time-spent-following including passing lane ³ , $PTSF_{pl}$ (%) $PTSF_{pl} = PTSF_d [L_u + L_d + f_{pl}L_{pl} + ((1+f_{pl})/2)L_{de}] / L_t$	52.4

Level of Service and Other Performance Measures⁴

Level of service including passing lane LOS_{pl} (Exhibit 20-3 or 20-4)	D
Peak 15-min total travel time, TT_{15} (veh-h) $TT_{15} = VMT_{15} / ATS_{pl}$	27.2

Notes

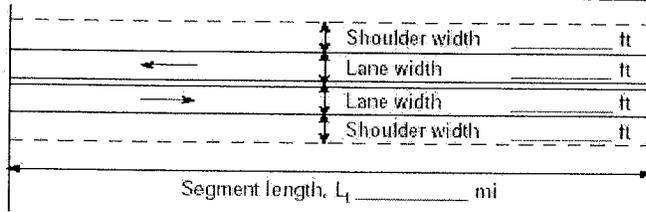
1. If $LOS_d = F$, passing lane analysis cannot be performed.
2. If $L_d < 0$, use alternative Equation 20-22.
3. If $L_d < 0$, use alternative Equation 20-20.
4. v/c, VMT_{15} and VMT_{60} are calculated on Directional Two-Lane Highway Segment Worksheet.

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	MKL	Highway / Direction of Travel	Foresthill Road - Eastbound
Agency or Company	MRO Engineers, Inc.	From/To	Spring Garden to Todd Valley W
Date Performed	2/27/07	Jurisdiction	Placer County
Analysis Time Period	PM Peak Hour	Analysis Year	Year 2030 Without Forest Ranch

Project Description: Foresthill Divide Community Plan

Input Data



<input checked="" type="checkbox"/> Class I highway	<input type="checkbox"/> Class II highway
Terrain <input type="checkbox"/> Level <input type="checkbox"/> Rolling	
Grade Length 1.70 mi	Up/down 3.4
Peak-hour factor, PHF 0.88	No-passing zone 29%
% Trucks and Buses, P _T 2%	% Recreational vehicles, P _R 2%
Access points/ mi 4	

Analysis direction vol., V_d 573veh/h
 Opposing direction vol., V_o 383veh/h

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E _T (Exhibit 20-9 or 20-15)	4.3	1.2
Passenger-car equivalents for RVs, E _R (Exhibit 20-9 or 20-17)	1.0	1.0
Heavy-vehicle adjustment factor, f _{HV} =1/(1+P _T (E _T -1)+P _R (E _R -1))	0.937	0.996
Grade adjustment factor ¹ , f _G (Exhibit 20-7 or 20-13)	1.00	1.00
Directional flow rate ² , v _i (pc/h) v _i =V _i /(PHF*f _{HV} *f _G)	695	437
Free-Flow Speed from Field Measurement	Estimated Free-Flow Speed	
Field measured speed ³ , S _{FM} mi/h	Base free-flow speed ³ , BFFS _{FM} 60.0 mi/h	
Observed volume ³ , V _i veh/h	Adj. for lane width and shoulder width ³ , f _{LS} (Exh 20-5) 0.0 mi/h	
Free-flow speed, FFS _d FFS=S _{FM} +0.00776(V _i /f _{HV}) mi/h	Adj. for access points ³ , f _A (Exhibit 20-5) 1.0 mi/h	
Adjustment for no-passing zones, f _{np} (Exhibit 20-19) 1.6 mi/h	Free-flow speed, FFS _d (FSS=BFFS-f _{LS} -f _A) 59.0 mi/h	
	Average travel speed, ATS=FFS-0.00776v _p -f _{np} 48.7 mi/h	

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E _T (Exhibit 20-10 or 20-16)	1.0	1.1
Passenger-car equivalents for RVs, E _R (Exhibit 20-10 or 20-16)	1.0	1.0
Heavy-vehicle adjustment factor, f _{HV} =1/(1+P _T (E _T -1)+P _R (E _R -1))	1.000	0.998
Grade adjustment factor ¹ , f _G (Exhibit 20-8 or 20-14)	0.94	1.00
Directional flow rate ² , v _i (pc/h)=V _i /(PHF*f _{HV} *f _G)	690	436
Base percent time-spent-following ⁴ , BPTSF(%)=100(1-e ^{-av_db})	60.9	
Adj. for no-passing zone, f _{np} (Exhibit. 20-20)	24.5	
Percent time-spent-following, PTSF(%)=BPTSF+f _{np}	76.0	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 or 20-4)	D
Volume to capacity ratio, v/c=V _p /1,700	0.41
Peak 15-min veh-miles of travel, VMT ₁₅ (veh- m)=0.25L _i (V/PHF)	277
Peak-hour vehicle-miles of travel, VMT ₆₀ (veh- m)=V*L _i	974
Peak 15-min total travel time, TT ₁₅ (veh-h)=VMT ₁₅ /ATS	5.7

Notes

1. If the highway is extended segment (level) or rolling terrain, f_G=1.0 .
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only.
4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

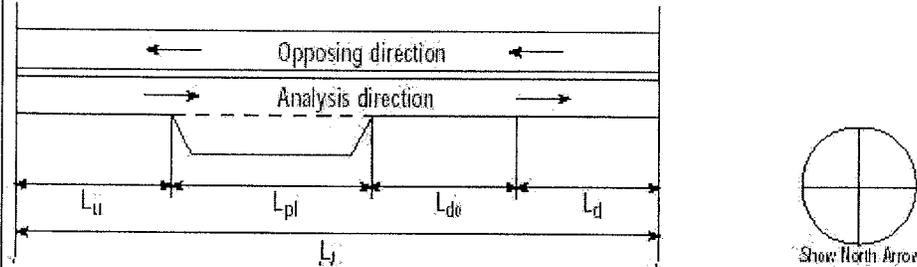
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET WITH PASSING LANE WORKSHEET

General Information		Site Information	
Analyst	MKL	Highway of Travel	Foresthill Road - Eastbound
Agency or Company	MRO Engineers, Inc.	From/To	Spring Garden to Todd Valley W
Date Performed	2/27/07	Jurisdiction	Placer County
Analysis Time Period	PM Peak Hour	Analysis Year	Year 2030 Without Forest Ranch

Project Description: Foresthill Divide Community Plan

Input Data

Class I highway Class II highway



Total length of analysis segment, L_t (mi)	1.7
Length of two-lane highway upstream of the passing lane, L_u (mi)	0.3
Length of passing lane including tapers, L_{pl} (mi)	1.2
Average travel speed, ATS_d (from Directional Two-Lane Highway Segment Worksheet)	48.7
Percent time-spent-following, $PTSF_d$ (from Directional Two-Lane Highway Segment Worksheet)	76.0
Level of service ¹ , LOS_d (from Directional Two-Lane Highway Segment Worksheet)	D

Average Travel Speed

Downstream length of two-lane highway within effective length of passing lane for average travel speed, L_{de} (mi) (Exhibit 20-23)	1.70
Length of two-lane highway downstream of effective length of the passing lane for avg travel speed, L_d (mi) $L_d = L_t - (L_u + L_{pl} + L_{de})$	-1.50
Adj. factor for the effect of passing lane on average speed, f_{pl} (Exhibit 20-24)	1.11
Average travel speed including passing lane ² , $ATS_{pl} = (ATS_d * L_t) / (L_u + L_d + (L_{pl}/f_{pl}) + (2L_{de}/(1+f_{pl})))$	52.9

Percent Time-Spent-Following

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, L_{de} (mi) (Exhibit 20-23)	5.78
Length of two-lane highway downstream of effective length of the passing lane for percent-time-following, L_d (mi) $L_d = L_t - (L_u + L_{pl} + L_{de})$	-5.58
Adj. factor for the effect of passing lane on percent time-spent-following, f_{pl} (Exhibit 20-24)	0.62
Percent time-spent-following including passing lane ³ , $PTSF_{pl}$ (%) $PTSF_{pl} = PTSF_d [L_u + L_d + f_{pl}L_{pl} + ((1+f_{pl})/2)L_{de}] / L_t$	52.3

Level of Service and Other Performance Measures⁴

Level of service including passing lane LOS_{pl} (Exhibit 20-3 or 20-4)	C
Peak 15-min total travel time, TT_{15} (veh-h) $TT_{15} = VMT_{15}/ATS_{pl}$	5.2

Notes

1. If $LOS_d = F$, passing lane analysis cannot be performed.
2. If $L_d < 0$, use alternative Equation 20-22.
3. If $L_d < 0$, use alternative Equation 20-20.
4. v/c, VMT_{15} and VMT_{60} are calculated on Directional Two-Lane Highway Segment Worksheet.

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	MKL	Highway / Direction of Travel	Foresthill Road - Westbound
Agency or Company	MRO Engineers, Inc.	From/To	Spring Garden to Todd Valley W
Date Performed	2/27/07	Jurisdiction	Placer County
Analysis Time Period	PM Peak Hour	Analysis Year	Year 2030 Without Forest Ranch

Project Description: *Foresthill Divide Community Plan*

Input Data

Segment length, L_t _____ mi

Class I highway
 Class II highway

Level
 Rolling

Terrain

Grade Length 1.70 mi Up/down -3.4

Peak-hour factor, PHF 0.88

No-passing zone 100%

% Trucks and Buses, P_T 3%

% Recreational vehicles, P_R 2%

Access points/ mi 5

Analysis direction vol., V_d 383veh/h
 Opposing direction vol., V_o 573veh/h

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-9 or 20-15)	1.2	4.3
Passenger-car equivalents for RVs, E_R (Exhibit 20-9 or 20-17)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.994	0.909
Grade adjustment factor ¹ , f_G (Exhibit 20-7 or 20-13)	1.00	1.00
Directional flow rate ² , v_i (pc/h) $v_i=V_i/(PHF \cdot f_{HV} \cdot f_G)$	438	716
Free-Flow Speed from Field Measurement	Estimated Free-Flow Speed	
Field measured speed ³ , S_{FM} mi/h	Base free-flow speed ³ , $BFFS_{FM}$ 60.0 mi/h	
Observed volume ³ , V_f veh/h	Adj. for lane width and shoulder width ³ , f_{LS} (Exh 20-5) 0.0 mi/h	
Free-flow speed, FFS_d $FFS=S_{FM}+0.00776(V_f/f_{HV})$ mi/h	Adj. for access points ³ , f_A (Exhibit 20-5) 1.3 mi/h	
Adjustment for no-passing zones, f_{np} (Exhibit 20-19) 1.6 mi/h	Free-flow speed, FFS_d ($FSS=BFFS \cdot f_{LS} \cdot f_A$) 58.8 mi/h	
	Average travel speed, $ATS=FFS \cdot 0.00776 v_o \cdot f_{np}$ 48.2 mi/h	

Percent Time Spent Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-10 or 20-16)	1.1	1.0
Passenger-car equivalents for RVs, E_R (Exhibit 20-10 or 20-16)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.997	1.000
Grade adjustment factor ¹ , f_G (Exhibit 20-8 or 20-14)	1.00	0.94
Directional flow rate ² , v_i (pc/h)= $V_i/(PHF \cdot f_{HV} \cdot f_G)$	437	690
Base percent time-spent-following ⁴ , $BPTSF(\%)=100(1-e^{-a v_d^b})$	49.7	
Adj. for no-passing zone, f_{np} (Exhibit. 20-20)	33.7	
Percent time-spent-following, $PTSF(\%)=BPTSF+f_{np}$	62.8	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 or 20-4)	C
Volume to capacity ratio, $v/c=V_p/1,700$	0.26
Peak 15-min veh-miles of travel, VMT_{15} (veh- mi)= $0.25L_t(V/PHF)$	185
Peak-hour vehicle-miles of travel, VMT_{60} (veh- mi)= $V \cdot L_t$	651
Peak 15-min total travel time, TT_{15} (veh-h)= VMT_{15}/ATS	3.8

Notes

1. If the highway is extended segment (level) or rolling terrain, $f_G=1.0$.
2. If $v_i(v_d$ or $v_o) \geq 1,700$ pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only.
4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

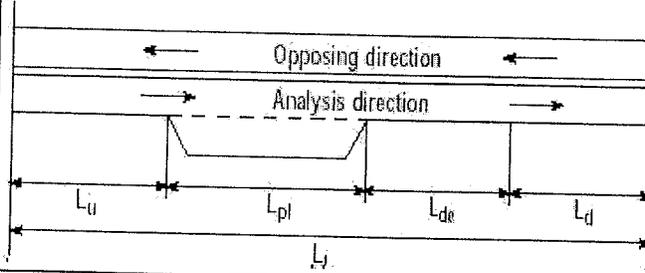
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET WITH PASSING LANE WORKSHEET

General Information		Site Information	
Analyst	MKL	Highway of Travel	Foresthill Road - Westbound
Agency or Company	MRO Engineers, Inc.	From/To	Spring Garden to Todd Valley W
Date Performed	2/27/07	Jurisdiction	Placer County
Analysis Time Period	PM Peak Hour	Analysis Year	Year 2030 Without Forest Ranch

Project Description: Foresthill Divide Community Plan

Input Data

Class I highway Class II highway



Total length of analysis segment, L_t (mi)	1.7
Length of two-lane highway upstream of the passing lane, L_u (mi)	1.7
Length of passing lane including tapers, L_{pl} (mi)	0.0
Average travel speed, ATS_d (from Directional Two-Lane Highway Segment Worksheet)	48.2
Percent time-spent-following, $PTSF_d$ (from Directional Two-Lane Highway Segment Worksheet)	62.8
Level of service ¹ , LOS_d (from Directional Two-Lane Highway Segment Worksheet)	C

Average Travel Speed

Downstream length of two-lane highway within effective length of passing lane for average travel speed, L_{de} (mi) (Exhibit 20-23)	1.70
Length of two-lane highway downstream of effective length of the passing lane for avg travel speed, L_d (mi) $L_d = L_t - (L_u + L_{pl} + L_{de})$	-1.70
Adj. factor for the effect of passing lane on average speed, f_{pl} (Exhibit 20-24)	1.10
Average travel speed including passing lane ² , $ATS_{pl} = (ATS_d * L_t) / (L_u + L_d + (L_{pl}/f_{pl}) + (2L_{de}/(1+f_{pl})))$	

Percent Time Spent Following

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, L_{de} (mi) (Exhibit 20-23)	7.80
Length of two-lane highway downstream of effective length of the passing lane for percent-time-following, L_d (mi) $L_d = L_t - (L_u + L_{pl} + L_{de})$	-7.80
Adj. factor for the effect of passing lane on percent time-spent-following, f_{pl} (Exhibit 20-24)	0.61
Percent time-spent-following including passing lane ³ , $PTSF_{pl}(\%)$ $PTSF_{pl} = PTSF_d [L_u + L_d + f_{pl}L_{pl} + ((1+f_{pl})/2)L_{de}] / L_t$	62.8

Level of Service and Other Performance Measures⁴

Level of service including passing lane LOS_{pl} (Exhibit 20-3 or 20-4)	
Peak 15-min total travel time, TT_{15} (veh-h) $TT_{15} = VMT_{15}/ATS_{pl}$	

Notes

1. If $LOS_d = F$, passing lane analysis cannot be performed.
2. If $L_d < 0$, use alternative Equation 20-22.
3. If $L_d < 0$, use alternative Equation 20-20.
4. v/c, VMT_{15} and VMT_{60} are calculated on Directional Two-Lane Highway Segment Worksheet.

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET WITH PASSING LANE WORKSHEET

General Information		Site Information	
Analyst	MKP	Highway of Travel	Foresthill Road - Eastbound
Agency or Company	MRO Engineers, Inc.	From/To	Todd Valley W to Owl Hill Ct.
Date Performed	10/22/07	Jurisdiction	Placer County
Analysis Time Period	PM Peak Hour	Analysis Year	Year 2030 Without Forest Ranch

Project Description: *Foresthill Divide Community Plan*

Class I highway Class II highway

Total length of analysis segment, L_t (mi)	1.2
Length of two-lane highway upstream of the passing lane, L_u (mi)	0.1
Length of passing lane including tapers, L_{pl} (mi)	1.0
Average travel speed, ATS_d (from Directional Two-Lane Highway Segment Worksheet)	49.6
Percent time-spent-following, $PTSF_d$ (from Directional Two-Lane Highway Segment Worksheet)	69.9
Level of service ¹ , LOS_d (from Directional Two-Lane Highway Segment Worksheet)	D
Average Travel Speed	
Downstream length of two-lane highway within effective length of passing lane for average travel speed, L_{d0} (mi) (Exhibit 20-23)	1.70
Length of two-lane highway downstream of effective length of the passing lane for avg travel speed, L_d (mi) $L_d = L_t - (L_u + L_{pl} + L_{d0})$	-1.60
Adj. factor for the effect of passing lane on average speed, f_{pl} (Exhibit 20-24)	1.10
Average travel speed including passing lane ² , $ATS_{pl} = (ATS_d * L_t) / (L_u + L_d + (L_{pl}/f_{pl}) + (2L_{d0}/(1+f_{pl})))$	54.1
Percent Time-Spent-Following	
Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, L_{d0} (mi) (Exhibit 20-23)	6.56
Length of two-lane highway downstream of effective length of the passing lane for percent-time-following, L_d (mi) $L_d = L_t - (L_u + L_{pl} + L_{d0})$	-6.46
Adj. factor for the effect of passing lane on percent time-spent-following, f_{pl} (Exhibit 20-24)	0.61
Percent time-spent-following including passing lane ³ , $PTSF_{pl}(\%)$ $PTSF_{pl} = PTSF_d [L_u + L_d + f_{pl}L_{pl} + ((1+f_{pl})/2)L_{d0}] / L_t$	44.9
Level of Service and Other Performance Measures⁴	
Level of service including passing lane LOS_{pl} (Exhibit 20-3 or 20-4)	B
Peak 15-min total travel time, TT_{15} (veh-h) $TT_{15} = VMT_{15}/ATS_{pl}$	3.1

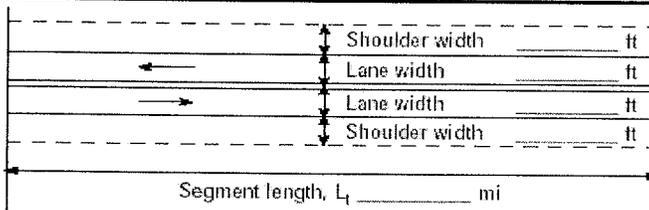
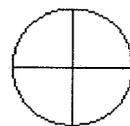
Notes

1. If $LOS_d = F$, passing lane analysis cannot be performed.
2. If $L_d < 0$, use alternative Equation 20-22.
3. If $L_d < 0$, use alternative Equation 20-20.
4. v/c, VMT_{15} and VMT_{60} are calculated on Directional Two-Lane Highway Segment Worksheet.

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	MKP	Highway / Direction of Travel	Foresthill Road - Westbound
Agency or Company	MRO Engineers, Inc.	From/To	Todd Valley W to Owl Hill Ct.
Date Performed	10/22/07	Jurisdiction	Placer County
Analysis Time Period	PM Peak Hour	Analysis Year	Year 2030 Without Forest Ranch

Project Description: *Foresthill Divide Community Plan*

Input Data	
 <p>Shoulder width _____ ft</p> <p>Lane width _____ ft</p> <p>Lane width _____ ft</p> <p>Shoulder width _____ ft</p> <p>Segment length, L_1 _____ mi</p>	<div style="text-align: center;">  <p>Show North Arrow</p> </div> <div style="margin-top: 10px;"> <input checked="" type="checkbox"/> Class I highway <input type="checkbox"/> Class II highway </div> <div style="margin-top: 10px;"> Terrain <input type="checkbox"/> Level <input type="checkbox"/> Rolling </div> <div style="margin-top: 5px;"> Grade Length 1.20 mi Up/down -3.0 </div> <div style="margin-top: 5px;"> Peak-hour factor, PHF 0.88 </div> <div style="margin-top: 5px;"> No-passing zone 100% </div> <div style="margin-top: 5px;"> % Trucks and Buses, P_T 4% </div> <div style="margin-top: 5px;"> % Recreational vehicles, P_R 2% </div> <div style="margin-top: 5px;"> Access points/ mi 4 </div>
Analysis direction vol., V_d	406 veh/h
Opposing direction vol., V_o	471 veh/h

Average Travel Speed	
	Analysis Direction (d) Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-9 or 20-15)	1.2 3.7
Passenger-car equivalents for RVs, E_R (Exhibit 20-9 or 20-17)	1.0 1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.992 0.901
Grade adjustment factor f_g (Exhibit 20-7 or 20-13)	1.00 1.00
Directional flow rate ² , v_i (pc/h) $v_i=V_i/(PHF \cdot f_{HV} \cdot f_g)$	465 594
Free-Flow Speed from Field Measurement	Estimated Free-Flow Speed
Field measured speed ³ , S_{FM} mi/h	Base free-flow speed ³ , $BFFS_{FM}$ 60.0 mi/h
Observed volume ³ , V_f veh/h	Adj. for lane width and shoulder width, ³ f_{LS} (Exh 20-5) 0.0 mi/h
Free-flow speed, FFS_d $FFS=S_{FM}+0.00776(V_f/f_{HV})$ mi/h	Adj. for access points ³ , f_A (Exhibit 20-5) 1.0 mi/h
Adjustment for no-passing zones, f_{np} (Exhibit 20-19) 2.0 mi/h	Free-flow speed, FFS_d ($FSS=BFFS-f_{LS}-f_A$) 59.0 mi/h
	Average travel speed, $ATS=FFS-0.00776v_p-f_{np}$ 48.8 mi/h

Percent Time-Spent-Following	
	Analysis Direction (d) Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-10 or 20-16)	1.1 1.0
Passenger-car equivalents for RVs, E_R (Exhibit 20-10 or 20-16)	1.0 1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.996 1.000
Grade adjustment factor, f_g (Exhibit 20-8 or 20-14)	1.00 0.93
Directional flow rate ² , v_i (pc/h)= $V_i/(PHF \cdot f_{HV} \cdot f_g)$	463 573
Base percent time-spent-following ⁴ , $BPTSF(\%)=100(1-e^{-v_i \cdot f_g})$	49.7
Adj. for no-passing zone, f_{np} (Exhibit 20-20)	35.8
Percent time-spent-following, $PTSF(\%)=BPTSF+f_{np}$	65.7

Level of Service and Other Performance Measures	
Level of service, LOS (Exhibit 20-3 or 20-4)	D
Volume to capacity ratio, $v/c=V_f/1,700$	0.27
Peak 15-min veh-miles of travel, VMT_{15} (veh- mi)= $0.25L_1(V/PHF)$	138
Peak-hour vehicle-miles of travel, VMT_{60} (veh- mi)= $V \cdot L_1$	487
Peak 15-min total travel time, TT_{15} (veh-h)= VMT_{15}/ATS	2.8

Notes

1. If the highway is extended segment (level) or rolling terrain, $f_g=1.0$.
2. If v_i (V_d or V_o) $\geq 1,700$ pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only.
4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET WITH PASSING LANE WORKSHEET

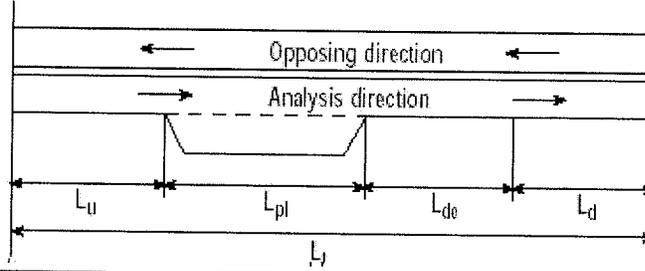
General Information

Analyst: MKP
 Agency or Company: MRO Engineers, Inc.
 Date Performed: 10/22/07
 Analysis Time Period: PM Peak Hour

Site Information

Highway of Travel: Foresthill Road - Westbound
 From/To: Todd Valley W to Owl Hill Ct.
 Jurisdiction: Placer County
 Analysis Year: Year 2030 Without Forest Ranch

Project Description: Foresthill Divide Community Plan

Input Data
 Class I highway Class II highway


Total length of analysis segment, L_1 (mi)	1.2
Length of two-lane highway upstream of the passing lane, L_u (mi)	1.2
Length of passing lane including tapers, L_{pl} (mi)	0.0
Average travel speed, ATS_d (from Directional Two-Lane Highway Segment Worksheet)	48.8
Percent time-spent-following, $PTSF_d$ (from Directional Two-Lane Highway Segment Worksheet)	65.7
Level of service ¹ , LOS_d (from Directional Two-Lane Highway Segment Worksheet)	D
Average Travel Speed	
Downstream length of two-lane highway within effective length of passing lane for average travel speed, L_{da} (mi) (Exhibit 20-23)	1.70
Length of two-lane highway downstream of effective length of the passing lane for avg travel speed, L_d (mi) $L_d = L_1 - (L_u + L_{pl} + L_{da})$	-1.70
Adj. factor for the effect of passing lane on average speed, f_{pl} (Exhibit 20-24)	1.10
Average travel speed including passing lane ² , $ATS_{pl} = (ATS_d * L_1) / (L_u + L_d + (L_{pl} * f_{pl}) + (2L_{da} / (1 + f_{pl})))$	
Percent Time-Spent-Following	
Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, L_{df} (mi) (Exhibit 20-23)	7.60
Length of two-lane highway downstream of effective length of the passing lane for percent-time-following, L_d (mi) $L_d = L_1 - (L_u + L_{pl} + L_{df})$	-7.60
Adj. factor for the effect of passing lane on percent time-spent-following, f_{pf} (Exhibit 20-24)	0.61
Percent time-spent-following including passing lane ³ , $PTSF_{pl}(\%)$ $PTSF_{pl} = PTSF_d [L_u + L_d + f_{pf} * L_{pl} + ((1 + f_{pf}) / 2) * L_{df}] / L_1$	65.7
Level of Service and Other Performance Measures⁴	
Level of service including passing lane LOS_{pl} (Exhibit 20-3 or 20-4)	
Peak 15-min total travel time, TT_{15} (veh-h) $TT_{15} = VMT_{15} / ATS_{pl}$	

Notes

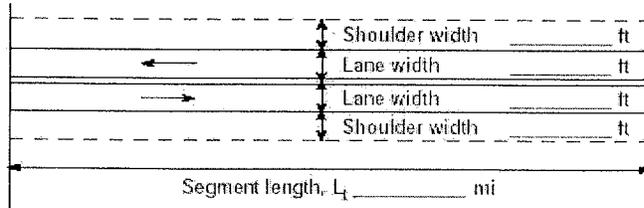
1. If $LOS_d = F$, passing lane analysis cannot be performed.
2. If $L_d < 0$, use alternative Equation 20-22.
3. If $L_d < 0$, use alternative Equation 20-20.
4. w/c , VMT_{15} and VMT_{60} are calculated on Directional Two-Lane Highway Segment Worksheet.

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	MKL	Highway / Direction of Travel	Foresthill Road - EB - Mitig.
Agency or Company	MRO Engineers, Inc.	From/To	Bridge to Spring Garden Road
Date Performed	2/27/07	Jurisdiction	Placer County
Analysis Time Period	AM Peak Hour	Analysis Year	Year 2030 Without Forest Ranch

Project Description: Foresthill Divide Community Plan

Input Data



<input checked="" type="checkbox"/> Class I highway	<input type="checkbox"/> Class II highway
Terrain <input type="checkbox"/> Level <input type="checkbox"/> Rolling	
Grade Length 4.00 mi	Up/down 3.0
Peak-hour factor, PHF 0.88	
No-passing zone 30%	
% Trucks and Buses, P_T 6%	
% Recreational vehicles, P_R 2%	
Access points/ mi 2	

Analysis direction vol., V_d 253veh/h
 Opposing direction vol., V_o 888veh/h

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-9 or 20-15)	7.5	1.1
Passenger-car equivalents for RVs, E_R (Exhibit 20-9 or 20-17)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.719	0.994
Grade adjustment factor ¹ , f_G (Exhibit 20-7 or 20-13)	0.94	1.00
Directional flow rate ² , v_i (pc/h) $v_i=V_i/(PHF \cdot f_{HV} \cdot f_G)$	425	1015
Free-Flow Speed from Field Measurement	Estimated Free-Flow Speed	
Field measured speed ³ , S_{FM} mi/h	Base free-flow speed ³ , $BFFS_{FM}$ 60.0 mi/h	
Observed volume ³ , V_f veh/h	Adj. for lane width and shoulder width ³ , f_{LS} (Exh 20-5) 0.0 mi/h	
Free-flow speed, FFS_d $FFS_d=S_{FM}+0.00776(V_f/f_{HV})$ mi/h	Adj. for access points ³ , f_A (Exhibit 20-5) 0.5 mi/h	
Adjustment for no-passing zones, f_{np} (Exhibit 20-19) 0.6 mi/h	Free-flow speed, FFS_d ($FFS=BFFS-f_{LS}-f_A$) 59.5 mi/h	
	Average travel speed, $ATS=FFS-0.00776V_p-f_{np}$ 47.7 mi/h	

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-10 or 20-16)	1.5	1.0
Passenger-car equivalents for RVs, E_R (Exhibit 20-10 or 20-16)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.971	1.000
Grade adjustment factor ¹ , f_G (Exhibit 20-8 or 20-14)	1.00	1.00
Directional flow rate ² , v_i (pc/h) $=V_i/(PHF \cdot f_{HV} \cdot f_G)$	296	1009
Base percent time-spent-following ⁴ , $BPTSF(\%)=100(1-e^{-v_d})$	42.3	
Adj. for no-passing zone, f_{np} (Exhibit. 20-20)	22.1	
Percent time-spent-following, $PTSF(\%)=BPTSF+f_{np}$	47.3	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 or 20-4)	C
Volume to capacity ratio, $v/c=V_p/1,700$	0.25
Peak 15-min veh-miles of travel, $VMT_{15}(\text{veh-mi})=0.25L_t(V/PHF)$	776
Peak-hour vehicle-miles of travel, $VMT_{60}(\text{veh-mi})=V \cdot L_t$	2732
Peak 15-min total travel time, $TT_{15}(\text{veh-h})=VMT_{15}/ATS$	16.3

Notes

1. If the highway is extended segment (level) or rolling terrain, $f_G=1.0$.
2. If $v_i(v_d$ or $v_o) \geq 1,700$ pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only.
4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

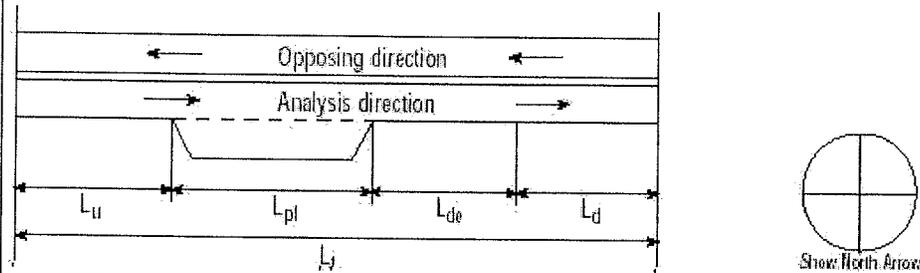
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET WITH PASSING LANE WORKSHEET

General Information		Site Information	
Analyst	MKL	Highway of Travel	Foresthill Road - EB - Mitig.
Agency or Company	MRO Engineers, Inc.	From/To	Bridge to Spring Garden Road
Date Performed	2/27/07	Jurisdiction	Placer County
Analysis Time Period	AM Peak Hour	Analysis Year	Year 2030 Without Forest Ranch

Project Description: *Foresthill Divide Community Plan*

Input Data

Class I highway Class II highway



Total length of analysis segment, L_t (mi)	10.8
Length of two-lane highway upstream of the passing lane, L_u (mi)	1.5
Length of passing lane including tapers, L_{pl} (mi)	7.6
Average travel speed, ATS_d (from Directional Two-Lane Highway Segment Worksheet)	47.7
Percent time-spent-following, $PTSF_d$ (from Directional Two-Lane Highway Segment Worksheet)	47.3
Level of service ¹ , LOS_d (from Directional Two-Lane Highway Segment Worksheet)	C
Average Travel Speed	
Downstream length of two-lane highway within effective length of passing lane for average travel speed, L_{de} (mi) (Exhibit 20-23)	1.70
Length of two-lane highway downstream of effective length of the passing lane for avg travel speed, L_d (mi) $L_d = L_t - (L_u + L_{pl} + L_{de})$	0.00
Adj. factor for the effect of passing lane on average speed, f_{pl} (Exhibit 20-24)	1.10
Average travel speed including passing lane ² , $ATS_{pl} = (ATS_d * L_t) / (L_u + L_d + (L_{pl}/f_{pl}) + (2L_{de}/(1+f_{pl})))$	51.4
Percent Time-Spent-Following	
Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, L_{de} (mi) (Exhibit 20-23)	10.65
Length of two-lane highway downstream of effective length of the passing lane for percent-time-following, L_d (mi) $L_d = L_t - (L_u + L_{pl} + L_{de})$	-8.95
Adj. factor for the effect of passing lane on percent time-spent-following, f_{pl} (Exhibit 20-24)	0.58
Percent time-spent-following including passing lane ³ , $PTSF_{pl}$ (%) $PTSF_{pl} = PTSF_d [L_u + L_d + f_{pl}L_{pl} + ((1+f_{pl})/2)L_{de}] / L_t$	30.5
Level of Service and Other Performance Measures⁴	
Level of service including passing lane LOS_{pl} (Exhibit 20-3 or 20-4)	B
Peak 15-min total travel time, TT_{15} (veh-h) $TT_{15} = VMT_{15} / ATS_{pl}$	15.1

Notes

1. If $LOS_d = F$, passing lane analysis cannot be performed.
2. If $L_d < 0$, use alternative Equation 20-22.
3. If $L_d < 0$, use alternative Equation 20-20.
4. v/c , VMT_{15} and VMT_{60} are calculated on Directional Two-Lane Highway Segment Worksheet.

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	MKL	Highway / Direction of Travel	Foresthill Road - WB - Mitig.
Agency or Company	MRO Engineers, Inc.	From/To	Bridge to Spring Garden Road
Date Performed	2/27/07	Jurisdiction	Placer County
Analysis Time Period	AM Peak Hour	Analysis Year	Year 2030 Without Forest Ranch

Project Description: Foresthill Divide Community Plan

Input Data

Segment length, L_1 _____ mi

Show North Arrow

Class I highway Class II highway
 Terrain Level Rolling
 Grade Length 4.00 mi Up/down -3.0
 Peak-hour factor, PHF 0.88
 No-passing zone 40%
 % Trucks and Buses, P_T 2%
 % Recreational vehicles, P_R 2%
 Access points/ mi 2

Analysis direction vol., V_d 888veh/h
 Opposing direction vol., V_o 253veh/h

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-9 or 20-15)	1.1	7.5
Passenger-car equivalents for RVs, E_R (Exhibit 20-9 or 20-17)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.998	0.885
Grade adjustment factor ¹ , f_G (Exhibit 20-7 or 20-13)	1.00	0.94
Directional flow rate ² , v_i (pc/h) $v_i=V_i/(PHF \cdot f_{HV} \cdot f_G)$	1011	346
Free-Flow Speed from Field Measurement	Estimated Free-Flow Speed	
Field measured speed ³ , S_{FM} mi/h	Base free-flow speed ³ , $BFFS_{FM}$ 60.0 mi/h	
Observed volume ³ , V_f veh/h	Adj. for lane width and shoulder width ³ , f_{LS} (Exh 20-5) 0.0 mi/h	
Free-flow speed, FFS_d $FFS_d=S_{FM}+0.00776(V_f/f_{HV})$ mi/h	Adj. for access points ³ , f_A (Exhibit 20-5) 0.5 mi/h	
Adjustment for no-passing zones, f_{np} (Exhibit 20-19) 2.2 mi/h	Free-flow speed, FFS_d ($FFS=BFFS-f_{LS}-f_A$) 59.5 mi/h	
	Average travel speed, $ATS=FFS-0.00776V_p \cdot f_{np}$ 46.7 mi/h	

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-10 or 20-16)	1.0	1.5
Passenger-car equivalents for RVs, E_R (Exhibit 20-10 or 20-16)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	1.000	0.990
Grade adjustment factor ¹ , f_G (Exhibit 20-8 or 20-14)	1.00	1.00
Directional flow rate ² , v_i (pc/h) $v_i=V_i/(PHF \cdot f_{HV} \cdot f_G)$	1009	290
Base percent time-spent-following ⁴ , $BPTSF(\%)=100(1-e^{-a \cdot v_o^b})$	71.7	
Adj. for no-passing zone, f_{np} (Exhibit. 20-20)	16.4	
Percent time-spent-following, $PTSF(\%)=BPTSF+f_{np}$	84.4	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 or 20-4)	E
Volume to capacity ratio, $v/c=V_p/1,700$	0.59
Peak 15-min veh-miles of travel, VMT_{15} (veh- mi) $=0.25L_1(V/PHF)$	2725
Peak-hour vehicle-miles of travel, VMT_{60} (veh- mi) $=V \cdot L_1$	9590
Peak 15-min total travel time, TT_{15} (veh-h) $=VMT_{15}/ATS$	58.3

Notes

1. If the highway is extended segment (level) or rolling terrain, $f_G=1.0$.
2. If v_i (v_d or v_o) $\geq 1,700$ pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only.
4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

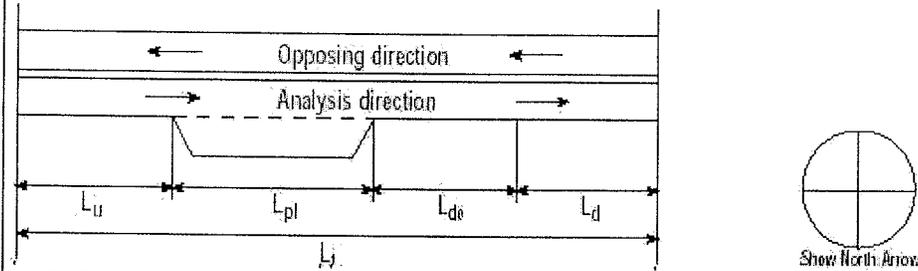
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET WITH PASSING LANE WORKSHEET

General Information		Site Information	
Analyst	MKL	Highway of Travel	Foresthill Road - WB - Mitig.
Agency or Company	MRO Engineers, Inc.	From/To	Bridge to Spring Garden Road
Date Performed	2/27/07	Jurisdiction	Placer County
Analysis Time Period	AM Peak Hour	Analysis Year	Year 2030 Without Forest Ranch

Project Description: Foresthill Divide Community Plan

Input Data

Class I highway Class II highway



Total length of analysis segment, L_t (mi)	10.8
Length of two-lane highway upstream of the passing lane, L_u (mi)	2.2
Length of passing lane including tapers, L_{pl} (mi)	6.5
Average travel speed, ATS_d (from Directional Two-Lane Highway Segment Worksheet)	46.7
Percent time-spent-following, $PTSF_d$ (from Directional Two-Lane Highway Segment Worksheet)	84.4
Level of service ¹ , LOS_d (from Directional Two-Lane Highway Segment Worksheet)	E

Average Travel Speed

Downstream length of two-lane highway within effective length of passing lane for average travel speed, L_{de} (mi) (Exhibit 20-23)	1.70
Length of two-lane highway downstream of effective length of the passing lane for avg travel speed, L_d (mi) $L_d = L_t - (L_u + L_{pl} + L_{de})$	0.40
Adj. factor for the effect of passing lane on average speed, f_{pl} (Exhibit 20-24)	1.11
Average travel speed including passing lane ² , $ATS_{pl} = (ATS_d * L_t) / (L_u + L_d + (L_{pl}/f_{pl}) + (2L_{de}/(1+f_{pl})))$	50.2

Percent Time-Spent-Following

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, L_{de} (mi) (Exhibit 20-23)	3.60
Length of two-lane highway downstream of effective length of the passing lane for percent-time-following, L_d (mi) $L_d = L_t - (L_u + L_{pl} + L_{de})$	-1.50
Adj. factor for the effect of passing lane on percent time-spent-following, f_{pl} (Exhibit 20-24)	0.62
Percent time-spent-following including passing lane ³ , $PTSF_{pl}$ (%) $PTSF_{pl} = PTSF_d [L_u + L_d + f_{pl} L_{pl} + ((1+f_{pl})/2)L_{de}] / L_t$	60.7

Level of Service and Other Performance Measures⁴

Level of service including passing lane LOS_{pl} (Exhibit 20-3 or 20-4)	C
Peak 15-min total travel time, TT_{15} (veh-h) $TT_{15} = VMT_{15}/ATS_{pl}$	54.3

Notes

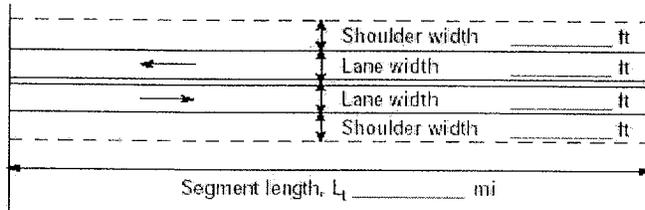
1. If $LOS_d = F$, passing lane analysis cannot be performed.
2. If $L_d < 0$, use alternative Equation 20-22.
3. If $L_d < 0$, use alternative Equation 20-20.
4. v/c, VMT_{15} and VMT_{60} are calculated on Directional Two-Lane Highway Segment Worksheet.

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	MKL	Highway / Direction of Travel	Foresthill Road - WB - Mitig.
Agency or Company	MRO Engineers, Inc.	From/To	Spring Garden to Todd Valley W
Date Performed	2/27/07	Jurisdiction	Placer County
Analysis Time Period	AM Peak Hour	Analysis Year	Year 2030 Without Forest Ranch

Project Description: Foresthill Divide Community Plan

Input Data



<input checked="" type="checkbox"/> Class I highway	<input type="checkbox"/> Class II highway
Terrain <input type="checkbox"/> Level <input type="checkbox"/> Rolling	
Grade Length 1.70 mi	Up/down -3.4
Peak-hour factor, PHF 0.88	
No-passing zone 50%	
% Trucks and Buses, P_T 2%	
% Recreational vehicles, P_R 2%	
Access points/ mi 5	

Analysis direction vol., V_d 605veh/h
 Opposing direction vol., V_o 328veh/h

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-9 or 20-15)	1.1	5.7
Passenger-car equivalents for RVs, E_R (Exhibit 20-9 or 20-17)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.998	0.915
Grade adjustment factor ¹ , f_G (Exhibit 20-7 or 20-13)	1.00	0.98
Directional flow rate ² , v_i (pc/h) $v_i=V_i/(PHF \cdot f_{HV} \cdot f_G)$	689	415
Free-Flow Speed from Field Measurement	Estimated Free-Flow Speed	
Field measured speed ³ , S_{FM} mi/h	Base free-flow speed ³ , $BFFS_{FM}$ 60.0 mi/h	
Observed volume ³ , V_i veh/h	Adj. for lane width and shoulder width ³ , f_{LS} (Exh 20-5) 0.0 mi/h	
Free-flow speed, FFS_d $FFS=S_{FM}+0.00776(V_i/f_{HV})$ mi/h	Adj. for access points ³ , f_A (Exhibit 20-5) 1.3 mi/h	
Adjustment for no-passing zones, f_{np} (Exhibit 20-19) 2.2 mi/h	Free-flow speed, FFS_d ($FFS=BFFS \cdot f_{LS} \cdot f_A$) 58.8 mi/h	
	Average travel speed, $ATS=FFS \cdot 0.00776 v_p \cdot f_{np}$ 48.0 mi/h	

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-10 or 20-16)	1.0	1.0
Passenger-car equivalents for RVs, E_R (Exhibit 20-10 or 20-16)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	1.000	1.000
Grade adjustment factor ¹ , f_G (Exhibit 20-8 or 20-14)	1.00	0.94
Directional flow rate ² , v_i (pc/h)= $V_i/(PHF \cdot f_{HV} \cdot f_G)$	688	395
Base percent time-spent-following ⁴ , $BPTSF(\%)=100(1-e^{-av_d^b})$	59.9	
Adj. for no-passing zone, f_{np} (Exhibit 20-20)	28.8	
Percent time-spent-following, $PTSF(\%)=BPTSF+f_{np}$	78.2	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 or 20-4)	D
Volume to capacity ratio, $v/c=V_p/1,700$	0.41
Peak 15-min veh-miles of travel, VMT_{15} (veh- <i>m</i>)= $0.25L_1(V/PHF)$	292
Peak-hour vehicle-miles of travel, VMT_{60} (veh- <i>m</i>)= $V \cdot L_1$	1029
Peak 15-min total travel time, TT_{15} (veh-h)= VMT_{15}/ATS	6.1

Notes

1. If the highway is extended segment (level) or rolling terrain, $f_G=1.0$.
2. If v_i (v_d or v_o) $\geq 1,700$ pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only.
4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

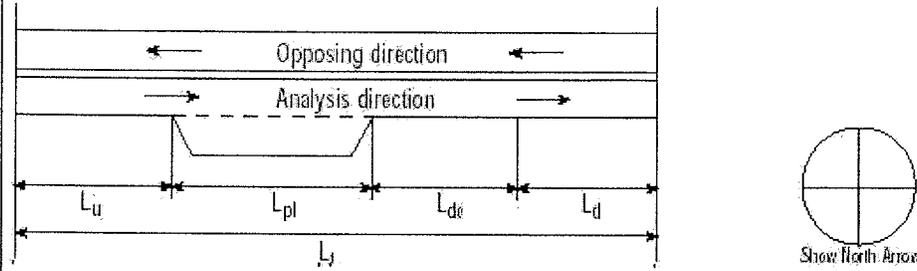
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET WITH PASSING LANE WORKSHEET

General Information		Site Information	
Analyst	MKL	Highway of Travel	Foresthill Road - WB - Mitig.
Agency or Company	MRO Engineers, Inc.	From/To	Spring Garden to Todd Valley W
Date Performed	2/27/07	Jurisdiction	Placer County
Analysis Time Period	AM Peak Hour	Analysis Year	Year 2030 Without Forest Ranch

Project Description: Foresthill Divide Community Plan

Input Data

Class I highway Class II highway



Total length of analysis segment, L_t (mi)	1.7
Length of two-lane highway upstream of the passing lane, L_u (mi)	0.5
Length of passing lane including tapers, L_{pl} (mi)	0.8
Average travel speed, ATS_d (from Directional Two-Lane Highway Segment Worksheet)	48.0
Percent time-spent-following, $PTSF_d$ (from Directional Two-Lane Highway Segment Worksheet)	78.2
Level of service ¹ , LOS_d (from Directional Two-Lane Highway Segment Worksheet)	D

Average Travel Speed

Downstream length of two-lane highway within effective length of passing lane for average travel speed, L_{de} (mi) (Exhibit 20-23)	1.70
Length of two-lane highway downstream of effective length of the passing lane for avg travel speed, L_d (mi) $L_d = L_t - (L_u + L_{pl} + L_{de})$	-1.30
Adj. factor for the effect of passing lane on average speed, f_{pl} (Exhibit 20-24)	1.11
Average travel speed including passing lane ² , $ATS_{pl} = (ATS_d * L_t) / (L_u + L_d + (L_{pl}/f_{pl}) + (2L_{de}/(1+f_{pl})))$	51.5

Percent Time Spent Following

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, L_{de} (mi) (Exhibit 20-23)	5.80
Length of two-lane highway downstream of effective length of the passing lane for percent-time-following, L_d (mi) $L_d = L_t - (L_u + L_{pl} + L_{de})$	-5.40
Adj. factor for the effect of passing lane on percent time-spent-following, f_{pl} (Exhibit 20-24)	0.62
Percent time-spent-following including passing lane ³ , $PTSF_{pl}$ (%) $PTSF_{pl} = PTSF_d [L_u + L_d + f_{pl}L_{pl} + ((1+f_{pl})/2)L_{de}] / L_t$	57.5

Level of Service and Other Performance Measures⁴

Level of service including passing lane LOS_{pl} (Exhibit 20-3 or 20-4)	C
Peak 15-min total travel time, TT_{15} (veh-h) $TT_{15} = VMT_{15}/ATS_{pl}$	5.7

Notes

1. If $LOS_d = F$, passing lane analysis cannot be performed.
2. If $L_d < 0$, use alternative Equation 20-22.
3. If $L_d < 0$, use alternative Equation 20-20.
4. v/c, VMT_{15} and VMT_{60} are calculated on Directional Two-Lane Highway Segment Worksheet.

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information	Site Information
Analyst Agency or Company Date Performed Analysis Time Period	MKP MRO Engineers, Inc. 10/29/07 AM Peak Hour
	Highway / Direction of Travel From/To Jurisdiction Analysis Year
	Foresthill Road - WB - Mitig. Todd Valley W to Owl Hill Ct. Placer County Year 2030 Without Forest Ranch

Project Description: *Foresthill Divide Community Plan*

Input Data	Site Information
Shoulder width _____ ft Lane width _____ ft Lane width _____ ft Shoulder width _____ ft Segment length, L_1 _____ mi	<input checked="" type="checkbox"/> Class I highway <input type="checkbox"/> Class II highway Terrain <input type="checkbox"/> Level <input type="checkbox"/> Rolling Grade Length 1.20 mi Up/down -3.0 Peak-hour factor, PHF 0.79 No-passing zone 50% % Trucks and Buses, P_T 2% % Recreational vehicles, P_R 2% Access points/ mi 4
Analysis direction vol., V_d 494veh/h Opposing direction vol., V_o 436veh/h	

Average Travel Speed	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-9 or 20-15)	1.1	5.0
Passenger-car equivalents for RVs, E_R (Exhibit 20-9 or 20-17)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV} = 1 / (1 + P_T(E_T - 1) + P_R(E_R - 1))$	0.998	0.927
Grade adjustment factor ¹ , f_G (Exhibit 20-7 or 20-13)	1.00	1.00
Directional flow rate ² , v_i (pc/h) $v_i = V_i / (PHF * f_{HV} * f_G)$	627	598
Free-Flow Speed from Field Measurement	Estimated Free-Flow Speed	
Field measured speed ³ , S_{FM} _____ mi/h	Base free-flow speed ⁵ , $BFFS_{FM}$ _____	60.0 mi/h
Observed volume ³ , V_i _____ veh/h	Adj. for lane width and shoulder width ³ , f_{LS} (Exh 20-5)	0.0 mi/h
Free-flow speed, FFS_d $FFS = S_{FM} + 0.00776(V_i / f_{HV})$ _____ mi/h	Adj. for access points ³ , f_A (Exhibit 20-5)	1.0 mi/h
Adjustment for no-passing zones, f_{np} (Exhibit 20-19) _____ 1.4 mi/h	Free-flow speed, FFS_d ($FFS = BFFS - f_{LS} - f_A$) _____	59.0 mi/h
	Average travel speed, $ATS = FFS - 0.00776 v_p - f_{np}$	48.1 mi/h

Percent Time-Spent-Following	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-10 or 20-16)	1.0	1.0
Passenger-car equivalents for RVs, E_R (Exhibit 20-10 or 20-16)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV} = 1 / (1 + P_T(E_T - 1) + P_R(E_R - 1))$	1.000	1.000
Grade adjustment factor ¹ , f_G (Exhibit 20-8 or 20-14)	1.00	0.93
Directional flow rate ² , v_i (pc/h) $v_i = V_i / (PHF * f_{HV} * f_G)$	625	591
Base percent time-spent-following ⁴ , $BPTSF(\%) = 100(1 - e^{-v_i})$	59.1	
Adj. for no-passing zone, f_{np} (Exhibit 20-20)	30.0	
Percent time-spent-following, $PTSF(\%) = BPTSF + f_{np}$	74.5	

Level of Service and Other Performance Measures	Value
Level of service, LOS (Exhibit 20-3 or 20-4)	D
Volume to capacity ratio, $v/c = V_p / 1,700$	0.37
Peak 15-min veh-miles of travel, $VMT_{15}(\text{veh} \cdot \text{mi}) = 0.25L_1(V/PHF)$	188
Peak-hour vehicle-miles of travel, $VMT_{60}(\text{veh} \cdot \text{mi}) = V * L_1$	593
Peak 15-min total travel time, $TT_{15}(\text{veh} \cdot \text{h}) = VMT_{15} / ATS$	3.9

Notes

- If the highway is extended segment (level) or rolling terrain, $f_G = 1.0$.
- If v_i (v_d or v_o) $\geq 1,700$ pc/h, terminate analysis--the LOS is F.
- For the analysis direction only.
- Exhibit 20-21 provides factors a and b.
- Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET WITH PASSING LANE WORKSHEET

General Information		Site Information	
Analyst	MKP	Highway of Travel	Foresthill Road - WB - Mitig.
Agency or Company	MRO Engineers, Inc.	From/To	Todd Valley W to Owl Hill Ct.
Date Performed	10/29/07	Jurisdiction	Placer County
Analysis Time Period	AM Peak Hour	Analysis Year	Year 2030 Without Forest Ranch

Project Description: *Foresthill Divide Community Plan*

Class I highway Class II highway

Total length of analysis segment, L_t (mi)	1.2
Length of two-lane highway upstream of the passing lane, L_u (mi)	0.3
Length of passing lane including tapers, L_{pl} (mi)	0.6
Average travel speed, ATS_d (from Directional Two-Lane Highway Segment Worksheet)	48.1
Percent time-spent-following, $PTSF_d$ (from Directional Two-Lane Highway Segment Worksheet)	74.5
Level of service ¹ , LOS_d (from Directional Two-Lane Highway Segment Worksheet)	D
Average Travel Speed	
Downstream length of two-lane highway within effective length of passing lane for average travel speed, L_{de} (mi) (Exhibit 20-23)	1.70
Length of two-lane highway downstream of effective length of the passing lane for avg travel speed, L_d (mi) $L_d = L_t - (L_u + L_{pl} + L_{de})$	-1.40
Adj. factor for the effect of passing lane on average speed, f_{pl} (Exhibit 20-24)	1.11
Average travel speed including passing lane ² , $ATS_{pl} = (ATS_d * L_t) / (L_u + L_d + (L_{pl}/f_{pl}) + (2L_{de}/(1+f_{pl})))$	51.8
Percent Time-Spent-Following	
Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, L_{de} (mi) (Exhibit 20-23)	6.30
Length of two-lane highway downstream of effective length of the passing lane for percent-time-following, L_d (mi) $L_d = L_t - (L_u + L_{pl} + L_{de})$	-6.00
Adj. factor for the effect of passing lane on percent time-spent-following, f_{pl} (Exhibit 20-24)	0.62
Percent time-spent-following including passing lane ³ , $PTSF_{pl}$ (%) $PTSF_{pl} = PTSF_d / (L_u + L_d + f_{pl}L_{pl} + ((1+f_{pl})/2)L_{de}) / L_t$	53.4
Level of Service and Other Performance Measures⁴	
Level of service including passing lane LOS_{pl} (Exhibit 20-3 or 20-4)	C
Peak 15-min total travel time, TT_{15} (veh-h) $TT_{15} = VMT_{15}/ATS_{pl}$	3.6

Notes

1. If $LOS_d = F$, passing lane analysis cannot be performed.
2. If $L_d < 0$, use alternative Equation 20-22.
3. If $L_d < 0$, use alternative Equation 20-20.
4. v/c, VMT_{15} and VMT_{60} are calculated on Directional Two-Lane Highway Segment Worksheet.

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	MKL	Highway / Direction of Travel	Foresthill Road - EB - Mitg.
Agency or Company	MRO Engineers, Inc.	From/To	Bridge to Spring Garden Road
Date Performed	2/27/07	Jurisdiction	Placer County
Analysis Time Period	PM Peak Hour	Analysis Year	Year 2030 Without Forest Ranch

Project Description: Foresthill Divide Community Plan

Input Data

Segment length, L_1 _____ mi

Show North Arrow

Class I highway Class II highway
 Level Rolling
 Terrain
 Grade Length 4.00 mi Up/down 3.0
 Peak-hour factor, PHF 0.88
 No-passing zone 30%
 % Trucks and Buses, P_T 1%
 % Recreational vehicles, P_R 2%
 Access points/ mi 2

Analysis direction vol., V_d 899veh/h
 Opposing direction vol., V_o 341veh/h

Average Travel Speed		Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-9 or 20-15)		5.7	1.2
Passenger-car equivalents for RVs, E_R (Exhibit 20-9 or 20-17)		1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$		0.955	0.998
Grade adjustment factor ¹ , f_G (Exhibit 20-7 or 20-13)		0.95	1.00
Directional flow rate ² , $v_i(\text{pc/h})=V_i/(\text{PHF} \cdot f_{HV} \cdot f_G)$		1126	388
Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Field measured speed ³ , S_{FM} _____ mi/h		Base free-flow speed ³ , BFFS_{FM}	60.0 mi/h
Observed volume ³ , V_f _____ veh/h		Adj. for lane width and shoulder width ³ , f_{LS} (Exh 20-5)	0.0 mi/h
Free-flow speed, $\text{FFS}_d = \text{FFS}_{FM} + 0.00776(V_f / f_{HV})$ _____ mi/h		Adj. for access points ³ , f_A (Exhibit 20-5)	0.5 mi/h
Adjustment for no-passing zones, f_{np} (Exhibit 20-19) _____ 1.7 mi/h		Free-flow speed, FFS_d ($\text{FSS} = \text{BFFS} - f_{LS} - f_A$)	59.5 mi/h
		Average travel speed, $\text{ATS} = \text{FFS} - 0.00776v_p - f_{np}$	46.0 mi/h

Percent Time Spent Following		Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-10 or 20-16)		1.0	1.1
Passenger-car equivalents for RVs, E_R (Exhibit 20-10 or 20-16)		1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$		1.000	0.999
Grade adjustment factor ¹ , f_G (Exhibit 20-8 or 20-14)		0.97	1.00
Directional flow rate ² , $v_i(\text{pc/h})=V_i/(\text{PHF} \cdot f_{HV} \cdot f_G)$		1053	388
Base percent time-spent-following ⁴ , $\text{BPTSF}(\%)=100(1-e^{-av_d^b})$		74.2	
Adj. for no-passing zone, f_{np} (Exhibit 20-20)		14.6	
Percent time-spent-following, $\text{PTSF}(\%) = \text{BPTSF} + f_{np}$		84.8	

Level of Service and Other Performance Measures	
Level of service, LOS (Exhibit 20-3 or 20-4)	E
Volume to capacity ratio, $v/c = V_p / 1,700$	0.66
Peak 15-min veh-miles of travel, $\text{VMT}_{15}(\text{veh} \cdot \text{mi}) = 0.25L_1(V/\text{PHF})$	2758
Peak-hour vehicle-miles of travel, $\text{VMT}_{60}(\text{veh} \cdot \text{mi}) = V \cdot L_1$	9709
Peak 15-min total travel time, $\text{TT}_{15}(\text{veh} \cdot \text{h}) = \text{VMT}_{15}/\text{ATS}$	59.9

Notes

- If the highway is extended segment (level) or rolling terrain, $f_G=1.0$.
- If $v_i(v_d \text{ or } v_o) \geq 1,700$ pc/h, terminate analysis--the LOS is F.
- For the analysis direction only.
- Exhibit 20-21 provides factors a and b.
- Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

Copyright © 2005 University of Florida, All Rights Reserved HCS+™ Version 5.21 Generated: 4/3/2007 3:25 PM

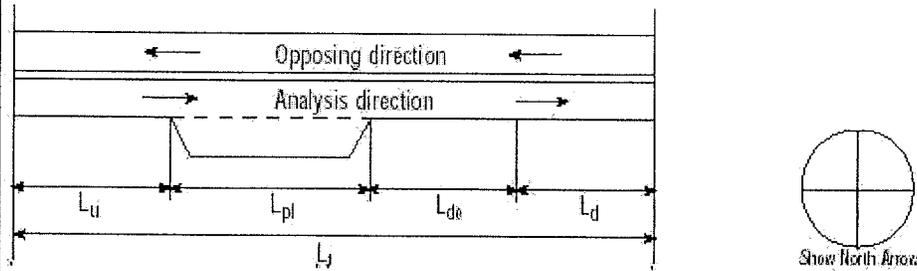
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET WITH PASSING LANE WORKSHEET

General Information		Site Information	
Analyst	MKL	Highway of Travel	Foresthill Road - EB - Mitig.
Agency or Company	MRO Engineers, Inc.	From/To	Bridge to Spring Garden Road
Date Performed	2/27/07	Jurisdiction	Placer County
Analysis Time Period	PM Peak Hour	Analysis Year	Year 2030 Without Forest Ranch

Project Description: Foresthill Divide Community Plan

Input Data

Class I highway Class II highway



Total length of analysis segment, L_t (mi)	10.8
Length of two-lane highway upstream of the passing lane, L_u (mi)	1.5
Length of passing lane including tapers, L_{pl} (mi)	7.6
Average travel speed, ATS_d (from Directional Two-Lane Highway Segment Worksheet)	46.0
Percent time-spent-following, $PTSF_d$ (from Directional Two-Lane Highway Segment Worksheet)	84.8
Level of service ¹ , LOS_d (from Directional Two-Lane Highway Segment Worksheet)	E

Average Travel Speed

Downstream length of two-lane highway within effective length of passing lane for average travel speed, L_{de} (mi) (Exhibit 20-23)	1.70
Length of two-lane highway downstream of effective length of the passing lane for avg travel speed, L_d (mi) $L_d = L_t - (L_u + L_{pl} + L_{de})$	0.00
Adj. factor for the effect of passing lane on average speed, f_{pl} (Exhibit 20-24)	1.11
Average travel speed including passing lane ² , $ATS_{pl} = (ATS_d * L_t) / (L_u + L_d + (L_{pl}/f_{pl}) + (2L_{de}/(1+f_{pl})))$	49.9

Percent Time-Spent-Following

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, L_{de} (mi) (Exhibit 20-23)	3.60
Length of two-lane highway downstream of effective length of the passing lane for percent-time-following, L_d (mi) $L_d = L_t - (L_u + L_{pl} + L_{de})$	-1.90
Adj. factor for the effect of passing lane on percent time-spent-following, f_{pl} (Exhibit 20-24)	0.62
Percent time-spent-following including passing lane ³ , $PTSF_{pl}$ (%) $PTSF_{pl} = PTSF_d [L_u + L_d + f_{pl}L_{pl} + ((1+f_{pl})/2)L_{de}] / L_t$	58.3

Level of Service and Other Performance Measures⁴

Level of service including passing lane LOS_{pl} (Exhibit 20-3 or 20-4)	C
Peak 15-min total travel time, TT_{15} (veh-h) $TT_{15} = VMT_{15}/ATS_{pl}$	55.3

Notes

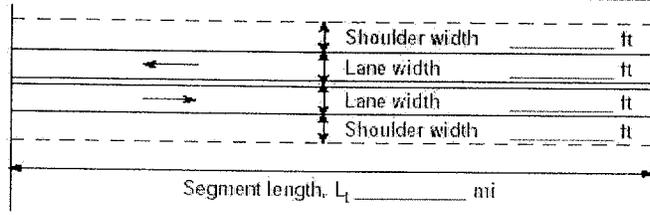
1. If $LOS_d = F$, passing lane analysis cannot be performed.
2. If $L_d < 0$, use alternative Equation 20-22.
3. If $L_d < 0$, use alternative Equation 20-20.
4. v/c, VMT_{15} and VMT_{60} are calculated on Directional Two-Lane Highway Segment Worksheet.

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	MKL	Highway / Direction of Travel	Foresthill Road - WB - Mitig.
Agency or Company	MRO Engineers, Inc.	From/To	Bridge to Spring Garden Road
Date Performed	2/27/07	Jurisdiction	Placer County
Analysis Time Period	PM Peak Hour	Analysis Year	Year 2030 Without Forest Ranch

Project Description: Foresthill Divide Community Plan

Input Data



<input checked="" type="checkbox"/> Class I highway	<input type="checkbox"/> Class II highway
Terrain <input type="checkbox"/> Level <input type="checkbox"/> Rolling	
Grade Length 4.00 mi	Up/down -3.0
Peak-hour factor, PHF 0.76	
No-passing zone 40%	
% Trucks and Buses, P_T 4%	
% Recreational vehicles, P_R 2%	
Access points/ mi 2	

Analysis direction vol., V_d 341veh/h
 Opposing direction vol., V_o 899veh/h

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-9 or 20-15)	1.2	5.7
Passenger-car equivalents for RVs, E_R (Exhibit 20-9 or 20-17)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.992	0.842
Grade adjustment factor ¹ , f_G (Exhibit 20-7 or 20-13)	1.00	0.95
Directional flow rate ² , $v_i(\text{pc/h}) v_i=V_i/(PHF \cdot f_{HV} \cdot f_G)$	452	1479
Free-Flow Speed from Field Measurement	Estimated Free-Flow Speed	
Field measured speed ³ , S_{FM} mi/h	Base free-flow speed ³ , $BFFS_{FM}$	60.0 mi/h
Observed volume ³ , V_i veh/h	Adj. for lane width and shoulder width ³ , f_{LS} (Exh 20-5)	0.0 mi/h
Free-flow speed, FFS_d $FFS=S_{FM}+0.00776(V_i/f_{HV})$ mi/h	Adj. for access points ³ , f_A (Exhibit 20-5)	0.5 mi/h
Adjustment for no-passing zones, f_{np} (Exhibit 20-19) 0.6 mi/h	Free-flow speed, FFS_d ($FFS=BFFS-f_{LS}-f_A$)	59.5 mi/h
	Average travel speed, $ATS=FFS-0.00776V_o \cdot f_{np}$	43.9 mi/h

Percent Time Spent Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-10 or 20-16)	1.1	1.0
Passenger-car equivalents for RVs, E_R (Exhibit 20-10 or 20-16)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.996	1.000
Grade adjustment factor ¹ , f_G (Exhibit 20-8 or 20-14)	1.00	0.97
Directional flow rate ² , $v_i(\text{pc/h})=V_i/(PHF \cdot f_{HV} \cdot f_G)$	450	1219
Base percent time-spent-following ⁴ , $BPTSF(\%)=100(1-e^{-v_d^b})$	56.7	
Adj. for no-passing zone, f_{np} (Exhibit 20-20)	19.2	
Percent time-spent-following, $PTSF(\%)=BPTSF+f_{np}$	61.9	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 or 20-4)	D
Volume to capacity ratio, $v/c=V_p/1,700$	0.27
Peak 15-min veh-miles of travel, $VMT_{15}(\text{veh} \cdot \text{mi})=0.25L_1(V/PHF)$	1211
Peak-hour vehicle-miles of travel, $VMT_{60}(\text{veh} \cdot \text{mi})=V \cdot L_1$	3683
Peak 15-min total travel time, $TT_{15}(\text{veh} \cdot \text{h})=VMT_{15}/ATS$	27.6

Notes

1. If the highway is extended segment (level) or rolling terrain, $f_G=1.0$.
2. If $v_i(v_d \text{ or } v_o) \geq 1,700 \text{ pc/h}$, terminate analysis--the LOS is F.
3. For the analysis direction only.
4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

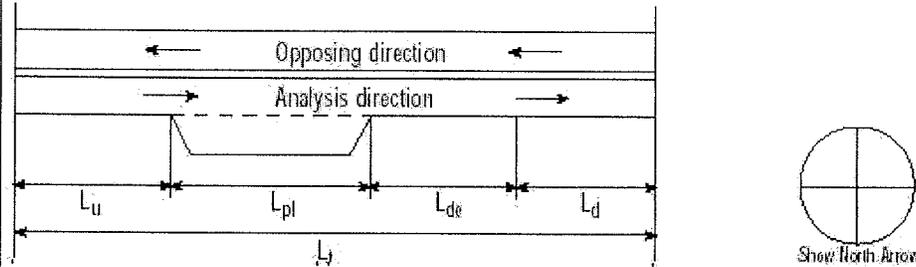
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET WITH PASSING LANE WORKSHEET

General Information		Site Information	
Analyst	MKL	Highway of Travel	Foresthill Road - WB - Mitig.
Agency or Company	MRO Engineers, Inc.	From/To	Bridge to Spring Garden Road
Date Performed	2/27/07	Jurisdiction	Placer County
Analysis Time Period	PM Peak Hour	Analysis Year	Year 2030 Without Forest Ranch

Project Description: Foresthill Divide Community Plan

Input Data

Class I highway Class II highway



Total length of analysis segment, L_t (mi)	10.8
Length of two-lane highway upstream of the passing lane, L_u (mi)	2.2
Length of passing lane including tapers, L_{pl} (mi)	6.5
Average travel speed, ATS_d (from Directional Two-Lane Highway Segment Worksheet)	43.9
Percent time-spent-following, $PTSF_d$ (from Directional Two-Lane Highway Segment Worksheet)	61.9
Level of service ¹ , LOS_d (from Directional Two-Lane Highway Segment Worksheet)	D

Average Travel Speed

Downstream length of two-lane highway within effective length of passing lane for average travel speed, L_{de} (mi) (Exhibit 20-23)	1.70
Length of two-lane highway downstream of effective length of the passing lane for avg travel speed, L_d (mi) $L_d = L_t - (L_u + L_{pl} + L_{de})$	0.40
Adj. factor for the effect of passing lane on average speed, f_{pl} (Exhibit 20-24)	1.10
Average travel speed including passing lane ² , $ATS_{pl} = (ATS_d * L_t) / (L_u + L_d + (L_{pl}/f_{pl}) + (2L_{de}/(1+f_{pl})))$	46.8

Percent Time Spent Following

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, L_{de} (mi) (Exhibit 20-23)	7.70
Length of two-lane highway downstream of effective length of the passing lane for percent-time-following, L_d (mi) $L_d = L_t - (L_u + L_{pl} + L_{de})$	-5.60
Adj. factor for the effect of passing lane on percent time-spent-following, f_{pl} (Exhibit 20-24)	0.61
Percent time-spent-following including passing lane ³ , $PTSF_{pl}(\%)$ $PTSF_{pl} = PTSF_d [L_u + L_d + f_{pl}L_{pl} + ((1+f_{pl})/2)L_{de}] / L_t$	43.3

Level of Service and Other Performance Measures⁴

Level of service including passing lane LOS_{pl} (Exhibit 20-3 or 20-4)	C
Peak 15-min total travel time, TT_{15} (veh-h) $TT_{15} = VMT_{15}/ATS_{pl}$	25.9

Notes

1. If $LOS_d = F$, passing lane analysis cannot be performed.
2. If $L_d < 0$, use alternative Equation 20-22.
3. If $L_d < 0$, use alternative Equation 20-20.
4. v/c, VMT_{15} and VMT_{60} are calculated on Directional Two-Lane Highway Segment Worksheet.

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	MKL	Highway / Direction of Travel	Foresthill Road - WB - Mitig.
Agency or Company	MRO Engineers, Inc.	From/To	Spring Garden to Todd Valley W
Date Performed	2/27/07	Jurisdiction	Placer County
Analysis Time Period	PM Peak Hour	Analysis Year	Year 2030 Without Forest Ranch

Project Description: *Foresthill Divide Community Plan*

Input Data

Segment length, L_1 _____ mi

Class I highway
 Class II highway

Terrain Level Rolling

Grade Length 1.70 mi Up/down -3.4

Peak-hour factor, PHF 0.88

No-passing zone 50%

% Trucks and Buses, P_T 3%

% Recreational vehicles, P_R 2%

Access points/ mi 5

Analysis direction vol., V_d 383veh/h

Oposing direction vol., V_o 573veh/h

Average Travel Speed

	Analysis Direction (d)	Oposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-9 or 20-15)	1.2	4.3
Passenger-car equivalents for RVs, E_R (Exhibit 20-9 or 20-17)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.994	0.909
Grade adjustment factor ¹ , f_G (Exhibit 20-7 or 20-13)	1.00	1.00
Directional flow rate ² , v_i (pc/h) $v_i=V_i/(PHF \cdot f_{HV} \cdot f_G)$	438	716
Free-Flow Speed from Field Measurement	Estimated Free-Flow Speed	
Field measured speed ³ , S_{FM} mi/h	Base free-flow speed ³ , $BFFS_{FM}$ 60.0 mi/h	
Observed volume ³ , V_f veh/h	Adj. for lane width and shoulder width ³ , f_{LS} (Exh 20-5) 0.0 mi/h	
Free-flow speed, FFS_d $FFS=S_{FM}+0.00776(V_f \cdot f_{HV})$ mi/h	Adj. for access points ³ , f_A (Exhibit 20-5) 1.3 mi/h	
Adjustment for no-passing zones, f_{np} (Exhibit 20-19) 1.2 mi/h	Free-flow speed, FFS_d ($FSS=BFFS \cdot f_{LS} \cdot f_A$) 58.8 mi/h	
	Average travel speed, $ATS=FFS \cdot 0.00776 v_p \cdot f_{np}$ 48.6 mi/h	

Percent Time-Spent-Following

	Analysis Direction (d)	Oposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-10 or 20-16)	1.1	1.0
Passenger-car equivalents for RVs, E_R (Exhibit 20-10 or 20-16)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.997	1.000
Grade adjustment factor ¹ , f_G (Exhibit 20-8 or 20-14)	1.00	0.94
Directional flow rate ² , v_i (pc/h) $=V_i/(PHF \cdot f_{HV} \cdot f_G)$	437	690
Base percent time-spent-following ⁴ , $BPTSF(\%)=100(1-e^{-av_d^b})$	49.7	
Adj. for no-passing zone, f_{np} (Exhibit. 20-20)	29.3	
Percent time-spent-following, $PTSF(\%)=BPTSF+f_{np}$	61.1	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 or 20-4)	C
Volume to capacity ratio, $v/c=V_p/1,700$	0.26
Peak 15-min veh-miles of travel, $VMT_{15}(\text{veh} \cdot \text{mi})=0.25L_1(V/PHF)$	185
Peak-hour vehicle-miles of travel, $VMT_{60}(\text{veh} \cdot \text{mi})=V \cdot L_1$	651
Peak 15-min total travel time, $TT_{15}(\text{veh} \cdot \text{h})=VMT_{15}/ATS$	3.8

Notes

1. If the highway is extended segment (level) or rolling terrain, $f_G=1.0$.
2. If $v_i(V_d \text{ or } V_o) \geq 1,700$ pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only.
4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

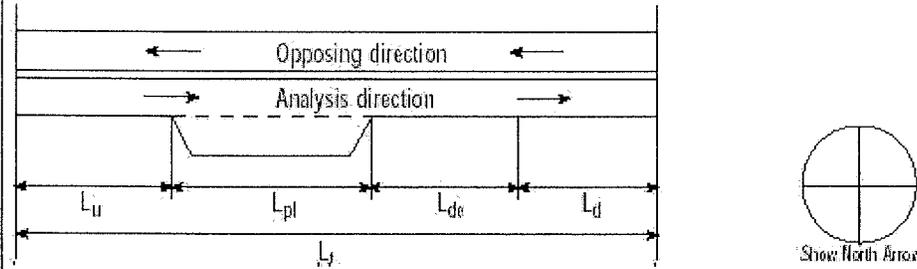
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET WITH PASSING LANE WORKSHEET

General Information		Site Information	
Analyst	MKL	Highway of Travel	Foresthill Road - WB - Mitig.
Agency or Company	MRO Engineers, Inc.	From/To	Spring Garden to Todd Valley W
Date Performed	2/27/07	Jurisdiction	Placer County
Analysis Time Period	PM Peak Hour	Analysis Year	Year 2030 Without Forest Ranch

Project Description: Foresthill Divide Community Plan

Input Data

Class I highway Class II highway



Total length of analysis segment, L_t (mi)	1.7
Length of two-lane highway upstream of the passing lane, L_u (mi)	0.5
Length of passing lane including tapers, L_{pl} (mi)	0.8
Average travel speed, ATS_d (from Directional Two-Lane Highway Segment Worksheet)	48.6
Percent time-spent-following, $PTSF_d$ (from Directional Two-Lane Highway Segment Worksheet)	61.1
Level of service ¹ , LOS_d (from Directional Two-Lane Highway Segment Worksheet)	C

Average Travel Speed

Downstream length of two-lane highway within effective length of passing lane for average travel speed, L_{de} (mi) (Exhibit 20-23)	1.70
Length of two-lane highway downstream of effective length of the passing lane for avg travel speed, L_d (mi) $L_d = L_t - (L_u + L_{pl} + L_{de})$	-1.30
Adj. factor for the effect of passing lane on average speed, f_{pl} (Exhibit 20-24)	1.10
Average travel speed including passing lane ² , $ATS_{pl} = (ATS_d * L_t) / (L_u + L_d + (L_{pl}/f_{pl}) + (2L_{de}/(1+f_{pl})))$	51.8

Percent Time Spent Following

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, L_{de} (mi) (Exhibit 20-23)	7.80
Length of two-lane highway downstream of effective length of the passing lane for percent-time-following, L_d (mi) $L_d = L_t - (L_u + L_{pl} + L_{de})$	-7.40
Adj. factor for the effect of passing lane on percent time-spent-following, f_{pl} (Exhibit 20-24)	0.61
Percent time-spent-following including passing lane ³ , $PTSF_{pl}$ (%) $PTSF_{pl} = PTSF_d [L_u + L_d + f_{pl}L_{pl} + ((1+f_{pl})/2)L_{de}] / L_t$	44.4

Level of Service and Other Performance Measures⁴

Level of service including passing lane LOS_{pl} (Exhibit 20-3 or 20-4)	B
Peak 15-min total travel time, TT_{15} (veh-h) $TT_{15} = VMT_{15}/ATS_{pl}$	3.6

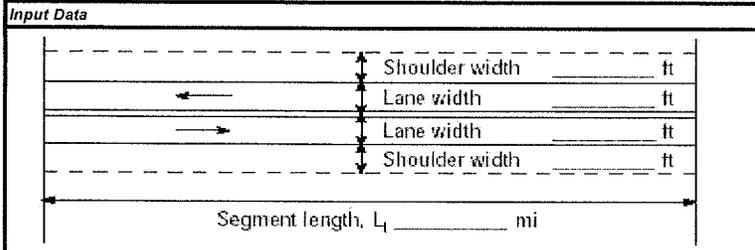
Notes

1. If $LOS_d = F$, passing lane analysis cannot be performed.
2. If $L_d < 0$, use alternative Equation 20-22.
3. If $L_d < 0$, use alternative Equation 20-20.
4. v/c, VMT_{15} and VMT_{60} are calculated on Directional Two-Lane Highway Segment Worksheet.

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	MKP	Highway / Direction of Travel	Foresthill Road - WB - Mitig.
Agency or Company	MRO Engineers, Inc.	From/To	Todd Valley W to Owl Hill Ct.
Date Performed	10/29/07	Jurisdiction	Placer County
Analysis Time Period	PM Peak Hour	Analysis Year	Year 2030 Without Forest Ranch

Project Description: Foresthill Divide Community Plan



<input checked="" type="checkbox"/> Class I highway	<input type="checkbox"/> Class II highway
Terrain <input type="checkbox"/> Level	<input type="checkbox"/> Rolling
Grade Length 1.20 mi	Up/down -3.0
Peak-hour factor, PHF 0.88	No-passing zone 50%
% Trucks and Buses, P_T 4%	% Recreational vehicles, P_R 2%
Access points/ mi 4	

Analysis direction vol., V_d 406veh/h
 Opposing direction vol., V_o 471veh/h

Average Travel Speed		Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-9 or 20-15)		1.2	3.7
Passenger-car equivalents for RVs, E_R (Exhibit 20-9 or 20-17)		1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$		0.992	0.901
Grade adjustment factor f_G (Exhibit 20-7 or 20-13)		1.00	1.00
Directional flow rate ² , v_i (pc/h) $v_i=V_i/(PHF \cdot f_{HV} \cdot f_G)$		465	594
Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Field measured speed ³ , S_{FM} mi/h		Base free-flow speed ³ , $BFFS_{FM}$ 60.0 mi/h	
Observed volume ³ , V_i veh/h		Adj. for lane width and shoulder width ³ , f_{LS} (Exh 20-5) 0.0 mi/h	
Free-flow speed, FFS_d $FFS=S_{FM}+0.00776(V_i/f_{HV})$ mi/h		Adj. for access points ³ , f_A (Exhibit 20-5) 1.0 mi/h	
Adjustment for no-passing zones, f_{np} (Exhibit 20-19) 1.5 mi/h		Free-flow speed, FFS_d ($FFS=BFFS \cdot f_{LS} \cdot f_A$) 59.0 mi/h	
		Average travel speed, $ATS=FFS-0.00776v_i \cdot f_{np}$ 49.3 mi/h	

Percent Time-Spent-Following		Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-10 or 20-16)		1.1	1.0
Passenger-car equivalents for RVs, E_R (Exhibit 20-10 or 20-16)		1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$		0.996	1.000
Grade adjustment factor ¹ , f_G (Exhibit 20-8 or 20-14)		1.00	0.93
Directional flow rate ² , v_i (pc/h)= $V_i/(PHF \cdot f_{HV} \cdot f_G)$		463	573
Base percent time-spent-following ⁴ , $BPTSF(\%)=100(1-e^{-v_i \cdot b})$		49.7	
Adj. for no-passing zone, f_{np} (Exhibit. 20-20)		31.2	
Percent time-spent-following, $PTSF(\%)=BPTSF \cdot f_{np}$		63.6	

Level of Service and Other Performance Measures	
Level of service, LOS (Exhibit 20-3 or 20-4)	C
Volume to capacity ratio, $v/c=V_p/1,700$	0.27
Peak 15-min veh-miles of travel, VMT_{15} (veh-mi)= $0.25L_i(V/PHF)$	138
Peak-hour vehicle-miles of travel, VMT_{60} (veh-mi)= $V \cdot L_i$	487
Peak 15-min total travel time, TT_{15} (veh-h)= VMT_{15}/ATS	2.8

- Notes**
1. If the highway is extended segment (level) or rolling terrain, $f_G=1.0$.
 2. If v_i (v_d or v_o) $\geq 1,700$ pc/h, terminate analysis--the LOS is F.
 3. For the analysis direction only.
 4. Exhibit 20-21 provides factors a and b.
 5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET WITH PASSING LANE WORKSHEET

General Information		Site Information	
Analyst	MKP	Highway of Travel	Foresthill Road - WB - Mitig.
Agency or Company	MRO Engineers, Inc.	From/To	Todd Valley W to Owl Hill Ct.
Date Performed	10/29/07	Jurisdiction	Placer County
Analysis Time Period	PM Peak Hour	Analysis Year	Year 2030 Without Forest Ranch

Project Description: *Foresthill Divide Community Plan*

Class I highway Class II highway

L_u L_{pi} L_{d0} L_d
 L_j

Show North Arrow

Total length of analysis segment, L_1 (mi)	1.2
Length of two-lane highway upstream of the passing lane, L_u (mi)	0.3
Length of passing lane including tapers, L_{pi} (mi)	0.6
Average travel speed, ATS_d (from Directional Two-Lane Highway Segment Worksheet)	49.3
Percent time-spent-following, $PTSF_d$ (from Directional Two-Lane Highway Segment Worksheet)	63.6
Level of service ¹ , LOS_d (from Directional Two-Lane Highway Segment Worksheet)	C

Average Travel Speed

Downstream length of two-lane highway within effective length of passing lane for average travel speed, L_{da} (mi) (Exhibit 20-23)	1.70
Length of two-lane highway downstream of effective length of the passing lane for avg travel speed, L_d (mi) $L_d = L_1 - (L_u + L_{pi} + L_{da})$	-1.40
Adj. factor for the effect of passing lane on average speed, f_{pl} (Exhibit 20-24)	1.10
Average travel speed including passing lane ² , $ATS_{pl} = (ATS_d * L_1) / (L_u + L_d + (L_{pi}/f_{pl}) + (2L_{da}/(1+f_{pl})))$	52.8

Percent Time-Spent-Following

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, L_{ds} (mi) (Exhibit 20-23)	7.60
Length of two-lane highway downstream of effective length of the passing lane for percent-time-following, L_d (mi) $L_d = L_1 - (L_u + L_{pi} + L_{ds})$	-7.30
Adj. factor for the effect of passing lane on percent time-spent-following, f_{pl} (Exhibit 20-24)	0.61
Percent time-spent-following including passing lane ³ , $PTSF_{pl}(\%)$ $PTSF_{pl} = PTSF_d [L_u + L_d + f_{pl}L_{pi} + ((1+f_{pl})/2)L_{ds}] / L_1$	45.1

Level of Service and Other Performance Measures⁴

Level of service including passing lane LOS_{pl} (Exhibit 20-3 or 20-4)	B
Peak 15-min total travel time, TT_{15} (veh-h) $TT_{15} = VMT_{15}/ATS_{pl}$	2.6

Notes

1. If $LOS_d = F$, passing lane analysis cannot be performed.
2. If $L_d < 0$, use alternative Equation 20-22.
3. If $L_d < 0$, use alternative Equation 20-20.
4. v/c, VMT_{15} and VMT_{60} are calculated on Directional Two-Lane Highway Segment Worksheet.

