APPENDICES

C-663A Pre-Construction Traffic Study for the Scudder Falls Bridge Replacement Project

APPENDIX L

CAPACITY ANALYSIS WORKSHEETS

(2-LANE ROADWAYS)

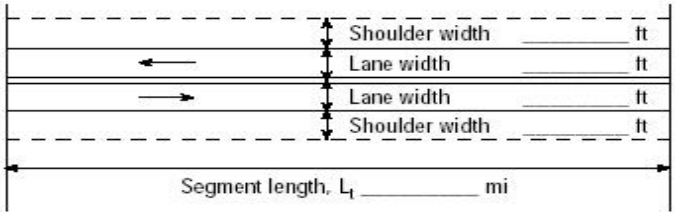
Pennoni

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Route 532 NB*
Agency or Company	*Pennoni*	From/To	*S.R. 2081 to S.R. 2075*
Date Performed	*8/24/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*AM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Show North Arrow

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.91*

No-passing zone *100%*

% Trucks and Buses , P_T *2 %*

% Recreational vehicles, P_R *0%*

Access points *mi* *15*/mi

Analysis direction vol., V_d *193*veh/h

Opposing direction vol., V_o *241*veh/h

Shoulder width ft *3.0*

Lane Width ft *10.0*

Segment Length mi *1.8*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.5*	*1.4*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.990*	*0.992*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*214*	*267*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*3.7 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*3.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*3.6 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*47.5 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*40.3 mi/h*
		Percent free flow speed, PFFS	*84.7 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.1*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.998*	*0.998*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*213*	*265*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*25.0*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*58.6*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*51.1*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*B*
Volume to capacity ratio, *v/c*	*0.13*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1686*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1697*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*84.7*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*212.1*
Effective width, Wv (Eq. 15-29) ft	*13.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*4.11*
Bicycle level of service (Exhibit 15-4)	*D*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
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 and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Route 532 SB*
Agency or Company	*Pennoni*	From/To	*S.R. 2081 to S.R. 2075*
Date Performed	*8/24/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*AM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

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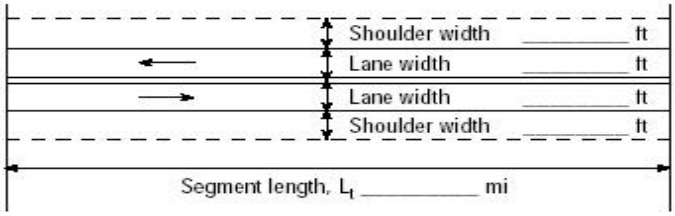

Show North Arrow

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.94*

No-passing zone *100%*

% Trucks and Buses , P_T *3 %*

% Recreational vehicles, P_R *0%*

Access points *mi* *15*/mi

Analysis direction vol., V_d *271*veh/h

Opposing direction vol., V_o *142*veh/h

Shoulder width ft *3.0*

Lane Width ft *10.0*

Segment Length mi *1.8*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.4*	*1.7*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.988*	*0.979*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*292*	*154*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*3.7 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*3.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*3.3 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*47.5 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*40.8 mi/h*
		Percent free flow speed, PFFS	*85.8 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.1*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.997*	*0.997*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*289*	*152*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*29.3*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*51.7*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*63.2*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*B*
Volume to capacity ratio, *v/c*	*0.17*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1664*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1695*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*85.8*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*288.3*
Effective width, Wv (Eq. 15-29) ft	*13.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*4.52*
Bicycle level of service (Exhibit 15-4)	*E*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
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 and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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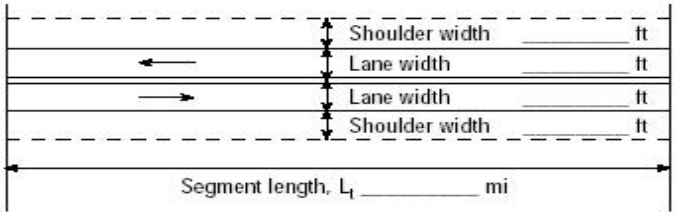
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Route 532 NB*
Agency or Company	*Pennoni*	From/To	*S.R. 2081 to S.R. 2075*
Date Performed	*8/24/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*PM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Show North Arrow

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.83*

No-passing zone *100%*

Analysis direction vol., V_d *318*veh/h

Opposing direction vol., V_o *210*veh/h

% Trucks and Buses , P_T *1 %*

% Recreational vehicles, P_R *0%*

Shoulder width ft *3.0*

Lane Width ft *10.0*

Segment Length mi *1.8*

Access points *mi* *15*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.3*	*1.4*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.997*	*0.996*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*384*	*254*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*3.7 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*3.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*3.6 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*47.5 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*39.0 mi/h*
		Percent free flow speed, PFFS	*81.9 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.1*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.999*	*0.999*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*384*	*253*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*38.4*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*52.0*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*69.7*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.23*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1693*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1698*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*81.9*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*383.1*
Effective width, Wv (Eq. 15-29) ft	*13.00*
Effective speed factor, S_t (Eq. 15-30)	*4.50*
Bicycle level of service score, BLOS (Eq. 15-31)	*4.11*
Bicycle level of service (Exhibit 15-4)	*D*
Notes	

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
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 and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Route 532 SB*
Agency or Company	*Pennoni*	From/To	*S.R. 2081 to S.R. 2075*
Date Performed	*8/24/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*PM Peak*	Analysis Year	*2015*

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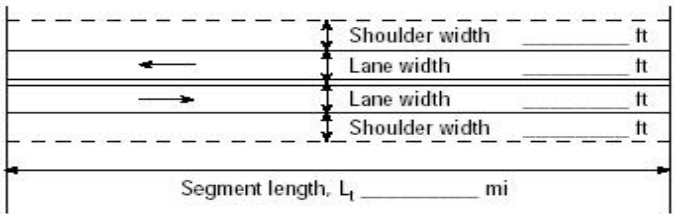

Show North Arrow

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Analysis direction vol., V_d	*235*veh/h	Grade Length mi	Up/down
Opposing direction vol., V_o	*173*veh/h	Peak-hour factor, PHF	*0.85*
Shoulder width ft	*3.0*	No-passing zone	*100*%
Lane Width ft	*10.0*	% Trucks and Buses , P_T	*1* %
Segment Length mi	*1.8*	% Recreational vehicles, P_R	*0*%
		Access points *mi*	*15*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.4*	*1.5*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.996*	*0.995*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*278*	*205*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*3.7 mi/h*
Free-flow speed, FFS=S_{FM}+0.00776(*v*/ $f_{HV,ATS}$)		Adj. for access points[4], f_A (Exhibit 15-8)	*3.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*4.0 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*47.5 mi/h*
		Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*39.8 mi/h*
		Percent free flow speed, PFFS	*83.8* %

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.1*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.999*	*0.999*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*277*	*204*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*28.2*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*57.2*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*61.1*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*B*
Volume to capacity ratio, *v/c*	*0.16*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1692*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1698*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*83.8*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*276.5*
Effective width, Wv (Eq. 15-29) ft	*13.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*4.01*
Bicycle level of service (Exhibit 15-4)	*D*
Notes	
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain. 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 and for v>200 veh/h. 4. For the analysis direction only 5. Exhibit 15-20 provides coefficients a and b for Equation 15-10. 6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.	

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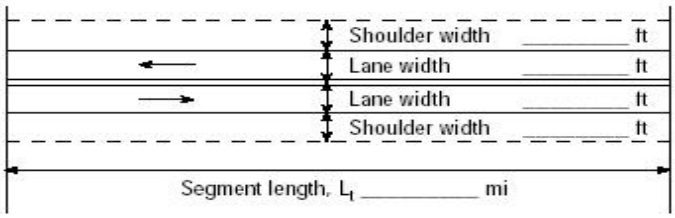

Show North Arrow

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☐ Level ☑ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.94*

No-passing zone *100%*

% Trucks and Buses , P_T *2 %*

% Recreational vehicles, P_R *0%*

Access points *mi* *40*/mi

Analysis direction vol., V_d *395*veh/h

Opposing direction vol., V_o *403*veh/h

Shoulder width ft *3.0*

Lane Width ft *10.0*

Segment Length mi *0.2*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*2.0*	*1.9*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.1*	*1.1*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.980*	*0.982*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*0.91*	*0.91*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*471*	*480*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*45.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*3.7 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*10.0 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*2.3 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*31.3 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*21.6 mi/h*
		Percent free flow speed, PFFS	*68.9 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.4*	*1.4*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.992*	*0.992*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*0.91*	*0.92*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*465*	*470*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*48.9*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*42.3*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*69.9*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*D*
Volume to capacity ratio, *v/c*	*0.28*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1569*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1585*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*68.9*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*420.2*
Effective width, Wv (Eq. 15-29) ft	*13.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*4.46*
Bicycle level of service (Exhibit 15-4)	*D*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
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 and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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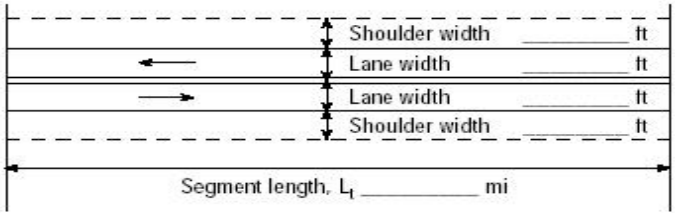
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Route 532 SB*
Agency or Company	*Pennoni*	From/To	*S.R. 2075 to S.R. 2069*
Date Performed	*8/24/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*AM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Show North Arrow

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☐ Level ☑ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.93*

No-passing zone *100%*

% Trucks and Buses , P_T *2 %*

% Recreational vehicles, P_R *0%*

Access points *mi* *40*/mi

Analysis direction vol., V_d *784*veh/h

Opposing direction vol., V_o *343*veh/h

Shoulder width ft *3.0*

Lane Width ft *10.0*

Segment Length mi *0.2*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.4*	*2.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.1*	*1.1*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.992*	*0.980*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*0.99*	*0.88*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*858*	*428*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*45.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*3.7 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*10.0 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*2.6 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*31.3 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*18.7 mi/h*
		Percent free flow speed, PFFS	*59.9 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.6*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*0.988*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*0.88*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*843*	*424*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*67.0*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*25.5*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*84.0*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*E*
Volume to capacity ratio, *v/c*	*0.50*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1516*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1535*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*59.9*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*843.0*
Effective width, Wv (Eq. 15-29) ft	*13.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*4.81*
Bicycle level of service (Exhibit 15-4)	*E*
Notes	

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
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 and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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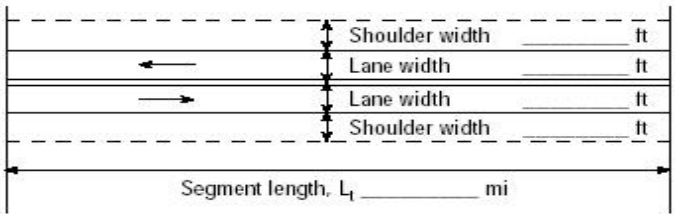
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Route 532 NB*
Agency or Company	*Pennoni*	From/To	*S.R. 2075 to S.R. 2069*
Date Performed	*8/24/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*PM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Show North Arrow

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☐ Level ☑ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.96*

No-passing zone *100%*

% Trucks and Buses , P_T *1 %*

% Recreational vehicles, P_R *0%*

Access points *mi* *40*/mi

Analysis direction vol., V_d *746*veh/h

Opposing direction vol., V_o *350*veh/h

Shoulder width ft *3.0*

Lane Width ft *10.0*

Segment Length mi *0.2*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.4*	*2.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.1*	*1.1*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.996*	*0.990*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*0.99*	*0.88*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*788*	*418*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*45.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*3.7 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*10.0 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*2.6 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*31.3 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*19.3 mi/h*
		Percent free flow speed, PFFS	*61.7 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.6*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*0.994*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*0.88*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*777*	*417*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*64.5*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*27.9*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*82.7*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*E*
Volume to capacity ratio, *v/c*	*0.46*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1532*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1541*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*61.7*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*777.1*
Effective width, Wv (Eq. 15-29) ft	*13.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*4.54*
Bicycle level of service (Exhibit 15-4)	*E*
Notes	
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain. 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 and for v>200 veh/h. 4. For the analysis direction only 5. Exhibit 15-20 provides coefficients a and b for Equation 15-10. 6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.	

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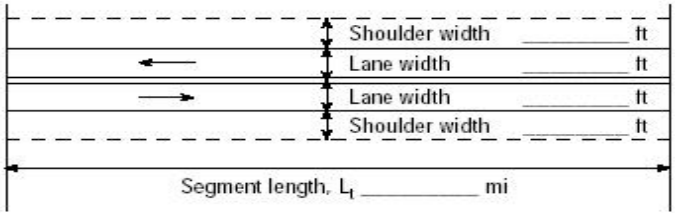
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Route 532 SB*
Agency or Company	*Pennoni*	From/To	*S.R. 2075 to S.R. 2069*
Date Performed	*8/24/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*PM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Show North Arrow

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☐ Level ☑ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.89*

No-passing zone *100%*

Analysis direction vol., V_d	*462*veh/h
Opposing direction vol., V_o	*680*veh/h
Shoulder width ft	*3.0*
Lane Width ft	*10.0*
Segment Length mi	*0.2*
% Trucks and Buses , P_T	*1* %
% Recreational vehicles, P_R	*0%*
Access points *mi*	*40*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.8*	*1.5*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.1*	*1.1*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.992*	*0.995*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*0.95*	*0.99*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*551*	*776*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*45.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*3.7 mi/h*
Free-flow speed, FFS=S_{FM}+0.00776(*v*/ $f_{HV,ATS}$)		Adj. for access points[4], f_A (Exhibit 15-8)	*10.0 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*1.3 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*31.3 mi/h*
		Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*19.7 mi/h*
		Percent free flow speed, PFFS	*63.0 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.2*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.998*	*1.000*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*0.96*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*542*	*764*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*57.3*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*29.6*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*69.6*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*E*
Volume to capacity ratio, *v/c*	*0.32*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1675*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*63.0*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*519.1*
Effective width, Wv (Eq. 15-29) ft	*13.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*4.33*
Bicycle level of service (Exhibit 15-4)	*D*
Notes	

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
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 and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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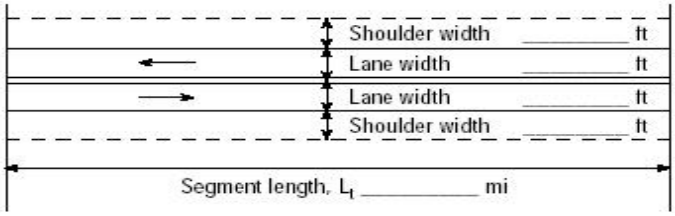
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Taylorsville Rd (S.R. 2071) SB*
Agency or Company	*Pennoni*	From/To	*Route 532 to I-95*
Date Performed	*8/24/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*AM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Show North Arrow

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☐ Level ☑ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.91*

No-passing zone *100%*

Analysis direction vol., V_d *612*veh/h

Opposing direction vol., V_o *290*veh/h

% Trucks and Buses , P_T *3 %*

% Recreational vehicles, P_R *0%*

Shoulder width ft *2.0*

Lane Width ft *12.0*

Segment Length mi *2.8*

Access points *mi* *18*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.6*	*2.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.1*	*1.1*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.982*	*0.968*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*0.98*	*0.84*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*699*	*392*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*2.6 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*4.5 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*2.8 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*47.9 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*36.7 mi/h*
		Percent free flow speed, PFFS	*76.6 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.6*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*0.982*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*0.98*	*0.86*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*686*	*377*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*59.6*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*30.9*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*79.5*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.41*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1453*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1486*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*76.6*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*672.5*
Effective width, Wv (Eq. 15-29) ft	*14.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*4.81*
Bicycle level of service (Exhibit 15-4)	*E*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
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 and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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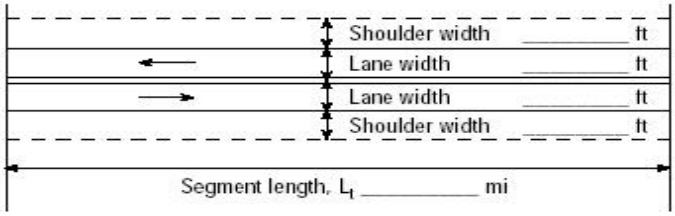
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Taylorsville Rd (S.R. 2071) WB*
Agency or Company	*Pennoni*	From/To	*Route 532 to I-95*
Date Performed	*8/24/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*AM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Analysis direction vol., V_d *520*veh/h

Opposing direction vol., V_o *404*veh/h

Shoulder width ft *2.0*

Lane Width ft *12.0*

Segment Length mi *2.8*

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☐ Level ☑ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.85*

No-passing zone *100*%

% Trucks and Buses , P_T *2* %

% Recreational vehicles, P_R *0*%

Access points *mi* *18*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.7*	*1.8*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.1*	*1.1*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.986*	*0.984*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*0.97*	*0.94*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*640*	*514*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*2.6 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*4.5 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*2.2 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*47.9 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*36.7 mi/h*
		Percent free flow speed, PFFS	*76.7* %

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.4*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*0.992*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*0.97*	*0.94*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*631*	*510*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*59.0*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*34.5*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*78.1*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.38*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1589*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1625*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*76.7*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*611.8*
Effective width, Wv (Eq. 15-29) ft	*14.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*4.51*
Bicycle level of service (Exhibit 15-4)	*E*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
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 and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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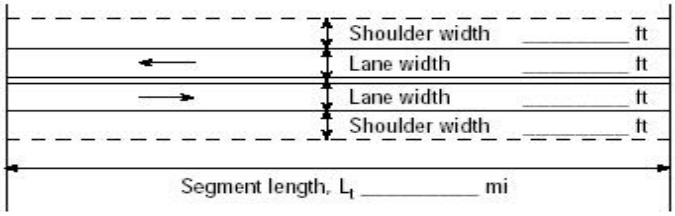
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Taylorsville Rd (S.R. 2071) NB*
Agency or Company	*Pennoni*	From/To	*Route 532 to I-95*
Date Performed	*8/24/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*PM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Analysis direction vol., V_d *506*veh/h

Opposing direction vol., V_o *434*veh/h

Shoulder width ft *2.0*

Lane Width ft *12.0*

Segment Length mi *2.8*

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☐ Level ☑ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.94*

No-passing zone *100*%

% Trucks and Buses , P_T *1* %

% Recreational vehicles, P_R *0*%

Access points *mi* *18*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.8*	*1.9*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.1*	*1.1*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.992*	*0.991*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*0.96*	*0.93*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*565*	*501*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*2.6 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*4.5 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*2.3 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*47.9 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*37.4 mi/h*
		Percent free flow speed, PFFS	*78.0* %

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.2*	*1.4*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.998*	*0.996*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*0.96*	*0.94*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*562*	*493*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*54.9*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*37.6*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*74.9*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.33*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1602*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1625*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*78.0*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*538.3*
Effective width, Wv (Eq. 15-29) ft	*14.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*4.22*
Bicycle level of service (Exhibit 15-4)	*D*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
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 and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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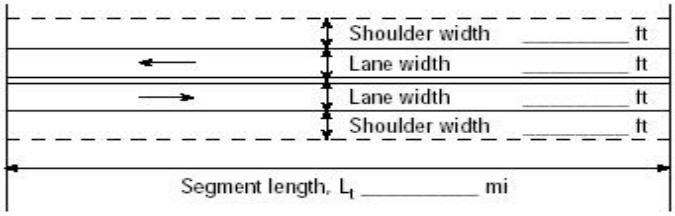
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Taylorsville Rd (S.R. 2071) SB*
Agency or Company	*Pennoni*	From/To	*Route 532 to I-95*
Date Performed	*8/24/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*PM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Analysis direction vol., V_d *632*veh/h

Opposing direction vol., V_o *406*veh/h

Shoulder width ft *2.0*

Lane Width ft *12.0*

Segment Length mi *2.8*

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.95*

No-passing zone *100*%

% Trucks and Buses , P_T *1* %

% Recreational vehicles, P_R *0*%

Access points *mi* *18*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.1*	*1.3*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.999*	*0.997*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*666*	*429*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*2.6 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*4.5 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*2.6 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*47.9 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*36.8 mi/h*
		Percent free flow speed, PFFS	*76.9* %

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*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], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*665*	*427*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*58.8*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*34.0*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*79.5*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.39*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1695*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*76.9*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*665.3*
Effective width, Wv (Eq. 15-29) ft	*14.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*4.32*
Bicycle level of service (Exhibit 15-4)	*D*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
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 and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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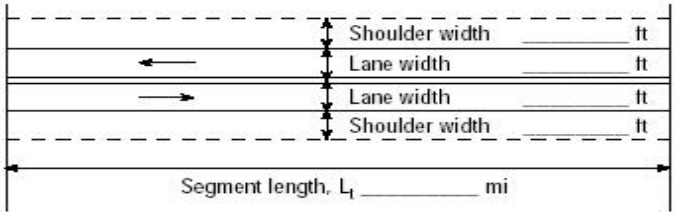
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*ACB*	Highway / Direction of Travel	*Taylorsville Rd EB*
Agency or Company	*Pennoni*	From/To	*Dolington Rd to I-95*
Date Performed	*11/24/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*AM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Analysis direction vol., V_d *320*veh/h

Opposing direction vol., V_o *381*veh/h

Shoulder width ft *3.0*

Lane Width ft *11.0*

Segment Length mi *0.4*

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.97*

No-passing zone *100%*

% Trucks and Buses , P_T *1 %*

% Recreational vehicles, P_R *0%*

Access points *mi* *27*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.4*	*1.3*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.996*	*0.997*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*331*	*394*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*45.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*3.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*6.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*2.7 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*35.3 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*26.9 mi/h*
		Percent free flow speed, PFFS	*76.3 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.1*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.999*	*0.999*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*330*	*393*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*37.5*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*48.7*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*59.7*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.19*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1695*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1698*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*76.3*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*329.9*
Effective width, Wv (Eq. 15-29) ft	*14.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*3.97*
Bicycle level of service (Exhibit 15-4)	*D*
Notes	

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
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 and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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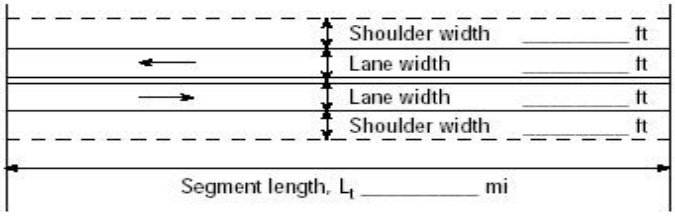
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*ACB*	Highway / Direction of Travel	*Taylorsville Rd WB*
Agency or Company	*Pennoni*	From/To	*Dolington Rd to I-95*
Date Performed	*11/24/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*AM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Analysis direction vol., V_d *1040*veh/h

Opposing direction vol., V_o *238*veh/h

Shoulder width ft *3.0*

Lane Width ft *11.0*

Segment Length mi *0.4*

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.95*

No-passing zone *100%*

% Trucks and Buses , P_T *1 %*

% Recreational vehicles, P_R *0%*

Access points *mi* *27*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.0*	*1.4*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*0.996*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*1095*	*252*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*45.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*3.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*6.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*3.7 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*35.3 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*21.1 mi/h*
		Percent free flow speed, PFFS	*60.0 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*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], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*1095*	*251*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*73.4*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*29.3*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*97.2*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*E*
Volume to capacity ratio, *v/c*	*0.64*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1693*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1698*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*60.0*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*1094.7*
Effective width, Wv (Eq. 15-29) ft	*14.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*4.58*
Bicycle level of service (Exhibit 15-4)	*E*
Notes	
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain. 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 and for v>200 veh/h. 4. For the analysis direction only 5. Exhibit 15-20 provides coefficients a and b for Equation 15-10. 6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.	

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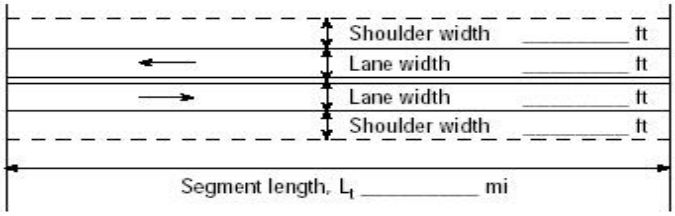
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*ACB*	Highway / Direction of Travel	*Taylorsville Rd EB*
Agency or Company	*Pennoni*	From/To	*Dolington Rd to I-95*
Date Performed	*11/24/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*PM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Analysis direction vol., V_d *675*veh/h

Opposing direction vol., V_o *294*veh/h

Shoulder width ft *3.0*

Lane Width ft *11.0*

Segment Length mi *0.4*

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.89*

No-passing zone *100%*

% Trucks and Buses , P_T *1 %*

% Recreational vehicles, P_R *0%*

Access points *mi* *27*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.1*	*1.4*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.999*	*0.996*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*759*	*332*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*45.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*3.0 mi/h*
Free-flow speed, FFS=S_{FM}+0.00776(*v*/ $f_{HV,ATS}$)		Adj. for access points[4], f_A (Exhibit 15-8)	*6.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*3.1 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*35.3 mi/h*
		Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*23.6 mi/h*
		Percent free flow speed, PFFS	*67.1 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*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], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*758*	*331*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*62.0*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*29.3*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*82.4*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*D*
Volume to capacity ratio, *v/c*	*0.45*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1693*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1698*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*67.1*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*758.4*
Effective width, Wv (Eq. 15-29) ft	*14.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*4.39*
Bicycle level of service (Exhibit 15-4)	*D*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
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 and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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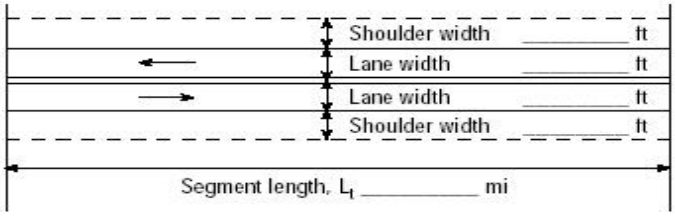
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*ACB*	Highway / Direction of Travel	*Taylorsville Rd WB*
Agency or Company	*Pennoni*	From/To	*Dolington Rd to I-95*
Date Performed	*11/24/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*PM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Show North Arrow

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.97*

No-passing zone *100%*

% Trucks and Buses , P_T *1 %*

% Recreational vehicles, P_R *0%*

Access points *mi* *27*/mi

Analysis direction vol., V_d *345*veh/h

Opposing direction vol., V_o *331*veh/h

Shoulder width ft *3.0*

Lane Width ft *11.0*

Segment Length mi *0.4*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.3*	*1.4*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.997*	*0.996*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*357*	*343*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*45.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*3.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*6.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*3.1 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*35.3 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*26.7 mi/h*
		Percent free flow speed, PFFS	*75.9 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.1*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.999*	*0.999*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*356*	*342*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*39.0*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*51.4*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*65.2*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.21*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1693*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1698*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*75.9*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*355.7*
Effective width, Wv (Eq. 15-29) ft	*14.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*4.01*
Bicycle level of service (Exhibit 15-4)	*D*
Notes	
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain. 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 and for v>200 veh/h. 4. For the analysis direction only 5. Exhibit 15-20 provides coefficients a and b for Equation 15-10. 6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.	

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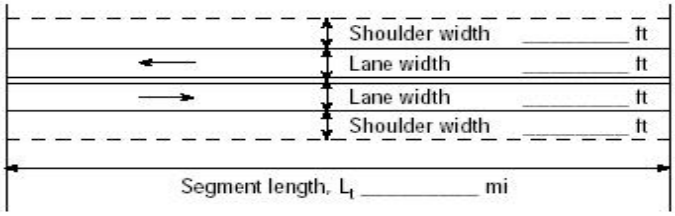
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*ACB*	Highway / Direction of Travel	*Taylorsville Rd EB*
Agency or Company	*Pennoni*	From/To	*Dolington Rd to Afton Avenue*
Date Performed	*11/24/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*AM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.95*

No-passing zone *100%*

Show North Arrow

Analysis direction vol., V_d	*395*veh/h	% Trucks and Buses , P_T	*1* %
Opposing direction vol., V_o	*386*veh/h	% Recreational vehicles, P_R	*0%*
Shoulder width ft	*2.0*	Access points *mi*	*40*/mi
Lane Width ft	*11.0*		
Segment Length mi	*0.6*		

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.3*	*1.3*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.997*	*0.997*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*417*	*408*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}	*30*	Base free-flow speed[4], BFFS	*mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*2.7 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*36.1 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*27.0 mi/h*
		Percent free flow speed, PFFS	*74.9 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*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], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*416*	*406*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*43.4*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*45.6*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*66.5*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*D*
Volume to capacity ratio, *v/c*	*0.25*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1695*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*74.9*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*415.8*
Effective width, Wv (Eq. 15-29) ft	*13.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*4.22*
Bicycle level of service (Exhibit 15-4)	*D*
Notes	
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain. 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 and for v>200 veh/h. 4. For the analysis direction only 5. Exhibit 15-20 provides coefficients a and b for Equation 15-10. 6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.	

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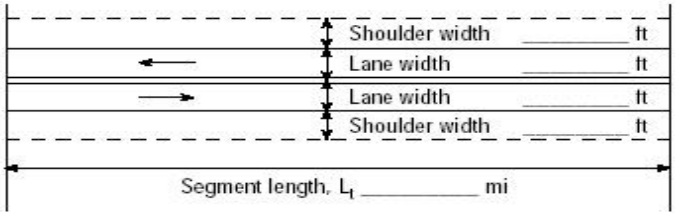
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*ACB*	Highway / Direction of Travel	*Taylorsville Rd EB*
Agency or Company	*Pennoni*	From/To	*Dolington Rd to Afton Avenue*
Date Performed	*11/24/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*PM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Analysis direction vol., V_d *621*veh/h

Opposing direction vol., V_o *372*veh/h

Shoulder width ft *2.0*
Lane Width ft *11.0*
Segment Length mi *0.6*

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling
Grade Length mi Up/down
Peak-hour factor, PHF *0.90*
No-passing zone *100*%
% Trucks and Buses , P_T *2* %
% Recreational vehicles, P_R *0*%
Access points *mi* *40*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.1*	*1.3*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.998*	*0.994*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*691*	*416*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}	*30*	Base free-flow speed[4], BFFS	*mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*2.6 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*37.7 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*26.5 mi/h*
		Percent free flow speed, PFFS	*70.3* %

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*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], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*690*	*413*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*61.0*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*32.9*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*81.6*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*D*
Volume to capacity ratio, *v/c*	*0.41*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1690*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*70.3*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*690.0*
Effective width, Wv (Eq. 15-29) ft	*13.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*4.71*
Bicycle level of service (Exhibit 15-4)	*E*
Notes	
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain. 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 and for v>200 veh/h. 4. For the analysis direction only 5. Exhibit 15-20 provides coefficients a and b for Equation 15-10. 6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.	

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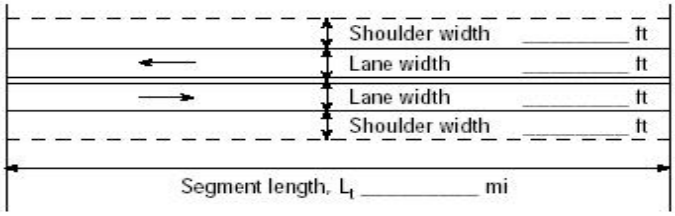
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*ACB*	Highway / Direction of Travel	*Taylorsville Rd WB*
Agency or Company	*Pennoni*	From/To	*Dolington Rd to Afton Avenue*
Date Performed	*11/24/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*AM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.86*

No-passing zone *100%*

Analysis direction vol., V_d *712*veh/h

Opposing direction vol., V_o *282*veh/h

% Trucks and Buses , P_T *2 %*

% Recreational vehicles, P_R *0%*

Shoulder width ft *2.0*

Lane Width ft *11.0*

Segment Length mi *0.6*

Access points *mi* *40*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.1*	*1.4*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.998*	*0.992*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*830*	*331*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}	*30*	Base free-flow speed[4], BFFS	*mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*3.1 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*37.7 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*25.6 mi/h*
		Percent free flow speed, PFFS	*67.8 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*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], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*828*	*329*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*65.3*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*28.2*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*85.5*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*D*
Volume to capacity ratio, *v/c*	*0.49*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1686*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1697*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*67.8*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*827.9*
Effective width, Wv (Eq. 15-29) ft	*13.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*4.80*
Bicycle level of service (Exhibit 15-4)	*E*
Notes	
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain. 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 and for v>200 veh/h. 4. For the analysis direction only 5. Exhibit 15-20 provides coefficients a and b for Equation 15-10. 6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.	

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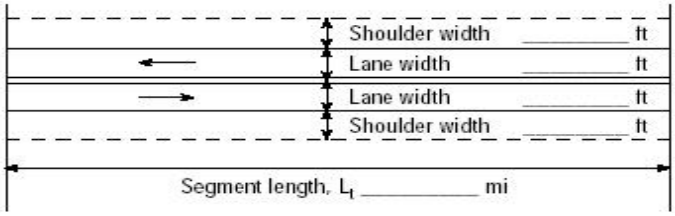
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*ACB*	Highway / Direction of Travel	*Taylorsville Rd WB*
Agency or Company	*Pennoni*	From/To	*Dolington Rd to Afton Avenue*
Date Performed	*11/24/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*PM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Analysis direction vol., V_d *394*veh/h

Opposing direction vol., V_o *533*veh/h

Shoulder width ft *2.0*

Lane Width ft *11.0*

Segment Length mi *0.6*

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.86*

No-passing zone *100*%

% Trucks and Buses , P_T *2* %

% Recreational vehicles, P_R *0*%

Access points *mi* *40*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.2*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.996*	*0.998*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*460*	*621*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}	*30*	Base free-flow speed[4], BFFS	*mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*mi/h*
Free-flow speed, FFS=S_{FM}+0.00776(*v*/ $f_{HV,ATS}$)		Adj. for access points[4], f_A (Exhibit 15-8)	*mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*1.7 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*37.2 mi/h*
		Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*27.1 mi/h*
		Percent free flow speed, PFFS	*72.8* %

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*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], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*458*	*620*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*49.6*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*35.7*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*64.8*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*D*
Volume to capacity ratio, *v/c*	*0.27*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1697*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*72.8*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*458.1*
Effective width, Wv (Eq. 15-29) ft	*13.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*4.50*
Bicycle level of service (Exhibit 15-4)	*E*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
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 and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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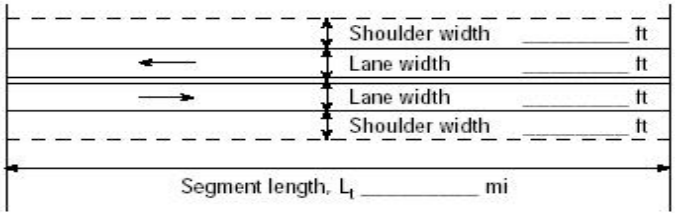
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Pine Grove Rd (S.R. 2071) NB*
Agency or Company	*Pennoni*	From/To	*S.R. 2026 to U.S. Route 1*
Date Performed	*8/24/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*AM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Analysis direction vol., V_d *532*veh/h

Opposing direction vol., V_o *533*veh/h

Shoulder width ft *6.0*

Lane Width ft *12.0*

Segment Length mi *0.8*

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.86*

No-passing zone *100*%

% Trucks and Buses , P_T *4* %

% Recreational vehicles, P_R *0*%

Access points *mi* *4*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.1*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.996*	*0.996*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*621*	*622*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*50.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*1.0 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*1.8 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*49.0 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*37.5 mi/h*
		Percent free flow speed, PFFS	*76.6* %

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*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], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*619*	*620*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*58.9*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*33.4*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*75.6*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.37*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1693*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*76.6*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*618.6*
Effective width, Wv (Eq. 15-29) ft	*24.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*3.14*
Bicycle level of service (Exhibit 15-4)	*C*
Notes	

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
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 and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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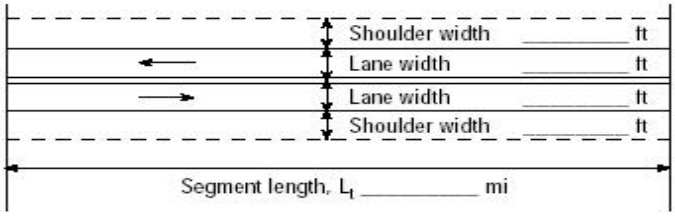
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Pine Grove Rd (S.R. 2071) SB*
Agency or Company	*Pennoni*	From/To	*S.R. 2026 to U.S. Route 1*
Date Performed	*8/24/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*AM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Analysis direction vol., V_d *533*veh/h

Opposing direction vol., V_o *532*veh/h

Shoulder width ft *6.0*

Lane Width ft *12.0*

Segment Length mi *0.8*

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.87*

No-passing zone *100*%

% Trucks and Buses , P_T *3* %

% Recreational vehicles, P_R *0*%

Access points *mi* *4*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.1*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.997*	*0.997*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*614*	*613*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*50.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*1.0 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*1.8 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*49.0 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*37.6 mi/h*
		Percent free flow speed, PFFS	*76.8* %

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*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], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*613*	*611*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*59.1*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*33.9*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*76.1*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.36*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1695*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*76.8*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*612.6*
Effective width, Wv (Eq. 15-29) ft	*24.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*2.86*
Bicycle level of service (Exhibit 15-4)	*C*
Notes	

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
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 and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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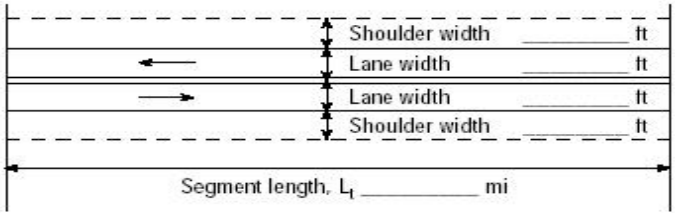
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Pine Grove Rd (S.R. 2071) NB*
Agency or Company	*Pennoni*	From/To	*S.R. 2026 to U.S. Route 1*
Date Performed	*8/24/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*PM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Analysis direction vol., V_d *721*veh/h

Opposing direction vol., V_o *600*veh/h

Shoulder width ft *6.0*

Lane Width ft *12.0*

Segment Length mi *0.8*

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.83*

No-passing zone *100%*

% Trucks and Buses , P_T *2 %*

% Recreational vehicles, P_R *0%*

Access points *mi* *4*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.0*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*0.998*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*869*	*724*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*50.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*1.0 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*1.5 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*49.0 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*35.1 mi/h*
		Percent free flow speed, PFFS	*71.7 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*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], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*869*	*723*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*70.9*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*24.8*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*84.4*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*D*
Volume to capacity ratio, *v/c*	*0.51*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1697*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*71.7*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*868.7*
Effective width, Wv (Eq. 15-29) ft	*24.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*2.79*
Bicycle level of service (Exhibit 15-4)	*C*
Notes	

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
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 and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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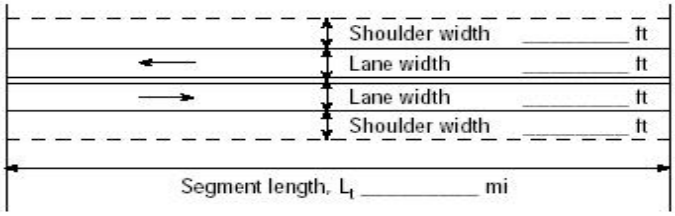
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Pine Grove Rd (S.R. 2071) SB*
Agency or Company	*Pennoni*	From/To	*S.R. 2026 to U.S. Route 1*
Date Performed	*8/24/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*PM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.95*

No-passing zone *100%*

Analysis direction vol., V_d *600*veh/h

Opposing direction vol., V_o *721*veh/h

% Trucks and Buses , P_T *3 %*

% Recreational vehicles, P_R *0%*

Shoulder width ft *6.0*

Lane Width ft *12.0*

Segment Length mi *0.8*

Access points *mi* *4*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.1*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.997*	*0.997*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*633*	*761*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*50.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*1.0 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*1.4 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*49.0 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*36.8 mi/h*
		Percent free flow speed, PFFS	*75.1 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*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], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*632*	*759*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*62.3*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*28.2*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*75.1*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.37*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1695*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*75.1*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*631.6*
Effective width, Wv (Eq. 15-29) ft	*24.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*2.88*
Bicycle level of service (Exhibit 15-4)	*C*
Notes	
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain. 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 and for v>200 veh/h. 4. For the analysis direction only 5. Exhibit 15-20 provides coefficients a and b for Equation 15-10. 6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.	

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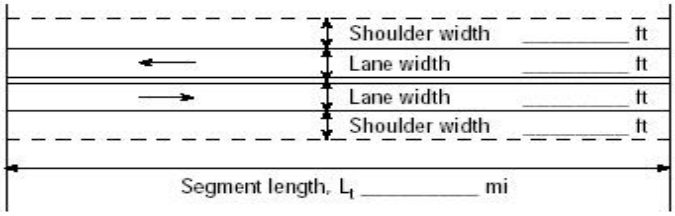
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Taylorsville Rd (S.R. 2071) NB*
Agency or Company	*Pennoni*	From/To	*Route 532 to Route 32*
Date Performed	*8/24/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*AM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Show North Arrow

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.84*

No-passing zone *91%*

Analysis direction vol., V_d *428*veh/h

Opposing direction vol., V_o *248*veh/h

% Trucks and Buses , P_T *2 %*

% Recreational vehicles, P_R *0%*

Access points *mi* *21*/mi

Shoulder width ft *1.0*

Lane Width ft *10.0*

Segment Length mi *2.2*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.2*	*1.4*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.996*	*0.992*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*512*	*298*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*5.3 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*5.3 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*3.3 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*44.5 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*34.9 mi/h*
		Percent free flow speed, PFFS	*78.5 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*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], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*510*	*296*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*48.7*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*38.7*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*73.2*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.30*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1686*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1697*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*78.5*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*509.5*
Effective width, Wv (Eq. 15-29) ft	*11.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*4.79*
Bicycle level of service (Exhibit 15-4)	*E*
Notes	
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain. 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 and for v>200 veh/h. 4. For the analysis direction only 5. Exhibit 15-20 provides coefficients a and b for Equation 15-10. 6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.	

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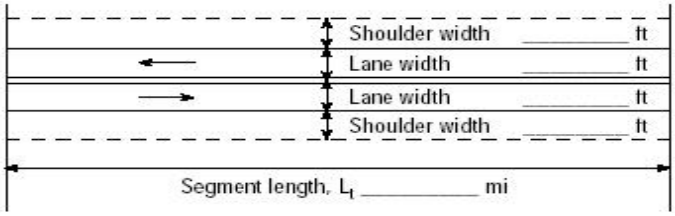
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Taylorsville Rd (S.R. 2071) SB*
Agency or Company	*Pennoni*	From/To	*Route 532 to Route 32*
Date Performed	*8/24/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*AM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.80*

No-passing zone *91%*

% Trucks and Buses , P_T *3 %*

% Recreational vehicles, P_R *0%*

Access points *mi* *21*/mi

Analysis direction vol., V_d *286*veh/h

Opposing direction vol., V_o *215*veh/h

Shoulder width ft *1.0*

Lane Width ft *10.0*

Segment Length mi *2.2*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.3*	*1.4*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.991*	*0.988*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*361*	*272*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*5.3 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*5.3 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*3.4 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*44.5 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*36.1 mi/h*
		Percent free flow speed, PFFS	*81.2 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.1*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.997*	*0.997*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*359*	*270*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*37.6*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*52.7*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*67.7*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.21*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1680*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1695*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*81.2*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*357.5*
Effective width, Wv (Eq. 15-29) ft	*11.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*4.87*
Bicycle level of service (Exhibit 15-4)	*E*
Notes	
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain. 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 and for v>200 veh/h. 4. For the analysis direction only 5. Exhibit 15-20 provides coefficients a and b for Equation 15-10. 6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.	

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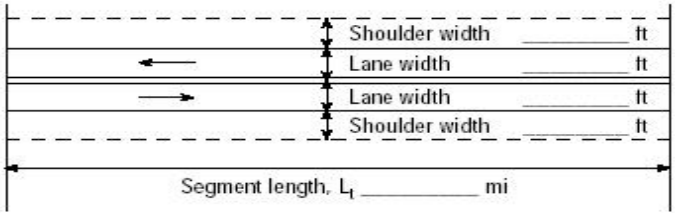
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Taylorsville Rd (S.R. 2071) NB*
Agency or Company	*Pennoni*	From/To	*Route 532 to Route 32*
Date Performed	*8/24/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*PM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.87*

No-passing zone *91%*

Analysis direction vol., V_d *440*veh/h

Opposing direction vol., V_o *252*veh/h

% Trucks and Buses , P_T *1 %*

% Recreational vehicles, P_R *0%*

Shoulder width ft *1.0*

Lane Width ft *10.0*

Segment Length mi *2.2*

Access points *mi* *21*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.2*	*1.4*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.998*	*0.996*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*507*	*291*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*5.3 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*5.3 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*3.3 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*44.5 mi/h*
		Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*34.9 mi/h*
		Percent free flow speed, PFFS	*78.6 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*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], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*506*	*290*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*48.9*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*38.9*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*73.6*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.30*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1693*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1698*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*78.6*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*505.7*
Effective width, Wv (Eq. 15-29) ft	*11.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*4.56*
Bicycle level of service (Exhibit 15-4)	*E*
Notes	
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain. 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 and for v>200 veh/h. 4. For the analysis direction only 5. Exhibit 15-20 provides coefficients a and b for Equation 15-10. 6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.	

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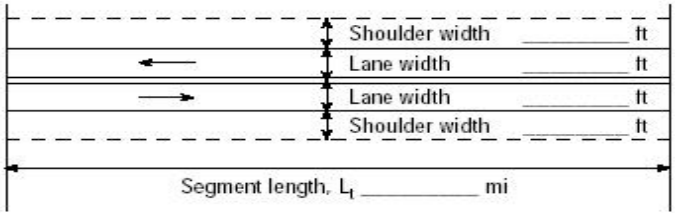
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Taylorsville Rd (S.R. 2071) SB*
Agency or Company	*Pennoni*	From/To	*Route 532 to Route 32*
Date Performed	*8/24/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*PM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Show North Arrow

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.89*

No-passing zone *91%*

Analysis direction vol., V_d *374*veh/h

Opposing direction vol., V_o *279*veh/h

% Trucks and Buses , P_T *1 %*

% Recreational vehicles, P_R *0%*

Shoulder width ft *1.0*

Lane Width ft *10.0*

Segment Length mi *2.2*

Access points *mi* *21*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.3*	*1.4*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.997*	*0.996*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*421*	*315*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*5.3 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*5.3 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*3.2 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*44.5 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*35.6 mi/h*
		Percent free flow speed, PFFS	*80.0 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*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], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*420*	*314*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*43.4*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*46.1*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*69.8*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.25*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1693*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1698*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*80.0*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*420.2*
Effective width, Wv (Eq. 15-29) ft	*11.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*4.47*
Bicycle level of service (Exhibit 15-4)	*D*
Notes	
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain. 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 and for v>200 veh/h. 4. For the analysis direction only 5. Exhibit 15-20 provides coefficients a and b for Equation 15-10. 6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.	

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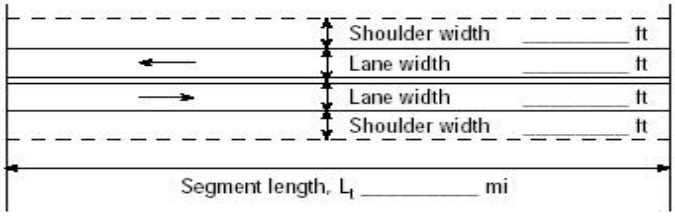
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Lindenhurst Rd (S.R. 2069) NB*
Agency or Company	*Pennoni*	From/To	*Route 532 to Route 332*
Date Performed	*9/4/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*AM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Show North Arrow

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☐ Level ☑ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.78*

No-passing zone *100%*

% Trucks and Buses , P_T *16 %*

% Recreational vehicles, P_R *0%*

Access points *mi* *15*/mi

Analysis direction vol., V_d *370*veh/h

Opposing direction vol., V_o *439*veh/h

Shoulder width ft *4.0*

Lane Width ft *11.0*

Segment Length mi *2.3*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.9*	*1.7*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.1*	*1.1*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.874*	*0.899*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*0.94*	*0.96*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*577*	*652*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*50.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*1.7 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*3.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*1.6 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*44.5 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*33.4 mi/h*
		Percent free flow speed, PFFS	*74.9 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.4*	*1.2*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.940*	*0.969*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*0.94*	*0.97*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*537*	*599*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*54.3*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*35.2*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*70.9*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*D*
Volume to capacity ratio, *v/c*	*0.34*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1482*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1598*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*74.9*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*474.4*
Effective width, Wv (Eq. 15-29) ft	*15.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*9.62*
Bicycle level of service (Exhibit 15-4)	*F*
Notes	
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain. 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 and for v>200 veh/h. 4. For the analysis direction only 5. Exhibit 15-20 provides coefficients a and b for Equation 15-10. 6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.	

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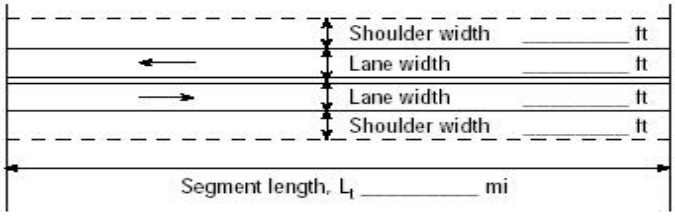
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Lindenhurst Rd (S.R. 2069) SB*
Agency or Company	*Pennoni*	From/To	*Route 532 to Route 332*
Date Performed	*9/4/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*AM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Analysis direction vol., V_d *534*veh/h

Opposing direction vol., V_o *167*veh/h

Shoulder width ft *4.0*

Lane Width ft *11.0*

Segment Length mi *2.3*

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☐ Level ☑ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.88*

No-passing zone *100*%

% Trucks and Buses , P_T *9* %

% Recreational vehicles, P_R *0*%

Access points *mi* *15*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.7*	*2.3*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.1*	*1.1*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.941*	*0.895*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*0.97*	*0.74*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*665*	*287*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*50.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*1.7 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*3.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*3.4 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*44.5 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*33.7 mi/h*
		Percent free flow speed, PFFS	*75.7* %

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.8*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*0.933*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*0.97*	*0.79*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*626*	*258*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*53.4*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*31.5*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*75.7*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.39*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1228*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1327*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*75.7*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*606.8*
Effective width, Wv (Eq. 15-29) ft	*15.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*6.55*
Bicycle level of service (Exhibit 15-4)	*F*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
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 and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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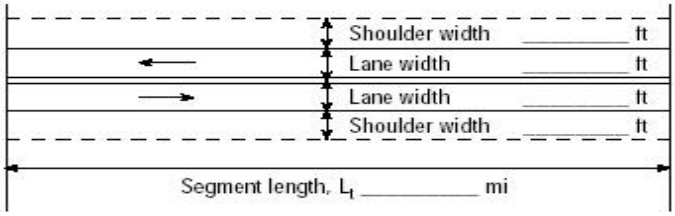
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Lindenhurst Rd (S.R. 2069) NB*
Agency or Company	*Pennoni*	From/To	*Route 532 to Route 332*
Date Performed	*9/4/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*PM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Show North Arrow

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☐ Level ☑ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.91*

No-passing zone *100%*

% Trucks and Buses , P_T *2 %*

% Recreational vehicles, P_R *0%*

Access points *mi* *15*/mi

Analysis direction vol., V_d *467*veh/h

Opposing direction vol., V_o *366*veh/h

Shoulder width ft *4.0*

Lane Width ft *11.0*

Segment Length mi *2.3*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.8*	*2.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.1*	*1.1*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.984*	*0.980*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*0.95*	*0.90*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*549*	*456*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*50.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*1.7 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*3.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*2.4 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*44.5 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*34.3 mi/h*
		Percent free flow speed, PFFS	*77.0 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.2*	*1.4*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.996*	*0.992*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*0.96*	*0.90*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*537*	*450*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*53.3*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*38.5*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*74.2*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.32*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1536*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1568*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*77.0*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*513.2*
Effective width, Wv (Eq. 15-29) ft	*15.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*4.28*
Bicycle level of service (Exhibit 15-4)	*D*
Notes	
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain. 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 and for v>200 veh/h. 4. For the analysis direction only 5. Exhibit 15-20 provides coefficients a and b for Equation 15-10. 6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.	

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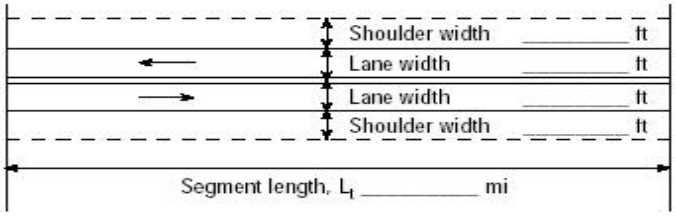
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Lindenhurst Rd (S.R. 2069) SB*
Agency or Company	*Pennoni*	From/To	*Route 532 to Route 332*
Date Performed	*9/4/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*PM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Show North Arrow

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☐ Level ☑ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.89*

No-passing zone *100%*

Analysis direction vol., V_d *400*veh/h

Opposing direction vol., V_o *358*veh/h

% Trucks and Buses , P_T *7 %*

% Recreational vehicles, P_R *0%*

Shoulder width ft *4.0*

Lane Width ft *11.0*

Segment Length mi *2.3*

Access points *mi* *15*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.9*	*2.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.1*	*1.1*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.941*	*0.935*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*0.92*	*0.90*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*519*	*478*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*50.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*1.7 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*3.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*2.3 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*44.5 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*34.5 mi/h*
		Percent free flow speed, PFFS	*77.4 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.4*	*1.4*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.973*	*0.973*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*0.93*	*0.90*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*497*	*459*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*50.2*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*40.7*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*71.4*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.31*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1488*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1554*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*77.4*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*449.4*
Effective width, Wv (Eq. 15-29) ft	*15.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*5.67*
Bicycle level of service (Exhibit 15-4)	*F*
Notes	

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
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 and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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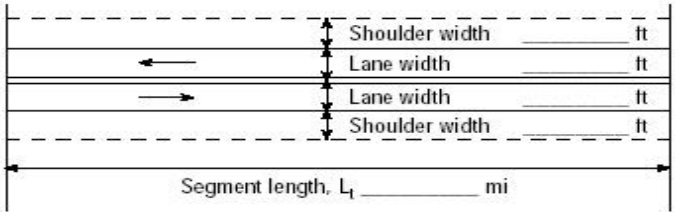
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Route 32 NB*
Agency or Company	*Pennoni*	From/To	*Route 532 to Route 179*
Date Performed	*8/24/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*AM Peak*	Analysis Year	*2015*

Project Description: *Pre-Constructin Traffic Study*

Input Data



Show North Arrow

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.90*

No-passing zone *100%*

% Trucks and Buses , P_T *0 %*

% Recreational vehicles, P_R *0%*

Access points *mi* *19*/mi

Analysis direction vol., V_d *437*veh/h

Opposing direction vol., V_o *278*veh/h

Shoulder width ft *2.0*

Lane Width ft *10.0*

Segment Length mi *7.3*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.2*	*1.4*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*1.000*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*486*	*309*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*45.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*3.7 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*4.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*3.3 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*36.5 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*27.1 mi/h*
		Percent free flow speed, PFFS	*74.1 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*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], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*486*	*309*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*46.5*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*41.0*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*71.6*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*D*
Volume to capacity ratio, *v/c*	*0.29*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1700*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*74.1*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*485.6*
Effective width, Wv (Eq. 15-29) ft	*12.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*4.22*
Bicycle level of service (Exhibit 15-4)	*D*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
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 and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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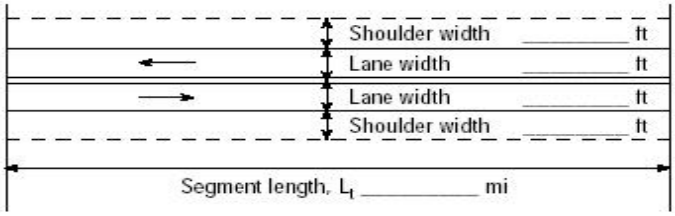
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Route 32 SB*
Agency or Company	*Pennoni*	From/To	*Route 532 to Route 179*
Date Performed	*8/24/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*AM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Show North Arrow

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.87*

No-passing zone *100%*

Analysis direction vol., V_d *349*veh/h

Opposing direction vol., V_o *273*veh/h

% Trucks and Buses , P_T *3 %*

% Recreational vehicles, P_R *0%*

Shoulder width ft *2.0*

Lane Width ft *10.0*

Segment Length mi *7.3*

Access points *mi* *19*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.3*	*1.4*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.991*	*0.988*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*405*	*318*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*45.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*3.7 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*4.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*3.2 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*36.5 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*27.7 mi/h*
		Percent free flow speed, PFFS	*75.8 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*0.997*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*401*	*315*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*42.0*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*48.4*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*69.1*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.24*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1680*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1695*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*75.8*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*401.1*
Effective width, Wv (Eq. 15-29) ft	*12.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*4.81*
Bicycle level of service (Exhibit 15-4)	*E*
Notes	
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain. 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 and for v>200 veh/h. 4. For the analysis direction only 5. Exhibit 15-20 provides coefficients a and b for Equation 15-10. 6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.	

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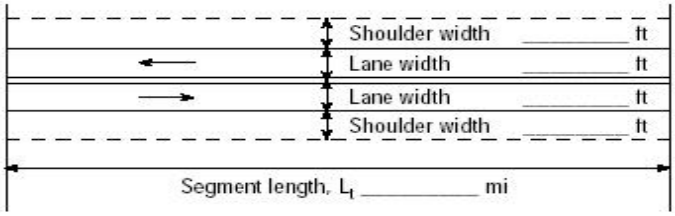
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Route 32 NB*
Agency or Company	*Pennoni*	From/To	*Route 532 to Route 179*
Date Performed	*8/24/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*PM Peak*	Analysis Year	*2015*

Project Description: *Pre-Constructin Traffic Study*

Input Data



Show North Arrow

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Analysis direction vol., V_d	*463*veh/h	Grade Length mi	Up/down
Opposing direction vol., V_o	*314*veh/h	Peak-hour factor, PHF	*0.95*
Shoulder width ft	*2.0*	No-passing zone	*100*%
Lane Width ft	*10.0*	% Trucks and Buses , P_T	*1* %
Segment Length mi	*7.3*	% Recreational vehicles, P_R	*0*%
		Access points *mi*	*19*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.2*	*1.4*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.998*	*0.996*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*488*	*332*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*45.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*3.7 mi/h*
Free-flow speed, FFS=S_{FM}+0.00776(*v*/ $f_{HV,ATS}$)		Adj. for access points[4], f_A (Exhibit 15-8)	*4.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*3.1 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*36.5 mi/h*
		Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*27.0 mi/h*
		Percent free flow speed, PFFS	*74.0* %

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*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], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*487*	*331*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*47.2*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*41.1*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*71.7*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*D*
Volume to capacity ratio, *v/c*	*0.29*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1693*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1698*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*74.0*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*487.4*
Effective width, Wv (Eq. 15-29) ft	*12.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*4.43*
Bicycle level of service (Exhibit 15-4)	*D*
Notes	
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain. 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 and for v>200 veh/h. 4. For the analysis direction only 5. Exhibit 15-20 provides coefficients a and b for Equation 15-10. 6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.	

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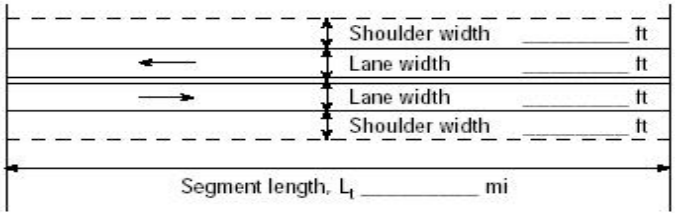
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Route 32 SB*
Agency or Company	*Pennoni*	From/To	*Route 532 to Route 179*
Date Performed	*8/24/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*PM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.84*

No-passing zone *100%*

Analysis direction vol., V_d *500*veh/h

Opposing direction vol., V_o *276*veh/h

% Trucks and Buses , P_T *0 %*

% Recreational vehicles, P_R *0%*

Shoulder width ft *2.0*

Lane Width ft *10.0*

Segment Length mi *7.3*

Access points *mi* *19*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.1*	*1.4*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*1.000*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*595*	*329*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*45.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*3.7 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*4.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*3.2 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*36.5 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*26.2 mi/h*
		Percent free flow speed, PFFS	*71.7 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*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], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*595*	*329*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*54.0*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*35.9*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*77.1*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*D*
Volume to capacity ratio, *v/c*	*0.35*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1700*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*71.7*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*595.2*
Effective width, Wv (Eq. 15-29) ft	*12.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*4.32*
Bicycle level of service (Exhibit 15-4)	*D*
Notes	
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain. 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 and for v>200 veh/h. 4. For the analysis direction only 5. Exhibit 15-20 provides coefficients a and b for Equation 15-10. 6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.	

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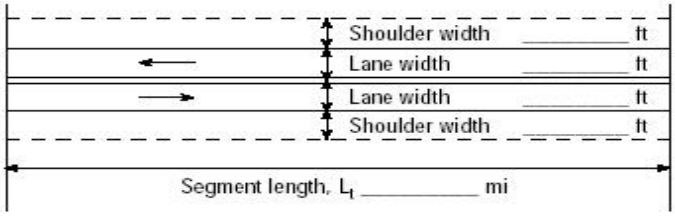
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Yardley Langhorne Pike EB*
Agency or Company	*Pennoni*	From/To	*East 95/West Edgewood Rd*
Date Performed	*9/4/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*AM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.83*

No-passing zone *100%*

Analysis direction vol., V_d	*316*veh/h
Opposing direction vol., V_o	*249*veh/h
Shoulder width ft	*2.0*
Lane Width ft	*12.0*
Segment Length mi	*0.4*
% Trucks and Buses , P_T	*3* %
% Recreational vehicles, P_R	*0%*
Access points *mi*	*35*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.3*	*1.4*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.991*	*0.988*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*384*	*304*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*45.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*2.6 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*8.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*3.3 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*33.7 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*25.0 mi/h*
		Percent free flow speed, PFFS	*74.3 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.1*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.997*	*0.997*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*382*	*301*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*39.6*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*50.5*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*67.8*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*D*
Volume to capacity ratio, *v/c*	*0.23*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1680*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1695*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*74.3*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*380.7*
Effective width, Wv (Eq. 15-29) ft	*14.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*4.52*
Bicycle level of service (Exhibit 15-4)	*E*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
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 and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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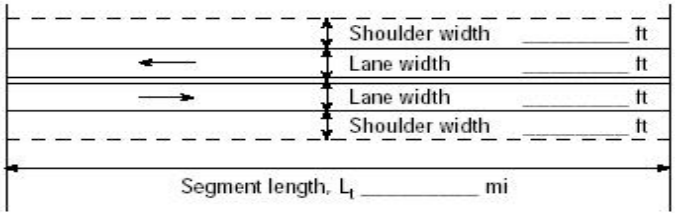
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Yardley Langhorne Pike WB*
Agency or Company	*Pennoni*	From/To	*East 95/West Edgewood Rd*
Date Performed	*9/4/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*AM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.89*

No-passing zone *100%*

Show North Arrow

Analysis direction vol., V_d	*263*veh/h	% Trucks and Buses , P_T	*2* %
Opposing direction vol., V_o	*273*veh/h	% Recreational vehicles, P_R	*0%*
Shoulder width ft	*2.0*	Access points *mi*	*35*/mi
Lane Width ft	*12.0*		
Segment Length mi	*0.4*		

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.4*	*1.4*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.992*	*0.992*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*298*	*309*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*45.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*2.6 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*8.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*3.3 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*33.7 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*25.6 mi/h*
		Percent free flow speed, PFFS	*76.2 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.1*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.998*	*0.998*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*296*	*307*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*32.4*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*56.4*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*60.1*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.18*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1686*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1697*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*76.2*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*295.5*
Effective width, Wv (Eq. 15-29) ft	*14.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*4.14*
Bicycle level of service (Exhibit 15-4)	*D*
Notes	

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
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 and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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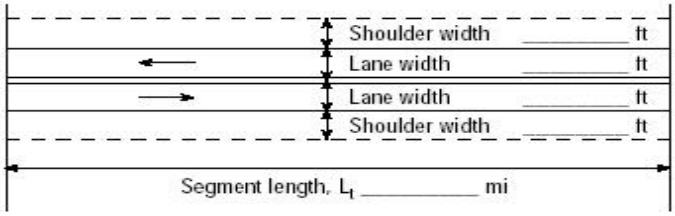
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Yardley Langhorne Pike EB*
Agency or Company	*Pennoni*	From/To	*East 95/West Edgewood Rd*
Date Performed	*9/4/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*PM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Show North Arrow

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.90*

No-passing zone *100*%

Analysis direction vol., V_d *403*veh/h

Opposing direction vol., V_o *341*veh/h

% Trucks and Buses , P_T *2* %

% Recreational vehicles, P_R *0*%

Access points *mi* *35*/mi

Shoulder width ft *2.0*

Lane Width ft *12.0*

Segment Length mi *0.4*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.3*	*1.3*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.994*	*0.994*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*450*	*381*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*45.0* *mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*2.6* *mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*8.8* *mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*2.8* *mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*33.7* *mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*24.4* *mi/h*
		Percent free flow speed, PFFS	*72.4* %

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*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], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*448*	*380*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*45.5*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*43.6*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*69.1*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*D*
Volume to capacity ratio, *v/c*	*0.26*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1690*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1697*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*72.4*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*447.8*
Effective width, Wv (Eq. 15-29) ft	*14.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*4.35*
Bicycle level of service (Exhibit 15-4)	*D*
Notes	
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain. 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 and for v>200 veh/h. 4. For the analysis direction only 5. Exhibit 15-20 provides coefficients a and b for Equation 15-10. 6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.	

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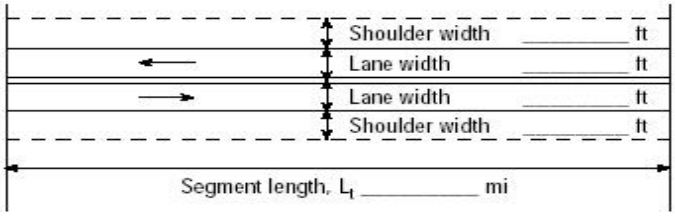
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Yardley Langhorne Pike WB*
Agency or Company	*Pennoni*	From/To	*East 95/West Edgewood Rd*
Date Performed	*9/4/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*PM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Show North Arrow

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.89*

No-passing zone *100%*

Analysis direction vol., V_d	*357*veh/h
Opposing direction vol., V_o	*387*veh/h
Shoulder width ft	*2.0*
Lane Width ft	*12.0*
Segment Length mi	*0.4*
% Trucks and Buses , P_T	*0* %
% Recreational vehicles, P_R	*0%*
Access points *mi*	*35*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.3*	*1.3*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*1.000*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*401*	*435*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*45.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*2.6 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*8.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*2.5 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*33.7 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*24.6 mi/h*
		Percent free flow speed, PFFS	*73.2 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*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], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*401*	*435*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*43.7*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*44.5*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*65.0*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*D*
Volume to capacity ratio, *v/c*	*0.24*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1700*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*73.2*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*401.1*
Effective width, Wv (Eq. 15-29) ft	*14.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*3.86*
Bicycle level of service (Exhibit 15-4)	*D*
Notes	

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
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 and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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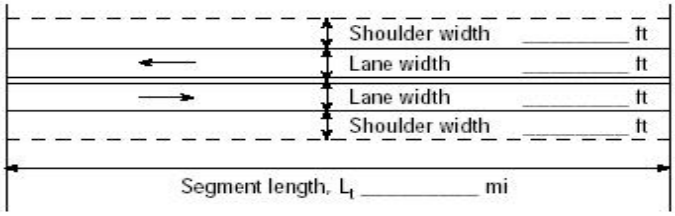
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*MTD*	Highway / Direction of Travel	*Yardley Langhorne Rd EB*
Agency or Company	*Pennoni*	From/To	*East Edgewood Rd/West Rt. 332*
Date Performed	*9/4/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*AM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.88*

No-passing zone *94%*

Show North Arrow

Analysis direction vol., V_d	*189*veh/h	% Trucks and Buses , P_T	*1* %
Opposing direction vol., V_o	*155*veh/h	% Recreational vehicles, P_R	*0%*
Shoulder width ft	*12.0*	Access points *mi*	*14*/mi
Lane Width ft	*12.0*		
Segment Length mi	*1.6*		

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.5*	*1.6*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.995*	*0.994*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*216*	*177*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*3.5 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*3.7 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*51.5 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*44.8 mi/h*
		Percent free flow speed, PFFS	*87.0 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.1*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.999*	*0.999*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*215*	*176*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*22.9*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*60.2*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*56.0*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*B*
Volume to capacity ratio, *v/c*	*0.13*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1690*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1698*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*87.0*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*214.8*
Effective width, Wv (Eq. 15-29) ft	*36.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*-1.75*
Bicycle level of service (Exhibit 15-4)	*A*
Notes	
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain. 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 and for v>200 veh/h. 4. For the analysis direction only 5. Exhibit 15-20 provides coefficients a and b for Equation 15-10. 6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.	

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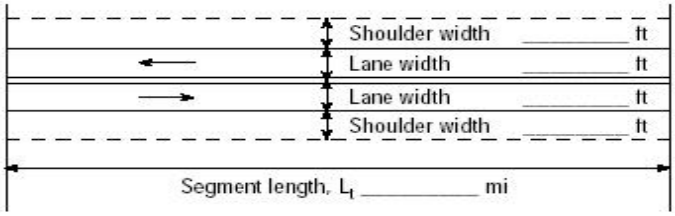
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*MTD*	Highway / Direction of Travel	*Yardley Langhorne Rd WB*
Agency or Company	*Pennoni*	From/To	*East Edgewood Rd/West Rt. 332*
Date Performed	*9/4/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*AM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Analysis direction vol., V_d *167*veh/h

Opposing direction vol., V_o *181*veh/h

Shoulder width ft *12.0*

Lane Width ft *12.0*

Segment Length mi *1.6*

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.80*

No-passing zone *94%*

% Trucks and Buses , P_T *1 %*

% Recreational vehicles, P_R *0%*

Access points *mi* *14*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.5*	*1.5*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.995*	*0.995*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*210*	*227*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*3.5 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*3.8 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*51.5 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*44.3 mi/h*
		Percent free flow speed, PFFS	*86.0 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.1*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.999*	*0.999*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*209*	*226*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*23.0*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*62.0*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*52.8*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*B*
Volume to capacity ratio, *v/c*	*0.12*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1692*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1698*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*86.0*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*208.8*
Effective width, Wv (Eq. 15-29) ft	*36.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*-1.76*
Bicycle level of service (Exhibit 15-4)	*A*
Notes	
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain. 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 and for v>200 veh/h. 4. For the analysis direction only 5. Exhibit 15-20 provides coefficients a and b for Equation 15-10. 6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.	

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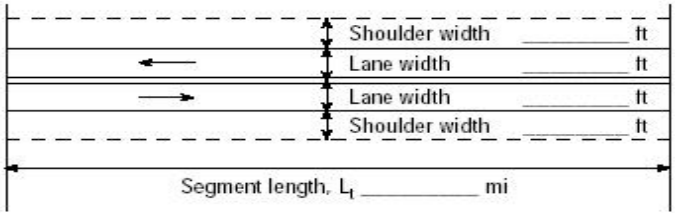
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Yardley Langhorne Rd EB*
Agency or Company	*Pennoni*	From/To	*East Edgewood Rd/West Rt. 332*
Date Performed	*9/4/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*PM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Show North Arrow

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.83*

No-passing zone *94%*

Analysis direction vol., V_d *189*veh/h

Opposing direction vol., V_o *199*veh/h

% Trucks and Buses , P_T *2 %*

% Recreational vehicles, P_R *0%*

Access points *mi* *14*/mi

Shoulder width ft *12.0*

Lane Width ft *12.0*

Segment Length mi *1.6*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.5*	*1.5*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.990*	*0.990*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*230*	*242*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*3.5 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*3.7 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*51.5 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*44.1 mi/h*
		Percent free flow speed, PFFS	*85.7 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.1*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.998*	*0.998*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*228*	*240*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*25.8*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*61.3*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*55.7*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*B*
Volume to capacity ratio, *v/c*	*0.14*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1683*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1697*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*85.7*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*227.7*
Effective width, Wv (Eq. 15-29) ft	*36.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*-1.49*
Bicycle level of service (Exhibit 15-4)	*A*
Notes	

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
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 and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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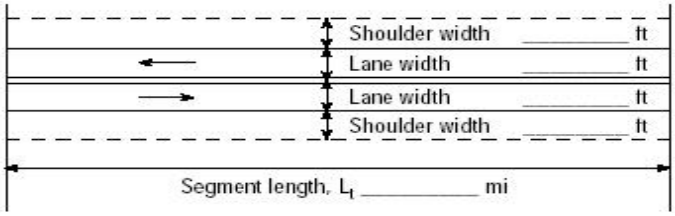
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Yardley Langhorne Rd WB*
Agency or Company	*Pennoni*	From/To	*East Edgewood Rd/West Rt. 332*
Date Performed	*9/4/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*PM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Show North Arrow

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.85*

No-passing zone *94%*

% Trucks and Buses , P_T *1 %*

% Recreational vehicles, P_R *0%*

Access points *mi* *14*/mi

Analysis direction vol., V_d *213*veh/h

Opposing direction vol., V_o *158*veh/h

Shoulder width ft *12.0*

Lane Width ft *12.0*

Segment Length mi *1.6*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.4*	*1.6*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.996*	*0.994*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*252*	*187*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*45.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*3.5 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*3.7 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*41.5 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*34.4 mi/h*
		Percent free flow speed, PFFS	*82.8 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.1*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.999*	*0.999*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*251*	*186*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*26.1*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*57.6*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*59.2*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.15*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1690*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1698*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*82.8*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*250.6*
Effective width, Wv (Eq. 15-29) ft	*36.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*-1.67*
Bicycle level of service (Exhibit 15-4)	*A*
Notes	
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain. 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 and for v>200 veh/h. 4. For the analysis direction only 5. Exhibit 15-20 provides coefficients a and b for Equation 15-10. 6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.	

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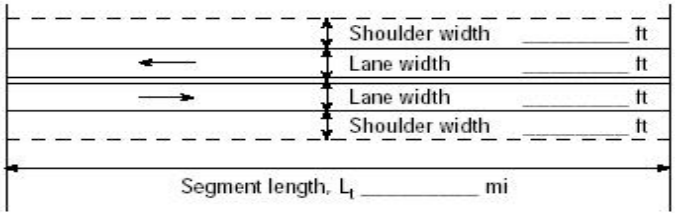
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Big Oak Rd (S.R. 2024) EB*
Agency or Company	*Pennoni*	From/To	*Pine Grove Rd/Stony Hill Rd*
Date Performed	*9/4/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*AM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Analysis direction vol., V_d *410*veh/h

Opposing direction vol., V_o *147*veh/h

Shoulder width ft *8.0*

Lane Width ft *10.0*

Segment Length mi *2.0*

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.75*

No-passing zone *100*%

% Trucks and Buses , P_T *4* %

% Recreational vehicles, P_R *0*%

Access points *mi* *35*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.2*	*1.5*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.992*	*0.980*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*551*	*200*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*45.0* *mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*1.1* *mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*8.8* *mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*4.0* *mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*35.2* *mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*25.3* *mi/h*
		Percent free flow speed, PFFS	*72.0* %

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*0.996*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*547*	*197*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*47.6*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*36.5*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*74.4*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*D*
Volume to capacity ratio, *v/c*	*0.32*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1666*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1693*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*72.0*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*546.7*
Effective width, Wv (Eq. 15-29) ft	*26.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*2.58*
Bicycle level of service (Exhibit 15-4)	*C*
Notes	
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain. 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 and for v>200 veh/h. 4. For the analysis direction only 5. Exhibit 15-20 provides coefficients a and b for Equation 15-10. 6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.	

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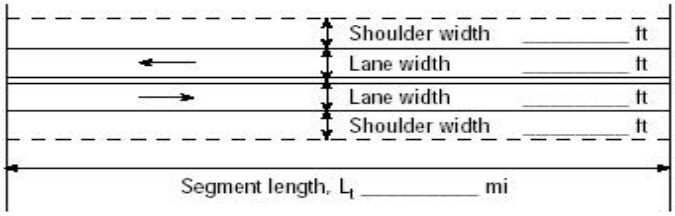
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Big Oak Rd (S.R. 2024) WB*
Agency or Company	*Pennoni*	From/To	*Pine Grove Rd/Stony Hill Rd*
Date Performed	*9/4/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*AM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Show North Arrow

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.69*

No-passing zone *100*%

Analysis direction vol., V_d *189*veh/h

Opposing direction vol., V_o *310*veh/h

% Trucks and Buses , P_T *8* %

% Recreational vehicles, P_R *0*%

Access points *mi* *35*/mi

Shoulder width ft *8.0*

Lane Width ft *10.0*

Segment Length mi *2.0*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.4*	*1.3*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.969*	*0.977*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*283*	*460*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*45.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*1.1 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*8.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*2.4 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*35.2 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*27.0 mi/h*
		Percent free flow speed, PFFS	*76.7* %

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.1*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.992*	*1.000*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*276*	*449*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*34.0*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*44.9*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*51.1*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.17*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1661*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*76.7*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*273.9*
Effective width, Wv (Eq. 15-29) ft	*26.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*3.52*
Bicycle level of service (Exhibit 15-4)	*D*
Notes	

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
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 and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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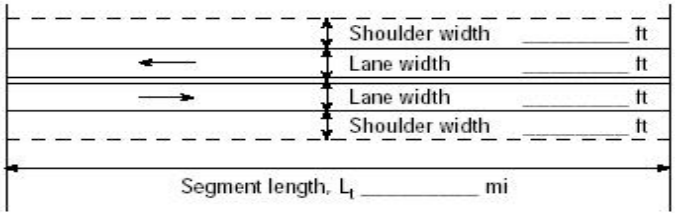
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Big Oak Rd (S.R. 2024) EB*
Agency or Company	*Pennoni*	From/To	*Pine Grove Rd/Stony Hill Rd*
Date Performed	*9/4/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*PM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Analysis direction vol., V_d *290*veh/h

Opposing direction vol., V_o *262*veh/h

Shoulder width ft *8.0*

Lane Width ft *10.0*

Segment Length mi *2.0*

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.94*

No-passing zone *100*%

% Trucks and Buses , P_T *1* %

% Recreational vehicles, P_R *0*%

Access points *mi* *35*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.4*	*1.4*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.996*	*0.996*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*310*	*280*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*45.0* *mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*1.1* *mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*8.8* *mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*3.5* *mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*35.2* *mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*27.1* *mi/h*
		Percent free flow speed, PFFS	*77.1* *%*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.1*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.999*	*0.999*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*309*	*279*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*33.0*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*56.7*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*62.8*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.18*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1693*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1698*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*77.1*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*308.5*
Effective width, Wv (Eq. 15-29) ft	*26.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*1.54*
Bicycle level of service (Exhibit 15-4)	*B*
Notes	
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain. 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 and for v>200 veh/h. 4. For the analysis direction only 5. Exhibit 15-20 provides coefficients a and b for Equation 15-10. 6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.	

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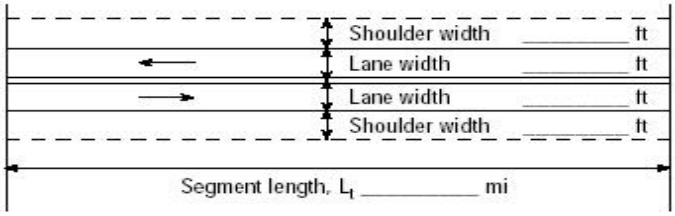
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Big Oak Rd (S.R. 2024) WB*
Agency or Company	*Pennoni*	From/To	*Pine Grove Rd/Stony Hill Rd*
Date Performed	*9/4/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*PM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Analysis direction vol., V_d *307*veh/h

Opposing direction vol., V_o *525*veh/h

Shoulder width ft *8.0*

Lane Width ft *10.0*

Segment Length mi *2.0*

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.92*

No-passing zone *100*%

% Trucks and Buses , P_T *1* %

% Recreational vehicles, P_R *0*%

Access points *mi* *35*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.4*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.996*	*0.999*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*335*	*571*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*45.0* *mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*1.1* *mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*8.8* *mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*1.9* *mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*35.2* *mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*26.2* *mi/h*
		Percent free flow speed, PFFS	*74.5* %

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.1*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.999*	*1.000*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*334*	*571*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*39.9*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*37.1*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*53.6*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*D*
Volume to capacity ratio, *v/c*	*0.20*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1698*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*74.5*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*333.7*
Effective width, Wv (Eq. 15-29) ft	*26.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*1.58*
Bicycle level of service (Exhibit 15-4)	*B*
Notes	
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain. 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 and for v>200 veh/h. 4. For the analysis direction only 5. Exhibit 15-20 provides coefficients a and b for Equation 15-10. 6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.	

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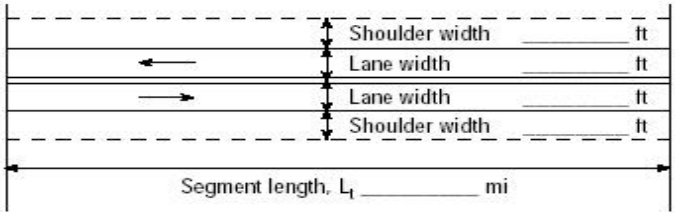
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*MTD*	Highway / Direction of Travel	*Stony Hill Rd (S.R. 2069) NB*
Agency or Company	*Pennoni*	From/To	*Rt. 1 to Big Oak Rd*
Date Performed	*9/4/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*AM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Analysis direction vol., V_d *281*veh/h
Opposing direction vol., V_o *363*veh/h
Shoulder width ft *2.0*
Lane Width ft *10.0*
Segment Length mi *0.9*

☐ Class I highway ☐ Class II highway ☑ Class III highway
Terrain ☑ Level ☐ Rolling
Grade Length mi Up/down
Peak-hour factor, PHF *0.83*
No-passing zone *100%*
% Trucks and Buses , P_T *10 %*
% Recreational vehicles, P_R *0%*
Access points *mi* *19*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.4*	*1.3*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.962*	*0.971*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*352*	*450*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0 mi/h*
Total demand flow rate, both directions, v		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*3.7 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*4.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*2.5 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*46.5 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*37.8 mi/h*
		Percent free flow speed, PFFS	*81.3 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.1*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.990*	*1.000*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*342*	*437*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*39.0*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*44.5*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*58.5*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.21*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1651*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*81.3*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*338.6*
Effective width, Wv (Eq. 15-29) ft	*12.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*7.05*
Bicycle level of service (Exhibit 15-4)	*F*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
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 and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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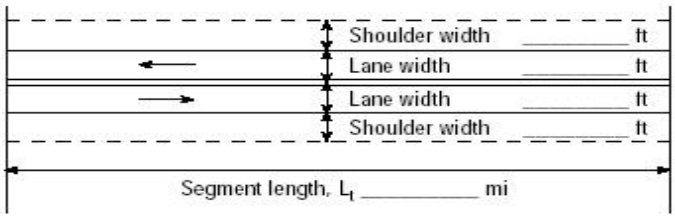
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Stony Hill Rd (S.R. 2069) SB*
Agency or Company	*Pennoni*	From/To	*Rt. 1 to Big Oak Rd*
Date Performed	*9/4/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*AM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Analysis direction vol., V_d *1002*veh/h

Opposing direction vol., V_o *254*veh/h

Shoulder width ft *2.0*

Lane Width ft *10.0*

Segment Length mi *0.9*

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.93*

No-passing zone *100*%

% Trucks and Buses , P_T *4* %

% Recreational vehicles, P_R *0*%

Access points *mi* *19*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.0*	*1.4*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*0.984*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*1077*	*278*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*3.7 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*4.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*3.5 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*46.5 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*32.5 mi/h*
		Percent free flow speed, PFFS	*69.9* %

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*0.996*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*1077*	*274*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*73.5*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*31.8*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*98.9*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*D*
Volume to capacity ratio, *v/c*	*0.63*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1673*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1693*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*69.9*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*1077.4*
Effective width, Wv (Eq. 15-29) ft	*12.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*5.58*
Bicycle level of service (Exhibit 15-4)	*F*
Notes	
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain. 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 and for v>200 veh/h. 4. For the analysis direction only 5. Exhibit 15-20 provides coefficients a and b for Equation 15-10. 6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.	

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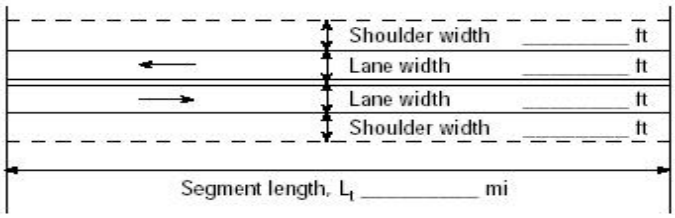
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Stony Hill Rd (S.R. 2069) NB*
Agency or Company	*Pennoni*	From/To	*Rt. 1 to Big Oak Rd*
Date Performed	*9/4/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*PM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Analysis direction vol., V_d	*416*veh/h	Grade Length mi	Up/down
Opposing direction vol., V_o	*337*veh/h	Peak-hour factor, PHF	*0.85*
Shoulder width ft	*2.0*	No-passing zone	*100*%
Lane Width ft	*10.0*	% Trucks and Buses , P_T	*2* %
Segment Length mi	*0.9*	% Recreational vehicles, P_R	*0*%
		Access points *mi*	*19*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.2*	*1.3*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.996*	*0.994*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*491*	*399*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*3.7 mi/h*
Free-flow speed, FFS=S_{FM}+0.00776(*v*/ $f_{HV,ATS}$)		Adj. for access points[4], f_A (Exhibit 15-8)	*4.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*2.7 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*46.5 mi/h*
		Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*36.9 mi/h*
		Percent free flow speed, PFFS	*79.3* %

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*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], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*489*	*397*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*48.9*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*41.5*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*71.8*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.29*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1690*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1697*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*79.3*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*489.4*
Effective width, Wv (Eq. 15-29) ft	*12.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*4.66*
Bicycle level of service (Exhibit 15-4)	*E*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
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 and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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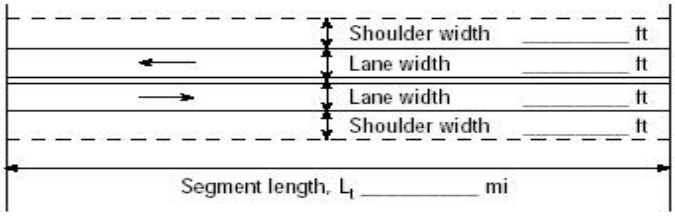
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Stony Hill Rd (S.R. 2069) SB*
Agency or Company	*Pennoni*	From/To	*Rt. 1 to Big Oak Rd*
Date Performed	*9/4/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*PM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.96*

No-passing zone *100%*

% Trucks and Buses , P_T *5 %*

% Recreational vehicles, P_R *0%*

Access points *mi* *19*/mi

Analysis direction vol., V_d *987*veh/h

Opposing direction vol., V_o *300*veh/h

Shoulder width ft *2.0*

Lane Width ft *10.0*

Segment Length mi *0.9*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.0*	*1.4*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*0.980*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*1028*	*319*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*3.7 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*4.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*3.2 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*46.5 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*32.9 mi/h*
		Percent free flow speed, PFFS	*70.6 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*0.995*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*1028*	*314*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*73.4*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*29.2*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*95.8*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*D*
Volume to capacity ratio, *v/c*	*0.60*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1666*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1692*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*70.6*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*1028.1*
Effective width, Wv (Eq. 15-29) ft	*12.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*5.85*
Bicycle level of service (Exhibit 15-4)	*F*
Notes	
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain. 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 and for v>200 veh/h. 4. For the analysis direction only 5. Exhibit 15-20 provides coefficients a and b for Equation 15-10. 6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.	

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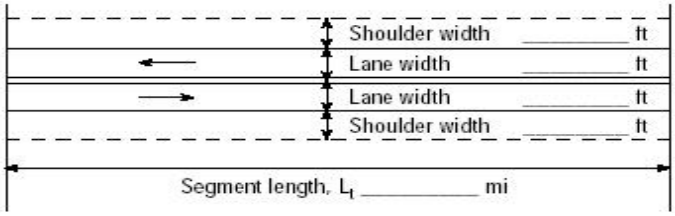
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Yardley Newtown Rd EB*
Agency or Company	*Pennoni*	From/To	*I-95 to Mirror Lake Rd*
Date Performed	*9/4/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*AM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Show North Arrow

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.91*

No-passing zone *100%*

% Trucks and Buses , P_T *4 %*

% Recreational vehicles, P_R *0%*

Access points *mi* *8*/mi

Analysis direction vol., V_d *550*veh/h

Opposing direction vol., V_o *464*veh/h

Shoulder width ft *4.0*

Lane Width ft *12.0*

Segment Length mi *0.4*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.1*	*1.2*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.996*	*0.992*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*607*	*514*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*1.3 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*2.0 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*2.3 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*51.7 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*40.7 mi/h*
		Percent free flow speed, PFFS	*78.8 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*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], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*604*	*510*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*57.6*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*35.8*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*77.0*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.36*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1686*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*78.8*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*604.4*
Effective width, Wv (Eq. 15-29) ft	*16.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*4.73*
Bicycle level of service (Exhibit 15-4)	*E*
Notes	
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain. 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 and for v>200 veh/h. 4. For the analysis direction only 5. Exhibit 15-20 provides coefficients a and b for Equation 15-10. 6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.	

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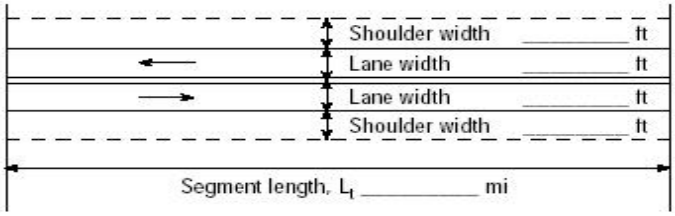
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Yardley Newtown Rd WB*
Agency or Company	*Pennoni*	From/To	*I-95 to Mirror Lake Rd*
Date Performed	*9/4/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*AM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Analysis direction vol., V_d *556*veh/h

Opposing direction vol., V_o *313*veh/h

Shoulder width ft *4.0*

Lane Width ft *12.0*

Segment Length mi *0.4*

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.93*

No-passing zone *100*%

% Trucks and Buses , P_T *2* %

% Recreational vehicles, P_R *0*%

Access points *mi* *8*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.1*	*1.4*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.998*	*0.992*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*599*	*339*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*1.3 mi/h*
Free-flow speed, FFS=S_{FM}+0.00776(*v*/ $f_{HV,ATS}$)		Adj. for access points[4], f_A (Exhibit 15-8)	*2.0 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*3.1 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*51.7 mi/h*
		Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*41.3 mi/h*
		Percent free flow speed, PFFS	*79.9* %

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*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], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*598*	*337*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*53.7*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*35.9*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*76.7*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.35*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1686*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1697*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*79.9*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*597.8*
Effective width, Wv (Eq. 15-29) ft	*16.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*4.20*
Bicycle level of service (Exhibit 15-4)	*D*
Notes	

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
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 and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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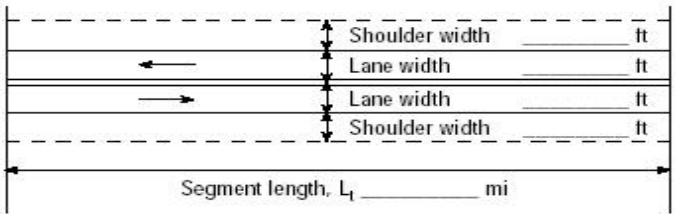
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Yardley Newtown Rd EB*
Agency or Company	*Pennoni*	From/To	*I-95 to Mirror Lake Rd*
Date Performed	*9/4/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*PM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Analysis direction vol., V_d *836*veh/h

Opposing direction vol., V_o *390*veh/h

Shoulder width ft *4.0*

Lane Width ft *12.0*

Segment Length mi *0.4*

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.95*

No-passing zone *100*%

% Trucks and Buses , P_T *1* %

% Recreational vehicles, P_R *0*%

Access points *mi* *8*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.0*	*1.3*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*0.997*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*880*	*412*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*1.3 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*2.0 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*2.7 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*51.7 mi/h*
		Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*39.0 mi/h*
		Percent free flow speed, PFFS	*75.4* %

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*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], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*880*	*411*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*69.2*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*25.6*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*86.7*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.52*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1695*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*75.4*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*880.0*
Effective width, Wv (Eq. 15-29) ft	*16.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*4.17*
Bicycle level of service (Exhibit 15-4)	*D*
Notes	

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
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 and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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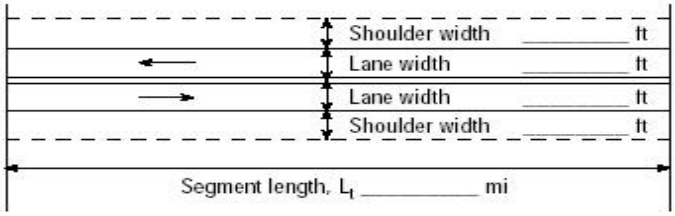
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Yardley Newtown Rd WB*
Agency or Company	*Pennoni*	From/To	*I-95 to Mirror Lake Rd*
Date Performed	*9/4/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*PM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.93*

No-passing zone *100%*

Show North Arrow

Analysis direction vol., V_d	*430*veh/h	% Trucks and Buses , P_T	*3* %
Opposing direction vol., V_o	*527*veh/h	% Recreational vehicles, P_R	*0%*
Shoulder width ft	*4.0*	Access points *mi*	*8*/mi
Lane Width ft	*12.0*		
Segment Length mi	*0.4*		

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.2*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.994*	*0.997*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*465*	*568*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*1.3 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*2.0 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*2.0 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*51.7 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*41.7 mi/h*
		Percent free flow speed, PFFS	*80.6 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*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], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*462*	*567*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*49.4*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*37.8*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*66.4*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.27*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1695*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*80.6*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*462.4*
Effective width, Wv (Eq. 15-29) ft	*16.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*4.32*
Bicycle level of service (Exhibit 15-4)	*D*
Notes	
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain. 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 and for v>200 veh/h. 4. For the analysis direction only 5. Exhibit 15-20 provides coefficients a and b for Equation 15-10. 6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.	

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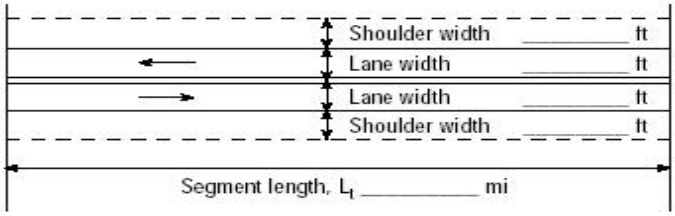
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Yardley Newtown Rd EB*
Agency or Company	*Pennoni*	From/To	*Mirror Lake/Langhorne Yardley*
Date Performed	*9/4/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*AM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.91*

No-passing zone *100%*

Analysis direction vol., V_d	*319*veh/h
Opposing direction vol., V_o	*536*veh/h
Shoulder width ft	*15.0*
Lane Width ft	*12.0*
Segment Length mi	*1.1*
% Trucks and Buses , P_T	*7 %*
% Recreational vehicles, P_R	*0%*
Access points *mi*	*32*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.3*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.979*	*0.993*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*358*	*593*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*50.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*8.0 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*1.8 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*42.0 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*32.8 mi/h*
		Percent free flow speed, PFFS	*78.1 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.1*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.993*	*1.000*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*353*	*589*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*41.5*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*36.5*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*55.2*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.21*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1688*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*78.1*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*350.5*
Effective width, Wv (Eq. 15-29) ft	*42.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*-2.15*
Bicycle level of service (Exhibit 15-4)	*A*
Notes	
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain. 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 and for v>200 veh/h. 4. For the analysis direction only 5. Exhibit 15-20 provides coefficients a and b for Equation 15-10. 6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.	

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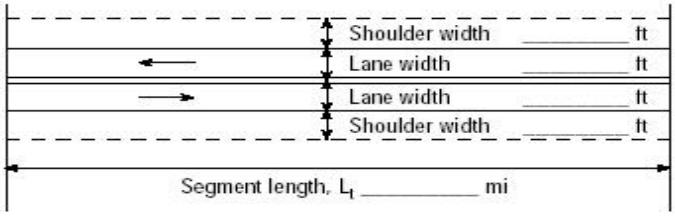
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*MTD*	Highway / Direction of Travel	*Yardley Newtown Rd WB*
Agency or Company	*Pennoni*	From/To	*Mirror Lake/Langhorne Yardley*
Date Performed	*9/4/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*AM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.93*

No-passing zone *100%*

Show North Arrow

Analysis direction vol., V_d	*601*veh/h	% Trucks and Buses , P_T	*1* %
Opposing direction vol., V_o	*278*veh/h	% Recreational vehicles, P_R	*0%*
Shoulder width ft	*15.0*	Access points *mi*	*32*/mi
Lane Width ft	*12.0*		
Segment Length mi	*1.1*		

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.1*	*1.4*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.999*	*0.996*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*647*	*300*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*50.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*8.0 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*3.3 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*42.0 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*31.3 mi/h*
		Percent free flow speed, PFFS	*74.5 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*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], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*646*	*299*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*56.4*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*33.2*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*79.1*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*D*
Volume to capacity ratio, *v/c*	*0.38*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1693*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1698*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*74.5*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*646.2*
Effective width, Wv (Eq. 15-29) ft	*42.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*-3.53*
Bicycle level of service (Exhibit 15-4)	*A*
Notes	

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
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 and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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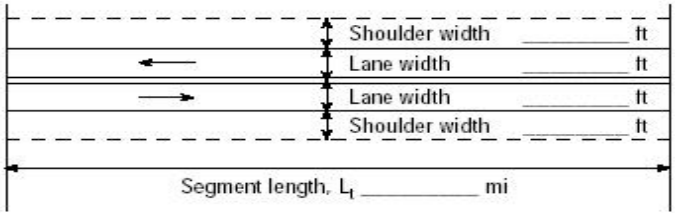
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*MTD*	Highway / Direction of Travel	*Yardley Newtown Rd EB*
Agency or Company	*Pennoni*	From/To	*Mirror Lake/Langhorne Yardley*
Date Performed	*9/4/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*PM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.90*

No-passing zone *100%*

Analysis direction vol., V_d	*374*veh/h
Opposing direction vol., V_o	*212*veh/h
Shoulder width ft	*15.0*
Lane Width ft	*12.0*
Segment Length mi	*1.1*
% Trucks and Buses , P_T	*3* %
% Recreational vehicles, P_R	*0%*
Access points *mi*	*32*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.3*	*1.5*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.991*	*0.985*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*419*	*239*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*50.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*8.0 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*3.7 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*42.0 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*33.1 mi/h*
		Percent free flow speed, PFFS	*78.9 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*0.997*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*416*	*236*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*39.5*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*48.4*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*70.4*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.25*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1675*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1695*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*78.9*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*415.6*
Effective width, Wv (Eq. 15-29) ft	*42.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*-3.27*
Bicycle level of service (Exhibit 15-4)	*A*
Notes	

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
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 and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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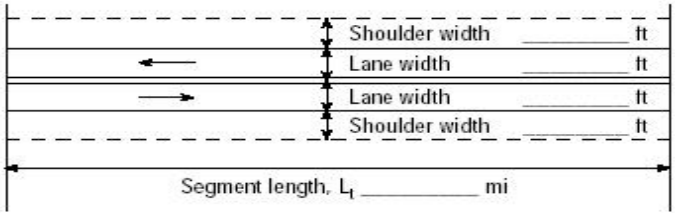
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Yardley Newtown Rd WB*
Agency or Company	*Pennoni*	From/To	*Mirror Lake/Langhorne Yardley*
Date Performed	*9/4/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*PM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Show North Arrow

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.94*

No-passing zone *100%*

% Trucks and Buses , P_T *4 %*

% Recreational vehicles, P_R *0%*

Access points *mi* *32*/mi

Analysis direction vol., V_d *304*veh/h

Opposing direction vol., V_o *311*veh/h

Shoulder width ft *15.0*

Lane Width ft *12.0*

Segment Length mi *1.1*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.4*	*1.4*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.984*	*0.984*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*329*	*336*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*50.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*8.0 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*3.1 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*42.0 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*33.7 mi/h*
		Percent free flow speed, PFFS	*80.3 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.1*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.996*	*0.996*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*325*	*332*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*35.4*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*53.7*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*62.0*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.19*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1673*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1693*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*80.3*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*323.4*
Effective width, Wv (Eq. 15-29) ft	*42.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*-3.13*
Bicycle level of service (Exhibit 15-4)	*A*
Notes	
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain. 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 and for v>200 veh/h. 4. For the analysis direction only 5. Exhibit 15-20 provides coefficients a and b for Equation 15-10. 6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.	

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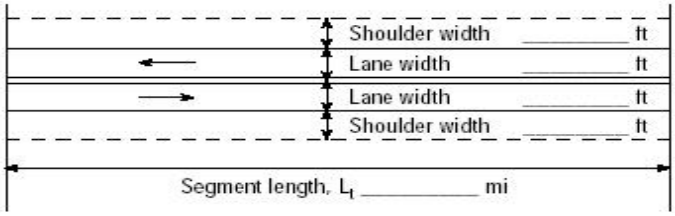
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Afton Ave EB*
Agency or Company	*Pennoni*	From/To	*Langhorne Yardley Rd/Main St*
Date Performed	*9/4/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*AM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.85*

No-passing zone *100%*

Show North Arrow

Analysis direction vol., V_d	*433*veh/h	% Trucks and Buses , P_T	*4* %
Opposing direction vol., V_o	*237*veh/h	% Recreational vehicles, P_R	*0%*
Shoulder width ft	*10.0*	Access points *mi*	*33*/mi
Lane Width ft	*12.0*		
Segment Length mi	*0.8*		

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.2*	*1.4*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.992*	*0.984*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*514*	*283*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*50.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*8.3 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*3.5 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*41.8 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*32.1 mi/h*
		Percent free flow speed, PFFS	*76.9 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*0.996*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*509*	*280*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*47.6*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*39.3*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*73.0*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.30*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1673*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1693*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*76.9*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*509.4*
Effective width, Wv (Eq. 15-29) ft	*32.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*0.80*
Bicycle level of service (Exhibit 15-4)	*A*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
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 and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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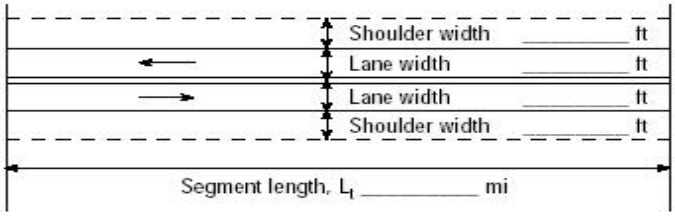
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*MTD*	Highway / Direction of Travel	*Afton Ave WB*
Agency or Company	*Pennoni*	From/To	*Langhorne Yardley Rd/Main St*
Date Performed	*9/4/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*AM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Show North Arrow

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Analysis direction vol., V_d	*362*veh/h	Grade Length mi	Up/down
Opposing direction vol., V_o	*316*veh/h	Peak-hour factor, PHF	*0.85*
Shoulder width ft	*10.0*	No-passing zone	*100*%
Lane Width ft	*12.0*	% Trucks and Buses , P_T	*1* %
Segment Length mi	*0.8*	% Recreational vehicles, P_R	*0*%
		Access points *mi*	*16*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.3*	*1.3*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.997*	*0.997*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*427*	*373*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*50.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*4.0 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*2.9 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*46.0 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*36.9 mi/h*
		Percent free flow speed, PFFS	*80.3* %

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*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], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*426*	*372*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*44.3*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*44.9*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*68.3*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.25*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1695*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1698*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*80.3*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*425.9*
Effective width, Wv (Eq. 15-29) ft	*32.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*-0.04*
Bicycle level of service (Exhibit 15-4)	*A*
Notes	
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain. 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 and for v>200 veh/h. 4. For the analysis direction only 5. Exhibit 15-20 provides coefficients a and b for Equation 15-10. 6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.	

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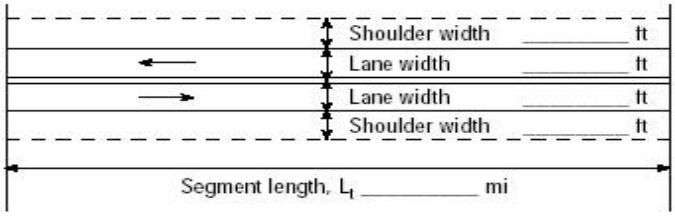
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Afton Ave EB*
Agency or Company	*Pennoni*	From/To	*Langhorne Yardley Rd/Main St*
Date Performed	*9/4/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*PM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.95*

No-passing zone *100%*

Show North Arrow

Analysis direction vol., V_d	*389*veh/h	% Trucks and Buses , P_T	*1* %
Opposing direction vol., V_o	*345*veh/h	% Recreational vehicles, P_R	*0%*
Shoulder width ft	*10.0*	Access points *mi*	*33*/mi
Lane Width ft	*12.0*		
Segment Length mi	*0.8*		

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.3*	*1.3*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.997*	*0.997*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*411*	*364*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*50.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, FFS=S_{FM}+0.00776(*v*/ $f_{HV,ATS}$)		Adj. for access points[4], f_A (Exhibit 15-8)	*8.3 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*2.9 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*41.8 mi/h*
		Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*32.8 mi/h*
		Percent free flow speed, PFFS	*78.6 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*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], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*409*	*364*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*43.5*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*46.5*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*68.1*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.24*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1695*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1698*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*78.6*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*409.5*
Effective width, Wv (Eq. 15-29) ft	*32.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*-0.06*
Bicycle level of service (Exhibit 15-4)	*A*
Notes	
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain. 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 and for v>200 veh/h. 4. For the analysis direction only 5. Exhibit 15-20 provides coefficients a and b for Equation 15-10. 6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.	

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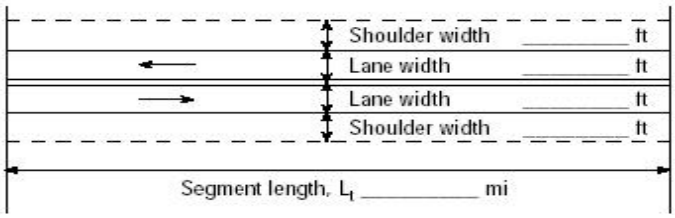
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Afton Ave WB*
Agency or Company	*Pennoni*	From/To	*Langhorne Yardley Rd/Main St*
Date Performed	*9/4/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*PM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.86*

No-passing zone *100%*

% Trucks and Buses , P_T *2 %*

% Recreational vehicles, P_R *0%*

Access points *mi* *16*/mi

Show North Arrow

Analysis direction vol., V_d *380*veh/h

Opposing direction vol., V_o *342*veh/h

Shoulder width ft *10.0*

Lane Width ft *12.0*

Segment Length mi *0.8*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.3*	*1.3*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.994*	*0.994*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*445*	*400*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*50.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*4.0 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*2.7 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*46.0 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*36.7 mi/h*
		Percent free flow speed, PFFS	*79.9 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*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], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*442*	*398*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*45.8*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*44.1*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*69.0*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.26*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1690*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1697*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*79.9*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*441.9*
Effective width, Wv (Eq. 15-29) ft	*32.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*0.21*
Bicycle level of service (Exhibit 15-4)	*A*
Notes	
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain. 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 and for v>200 veh/h. 4. For the analysis direction only 5. Exhibit 15-20 provides coefficients a and b for Equation 15-10. 6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.	

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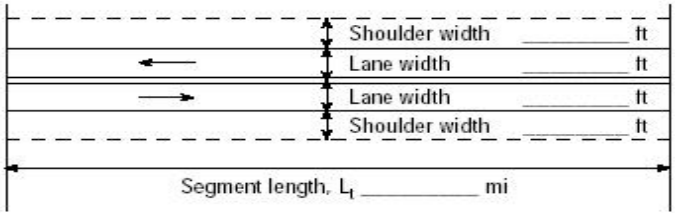
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Oxford Valley Rd NB*
Agency or Company	*Pennoni*	From/To	*Big Oak Rd/Stony Hill Rd*
Date Performed	*9/4/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*AM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Show North Arrow

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☐ Level ☑ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.88*

No-passing zone *40%*

Analysis direction vol., V_d *463*veh/h

Opposing direction vol., V_o *456*veh/h

% Trucks and Buses , P_T *2 %*

% Recreational vehicles, P_R *0%*

Access points *mi* *20*/mi

Shoulder width ft *9.0*

Lane Width ft *13.0*

Segment Length mi *1.5*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.8*	*1.8*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.1*	*1.1*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.984*	*0.984*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*0.96*	*0.95*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*557*	*554*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*45.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*5.0 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*0.3 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*40.0 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*31.0 mi/h*
		Percent free flow speed, PFFS	*77.6 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.2*	*1.2*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.996*	*0.996*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*0.96*	*0.96*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*550*	*542*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*55.0*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*32.2*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*71.2*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.33*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1606*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1625*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*77.6*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*526.1*
Effective width, Wv (Eq. 15-29) ft	*31.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*0.61*
Bicycle level of service (Exhibit 15-4)	*A*
Notes	

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
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 and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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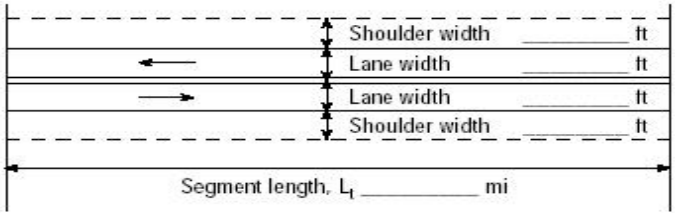
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Oxford Valley Rd SB*
Agency or Company	*Pennoni*	From/To	*Big Oak Rd/Stony Hill Rd*
Date Performed	*9/4/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*AM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Show North Arrow

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☐ Level ☑ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.96*

No-passing zone *100%*

% Trucks and Buses , P_T *2 %*

% Recreational vehicles, P_R *0%*

Access points *mi* *20*/mi

Analysis direction vol., V_d *457*veh/h

Opposing direction vol., V_o *441*veh/h

Shoulder width ft *9.0*

Lane Width ft *13.0*

Segment Length mi *1.5*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.8*	*1.9*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.1*	*1.1*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.984*	*0.982*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*0.94*	*0.93*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*515*	*503*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*45.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*5.0 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*2.2 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*40.0 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*29.9 mi/h*
		Percent free flow speed, PFFS	*74.7 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.4*	*1.4*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.992*	*0.992*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*0.95*	*0.94*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*505*	*493*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*51.5*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*40.3*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*71.9*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*D*
Volume to capacity ratio, *v/c*	*0.30*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1589*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1619*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*74.7*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*476.0*
Effective width, Wv (Eq. 15-29) ft	*31.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*0.56*
Bicycle level of service (Exhibit 15-4)	*A*
Notes	

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
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 and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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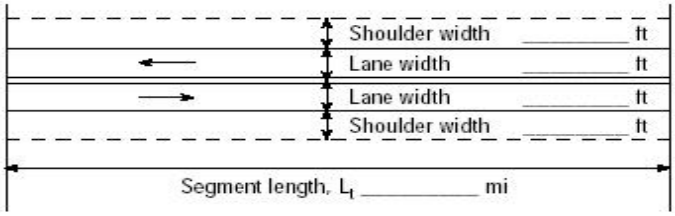
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Oxford Valley Rd NB*
Agency or Company	*Pennoni*	From/To	*Big Oak Rd/Stony Hill Rd*
Date Performed	*9/4/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*PM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Analysis direction vol., V_d *577*veh/h

Opposing direction vol., V_o *531*veh/h

Shoulder width ft *9.0*

Lane Width ft *13.0*

Segment Length mi *1.5*

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☐ Level ☑ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.91*

No-passing zone *100*%

% Trucks and Buses , P_T *1* %

% Recreational vehicles, P_R *0*%

Access points *mi* *20*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.7*	*1.7*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.1*	*1.1*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.993*	*0.993*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*0.97*	*0.97*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*658*	*606*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*45.0* *mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0* *mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*5.0* *mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*1.8* *mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*40.0* *mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*28.4* *mi/h*
		Percent free flow speed, PFFS	*71.0* %

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.2*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*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], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*0.98*	*0.97*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*647*	*603*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*59.9*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*32.6*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*76.8*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*D*
Volume to capacity ratio, *v/c*	*0.39*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1637*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1649*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*71.0*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*634.1*
Effective width, Wv (Eq. 15-29) ft	*31.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*0.48*
Bicycle level of service (Exhibit 15-4)	*A*
Notes	
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain. 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 and for v>200 veh/h. 4. For the analysis direction only 5. Exhibit 15-20 provides coefficients a and b for Equation 15-10. 6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.	

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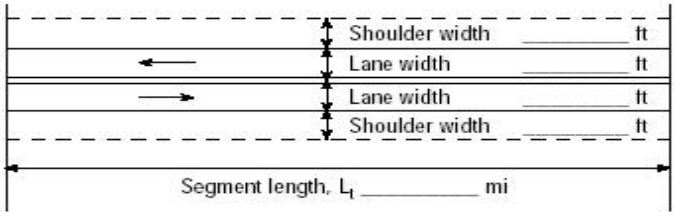
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Oxford Valley Rd SB*
Agency or Company	*Pennoni*	From/To	*Big Oak Rd/Stony Hill Rd*
Date Performed	*9/4/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*PM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☐ Level ☑ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.89*

No-passing zone *100%*

% Trucks and Buses , P_T *2 %*

% Recreational vehicles, P_R *0%*

Access points *mi* *20*/mi

Show North Arrow

Analysis direction vol., V_d *551*veh/h

Opposing direction vol., V_o *533*veh/h

Shoulder width ft *9.0*

Lane Width ft *13.0*

Segment Length mi *1.5*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.7*	*1.7*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.1*	*1.1*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.986*	*0.986*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*0.97*	*0.97*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*647*	*626*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*45.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*5.0 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*1.7 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*40.0 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*28.4 mi/h*
		Percent free flow speed, PFFS	*71.0 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.2*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*0.996*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*0.97*	*0.97*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*638*	*620*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*59.9*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*32.7*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*76.5*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*D*
Volume to capacity ratio, *v/c*	*0.38*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1626*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1649*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*71.0*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*619.1*
Effective width, Wv (Eq. 15-29) ft	*31.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*0.69*
Bicycle level of service (Exhibit 15-4)	*A*
Notes	

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
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 and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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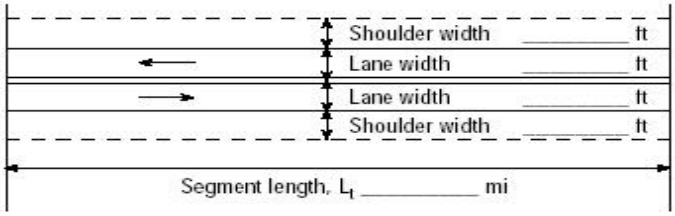
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Bristol Oxford Valley Rd NB*
Agency or Company	*Pennoni*	From/To	*Woodbourne Rd/New Falls Rd*
Date Performed	*9/4/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*AM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Show North Arrow

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.87*

No-passing zone *100%*

Analysis direction vol., V_d *532*veh/h

Opposing direction vol., V_o *379*veh/h

% Trucks and Buses , P_T *3 %*

% Recreational vehicles, P_R *0%*

Shoulder width ft *10.0*

Lane Width ft *12.0*

Segment Length mi *1.7*

Access points *mi* *25*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.1*	*1.3*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.997*	*0.991*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*613*	*440*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*50.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*6.3 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*2.5 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*43.8 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*33.1 mi/h*
		Percent free flow speed, PFFS	*75.6 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*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], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*611*	*436*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*56.8*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*36.1*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*77.9*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.36*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1685*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*75.6*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*611.5*
Effective width, Wv (Eq. 15-29) ft	*32.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*0.62*
Bicycle level of service (Exhibit 15-4)	*A*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
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 and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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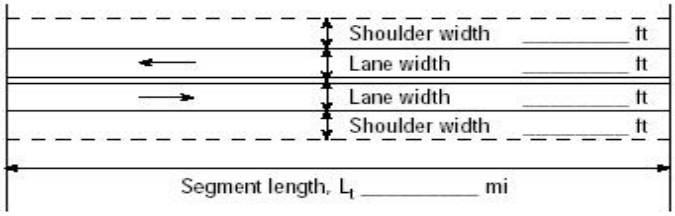
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Bristol Oxford Valley Rd SB*
Agency or Company	*Pennoni*	From/To	*Woodbourne Rd/New Falls Rd*
Date Performed	*9/4/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*AM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Show North Arrow

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.88*

No-passing zone *100%*

Analysis direction vol., V_d	*523*veh/h
Opposing direction vol., V_o	*466*veh/h
Shoulder width ft	*10.0*
Lane Width ft	*12.0*
Segment Length mi	*1.7*
% Trucks and Buses , P_T	*2 %*
% Recreational vehicles, P_R	*0%*
Access points *mi*	*25*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.1*	*1.2*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.998*	*0.996*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*596*	*532*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*50.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*6.3 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*2.1 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*43.8 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*32.9 mi/h*
		Percent free flow speed, PFFS	*75.2 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*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], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*594*	*530*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*57.2*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*36.0*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*76.2*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.35*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1693*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*75.2*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*594.3*
Effective width, Wv (Eq. 15-29) ft	*32.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*0.36*
Bicycle level of service (Exhibit 15-4)	*A*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
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 and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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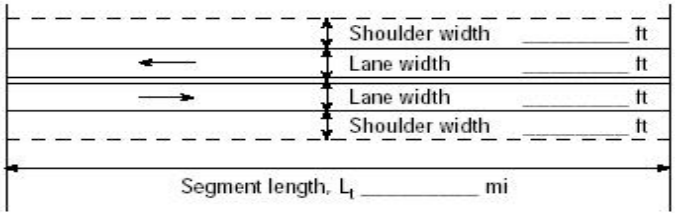
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Bristol Oxford Valley Rd NB*
Agency or Company	*Pennoni*	From/To	*Woodbourne Rd/New Falls Rd*
Date Performed	*9/4/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*PM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Analysis direction vol., V_d *576*veh/h

Opposing direction vol., V_o *654*veh/h

Shoulder width ft *10.0*

Lane Width ft *12.0*

Segment Length mi *1.7*

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.93*

No-passing zone *100*%

% Trucks and Buses , P_T *2* %

% Recreational vehicles, P_R *0*%

Access points *mi* *25*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.1*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.998*	*0.998*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*621*	*705*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*50.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*6.3 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*1.5 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*43.8 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*32.0 mi/h*
		Percent free flow speed, PFFS	*73.1* %

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*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], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*619*	*703*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*60.4*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*30.4*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*74.6*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*D*
Volume to capacity ratio, *v/c*	*0.37*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1697*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*73.1*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*619.4*
Effective width, Wv (Eq. 15-29) ft	*32.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*0.38*
Bicycle level of service (Exhibit 15-4)	*A*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
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 and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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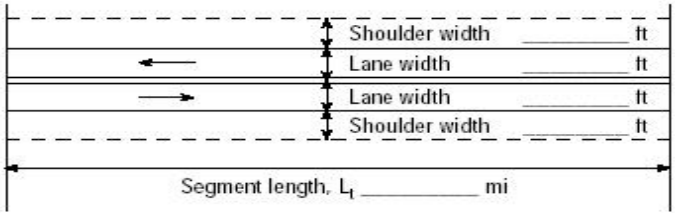
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Bristol Oxford Valley Rd SB*
Agency or Company	*Pennoni*	From/To	*Woodbourne Rd/New Falls Rd*
Date Performed	*9/4/2015*	Jurisdiction	*PennDOT*
Analysis Time Period	*PM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Analysis direction vol., V_d *661* veh/h

Opposing direction vol., V_o *544* veh/h

Shoulder width ft *10.0*

Lane Width ft *12.0*

Segment Length mi *1.7*

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.96*

No-passing zone *100*%

% Trucks and Buses , P_T *1* %

% Recreational vehicles, P_R *0*%

Access points *mi* *25*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.1*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.999*	*0.999*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*689*	*567*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*50.0* *mi/h*
Total demand flow rate, both directions, v		Adj. for lane and shoulder width,[4] f_{LS} (Exhibit 15-7)	*0.0* *mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*6.3* *mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*1.9* *mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*43.8* *mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*32.1* *mi/h*
		Percent free flow speed, PFFS	*73.3* %

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*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], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*689*	*567*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*62.0*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*31.8*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*79.4*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*D*
Volume to capacity ratio, *v/c*	*0.41*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1698*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*73.3*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*688.5*
Effective width, Wv (Eq. 15-29) ft	*32.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*0.20*
Bicycle level of service (Exhibit 15-4)	*A*
Notes	
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain. 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 and for v>200 veh/h. 4. For the analysis direction only 5. Exhibit 15-20 provides coefficients a and b for Equation 15-10. 6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.	

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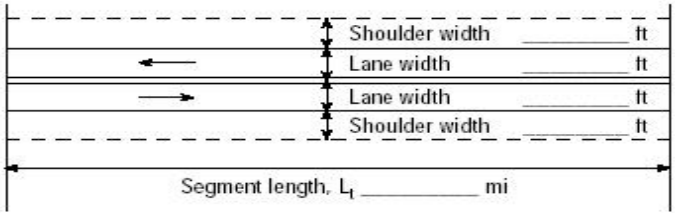
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*MTD*	Highway / Direction of Travel	*Lower Ferry Rd (CR 643) NB*
Agency or Company	*Pennoni*	From/To	*CR 546 to CR 636*
Date Performed	*9/8/2015*	Jurisdiction	*NJDOT*
Analysis Time Period	*AM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Show North Arrow

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.77*

No-passing zone *100%*

% Trucks and Buses , P_T *5 %*

% Recreational vehicles, P_R *0%*

Access points *mi* *35*/mi

Analysis direction vol., V_d *132*veh/h

Opposing direction vol., V_o *77*veh/h

Shoulder width ft *8.0*

Lane Width ft *10.0*

Segment Length mi *2.3*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.6*	*1.9*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.971*	*0.957*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*177*	*104*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*45.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*1.1 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*8.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*2.5 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*35.2 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*30.5 mi/h*
		Percent free flow speed, PFFS	*86.8 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.1*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.995*	*0.995*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*172*	*101*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*18.9*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*52.8*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*52.2*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*B*
Volume to capacity ratio, *v/c*	*0.10*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1627*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1692*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*86.8*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*171.4*
Effective width, Wv (Eq. 15-29) ft	*32.12*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*0.50*
Bicycle level of service (Exhibit 15-4)	*A*
Notes	

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
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 and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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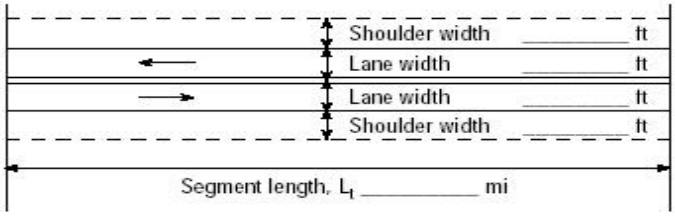
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Lower Ferry Rd (CR 643) SB*
Agency or Company	*Pennoni*	From/To	*CR 546 to CR 636*
Date Performed	*9/8/2015*	Jurisdiction	*NJDOT*
Analysis Time Period	*AM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.89*

No-passing zone *100*%

Analysis direction vol., V_d *235*veh/h

Opposing direction vol., V_o *108*veh/h

% Trucks and Buses , P_T *5* %

% Recreational vehicles, P_R *0*%

Shoulder width ft *8.0*

Lane Width ft *10.0*

Segment Length mi *2.3*

Access points *mi* *35*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.4*	*1.8*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.980*	*0.962*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*269*	*126*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*45.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*1.1 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*8.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*2.8 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*35.2 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*29.3 mi/h*
		Percent free flow speed, PFFS	*83.3* %

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.1*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.995*	*0.995*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*265*	*122*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*27.3*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*49.9*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*61.5*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.16*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1635*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1692*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*83.3*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*264.0*
Effective width, Wv (Eq. 15-29) ft	*26.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*2.50*
Bicycle level of service (Exhibit 15-4)	*B*
Notes	
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain. 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 and for v>200 veh/h. 4. For the analysis direction only 5. Exhibit 15-20 provides coefficients a and b for Equation 15-10. 6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.	

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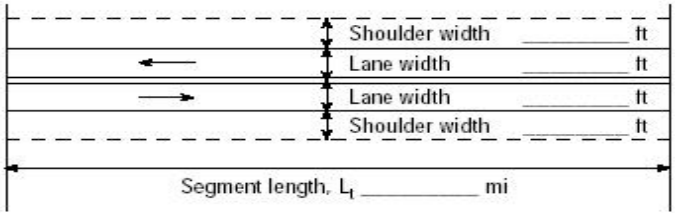
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Lower Ferry Rd (CR 643) NB*
Agency or Company	*Pennoni*	From/To	*CR 546 to CR 636*
Date Performed	*9/8/2015*	Jurisdiction	*NJDOT*
Analysis Time Period	*PM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Analysis direction vol., V_d *241*veh/h

Opposing direction vol., V_o *145*veh/h

Shoulder width ft *8.0*

Lane Width ft *10.0*

Segment Length mi *2.3*

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.96*

No-passing zone *100*%

% Trucks and Buses , P_T *4* %

% Recreational vehicles, P_R *4*%

Access points *mi* *35*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.4*	*1.7*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.984*	*0.973*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*255*	*155*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*45.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*1.1 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*8.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*3.3 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*35.2 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*28.7 mi/h*
		Percent free flow speed, PFFS	*81.6 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.1*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.996*	*0.996*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*252*	*152*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*26.2*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*54.4*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*60.1*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.15*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1654*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1693*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*81.6*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*251.0*
Effective width, Wv (Eq. 15-29) ft	*26.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*2.18*
Bicycle level of service (Exhibit 15-4)	*B*
Notes	
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain. 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 and for v>200 veh/h. 4. For the analysis direction only 5. Exhibit 15-20 provides coefficients a and b for Equation 15-10. 6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.	

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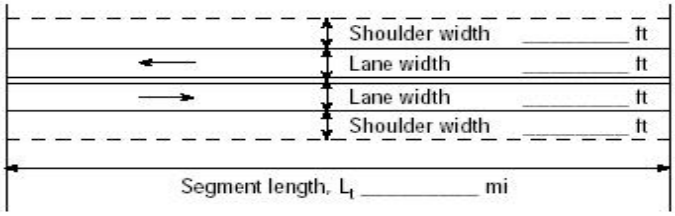
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Lower Ferry Rd (CR 643) SB*
Agency or Company	*Pennoni*	From/To	*CR 546 to CR 636*
Date Performed	*9/8/2015*	Jurisdiction	*NJDOT*
Analysis Time Period	*PM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Analysis direction vol., V_d *166*veh/h

Opposing direction vol., V_o *211*veh/h

Shoulder width ft *8.0*

Lane Width ft *10.0*

Segment Length mi *2.3*

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.86*

No-passing zone *100*%

% Trucks and Buses , P_T *1* %

% Recreational vehicles, P_R *0*%

Access points *mi* *35*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.5*	*1.5*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.995*	*0.995*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*194*	*247*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*45.0* *mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*1.1* *mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*8.8* *mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*3.7* *mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*35.2* *mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*28.0* *mi/h*
		Percent free flow speed, PFFS	*79.8* %

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.1*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.999*	*0.999*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*193*	*246*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*22.2*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*59.2*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*48.2*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.11*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1692*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1698*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*79.8*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*193.0*
Effective width, Wv (Eq. 15-29) ft	*26.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*1.30*
Bicycle level of service (Exhibit 15-4)	*A*
Notes	
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain. 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 and for v>200 veh/h. 4. For the analysis direction only 5. Exhibit 15-20 provides coefficients a and b for Equation 15-10. 6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.	

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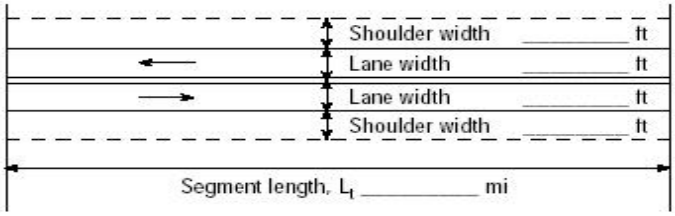
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*CR 546 EB*
Agency or Company	*Pennoni*	From/To	*Route 29 to Bear Tavern Rd*
Date Performed	*9/8/2015*	Jurisdiction	*NJDOT*
Analysis Time Period	*AM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Show North Arrow

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.91*

No-passing zone *100%*

% Trucks and Buses , P_T *0 %*

% Recreational vehicles, P_R *0%*

Access points *mi* *31*/mi

Analysis direction vol., V_d *273*veh/h

Opposing direction vol., V_o *211*veh/h

Shoulder width ft *6.0*

Lane Width ft *12.0*

Segment Length mi *1.3*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.4*	*1.5*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*1.000*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*300*	*232*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*7.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*3.8 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*47.3 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*39.3 mi/h*
		Percent free flow speed, PFFS	*83.2 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.1*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*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], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*300*	*232*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*30.8*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*56.9*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*62.9*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.18*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1700*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*83.2*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*300.0*
Effective width, Wv (Eq. 15-29) ft	*24.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*1.81*
Bicycle level of service (Exhibit 15-4)	*B*
Notes	
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain. 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 and for v>200 veh/h. 4. For the analysis direction only 5. Exhibit 15-20 provides coefficients a and b for Equation 15-10. 6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.	

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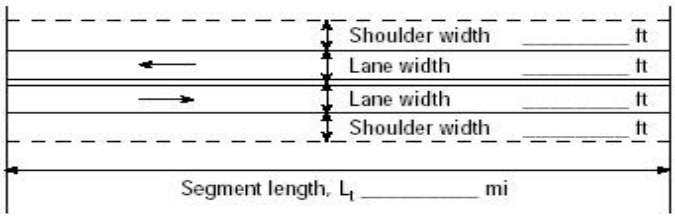
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*CR 546 WB*
Agency or Company	*Pennoni*	From/To	*Route 29 to Bear Tavern Rd*
Date Performed	*9/8/2015*	Jurisdiction	*NJDOT*
Analysis Time Period	*AM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Show North Arrow

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.96*

No-passing zone *100%*

Analysis direction vol., V_d *620*veh/h

% Trucks and Buses , P_T *0* %

Opposing direction vol., V_o *235*veh/h

% Recreational vehicles, P_R *0%*

Shoulder width ft *6.0*

Access points *mi* *31*/mi

Lane Width ft *12.0*

Segment Length mi *1.3*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.1*	*1.5*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*1.000*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*646*	*245*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*7.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*3.7 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*47.3 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*36.6 mi/h*
		Percent free flow speed, PFFS	*77.5 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*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], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*646*	*245*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*55.4*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*32.7*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*79.1*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.38*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1700*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*77.5*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*645.8*
Effective width, Wv (Eq. 15-29) ft	*24.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*2.20*
Bicycle level of service (Exhibit 15-4)	*B*
Notes	
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain. 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 and for v>200 veh/h. 4. For the analysis direction only 5. Exhibit 15-20 provides coefficients a and b for Equation 15-10. 6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.	

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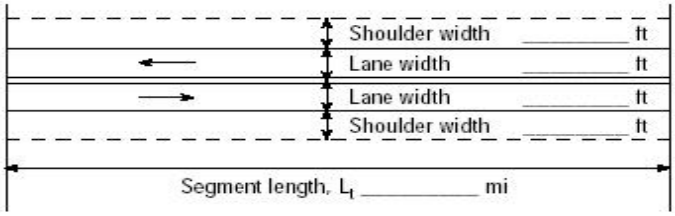
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*MTD*	Highway / Direction of Travel	*CR 546 EB*
Agency or Company	*Pennoni*	From/To	*Route 29 to Bear Tavern Rd*
Date Performed	*9/8/2015*	Jurisdiction	*NJDOT*
Analysis Time Period	*PM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Show North Arrow

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Analysis direction vol., V_d	*686*veh/h	Grade Length mi	Up/down
Opposing direction vol., V_o	*248*veh/h	Peak-hour factor, PHF	*0.91*
Shoulder width ft	*6.0*	No-passing zone	*100*%
Lane Width ft	*12.0*	% Trucks and Buses , P_T	*0* %
Segment Length mi	*1.3*	% Recreational vehicles, P_R	*0*%
		Access points *mi*	*31*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.1*	*1.4*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*1.000*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*754*	*273*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*7.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*3.5 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*47.3 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*35.8 mi/h*
		Percent free flow speed, PFFS	*75.7 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*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], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*754*	*273*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*61.4*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*30.6*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*83.9*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.44*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1700*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*75.7*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*753.8*
Effective width, Wv (Eq. 15-29) ft	*24.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*2.28*
Bicycle level of service (Exhibit 15-4)	*B*
Notes	
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain. 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 and for v>200 veh/h. 4. For the analysis direction only 5. Exhibit 15-20 provides coefficients a and b for Equation 15-10. 6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.	

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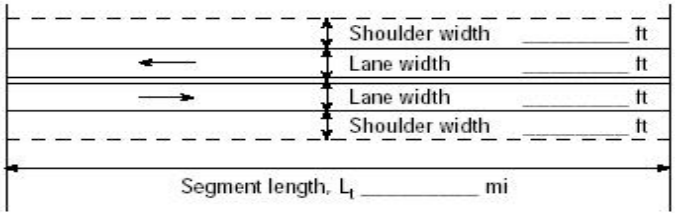
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*MTD*	Highway / Direction of Travel	*CR 546 WB*
Agency or Company	*Pennoni*	From/To	*Route 29 to Bear Tavern Rd*
Date Performed	*9/8/2015*	Jurisdiction	*NJDOT*
Analysis Time Period	*PM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Show North Arrow

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.90*

No-passing zone *100%*

% Trucks and Buses , P_T *2 %*

% Recreational vehicles, P_R *0%*

Access points *mi* *31*/mi

Analysis direction vol., V_d	*269*veh/h
Opposing direction vol., V_o	*459*veh/h
Shoulder width ft	*6.0*
Lane Width ft	*12.0*
Segment Length mi	*1.3*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.4*	*1.2*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.992*	*0.996*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*301*	*512*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*7.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*2.2 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*47.3 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*38.7 mi/h*
		Percent free flow speed, PFFS	*81.9 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.1*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.998*	*1.000*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*299*	*510*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*36.7*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*39.3*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*51.2*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.18*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1693*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*81.9*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*298.9*
Effective width, Wv (Eq. 15-29) ft	*24.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*2.25*
Bicycle level of service (Exhibit 15-4)	*B*
Notes	

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
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 and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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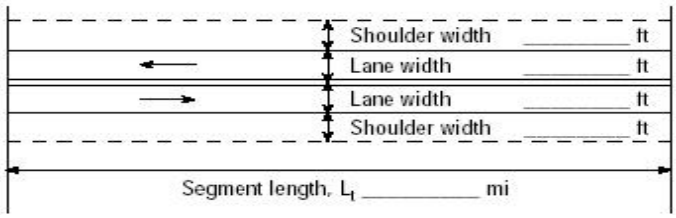
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*CR 546 EB*
Agency or Company	*Pennoni*	From/To	*Bear Tavern Rd/Jacobs Creek Rd*
Date Performed	*9/8/2015*	Jurisdiction	*NJDOT*
Analysis Time Period	*AM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Show North Arrow

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☐ Level ☑ Rolling

Grade Length mi Up/down	
Peak-hour factor, PHF	*0.89*
No-passing zone	*74%*
% Trucks and Buses , P_T	*2 %*
% Recreational vehicles, P_R	*0%*
Access points *mi*	*38*/mi
Analysis direction vol., V_d	*805*veh/h
Opposing direction vol., V_o	*225*veh/h
Shoulder width ft	*8.0*
Lane Width ft	*13.0*
Segment Length mi	*1.2*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.3*	*2.2*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.1*	*1.1*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.994*	*0.977*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*0.79*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*910*	*328*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*9.5 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*2.8 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*45.5 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*33.1 mi/h*
		Percent free flow speed, PFFS	*72.7 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.7*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*0.986*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*0.83*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*904*	*309*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*67.6*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*21.4*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*83.5*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*D*

Volume to capacity ratio, *v/c*	*0.54*
Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1397*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1428*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*72.7*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*904.5*
Effective width, Wv (Eq. 15-29) ft	*29.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*1.49*
Bicycle level of service (Exhibit 15-4)	*A*
Notes	

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
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 and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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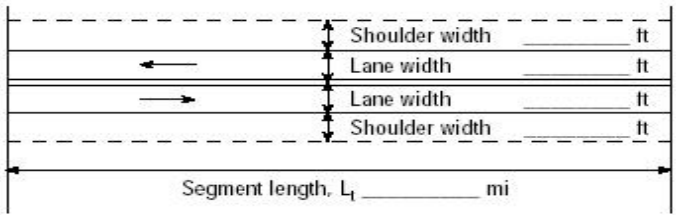
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*CR 546 WB*
Agency or Company	*Pennoni*	From/To	*Bear Tavern Rd/Jacobs Creek Rd*
Date Performed	*9/8/2015*	Jurisdiction	*NJDOT*
Analysis Time Period	*AM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Show North Arrow

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☐ Level ☑ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.89*

No-passing zone *74%*

% Trucks and Buses , P_T *2 %*

% Recreational vehicles, P_R *0%*

Access points *mi* *38*/mi

Analysis direction vol., V_d *275*veh/h

Opposing direction vol., V_o *265*veh/h

Shoulder width ft *8.0*

Lane Width ft *13.0*

Segment Length mi *1.2*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*2.1*	*2.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.1*	*1.1*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.978*	*0.978*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*0.84*	*0.83*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*376*	*367*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*9.5 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*2.6 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*45.5 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*37.2 mi/h*
		Percent free flow speed, PFFS	*81.7 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.6*	*1.7*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.988*	*0.986*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*0.85*	*0.85*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*368*	*355*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*39.2*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*48.1*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*63.7*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*

Volume to capacity ratio, *v/c*	*0.22*
Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1449*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1478*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*81.7*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*309.0*
Effective width, Wv (Eq. 15-29) ft	*29.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*0.94*
Bicycle level of service (Exhibit 15-4)	*A*
Notes	
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain. 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 and for v>200 veh/h. 4. For the analysis direction only 5. Exhibit 15-20 provides coefficients a and b for Equation 15-10. 6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.	

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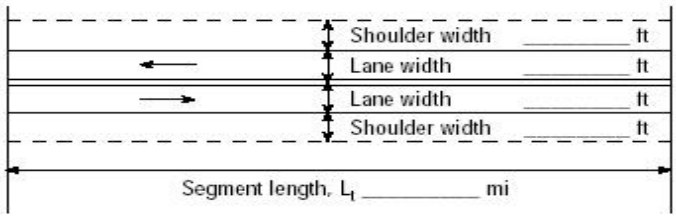
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*CR 546 EB*
Agency or Company	*Pennoni*	From/To	*Bear Tavern Rd/Jacobs Creek Rd*
Date Performed	*9/8/2015*	Jurisdiction	*NJDOT*
Analysis Time Period	*PM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Show North Arrow

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☐ Level ☑ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.88*

No-passing zone *74%*

% Trucks and Buses , P_T *0 %*

% Recreational vehicles, P_R *0%*

Access points *mi* *38*/mi

Analysis direction vol., V_d *317*veh/h

Opposing direction vol., V_o *313*veh/h

Shoulder width ft *8.0*

Lane Width ft *13.0*

Segment Length mi *1.2*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*2.0*	*2.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.1*	*1.1*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*1.000*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*0.87*	*0.87*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*414*	*409*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*9.5 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*2.3 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*45.5 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*36.8 mi/h*
		Percent free flow speed, PFFS	*80.8 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.6*	*1.6*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*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], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*0.88*	*0.88*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*409*	*404*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*43.0*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*44.0*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*65.1*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*

Volume to capacity ratio, *v/c*	*0.24*
Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1530*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1530*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*80.8*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*360.2*
Effective width, Wv (Eq. 15-29) ft	*29.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*0.58*
Bicycle level of service (Exhibit 15-4)	*A*
Notes	

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
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 and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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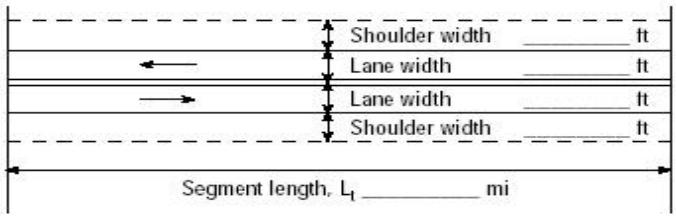
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*CR 546 WB*
Agency or Company	*Pennoni*	From/To	*Bear Tavern Rd/Jacobs Creek Rd*
Date Performed	*9/8/2015*	Jurisdiction	*NJDOT*
Analysis Time Period	*PM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Show North Arrow

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☐ Level ☑ Rolling

Grade Length mi Up/down

Analysis direction vol., V_d	*836*veh/h
Opposing direction vol., V_o	*260*veh/h
Shoulder width ft	*8.0*
Lane Width ft	*13.0*
Segment Length mi	*1.2*
Peak-hour factor, PHF	*0.95*
No-passing zone	*74%*
% Trucks and Buses , P_T	*1 %*
% Recreational vehicles, P_R	*0%*
Access points *mi*	*38*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.3*	*2.2*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.1*	*1.1*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.997*	*0.988*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*0.81*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*883*	*342*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*9.5 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*2.7 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*45.5 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*33.3 mi/h*
		Percent free flow speed, PFFS	*73.1 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.7*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*0.993*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*0.84*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*880*	*328*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*67.4*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*22.4*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*83.7*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*D*

Volume to capacity ratio, *v/c*	*0.52*
Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1429*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1453*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*73.1*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*880.0*
Effective width, Wv (Eq. 15-29) ft	*29.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*1.24*
Bicycle level of service (Exhibit 15-4)	*A*
Notes	

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
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 and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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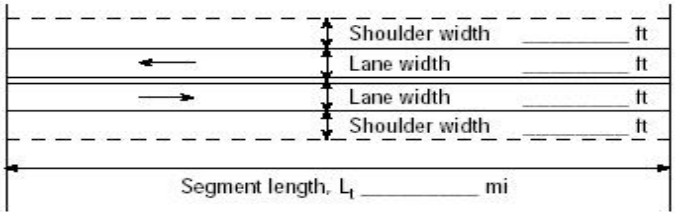
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*CR 546 EB*
Agency or Company	*Pennoni*	From/To	*Jacobs Creek Rd/Scotch Rd*
Date Performed	*9/8/2015*	Jurisdiction	*NJDOT*
Analysis Time Period	*AM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Show North Arrow

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.93*

No-passing zone *100%*

Analysis direction vol., V_d *871*veh/h

Opposing direction vol., V_o *257*veh/h

% Trucks and Buses , P_T *2 %*

% Recreational vehicles, P_R *0%*

Shoulder width ft *8.0*

Lane Width ft *12.0*

Segment Length mi *0.7*

Access points *mi* *14*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.0*	*1.4*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*0.992*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*937*	*279*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*3.5 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*3.5 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*51.5 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*38.5 mi/h*
		Percent free flow speed, PFFS	*74.8 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*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], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*937*	*277*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*68.7*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*30.0*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*91.9*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*D*
Volume to capacity ratio, *v/c*	*0.55*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1686*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1697*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*74.8*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*936.6*
Effective width, Wv (Eq. 15-29) ft	*28.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*1.79*
Bicycle level of service (Exhibit 15-4)	*B*
Notes	
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain. 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 and for v>200 veh/h. 4. For the analysis direction only 5. Exhibit 15-20 provides coefficients a and b for Equation 15-10. 6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.	

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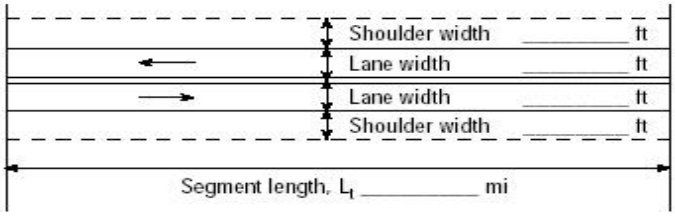
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*CR 546 WB*
Agency or Company	*Pennoni*	From/To	*Jacobs Creek Rd/Scotch Rd*
Date Performed	*9/8/2015*	Jurisdiction	*NJDOT*
Analysis Time Period	*AM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Show North Arrow

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.97*

No-passing zone *100%*

% Trucks and Buses , P_T *2 %*

% Recreational vehicles, P_R *0%*

Access points *mi* *14*/mi

Analysis direction vol., V_d *309*veh/h

Opposing direction vol., V_o *321*veh/h

Shoulder width ft *8.0*

Lane Width ft *12.0*

Segment Length mi *0.7*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.4*	*1.4*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.992*	*0.992*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*321*	*334*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*3.5 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*3.2 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*51.5 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*43.3 mi/h*
		Percent free flow speed, PFFS	*84.0 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.1*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.998*	*0.998*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*319*	*332*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*34.9*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*53.9*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*61.3*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*B*
Volume to capacity ratio, *v/c*	*0.19*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1686*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1697*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*84.0*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*318.6*
Effective width, Wv (Eq. 15-29) ft	*28.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*1.24*
Bicycle level of service (Exhibit 15-4)	*A*
Notes	
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain. 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 and for v>200 veh/h. 4. For the analysis direction only 5. Exhibit 15-20 provides coefficients a and b for Equation 15-10. 6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.	

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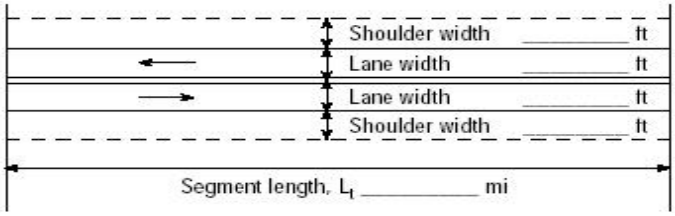
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*MTD*	Highway / Direction of Travel	*CR 546 EB*
Agency or Company	*Pennoni*	From/To	*Jacobs Creek Rd/Scotch Rd*
Date Performed	*9/8/2015*	Jurisdiction	*NJDOT*
Analysis Time Period	*PM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Show North Arrow

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.88*

No-passing zone *100%*

% Trucks and Buses , P_T *0 %*

% Recreational vehicles, P_R *0%*

Access points *mi* *14*/mi

Analysis direction vol., V_d *369*veh/h

Opposing direction vol., V_o *370*veh/h

Shoulder width ft *8.0*

Lane Width ft *12.0*

Segment Length mi *0.7*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.3*	*1.3*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*1.000*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*419*	*420*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*3.5 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*2.6 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*51.5 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*42.3 mi/h*
		Percent free flow speed, PFFS	*82.2 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*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], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*419*	*420*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*44.4*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*45.4*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*67.1*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.25*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1700*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*82.2*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*419.3*
Effective width, Wv (Eq. 15-29) ft	*28.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*0.94*
Bicycle level of service (Exhibit 15-4)	*A*
Notes	
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain. 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 and for v>200 veh/h. 4. For the analysis direction only 5. Exhibit 15-20 provides coefficients a and b for Equation 15-10. 6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.	

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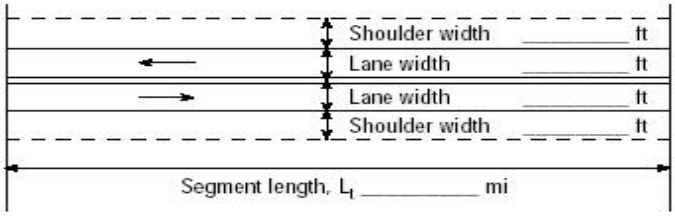
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*CR 546 WB*
Agency or Company	*Pennoni*	From/To	*Jacobs Creek Rd/Scotch Rd*
Date Performed	*9/8/2015*	Jurisdiction	*NJDOT*
Analysis Time Period	*PM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Show North Arrow

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Analysis direction vol., V_d	*949*veh/h	Grade Length mi	Up/down
Opposing direction vol., V_o	*328*veh/h	Peak-hour factor, PHF	*0.87*
Shoulder width ft	*8.0*	No-passing zone	*100*%
Lane Width ft	*12.0*	% Trucks and Buses , P_T	*0* %
Segment Length mi	*0.7*	% Recreational vehicles, P_R	*0*%
		Access points *mi*	*14*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.0*	*1.3*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*1.000*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*1091*	*377*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, FFS=S_{FM}+0.00776(*v*/ $f_{HV,ATS}$)		Adj. for access points[4], f_A (Exhibit 15-8)	*3.5 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*2.9 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*51.5 mi/h*
		Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*37.2 mi/h*
		Percent free flow speed, PFFS	*72.3 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*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], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*1091*	*377*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*75.2*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*25.0*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*93.8*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*D*
Volume to capacity ratio, *v/c*	*0.64*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1700*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*72.3*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*1090.8*
Effective width, Wv (Eq. 15-29) ft	*28.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*1.43*
Bicycle level of service (Exhibit 15-4)	*A*
Notes	
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain. 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 and for v>200 veh/h. 4. For the analysis direction only 5. Exhibit 15-20 provides coefficients a and b for Equation 15-10. 6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.	

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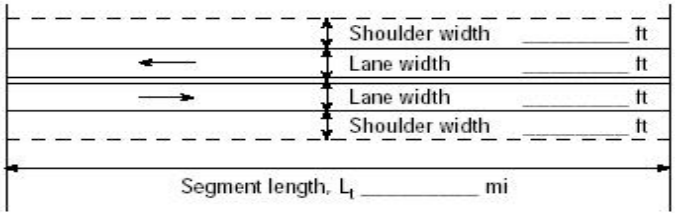
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*River Rd (NJ 29) NB*
Agency or Company	*Pennoni*	From/To	*I-95 to Jacobs Creek Rd*
Date Performed	*9/8/2015*	Jurisdiction	*NJDOT*
Analysis Time Period	*AM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.89*

No-passing zone *100%*

% Trucks and Buses , P_T *4 %*

% Recreational vehicles, P_R *0%*

Access points *mi* *15*/mi

Show North Arrow

Analysis direction vol., V_d *665*veh/h

Opposing direction vol., V_o *489*veh/h

Shoulder width ft *4.0*

Lane Width ft *12.0*

Segment Length mi *1.3*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.1*	*1.2*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.996*	*0.992*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*750*	*554*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*1.3 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*3.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*2.1 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*50.0 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*37.7 mi/h*
		Percent free flow speed, PFFS	*75.6 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*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], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*747*	*549*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*64.7*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*30.2*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*82.1*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.44*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1686*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*75.6*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*747.2*
Effective width, Wv (Eq. 15-29) ft	*16.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*4.83*
Bicycle level of service (Exhibit 15-4)	*E*
Notes	
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain. 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 and for v>200 veh/h. 4. For the analysis direction only 5. Exhibit 15-20 provides coefficients a and b for Equation 15-10. 6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.	

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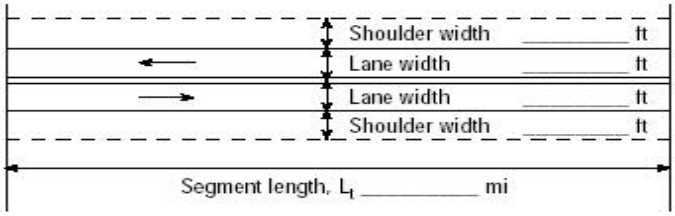
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*River Rd (NJ 29) SB*
Agency or Company	*Pennoni*	From/To	*I-95 to Jacobs Creek Rd*
Date Performed	*9/8/2015*	Jurisdiction	*NJDOT*
Analysis Time Period	*AM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.93*

No-passing zone *100%*

% Trucks and Buses , P_T *5 %*

% Recreational vehicles, P_R *0%*

Access points *mi* *15*/mi

Show North Arrow

Analysis direction vol., V_d *1036*veh/h

Opposing direction vol., V_o *451*veh/h

Shoulder width ft *4.0*

Lane Width ft *12.0*

Segment Length mi *1.3*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.0*	*1.2*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*0.990*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*1114*	*490*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*1.3 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*3.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*2.3 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*50.0 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*35.2 mi/h*
		Percent free flow speed, PFFS	*70.4 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*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], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*1114*	*485*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*77.5*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*19.9*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*91.4*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*D*
Volume to capacity ratio, *v/c*	*0.66*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1683*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*70.4*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*1114.0*
Effective width, Wv (Eq. 15-29) ft	*16.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*5.33*
Bicycle level of service (Exhibit 15-4)	*E*
Notes	

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
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 and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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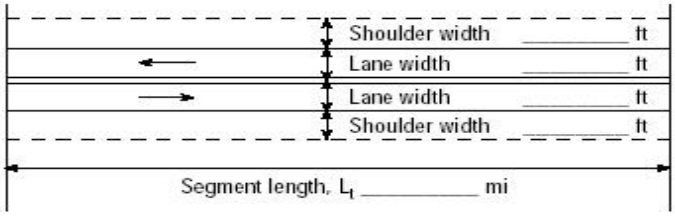
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*River Rd (NJ 29) NB*
Agency or Company	*Pennoni*	From/To	*I-95 to Jacobs Creek Rd*
Date Performed	*9/8/2015*	Jurisdiction	*NJDOT*
Analysis Time Period	*PM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.83*

No-passing zone *100%*

Show North Arrow

Analysis direction vol., V_d	*981*veh/h	% Trucks and Buses , P_T	*2* %
Opposing direction vol., V_o	*515*veh/h	% Recreational vehicles, P_R	*0%*
Shoulder width ft	*4.0*	Access points *mi*	*15*/mi
Lane Width ft	*12.0*		
Segment Length mi	*1.3*		

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.0*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*0.998*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*1182*	*622*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*1.3 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*3.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*1.8 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*50.0 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*34.1 mi/h*
		Percent free flow speed, PFFS	*68.3 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*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], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*1182*	*620*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*78.9*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*18.6*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*91.1*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*D*
Volume to capacity ratio, *v/c*	*0.70*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1697*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*68.3*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*1181.9*
Effective width, Wv (Eq. 15-29) ft	*16.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*4.55*
Bicycle level of service (Exhibit 15-4)	*E*
Notes	
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain. 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 and for v>200 veh/h. 4. For the analysis direction only 5. Exhibit 15-20 provides coefficients a and b for Equation 15-10. 6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.	

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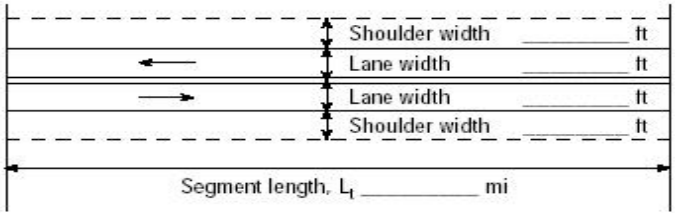
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*River Rd (NJ 29) SB*
Agency or Company	*Pennoni*	From/To	*I-95 to Jacobs Creek Rd*
Date Performed	*9/8/2015*	Jurisdiction	*NJDOT*
Analysis Time Period	*PM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Show North Arrow

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.91*

No-passing zone *100%*

Analysis direction vol., V_d *696*veh/h

Opposing direction vol., V_o *489*veh/h

% Trucks and Buses , P_T *2 %*

% Recreational vehicles, P_R *0%*

Shoulder width ft *4.0*

Lane Width ft *12.0*

Segment Length mi *1.3*

Access points *mi* *15*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.1*	*1.2*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.998*	*0.996*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*766*	*540*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*1.3 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*3.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*2.1 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*50.0 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*37.7 mi/h*
		Percent free flow speed, PFFS	*75.4 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*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], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*765*	*537*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*66.2*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*29.8*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*83.7*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.45*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1693*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*75.4*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*764.8*
Effective width, Wv (Eq. 15-29) ft	*16.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*4.33*
Bicycle level of service (Exhibit 15-4)	*D*
Notes	

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
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 and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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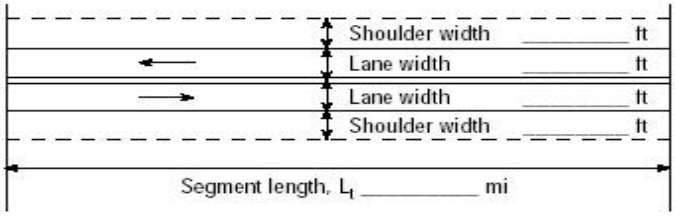
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*River Rd (Rt. 29) NB*
Agency or Company	*Pennoni*	From/To	*Jacobs Creek Rd/CR 546*
Date Performed	*9/8/2015*	Jurisdiction	*NJDOT*
Analysis Time Period	*AM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.92*

No-passing zone *100%*

Show North Arrow

Analysis direction vol., V_d	*665*veh/h	% Trucks and Buses , P_T	*4* %
Opposing direction vol., V_o	*477*veh/h	% Recreational vehicles, P_R	*0%*
Shoulder width ft	*4.0*	Access points *mi*	*27*/mi
Lane Width ft	*12.0*		
Segment Length mi	*1.5*		

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.1*	*1.2*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.996*	*0.992*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*726*	*523*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*1.3 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*6.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*2.2 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*47.0 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*35.1 mi/h*
		Percent free flow speed, PFFS	*74.7 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*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], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*723*	*518*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*63.0*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*31.4*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*81.3*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*D*
Volume to capacity ratio, *v/c*	*0.43*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1686*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*74.7*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*722.8*
Effective width, Wv (Eq. 15-29) ft	*16.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*4.82*
Bicycle level of service (Exhibit 15-4)	*E*
Notes	
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain. 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 and for v>200 veh/h. 4. For the analysis direction only 5. Exhibit 15-20 provides coefficients a and b for Equation 15-10. 6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.	

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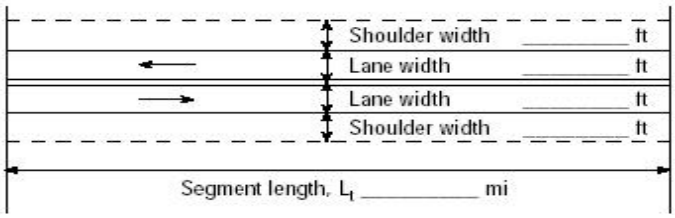
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*River Rd (Rt. 29) SB*
Agency or Company	*Pennoni*	From/To	*Jacobs Creek Rd/CR 546*
Date Performed	*9/8/2015*	Jurisdiction	*NJDOT*
Analysis Time Period	*AM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Analysis direction vol., V_d *1001*veh/h

Opposing direction vol., V_o *375*veh/h

Shoulder width ft *4.0*

Lane Width ft *12.0*

Segment Length mi *1.5*

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.93*

No-passing zone *100%*

% Trucks and Buses , P_T *5 %*

% Recreational vehicles, P_R *0%*

Access points *mi* *27*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.0*	*1.3*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*0.985*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*1076*	*409*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*1.3 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*6.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*2.7 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*47.0 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*32.8 mi/h*
		Percent free flow speed, PFFS	*69.8 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*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], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*1076*	*403*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*74.7*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*23.5*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*91.8*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*D*
Volume to capacity ratio, *v/c*	*0.63*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1675*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*69.8*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*1076.3*
Effective width, Wv (Eq. 15-29) ft	*16.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*5.31*
Bicycle level of service (Exhibit 15-4)	*E*
Notes	
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain. 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 and for v>200 veh/h. 4. For the analysis direction only 5. Exhibit 15-20 provides coefficients a and b for Equation 15-10. 6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.	

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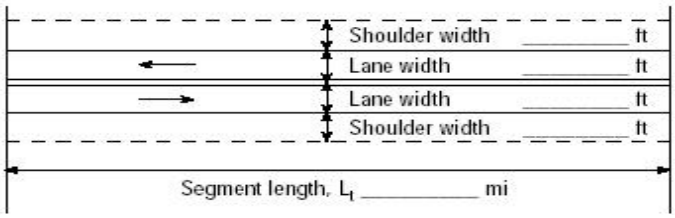
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*River Rd (Rt. 29) NB*
Agency or Company	*Pennoni*	From/To	*Jacobs Creek Rd/CR 546*
Date Performed	*9/8/2015*	Jurisdiction	*NJDOT*
Analysis Time Period	*PM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Show North Arrow

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Analysis direction vol., V_d	*924* veh/h	Grade Length mi	Up/down
Opposing direction vol., V_o	*494* veh/h	Peak-hour factor, PHF	*0.91*
Shoulder width ft	*4.0*	No-passing zone	*100*%
Lane Width ft	*12.0*	% Trucks and Buses , P_T	*3* %
Segment Length mi	*1.5*	% Recreational vehicles, P_R	*0*%
		Access points *mi*	*27*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.0*	*1.2*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*0.994*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*1015*	*546*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*1.3 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*6.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*2.1 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*47.0 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*32.8 mi/h*
		Percent free flow speed, PFFS	*69.8* %

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*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], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*1015*	*543*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*74.7*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*22.4*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*89.3*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*D*
Volume to capacity ratio, *v/c*	*0.60*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1690*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*69.8*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*1015.4*
Effective width, Wv (Eq. 15-29) ft	*16.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*4.72*
Bicycle level of service (Exhibit 15-4)	*E*
Notes	
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain. 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 and for v>200 veh/h. 4. For the analysis direction only 5. Exhibit 15-20 provides coefficients a and b for Equation 15-10. 6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.	

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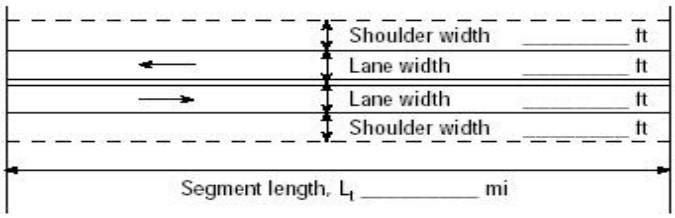
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*River Rd (Rt. 29) SB*
Agency or Company	*Pennoni*	From/To	*Jacobs Creek Rd/CR 546*
Date Performed	*9/8/2015*	Jurisdiction	*NJDOT*
Analysis Time Period	*PM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Show North Arrow

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.94*

No-passing zone *100%*

% Trucks and Buses , P_T *2 %*

% Recreational vehicles, P_R *0%*

Access points *mi* *27*/mi

Analysis direction vol., V_d *693*veh/h

Opposing direction vol., V_o *461*veh/h

Shoulder width ft *4.0*

Lane Width ft *12.0*

Segment Length mi *1.5*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.1*	*1.2*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.998*	*0.996*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*739*	*492*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*1.3 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*6.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*2.3 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*47.0 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*35.1 mi/h*
		Percent free flow speed, PFFS	*74.7 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*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], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*737*	*490*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*64.0*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*31.3*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*82.8*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*D*
Volume to capacity ratio, *v/c*	*0.43*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1693*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*74.7*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*737.2*
Effective width, Wv (Eq. 15-29) ft	*16.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*4.31*
Bicycle level of service (Exhibit 15-4)	*D*
Notes	
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain. 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 and for v>200 veh/h. 4. For the analysis direction only 5. Exhibit 15-20 provides coefficients a and b for Equation 15-10. 6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.	

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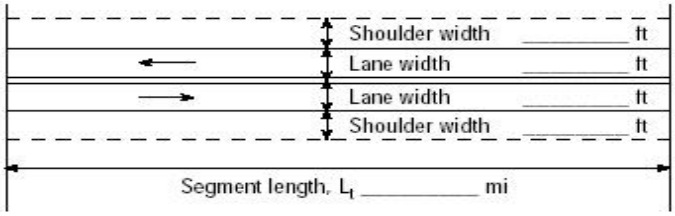
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*MTD*	Highway / Direction of Travel	*Bear Tavern Rd NB*
Agency or Company	*Pennoni*	From/To	*CR 546 to Jacobs Creek Rd*
Date Performed	*9/8/2015*	Jurisdiction	*NJDOT*
Analysis Time Period	*AM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Show North Arrow

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☐ Level ☑ Rolling

Analysis direction vol., V_d	*220*veh/h	Grade Length	mi Up/down
Opposing direction vol., V_o	*339*veh/h	Peak-hour factor, PHF	*0.86*
Shoulder width ft	*6.0*	No-passing zone	*100*%
Lane Width ft	*14.0*	% Trucks and Buses , P_T	*2* %
Segment Length mi	*1.4*	% Recreational vehicles, P_R	*0*%
		Access points *mi*	*21*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*2.2*	*2.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.1*	*1.1*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.977*	*0.980*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*0.79*	*0.90*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*331*	*447*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*60.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*5.3 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*2.6 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*54.8 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*46.1 mi/h*
		Percent free flow speed, PFFS	*84.3* %

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.7*	*1.6*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.986*	*0.988*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*0.83*	*0.90*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*313*	*443*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*36.4*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*43.8*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*54.5*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*B*
Volume to capacity ratio, *v/c*	*0.19*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1536*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1568*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*84.3*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*255.8*
Effective width, Wv (Eq. 15-29) ft	*26.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*1.67*
Bicycle level of service (Exhibit 15-4)	*B*
Notes	
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain. 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 and for v>200 veh/h. 4. For the analysis direction only 5. Exhibit 15-20 provides coefficients a and b for Equation 15-10. 6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.	

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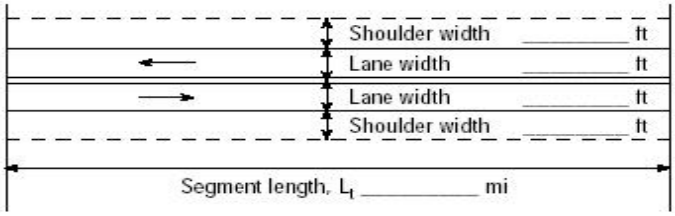
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*MTD*	Highway / Direction of Travel	*Bear Tavern Rd SB*
Agency or Company	*Pennoni*	From/To	*CR 546 to Jacobs Creek Rd*
Date Performed	*9/8/2015*	Jurisdiction	*NJDOT*
Analysis Time Period	*AM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Analysis direction vol., V_d *599*veh/h
Opposing direction vol., V_o *160*veh/h
Shoulder width ft *6.0*
Lane Width ft *14.0*
Segment Length mi *1.4*

☐ Class I highway ☐ Class II highway ☑ Class III highway
Terrain ☐ Level ☑ Rolling
Grade Length mi Up/down
Peak-hour factor, PHF *0.87*
No-passing zone *100*%
% Trucks and Buses , P_T *1* %
% Recreational vehicles, P_R *0*%
Access points *mi* *21*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.6*	*2.4*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.1*	*1.1*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.994*	*0.986*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*0.98*	*0.74*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*707*	*252*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*60.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*5.3 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*3.8 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*54.8 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*43.6 mi/h*
		Percent free flow speed, PFFS	*79.5* %

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.8*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*0.992*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*0.99*	*0.79*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*695*	*235*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*56.1*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*30.6*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*79.0*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.42*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1310*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1384*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*79.5*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*688.5*
Effective width, Wv (Eq. 15-29) ft	*26.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*1.94*
Bicycle level of service (Exhibit 15-4)	*B*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
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 and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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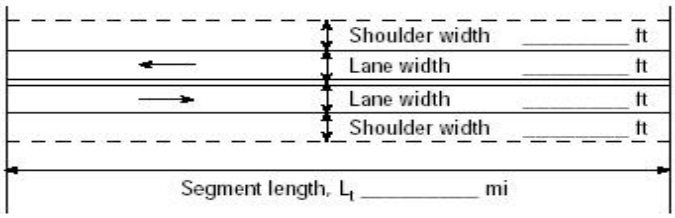
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Bear Tavern Rd NB*
Agency or Company	*Pennoni*	From/To	*CR 546 to Jacobs Creek Rd*
Date Performed	*9/8/2015*	Jurisdiction	*NJDOT*
Analysis Time Period	*PM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☐ Level ☑ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.92*

No-passing zone *100%*

% Trucks and Buses , P_T *0 %*

% Recreational vehicles, P_R *0%*

Access points *mi* *21*/mi

Show North Arrow

Analysis direction vol., V_d *520*veh/h

Opposing direction vol., V_o *238*veh/h

Shoulder width ft *6.0*

Lane Width ft *14.0*

Segment Length mi *1.4*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.7*	*2.2*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.1*	*1.1*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*1.000*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*0.96*	*0.80*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*589*	*323*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*60.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, FFS=S_{FM}+0.00776(*v*/ $f_{HV,ATS}$)		Adj. for access points[4], f_A (Exhibit 15-8)	*5.3 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*3.3 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*54.8 mi/h*
		Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*44.4 mi/h*
		Percent free flow speed, PFFS	*81.1 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.2*	*1.7*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*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], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*0.97*	*0.83*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*583*	*312*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*52.3*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*34.2*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*74.6*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.35*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1428*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1462*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*81.1*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*565.2*
Effective width, Wv (Eq. 15-29) ft	*26.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*1.63*
Bicycle level of service (Exhibit 15-4)	*B*
Notes	

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
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 and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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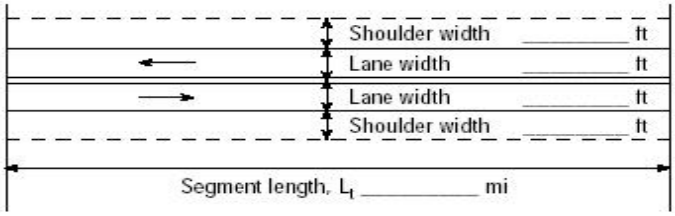
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*MTD*	Highway / Direction of Travel	*Bear Tavern Rd SB*
Agency or Company	*Pennoni*	From/To	*CR 546 to Jacobs Creek Rd*
Date Performed	*9/8/2015*	Jurisdiction	*NJDOT*
Analysis Time Period	*PM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☐ Level ☑ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.90*

No-passing zone *100%*

% Trucks and Buses , P_T *2 %*

% Recreational vehicles, P_R *0%*

Access points *mi* *21*/mi

Show North Arrow

Analysis direction vol., V_d *299*veh/h

Opposing direction vol., V_o *447*veh/h

Shoulder width ft *6.0*

Lane Width ft *14.0*

Segment Length mi *1.4*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*2.1*	*1.8*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.1*	*1.1*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.978*	*0.984*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*0.85*	*0.95*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*400*	*531*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*60.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*5.3 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*2.2 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*54.8 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*45.3 mi/h*
		Percent free flow speed, PFFS	*82.8 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.6*	*1.4*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.988*	*0.992*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*0.87*	*0.96*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*386*	*522*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*44.3*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*38.8*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*60.8*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.24*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1589*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1625*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*82.8*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*332.2*
Effective width, Wv (Eq. 15-29) ft	*26.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*1.80*
Bicycle level of service (Exhibit 15-4)	*B*
Notes	

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
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 and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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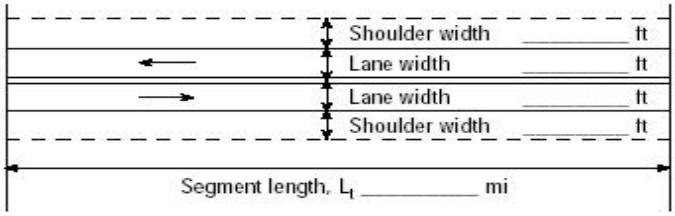
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*MTD*	Highway / Direction of Travel	*Bear Tavern Rd NB*
Agency or Company	*Pennoni*	From/To	*Jacobs Creek Rd/I-95*
Date Performed	*9/8/2015*	Jurisdiction	*NJDOT*
Analysis Time Period	*AM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Analysis direction vol., V_d *585*veh/h

Opposing direction vol., V_o *600*veh/h

Shoulder width ft *6.0*

Lane Width ft *14.0*

Segment Length mi *1.1*

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.88*

No-passing zone *100*%

% Trucks and Buses , P_T *2* %

% Recreational vehicles, P_R *0*%

Access points *mi* *40*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.1*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.998*	*0.998*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*666*	*683*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0 mi/h*
Total demand flow rate, both directions, v		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*10.0 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*1.6 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*45.0 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*33.0 mi/h*
		Percent free flow speed, PFFS	*73.3* %

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*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], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*665*	*682*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*62.6*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*30.1*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*77.5*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*D*
Volume to capacity ratio, *v/c*	*0.39*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1697*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*73.3*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*664.8*
Effective width, Wv (Eq. 15-29) ft	*26.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*2.15*
Bicycle level of service (Exhibit 15-4)	*B*
Notes	

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
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 and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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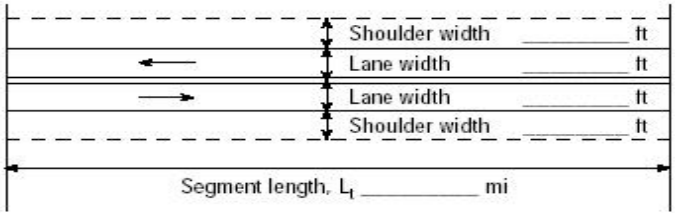
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Bear Tavern Rd SB*
Agency or Company	*Pennoni*	From/To	*Jacobs Creek Rd/I-95*
Date Performed	*9/8/2015*	Jurisdiction	*NJDOT*
Analysis Time Period	*AM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling
Grade Length mi Up/down
Peak-hour factor, PHF *0.90*
No-passing zone *100*%
% Trucks and Buses , P_T *3* %
% Recreational vehicles, P_R *0*%
Access points *mi* *40*/mi

Analysis direction vol., V_d *613*veh/h
Opposing direction vol., V_o *566*veh/h
Shoulder width ft *6.0*
Lane Width ft *14.0*
Segment Length mi *1.1*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.1*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.997*	*0.997*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*683*	*631*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*10.0 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*1.7 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*45.0 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*33.1 mi/h*
		Percent free flow speed, PFFS	*73.5* %

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*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], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*681*	*629*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*62.8*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*30.9*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*78.9*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*D*
Volume to capacity ratio, *v/c*	*0.40*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1695*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*73.5*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*681.1*
Effective width, Wv (Eq. 15-29) ft	*26.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*2.42*
Bicycle level of service (Exhibit 15-4)	*B*
Notes	

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
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 and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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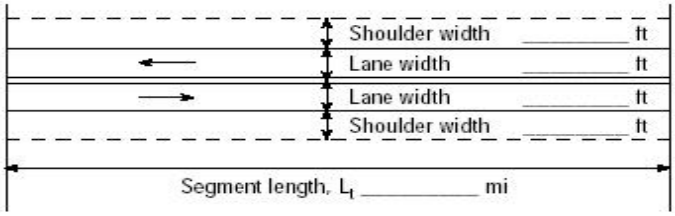
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*MTD*	Highway / Direction of Travel	*Bear Tavern Rd NB*
Agency or Company	*Pennoni*	From/To	*Jacobs Creek Rd/I-95*
Date Performed	*9/8/2015*	Jurisdiction	*NJDOT*
Analysis Time Period	*PM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



Show North Arrow

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Analysis direction vol., V_d	*571* veh/h	Grade Length mi	Up/down
Opposing direction vol., V_o	*661* veh/h	Peak-hour factor, PHF	*0.96*
Shoulder width ft	*6.0*	No-passing zone	*100*%
Lane Width ft	*14.0*	% Trucks and Buses , P_T	*1* %
Segment Length mi	*1.1*	% Recreational vehicles, P_R	*0*%
		Access points *mi*	*40*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.1*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.999*	*0.999*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*595*	*689*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*10.0 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*1.5 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*45.0 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*33.5 mi/h*
		Percent free flow speed, PFFS	*74.5* %

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*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], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*595*	*689*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*58.9*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*31.3*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*73.4*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*D*
Volume to capacity ratio, *v/c*	*0.35*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1698*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*74.5*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*594.8*
Effective width, Wv (Eq. 15-29) ft	*26.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*1.87*
Bicycle level of service (Exhibit 15-4)	*B*
Notes	
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain. 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 and for v>200 veh/h. 4. For the analysis direction only 5. Exhibit 15-20 provides coefficients a and b for Equation 15-10. 6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.	

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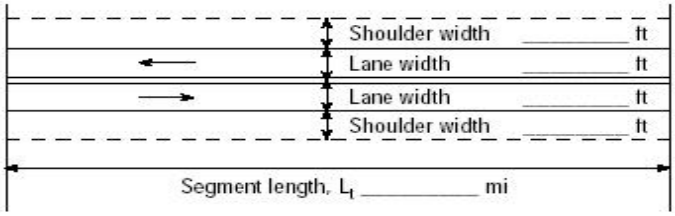
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*MTD*	Highway / Direction of Travel	*Bear Tavern Rd SB*
Agency or Company	*Pennoni*	From/To	*Jacobs Creek Rd/I-95*
Date Performed	*9/8/2015*	Jurisdiction	*NJDOT*
Analysis Time Period	*PM Peak*	Analysis Year	*2015*

Project Description: *Pre-Construction Traffic Study*

Input Data



☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.83*

No-passing zone *100%*

% Trucks and Buses , P_T *3 %*

% Recreational vehicles, P_R *0%*

Access points *mi* *40*/mi

Show North Arrow

Analysis direction vol., V_d *689*veh/h

Opposing direction vol., V_o *431*veh/h

Shoulder width ft *6.0*

Lane Width ft *14.0*

Segment Length mi *1.1*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.1*	*1.2*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.997*	*0.994*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*833*	*522*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*10.0 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*2.2 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*45.0 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*32.3 mi/h*
		Percent free flow speed, PFFS	*71.9 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*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], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*830*	*519*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*68.6*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*27.7*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*85.6*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*D*
Volume to capacity ratio, *v/c*	*0.49*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1690*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*71.9*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*830.1*
Effective width, Wv (Eq. 15-29) ft	*26.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*2.52*
Bicycle level of service (Exhibit 15-4)	*C*
Notes	

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
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 and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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