

Appendix B

HCS+ Data

HCS+: Two-Lane Highways Release 5.2

Boday Borres

KYTC- Division of Planning

200 Mero Street, 5th Floor

Frankfort, KY 40622

W5-05-01

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Two-Way Two-Lane Highway Segment Analysis

Analyst Boday
Agency/Co. KYTC
Date Performed 2/7/2007
Analysis Time Period 2007 - Current
Highway KY 76
From/To MP 11.498 to MP 14.135
Jurisdiction Russell Co.
Analysis Year 2007
Description Scoping Study for KY 76

Input Data

Highway class Class 2
Shoulder width 3.0 ft Peak-hour factor, PHF 0.90
Lane width 9.0 ft % Trucks and buses 7 %
Segment length 2.6 mi % Recreational vehicles 0 %
Terrain type Rolling % No-passing zones 0 %
Grade: Length mi Access points/mi 3 /mi
 Up/down %

Two-way hourly volume, V 160 veh/h
Directional split 60 / 40 %

Average Travel Speed

Grade adjustment factor, fG 0.71
PCE for trucks, ET 2.5
PCE for RVs, ER 1.1

Heavy-vehicle adjustment factor,	0.905
Two-way flow rate,(note-1) vp	277 pc/h
Highest directional split proportion (note-2)	166 pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, SFM	- mi/h
Observed volume, Vf	- veh/h
Estimated Free-Flow Speed:	
Base free-flow speed, BFFS	55.0 mi/h
Adj. for lane and shoulder width, fLS	4.8 mi/h
Adj. for access points, fA	0.0* mi/h

Free-flow speed, FFS	50.2 mi/h
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Adjustment for no-passing zones, fnp	0.0 mi/h
Average travel speed, ATS	48.1 mi/h

 Percent Time-Spent-Following

Grade adjustment factor, fG	0.77
PCE for trucks, ET	1.8
PCE for RVs, ER	1.0
Heavy-vehicle adjustment factor, fHV	0.947
Two-way flow rate,(note-1) vp	244 pc/h
Highest directional split proportion (note-2)	146
Base percent time-spent-following, BPTSF	19.3 %
Adj.for directional distribution and no-passing zones, fd/np	1.4
Percent time-spent-following, PTSF	20.7 %

 Level of Service and Other Performance Measures

Level of service, LOS	A
Volume to capacity ratio, v/c	0.09
Peak 15-min vehicle-miles of travel, VMT15	116 veh-mi
Peak-hour vehicle-miles of travel, VMT60	416 veh-mi
Peak 15-min total travel time, TT15	2.4 veh-h

Notes:

1. If $vp \geq 3200$ pc/h, terminate analysis-the LOS is F.
 2. If highest directional split $vp \geq 1700$ pc/h, terminate analysis-the LOS is F.
- * These items have been entered or edited to override calculated value

HCS+: Two-Lane Highways Release 5.2

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 Two-Way Two-Lane Highway Segment Analysis

Analyst Boday
 Agency/Co. KYTC
 Date Performed 2/7/2007
 Analysis Time Period 2030 / No Improvements
 Highway KY 76
 From/To MP 11.498 to MP 14.135
 Jurisdiction Russell Co.
 Analysis Year 2007
 Description Scoping Study for KY 76

 Input Data

Highway class Class 2
 Shoulder width 3.0 ft Peak-hour factor, PHF 0.90
 Lane width 9.0 ft % Trucks and buses 7 %
 Segment length 2.6 mi % Recreational vehicles 0 %
 Terrain type Rolling % No-passing zones 0 %
 Grade: Length mi Access points/mi 3 /mi
 Up/down %

Two-way hourly volume, V 310 veh/h
 Directional split 60 / 40 %

 Average Travel Speed

Grade adjustment factor, fG 0.71
 PCE for trucks, ET 2.5
 PCE for RVs, ER 1.1

Heavy-vehicle adjustment factor,	0.905
Two-way flow rate,(note-1) vp	536 pc/h
Highest directional split proportion (note-2)	322 pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, SFM	- mi/h
Observed volume, Vf	- veh/h
Estimated Free-Flow Speed:	
Base free-flow speed, BFFS	55.0 mi/h
Adj. for lane and shoulder width, fLS	4.8 mi/h
Adj. for access points, fA	0.0* mi/h

Free-flow speed, FFS	50.2 mi/h
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Adjustment for no-passing zones, fnp	0.0* mi/h
Average travel speed, ATS	46.0 mi/h

 Percent Time-Spent-Following

Grade adjustment factor, fG	0.77
PCE for trucks, ET	1.8
PCE for RVs, ER	1.0
Heavy-vehicle adjustment factor, fHV	0.947
Two-way flow rate,(note-1) vp	472 pc/h
Highest directional split proportion (note-2)	283
Base percent time-spent-following, BPTSF	34.0 %
Adj.for directional distribution and no-passing zones, fd/np	0.3
Percent time-spent-following, PTSF	34.3 %

 Level of Service and Other Performance Measures

Level of service, LOS	A
Volume to capacity ratio, v/c	0.17
Peak 15-min vehicle-miles of travel, VMT15	224 veh-mi
Peak-hour vehicle-miles of travel, VMT60	806 veh-mi
Peak 15-min total travel time, TT15	4.9 veh-h

Notes:

1. If $vp \geq 3200$ pc/h, terminate analysis-the LOS is F.
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Analyst Boday
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 Date Performed 2/7/2007
 Analysis Time Period 2030 / With Improvements
 Highway KY 76
 From/To MP 11.498 to MP 14.135
 Jurisdiction Russell Co.
 Analysis Year 2007
 Description Scoping Study for KY 76

Input Data

Highway class Class 2
 Shoulder width 8.0 ft Peak-hour factor, PHF 0.90
 Lane width 12.0 ft % Trucks and buses 7 %
 Segment length 2.6 mi % Recreational vehicles 0 %
 Terrain type Rolling % No-passing zones 0 %
 Grade: Length mi Access points/mi 3 /mi
 Up/down %

Two-way hourly volume, V 310 veh/h
 Directional split 60 / 40 %

Average Travel Speed

Grade adjustment factor, fG 0.71
 PCE for trucks, ET 2.5
 PCE for RVs, ER 1.1

Heavy-vehicle adjustment factor,	0.905
Two-way flow rate,(note-1) vp	536 pc/h
Highest directional split proportion (note-2)	322 pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, SFM	- mi/h
Observed volume, Vf	- veh/h
Estimated Free-Flow Speed:	
Base free-flow speed, BFFS	55.0 mi/h
Adj. for lane and shoulder width, fLS	0.0 mi/h
Adj. for access points, fA	0.0* mi/h

Free-flow speed, FFS	55.0 mi/h
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Adjustment for no-passing zones, fnp	0.0* mi/h
Average travel speed, ATS	50.8 mi/h

 Percent Time-Spent-Following

Grade adjustment factor, fG	0.77
PCE for trucks, ET	1.8
PCE for RVs, ER	1.0
Heavy-vehicle adjustment factor, fHV	0.947
Two-way flow rate,(note-1) vp	472 pc/h
Highest directional split proportion (note-2)	283
Base percent time-spent-following, BPTSF	34.0 %
Adj.for directional distribution and no-passing zones, fd/np	0.3
Percent time-spent-following, PTSF	34.3 %

 Level of Service and Other Performance Measures

Level of service, LOS	A
Volume to capacity ratio, v/c	0.17
Peak 15-min vehicle-miles of travel, VMT15	224 veh-mi
Peak-hour vehicle-miles of travel, VMT60	806 veh-mi
Peak 15-min total travel time, TT15	4.4 veh-h

Notes:

1. If $vp \geq 3200$ pc/h, terminate analysis-the LOS is F.
 2. If highest directional split $vp \geq 1700$ pc/h, terminate analysis-the LOS is F.
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Two-Way Two-Lane Highway Segment Analysis

Analyst Boday
Agency/Co. KYTC
Date Performed 2/7/2007
Analysis Time Period 2007 - Current
Highway KY 76
From/To MP 0.00 to MP 3.455
Jurisdiction Adair Co.
Analysis Year 2007
Description Scoping Study for KY 76

Input Data

Highway class Class 2
Shoulder width 4.0 ft Peak-hour factor, PHF 0.90
Lane width 9.0 ft % Trucks and buses 7 %
Segment length 3.5 mi % Recreational vehicles 0 %
Terrain type Rolling % No-passing zones 0 %
Grade: Length mi Access points/mi 3 /mi
 Up/down %

Two-way hourly volume, V 126 veh/h
Directional split 60 / 40 %

Average Travel Speed

Grade adjustment factor, fG 0.71
PCE for trucks, ET 2.5
PCE for RVs, ER 1.1

Heavy-vehicle adjustment factor,	0.905
Two-way flow rate,(note-1) vp	218 pc/h
Highest directional split proportion (note-2)	131 pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, SFM	- mi/h
Observed volume, Vf	- veh/h
Estimated Free-Flow Speed:	
Base free-flow speed, BFFS	55.0 mi/h
Adj. for lane and shoulder width, fLS	3.5 mi/h
Adj. for access points, fA	0.0* mi/h

Free-flow speed, FFS	51.5 mi/h
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Adjustment for no-passing zones, fnp	0.0 mi/h
Average travel speed, ATS	49.8 mi/h

 Percent Time-Spent-Following

Grade adjustment factor, fG	0.77
PCE for trucks, ET	1.8
PCE for RVs, ER	1.0
Heavy-vehicle adjustment factor, fHV	0.947
Two-way flow rate,(note-1) vp	192 pc/h
Highest directional split proportion (note-2)	115
Base percent time-spent-following, BPTSF	15.5 %
Adj.for directional distribution and no-passing zones, fd/np	1.6
Percent time-spent-following, PTSF	17.2 %

 Level of Service and Other Performance Measures

Level of service, LOS	A
Volume to capacity ratio, v/c	0.07
Peak 15-min vehicle-miles of travel, VMT15	123 veh-mi
Peak-hour vehicle-miles of travel, VMT60	441 veh-mi
Peak 15-min total travel time, TT15	2.5 veh-h

Notes:

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Two-Way Two-Lane Highway Segment Analysis

Analyst Boday
 Agency/Co. KYTC
 Date Performed 2/7/2007
 Analysis Time Period 2030 / No Improvements
 Highway KY 76
 From/To MP 0.00 to MP 3.455
 Jurisdiction Adair Co.
 Analysis Year 2007
 Description Scoping Study for KY 76

Input Data

Highway class Class 2
 Shoulder width 4.0 ft Peak-hour factor, PHF 0.90
 Lane width 9.0 ft % Trucks and buses 7 %
 Segment length 3.5 mi % Recreational vehicles 0 %
 Terrain type Rolling % No-passing zones 0 %
 Grade: Length mi Access points/mi 3 /mi
 Up/down %

Two-way hourly volume, V 240 veh/h
 Directional split 60 / 40 %

Average Travel Speed

Grade adjustment factor, fG 0.71
 PCE for trucks, ET 2.5
 PCE for RVs, ER 1.1

Heavy-vehicle adjustment factor,	0.905
Two-way flow rate,(note-1) vp	415 pc/h
Highest directional split proportion (note-2)	249 pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, SFM	- mi/h
Observed volume, Vf	- veh/h
Estimated Free-Flow Speed:	
Base free-flow speed, BFFS	55.0 mi/h
Adj. for lane and shoulder width, fLS	3.5 mi/h
Adj. for access points, fA	0.0* mi/h

Free-flow speed, FFS	51.5 mi/h
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Adjustment for no-passing zones, fnp	0.0 mi/h
Average travel speed, ATS	48.3 mi/h

 Percent Time-Spent-Following

Grade adjustment factor, fG	0.77
PCE for trucks, ET	1.8
PCE for RVs, ER	1.0
Heavy-vehicle adjustment factor, fHV	0.947
Two-way flow rate,(note-1) vp	366 pc/h
Highest directional split proportion (note-2)	220
Base percent time-spent-following, BPTSF	27.5 %
Adj.for directional distribution and no-passing zones, fd/np	0.7
Percent time-spent-following, PTSF	28.2 %

 Level of Service and Other Performance Measures

Level of service, LOS	A
Volume to capacity ratio, v/c	0.13
Peak 15-min vehicle-miles of travel, VMT15	233 veh-mi
Peak-hour vehicle-miles of travel, VMT60	840 veh-mi
Peak 15-min total travel time, TT15	4.8 veh-h

Notes:

1. If $vp \geq 3200$ pc/h, terminate analysis-the LOS is F.
 2. If highest directional split $vp \geq 1700$ pc/h, terminate analysis-the LOS is F.
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Two-Way Two-Lane Highway Segment Analysis

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 Date Performed 2/7/2007
 Analysis Time Period 2030 / With Improvements
 Highway KY 76
 From/To MP 0.00 to MP 3.455
 Jurisdiction Adair Co.
 Analysis Year 2007
 Description Scoping Study for KY 76

Input Data

Highway class Class 2
 Shoulder width 8.0 ft Peak-hour factor, PHF 0.90
 Lane width 12.0 ft % Trucks and buses 7 %
 Segment length 3.5 mi % Recreational vehicles 0 %
 Terrain type Rolling % No-passing zones 0 %
 Grade: Length mi Access points/mi 3 /mi
 Up/down %

Two-way hourly volume, V 240 veh/h
 Directional split 60 / 40 %

Average Travel Speed

Grade adjustment factor, fG 0.71
 PCE for trucks, ET 2.5
 PCE for RVs, ER 1.1

Heavy-vehicle adjustment factor,	0.905
Two-way flow rate,(note-1) vp	415 pc/h
Highest directional split proportion (note-2)	249 pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, SFM	- mi/h
Observed volume, Vf	- veh/h
Estimated Free-Flow Speed:	
Base free-flow speed, BFFS	55.0 mi/h
Adj. for lane and shoulder width, fLS	0.0 mi/h
Adj. for access points, fA	0.0* mi/h

Free-flow speed, FFS	55.0 mi/h
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Adjustment for no-passing zones, fnp	0.0 mi/h
Average travel speed, ATS	51.8 mi/h

 Percent Time-Spent-Following

Grade adjustment factor, fG	0.77
PCE for trucks, ET	1.8
PCE for RVs, ER	1.0
Heavy-vehicle adjustment factor, fHV	0.947
Two-way flow rate,(note-1) vp	366 pc/h
Highest directional split proportion (note-2)	220
Base percent time-spent-following, BPTSF	27.5 %
Adj.for directional distribution and no-passing zones, fd/np	0.7
Percent time-spent-following, PTSF	28.2 %

 Level of Service and Other Performance Measures

Level of service, LOS	A
Volume to capacity ratio, v/c	0.13
Peak 15-min vehicle-miles of travel, VMT15	233 veh-mi
Peak-hour vehicle-miles of travel, VMT60	840 veh-mi
Peak 15-min total travel time, TT15	4.5 veh-h

Notes:

1. If $vp \geq 3200$ pc/h, terminate analysis-the LOS is F.
 2. If highest directional split $vp \geq 1700$ pc/h, terminate analysis-the LOS is F.
- * These items have been entered or edited to override calculated value

HCS+: Multilane Highways Release 5.2

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OPERATIONAL ANALYSIS

Analyst: Boday

Agency/Co: KYTC

Date: 2/7/2007

Analysis Period: 2030 / 4-Lane

Highway: KY 76

From/To: MP 11.498 to MP 14.135

Jurisdiction: Russell Co.

Analysis Year: 2007

Project ID: Scoping Study for KY 76

FREE-FLOW SPEED

Direction	1		2	
Lane width	12.0	ft	12.0	ft
Lateral clearance:				
Right edge	6.0	ft	6.0	ft
Left edge	6.0	ft	6.0	ft
Total lateral clearance	12.0	ft	12.0	ft
Access points per mile	3		3	
Median type	Undivided		Undivided	
Free-flow speed:	Base		Base	
FFS or BFFS	60.0	mph	60.0	mph
Lane width adjustment, FLW	0.0	mph	0.0	mph
Lateral clearance adjustment, FLC	0.0	mph	0.0	mph
Median type adjustment, FM	1.6	mph	1.6	mph
Access points adjustment, FA	0.8	mph	0.8	mph
Free-flow speed	57.7	mph	57.7	mph

VOLUME

Direction	1		2	
Volume, V	186	vph	124	vph
Peak-hour factor, PHF	0.90		0.90	
Peak 15-minute volume, v15	52		34	
Trucks and buses	7	%	7	%
Recreational vehicles	0	%	0	%
Terrain type	Rolling		Rolling	
Grade	0.00	%	0.00	%
Segment length	0.00	mi	0.00	mi
Number of lanes	2		2	
Driver population adjustment, fP	1.00		1.00	
Trucks and buses PCE, ET	2.5		2.5	
Recreational vehicles PCE, ER	2.0		2.0	
Heavy vehicle adjustment, fHV	0.905		0.905	
Flow rate, vp	114	pcphpl	76	pcphpl

RESULTS

Direction	1		2	
Flow rate, vp	114	pcphpl	76	pcphpl
Free-flow speed, FFS	57.7		57.7	
Avg. passenger-car travel speed, S	57.7		57.7	
Level of service, LOS	A		A	
Density, D	2.0	pc/mi/ln	1.3	pc/mi/ln

Overall results are not computed when free-flow speed is less than 45 mph.

HCS+: Multilane Highways Release 5.2

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OPERATIONAL ANALYSIS

Analyst: Boday

Agency/Co: KYTC

Date: 2/7/2007

Analysis Period: 2030 / 4-Lane

Highway: KY 76

From/To: MP 0.000 to MP 3.422

Jurisdiction: Adair Co.

Analysis Year: 2007

Project ID: Scoping Study for KY 76

FREE-FLOW SPEED

Direction	1		2	
Lane width	12.0	ft	12.0	ft
Lateral clearance:				
Right edge	6.0	ft	6.0	ft
Left edge	6.0	ft	6.0	ft
Total lateral clearance	12.0	ft	12.0	ft
Access points per mile	3		3	
Median type	Undivided		Undivided	
Free-flow speed:	Base		Base	
FFS or BFFS	60.0	mph	60.0	mph
Lane width adjustment, FLW	0.0	mph	0.0	mph
Lateral clearance adjustment, FLC	0.0	mph	0.0	mph
Median type adjustment, FM	1.6	mph	1.6	mph
Access points adjustment, FA	0.8	mph	0.8	mph
Free-flow speed	57.7	mph	57.7	mph

VOLUME

Direction	1	2		
Volume, V	144	vph	96	vph
Peak-hour factor, PHF	0.90		0.90	
Peak 15-minute volume, v15	40		27	
Trucks and buses	7	%	7	%
Recreational vehicles	0	%	0	%
Terrain type	Rolling		Rolling	
Grade	0.00	%	0.00	%
Segment length	0.00	mi	0.00	mi
Number of lanes	2		2	
Driver population adjustment, fP	1.00		1.00	
Trucks and buses PCE, ET	2.5		2.5	
Recreational vehicles PCE, ER	2.0		2.0	
Heavy vehicle adjustment, fHV	0.905		0.905	
Flow rate, vp	88	pcphpl	58	pcphpl

RESULTS

Direction	1	2		
Flow rate, vp	88	pcphpl	58	pcphpl
Free-flow speed, FFS	57.7		mph	
Avg. passenger-car travel speed, S	57.7		mph	
Level of service, LOS	A		A	
Density, D	1.5	pc/mi/ln	1.0	pc/mi/ln

Overall results are not computed when free-flow speed is less than 45 mph.