

APPENDIX 11E – SOFTWARE GUIDANCE

This appendix provides software guidance to illustrate the software-specific data entry procedures to input Oregon specific-default values for freeway and multilane highway analysis using Highway Capacity Manual analysis procedures.

The following guidance is not intended to be an all-encompassing software tutorial. The guidance assumes the user has a working knowledge of the software and provides a visual reference on how to update the Oregon-specific default values within the existing software tools. The software tools covered in this document include McTrans HCS7, SwashWare HCM-Calc, and FREEVAL.

ODOT Default Values

Many of the Oregon-specific default values such as Peak Hour Factor (PHF) or Truck Percentage are direct inputs in all three software tools. An excerpt of Appendix C listing the Oregon-specific default values are provided in Table 1.

However, ODOT’s methodology for default capacity values uses the unit of total passenger cars per hour per lane (pc/h/ln) while both software tools use a capacity adjustment factor (CAF) and a speed adjustment factor (SAF), which result in the ODOT suggested default bottleneck capacity. As a result, the user will be required to convert the desired bottleneck capacity values, from Table 1 below, into CAF and SAF. An [ODOT-specific capacity calculator spreadsheet](#) is provided to assist with this.

A companion Microsoft Excel spreadsheet was developed with this software guidance to aid the user in computing the appropriate CAF and SAF based on free flow speed, weather, and driver population factor. The companion spreadsheet is designed to work with HCS7, HCM-Calc, or FREEVAL – although most computations are automated within FREEVAL already.

Table 1. Oregon Default Values from Appendix C.

Required Data and Units		Source	Suggested Default Value		
Ⓐ	Peak Hour Factor (PHF)	HCM 6 th Edition	Rural:	0.94	
			Urban:	0.88	
Ⓑ	Truck Percentage (%)	HCM 7 th Edition	Rural:	26%	
			Small Urban:	19%	
			Medium Urban:	10%	
			Large Urban:	7%	
Ⓒ	Terrain Type	HPMS and ODOT Vertical Grade Information	Generally level with few exceptions in the Cascade Range and Blue Mountains (see Exhibit 11-28)		
Ⓓ	Area Type	GIS Database	No default, use urban or rural based on GIS		
Ⓔ	Weave Volumes	Traffic Counts	$(\text{Ramp to ramp flow}) = (\text{on-ramp flow}) / (\text{mainline flow}) * (\text{off-ramp flow})$		
Ⓕ	CAV Proportion and Driver Population Factor	Exhibit 11-15	CAV proportion	0%	
			Rural:	0.939	
			Urban:	0.968	
Ⓖ	Acceleration Lanes (ft)	ODOT 2012 HDM	750 ft		
Ⓗ	Deceleration Lanes (ft)	ODOT 2012 HDM	500 ft		
Ⓘ	Free Flow Speed (mph)	ODOT TransGIS	Speed Limit + 5 mph		
Ⓙ	Ramp Free Flow Speed (mph)	HCM 7 th Edition, and ODOT 2012 HDM	35 mph for loops ramps, 45 mph for diamond ramps		
Ⓚ	Jam Density (pc/mi/ln)	HCM 7 th Edition	190 pc/mi/ln		
Ⓛ	Queue Discharge Capacity Drop (%)	HCM 7 th Edition	7%		
Ⓜ	Default Bottleneck Capacities (pc/h/ln)	Florida DOT Defaults for Freeway Segments	Urban merge and diverge freeway segments	3 lanes	2,100
				2: 3> lanes	2,000
			Urban weaving freeway segments	3 lanes	2,200
				2: 3> lanes	2,100
			Rural merge and diverge segments	3 lanes	1,900
				2: 3> lanes	1,800

HCS2023 Software Guidance

The guidance below highlights the location of HCS2023 (HCS Freeways Version 8.2) input fields and notes the corresponding Oregon-specific default values in Table 1. This section is organized based on the freeway analysis options available in HCS2023: Basic, Merge, Diverge, Weaving, and Facility analysis. Oregon default values are noted using letters **(A)** through **(M)** in the screen captures and correspond to the first column of Table 1. Inputs noted with a yellow circle (e.g. **(M)**) will require conversion to an adjustment factor, which can be performed using the adjustment factors spreadsheet provided. The user should refer to the Highway Capacity Manual for inputs not noted in Figures 1 – 4.

Basic Freeway Segment Analysis

Figure 1. Basic Freeway Segment Analysis Window in HCS2023

Geometric Data	
Number of Lanes	3
Measured FFS	<input type="checkbox"/>
Base Free Flow Speed, mi/h	75.4
Length, ft	-
Lane Width, ft	12
Managed Lane	<input type="checkbox"/>
Terrain Type	Level
Percent Grade, %	-
Grade Length, mi	-
Right Side Clearance, ft	10
Total Ramp Density, ramps/mi	0.00

Demand Data	
Demand, veh/h	0
Total Trucks, %	0.00
Tractor-Trailers (TT), %	-
Proportion of CAVs	0
Peak Hour Factor	0.94
Single-Unit Trucks (SUT), %	-
Mixed Flow Model	<input type="checkbox"/>

Adjustment Factors	
Driver Population	All Familiar
Weather Type	Non-Severe Weather
Incident Type	No Incident
Work Zone	<input type="checkbox"/>
Speed Adjustment Factor	1.000
Capacity Adjustment Factor	1.000
Demand Adjustment Factor	1.000

Merge Segment Analysis

Figure 2. Merge Segment Analysis Window in HCS2023

Geometric Data			
I	Number of Lanes	3	
	Base Free Flow Speed, mi/h	75.4	
C	Freeway Length, ft	1500	
	Freeway Terrain Type	Level	
	Freeway Grade, %	-	
	Freeway Grade Length, mi	-	
	Measured FFS	<input type="checkbox"/>	
	Right Side Clearance, ft	10	
	Lane Width, ft	12	
	Total Ramp Density, ramps/mi	0.00	
	Managed Lane	<input type="checkbox"/>	
	Ramp Lanes	1	J
	Ramp Free Flow Speed, mi/h	35.0	
	Ramp Side	Right	
	Ramp Terrain Type	Level	
	Ramp Grade, %	-	
	Ramp Grade Length, mi	-	
	Highway or C-D Roadway	<input type="checkbox"/>	
	Length of First Accel. Lane (LA), ft	800	G
	Length of Second Accel. Lane (LA2), ft	-	

Demand Data			
A	Freeway Demand, veh/h	0	
	Freeway Peak Hour Factor	0.94	
B	Freeway Total Trucks, %	0.00	
	Freeway Single-Unit Trucks (SUT), %	-	
	Freeway Tractor-Trailers (TT), %	-	
F	Proportion of CAVs	0	
	Merge Demand, veh/h	0	
	Ramp Peak Hour Factor	0.94	
	Ramp Total Trucks, %	0.00	
	Ramp Single-Unit Trucks (SUT), %	-	
	Ramp Tractor-Trailers (TT), %	-	

Adjustment Factors			
F	Freeway Driver Population	All Familiar	
	Freeway Weather Type	Non-Severe Weather	
	Freeway Speed Adjustment Factor	1.000	
M	Freeway Capacity Adjustment Factor	1.000	
	Freeway Demand Adjustment Factor	1.000	
	Incident Type	No Incident	
	Ramp Driver Population	All Familiar	
	Ramp Weather Type	Non-Severe Weather	
	Ramp Speed Adjustment Factor	1.000	
	Ramp Capacity Adjustment Factor	1.000	
	Ramp Demand Adjustment Factor	1.000	

Adjacent Ramps			
	Upstream Ramp	No Ramp	
	Distance to Upstream Ramp, ft	-	
	Upstream Ramp Terrain	Level	
	Upstream Ramp Demand, veh/h	-	
	Upstream Ramp PHF	-	
	Upstream Ramp Trucks, %	-	
	Downstream Ramp	No Ramp	
	Distance to Downstream Ramp, ft	-	
	Downstream Ramp Terrain	Level	
	Downstream Ramp Demand, veh/h	-	
	Downstream Ramp PHF	-	
	Downstream Ramp Trucks, %	-	

Diverge Segment Analysis

Figure 3. Diverge Segment Analysis Window in HCS2023

Geometric Data			
I	Number of Lanes	3	
	Base Free Flow Speed, mi/h	75.4	
C	Freeway Length, ft	1500	
	Freeway Terrain Type	Level	
	Freeway Grade, %	-	
	Freeway Grade Length, mi	-	
	Measured FFS	<input type="checkbox"/>	
	Right Side Clearance, ft	10	
	Lane Width, ft	12	
	Total Ramp Density, ramps/mi	0.00	
	Managed Lane	<input type="checkbox"/>	
	Ramp Lanes	1	J
	Ramp Free Flow Speed, mi/h	35.0	
	Ramp Side	Right	
	Ramp Terrain Type	Level	
	Ramp Grade, %	-	
	Ramp Grade Length, mi	-	
	Highway or C-D Roadway	<input type="checkbox"/>	
	Length of First Decel. Lane (LD), ft	400	H
	Length of Second Decel. Lane (LD2), ft	-	
Demand Data			
A	Freeway Demand, veh/h	0	
	Freeway Peak Hour Factor	0.94	
B	Freeway Total Trucks, %	0.00	
	Freeway Single-Unit Trucks (SUT), %	-	
	Freeway Tractor-Trailers (TT), %	-	
F	Proportion of CAVs	0	
	Diverge Demand, veh/h	0	
	Ramp Peak Hour Factor	0.94	
	Ramp Total Trucks, %	0.00	
	Ramp Single-Unit Trucks (SUT), %	-	
	Ramp Tractor-Trailers (TT), %	-	
Adjustment Factors			
F	Freeway Driver Population	All Familiar	
	Freeway Weather Type	Non-Severe Weather	
	Freeway Speed Adjustment Factor	1.000	
M	Freeway Capacity Adjustment Factor	1.000	
	Freeway Demand Adjustment Factor	1.000	
	Incident Type	No Incident	
	Ramp Driver Population	All Familiar	
	Ramp Weather Type	Non-Severe Weather	
	Ramp Speed Adjustment Factor	1.000	
	Ramp Capacity Adjustment Factor	1.000	
	Ramp Demand Adjustment Factor	1.000	
Adjacent Ramps			
	Upstream Ramp	No Ramp	
	Distance to Upstream Ramp, ft	-	
	Upstream Ramp Terrain	Level	
	Upstream Ramp Demand, veh/h	-	
	Upstream Ramp PHF	-	
	Upstream Ramp Trucks, %	-	
	Downstream Ramp	No Ramp	
	Distance to Downstream Ramp, ft	-	
	Downstream Ramp Terrain	Level	
	Downstream Ramp Demand, veh/h	-	
	Downstream Ramp PHF	-	
	Downstream Ramp Trucks, %	-	

Weaving Segment Analysis

Figure 4. Weaving Segment Analysis Window in HCS2023

Freeway Geometric Data

Number of Lanes <input style="width: 80%;" type="text" value="3"/> Measured FFS <input type="checkbox"/> I Base Free Flow Speed, mi/h <input style="width: 80%;" type="text" value="75.4"/> Weaving Configuration <input style="width: 80%;" type="text" value="One-Sided"/> Number of Weaving Lanes (NWL) <input style="width: 80%;" type="text" value="2"/> Short Length (LS), ft <input style="width: 80%;" type="text" value="500"/> Interchange Density, int/mi <input style="width: 80%;" type="text" value="0.80"/> Lane Width, ft <input style="width: 80%;" type="text" value="12"/> Managed Lane <input type="checkbox"/> Cross Weaving Managed Lane <input type="checkbox"/>	Terrain Type <input style="width: 80%;" type="text" value="Level"/> Percent Grade, % <input style="width: 80%;" type="text" value="-"/> Grade Length, mi <input style="width: 80%;" type="text" value="-"/> Minimum FR Lane Changes <input style="width: 80%;" type="text" value="1"/> Minimum RF Lane Changes <input style="width: 80%;" type="text" value="1"/> Minimum RR Lane Changes <input style="width: 80%;" type="text" value="0"/> Right Side Clearance, ft <input style="width: 80%;" type="text" value="10"/> Total Ramp Density, ramps/mi <input style="width: 80%;" type="text" value="0.00"/> Highway or C-D Roadway <input type="checkbox"/>
---	--

*Number of Lanes for a one-sided weaving segment includes auxiliary lanes

Ramp Geometric Data

J On-Ramp Number of Lanes <input style="width: 80%;" type="text" value="1"/> Free Flow Speed, mi/h <input style="width: 80%;" type="text" value="35.0"/> Terrain Type <input style="width: 80%;" type="text" value="Level"/> Grade, % <input style="width: 80%;" type="text" value="-"/> Grade Length, mi <input style="width: 80%;" type="text" value="-"/> Left-Sided <input type="checkbox"/>	Off-Ramp Number of Lanes <input style="width: 80%;" type="text" value="1"/> J Free Flow Speed, mi/h <input style="width: 80%;" type="text" value="35.0"/> Terrain Type <input style="width: 80%;" type="text" value="Level"/> Grade, % <input style="width: 80%;" type="text" value="-"/> Grade Length, mi <input style="width: 80%;" type="text" value="-"/>
---	---

Demand Data

Freeway-to-Freeway	Ramp-to-Freeway	Ramp-to-Ramp	Freeway-to-Ramp
Demand, veh/h <input style="width: 80%;" type="text" value="0"/>	Demand, veh/h <input style="width: 80%;" type="text" value="0"/>	Demand, veh/h <input style="width: 80%;" type="text" value="0"/>	Demand, veh/h <input style="width: 80%;" type="text" value="0"/>
A Demand Adjustment Factor <input style="width: 80%;" type="text" value="1.000"/>	Demand Adjustment Factor <input style="width: 80%;" type="text" value="1.000"/>	Demand Adjustment Factor <input style="width: 80%;" type="text" value="1.000"/>	Demand Adjustment Factor <input style="width: 80%;" type="text" value="1.000"/>
B Peak Hour Factor <input style="width: 80%;" type="text" value="0.94"/>	Peak Hour Factor <input style="width: 80%;" type="text" value="0.94"/>	Peak Hour Factor <input style="width: 80%;" type="text" value="0.94"/>	Peak Hour Factor <input style="width: 80%;" type="text" value="0.94"/>
Total Trucks, % <input style="width: 80%;" type="text" value="0.00"/>	Total Trucks, % <input style="width: 80%;" type="text" value="0.00"/>	Total Trucks, % <input style="width: 80%;" type="text" value="0.00"/>	Total Trucks, % <input style="width: 80%;" type="text" value="0.00"/>
Single-Unit Trucks (SUT), % <input style="width: 80%;" type="text" value="-"/>	Single-Unit Trucks (SUT), % <input style="width: 80%;" type="text" value="-"/>	Single-Unit Trucks (SUT), % <input style="width: 80%;" type="text" value="-"/>	Single-Unit Trucks (SUT), % <input style="width: 80%;" type="text" value="-"/>
Tractor-Trailers (TT), % <input style="width: 80%;" type="text" value="-"/>	Tractor-Trailers (TT), % <input style="width: 80%;" type="text" value="-"/>	Tractor-Trailers (TT), % <input style="width: 80%;" type="text" value="-"/>	Tractor-Trailers (TT), % <input style="width: 80%;" type="text" value="-"/>
F Prop. of CAVs (segment) <input style="width: 80%;" type="text" value="0"/>			

Freeway Adjustment Factors

F Driver Population <input style="width: 80%;" type="text" value="All Familiar"/> Weather Type <input style="width: 80%;" type="text" value="Non-Severe Weather"/> Incident Type <input style="width: 80%;" type="text" value="No Incident"/>	Speed Adjustment Factor <input style="width: 80%;" type="text" value="1.000"/> M Capacity Adjustment Factor <input style="width: 80%;" type="text" value="1.000"/>
--	--

Facility Analysis

Figure 5. Facility Analysis Window in HCS2023

Facility Global Inputs

<div style="display: flex; justify-content: space-between; align-items: center;"> K <div style="border: 1px dashed black; padding: 2px;"> Jam Density, pc/mi/ln <input style="width: 100%;" type="text" value="190.0"/> </div> </div> <div style="display: flex; justify-content: space-between; align-items: center; margin-top: 5px;"> L <div style="border: 1px dashed black; padding: 2px;"> Queue Discharge Capacity Drop, % <input style="width: 100%;" type="text" value="7"/> </div> </div> <div style="margin-top: 5px;"> Managed Lane <input type="checkbox"/> </div> <div style="margin-top: 5px;"> Lane-By-Lane Analysis <input type="checkbox"/> </div>	<div style="display: flex; justify-content: space-between; align-items: center;"> <div style="border: 1px dashed black; padding: 2px;"> Area Type <input style="width: 100%;" type="text" value="Urban"/> </div> D </div> <div style="margin-top: 5px;"> Demand Factor <input style="width: 100%;" type="text" value="1.000"/> </div> <div style="margin-top: 5px;"> Vehicle Value of Time (VOT), \$/h <input style="width: 100%;" type="text" value="25.00"/> </div> <div style="margin-top: 5px;"> Mixed Flow Model <input type="checkbox"/> </div>
--	--

Segments Global Inputs

<div style="display: flex; justify-content: space-between; align-items: center;"> I <div style="border: 1px dashed black; padding: 2px;"> Freeway Thru Lanes <input checked="" type="checkbox"/> <input style="width: 100%;" type="text" value="3"/> </div> </div> <div style="display: flex; justify-content: space-between; align-items: center; margin-top: 5px;"> C <div style="border: 1px dashed black; padding: 2px;"> Freeway Free Flow Speed, mi/h <input checked="" type="checkbox"/> <input style="width: 100%;" type="text" value="75.4"/> </div> </div> <div style="display: flex; justify-content: space-between; align-items: center; margin-top: 5px;"> A <div style="border: 1px dashed black; padding: 2px;"> Freeway Terrain Type <input checked="" type="checkbox"/> <input style="width: 100%;" type="text" value="Level"/> </div> </div> <div style="display: flex; justify-content: space-between; align-items: center; margin-top: 5px;"> B <div style="border: 1px dashed black; padding: 2px;"> Freeway Peak Hour Factor <input checked="" type="checkbox"/> <input style="width: 100%;" type="text" value="0.94"/> </div> </div> <div style="display: flex; justify-content: space-between; align-items: center; margin-top: 5px;"> F <div style="border: 1px dashed black; padding: 2px;"> Freeway Total Trucks, % <input checked="" type="checkbox"/> <input style="width: 100%;" type="text" value="0.00"/> </div> </div> <div style="display: flex; justify-content: space-between; align-items: center; margin-top: 5px;"> F <div style="border: 1px dashed black; padding: 2px;"> Driver Population <input checked="" type="checkbox"/> <input style="width: 100%;" type="text" value="All Familiar"/> </div> </div> <div style="display: flex; justify-content: space-between; align-items: center; margin-top: 5px;"> F <div style="border: 1px dashed black; padding: 2px;"> Proportion of CAVs, % <input type="checkbox"/> <input style="width: 100%;" type="text" value="0"/> </div> </div>	<div style="display: flex; justify-content: space-between; align-items: center;"> <div style="border: 1px dashed black; padding: 2px;"> Ramp Lanes <input checked="" type="checkbox"/> <input style="width: 100%;" type="text" value="1"/> </div> </div> <div style="display: flex; justify-content: space-between; align-items: center; margin-top: 5px;"> <div style="border: 1px dashed black; padding: 2px;"> Ramp Free Flow Speed, mi/h <input checked="" type="checkbox"/> <input style="width: 100%;" type="text" value="35.0"/> </div> J </div> <div style="margin-top: 5px;"> Ramp Terrain Type <input checked="" type="checkbox"/> <input style="width: 100%;" type="text" value="Level"/> </div> <div style="margin-top: 5px;"> Ramp Peak Hour Factor <input checked="" type="checkbox"/> <input style="width: 100%;" type="text" value="0.94"/> </div> <div style="margin-top: 5px;"> Ramp Total Trucks, % <input checked="" type="checkbox"/> <input style="width: 100%;" type="text" value="0.00"/> </div> <div style="margin-top: 5px;"> Weather Type <input checked="" type="checkbox"/> <input style="width: 100%;" type="text" value="Non-Severe Weather"/> </div> <div style="margin-top: 5px;"> Ramp Demand Adj. Factor <input checked="" type="checkbox"/> <input style="width: 100%;" type="text" value="1.000"/> </div>
--	---

Select All
Apply Global Inputs

HCM-Calc software guidance

The guidance below highlights the location of HCM-Calc input fields and notes the corresponding Oregon-specific default values. This section is organized based on the analysis options available in HCM-Calc: Basic, Merge, Diverge, Weaving, Facility, and Multilane Highway analysis. Oregon default values are noted using letters **A** through **M** in the screen captures and correspond to the first column of Table 1. Inputs noted with a yellow circle (e.g. **M**) will require conversion to an adjustment factor, which can be performed using the adjustment factors spreadsheet provided. The user should refer to the Highway Capacity Manual for inputs not noted in Figures 6 - 16.

Basic Segment Analysis

Figure 6. Basic Segment Analysis Window in HCM-Calc

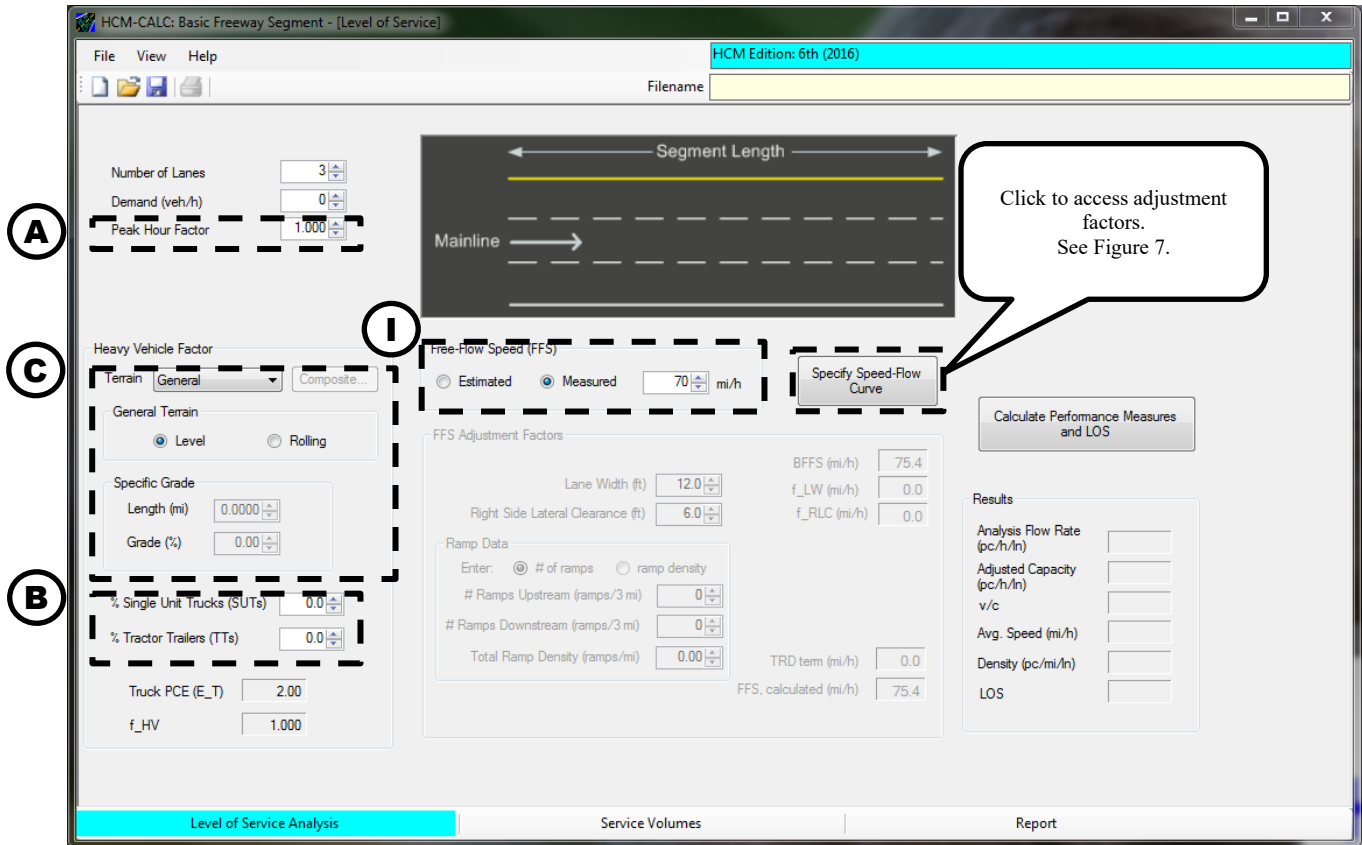
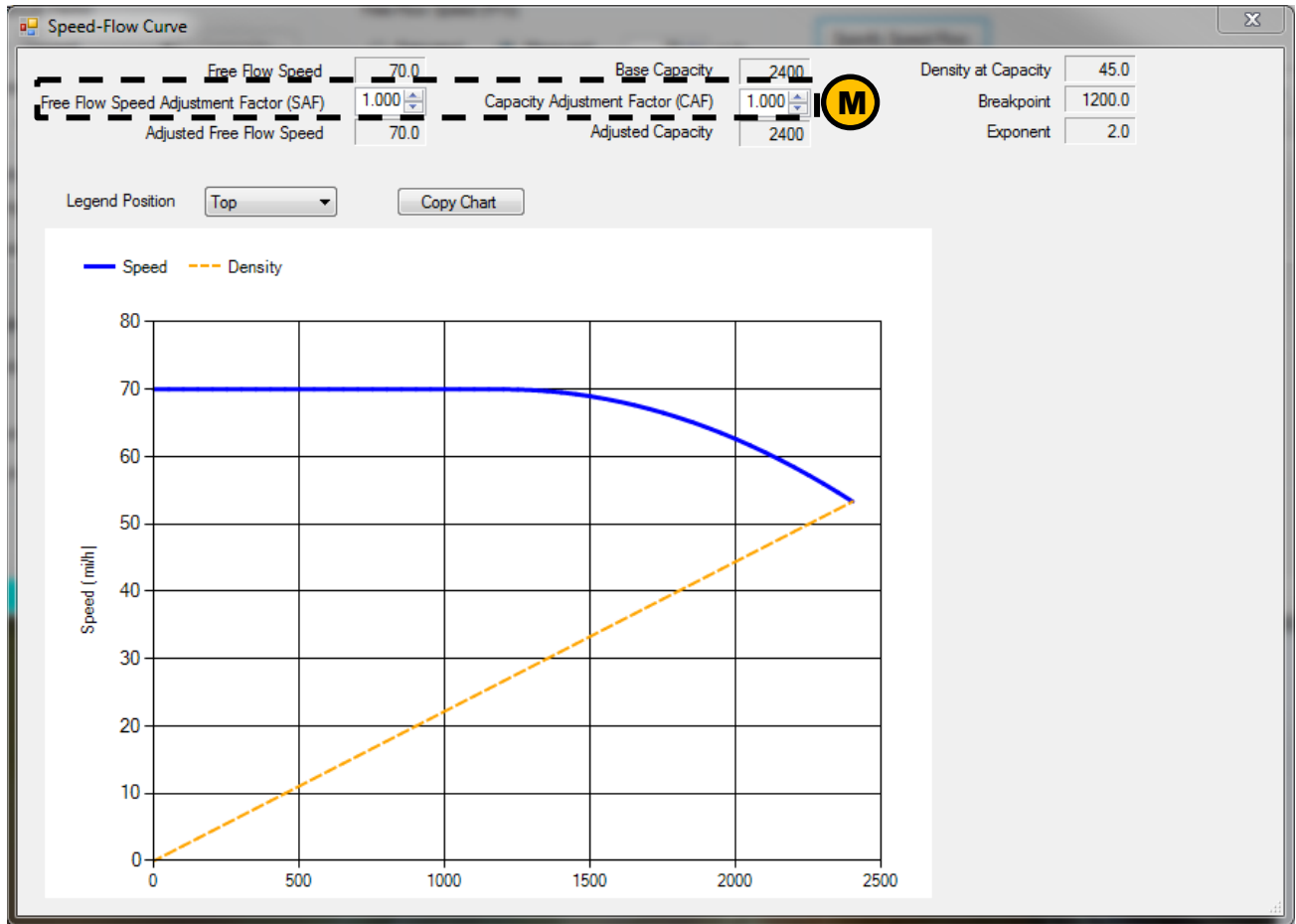


Figure 7. Speed-Flow Curve Accessible Through the Basic Segment and Multilane Highway Window in HCM-Calc



Merge Segment Analysis

Figure 8. Merge Segment Analysis Window in HCM-Calc

The screenshot shows the HCM-CALC On-Ramp Segment analysis window. The interface is organized into several functional areas:

- Mainline Section (A, I, M, C):** Contains input fields for Number of Lanes (3), Demand (veh/h) (0), Peak Hour Factor (1.000), FFS Adjustment Fact. (1.000), Free-Flow Speed (mi/h) (70.0), Capacity Adjustment Fact. (1.000), and Heavy Vehicle Factor (1.000).
- Terrain Section (B):** Includes a Terrain dropdown (General), General Terrain radio buttons (Level, Rolling), and Specific Grade inputs (Length (mi) 0.0000, Grade (%) 0.00).
- On-Ramp Section (J, G):** Features input fields for Demand (veh/h) (0), % SUTs (0.0), % TTs (0.0), f_HV (1.000), Number of Lanes (1), Free-Flow Speed (mi/h) (40), and Acceleration Lane Length (ft) (1000).
- Adjacent Ramp Data:** Includes checkboxes for Upstream and Downstream Off-Ramp, with associated input fields for Distance (ft), Demand (veh/h), % SUTs, % TTs, and f_HV.
- Diagram:** A central diagram illustrates the merge segment geometry, showing the Mainline lanes, the On Ramp lane, the Segment Length, and the Acceleration Length.
- Results Section:** A list of performance measures and LOS metrics, including Analysis Flow Rate (Mainline, Ramp), v_FO, Mainline Capacity, On-Ramp Capacity, Mainline v/c, On-Ramp v/c, v_up, L_EQup, P_FMup, v_down, L_EQdown, P_FMdown, P_FM, v_12, v_R12, S_R, D_R, LOS, Avg. Speed, and Density.

The window title is "HCM-CALC: On-Ramp Segment - [Level of Service]" and the version is "HCM Edition: 6th (2016)". The interface includes a "Calculate Performance Measures and LOS" button and a "Level of Service Analysis" tab at the bottom.

Diverge Segment Analysis

Figure 9. Diverge Segment Analysis Window in HCM-Calc

The screenshot shows the HCM-CALC: Off-Ramp Segment - [Level of Service] window. The interface includes a menu bar (File, View, Help), a toolbar, and a filename field. The main area is divided into three primary sections:

- Mainline:** Contains input fields for Number of Lanes (8), Demand (veh/h) (0), Peak Hour Factor (1.000), FFS Adjustment Fact. (1.000), Free-Flow Speed (mi/h) (70.0), Capacity Adjustment Fact. (1.000), and Heavy Vehicle Factor. It also has radio buttons for Measured and Estimated, and a Terrain dropdown set to General.
- Off-Ramp:** Contains input fields for Demand (veh/h) (0), % SUTs (0.0), % TTs (0.0), f_HV (1.000), Number of Lanes (1), Free-Flow Speed (mi/h) (40), and Deceleration Lane Length (ft) (450).
- Results:** A list of performance measures and LOS values, including Analysis Flow Rate (Mainline and Ramp), v_FO, Mainline and Off-Ramp Capacity, Mainline and Off-Ramp v/c, v_up, L_EQup, P_FDup, v_down, L_EQdown, P_FDdown, P_FD, v_12, S_R, D_R, LOS, Avg. Speed, All Lanes, and Density, All Lanes.

Additional sections include **Adjacent Ramp Data** with checkboxes for Upstream On-Ramp? and Downstream Off-Ramp?, and a **Diagram** showing a diverge segment with labels for Segment Length, Mainline, and Off Ramp. Callouts A, B, C, J, M, and H are placed around the interface to highlight specific areas.

Weaving Segment Analysis

Figure 10. Weaving Segment Analysis Window in HCM-Calc

Mainline

- Segment Type: Freeway
- Number of Lanes: 3
- Demand (veh/h): 0
- Peak Hour Factor: 1.000
- FFS Adjustment Fact.: 1.000
- Free-Flow Speed (mi/h): 70.0
- Interchange Density (int/mi): 0.00

Weave Configuration

- One-Sided (selected) / Two-Sided
- Short Length (L_S) (ft): 0
- # of Weaving Lanes (N_WL): 2
- Min. Lane Changes Freeway-Ramp (LC_FR): 1
- Min. Lane Changes Ramp-Freeway (LC_RF): 1
- Min. Lane Changes Ramp-Ramp (LC_RR): 0

Heavy Vehicle Factor

- Terrain: General
- General Terrain: Level (selected) / Rolling
- Specific Grade: Length (mi): 0.0000, Grade (%): 0.00
- % Single Unit Trucks (SUTs): 0.0
- % Tractor Trailers (TTs): 0.0
- Truck PCE (E_T): 2.00
- f_HV: 1.000

On-Ramp to Freeway

- Demand (veh/h): 0
- % SUTs: 0.0
- % TTs: 0.0
- f_HV: 1.000

Ramp-to-Ramp

- Demand (veh/h): 0

Freeway to Off-Ramp

- Demand (veh/h): 0
- % SUTs: 0.0
- % TTs: 0.0
- f_HV: 1.000

Results

- v_FF (pc/h)
- v_FR (pc/h)
- v_RF (pc/h)
- v_RR (pc/h)
- Volume Ratio
- Maximum Length (ft)
- C_IWL (pc/h/in)
- C_IW (pc/h)
- C_W (veh/h)
- v/c
- LC_min (c/h)
- LC_W (c/h)
- I_NW
- LC_NW (c/h)
- LC_All (c/h)
- Weaving Intensity
- Non-Weaving Speed (mi/h)
- Weaving Speed (mi/h)
- Avg. Speed (mi/h)
- Density (pc/mi/in)
- LOS

Diagram Labels: Mainline, Segment Length, Short Length, Auxiliary Lane, On Ramp, Off Ramp.

Note: The on-ramp and off-ramp demand volumes should not include the ramp-to-ramp volume.

Callouts: A, B, C, I

Buttons: Calculate Performance Measures and LOS, Level of Service Analysis, Service Volumes, Report

Facility Analysis

Input parameters for the facility analysis are included the facility analysis main window, and within the nested windows for each freeway segment defined in the facility. This guidance illustrates the location of the HCM-Calc input fields in the main window (Figure 11) and for the individual segment types (Figures 12 through 15).

Figure 11. Facility Analysis Main Window in HCM-Calc

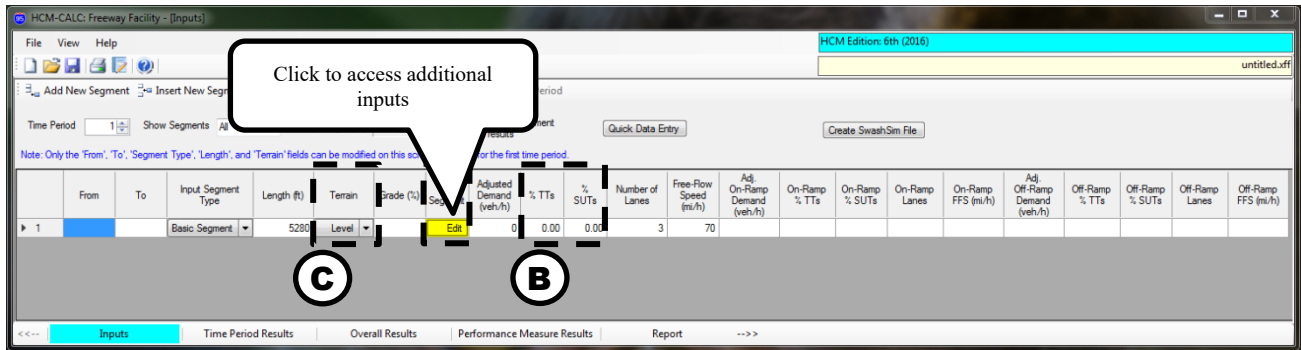


Figure 12. Basic Segment Window within the Facility Analysis in HCM-Calc

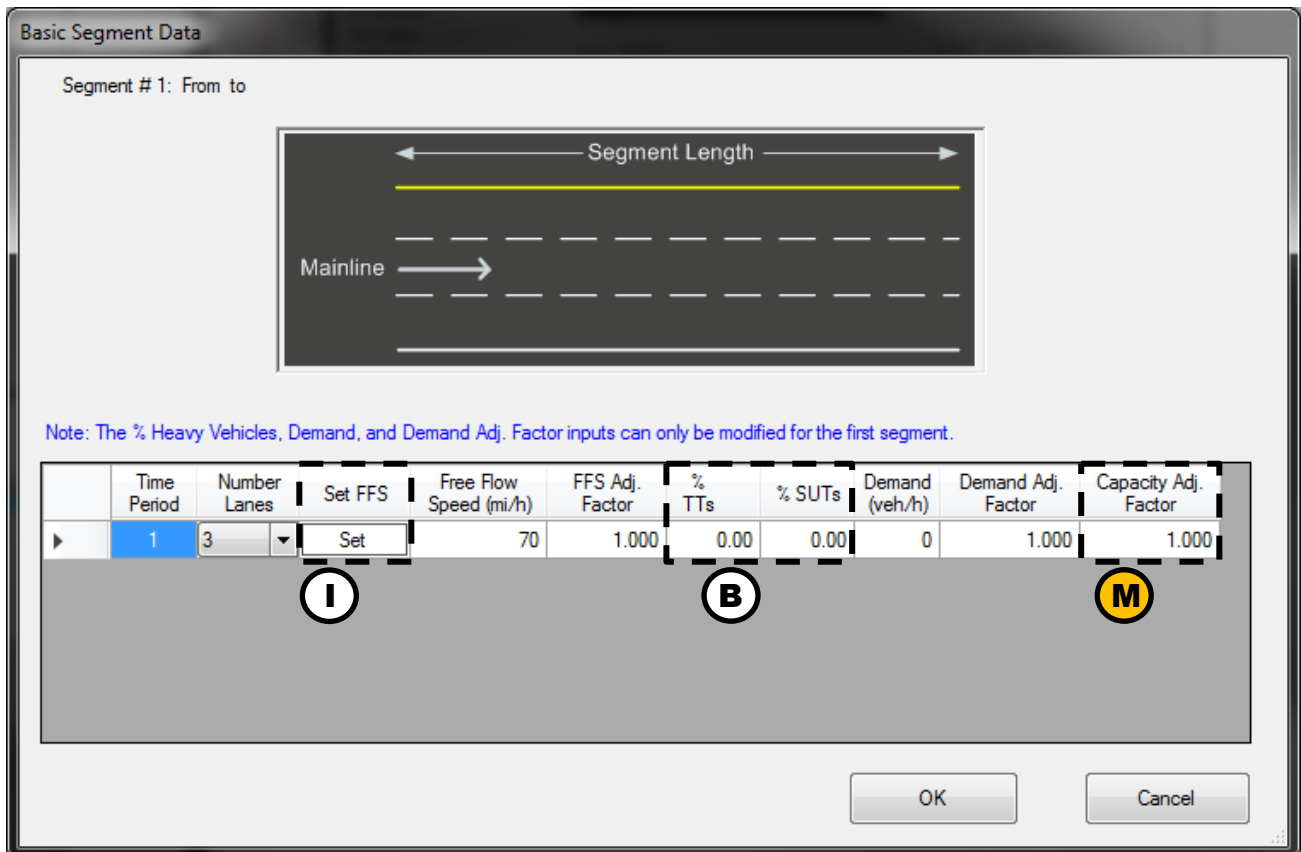


Figure 13. Merging Segment Window within the Facility Analysis in HCM-Calc

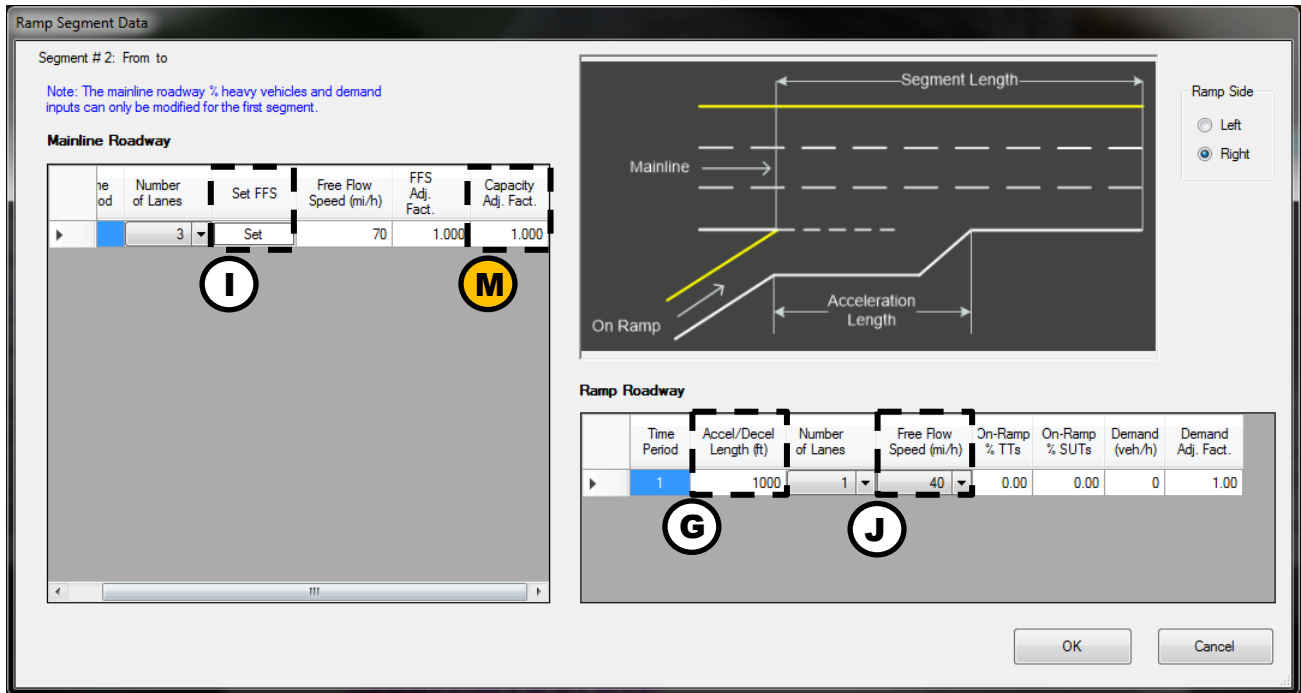


Figure 14. Diverging Segment Window within the Facility Analysis in HCM-Calc

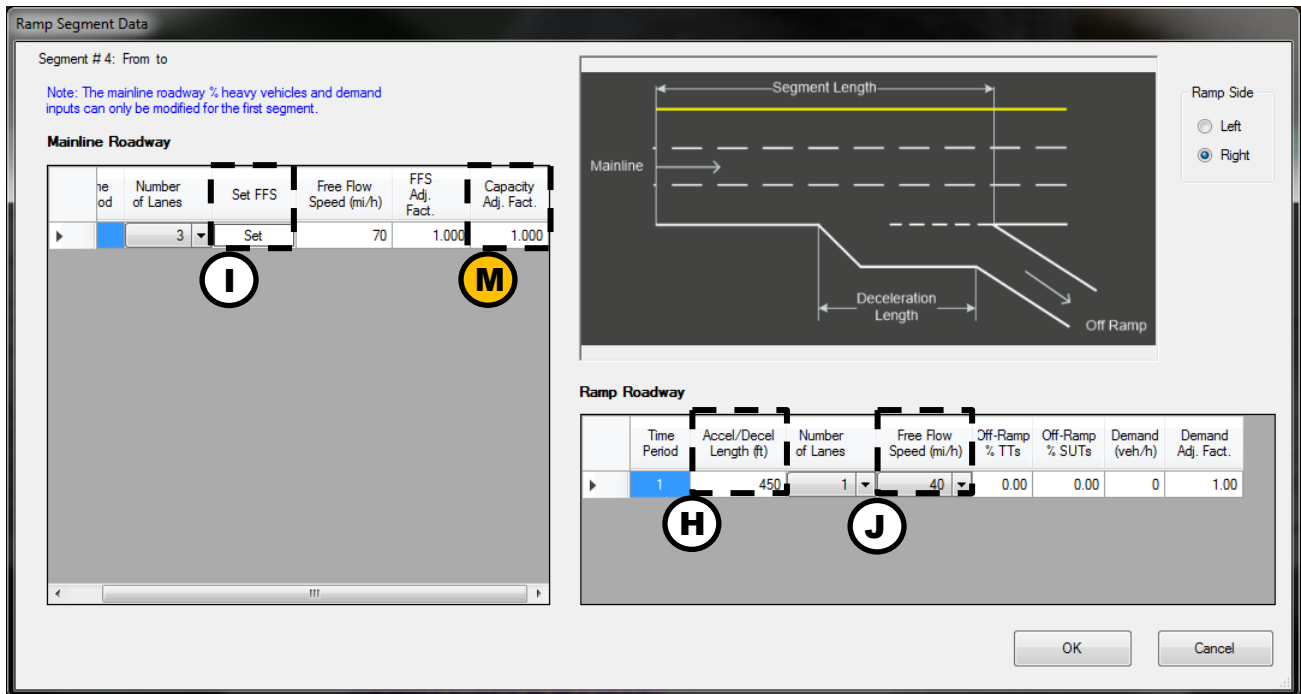
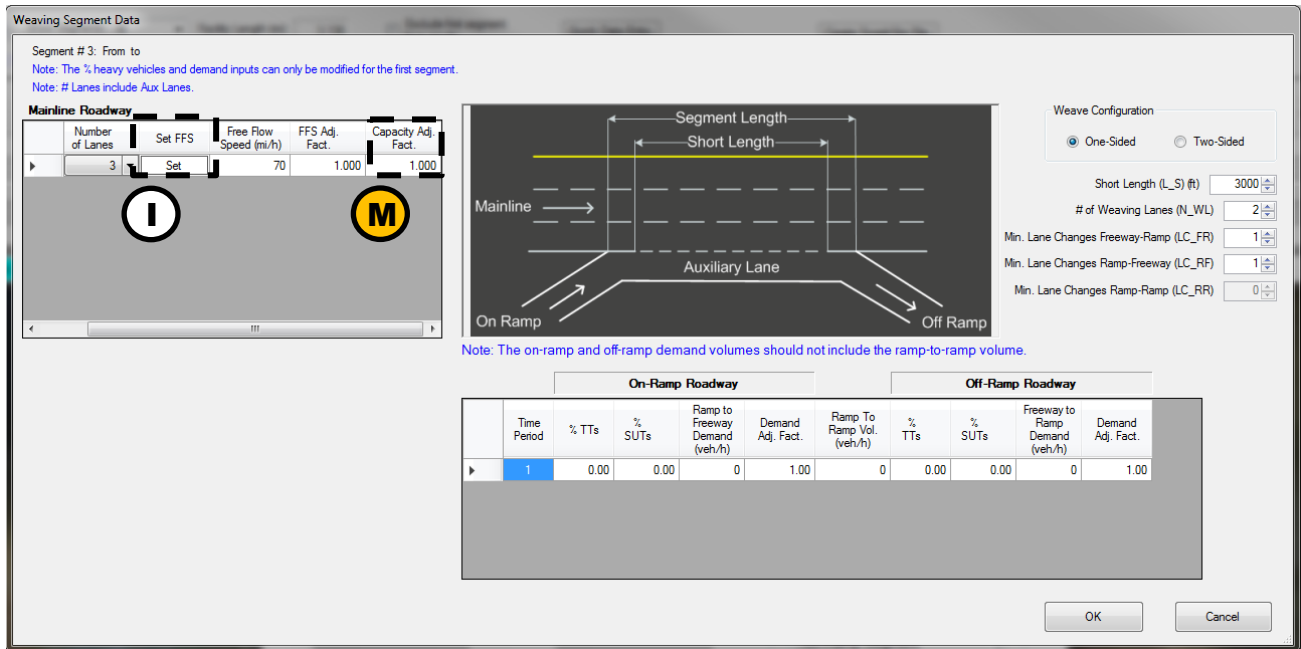
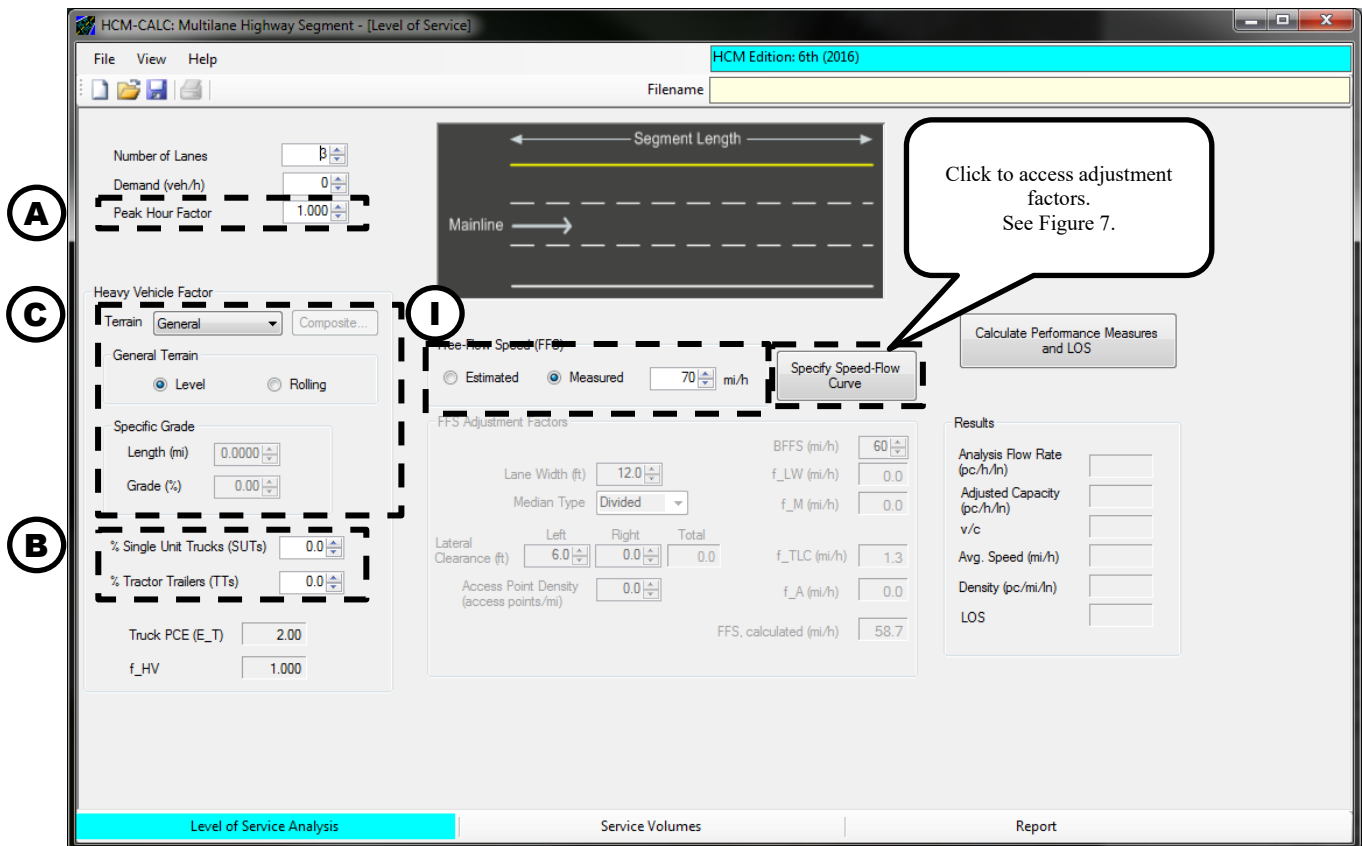


Figure 15. Weaving Segment Window within the Facility Analysis in HCM-Calc



Multilane Highway Segment Analysis

Figure 16. Multilane Highway Segment Window within the Facility Analysis in HCM-Calc



FREEVAL Software Guidance

The [FREEVAL-OR](#) software tool has been customized to incorporate all the Oregon-specific default values identified in the APM. A drop down menu (Figure 17) is available to apply the ODOT default values for a new facility, which are then translated into the global settings screen (Figure 18). The following guidance is based on FREEVAL+ OR version REL 20180627.

The guidance below highlights the location of FREEVAL input fields and notes the corresponding Oregon-specific default values. This section is organized based on freeway facilities analysis available in FREEVAL. While FREEVAL can support segment analysis, it is done in the context of a facility. Oregon default values are noted using letters **(A)** through **(M)** in the screen captures and correspond to the first column of Table 1. The user should refer to the Highway Capacity Manual for inputs not noted in Figures 17-20.

Since FREEVAL implements the freeway facilities analysis, the ODOT default for peak hour factor (**(A)**) is not used (all entries are in 15 minute intervals for the facility method).

Truck percentage (**(B)**) is divided into Single Unit Truck (SUT) and Tractor Trailer (TT) values. These can be specifically entered, but are also automatically populated based on the Area Type (**(D)**) from Table 1. The Driver Population speed and capacity adjustment factors (**(F)**) are also automatically updated based on the Area Type selection.

A tool for computing proportional ramp to ramp demands for weaving segments (Figure 19) can be accessed using the *Analyze->Demand Editor/Visualizer* option in the top menu bar.

The default bottleneck capacities for Oregon can be viewed and applied using the capacity tool (Figure 20) accessed using the *Analyze->Apply/Edit Default Parameters* option in the top menu bar.

Figure 17. Initial Prompt to Pre-select ODOT Defaults Over the HCM Defaults in FREEVAL

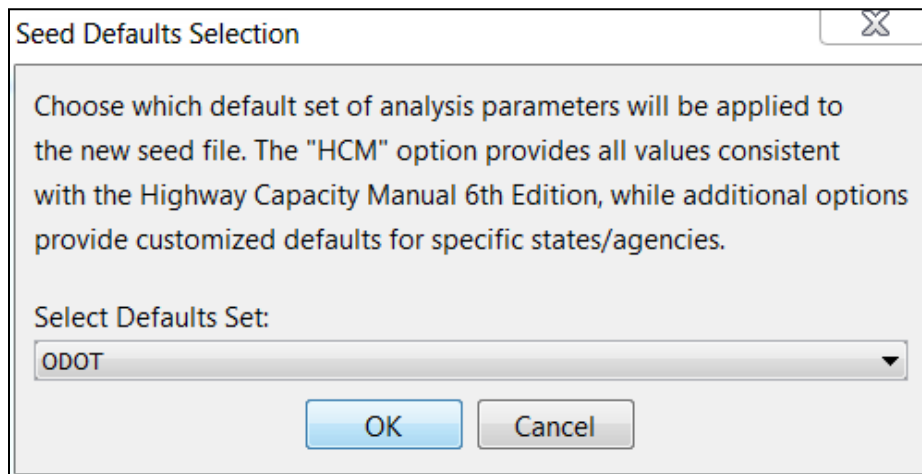


Figure 18. Project Seed Global Defaults in FREEVAL

Project Properties (ODOT Defaults)

General Information

Project Name: New Project 1 Number Of HCM Segments: 7

Study Period Start Time (hh:mm): 17:00 Study Period End Time (hh:mm): 18:00

Seed Calibration Date: Nov 7, 2017 Jam Density (pc/mi/ln): 190

Capacity Drop due to Breakdown (%): 7 GP Vehicle Occupancy (p/veh): 1.0

Area Type: Small Urban

Analysis Options

Free Flow Speed Known Managed Lanes Analysis

Prefill Global Values

General Purpose Segments

General Terrain: Level (Default=2.0) Current Truck PCE: 2.0 Look-up Tables

Num Of Mainline Lanes: 3 Mainline FFS (mph): 70

Lane Width (ft)

Lateral Clearance (ft)

Num Of Ramp Lanes: 1 Ramp FFS (mph): 35

Ramp Acceleration Length (ft): 750 Ramp Deceleration Length (ft): 500

Single Unit Trucks and Buses (%): 5.0 Tractor Trailers (%): 5.0

Driver Population CAF: 0.968 Driver Population SAF: 0.975

OK Cancel

Figure 19. FREEVAL Weave Ramp to Ramp Demand Tool

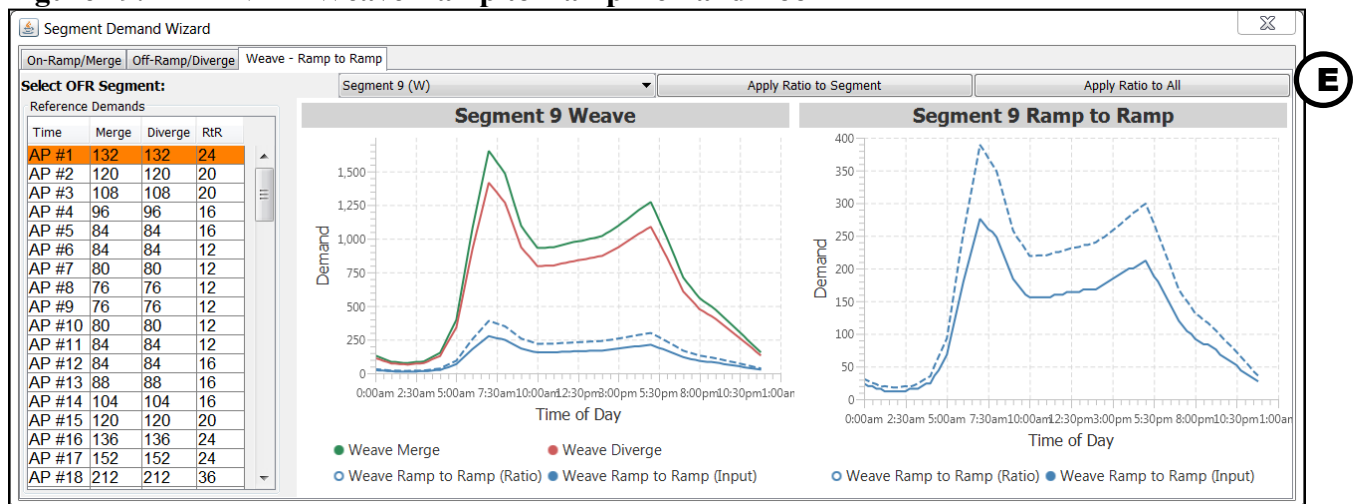


Figure 20. Default Bottleneck Capacity Input Window in FREEVAL

View/Apply Capacity Defaults

Use the table below to define pre-breakdown capacities for the specified segment types. The capacities will be converted to Capacity Adjustment Factors (CAFs) and applied to the seed file. The dropdown box can be used to select a set of default values as a starting point.

Utilize Default Capacities for Segments Oregon ▾

Pre-Breakdown Capacity (pc/hr/ln)

Segment Type	3 Lanes	2;>3 Lanes
Urban Merge	2100	2000
Urban Diverge	2100	2000
Urban weaving	2200	2100
Rural Merge	1900	1800
Rural Diverge	1900	1800

Save Cancel

ODOT Default Values for Reliability

The following sections highlight updates to [FREEVAL-OR](#) for the inclusion of Oregon-specific default values for the Highway Capacity Manual's (HCM) reliability analysis approach for the freeway facilities methodology.

Required Data and Units	Source	Suggested Default Value
A Seed Date	N/A	Date the seed analysis represents (Seasonal average day if not calibrated to specific date)
B Reliability Reporting Period (RRP) Dates	N/A	Jan. 1 st 20XX – Dec. 31 st 20XX
C Event Types	N/A	General Purpose Incidents, Weather, and Work Zones (as applicable)
D Random Number Generator Seed	N/A	
E Realizations per Demand-Combination	HCM 6th	4 – Approximates number of weekdays per month
F Days of Week Included	HCM 6 th	Monday – Friday (All Weekdays)
G Days to Exclude	N/A	None
H Daily Demand Multipliers	ODOT	Regional-specific value (see ODOT APM Chapter 11 Appendix C)
I Dates Active	N/A	Analysis-specific values
J Segments Active	N/A	Analysis-specific values
K Daily Time Active	N/A	Analysis-specific values
L Work Zone Configuration	N/A	Analysis-specific values
M Incident Frequencies	N/A	Analysis-specific values
N Incident Severity Distribution	N/A	Analysis-specific values
O Incident Severity Durations	HCM 6 th	Location-specific values (see ODOT APM Chapter 11 Appendix C)
P Incident Adjustment Factors	HCM 6 th	Highway Capacity Manual defaults
Q Monthly Weather Severity Distribution	HCM/ NOAA Data	Location-specific values (see ODOT APM Chapter 11 Appendix C)
R Weather Severity Durations	HCM/ NOAA Data	Location-specific values (see ODOT APM Chapter 11 Appendix C)
S Weather Severity Adjustments	HCM 6 th	Highway Capacity Manual defaults

General Project Properties

Scenario Generator - New Project 1

Properties: GP - Demand | GP - Work Zones | GP - Incidents | Weather

Reliability Analysis Properties

Seed Date: RRP Start Date: RRP End Date:

Include Event Types

GP - Work Zones GP - Incidents Weather ML - Incidents

Random Number Generator (RNG) Seed Options (Any new RNG Seed value will be saved to the seed file)

Use new random RNG seed
 Use user specified RNG seed
 Use previous used RNG seed

Number of Demand Combination Realizations

Number of realizations (default 4):

Demand

Scenario Generator - New Project 1

Properties GP - Demand GP - Work Zones GP - Incidents Weather

Days in RRP

- Monday
- Tuesday
- Wednesday
- Thursday
- Friday
- Saturday
- Sunday

Select All

Select Weekdays

Select Weekends

Daily Demand Multipliers

	Monday	Tuesday	Wednesday	Thursday	Friday
January	1.0	1.0	1.0	1.0	1.0
February	1.0	1.0	1.0	1.0	1.0
March	1.0	1.0	1.0	1.0	1.0
April	1.0	1.0	1.0	1.0	1.0
May	1.0	1.0	1.0	1.0	1.0
June	1.0	1.0	1.0	1.0	1.0
July	1.0	1.0	1.0	1.0	1.0
August	1.0	1.0	1.0	1.0	1.0
September	1.0	1.0	1.0	1.0	1.0
October	1.0	1.0	1.0	1.0	1.0
November	1.0	1.0	1.0	1.0	1.0
December	1.0	1.0	1.0	1.0	1.0

Use Defaults

National Defaults Urban Saved Facility Specific User Input Values

Exclude Specific Calendar Dates From RRP

Specific Date

Jul 4, 2018

Add

Remove

Remove All

Dates Excluded From RRP

Generate Scenarios Only Generate and Run Scenarios Cancel

ODOT Default Demand Multipliers

The HCM provides two default sets of daily and season demand multipliers for urban and rural freeways. To supplement these, 11 new distinct sets of demand multipliers have been developed to represent the national and state highway system of Oregon. The new demand multiplier types are designated by thematic trend and guidance on which type applies to which section of roadway can be found in Chapter 11 Appendix C. The Oregon specific types are as follows:

- Agricultural.
- Coastal Destination.
- Coastal Destination Route.
- Commuter.
- Interstate—Nonurbanized.
- Interstate—Urbanized.
- Recreational—Summer.
- Recreational—Summer and Winter.
- Recreational—Winter.
- Summer.
- Summer < 2,500 AADT.

These have been incorporated directly into FREEVAL’s reliability scenario generation functionality. A new option to choose between the national and Oregon-specific defaults is presented to the user as seen in Figure 21.

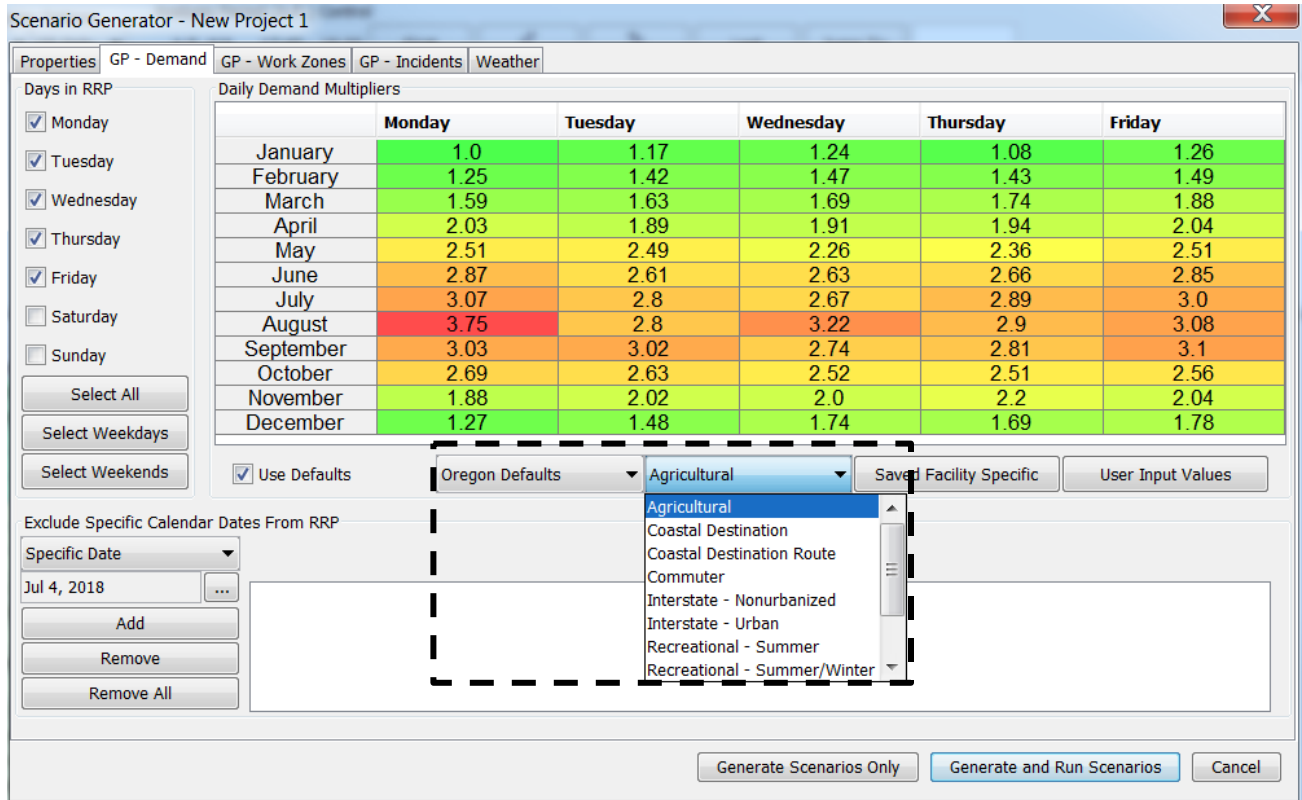
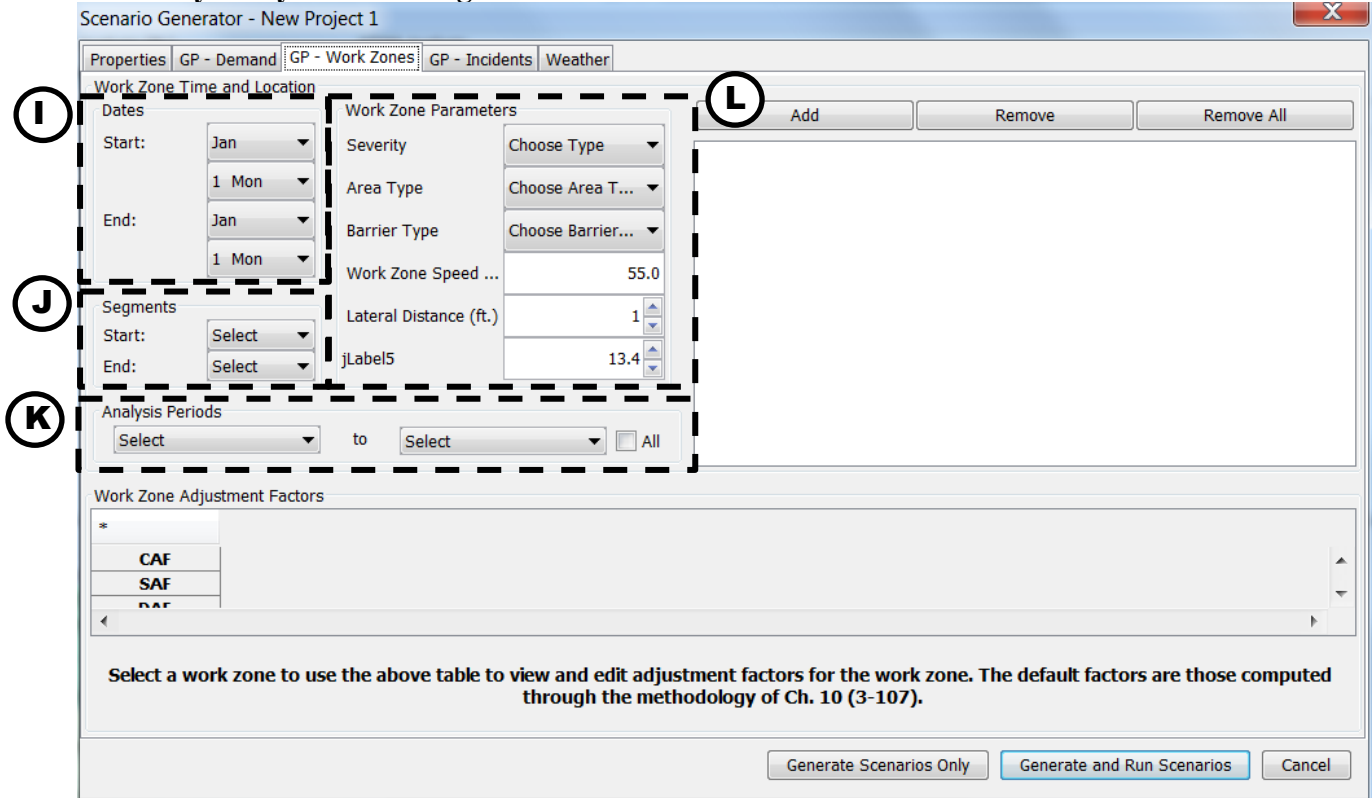


Figure 21 Screenshot of FREEVAL’s demand options configuration window for the reliability analysis scenario generator.



Incidents

There are no available Oregon-specific defaults for the incident rates, durations, and operational adjustments of the reliability analysis method. These values are highly dependent on geometric aspects of a given facility, and as such should be developed on an individual basis. There are three methods to compute incident rates within FREEVAL, and guidance on which approach to use is available in Chapter 11. Further, while a default severity type distribution is provided, it is highly recommended that these values be set for each specific analysis. One example to demonstrate the importance of this, is that the default distribution includes a percentage for three-lane closure incidents, which are only possible on four-lane freeway segments (the HCM method requires that at least one lane is always open). If no segment of a facility has at least 4-lanes, then this percentage of incidents cannot be assigned. In order for the full number of incidents to be assigned, it is critical that a user update this distribution to appropriately reflect a realistic incident severity distribution.

Scenario Generator - New Project 1

Properties | GP - Demand | GP - Work Zones | GP - Incidents | Weather

M Incident Frequencies

Month	Frequency
Jan	0.00
Feb	0.00
Mar	0.00
Apr	0.00
May	0.00
Jun	0.00
Jul	0.00
Aug	0.00
Sep	0.00

Calculate Frequencies...
Use Seed File Values

Frequencies represent the number of incidents per study period per month.
A red background indicates that the frequency values have not been set or are very small (<0.01)

N Incident Durations

Incident Severity	Distribution %	Mean Duration	Std. ...	Minimum Duration	Maximum Duration
Shoulder Closure	75.4	34.0	15.1	8.7	58.0
One Lane Closure	19.6	34.6	13.8	16.0	58.2
Two Lane Closure	3.1	53.6	13.9	30.5	66.9
Three Lane Closure	1.9	67.9	21.9	36.0	93.3
Four Lane Closure	0.0	67.0	21.0	36.0	93.3

Use National Default Data | Use Default Durations
Use Saved Seed File Distribution | Use Saved Seed File Durations

P Adjustment Factors

Capacity Adjustment Factors (CAFs)

Segment Lanes	Shoulder Closure	1 Lane Closure	2 Lane Closure	3 Lane Closure	4 Lane Closure
2	0.81	0.7			
3	0.83	0.74	0.51		
4	0.85	0.77	0.5	0.52	

FFS Adjustment Factors (SAFs)

Segment Lanes	Shoulder Closure	1 Lane Closure	2 Lane Closure	3 Lane Closure	4 Lane Closure
2	1.0	1.0			
3	1.0	1.0	1.0		
4	1.0	1.0	1.0	1.0	

Demand Adjustment Factors (DAFs)

Segment Lanes	Shoulder Closure	1 Lane Closure	2 Lane Closure	3 Lane Closure	4 Lane Closure
2	1.0	1.0			
3	1.0	1.0	1.0		
4	1.0	1.0	1.0	1.0	

Lane Adjustment Factors

Segment Lanes	Shoulder Closure	1 Lane Closure	2 Lane Closure	3 Lane Closure	4 Lane Closure
2	0	-1			
3	0	-1	-2		
4	0	-1	-2	-3	

Generate Scenarios Only | Generate and Run Scenarios | Cancel

Weather

Scenario Generator - New Project 1

Properties | GP - Demand | GP - Work Zones | GP - Incidents | Weather

Please enter probabilities, durations, and adjustment factors for weather events, or fill by specifying the nearest metropolitan area:

Use the dropdown selection boxes to choose a region and city.

National | Extract Historic Regional Weather Data | Import from File
New Facility Specific | Use Values Stored In Seed | Export to File

Q

	Med Rain	Heavy Rain	Light Snow	LM Snow	MH Snow	Heavy Snow	Severe Cold	Low Vis	Very Low Vis	Min Vis	Normal Weather
January	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
February	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
March	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
April	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
May	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
June	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
July	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
August	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
September	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%

R

	Med Rain	Heavy Rain	Light Snow	LM Snow	MH Snow	Heavy Snow	Severe Cold	Low Vis	Very Low Vis	Min Vis	Normal Weather
Avg Dur (mi)	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
CAF	0.93	0.86	0.96	0.91	0.89	0.78	0.92	0.90	0.88	0.90	1.00
SAF	0.93	0.92	0.87	0.86	0.84	0.83	0.93	0.94	0.92	0.92	1.00

S

Generate Scenarios Only | Generate and Run Scenarios | Cancel

ODOT Specific Weather Data

In addition to the 98 default weather locations provided by the HCM, new Oregon-specific weather defaults were developed for 12 additional locations. As with the demand multipliers, these have been incorporated directly into FREEVAL’s reliability scenario generation interface. A user can toggle between the national and Oregon-specific options, which then allows for additional selection of the specific location as a secondary option. Figure 22 shows the location of these new options within the software.

Figure 22 Example selection of the Oregon specific default weather station locations.

