# APPENDIX G

2020 & 2040 No-Build Freeway HCS Analysis

# FREEWAY WEAVING WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency/Company | AECOM |
| Date Performed | |
| Analysis Time Period | AM |

## Site Information

| | |
|---|---|
| Freeway/Dir of Travel | I-95 NB |
| Weaving Segment Location | Seg 1-Bet Copans & Sample |
| Analysis Year | No-Build 2020 |

Project Description SW 10th Street SIMR

## Inputs

| | | | |
|---|---|---|---|
| Weaving configuration | One-Sided | Segment type | Freeway |
| Weaving number of lanes, N | 4 | Freeway minimum speed, $S_{MIN}$ | 15 |
| Weaving segment length, $L_S$ | 1820ft | Freeway maximum capacity, $C_{IFL}$ | 2400 |
| Freeway free-flow speed, FFS | 70 mph | Terrain type | Level |

## Conversions to pc/h Under Base Conditions

| | V (veh/h) | PHF | Truck (%) | RV (%) | $E_T$ | $E_R$ | $f_{HV}$ | $f_p$ | v (pc/h) |
|---|---|---|---|---|---|---|---|---|---|
| $V_{FF}$ | 4435 | 0.95 | 3 | 0 | 1.5 | 1.2 | 0.985 | 1.00 | 4738 |
| $V_{RF}$ | 345 | 0.92 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 379 |
| $V_{FR}$ | 810 | 0.92 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 889 |
| $V_{RR}$ | 0 | 0.92 | 0 | 0 | 1.5 | 1.2 | 1.000 | 1.00 | 0 |
| $V_{NW}$ | 4738 | | | | | | | V = | 6006 |
| $V_W$ | 1268 | | | | | | | | |
| VR | 0.211 | | | | | | | | |

## Configuration Characteristics

| | | | |
|---|---|---|---|
| Minimum maneuver lanes, $N_{WL}$ | 2 lc | Minimum weaving lane changes, $LC_{MIN}$ | 1268 lc/h |
| Interchange density, ID | 0.7 int/mi | Weaving lane changes, $LC_W$ | 1640 lc/h |
| Minimum RF lane changes, $LC_{RF}$ | 1 lc/pc | Non-weaving lane changes, $LC_{NW}$ | 1192 lc/h |
| Minimum FR lane changes, $LC_{FR}$ | 1 lc/pc | Total lane changes, $LC_{ALL}$ | 2832 lc/h |
| Minimum RR lane changes, $LC_{RR}$ | lc/pc | Non-weaving vehicle index, $I_{NW}$ | 604 |

## Weaving Segment Speed, Density, Level of Service, and Capacity

| | | | |
|---|---|---|---|
| Weaving segment flow rate, v | 5924 veh/h | Weaving intensity factor, W | 0.320 |
| Weaving segment capacity, $c_w$ | 8603 veh/h | Weaving segment speed, S | 54.3 mph |
| Weaving segment v/c ratio | 0.689 | Average weaving speed, $S_W$ | 56.7 mph |
| Weaving segment density, D | 27.7 pc/mi/ln | Average non-weaving speed, $S_{NW}$ | 53.7 mph |
| Level of Service, LOS | C | Maximum weaving length, $L_{MAX}$ | 4650 ft |

## Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".



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# BASIC FREEWAY SEGMENTS WORKSHEET

| General Information | | Site Information | |
|---|---|---|---|
| Analyst | | Highway/Direction of Travel | *I-95 NB* |
| Agency or Company | *AECOM* | From/To | *Seg 2-Bet Off & On from Sample* |
| Date Performed | | Jurisdiction | |
| Analysis Time Period | *AM* | Analysis Year | *No-Build 2020* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | |
|---|---|---|---|---|
| Volume, V | *4780* | veh/h | Peak-Hour Factor, PHF | *0.95* |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *3* |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* |

## Calculate Flow Adjustments

| | | | |
|---|---|---|---|
| $f_p$ | *1.00* | $E_R$ | *1.2* |
| $E_T$ | *1.5* | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.985* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *3* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *70.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *1702* | pc/h/ln |
| S | *67.1* | mph |
| D = $v_p$ / S | *25.4* | pc/mi/ln |
| LOS | *C* | |

## Design (N)

Design (N)

| | |
|---|---|
| Design LOS | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | pc/h/ln |
| S | mph |
| D = $v_p$ / S | pc/mi/ln |
| Required Number of Lanes, N | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 10-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |

# RAMPS AND RAMP JUNCTIONS WORKSHEET

## General Information / Site Information

| | | | |
|---|---|---|---|
| Analyst | | Freeway/Dir of Travel | I-95 NB |
| Agency or Company | AECOM | Junction | Seg 3-On Ramp from Sample |
| Date Performed | | Jurisdiction | |
| Analysis Time Period | AM | Analysis Year | No-Build 2020 |

Project Description SW 10th Street SIMR

## Inputs

| Upstream Adj Ramp | | Freeway Number of Lanes, N | 3 | Downstream Adj Ramp | |
|---|---|---|---|---|---|
| ☐ Yes | ☐ On | Ramp Number of Lanes, N | 1 | ☑ Yes | ☑ On |
| ☑ No | ☐ Off | Acceleration Lane Length, $L_A$ | 500 | ☐ No | ☐ Off |
| $L_{up}$ = | ft | Deceleration Lane Length $L_D$ | | $L_{down}$ = | 1950 ft |
| $V_u$ = | veh/h | Freeway Volume, $V_F$ | 4780 | $V_D$ = | 890 veh/h |
| | | Ramp Volume, $V_R$ | 1250 | | |
| | | Freeway Free-Flow Speed, $S_{FF}$ | 70.0 | | |
| | | Ramp Free-Flow Speed, $S_{FR}$ | 50.0 | | |

## Conversion to pc/h Under Base Conditions

| (pc/h) | V (Veh/hr) | PHF | Terrain | %Truck | %Rv | $f_{HV}$ | $f_p$ | v = V/PHF x $f_{HV}$ x $f_p$ |
|---|---|---|---|---|---|---|---|---|
| Freeway | 4780 | 0.95 | Level | 3 | 0 | 0.985 | 1.00 | 5107 |
| Ramp | 1250 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 1372 |
| UpStream | | | | | | | | |
| DownStream | 890 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 977 |

### Merge Areas

#### Estimation of $v_{12}$

$V_{12} = V_F ( P_{FM} )$

$L_{EQ}$ = (Equation 13-6 or 13-7)

$P_{FM}$ = 0.591 using Equation (Exhibit 13-6)

$V_{12}$ = 3021 pc/h

$V_3$ or $V_{av34}$ 2086 pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☑ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☑ Yes ☐ No

If Yes,$V_{12a}$ = 3021 pc/h (Equation 13-16, 13-18, or 13-19)

#### Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_{FO}$ | 6479 | Exhibit 13-8 | | No |

#### Flow Entering Merge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{R12}$ | 4393 | Exhibit 13-8 | 4600:All | No |

#### Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

$D_R$ = 36.0 (pc/mi/ln)

LOS = E (Exhibit 13-2)

#### Speed Determination

$M_S$ = 0.586 (Exibit 13-11)

$S_R$= 53.6 mph (Exhibit 13-11)

$S_0$= 64.3 mph (Exhibit 13-11)

S = 56.6 mph (Exhibit 13-13)

### Diverge Areas

#### Estimation of $v_{12}$

$V_{12} = V_R + (V_F - V_R)P_{FD}$

$L_{EQ}$ = (Equation 13-12 or 13-13)

$P_{FD}$ = using Equation (Exhibit 13-7)

$V_{12}$ = pc/h

$V_3$ or $V_{av34}$ pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☐ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☐ No

If Yes,$V_{12a}$ = pc/h (Equation 13-16, 13-18, or 13-19)

#### Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_F$ | | Exhibit 13-8 | | |
| $V_{FO} = V_F - V_R$ | | Exhibit 13-8 | | |
| $V_R$ | | Exhibit 13-10 | | |

#### Flow Entering Diverge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{12}$ | | Exhibit 13-8 | | |

#### Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

$D_R$ = (pc/mi/ln)

LOS = (Exhibit 13-2)

#### Speed Determination

$D_s$ = (Exhibit 13-12)

$S_R$= mph (Exhibit 13-12)

$S_0$= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency or Company | *AECOM* |
| Date Performed | |
| Analysis Time Period | *AM* |

## Site Information

| | |
|---|---|
| Highway/Direction of Travel | *I-95 NB* |
| From/To | *Seg 4-Bet On from Sample & Exp* |
| Jurisdiction | |
| Analysis Year | *No-Build 2020* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | |
|---|---|---|---|---|
| Volume, V | *6030* | veh/h | Peak-Hour Factor, PHF | *0.95* |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *3* |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* |

## Calculate Flow Adjustments

| | | | |
|---|---|---|---|
| $f_p$ | *1.00* | $E_R$ | *1.2* |
| $E_T$ | *1.5* | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.985* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *3* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *70.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *2148* | pc/h/ln |
| S | *59.6* | mph |
| D = $v_p$ / S | *36.1* | pc/mi/ln |
| LOS | *E* | |

## Design (N)

Design (N)

| | |
|---|---|
| Design LOS | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | pc/h/ln |
| S | mph |
| D = $v_p$ / S | pc/mi/ln |
| Required Number of Lanes, N | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 10-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |

# RAMPS AND RAMP JUNCTIONS WORKSHEET

## General Information

| | | | |
|---|---|---|---|
| Analyst | | Freeway/Dir of Travel | I-95 NB |
| Agency or Company | AECOM | Junction | Seg 5-On from Exp |
| Date Performed | | Jurisdiction | |
| Analysis Time Period | AM | Analysis Year | No-Build 2020 |

Project Description SW 10th Street SIMR

## Site Information

## Inputs

| Upstream Adj Ramp | | Freeway Number of Lanes, N | 3 | Downstream Adj Ramp | |
|---|---|---|---|---|---|
| ☐ Yes | ☐ On | Ramp Number of Lanes, N | 1 | ☑ Yes | ☐ On |
| ☑ No | ☐ Off | Acceleration Lane Length, $L_A$ | 600 | ☐ No | ☑ Off |
| $L_{up}$ = | ft | Deceleration Lane Length $L_D$ | | $L_{down}$ = | 5545 ft |
| $V_u$ = | veh/h | Freeway Volume, $V_F$ | 6030 | $V_D$ = | 1070 veh/h |
| | | Ramp Volume, $V_R$ | 890 | | |
| | | Freeway Free-Flow Speed, $S_{FF}$ | 70.0 | | |
| | | Ramp Free-Flow Speed, $S_{FR}$ | 50.0 | | |

## Conversion to pc/h Under Base Conditions

| (pc/h) | V (Veh/hr) | PHF | Terrain | %Truck | %Rv | $f_{HV}$ | $f_p$ | v = V/PHF x $f_{HV}$ x $f_p$ |
|---|---|---|---|---|---|---|---|---|
| Freeway | 6030 | 0.95 | Level | 3 | 0 | 0.985 | 1.00 | 6443 |
| Ramp | 890 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 977 |
| UpStream | | | | | | | | |
| DownStream | 1070 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 1175 |

**Merge Areas**

## Estimation of $v_{12}$

$V_{12} = V_F ( P_{FM} )$

$L_{EQ}$ = 6760.64 (Equation 13-6 or 13-7)

$P_{FM}$ = 0.604 using Equation (Exhibit 13-6)

$V_{12}$ = 3894 pc/h

$V_3$ or $V_{av34}$ 2549 pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☑ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☑ Yes ☐ No

If Yes,$V_{12a}$ = 3894 pc/h (Equation 13-16, 13-18, or 13-19)

## Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_{FO}$ | 7420 | Exhibit 13-8 | | Yes |

## Flow Entering Merge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{R12}$ | 5338 | Exhibit 13-8 | 4600:All | Yes |

## Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

$D_R$ = 42.9 (pc/mi/ln)

LOS = F (Exhibit 13-2)

## Speed Determination

$M_S$ = 1.073 (Exibit 13-11)

$S_R$= 40.0 mph (Exhibit 13-11)

$S_0$= 64.3 mph (Exhibit 13-11)

S = 44.7 mph (Exhibit 13-13)

**Diverge Areas**

## Estimation of $v_{12}$

$V_{12} = V_R + (V_F - V_R)P_{FD}$

$L_{EQ}$ = (Equation 13-12 or 13-13)

$P_{FD}$ = using Equation (Exhibit 13-7)

$V_{12}$ = pc/h

$V_3$ or $V_{av34}$ pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☐ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☐ No

If Yes,$V_{12a}$ = pc/h (Equation 13-16, 13-18, or 13-19)

## Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_F$ | | Exhibit 13-8 | | |
| $V_{FO} = V_F - V_R$ | | Exhibit 13-8 | | |
| $V_R$ | | Exhibit 13-10 | | |

## Flow Entering Diverge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{12}$ | | Exhibit 13-8 | | |

## Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

$D_R$ = (pc/mi/ln)

LOS = (Exhibit 13-2)

## Speed Determination

$D_s$ = (Exhibit 13-12)

$S_R$= mph (Exhibit 13-12)

$S_0$= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency or Company | *AECOM* |
| Date Performed | |
| Analysis Time Period | *AM* |

## Site Information

| | |
|---|---|
| Highway/Direction of Travel | *I-95 NB* |
| From/To | |
| Jurisdiction | |
| Analysis Year | *No-Build 2020* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | | |
|---|---|---|---|---|---|
| Volume, V | *6920* | veh/h | Peak-Hour Factor, PHF | *0.95* | |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *3* | |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* | |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* | |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* | |

## Calculate Flow Adjustments

| | | | |
|---|---|---|---|
| $f_p$ | *1.00* | $E_R$ | *1.2* |
| $E_T$ | *1.5* | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.985* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *3* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *70.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *2464* | pc/h/ln |
| S | *51.5* | mph |
| D = $v_p$ / S | *47.9* | pc/mi/ln |
| LOS | *F* | |

## Design (N)

Design (N)

| | | |
|---|---|---|
| Design LOS | | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | | pc/h/ln |
| S | | mph |
| D = $v_p$ / S | | pc/mi/ln |
| Required Number of Lanes, N | | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |

# RAMPS AND RAMP JUNCTIONS WORKSHEET

## General Information

| | | | |
|---|---|---|---|
| Analyst | | Freeway/Dir of Travel | I-95 NB |
| Agency or Company | AECOM | Junction | Seg 7-Off Ramp to 10th St |
| Date Performed | | Jurisdiction | |
| Analysis Time Period | AM | Analysis Year | No-Build 2020 |

Project Description SW 10th Street SIMR

## Inputs

| Upstream Adj Ramp | | Freeway Number of Lanes, N | 3 | Downstream Adj Ramp | |
|---|---|---|---|---|---|
| ☐ Yes | ☐ On | Ramp Number of Lanes, N | 1 | ☑ Yes | ☑ On |
| ☑ No | ☐ Off | Acceleration Lane Length, $L_A$ | | ☐ No | ☐ Off |
| $L_{up}$ = | ft | Deceleration Lane Length $L_D$ | 250 | $L_{down}$ = | 1370 ft |
| $V_u$ = | veh/h | Freeway Volume, $V_F$ | 6920 | $V_D$ = | 1460 veh/h |
| | | Ramp Volume, $V_R$ | 1070 | | |
| | | Freeway Free-Flow Speed, $S_{FF}$ | 70.0 | | |
| | | Ramp Free-Flow Speed, $S_{FR}$ | 45.0 | | |

## Conversion to pc/h Under Base Conditions

| (pc/h) | V (Veh/hr) | PHF | Terrain | %Truck | %Rv | $f_{HV}$ | $f_p$ | v = V/PHF x $f_{HV}$ x $f_p$ |
|---|---|---|---|---|---|---|---|---|
| Freeway | 6920 | 0.95 | Level | 3 | 0 | 0.985 | 1.00 | 7393 |
| Ramp | 1070 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 1175 |
| UpStream | | | | | | | | |
| DownStream | 1460 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 1603 |

### Merge Areas

#### Estimation of $v_{12}$

$V_{12} = V_F ( P_{FM} )$

$L_{EQ}$ = (Equation 13-6 or 13-7)

$P_{FM}$ = using Equation (Exhibit 13-6)

$V_{12}$ = pc/h

$V_3$ or $V_{av34}$ pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☐ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☐ No

If Yes,$V_{12a}$ = pc/h (Equation 13-16, 13-18, or 13-19)

#### Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_{FO}$ | | Exhibit 13-8 | | |

#### Flow Entering Merge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{R12}$ | | Exhibit 13-8 | | |

#### Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

$D_R$ = (pc/mi/ln)

LOS = (Exhibit 13-2)

#### Speed Determination

$M_S$ = (Exibit 13-11)

$S_R$= mph (Exhibit 13-11)

$S_0$= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

### Diverge Areas

#### Estimation of $v_{12}$

$V_{12} = V_R + (V_F - V_R)P_{FD}$

$L_{EQ}$ = (Equation 13-12 or 13-13)

$P_{FD}$ = 0.521 using Equation (Exhibit 13-7)

$V_{12}$ = 4415 pc/h

$V_3$ or $V_{av34}$ 2978 pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☑ Yes ☐ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☑ No

If Yes,$V_{12a}$ = 4693 pc/h (Equation 13-16, 13-18, or 13-19)

#### Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_F$ | 7393 | Exhibit 13-8 | 7200 | Yes |
| $V_{FO} = V_F - V_R$ | 6218 | Exhibit 13-8 | 7200 | No |
| $V_R$ | 1175 | Exhibit 13-10 | 2100 | No |

#### Flow Entering Diverge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{12}$ | 4415 | Exhibit 13-8 | 4400:All | Yes |

#### Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

$D_R$ = 42.4 (pc/mi/ln)

LOS = F (Exhibit 13-2)

#### Speed Determination

$D_s$ = 0.404 (Exhibit 13-12)

$S_R$= 58.7 mph (Exhibit 13-12)

$S_0$= 70.2 mph (Exhibit 13-12)

S = 62.4 mph (Exhibit 13-13)

# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency or Company | *AECOM* |
| Date Performed | |
| Analysis Time Period | *AM* |

## Site Information

| | |
|---|---|
| Highway/Direction of Travel | *I-95 NB* |
| From/To | *Seg 8-Bet Off & On 10th St* |
| Jurisdiction | |
| Analysis Year | *No-Build 2020* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | | |
|---|---|---|---|---|---|
| Volume, V | *5850* | veh/h | Peak-Hour Factor, PHF | *0.95* | |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *3* | |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* | |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* | |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* | |

## Calculate Flow Adjustments

| | | | |
|---|---|---|---|
| $f_p$ | *1.00* | $E_R$ | *1.2* |
| $E_T$ | *1.5* | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.985* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *3* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *70.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *2083* | pc/h/ln |
| S | *61.0* | mph |
| D = $v_p$ / S | *34.2* | pc/mi/ln |
| LOS | *D* | |

## Design (N)

Design (N)

| | |
|---|---|
| Design LOS | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | pc/h/ln |
| S | mph |
| D = $v_p$ / S | pc/mi/ln |
| Required Number of Lanes, N | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |

# RAMPS AND RAMP JUNCTIONS WORKSHEET

## General Information / Site Information

| | | | |
|---|---|---|---|
| Analyst | | Freeway/Dir of Travel | I-95 NB |
| Agency or Company | AECOM | Junction | Seg 9-On Ramp 10th St EB & WB |
| Date Performed | | Jurisdiction | |
| Analysis Time Period | AM | Analysis Year | No-Build 2020 |

Project Description SW 10th Street SIMR

## Inputs

| Upstream Adj Ramp | | Freeway Number of Lanes, N | 3 | Downstream Adj Ramp | |
|---|---|---|---|---|---|
| ☑ Yes | ☐ On | Ramp Number of Lanes, N | 1 | ☐ Yes | ☐ On |
| ☐ No | ☑ Off | Acceleration Lane Length, $L_A$ | 1345 | ☑ No | ☐ Off |
| $L_{up}$ = | 1370 ft | Deceleration Lane Length $L_D$ | | $L_{down}$ = | ft |
| $V_u$ = | 1070 veh/h | Freeway Volume, $V_F$ | 5850 | $V_D$ = | veh/h |
| | | Ramp Volume, $V_R$ | 1460 | | |
| | | Freeway Free-Flow Speed, $S_{FF}$ | 70.0 | | |
| | | Ramp Free-Flow Speed, $S_{FR}$ | 50.0 | | |

## Conversion to pc/h Under Base Conditions

| (pc/h) | V (Veh/hr) | PHF | Terrain | %Truck | %Rv | $f_{HV}$ | $f_p$ | v = V/PHF x $f_{HV}$ x $f_p$ |
|---|---|---|---|---|---|---|---|---|
| Freeway | 5850 | 0.95 | Level | 3 | 0 | 0.985 | 1.00 | 6250 |
| Ramp | 1460 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 1603 |
| UpStream | 1070 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 1175 |
| DownStream | | | | | | | | |

### Merge Areas

#### Estimation of $v_{12}$

$V_{12} = V_F ( P_{FM} )$

$L_{EQ}$ = 2490.72 (Equation 13-6 or 13-7)

$P_{FM}$ = 0.544 using Equation (Exhibit 13-6)

$V_{12}$ = 3402 pc/h

$V_3$ or $V_{av34}$ 2848 pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☑ Yes ☐ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☑ Yes ☐ No

If Yes,$V_{12a}$ = 3571 pc/h (Equation 13-16, 13-18, or 13-19)

#### Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_{FO}$ | 7853 | Exhibit 13-8 | | Yes |

#### Flow Entering Merge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{R12}$ | 5174 | Exhibit 13-8 | 4600:All | Yes |

#### Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

$D_R$ = 36.7 (pc/mi/ln)

LOS = F (Exhibit 13-2)

#### Speed Determination

$M_S$ = 0.875 (Exibit 13-11)

$S_R$= 45.5 mph (Exhibit 13-11)

$S_0$= 61.2 mph (Exhibit 13-11)

S = 49.9 mph (Exhibit 13-13)

### Diverge Areas

#### Estimation of $v_{12}$

$V_{12} = V_R + (V_F - V_R)P_{FD}$

$L_{EQ}$ = (Equation 13-12 or 13-13)

$P_{FD}$ = using Equation (Exhibit 13-7)

$V_{12}$ = pc/h

$V_3$ or $V_{av34}$ pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☐ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☐ No

If Yes,$V_{12a}$ = pc/h (Equation 13-16, 13-18, or 13-19)

#### Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_F$ | | Exhibit 13-8 | | |
| $V_{FO} = V_F - V_R$ | | Exhibit 13-8 | | |
| $V_R$ | | Exhibit 13-10 | | |

#### Flow Entering Diverge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{12}$ | | Exhibit 13-8 | | |

#### Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

$D_R$ = (pc/mi/ln)

LOS = (Exhibit 13-2)

#### Speed Determination

$D_s$ = (Exhibit 13-12)

$S_R$= mph (Exhibit 13-12)

$S_0$= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency or Company | *AECOM* |
| Date Performed | |
| Analysis Time Period | *AM* |

## Site Information

| | |
|---|---|
| Highway/Direction of Travel | *I-95 NB* |
| From/To | |
| Jurisdiction | |
| Analysis Year | *No-Build 2020* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | | |
|---|---|---|---|---|---|
| Volume, V | *7310* | veh/h | Peak-Hour Factor, PHF | *0.95* | |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *3* | |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* | |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* | |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* | |

## Calculate Flow Adjustments

| | | | |
|---|---|---|---|
| $f_p$ | *1.00* | $E_R$ | *1.2* |
| $E_T$ | *1.5* | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.985* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *3* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *70.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *2603* | pc/h/ln |
| S | *47.2* | mph |
| D = $v_p$ / S | *55.2* | pc/mi/ln |
| LOS | *F* | |

## Design (N)

Design (N)

| | |
|---|---|
| Design LOS | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | pc/h/ln |
| S | mph |
| D = $v_p$ / S | pc/mi/ln |
| Required Number of Lanes, N | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |

# RAMPS AND RAMP JUNCTIONS WORKSHEET

## General Information

| | | | |
|---|---|---|---|
| Analyst | | Freeway/Dir of Travel | I-95 NB |
| Agency or Company | AECOM | Junction | Seg 11-Off Ramp Hillsboro EB |
| Date Performed | | Jurisdiction | |
| Analysis Time Period | AM | Analysis Year | No-Build 2020 |

Project Description SW 10th Street SIMR

## Inputs

| Upstream Adj Ramp | | Freeway Number of Lanes, N | 3 | Downstream Adj Ramp | |
|---|---|---|---|---|---|
| ☑ Yes | ☑ On | Ramp Number of Lanes, N | 1 | ☐ Yes | ☐ On |
| ☐ No | ☐ Off | Acceleration Lane Length, $L_A$ | | ☑ No | ☐ Off |
| $L_{up}$ = | 3085 ft | Deceleration Lane Length $L_D$ | 220 | $L_{down}$ = | ft |
| $V_u$ = | 1460 veh/h | Freeway Volume, $V_F$ | 7310 | $V_D$ = | veh/h |
| | | Ramp Volume, $V_R$ | 720 | | |
| | | Freeway Free-Flow Speed, $S_{FF}$ | 70.0 | | |
| | | Ramp Free-Flow Speed, $S_{FR}$ | 45.0 | | |

## Conversion to pc/h Under Base Conditions

| (pc/h) | V (Veh/hr) | PHF | Terrain | %Truck | %Rv | $f_{HV}$ | $f_p$ | v = V/PHF x $f_{HV}$ x $f_p$ |
|---|---|---|---|---|---|---|---|---|
| Freeway | 7310 | 0.95 | Level | 3 | 0 | 0.985 | 1.00 | 7810 |
| Ramp | 720 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 790 |
| UpStream | 1460 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 1603 |
| DownStream | | | | | | | | |

**Merge Areas**

## Estimation of $v_{12}$

$V_{12} = V_F ( P_{FM} )$

$L_{EQ}$ = (Equation 13-6 or 13-7)

$P_{FM}$ = using Equation (Exhibit 13-6)

$V_{12}$ = pc/h

$V_3$ or $V_{av34}$ pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☐ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☐ No

If Yes,$V_{12a}$ = pc/h (Equation 13-16, 13-18, or 13-19)

## Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_{FO}$ | | Exhibit 13-8 | | |

## Flow Entering Merge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{R12}$ | | Exhibit 13-8 | | |

## Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

$D_R$ = (pc/mi/ln)

LOS = (Exhibit 13-2)

## Speed Determination

$M_S$ = (Exibit 13-11)

$S_R$= mph (Exhibit 13-11)

$S_0$= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

**Diverge Areas**

## Estimation of $v_{12}$

$V_{12} = V_R + (V_F - V_R)P_{FD}$

$L_{EQ}$ = 8410.72 (Equation 13-12 or 13-13)

$P_{FD}$ = 0.528 using Equation (Exhibit 13-7)

$V_{12}$ = 4499 pc/h

$V_3$ or $V_{av34}$ 3311 pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☑ Yes ☐ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☑ No

If Yes,$V_{12a}$ = 5110 pc/h (Equation 13-16, 13-18, or 13-19)

## Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_F$ | 7810 | Exhibit 13-8 | 7200 | Yes |
| $V_{FO} = V_F - V_R$ | 7020 | Exhibit 13-8 | 7200 | No |
| $V_R$ | 790 | Exhibit 13-10 | 2100 | No |

## Flow Entering Diverge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{12}$ | 4499 | Exhibit 13-8 | 4400:All | Yes |

## Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

$D_R$ = 46.2 (pc/mi/ln)

LOS = F (Exhibit 13-2)

## Speed Determination

$D_s$ = 0.369 (Exhibit 13-12)

$S_R$= 59.7 mph (Exhibit 13-12)

$S_0$= 70.2 mph (Exhibit 13-12)

S = 62.9 mph (Exhibit 13-13)

# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency or Company | *AECOM* |
| Date Performed | |
| Analysis Time Period | *AM* |

## Site Information

| | |
|---|---|
| Highway/Direction of Travel | *I-95 NB* |
| From/To | *Seg 12-Bet Off & On Hillsboro* |
| Jurisdiction | |
| Analysis Year | *No-Build 2020* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | | |
|---|---|---|---|---|---|
| Volume, V | *6590* | veh/h | Peak-Hour Factor, PHF | *0.95* | |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *3* | |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* | |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* | |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* | |

## Calculate Flow Adjustments

| | | | | |
|---|---|---|---|---|
| $f_p$ | *1.00* | | $E_R$ | *1.2* |
| $E_T$ | *1.5* | | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.985* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *3* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *70.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *2347* | pc/h/ln |
| S | *54.7* | mph |
| D = $v_p$ / S | *42.9* | pc/mi/ln |
| LOS | *E* | |

## Design (N)

Design (N)

| | | |
|---|---|---|
| Design LOS | | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | | pc/h/ln |
| S | | mph |
| D = $v_p$ / S | | pc/mi/ln |
| Required Number of Lanes, N | | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |

# FREEWAY WEAVING WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency/Company | AECOM |
| Date Performed | |
| Analysis Time Period | AM |

## Site Information

| | |
|---|---|
| Freeway/Dir of Travel | I-95 NB |
| Weaving Segment Location | Seg 13-Bet On & Off Hillsboro |
| Analysis Year | No-Build 2020 |

Project Description SW 10th Street SIMR

## Inputs

| | | | |
|---|---|---|---|
| Weaving configuration | One-Sided | Segment type | Freeway |
| Weaving number of lanes, N | 4 | Freeway minimum speed, $S_{MIN}$ | 15 |
| Weaving segment length, $L_S$ | 790ft | Freeway maximum capacity, $C_{IFL}$ | 2400 |
| Freeway free-flow speed, FFS | 70 mph | Terrain type | Level |

## Conversions to pc/h Under Base Conditions

| | V (veh/h) | PHF | Truck (%) | RV (%) | $E_T$ | $E_R$ | $f_{HV}$ | $f_p$ | v (pc/h) |
|---|---|---|---|---|---|---|---|---|---|
| $V_{FF}$ | 6000 | 0.95 | 3 | 0 | 1.5 | 1.2 | 0.985 | 1.00 | 6411 |
| $V_{RF}$ | 560 | 0.92 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 615 |
| $V_{FR}$ | 590 | 0.92 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 648 |
| $V_{RR}$ | 0 | 0.95 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 0 |
| $V_{NW}$ | 6411 | | | | | | | V = | 7674 |
| $V_W$ | 1263 | | | | | | | | |
| VR | 0.165 | | | | | | | | |

## Configuration Characteristics

| | | | |
|---|---|---|---|
| Minimum maneuver lanes, $N_{WL}$ | 2 lc | Minimum weaving lane changes, $LC_{MIN}$ | 1263 lc/h |
| Interchange density, ID | 0.7 int/mi | Weaving lane changes, $LC_W$ | 1474 lc/h |
| Minimum RF lane changes, $LC_{RF}$ | 1 lc/pc | Non-weaving lane changes, $LC_{NW}$ | 978 lc/h |
| Minimum FR lane changes, $LC_{FR}$ | 1 lc/pc | Total lane changes, $LC_{ALL}$ | 2452 lc/h |
| Minimum RR lane changes, $LC_{RR}$ | lc/pc | Non-weaving vehicle index, $I_{NW}$ | 355 |

## Weaving Segment Speed, Density, Level of Service, and Capacity

| | | | |
|---|---|---|---|
| Weaving segment flow rate, v | 7566 veh/h | Weaving intensity factor, W | 0.552 |
| Weaving segment capacity, $c_w$ | 8437 veh/h | Weaving segment speed, S | 51.5 mph |
| Weaving segment v/c ratio | 0.897 | Average weaving speed, $S_W$ | 50.4 mph |
| Weaving segment density, D | 37.3 pc/mi/ln | Average non-weaving speed, $S_{NW}$ | 51.7 mph |
| Level of Service, LOS | E | Maximum weaving length, $L_{MAX}$ | 4177 ft |

## Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".



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# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency or Company | *AECOM* |
| Date Performed | |
| Analysis Time Period | *AM* |

## Site Information

| | |
|---|---|
| Highway/Direction of Travel | *I-95 NB* |
| From/To | *Seg 14-Bet Off & On Hillsboro* |
| Jurisdiction | |
| Analysis Year | *No-Build 2020* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | | |
|---|---|---|---|---|---|
| Volume, V | *6560* | veh/h | Peak-Hour Factor, PHF | *0.95* | |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *3* | |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* | |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* | |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* | |

## Calculate Flow Adjustments

| | | | |
|---|---|---|---|
| $f_p$ | *1.00* | $E_R$ | *1.2* |
| $E_T$ | *1.5* | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.985* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *3* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *70.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *2336* | pc/h/ln |
| S | *55.0* | mph |
| D = $v_p$ / S | *42.4* | pc/mi/ln |
| LOS | *E* | |

## Design (N)

Design (N)

| | |
|---|---|
| Design LOS | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | pc/h/ln |
| S | mph |
| D = $v_p$ / S | pc/mi/ln |
| Required Number of Lanes, N | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |

# FREEWAY WEAVING WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency/Company | AECOM |
| Date Performed | |
| Analysis Time Period | AM |

## Site Information

| | |
|---|---|
| Freeway/Dir of Travel | I-95 NB |
| Weaving Segment Location | Seg 15-Bet On & Off to Exp |
| Analysis Year | No-Build 2020 |

Project Description SW 10th Street SIMR

## Inputs

| | | | |
|---|---|---|---|
| Weaving configuration | Two-Sided | Segment type | Freeway |
| Weaving number of lanes, N | 3 | Freeway minimum speed, $S_{MIN}$ | 15 |
| Weaving segment length, $L_S$ | 4665ft | Freeway maximum capacity, $C_{IFL}$ | 2400 |
| Freeway free-flow speed, FFS | 70 mph | Terrain type | Level |

## Conversions to pc/h Under Base Conditions

| | V (veh/h) | PHF | Truck (%) | RV (%) | $E_T$ | $E_R$ | $f_{HV}$ | $f_p$ | v (pc/h) |
|---|---|---|---|---|---|---|---|---|---|
| $V_{FF}$ | 5275 | 0.95 | 3 | 0 | 1.5 | 1.2 | 0.985 | 1.00 | 5636 |
| $V_{RF}$ | 635 | 0.92 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 697 |
| $V_{FR}$ | 1285 | 0.92 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 1411 |
| $V_{RR}$ | 75 | 0.92 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 82 |
| $V_{NW}$ | 7744 | | | | | | | V = | 7826 |
| $V_W$ | 82 | | | | | | | | |
| VR | 0.010 | | | | | | | | |

## Configuration Characteristics

| | | | |
|---|---|---|---|
| Minimum maneuver lanes, $N_{WL}$ | 0 lc | Minimum weaving lane changes, $LC_{MIN}$ | lc/h |
| Interchange density, ID | 0.7 int/mi | Weaving lane changes, $LC_W$ | lc/h |
| Minimum RF lane changes, $LC_{RF}$ | 0 lc/pc | Non-weaving lane changes, $LC_{NW}$ | lc/h |
| Minimum FR lane changes, $LC_{FR}$ | 0 lc/pc | Total lane changes, $LC_{ALL}$ | lc/h |
| Minimum RR lane changes, $LC_{RR}$ | 3 lc/pc | Non-weaving vehicle index, $I_{NW}$ | |

## Weaving Segment Speed, Density, Level of Service, and Capacity

| | | | |
|---|---|---|---|
| Weaving segment flow rate, v | 7722 veh/h | Weaving intensity factor, W | |
| Weaving segment capacity, $c_w$ | 6831 veh/h | Weaving segment speed, S | mph |
| Weaving segment v/c ratio | 1.130 | Average weaving speed, $S_W$ | mph |
| Weaving segment density, D | pc/mi/ln | Average non-weaving speed, $S_{NW}$ | mph |
| Level of Service, LOS | F | Maximum weaving length, $L_{MAX}$ | 5824 ft |

## Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency or Company | *AECOM* |
| Date Performed | |
| Analysis Time Period | *AM* |

## Site Information

| | |
|---|---|
| Highway/Direction of Travel | *I-95 NB* |
| From/To | *Seg 16-North of Hillsboro* |
| Jurisdiction | |
| Analysis Year | *No-Build 2040* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | |
|---|---|---|---|---|
| Volume, V | *5910* | veh/h | Peak-Hour Factor, PHF | *0.95* |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *4* |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* |

## Calculate Flow Adjustments

| | | | |
|---|---|---|---|
| $f_p$ | *1.00* | $E_R$ | *1.2* |
| $E_T$ | *1.5* | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.980* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *3* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *70.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *2115* | pc/h/ln |
| S | *60.3* | mph |
| D = $v_p$ / S | *35.1* | pc/mi/ln |
| LOS | *E* | |

## Design (N)

Design (N)

| | |
|---|---|
| Design LOS | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | pc/h/ln |
| S | mph |
| D = $v_p$ / S | pc/mi/ln |
| Required Number of Lanes, N | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |

# FREEWAY WEAVING WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency/Company | AECOM |
| Date Performed | |
| Analysis Time Period | PM |

## Site Information

| | |
|---|---|
| Freeway/Dir of Travel | I-95 NB |
| Weaving Segment Location | Seg 1-Bet Copans & Sample |
| Analysis Year | No-Build 2020 |

Project Description SW 10th Street SIMR

## Inputs

| | | | |
|---|---|---|---|
| Weaving configuration | One-Sided | Segment type | Freeway |
| Weaving number of lanes, N | 4 | Freeway minimum speed, $S_{MIN}$ | 15 |
| Weaving segment length, $L_S$ | 1820ft | Freeway maximum capacity, $C_{IFL}$ | 2400 |
| Freeway free-flow speed, FFS | 70 mph | Terrain type | Level |

## Conversions to pc/h Under Base Conditions

| | V (veh/h) | PHF | Truck (%) | RV (%) | $E_T$ | $E_R$ | $f_{HV}$ | $f_p$ | v (pc/h) |
|---|---|---|---|---|---|---|---|---|---|
| $V_{FF}$ | 4400 | 0.95 | 3 | 0 | 1.5 | 1.2 | 0.985 | 1.00 | 4701 |
| $V_{RF}$ | 410 | 0.92 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 450 |
| $V_{FR}$ | 1570 | 0.92 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 1724 |
| $V_{RR}$ | 0 | 0.92 | 0 | 0 | 1.5 | 1.2 | 1.000 | 1.00 | 0 |
| $V_{NW}$ | 4701 | | | | | | | V = | 6875 |
| $V_W$ | 2174 | | | | | | | | |
| VR | 0.316 | | | | | | | | |

## Configuration Characteristics

| | | | |
|---|---|---|---|
| Minimum maneuver lanes, $N_{WL}$ | 2 lc | Minimum weaving lane changes, $LC_{MIN}$ | 2174 lc/h |
| Interchange density, ID | 0.7 int/mi | Weaving lane changes, $LC_W$ | 2546 lc/h |
| Minimum RF lane changes, $LC_{RF}$ | 1 lc/pc | Non-weaving lane changes, $LC_{NW}$ | 1184 lc/h |
| Minimum FR lane changes, $LC_{FR}$ | 1 lc/pc | Total lane changes, $LC_{ALL}$ | 3730 lc/h |
| Minimum RR lane changes, $LC_{RR}$ | lc/pc | Non-weaving vehicle index, $I_{NW}$ | 599 |

## Weaving Segment Speed, Density, Level of Service, and Capacity

| | | | |
|---|---|---|---|
| Weaving segment flow rate, v | 6784 veh/h | Weaving intensity factor, W | 0.398 |
| Weaving segment capacity, $c_w$ | 7478 veh/h | Weaving segment speed, S | 48.4 mph |
| Weaving segment v/c ratio | 0.907 | Average weaving speed, $S_W$ | 54.3 mph |
| Weaving segment density, D | 35.5 pc/mi/ln | Average non-weaving speed, $S_{NW}$ | 46.1 mph |
| Level of Service, LOS | E | Maximum weaving length, $L_{MAX}$ | 5759 ft |

## Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

# BASIC FREEWAY SEGMENTS WORKSHEET

| General Information | | Site Information | |
|---|---|---|---|
| Analyst | | Highway/Direction of Travel | *I-95 NB* |
| Agency or Company | *AECOM* | From/To | *Seg 2-Bet Off & On from Sample* |
| Date Performed | | Jurisdiction | |
| Analysis Time Period | *PM* | Analysis Year | *No-Build 2020* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | |
|---|---|---|---|---|
| Volume, V | *4810* | veh/h | Peak-Hour Factor, PHF | *0.95* |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *3* |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* |

## Calculate Flow Adjustments

| | | | |
|---|---|---|---|
| $f_p$ | *1.00* | $E_R$ | *1.2* |
| $E_T$ | *1.5* | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.985* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *3* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *70.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *1713* | pc/h/ln |
| S | *66.9* | mph |
| D = $v_p$ / S | *25.6* | pc/mi/ln |
| LOS | *C* | |

## Design (N)

Design (N)

| | |
|---|---|
| Design LOS | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | pc/h/ln |
| S | mph |
| D = $v_p$ / S | pc/mi/ln |
| Required Number of Lanes, N | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |



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# RAMPS AND RAMP JUNCTIONS WORKSHEET

## General Information / Site Information

| | | | |
|---|---|---|---|
| Analyst | | Freeway/Dir of Travel | I-95 NB |
| Agency or Company | AECOM | Junction | Seg 3-On Ramp from Sample |
| Date Performed | | Jurisdiction | |
| Analysis Time Period | PM | Analysis Year | No-Build 2020 |

Project Description SW 10th Street SIMR

## Inputs

| Upstream Adj Ramp | | Freeway Number of Lanes, N | 3 | Downstream Adj Ramp | |
|---|---|---|---|---|---|
| ☐ Yes | ☐ On | Ramp Number of Lanes, N | 1 | ☑ Yes | ☑ On |
| ☑ No | ☐ Off | Acceleration Lane Length, $L_A$ | 500 | ☐ No | ☐ Off |
| $L_{up}$ = | ft | Deceleration Lane Length $L_D$ | | $L_{down}$ = | 1950 ft |
| $V_u$ = | veh/h | Freeway Volume, $V_F$ | 4810 | $V_D$ = | 730 veh/h |
| | | Ramp Volume, $V_R$ | 970 | | |
| | | Freeway Free-Flow Speed, $S_{FF}$ | 70.0 | | |
| | | Ramp Free-Flow Speed, $S_{FR}$ | 50.0 | | |

## Conversion to pc/h Under Base Conditions

| (pc/h) | V (Veh/hr) | PHF | Terrain | %Truck | %Rv | $f_{HV}$ | $f_p$ | v = V/PHF x $f_{HV}$ x $f_p$ |
|---|---|---|---|---|---|---|---|---|
| Freeway | 4810 | 0.95 | Level | 3 | 0 | 0.985 | 1.00 | 5139 |
| Ramp | 970 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 1065 |
| UpStream | | | | | | | | |
| DownStream | 730 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 801 |

### Merge Areas

#### Estimation of $v_{12}$

$V_{12} = V_F ( P_{FM} )$

$L_{EQ}$ = (Equation 13-6 or 13-7)

$P_{FM}$ = 0.591 using Equation (Exhibit 13-6)

$V_{12}$ = 3040 pc/h

$V_3$ or $V_{av34}$ 2099 pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☑ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☑ Yes ☐ No

If Yes,$V_{12a}$ = 3040 pc/h (Equation 13-16, 13-18, or 13-19)

#### Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_{FO}$ | 6204 | Exhibit 13-8 | | No |

#### Flow Entering Merge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{R12}$ | 4105 | Exhibit 13-8 | 4600:All | No |

#### Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

$D_R$ = 33.9 (pc/mi/ln)

LOS = D (Exhibit 13-2)

#### Speed Determination

$M_S$ = 0.508 (Exibit 13-11)

$S_R$= 55.8 mph (Exhibit 13-11)

$S_0$= 64.2 mph (Exhibit 13-11)

S = 58.4 mph (Exhibit 13-13)

### Diverge Areas

#### Estimation of $v_{12}$

$V_{12} = V_R + (V_F - V_R)P_{FD}$

$L_{EQ}$ = (Equation 13-12 or 13-13)

$P_{FD}$ = using Equation (Exhibit 13-7)

$V_{12}$ = pc/h

$V_3$ or $V_{av34}$ pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☐ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☐ No

If Yes,$V_{12a}$ = pc/h (Equation 13-16, 13-18, or 13-19)

#### Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_F$ | | Exhibit 13-8 | | |
| $V_{FO} = V_F - V_R$ | | Exhibit 13-8 | | |
| $V_R$ | | Exhibit 13-10 | | |

#### Flow Entering Diverge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{12}$ | | Exhibit 13-8 | | |

#### Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

$D_R$ = (pc/mi/ln)

LOS = (Exhibit 13-2)

#### Speed Determination

$D_s$ = (Exhibit 13-12)

$S_R$= mph (Exhibit 13-12)

$S_0$= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

# BASIC FREEWAY SEGMENTS WORKSHEET

| General Information | | Site Information | |
|---|---|---|---|
| Analyst | | Highway/Direction of Travel | *I-95 NB* |
| Agency or Company | *AECOM* | From/To | *Seg 4-Bet On from Sample & Exp* |
| Date Performed | | Jurisdiction | |
| Analysis Time Period | *PM* | Analysis Year | *No-Build 2020* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | |
|---|---|---|---|---|
| Volume, V | *5780* | veh/h | Peak-Hour Factor, PHF | *0.95* |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *3* |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* |

## Calculate Flow Adjustments

| | | | |
|---|---|---|---|
| $f_p$ | *1.00* | $E_R$ | *1.2* |
| $E_T$ | *1.5* | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.985* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *3* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *70.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *2058* | pc/h/ln |
| S | *61.5* | mph |
| D = $v_p$ / S | *33.5* | pc/mi/ln |
| LOS | *D* | |

## Design (N)

Design (N)

| | |
|---|---|
| Design LOS | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | pc/h/ln |
| S | mph |
| D = $v_p$ / S | pc/mi/ln |
| Required Number of Lanes, N | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |



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# RAMPS AND RAMP JUNCTIONS WORKSHEET

## General Information / Site Information

| | | | |
|---|---|---|---|
| Analyst | | Freeway/Dir of Travel | I-95 NB |
| Agency or Company | AECOM | Junction | Seg 5-On from Exp |
| Date Performed | | Jurisdiction | |
| Analysis Time Period | PM | Analysis Year | No-Build 2020 |

Project Description SW 10th Street SIMR

## Inputs

| Upstream Adj Ramp | | Freeway Number of Lanes, N | 3 | Downstream Adj Ramp | |
|---|---|---|---|---|---|
| ☐ Yes | ☐ On | Ramp Number of Lanes, N | 1 | ☑ Yes | ☐ On |
| ☑ No | ☐ Off | Acceleration Lane Length, $L_A$ | 600 | ☐ No | ☑ Off |
| $L_{up}$ = | ft | Deceleration Lane Length $L_D$ | | $L_{down}$ = | 5545 ft |
| $V_u$ = | veh/h | Freeway Volume, $V_F$ | 5780 | $V_D$ = | 1300 veh/h |
| | | Ramp Volume, $V_R$ | 730 | | |
| | | Freeway Free-Flow Speed, $S_{FF}$ | 70.0 | | |
| | | Ramp Free-Flow Speed, $S_{FR}$ | 50.0 | | |

## Conversion to pc/h Under Base Conditions

| (pc/h) | V (Veh/hr) | PHF | Terrain | %Truck | %Rv | $f_{HV}$ | $f_p$ | v = V/PHF x $f_{HV}$ x $f_p$ |
|---|---|---|---|---|---|---|---|---|
| Freeway | 5780 | 0.95 | Level | 3 | 0 | 0.985 | 1.00 | 6175 |
| Ramp | 730 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 801 |
| UpStream | | | | | | | | |
| DownStream | 1300 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 1427 |

**Merge Areas**

## Estimation of $v_{12}$

$V_{12} = V_F ( P_{FM} )$

$L_{EQ}$ = 8210.59 (Equation 13-6 or 13-7)

$P_{FM}$ = 0.616 using Equation (Exhibit 13-6)

$V_{12}$ = 3806 pc/h

$V_3$ or $V_{av34}$ 2369 pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☑ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☑ Yes ☐ No

If Yes,$V_{12a}$ = 3806 pc/h (Equation 13-16, 13-18, or 13-19)

## Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_{FO}$ | 6976 | Exhibit 13-8 | | No |

## Flow Entering Merge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{R12}$ | 5063 | Exhibit 13-8 | 4600:All | Yes |

## Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

$D_R$ = 40.8 (pc/mi/ln)

LOS = E (Exhibit 13-2)

## Speed Determination

$M_S$ = 0.877 (Exibit 13-11)

$S_R$= 45.4 mph (Exhibit 13-11)

$S_0$= 64.9 mph (Exhibit 13-11)

S = 49.5 mph (Exhibit 13-13)

**Diverge Areas**

## Estimation of $v_{12}$

$V_{12} = V_R + (V_F - V_R)P_{FD}$

$L_{EQ}$ = (Equation 13-12 or 13-13)

$P_{FD}$ = using Equation (Exhibit 13-7)

$V_{12}$ = pc/h

$V_3$ or $V_{av34}$ pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☐ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☐ No

If Yes,$V_{12a}$ = pc/h (Equation 13-16, 13-18, or 13-19)

## Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_F$ | | Exhibit 13-8 | | |
| $V_{FO} = V_F - V_R$ | | Exhibit 13-8 | | |
| $V_R$ | | Exhibit 13-10 | | |

## Flow Entering Diverge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{12}$ | | Exhibit 13-8 | | |

## Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

$D_R$ = (pc/mi/ln)

LOS = (Exhibit 13-2)

## Speed Determination

$D_s$ = (Exhibit 13-12)

$S_R$= mph (Exhibit 13-12)

$S_0$= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

# BASIC FREEWAY SEGMENTS WORKSHEET

| General Information | | Site Information | |
|---|---|---|---|
| Analyst | | Highway/Direction of Travel | *I-95 NB* |
| Agency or Company | *AECOM* | From/To | *Seg 6-Bet Exp On & Off to 10th* |
| Date Performed | | Jurisdiction | |
| Analysis Time Period | *PM* | Analysis Year | *No-Build 2020* |

Project Description *I-95 AT HILLSBORO BOULEVARD IMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | |
|---|---|---|---|---|
| Volume, V | *6510* | veh/h | Peak-Hour Factor, PHF | *0.95* |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *3* |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* |

## Calculate Flow Adjustments

| | | | |
|---|---|---|---|
| $f_p$ | *1.00* | $E_R$ | *1.2* |
| $E_T$ | *1.5* | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.985* |

| Speed Inputs | | | Calc Speed Adj and FFS | | |
|---|---|---|---|---|---|
| Lane Width | | ft | | | |
| Rt-Side Lat. Clearance | | ft | $f_{LW}$ | | mph |
| Number of Lanes, N | *3* | | $f_{LC}$ | | mph |
| Total Ramp Density, TRD | | ramps/mi | TRD Adjustment | | mph |
| FFS (measured) | *70.0* | mph | FFS | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph | | | |

| LOS and Performance Measures | | | Design (N) | |
|---|---|---|---|---|
| Operational (LOS) | | | Design (N) | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *2318* | pc/h/ln | Design LOS | |
| S | *55.5* | mph | $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | pc/h/ln |
| D = $v_p$ / S | *41.8* | pc/mi/ln | S | mph |
| LOS | *E* | | D = $v_p$ / S | pc/mi/ln |
| | | | Required Number of Lanes, N | |

| Glossary | | Factor Location | |
|---|---|---|---|
| N - Number of lanes | S - Speed | $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| V - Hourly volume | D - Density | $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $v_p$ - Flow rate | FFS - Free-flow speed | $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS - Level of service | BFFS - Base free-flow speed | LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |
| DDHV - Directional design hour volume | | | |



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# RAMPS AND RAMP JUNCTIONS WORKSHEET

## General Information

| | | | |
|---|---|---|---|
| Analyst | | Freeway/Dir of Travel | I-95 NB |
| Agency or Company | AECOM | Junction | Seg 7-Off Ramp to 10th St |
| Date Performed | | Jurisdiction | |
| Analysis Time Period | PM | Analysis Year | No-Build 2020 |

Project Description SW 10th Street SIMR

## Site Information

## Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

$L_{up}$ = ft

$V_u$ = veh/h

| | |
|---|---|
| Freeway Number of Lanes, N | 3 |
| Ramp Number of Lanes, N | 1 |
| Acceleration Lane Length, $L_A$ | |
| Deceleration Lane Length $L_D$ | 250 |
| Freeway Volume, $V_F$ | 6510 |
| Ramp Volume, $V_R$ | 1300 |
| Freeway Free-Flow Speed, $S_{FF}$ | 70.0 |
| Ramp Free-Flow Speed, $S_{FR}$ | 45.0 |

Downstream Adj Ramp

☑ Yes ☑ On

☐ No ☐ Off

$L_{down}$ = 1370 ft

$V_D$ = 1160 veh/h

## Conversion to pc/h Under Base Conditions

| (pc/h) | V (Veh/hr) | PHF | Terrain | %Truck | %Rv | $f_{HV}$ | $f_p$ | v = V/PHF x $f_{HV}$ x $f_p$ |
|---|---|---|---|---|---|---|---|---|
| Freeway | 6510 | 0.95 | Level | 3 | 0 | 0.985 | 1.00 | 6955 |
| Ramp | 1300 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 1427 |
| UpStream | | | | | | | | |
| DownStream | 1160 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 1273 |

**Merge Areas**

## Estimation of $v_{12}$

$V_{12} = V_F ( P_{FM} )$

$L_{EQ}$ = (Equation 13-6 or 13-7)

$P_{FM}$ = using Equation (Exhibit 13-6)

$V_{12}$ = pc/h

$V_3$ or $V_{av34}$ pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☐ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☐ No

If Yes, $V_{12a}$ = pc/h (Equation 13-16, 13-18, or 13-19)

## Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_{FO}$ | | Exhibit 13-8 | | |

## Flow Entering Merge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{R12}$ | | Exhibit 13-8 | | |

## Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

$D_R$ = (pc/mi/ln)

LOS = (Exhibit 13-2)

## Speed Determination

$M_S$ = (Exibit 13-11)

$S_R$ = mph (Exhibit 13-11)

$S_0$ = mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

**Diverge Areas**

## Estimation of $v_{12}$

$V_{12} = V_R + (V_F - V_R)P_{FD}$

$L_{EQ}$ = (Equation 13-12 or 13-13)

$P_{FD}$ = 0.520 using Equation (Exhibit 13-7)

$V_{12}$ = 4304 pc/h

$V_3$ or $V_{av34}$ 2651 pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☑ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☑ No

If Yes, $V_{12a}$ = pc/h (Equation 13-16, 13-18, or 13-19)

## Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_F$ | 6955 | Exhibit 13-8 | 7200 | No |
| $V_{FO} = V_F - V_R$ | 5528 | Exhibit 13-8 | 7200 | No |
| $V_R$ | 1427 | Exhibit 13-10 | 2100 | No |

## Flow Entering Diverge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{12}$ | 4304 | Exhibit 13-8 | 4400:All | No |

## Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

$D_R$ = 39.0 (pc/mi/ln)

LOS = E (Exhibit 13-2)

## Speed Determination

$D_s$ = 0.426 (Exhibit 13-12)

$S_R$ = 58.1 mph (Exhibit 13-12)

$S_0$ = 70.4 mph (Exhibit 13-12)

S = 62.2 mph (Exhibit 13-13)

# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency or Company | *AECOM* |
| Date Performed | |
| Analysis Time Period | *PM* |

## Site Information

| | |
|---|---|
| Highway/Direction of Travel | *I-95 NB* |
| From/To | *Seg 8-Bet Off & On 10th St* |
| Jurisdiction | |
| Analysis Year | *No-Build 2020* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | | |
|---|---|---|---|---|---|
| Volume, V | *5210* | veh/h | Peak-Hour Factor, PHF | *0.95* | |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *3* | |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* | |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* | |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* | |

## Calculate Flow Adjustments

| | | | |
|---|---|---|---|
| $f_p$ | *1.00* | $E_R$ | *1.2* |
| $E_T$ | *1.5* | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.985* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *3* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *70.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *1855* | pc/h/ln |
| S | *65.0* | mph |
| D = $v_p$ / S | *28.5* | pc/mi/ln |
| LOS | *D* | |

## Design (N)

Design (N)

| | | |
|---|---|---|
| Design LOS | | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | | pc/h/ln |
| S | | mph |
| D = $v_p$ / S | | pc/mi/ln |
| Required Number of Lanes, N | | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |

# RAMPS AND RAMP JUNCTIONS WORKSHEET

## General Information / Site Information

| | | | |
|---|---|---|---|
| Analyst | | Freeway/Dir of Travel | I-95 NB |
| Agency or Company | AECOM | Junction | Seg 9-On Ramp 10th St EB & WB |
| Date Performed | | Jurisdiction | |
| Analysis Time Period | PM | Analysis Year | No-Build 2020 |

Project Description SW 10th Street SIMR

## Inputs

| Upstream Adj Ramp | | Freeway Number of Lanes, N | 3 | Downstream Adj Ramp | |
|---|---|---|---|---|---|
| ☑ Yes | ☐ On | Ramp Number of Lanes, N | 1 | ☐ Yes | ☐ On |
| ☐ No | ☑ Off | Acceleration Lane Length, $L_A$ | 1345 | ☑ No | ☐ Off |
| $L_{up}$ = | 1370 ft | Deceleration Lane Length $L_D$ | | $L_{down}$ = | ft |
| $V_u$ = | 1300 veh/h | Freeway Volume, $V_F$ | 5210 | $V_D$ = | veh/h |
| | | Ramp Volume, $V_R$ | 1160 | | |
| | | Freeway Free-Flow Speed, $S_{FF}$ | 70.0 | | |
| | | Ramp Free-Flow Speed, $S_{FR}$ | 50.0 | | |

## Conversion to pc/h Under Base Conditions

| (pc/h) | V (Veh/hr) | PHF | Terrain | %Truck | %Rv | $f_{HV}$ | $f_p$ | v = V/PHF x $f_{HV}$ x $f_p$ |
|---|---|---|---|---|---|---|---|---|
| Freeway | 5210 | 0.95 | Level | 3 | 0 | 0.985 | 1.00 | 5566 |
| Ramp | 1160 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 1273 |
| UpStream | 1300 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 1427 |
| DownStream | | | | | | | | |

**Merge Areas**

## Estimation of $v_{12}$

$V_{12} = V_F ( P_{FM} )$

$L_{EQ}$ = 2273.73 (Equation 13-6 or 13-7)

$P_{FM}$ = 0.558 using Equation (Exhibit 13-6)

$V_{12}$ = 3106 pc/h

$V_3$ or $V_{av34}$ 2460 pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☑ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☑ Yes ☐ No

If Yes,$V_{12a}$ = 3180 pc/h (Equation 13-16, 13-18, or 13-19)

## Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_{FO}$ | 6839 | Exhibit 13-8 | | No |

## Flow Entering Merge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{R12}$ | 4453 | Exhibit 13-8 | 4600:All | No |

## Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

$D_R$ = 31.2 (pc/mi/ln)

LOS = D (Exhibit 13-2)

## Speed Determination

$M_S$ = 0.521 (Exibit 13-11)

$S_R$= 55.4 mph (Exhibit 13-11)

$S_0$= 63.0 mph (Exhibit 13-11)

S = 57.8 mph (Exhibit 13-13)

**Diverge Areas**

## Estimation of $v_{12}$

$V_{12} = V_R + (V_F - V_R)P_{FD}$

$L_{EQ}$ = (Equation 13-12 or 13-13)

$P_{FD}$ = using Equation (Exhibit 13-7)

$V_{12}$ = pc/h

$V_3$ or $V_{av34}$ pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☐ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☐ No

If Yes,$V_{12a}$ = pc/h (Equation 13-16, 13-18, or 13-19)

## Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_F$ | | Exhibit 13-8 | | |
| $V_{FO} = V_F - V_R$ | | Exhibit 13-8 | | |
| $V_R$ | | Exhibit 13-10 | | |

## Flow Entering Diverge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{12}$ | | Exhibit 13-8 | | |

## Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

$D_R$ = (pc/mi/ln)

LOS = (Exhibit 13-2)

## Speed Determination

$D_s$ = (Exhibit 13-12)

$S_R$= mph (Exhibit 13-12)

$S_0$= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency or Company | *AECOM* |
| Date Performed | |
| Analysis Time Period | *PM* |

## Site Information

| | |
|---|---|
| Highway/Direction of Travel | *I-95 NB* |
| From/To | |
| Jurisdiction | |
| Analysis Year | *No-Build 2020* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | | |
|---|---|---|---|---|---|
| Volume, V | *6370* | veh/h | Peak-Hour Factor, PHF | *0.95* | |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *3* | |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* | |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* | |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* | |

## Calculate Flow Adjustments

| | | | |
|---|---|---|---|
| $f_p$ | *1.00* | $E_R$ | *1.2* |
| $E_T$ | *1.5* | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.985* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *3* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *70.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *2269* | pc/h/ln |
| S | *56.7* | mph |
| D = $v_p$ / S | *40.0* | pc/mi/ln |
| LOS | *E* | |

## Design (N)

Design (N)

| | |
|---|---|
| Design LOS | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | pc/h/ln |
| S | mph |
| D = $v_p$ / S | pc/mi/ln |
| Required Number of Lanes, N | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |

# RAMPS AND RAMP JUNCTIONS WORKSHEET

## General Information

| | | | |
|---|---|---|---|
| Analyst | | Freeway/Dir of Travel | I-95 NB |
| Agency or Company | AECOM | Junction | |
| Date Performed | | Jurisdiction | |
| Analysis Time Period | PM | Analysis Year | No-Build 2020 |

Project Description SW 10th Street SIMR

## Site Information

## Inputs

| Upstream Adj Ramp | | Freeway Number of Lanes, N | 3 | Downstream Adj Ramp | |
|---|---|---|---|---|---|
| ☑ Yes | ☑ On | Ramp Number of Lanes, N | 1 | ☐ Yes | ☐ On |
| ☐ No | ☐ Off | Acceleration Lane Length, $L_A$ | | ☑ No | ☐ Off |
| $L_{up}$ = | 3085 ft | Deceleration Lane Length $L_D$ | 220 | $L_{down}$ = | ft |
| $V_u$ = | 1160 veh/h | Freeway Volume, $V_F$ | 6370 | $V_D$ = | veh/h |
| | | Ramp Volume, $V_R$ | 680 | | |
| | | Freeway Free-Flow Speed, $S_{FF}$ | 70.0 | | |
| | | Ramp Free-Flow Speed, $S_{FR}$ | 45.0 | | |

## Conversion to pc/h Under Base Conditions

| (pc/h) | V (Veh/hr) | PHF | Terrain | %Truck | %Rv | $f_{HV}$ | $f_p$ | v = V/PHF x $f_{HV}$ x $f_p$ |
|---|---|---|---|---|---|---|---|---|
| Freeway | 6370 | 0.95 | Level | 3 | 0 | 0.985 | 1.00 | 6806 |
| Ramp | 680 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 747 |
| UpStream | 1160 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 1273 |
| DownStream | | | | | | | | |

**Merge Areas**

## Estimation of $v_{12}$

$V_{12} = V_F ( P_{FM} )$

$L_{EQ}$ = (Equation 13-6 or 13-7)

$P_{FM}$ = using Equation (Exhibit 13-6)

$V_{12}$ = pc/h

$V_3$ or $V_{av34}$ pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☐ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☐ No

If Yes, $V_{12a}$ = pc/h (Equation 13-16, 13-18, or 13-19)

## Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_{FO}$ | | Exhibit 13-8 | | |

## Flow Entering Merge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{R12}$ | | Exhibit 13-8 | | |

## Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

$D_R$ = (pc/mi/ln)

LOS = (Exhibit 13-2)

## Speed Determination

$M_S$ = (Exibit 13-11)

$S_R$= mph (Exhibit 13-11)

$S_0$= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

**Diverge Areas**

## Estimation of $v_{12}$

$V_{12} = V_R + (V_F - V_R)P_{FD}$

$L_{EQ}$ = 7454.65 (Equation 13-12 or 13-13)

$P_{FD}$ = 0.555 using Equation (Exhibit 13-7)

$V_{12}$ = 4113 pc/h

$V_3$ or $V_{av34}$ 2693 pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☑ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☑ No

If Yes, $V_{12a}$ = pc/h (Equation 13-16, 13-18, or 13-19)

## Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_F$ | 6806 | Exhibit 13-8 | 7200 | No |
| $V_{FO} = V_F - V_R$ | 6059 | Exhibit 13-8 | 7200 | No |
| $V_R$ | 747 | Exhibit 13-10 | 2100 | No |

## Flow Entering Diverge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{12}$ | 4113 | Exhibit 13-8 | 4400:All | No |

## Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

$D_R$ = 37.6 (pc/mi/ln)

LOS = E (Exhibit 13-2)

## Speed Determination

$D_s$ = 0.365 (Exhibit 13-12)

$S_R$= 59.8 mph (Exhibit 13-12)

$S_0$= 70.2 mph (Exhibit 13-12)

S = 63.5 mph (Exhibit 13-13)

# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency or Company | *AECOM* |
| Date Performed | |
| Analysis Time Period | *PM* |

## Site Information

| | |
|---|---|
| Highway/Direction of Travel | *I-95 NB* |
| From/To | *Seg 12-Bet Off & On Hillsboro* |
| Jurisdiction | |
| Analysis Year | *No-Build 2020* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | | |
|---|---|---|---|---|---|
| Volume, V | *5690* | veh/h | Peak-Hour Factor, PHF | *0.95* | |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *3* | |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* | |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* | |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* | |

## Calculate Flow Adjustments

| | | | |
|---|---|---|---|
| $f_p$ | *1.00* | $E_R$ | *1.2* |
| $E_T$ | *1.5* | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.985* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *3* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *70.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *2026* | pc/h/ln |
| S | *62.1* | mph |
| D = $v_p$ / S | *32.6* | pc/mi/ln |
| LOS | *D* | |

## Design (N)

Design (N)

| | |
|---|---|
| Design LOS | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | pc/h/ln |
| S | mph |
| D = $v_p$ / S | pc/mi/ln |
| Required Number of Lanes, N | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |

# FREEWAY WEAVING WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency/Company | AECOM |
| Date Performed | |
| Analysis Time Period | PM |

## Site Information

| | |
|---|---|
| Freeway/Dir of Travel | I-95 NB |
| Weaving Segment Location | Seg 13-Bet On & Off Hillsboro |
| Analysis Year | No-Build 2020 |

Project Description SW 10th Street SIMR

## Inputs

| | | | |
|---|---|---|---|
| Weaving configuration | One-Sided | Segment type | Freeway |
| Weaving number of lanes, N | 4 | Freeway minimum speed, $S_{MIN}$ | 15 |
| Weaving segment length, $L_S$ | 790ft | Freeway maximum capacity, $C_{IFL}$ | 2400 |
| Freeway free-flow speed, FFS | 70 mph | Terrain type | Level |

## Conversions to pc/h Under Base Conditions

| | V (veh/h) | PHF | Truck (%) | RV (%) | $E_T$ | $E_R$ | $f_{HV}$ | $f_p$ | v (pc/h) |
|---|---|---|---|---|---|---|---|---|---|
| $V_{FF}$ | 5060 | 0.95 | 3 | 0 | 1.5 | 1.2 | 0.985 | 1.00 | 5406 |
| $V_{RF}$ | 630 | 0.92 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 692 |
| $V_{FR}$ | 630 | 0.92 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 692 |
| $V_{RR}$ | 0 | 0.95 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 0 |
| $V_{NW}$ | 5406 | | | | | | | V = | 6790 |
| $V_W$ | 1384 | | | | | | | | |
| VR | 0.204 | | | | | | | | |

## Configuration Characteristics

| | | | |
|---|---|---|---|
| Minimum maneuver lanes, $N_{WL}$ | 2 lc | Minimum weaving lane changes, $LC_{MIN}$ | 1384 lc/h |
| Interchange density, ID | 0.7 int/mi | Weaving lane changes, $LC_W$ | 1595 lc/h |
| Minimum RF lane changes, $LC_{RF}$ | 1 lc/pc | Non-weaving lane changes, $LC_{NW}$ | 771 lc/h |
| Minimum FR lane changes, $LC_{FR}$ | 1 lc/pc | Total lane changes, $LC_{ALL}$ | 2366 lc/h |
| Minimum RR lane changes, $LC_{RR}$ | lc/pc | Non-weaving vehicle index, $I_{NW}$ | 299 |

## Weaving Segment Speed, Density, Level of Service, and Capacity

| | | | |
|---|---|---|---|
| Weaving segment flow rate, v | 6696 veh/h | Weaving intensity factor, W | 0.537 |
| Weaving segment capacity, $c_w$ | 8315 veh/h | Weaving segment speed, S | 51.7 mph |
| Weaving segment v/c ratio | 0.805 | Average weaving speed, $S_W$ | 50.8 mph |
| Weaving segment density, D | 32.9 pc/mi/ln | Average non-weaving speed, $S_{NW}$ | 51.9 mph |
| Level of Service, LOS | D | Maximum weaving length, $L_{MAX}$ | 4575 ft |

## Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".



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# BASIC FREEWAY SEGMENTS WORKSHEET

| General Information | | Site Information | |
|---|---|---|---|
| Analyst | | Highway/Direction of Travel | *I-95 NB* |
| Agency or Company | *AECOM* | From/To | *Seg 14-Bet Off & On Hillsboro* |
| Date Performed | | Jurisdiction | |
| Analysis Time Period | *PM* | Analysis Year | *No-Build 2020* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | |
|---|---|---|---|---|
| Volume, V | *5690* | veh/h | Peak-Hour Factor, PHF | *0.95* |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *3* |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* |

## Calculate Flow Adjustments

| | | | |
|---|---|---|---|
| $f_p$ | *1.00* | $E_R$ | *1.2* |
| $E_T$ | *1.5* | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.985* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *3* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *70.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *2026* | pc/h/ln |
| S | *62.1* | mph |
| D = $v_p$ / S | *32.6* | pc/mi/ln |
| LOS | *D* | |

## Design (N)

Design (N)

| | | |
|---|---|---|
| Design LOS | | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | | pc/h/ln |
| S | | mph |
| D = $v_p$ / S | | pc/mi/ln |
| Required Number of Lanes, N | | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |



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# FREEWAY WEAVING WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency/Company | AECOM |
| Date Performed | |
| Analysis Time Period | PM |

## Site Information

| | |
|---|---|
| Freeway/Dir of Travel | I-95 NB |
| Weaving Segment Location | Seg 15-Bet On & Off to Exp |
| Analysis Year | No-Build 2020 |

Project Description SW 10th Street SIMR

## Inputs

| | | | |
|---|---|---|---|
| Weaving configuration | Two-Sided | Segment type | Freeway |
| Weaving number of lanes, N | 3 | Freeway minimum speed, $S_{MIN}$ | 15 |
| Weaving segment length, $L_S$ | 4665ft | Freeway maximum capacity, $C_{IFL}$ | 2400 |
| Freeway free-flow speed, FFS | 70 mph | Terrain type | Level |

## Conversions to pc/h Under Base Conditions

| | V (veh/h) | PHF | Truck (%) | RV (%) | $E_T$ | $E_R$ | $f_{HV}$ | $f_p$ | v (pc/h) |
|---|---|---|---|---|---|---|---|---|---|
| $V_{FF}$ | 4665 | 0.95 | 3 | 0 | 1.5 | 1.2 | 0.985 | 1.00 | 4984 |
| $V_{RF}$ | 575 | 0.92 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 631 |
| $V_{FR}$ | 1025 | 0.92 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 1125 |
| $V_{RR}$ | 65 | 0.92 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 71 |
| $V_{NW}$ | 6740 | | | | | | | V = | 6811 |
| $V_W$ | 71 | | | | | | | | |
| VR | 0.010 | | | | | | | | |

## Configuration Characteristics

| | | | |
|---|---|---|---|
| Minimum maneuver lanes, $N_{WL}$ | 0 lc | Minimum weaving lane changes, $LC_{MIN}$ | 213 lc/h |
| Interchange density, ID | 0.7 int/mi | Weaving lane changes, $LC_W$ | 568 lc/h |
| Minimum RF lane changes, $LC_{RF}$ | 0 lc/pc | Non-weaving lane changes, $LC_{NW}$ | 3192 lc/h |
| Minimum FR lane changes, $LC_{FR}$ | 0 lc/pc | Total lane changes, $LC_{ALL}$ | 3760 lc/h |
| Minimum RR lane changes, $LC_{RR}$ | 3 lc/pc | Non-weaving vehicle index, $I_{NW}$ | 2201 |

## Weaving Segment Speed, Density, Level of Service, and Capacity

| | | | |
|---|---|---|---|
| Weaving segment flow rate, v | 6721 veh/h | Weaving intensity factor, W | 0.191 |
| Weaving segment capacity, $c_w$ | 6831 veh/h | Weaving segment speed, S | 57.6 mph |
| Weaving segment v/c ratio | 0.984 | Average weaving speed, $S_W$ | 61.2 mph |
| Weaving segment density, D | 39.4 pc/mi/ln | Average non-weaving speed, $S_{NW}$ | 57.6 mph |
| Level of Service, LOS | E | Maximum weaving length, $L_{MAX}$ | 5824 ft |

## Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".



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# BASIC FREEWAY SEGMENTS WORKSHEET

| General Information | | Site Information | |
|---|---|---|---|
| Analyst | | Highway/Direction of Travel | *I-95 NB* |
| Agency or Company | *AECOM* | From/To | *Seg 16-North of Hillsboro* |
| Date Performed | | Jurisdiction | |
| Analysis Time Period | *PM* | Analysis Year | *No-Build 2020* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | |
|---|---|---|---|---|
| Volume, V | *5240* | veh/h | Peak-Hour Factor, PHF | *0.95* |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *3* |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* |

## Calculate Flow Adjustments

| | | | |
|---|---|---|---|
| $f_p$ | *1.00* | $E_R$ | *1.2* |
| $E_T$ | *1.5* | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.985* |

| Speed Inputs | | | Calc Speed Adj and FFS | | |
|---|---|---|---|---|---|
| Lane Width | | ft | | | |
| Rt-Side Lat. Clearance | | ft | $f_{LW}$ | | mph |
| Number of Lanes, N | *3* | | $f_{LC}$ | | mph |
| Total Ramp Density, TRD | | ramps/mi | TRD Adjustment | | mph |
| FFS (measured) | *70.0* | mph | FFS | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph | | | |

| LOS and Performance Measures | | | Design (N) | |
|---|---|---|---|---|
| Operational (LOS) | | | Design (N) | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *1866* | pc/h/ln | Design LOS | |
| S | *64.9* | mph | $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | pc/h/ln |
| D = $v_p$ / S | *28.8* | pc/mi/ln | S | mph |
| LOS | *D* | | D = $v_p$ / S | pc/mi/ln |
| | | | Required Number of Lanes, N | |

| Glossary | | Factor Location | |
|---|---|---|---|
| N - Number of lanes | S - Speed | $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| V - Hourly volume | D - Density | $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $v_p$ - Flow rate | FFS - Free-flow speed | $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS - Level of service | BFFS - Base free-flow speed | LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |
| DDHV - Directional design hour volume | | | |

# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency or Company | *AECOM* |
| Date Performed | |
| Analysis Time Period | *AM* |

## Site Information

| | |
|---|---|
| Highway/Direction of Travel | *I-95 SB* |
| From/To | *Seg 1-Bet Hillsboro & Palmetto* |
| Jurisdiction | |
| Analysis Year | *No-Build 2020* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | | |
|---|---|---|---|---|---|
| Volume, V | *4540* | veh/h | Peak-Hour Factor, PHF | *0.95* | |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *4* | |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* | |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* | |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* | |

## Calculate Flow Adjustments

| | | | |
|---|---|---|---|
| $f_p$ | *1.00* | $E_R$ | *1.2* |
| $E_T$ | *1.5* | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.980* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *3* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *70.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *1625* | pc/h/ln |
| S | *67.9* | mph |
| D = $v_p$ / S | *23.9* | pc/mi/ln |
| LOS | *C* | |

## Design (N)

Design (N)

| | | |
|---|---|---|
| Design LOS | | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | | pc/h/ln |
| S | | mph |
| D = $v_p$ / S | | pc/mi/ln |
| Required Number of Lanes, N | | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |

# FREEWAY WEAVING WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency/Company | AECOM |
| Date Performed | |
| Analysis Time Period | AM |

## Site Information

| | |
|---|---|
| Freeway/Dir of Travel | I-95 SB |
| Weaving Segment Location | Seg 2-Bet On from Exp & Off |
| Analysis Year | No-Build 2020 |

Project Description SW 10th Street SIMR

## Inputs

| | | | |
|---|---|---|---|
| Weaving configuration | One-Sided | Segment type | Freeway |
| Weaving number of lanes, N | 3 | Freeway minimum speed, $S_{MIN}$ | 15 |
| Weaving segment length, $L_S$ | 5085ft | Freeway maximum capacity, $C_{IFL}$ | 2400 |
| Freeway free-flow speed, FFS | 70 mph | Terrain type | Level |

## Conversions to pc/h Under Base Conditions

| | V (veh/h) | PHF | Truck (%) | RV (%) | $E_T$ | $E_R$ | $f_{HV}$ | $f_p$ | v (pc/h) |
|---|---|---|---|---|---|---|---|---|---|
| $V_{FF}$ | 3440 | 0.95 | 3 | 0 | 1.5 | 1.2 | 0.985 | 1.00 | 3675 |
| $V_{RF}$ | 1070 | 0.92 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 1175 |
| $V_{FR}$ | 1100 | 0.92 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 1208 |
| $V_{RR}$ | 120 | 0.92 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 132 |
| $V_{NW}$ | 3807 | | | | | | | V = | 6190 |
| $V_W$ | 2383 | | | | | | | | |
| VR | 0.385 | | | | | | | | |

## Configuration Characteristics

| | | | |
|---|---|---|---|
| Minimum maneuver lanes, $N_{WL}$ | 2 lc | Minimum weaving lane changes, $LC_{MIN}$ | 0 lc/h |
| Interchange density, ID | 0.7 int/mi | Weaving lane changes, $LC_W$ | 371 lc/h |
| Minimum RF lane changes, $LC_{RF}$ | 0 lc/pc | Non-weaving lane changes, $LC_{NW}$ | 2538 lc/h |
| Minimum FR lane changes, $LC_{FR}$ | 0 lc/pc | Total lane changes, $LC_{ALL}$ | 2909 lc/h |
| Minimum RR lane changes, $LC_{RR}$ | lc/pc | Non-weaving vehicle index, $I_{NW}$ | 1355 |

## Weaving Segment Speed, Density, Level of Service, and Capacity

| | | | |
|---|---|---|---|
| Weaving segment flow rate, v | 6111 veh/h | Weaving intensity factor, W | 0.145 |
| Weaving segment capacity, $c_w$ | 6142 veh/h | Weaving segment speed, S | 61.2 mph |
| Weaving segment v/c ratio | 0.995 | Average weaving speed, $S_W$ | 63.0 mph |
| Weaving segment density, D | 33.7 pc/mi/ln | Average non-weaving speed, $S_{NW}$ | 60.1 mph |
| Level of Service, LOS | D | Maximum weaving length, $L_{MAX}$ | 6513 ft |

## Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".



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# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency or Company | *AECOM* |
| Date Performed | |
| Analysis Time Period | *AM* |

## Site Information

| | |
|---|---|
| Highway/Direction of Travel | *I-95 SB* |
| From/To | *Seg 3-Bet Off & On Ramp* |
| Jurisdiction | |
| Analysis Year | *No-Build 2020* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | |
|---|---|---|---|---|
| Volume, V | *4510* | veh/h | Peak-Hour Factor, PHF | *0.95* |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *3* |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* |

## Calculate Flow Adjustments

| | | | |
|---|---|---|---|
| $f_p$ | *1.00* | $E_R$ | *1.2* |
| $E_T$ | *1.5* | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.985* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *3* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *70.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *1606* | pc/h/ln |
| S | *68.1* | mph |
| D = $v_p$ / S | *23.6* | pc/mi/ln |
| LOS | *C* | |

## Design (N)

Design (N)

| | |
|---|---|
| Design LOS | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | pc/h/ln |
| S | mph |
| D = $v_p$ / S | pc/mi/ln |
| Required Number of Lanes, N | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |

# RAMPS AND RAMP JUNCTIONS WORKSHEET

## General Information

| | | | |
|---|---|---|---|
| Analyst | | Freeway/Dir of Travel | I-95 SB |
| Agency or Company | AECOM | Junction | Seg 4-Merge from Hillsboro WB |
| Date Performed | | Jurisdiction | |
| Analysis Time Period | AM | Analysis Year | No-Build 2020 |

Project Description SW 10th Street SIMR

## Inputs

| Upstream Adj Ramp | | Freeway Number of Lanes, N | 3 | Downstream Adj Ramp | |
|---|---|---|---|---|---|
| ☑ Yes | ☐ On | Ramp Number of Lanes, N | 1 | ☐ Yes | ☐ On |
| ☐ No | ☑ Off | Acceleration Lane Length, $L_A$ | 950 | ☑ No | ☐ Off |
| $L_{up}$ = | 2175 ft | Deceleration Lane Length $L_D$ | | $L_{down}$ = | ft |
| $V_u$ = | 1220 veh/h | Freeway Volume, $V_F$ | 4510 | $V_D$ = | veh/h |
| | | Ramp Volume, $V_R$ | 630 | | |
| | | Freeway Free-Flow Speed, $S_{FF}$ | 70.0 | | |
| | | Ramp Free-Flow Speed, $S_{FR}$ | 50.0 | | |

## Conversion to pc/h Under Base Conditions

| (pc/h) | V (Veh/hr) | PHF | Terrain | %Truck | %Rv | $f_{HV}$ | $f_p$ | v = V/PHF x $f_{HV}$ x $f_p$ |
|---|---|---|---|---|---|---|---|---|
| Freeway | 4510 | 0.95 | Level | 3 | 0 | 0.985 | 1.00 | 4819 |
| Ramp | 630 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 692 |
| UpStream | 1220 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 1339 |
| DownStream | | | | | | | | |

**Merge Areas**

## Estimation of $v_{12}$

$V_{12} = V_F ( P_{FM} )$

$L_{EQ}$ = 1814.15 (Equation 13-6 or 13-7)

$P_{FM}$ = 0.604 using Equation (Exhibit 13-6)

$V_{12}$ = 2911 pc/h

$V_3$ or $V_{av34}$ 1908 pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☑ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☑ Yes ☐ No

If Yes,$V_{12a}$ = 2911 pc/h (Equation 13-16, 13-18, or 13-19)

## Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_{FO}$ | 5511 | Exhibit 13-8 | | No |

## Flow Entering Merge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{R12}$ | 3603 | Exhibit 13-8 | 4600:All | No |

## Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

$D_R$ = 27.3 (pc/mi/ln)

LOS = C (Exhibit 13-2)

## Speed Determination

$M_S$ = 0.369 (Exibit 13-11)

$S_R$= 59.7 mph (Exhibit 13-11)

$S_0$= 64.9 mph (Exhibit 13-11)

S = 61.4 mph (Exhibit 13-13)

**Diverge Areas**

## Estimation of $v_{12}$

$V_{12} = V_R + (V_F - V_R)P_{FD}$

$L_{EQ}$ = (Equation 13-12 or 13-13)

$P_{FD}$ = using Equation (Exhibit 13-7)

$V_{12}$ = pc/h

$V_3$ or $V_{av34}$ pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☐ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☐ No

If Yes,$V_{12a}$ = pc/h (Equation 13-16, 13-18, or 13-19)

## Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_F$ | | Exhibit 13-8 | | |
| $V_{FO} = V_F - V_R$ | | Exhibit 13-8 | | |
| $V_R$ | | Exhibit 13-10 | | |

## Flow Entering Diverge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{12}$ | | Exhibit 13-8 | | |

## Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

$D_R$ = (pc/mi/ln)

LOS = (Exhibit 13-2)

## Speed Determination

$D_s$ = (Exhibit 13-12)

$S_R$= mph (Exhibit 13-12)

$S_0$= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

# BASIC FREEWAY SEGMENTS WORKSHEET

| General Information | | Site Information | |
|---|---|---|---|
| Analyst | | Highway/Direction of Travel | *I95/SB* |
| Agency or Company | *AECOM* | From/To | *Seg 5-Bet WB On & EB On Ramps* |
| Date Performed | | Jurisdiction | |
| Analysis Time Period | *AM* | Analysis Year | *No-Build 2020* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | |
|---|---|---|---|---|
| Volume, V | *5140* | veh/h | Peak-Hour Factor, PHF | *0.95* |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *3* |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* |

## Calculate Flow Adjustments

| | | | |
|---|---|---|---|
| $f_p$ | *1.00* | $E_R$ | *1.2* |
| $E_T$ | *1.5* | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.985* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *3* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *70.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *1831* | pc/h/ln |
| S | *65.4* | mph |
| D = $v_p$ / S | *28.0* | pc/mi/ln |
| LOS | *D* | |

## Design (N)

Design (N)

| | |
|---|---|
| Design LOS | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | pc/h/ln |
| S | mph |
| D = $v_p$ / S | pc/mi/ln |
| Required Number of Lanes, N | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |

# FREEWAY WEAVING WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency/Company | AECOM |
| Date Performed | |
| Analysis Time Period | AM |

## Site Information

| | |
|---|---|
| Freeway/Dir of Travel | I-95 SB |
| Weaving Segment Location | Seg 6- Bet Hillsboro & 10th St |
| Analysis Year | No-Build 2020 |

Project Description SW 10th Street SIMR

## Inputs

| | | | |
|---|---|---|---|
| Weaving configuration | One-Sided | Segment type | Freeway |
| Weaving number of lanes, N | 4 | Freeway minimum speed, $S_{MIN}$ | 15 |
| Weaving segment length, $L_S$ | 1830ft | Freeway maximum capacity, $C_{IFL}$ | 2400 |
| Freeway free-flow speed, FFS | 70 mph | Terrain type | Level |

## Conversions to pc/h Under Base Conditions

| | V (veh/h) | PHF | Truck (%) | RV (%) | $E_T$ | $E_R$ | $f_{HV}$ | $f_p$ | v (pc/h) |
|---|---|---|---|---|---|---|---|---|---|
| $V_{FF}$ | 3960 | 0.95 | 3 | 0 | 1.5 | 1.2 | 0.985 | 1.00 | 4231 |
| $V_{RF}$ | 740 | 0.92 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 812 |
| $V_{FR}$ | 1180 | 0.92 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 1295 |
| $V_{RR}$ | 0 | 0.95 | 0 | 0 | 1.5 | 1.2 | 1.000 | 1.00 | 0 |
| $V_{NW}$ | 4231 | | | | | | | V = | 6338 |
| $V_W$ | 2107 | | | | | | | | |
| VR | 0.332 | | | | | | | | |

## Configuration Characteristics

| | | | |
|---|---|---|---|
| Minimum maneuver lanes, $N_{WL}$ | 2 lc | Minimum weaving lane changes, $LC_{MIN}$ | 812 lc/h |
| Interchange density, ID | 0.7 int/mi | Weaving lane changes, $LC_W$ | 1185 lc/h |
| Minimum RF lane changes, $LC_{RF}$ | 1 lc/pc | Non-weaving lane changes, $LC_{NW}$ | 1093 lc/h |
| Minimum FR lane changes, $LC_{FR}$ | 0 lc/pc | Total lane changes, $LC_{ALL}$ | 2278 lc/h |
| Minimum RR lane changes, $LC_{RR}$ | lc/pc | Non-weaving vehicle index, $I_{NW}$ | 542 |

## Weaving Segment Speed, Density, Level of Service, and Capacity

| | | | |
|---|---|---|---|
| Weaving segment flow rate, v | 6256 veh/h | Weaving intensity factor, W | 0.269 |
| Weaving segment capacity, $c_w$ | 7113 veh/h | Weaving segment speed, S | 57.1 mph |
| Weaving segment v/c ratio | 0.879 | Average weaving speed, $S_W$ | 58.4 mph |
| Weaving segment density, D | 27.7 pc/mi/ln | Average non-weaving speed, $S_{NW}$ | 56.5 mph |
| Level of Service, LOS | C | Maximum weaving length, $L_{MAX}$ | 5934 ft |

## Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".



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# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency or Company | *AECOM* |
| Date Performed | |
| Analysis Time Period | *AM* |

## Site Information

| | |
|---|---|
| Highway/Direction of Travel | *I-95 SB* |
| From/To | *Seg 7-Bet Off & On Ramp* |
| Jurisdiction | |
| Analysis Year | *No-Build 2020* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | |
|---|---|---|---|---|
| Volume, V | *4700* | veh/h | Peak-Hour Factor, PHF | *0.95* |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *3* |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* |

## Calculate Flow Adjustments

| | | | |
|---|---|---|---|
| $f_p$ | *1.00* | $E_R$ | *1.2* |
| $E_T$ | *1.5* | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.985* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *3* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *70.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *1674* | pc/h/ln |
| S | *67.4* | mph |
| D = $v_p$ / S | *24.8* | pc/mi/ln |
| LOS | *C* | |

## Design (N)

Design (N)

| | |
|---|---|
| Design LOS | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | pc/h/ln |
| S | mph |
| D = $v_p$ / S | pc/mi/ln |
| Required Number of Lanes, N | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |

# RAMPS AND RAMP JUNCTIONS WORKSHEET

## General Information / Site Information

| | | | |
|---|---|---|---|
| Analyst | | Freeway/Dir of Travel | I-95 SB |
| Agency or Company | AECOM | Junction | Seg 8-Merge from 10th St |
| Date Performed | | Jurisdiction | |
| Analysis Time Period | AM | Analysis Year | No-Build 2020 |

Project Description I-95 AT HILLSBORO BOULEVARD IMR

## Inputs

| Upstream Adj Ramp | | Freeway Number of Lanes, N | 3 | Downstream Adj Ramp | |
|---|---|---|---|---|---|
| ☑ Yes | ☐ On | Ramp Number of Lanes, N | 1 | ☐ Yes | ☐ On |
| ☐ No | ☑ Off | Acceleration Lane Length, $L_A$ | 1470 | ☑ No | ☐ Off |
| $L_{up}$ = | 2210 ft | Deceleration Lane Length $L_D$ | | $L_{down}$ = | ft |
| $V_u$ = | 1180 veh/h | Freeway Volume, $V_F$ | 4700 | $V_D$ = | veh/h |
| | | Ramp Volume, $V_R$ | 1220 | | |
| | | Freeway Free-Flow Speed, $S_{FF}$ | 70.0 | | |
| | | Ramp Free-Flow Speed, $S_{FR}$ | 50.0 | | |

## Conversion to pc/h Under Base Conditions

| (pc/h) | V (Veh/hr) | PHF | Terrain | %Truck | %Rv | $f_{HV}$ | $f_p$ | v = V/PHF x $f_{HV}$ x $f_p$ |
|---|---|---|---|---|---|---|---|---|
| Freeway | 4700 | 0.95 | Level | 3 | 0 | 0.985 | 1.00 | 5022 |
| Ramp | 1220 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 1339 |
| UpStream | 1180 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 1295 |
| DownStream | | | | | | | | |

**Merge Areas**

## Estimation of $v_{12}$

$V_{12} = V_F ( P_{FM} )$

$L_{EQ}$ = 2226.93 (Equation 13-6 or 13-7)

$P_{FM}$ = 0.617 using Equation (Exhibit 13-6)

$V_{12}$ = 3101 pc/h

$V_3$ or $V_{av34}$ 1921 pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☑ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☑ Yes ☐ No

If Yes,$V_{12a}$ = 3101 pc/h (Equation 13-16, 13-18, or 13-19)

## Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_{FO}$ | 6361 | Exhibit 13-8 | | No |

## Flow Entering Merge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{R12}$ | 4440 | Exhibit 13-8 | 4600:All | No |

## Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

$D_R$ = 30.3 (pc/mi/ln)

LOS = D (Exhibit 13-2)

## Speed Determination

$M_S$ = 0.505 (Exibit 13-11)

$S_R$= 55.9 mph (Exhibit 13-11)

$S_0$= 64.9 mph (Exhibit 13-11)

S = 58.3 mph (Exhibit 13-13)

**Diverge Areas**

## Estimation of $v_{12}$

$V_{12} = V_R + (V_F - V_R)P_{FD}$

$L_{EQ}$ = (Equation 13-12 or 13-13)

$P_{FD}$ = using Equation (Exhibit 13-7)

$V_{12}$ = pc/h

$V_3$ or $V_{av34}$ pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☐ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☐ No

If Yes,$V_{12a}$ = pc/h (Equation 13-16, 13-18, or 13-19)

## Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_F$ | | Exhibit 13-8 | | |
| $V_{FO} = V_F - V_R$ | | Exhibit 13-8 | | |
| $V_R$ | | Exhibit 13-10 | | |

## Flow Entering Diverge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{12}$ | | Exhibit 13-8 | | |

## Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

$D_R$ = (pc/mi/ln)

LOS = (Exhibit 13-2)

## Speed Determination

$D_s$ = (Exhibit 13-12)

$S_R$= mph (Exhibit 13-12)

$S_0$= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency or Company | *AECOM* |
| Date Performed | |
| Analysis Time Period | *AM* |

## Site Information

| | |
|---|---|
| Highway/Direction of Travel | *I-95 SB* |
| From/To | *Seg 9-Bet 10th & Exit to Exp* |
| Jurisdiction | |
| Analysis Year | *No-Build 2020* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | | |
|---|---|---|---|---|---|
| Volume, V | *5920* | veh/h | Peak-Hour Factor, PHF | *0.95* | |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *3* | |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* | |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* | |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* | |

## Calculate Flow Adjustments

| | | | |
|---|---|---|---|
| $f_p$ | *1.00* | $E_R$ | *1.2* |
| $E_T$ | *1.5* | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.985* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *3* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *70.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *2108* | pc/h/ln |
| S | *60.4* | mph |
| D = $v_p$ / S | *34.9* | pc/mi/ln |
| LOS | *D* | |

## Design (N)

Design (N)

| | |
|---|---|
| Design LOS | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | pc/h/ln |
| S | mph |
| D = $v_p$ / S | pc/mi/ln |
| Required Number of Lanes, N | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |



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# RAMPS AND RAMP JUNCTIONS WORKSHEET

## General Information

| | | | |
|---|---|---|---|
| Analyst | | Freeway/Dir of Travel | I-95 SB |
| Agency or Company | AECOM | Junction | Seg 10- Diverge to Express |
| Date Performed | | Jurisdiction | |
| Analysis Time Period | AM | Analysis Year | No-Build 2020 |

Project Description SW 10th Street SIMR

## Site Information

## Inputs

| Upstream Adj Ramp | | Freeway Number of Lanes, N | 3 | Downstream Adj Ramp | |
|---|---|---|---|---|---|
| ☑ Yes | ☑ On | Ramp Number of Lanes, N | 1 | ☐ Yes | ☐ On |
| ☐ No | ☐ Off | Acceleration Lane Length, $L_A$ | | ☑ No | ☐ Off |
| $L_{up}$ = | 6000 ft | Deceleration Lane Length $L_D$ | 300 | $L_{down}$ = | ft |
| $V_u$ = | 1220 veh/h | Freeway Volume, $V_F$ | 5920 | $V_D$ = | veh/h |
| | | Ramp Volume, $V_R$ | 860 | | |
| | | Freeway Free-Flow Speed, $S_{FF}$ | 70.0 | | |
| | | Ramp Free-Flow Speed, $S_{FR}$ | 45.0 | | |

## Conversion to pc/h Under Base Conditions

| (pc/h) | V (Veh/hr) | PHF | Terrain | %Truck | %Rv | $f_{HV}$ | $f_p$ | v = V/PHF x $f_{HV}$ x $f_p$ |
|---|---|---|---|---|---|---|---|---|
| Freeway | 5920 | 0.95 | Level | 3 | 0 | 0.985 | 1.00 | 6325 |
| Ramp | 860 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 944 |
| UpStream | 1220 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 1339 |
| DownStream | | | | | | | | |

**Merge Areas**

## Estimation of $v_{12}$

$V_{12} = V_F ( P_{FM} )$

$L_{EQ}$ = (Equation 13-6 or 13-7)

$P_{FM}$ = using Equation (Exhibit 13-6)

$V_{12}$ = pc/h

$V_3$ or $V_{av34}$ pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☐ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☐ No

If Yes,$V_{12a}$ = pc/h (Equation 13-16, 13-18, or 13-19)

## Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_{FO}$ | | Exhibit 13-8 | | |

## Flow Entering Merge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{R12}$ | | Exhibit 13-8 | | |

## Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

$D_R$ = (pc/mi/ln)

LOS = (Exhibit 13-2)

## Speed Determination

$M_S$ = (Exibit 13-11)

$S_R$= mph (Exhibit 13-11)

$S_0$= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

**Diverge Areas**

## Estimation of $v_{12}$

$V_{12} = V_R + (V_F - V_R)P_{FD}$

$L_{EQ}$ = 9251.65 (Equation 13-12 or 13-13)

$P_{FD}$ = 0.558 using Equation (Exhibit 13-7)

$V_{12}$ = 3949 pc/h

$V_3$ or $V_{av34}$ 2376 pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☑ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☑ No

If Yes,$V_{12a}$ = pc/h (Equation 13-16, 13-18, or 13-19)

## Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_F$ | 6325 | Exhibit 13-8 | 7200 | No |
| $V_{FO} = V_F - V_R$ | 5381 | Exhibit 13-8 | 7200 | No |
| $V_R$ | 944 | Exhibit 13-10 | 2100 | No |

## Flow Entering Diverge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{12}$ | 3949 | Exhibit 13-8 | 4400:All | No |

## Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

$D_R$ = 37.2 (pc/mi/ln)

LOS = E (Exhibit 13-2)

## Speed Determination

$D_s$ = 0.383 (Exhibit 13-12)

$S_R$= 59.3 mph (Exhibit 13-12)

$S_0$= 72.2 mph (Exhibit 13-12)

S = 63.2 mph (Exhibit 13-13)

# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency or Company | *AECOM* |
| Date Performed | |
| Analysis Time Period | *AM* |

## Site Information

| | |
|---|---|
| Highway/Direction of Travel | *I-95 SB* |
| From/To | *Seg 11-Bet Off Exp Off Sample* |
| Jurisdiction | |
| Analysis Year | *No-Build 2020* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | | |
|---|---|---|---|---|---|
| Volume, V | *5060* | veh/h | Peak-Hour Factor, PHF | *0.95* | |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *3* | |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* | |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* | |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* | |

## Calculate Flow Adjustments

| | | | |
|---|---|---|---|
| $f_p$ | *1.00* | $E_R$ | *1.2* |
| $E_T$ | *1.5* | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.985* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *3* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *70.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *1802* | pc/h/ln |
| S | *65.8* | mph |
| D = $v_p$ / S | *27.4* | pc/mi/ln |
| LOS | *D* | |

## Design (N)

Design (N)

| | | |
|---|---|---|
| Design LOS | | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | | pc/h/ln |
| S | | mph |
| D = $v_p$ / S | | pc/mi/ln |
| Required Number of Lanes, N | | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |

# RAMPS AND RAMP JUNCTIONS WORKSHEET

## General Information

| | | | |
|---|---|---|---|
| Analyst | | Freeway/Dir of Travel | I-95 SB |
| Agency or Company | AECOM | Junction | Seg 12- Diverge to Sample Rd |
| Date Performed | | Jurisdiction | |
| Analysis Time Period | AM | Analysis Year | No-Build 2020 |

Project Description SW 10th Street SIMR

## Site Information

## Inputs

Upstream Adj Ramp

☑ Yes ☐ On

☐ No ☑ Off

$L_{up}$ = 2000 ft

$V_u$ = 860 veh/h

| | |
|---|---|
| Freeway Number of Lanes, N | 3 |
| Ramp Number of Lanes, N | 1 |
| Acceleration Lane Length, $L_A$ | |
| Deceleration Lane Length $L_D$ | 250 |
| Freeway Volume, $V_F$ | 5060 |
| Ramp Volume, $V_R$ | 880 |
| Freeway Free-Flow Speed, $S_{FF}$ | 70.0 |
| Ramp Free-Flow Speed, $S_{FR}$ | 45.0 |

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

$L_{down}$ = ft

$V_D$ = veh/h

## Conversion to pc/h Under Base Conditions

| (pc/h) | V (Veh/hr) | PHF | Terrain | %Truck | %Rv | $f_{HV}$ | $f_p$ | v = V/PHF x $f_{HV}$ x $f_p$ |
|---|---|---|---|---|---|---|---|---|
| Freeway | 5060 | 0.95 | Level | 3 | 0 | 0.985 | 1.00 | 5406 |
| Ramp | 880 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 966 |
| UpStream | 860 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 944 |
| DownStream | | | | | | | | |

**Merge Areas**

## Estimation of $v_{12}$

$V_{12} = V_F ( P_{FM} )$

$L_{EQ}$ = (Equation 13-6 or 13-7)

$P_{FM}$ = using Equation (Exhibit 13-6)

$V_{12}$ = pc/h

$V_3$ or $V_{av34}$ pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☐ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☐ No

If Yes, $V_{12a}$ = pc/h (Equation 13-16, 13-18, or 13-19)

## Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_{FO}$ | | Exhibit 13-8 | | |

## Flow Entering Merge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{R12}$ | | Exhibit 13-8 | | |

## Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

$D_R$ = (pc/mi/ln)

LOS = (Exhibit 13-2)

## Speed Determination

$M_S$ = (Exibit 13-11)

$S_R$= mph (Exhibit 13-11)

$S_0$= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

**Diverge Areas**

## Estimation of $v_{12}$

$V_{12} = V_R + (V_F - V_R)P_{FD}$

$L_{EQ}$ = (Equation 13-12 or 13-13)

$P_{FD}$ = 0.580 using Equation (Exhibit 13-7)

$V_{12}$ = 3543 pc/h

$V_3$ or $V_{av34}$ 1863 pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☑ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☑ No

If Yes, $V_{12a}$ = pc/h (Equation 13-16, 13-18, or 13-19)

## Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_F$ | 5406 | Exhibit 13-8 | 7200 | No |
| $V_{FO} = V_F - V_R$ | 4440 | Exhibit 13-8 | 7200 | No |
| $V_R$ | 966 | Exhibit 13-10 | 2100 | No |

## Flow Entering Diverge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{12}$ | 3543 | Exhibit 13-8 | 4400:All | No |

## Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

$D_R$ = 34.0 (pc/mi/ln)

LOS = D (Exhibit 13-2)

## Speed Determination

$D_s$ = 0.385 (Exhibit 13-12)

$S_R$= 59.2 mph (Exhibit 13-12)

$S_0$= 74.1 mph (Exhibit 13-12)

S = 63.2 mph (Exhibit 13-13)

# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency or Company | *AECOM* |
| Date Performed | |
| Analysis Time Period | *AM* |

## Site Information

| | |
|---|---|
| Highway/Direction of Travel | *I-95 SB* |
| From/To | *Seg 13-Bet Off & On Ramps* |
| Jurisdiction | |
| Analysis Year | *No-Build 2020* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | |
|---|---|---|---|---|
| Volume, V | *4180* | veh/h | Peak-Hour Factor, PHF | *0.95* |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *3* |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* |

## Calculate Flow Adjustments

| | | | |
|---|---|---|---|
| $f_p$ | *1.00* | $E_R$ | *1.2* |
| $E_T$ | *1.5* | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.985* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *3* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *70.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *1489* | pc/h/ln |
| S | *69.0* | mph |
| D = $v_p$ / S | *21.6* | pc/mi/ln |
| LOS | *C* | |

## Design (N)

Design (N)

| | | |
|---|---|---|
| Design LOS | | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | | pc/h/ln |
| S | | mph |
| D = $v_p$ / S | | pc/mi/ln |
| Required Number of Lanes, N | | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |

# FREEWAY WEAVING WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency/Company | AECOM |
| Date Performed | |
| Analysis Time Period | AM |

## Site Information

| | |
|---|---|
| Freeway/Dir of Travel | I-95 SB |
| Weaving Segment Location | Seg 14- Bet Sample & Copans |
| Analysis Year | No-Build 2020 |

Project Description SW 10th Street SIMR

## Inputs

| | | | |
|---|---|---|---|
| Weaving configuration | One-Sided | Segment type | Freeway |
| Weaving number of lanes, N | 4 | Freeway minimum speed, $S_{MIN}$ | 15 |
| Weaving segment length, $L_S$ | 1650ft | Freeway maximum capacity, $C_{IFL}$ | 2400 |
| Freeway free-flow speed, FFS | 70 mph | Terrain type | Level |

## Conversions to pc/h Under Base Conditions

| | V (veh/h) | PHF | Truck (%) | RV (%) | $E_T$ | $E_R$ | $f_{HV}$ | $f_p$ | v (pc/h) |
|---|---|---|---|---|---|---|---|---|---|
| $V_{FF}$ | 3575 | 0.95 | 3 | 0 | 1.5 | 1.2 | 0.985 | 1.00 | 3820 |
| $V_{RF}$ | 1790 | 0.92 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 1965 |
| $V_{FR}$ | 605 | 0.92 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 664 |
| $V_{RR}$ | 0 | 0.95 | 0 | 0 | 1.5 | 1.2 | 1.000 | 1.00 | 0 |
| $V_{NW}$ | 3820 | | | | | | | V = | 6449 |
| $V_W$ | 2629 | | | | | | | | |
| VR | 0.408 | | | | | | | | |

## Configuration Characteristics

| | | | |
|---|---|---|---|
| Minimum maneuver lanes, $N_{WL}$ | 2 lc | Minimum weaving lane changes, $LC_{MIN}$ | lc/h |
| Interchange density, ID | 0.7 int/mi | Weaving lane changes, $LC_W$ | lc/h |
| Minimum RF lane changes, $LC_{RF}$ | 1 lc/pc | Non-weaving lane changes, $LC_{NW}$ | lc/h |
| Minimum FR lane changes, $LC_{FR}$ | 1 lc/pc | Total lane changes, $LC_{ALL}$ | lc/h |
| Minimum RR lane changes, $LC_{RR}$ | lc/pc | Non-weaving vehicle index, $I_{NW}$ | 551 |

## Weaving Segment Speed, Density, Level of Service, and Capacity

| | | | |
|---|---|---|---|
| Weaving segment flow rate, v | 6367 veh/h | Weaving intensity factor, W | |
| Weaving segment capacity, $c_w$ | 5800 veh/h | Weaving segment speed, S | mph |
| Weaving segment v/c ratio | 1.098 | Average weaving speed, $S_W$ | mph |
| Weaving segment density, D | pc/mi/ln | Average non-weaving speed, $S_{NW}$ | mph |
| Level of Service, LOS | F | Maximum weaving length, $L_{MAX}$ | 6767 ft |

## Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency or Company | *AECOM* |
| Date Performed | |
| Analysis Time Period | *PM* |

## Site Information

| | |
|---|---|
| Highway/Direction of Travel | *I-95 SB* |
| From/To | *Seg 1-Bet Hillsboro & Palmetto* |
| Jurisdiction | |
| Analysis Year | *No-Build 2020* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | | |
|---|---|---|---|---|---|
| Volume, V | *4990* | veh/h | Peak-Hour Factor, PHF | *0.95* | |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *4* | |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* | |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* | |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* | |

## Calculate Flow Adjustments

| | | | |
|---|---|---|---|
| $f_p$ | *1.00* | $E_R$ | *1.2* |
| $E_T$ | *1.5* | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.980* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *3* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *70.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *1786* | pc/h/ln |
| S | *66.0* | mph |
| D = $v_p$ / S | *27.1* | pc/mi/ln |
| LOS | *D* | |

## Design (N)

Design (N)

| | | |
|---|---|---|
| Design LOS | | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | | pc/h/ln |
| S | | mph |
| D = $v_p$ / S | | pc/mi/ln |
| Required Number of Lanes, N | | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |

# FREEWAY WEAVING WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency/Company | AECOM |
| Date Performed | |
| Analysis Time Period | PM |

## Site Information

| | |
|---|---|
| Freeway/Dir of Travel | I-95 SB |
| Weaving Segment Location | Seg 2-Bet On from Exp & Off |
| Analysis Year | No-Build 2020 |

Project Description I-95 AT HILLSBORO BOULEVARD IMR

## Inputs

| | | | |
|---|---|---|---|
| Weaving configuration | Two-Sided | Segment type | Freeway |
| Weaving number of lanes, N | 3 | Freeway minimum speed, $S_{MIN}$ | 15 |
| Weaving segment length, $L_S$ | 5085ft | Freeway maximum capacity, $C_{IFL}$ | 2400 |
| Freeway free-flow speed, FFS | 70 mph | Terrain type | Level |

## Conversions to pc/h Under Base Conditions

| | V (veh/h) | PHF | Truck (%) | RV (%) | $E_T$ | $E_R$ | $f_{HV}$ | $f_p$ | v (pc/h) |
|---|---|---|---|---|---|---|---|---|---|
| $V_{FF}$ | 4055 | 0.95 | 3 | 0 | 1.5 | 1.2 | 0.985 | 1.00 | 4332 |
| $V_{RF}$ | 1105 | 0.92 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 1213 |
| $V_{FR}$ | 935 | 0.92 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 1026 |
| $V_{RR}$ | 125 | 0.92 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 137 |
| $V_{NW}$ | 6571 | | | | | | | V = | 6708 |
| $V_W$ | 137 | | | | | | | | |
| VR | 0.020 | | | | | | | | |

## Configuration Characteristics

| | | | |
|---|---|---|---|
| Minimum maneuver lanes, $N_{WL}$ | 0 lc | Minimum weaving lane changes, $LC_{MIN}$ | 411 lc/h |
| Interchange density, ID | 0.7 int/mi | Weaving lane changes, $LC_W$ | 782 lc/h |
| Minimum RF lane changes, $LC_{RF}$ | 0 lc/pc | Non-weaving lane changes, $LC_{NW}$ | 3154 lc/h |
| Minimum FR lane changes, $LC_{FR}$ | 0 lc/pc | Total lane changes, $LC_{ALL}$ | 3936 lc/h |
| Minimum RR lane changes, $LC_{RR}$ | 3 lc/pc | Non-weaving vehicle index, $I_{NW}$ | 2339 |

## Weaving Segment Speed, Density, Level of Service, and Capacity

| | | | |
|---|---|---|---|
| Weaving segment flow rate, v | 6622 veh/h | Weaving intensity factor, W | 0.185 |
| Weaving segment capacity, $c_w$ | 6904 veh/h | Weaving segment speed, S | 56.4 mph |
| Weaving segment v/c ratio | 0.959 | Average weaving speed, $S_W$ | 61.4 mph |
| Weaving segment density, D | 39.6 pc/mi/ln | Average non-weaving speed, $S_{NW}$ | 56.3 mph |
| Level of Service, LOS | E | Maximum weaving length, $L_{MAX}$ | 5916 ft |

## Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency or Company | *AECOM* |
| Date Performed | |
| Analysis Time Period | *PM* |

## Site Information

| | |
|---|---|
| Highway/Direction of Travel | *I-95 SB* |
| From/To | *Seg 3-Bet Off & On Ramp* |
| Jurisdiction | |
| Analysis Year | *No-Build 2020* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | |
|---|---|---|---|---|
| Volume, V | *5160* | veh/h | Peak-Hour Factor, PHF | *0.95* |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *3* |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* |

## Calculate Flow Adjustments

| | | | |
|---|---|---|---|
| $f_p$ | *1.00* | $E_R$ | *1.2* |
| $E_T$ | *1.5* | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.985* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *3* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *70.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *1838* | pc/h/ln |
| S | *65.3* | mph |
| D = $v_p$ / S | *28.2* | pc/mi/ln |
| LOS | *D* | |

## Design (N)

Design (N)

| | | |
|---|---|---|
| Design LOS | | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | | pc/h/ln |
| S | | mph |
| D = $v_p$ / S | | pc/mi/ln |
| Required Number of Lanes, N | | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |

# RAMPS AND RAMP JUNCTIONS WORKSHEET

## General Information

| | | | |
|---|---|---|---|
| Analyst | | Freeway/Dir of Travel | I-95 SB |
| Agency or Company | AECOM | Junction | Seg 4-Merge from Hillsboro WB |
| Date Performed | | Jurisdiction | |
| Analysis Time Period | PM | Analysis Year | No-Build 2020 |

Project Description SW 10th Street SIMR

## Inputs

| Upstream Adj Ramp | | Freeway Number of Lanes, N | 3 | Downstream Adj Ramp | |
|---|---|---|---|---|---|
| ☑ Yes | ☐ On | Ramp Number of Lanes, N | 1 | ☐ Yes | ☐ On |
| ☐ No | ☑ Off | Acceleration Lane Length, $L_A$ | 950 | ☑ No | ☐ Off |
| $L_{up}$ = | 2175 ft | Deceleration Lane Length $L_D$ | | $L_{down}$ = | ft |
| $V_u$ = | 1060 veh/h | Freeway Volume, $V_F$ | 5160 | $V_D$ = | veh/h |
| | | Ramp Volume, $V_R$ | 790 | | |
| | | Freeway Free-Flow Speed, $S_{FF}$ | 70.0 | | |
| | | Ramp Free-Flow Speed, $S_{FR}$ | 50.0 | | |

## Conversion to pc/h Under Base Conditions

| (pc/h) | V (Veh/hr) | PHF | Terrain | %Truck | %Rv | $f_{HV}$ | $f_p$ | v = V/PHF x $f_{HV}$ x $f_p$ |
|---|---|---|---|---|---|---|---|---|
| Freeway | 5160 | 0.95 | Level | 3 | 0 | 0.985 | 1.00 | 5513 |
| Ramp | 790 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 867 |
| UpStream | 1060 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 1164 |
| DownStream | | | | | | | | |

**Merge Areas**

## Estimation of $v_{12}$

$V_{12} = V_F ( P_{FM} )$

$L_{EQ}$ = 2000.12 (Equation 13-6 or 13-7)

$P_{FM}$ = 0.604 using Equation (Exhibit 13-6)

$V_{12}$ = 3330 pc/h

$V_3$ or $V_{av34}$ 2183 pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☑ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☑ Yes ☐ No

If Yes,$V_{12a}$ = 3330 pc/h (Equation 13-16, 13-18, or 13-19)

## Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_{FO}$ | 6380 | Exhibit 13-8 | | No |

## Flow Entering Merge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{R12}$ | 4197 | Exhibit 13-8 | 4600:All | No |

## Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

$D_R$ = 31.9 (pc/mi/ln)

LOS = D (Exhibit 13-2)

## Speed Determination

$M_S$ = 0.485 (Exibit 13-11)

$S_R$= 56.4 mph (Exhibit 13-11)

$S_0$= 63.9 mph (Exhibit 13-11)

S = 58.8 mph (Exhibit 13-13)

**Diverge Areas**

## Estimation of $v_{12}$

$V_{12} = V_R + (V_F - V_R)P_{FD}$

$L_{EQ}$ = (Equation 13-12 or 13-13)

$P_{FD}$ = using Equation (Exhibit 13-7)

$V_{12}$ = pc/h

$V_3$ or $V_{av34}$ pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☐ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☐ No

If Yes,$V_{12a}$ = pc/h (Equation 13-16, 13-18, or 13-19)

## Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_F$ | | Exhibit 13-8 | | |
| $V_{FO} = V_F - V_R$ | | Exhibit 13-8 | | |
| $V_R$ | | Exhibit 13-10 | | |

## Flow Entering Diverge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{12}$ | | Exhibit 13-8 | | |

## Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

$D_R$ = (pc/mi/ln)

LOS = (Exhibit 13-2)

## Speed Determination

$D_s$ = (Exhibit 13-12)

$S_R$= mph (Exhibit 13-12)

$S_0$= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency or Company | *AECOM* |
| Date Performed | |
| Analysis Time Period | *PM* |

## Site Information

| | |
|---|---|
| Highway/Direction of Travel | *I-95 SB* |
| From/To | *Seg 5-Bet WB On & EB On Ramps* |
| Jurisdiction | |
| Analysis Year | *No-Build 2020* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | |
|---|---|---|---|---|
| Volume, V | *5950* | veh/h | Peak-Hour Factor, PHF | *0.95* |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *3* |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* |

## Calculate Flow Adjustments

| | | | |
|---|---|---|---|
| $f_p$ | *1.00* | $E_R$ | *1.2* |
| $E_T$ | *1.5* | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.985* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *3* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *70.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *2119* | pc/h/ln |
| S | *60.2* | mph |
| D = $v_p$ / S | *35.2* | pc/mi/ln |
| LOS | *E* | |

## Design (N)

Design (N)

| | |
|---|---|
| Design LOS | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | pc/h/ln |
| S | mph |
| D = $v_p$ / S | pc/mi/ln |
| Required Number of Lanes, N | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 10-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |



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# FREEWAY WEAVING WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency/Company | AECOM |
| Date Performed | |
| Analysis Time Period | PM |

## Site Information

| | |
|---|---|
| Freeway/Dir of Travel | I-95 SB |
| Weaving Segment Location | Seg 6- Bet Hillsboro & 10th St |
| Analysis Year | No-Build 2020 |

Project Description SW 10th Street SIMR

## Inputs

| | | | |
|---|---|---|---|
| Weaving configuration | One-Sided | Segment type | Freeway |
| Weaving number of lanes, N | 4 | Freeway minimum speed, $S_{MIN}$ | 15 |
| Weaving segment length, $L_S$ | 1830ft | Freeway maximum capacity, $C_{IFL}$ | 2400 |
| Freeway free-flow speed, FFS | 70 mph | Terrain type | Level |

## Conversions to pc/h Under Base Conditions

| | V (veh/h) | PHF | Truck (%) | RV (%) | $E_T$ | $E_R$ | $f_{HV}$ | $f_p$ | v (pc/h) |
|---|---|---|---|---|---|---|---|---|---|
| $V_{FF}$ | 4700 | 0.95 | 3 | 0 | 1.5 | 1.2 | 0.985 | 1.00 | 5022 |
| $V_{RF}$ | 710 | 0.92 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 779 |
| $V_{FR}$ | 1250 | 0.92 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 1372 |
| $V_{RR}$ | 0 | 0.95 | 0 | 0 | 1.5 | 1.2 | 1.000 | 1.00 | 0 |
| $V_{NW}$ | 5022 | | | | | | | V = | 7173 |
| $V_W$ | 2151 | | | | | | | | |
| VR | 0.300 | | | | | | | | |

## Configuration Characteristics

| | | | |
|---|---|---|---|
| Minimum maneuver lanes, $N_{WL}$ | 2 lc | Minimum weaving lane changes, $LC_{MIN}$ | 779 lc/h |
| Interchange density, ID | 0.7 int/mi | Weaving lane changes, $LC_W$ | 1152 lc/h |
| Minimum RF lane changes, $LC_{RF}$ | 1 lc/pc | Non-weaving lane changes, $LC_{NW}$ | 1256 lc/h |
| Minimum FR lane changes, $LC_{FR}$ | 0 lc/pc | Total lane changes, $LC_{ALL}$ | 2408 lc/h |
| Minimum RR lane changes, $LC_{RR}$ | lc/pc | Non-weaving vehicle index, $I_{NW}$ | 643 |

## Weaving Segment Speed, Density, Level of Service, and Capacity

| | | | |
|---|---|---|---|
| Weaving segment flow rate, v | 7078 veh/h | Weaving intensity factor, W | 0.281 |
| Weaving segment capacity, $c_w$ | 7885 veh/h | Weaving segment speed, S | 56.4 mph |
| Weaving segment v/c ratio | 0.898 | Average weaving speed, $S_W$ | 57.9 mph |
| Weaving segment density, D | 31.8 pc/mi/ln | Average non-weaving speed, $S_{NW}$ | 55.8 mph |
| Level of Service, LOS | D | Maximum weaving length, $L_{MAX}$ | 5583 ft |

## Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency or Company | *AECOM* |
| Date Performed | |
| Analysis Time Period | *PM* |

## Site Information

| | |
|---|---|
| Highway/Direction of Travel | *I-95 SB* |
| From/To | *Seg 7-Bet Off & On Ramp* |
| Jurisdiction | |
| Analysis Year | *No-Build 2020* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | |
|---|---|---|---|---|
| Volume, V | *5410* | veh/h | Peak-Hour Factor, PHF | *0.95* |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *3* |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* |

## Calculate Flow Adjustments

| | | | |
|---|---|---|---|
| $f_p$ | *1.00* | $E_R$ | *1.2* |
| $E_T$ | *1.5* | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.985* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *3* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *70.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *1927* | pc/h/ln |
| S | *63.9* | mph |
| D = $v_p$ / S | *30.2* | pc/mi/ln |
| LOS | *D* | |

## Design (N)

Design (N)

| | |
|---|---|
| Design LOS | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | pc/h/ln |
| S | mph |
| D = $v_p$ / S | pc/mi/ln |
| Required Number of Lanes, N | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |



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# RAMPS AND RAMP JUNCTIONS WORKSHEET

## General Information

| | | | |
|---|---|---|---|
| Analyst | | Freeway/Dir of Travel | I-95 SB |
| Agency or Company | AECOM | Junction | Seg 8-Merge from 10th St |
| Date Performed | | Jurisdiction | |
| Analysis Time Period | PM | Analysis Year | No-Build 2020 |

Project Description SW 10th Street SIMR

## Inputs

| Upstream Adj Ramp | | Freeway Number of Lanes, N | 3 | Downstream Adj Ramp | |
|---|---|---|---|---|---|
| ☑ Yes | ☐ On | Ramp Number of Lanes, N | 1 | ☐ Yes | ☐ On |
| ☐ No | ☑ Off | Acceleration Lane Length, $L_A$ | 1470 | ☑ No | ☐ Off |
| $L_{up}$ = | 2210 ft | Deceleration Lane Length $L_D$ | | $L_{down}$ = | ft |
| $V_u$ = | 1250 veh/h | Freeway Volume, $V_F$ | 5410 | $V_D$ = | veh/h |
| | | Ramp Volume, $V_R$ | 1220 | | |
| | | Freeway Free-Flow Speed, $S_{FF}$ | 70.0 | | |
| | | Ramp Free-Flow Speed, $S_{FR}$ | 50.0 | | |

## Conversion to pc/h Under Base Conditions

| (pc/h) | V (Veh/hr) | PHF | Terrain | %Truck | %Rv | $f_{HV}$ | $f_p$ | v = V/PHF x $f_{HV}$ x $f_p$ |
|---|---|---|---|---|---|---|---|---|
| Freeway | 5410 | 0.95 | Level | 3 | 0 | 0.985 | 1.00 | 5780 |
| Ramp | 1220 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 1339 |
| UpStream | 1250 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 1372 |
| DownStream | | | | | | | | |

### Merge Areas

#### Estimation of $v_{12}$

$V_{12} = V_F ( P_{FM} )$

$L_{EQ}$ = 2389.15 (Equation 13-6 or 13-7)

$P_{FM}$ = 0.607 using Equation (Exhibit 13-6)

$V_{12}$ = 3510 pc/h

$V_3$ or $V_{av34}$ 2270 pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☑ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☑ Yes ☐ No

If Yes,$V_{12a}$ = 3510 pc/h (Equation 13-16, 13-18, or 13-19)

#### Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_{FO}$ | 7119 | Exhibit 13-8 | | No |

#### Flow Entering Merge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{R12}$ | 4849 | Exhibit 13-8 | 4600:All | Yes |

#### Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

$D_R$ = 33.5 (pc/mi/ln)

LOS = D (Exhibit 13-2)

#### Speed Determination

$M_S$ = 0.672 (Exibit 13-11)

$S_R$= 51.2 mph (Exhibit 13-11)

$S_0$= 63.6 mph (Exhibit 13-11)

S = 54.6 mph (Exhibit 13-13)

### Diverge Areas

#### Estimation of $v_{12}$

$V_{12} = V_R + (V_F - V_R)P_{FD}$

$L_{EQ}$ = (Equation 13-12 or 13-13)

$P_{FD}$ = using Equation (Exhibit 13-7)

$V_{12}$ = pc/h

$V_3$ or $V_{av34}$ pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☐ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☐ No

If Yes,$V_{12a}$ = pc/h (Equation 13-16, 13-18, or 13-19)

#### Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_F$ | | Exhibit 13-8 | | |
| $V_{FO} = V_F - V_R$ | | Exhibit 13-8 | | |
| $V_R$ | | Exhibit 13-10 | | |

#### Flow Entering Diverge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{12}$ | | Exhibit 13-8 | | |

#### Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

$D_R$ = (pc/mi/ln)

LOS = (Exhibit 13-2)

#### Speed Determination

$D_s$ = (Exhibit 13-12)

$S_R$= mph (Exhibit 13-12)

$S_0$= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency or Company | *AECOM* |
| Date Performed | |
| Analysis Time Period | *PM* |

## Site Information

| | |
|---|---|
| Highway/Direction of Travel | *I-95 SB* |
| From/To | *Seg 9-Bet 10th & Exit to Exp* |
| Jurisdiction | |
| Analysis Year | *No-Build 2020* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | | |
|---|---|---|---|---|---|
| Volume, V | *6630* | veh/h | Peak-Hour Factor, PHF | *0.95* | |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *3* | |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* | |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* | |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* | |

## Calculate Flow Adjustments

| | | | |
|---|---|---|---|
| $f_p$ | *1.00* | $E_R$ | *1.2* |
| $E_T$ | *1.5* | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.985* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *3* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *70.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *2361* | pc/h/ln |
| S | *54.4* | mph |
| D = $v_p$ / S | *43.4* | pc/mi/ln |
| LOS | *E* | |

## Design (N)

Design (N)

| | |
|---|---|
| Design LOS | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | pc/h/ln |
| S | mph |
| D = $v_p$ / S | pc/mi/ln |
| Required Number of Lanes, N | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |

# RAMPS AND RAMP JUNCTIONS WORKSHEET

## General Information / Site Information

| | | | |
|---|---|---|---|
| Analyst | | Freeway/Dir of Travel | I-95 SB |
| Agency or Company | AECOM | Junction | Seg 10- Diverge to Express |
| Date Performed | | Jurisdiction | |
| Analysis Time Period | PM | Analysis Year | No-Build 2040 |

Project Description SW 10th Street SIMR

## Inputs

| Upstream Adj Ramp | | Freeway Number of Lanes, N | 3 | Downstream Adj Ramp | |
|---|---|---|---|---|---|
| ☑ Yes | ☑ On | Ramp Number of Lanes, N | 1 | ☐ Yes | ☐ On |
| ☐ No | ☐ Off | Acceleration Lane Length, $L_A$ | | ☑ No | ☐ Off |
| $L_{up}$ = | 6000 ft | Deceleration Lane Length $L_D$ | 300 | $L_{down}$ = | ft |
| $V_u$ = | 1220 veh/h | Freeway Volume, $V_F$ | 6630 | $V_D$ = | veh/h |
| | | Ramp Volume, $V_R$ | 720 | | |
| | | Freeway Free-Flow Speed, $S_{FF}$ | 70.0 | | |
| | | Ramp Free-Flow Speed, $S_{FR}$ | 45.0 | | |

## Conversion to pc/h Under Base Conditions

| (pc/h) | V (Veh/hr) | PHF | Terrain | %Truck | %Rv | $f_{HV}$ | $f_p$ | v = V/PHF x $f_{HV}$ x $f_p$ |
|---|---|---|---|---|---|---|---|---|
| Freeway | 6630 | 0.95 | Level | 3 | 0 | 0.985 | 1.00 | 7084 |
| Ramp | 720 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 790 |
| UpStream | 1220 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 1339 |
| DownStream | | | | | | | | |

**Merge Areas**

## Estimation of $v_{12}$

$V_{12} = V_F ( P_{FM} )$

$L_{EQ}$ = (Equation 13-6 or 13-7)

$P_{FM}$ = using Equation (Exhibit 13-6)

$V_{12}$ = pc/h

$V_3$ or $V_{av34}$ pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☐ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☐ No

If Yes,$V_{12a}$ = pc/h (Equation 13-16, 13-18, or 13-19)

## Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_{FO}$ | | Exhibit 13-8 | | |

## Flow Entering Merge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{R12}$ | | Exhibit 13-8 | | |

## Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

$D_R$ = (pc/mi/ln)

LOS = (Exhibit 13-2)

## Speed Determination

$M_S$ = (Exibit 13-11)

$S_R$= mph (Exhibit 13-11)

$S_0$= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

**Diverge Areas**

## Estimation of $v_{12}$

$V_{12} = V_R + (V_F - V_R)P_{FD}$

$L_{EQ}$ = 7700.18 (Equation 13-12 or 13-13)

$P_{FD}$ = 0.547 using Equation (Exhibit 13-7)

$V_{12}$ = 4230 pc/h

$V_3$ or $V_{av34}$ 2854 pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☑ Yes ☐ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☑ No

If Yes,$V_{12a}$ = 4384 pc/h (Equation 13-16, 13-18, or 13-19)

## Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_F$ | 7084 | Exhibit 13-8 | 7200 | No |
| $V_{FO} = V_F - V_R$ | 6294 | Exhibit 13-8 | 7200 | No |
| $V_R$ | 790 | Exhibit 13-10 | 2100 | No |

## Flow Entering Diverge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{12}$ | 4230 | Exhibit 13-8 | 4400:All | No |

## Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

$D_R$ = 41.1 (pc/mi/ln)

LOS = E (Exhibit 13-2)

## Speed Determination

$D_s$ = 0.369 (Exhibit 13-12)

$S_R$= 59.7 mph (Exhibit 13-12)

$S_0$= 71.0 mph (Exhibit 13-12)

S = 63.2 mph (Exhibit 13-13)

# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency or Company | *AECOM* |
| Date Performed | |
| Analysis Time Period | *PM* |

## Site Information

| | |
|---|---|
| Highway/Direction of Travel | *I-95 SB* |
| From/To | *Seg 11-Bet Off Exp Off Sample* |
| Jurisdiction | |
| Analysis Year | *No-Build 2020* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | | |
|---|---|---|---|---|---|
| Volume, V | *5910* | veh/h | Peak-Hour Factor, PHF | *0.95* | |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *3* | |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* | |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* | |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* | |

## Calculate Flow Adjustments

| | | | | |
|---|---|---|---|---|
| $f_p$ | *1.00* | | $E_R$ | *1.2* |
| $E_T$ | *1.5* | | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.985* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *3* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *70.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *2105* | pc/h/ln |
| S | *60.5* | mph |
| D = $v_p$ / S | *34.8* | pc/mi/ln |
| LOS | *D* | |

## Design (N)

Design (N)

| | |
|---|---|
| Design LOS | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | pc/h/ln |
| S | mph |
| D = $v_p$ / S | pc/mi/ln |
| Required Number of Lanes, N | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |

# RAMPS AND RAMP JUNCTIONS WORKSHEET

## General Information

| | | | |
|---|---|---|---|
| Analyst | | Freeway/Dir of Travel | I-95 SB |
| Agency or Company | AECOM | Junction | Seg 12- Diverge to Sample Rd |
| Date Performed | | Jurisdiction | |
| Analysis Time Period | PM | Analysis Year | No-Build 2020 |

Project Description SW 10th Street SIMR

## Site Information

## Inputs

Upstream Adj Ramp

☑ Yes ☐ On

☐ No ☑ Off

$L_{up}$ = 2000 ft

$V_u$ = 720 veh/h

| | |
|---|---|
| Freeway Number of Lanes, N | 3 |
| Ramp Number of Lanes, N | 1 |
| Acceleration Lane Length, $L_A$ | |
| Deceleration Lane Length $L_D$ | 250 |
| Freeway Volume, $V_F$ | 5910 |
| Ramp Volume, $V_R$ | 1110 |
| Freeway Free-Flow Speed, $S_{FF}$ | 70.0 |
| Ramp Free-Flow Speed, $S_{FR}$ | 45.0 |

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

$L_{down}$ = ft

$V_D$ = veh/h

## Conversion to pc/h Under Base Conditions

| (pc/h) | V (Veh/hr) | PHF | Terrain | %Truck | %Rv | $f_{HV}$ | $f_p$ | v = V/PHF x $f_{HV}$ x $f_p$ |
|---|---|---|---|---|---|---|---|---|
| Freeway | 5910 | 0.95 | Level | 3 | 0 | 0.985 | 1.00 | 6314 |
| Ramp | 1110 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 1219 |
| UpStream | 720 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 790 |
| DownStream | | | | | | | | |

**Merge Areas**

## Estimation of $v_{12}$

$V_{12} = V_F ( P_{FM} )$

$L_{EQ}$ = (Equation 13-6 or 13-7)

$P_{FM}$ = using Equation (Exhibit 13-6)

$V_{12}$ = pc/h

$V_3$ or $V_{av34}$ pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☐ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☐ No

If Yes, $V_{12a}$ = pc/h (Equation 13-16, 13-18, or 13-19)

## Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_{FO}$ | | Exhibit 13-8 | | |

## Flow Entering Merge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{R12}$ | | Exhibit 13-8 | | |

## Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

$D_R$ = (pc/mi/ln)

LOS = (Exhibit 13-2)

## Speed Determination

$M_S$ = (Exibit 13-11)

$S_R$= mph (Exhibit 13-11)

$S_0$= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

**Diverge Areas**

## Estimation of $v_{12}$

$V_{12} = V_R + (V_F - V_R)P_{FD}$

$L_{EQ}$ = (Equation 13-12 or 13-13)

$P_{FD}$ = 0.546 using Equation (Exhibit 13-7)

$V_{12}$ = 4001 pc/h

$V_3$ or $V_{av34}$ 2313 pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☑ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☑ No

If Yes, $V_{12a}$ = pc/h (Equation 13-16, 13-18, or 13-19)

## Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_F$ | 6314 | Exhibit 13-8 | 7200 | No |
| $V_{FO} = V_F - V_R$ | 5095 | Exhibit 13-8 | 7200 | No |
| $V_R$ | 1219 | Exhibit 13-10 | 2100 | No |

## Flow Entering Diverge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{12}$ | 4001 | Exhibit 13-8 | 4400:All | No |

## Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

$D_R$ = 38.1 (pc/mi/ln)

LOS = E (Exhibit 13-2)

## Speed Determination

$D_s$ = 0.408 (Exhibit 13-12)

$S_R$= 58.6 mph (Exhibit 13-12)

$S_0$= 72.4 mph (Exhibit 13-12)

S = 62.6 mph (Exhibit 13-13)

# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency or Company | *AECOM* |
| Date Performed | |
| Analysis Time Period | *PM* |

## Site Information

| | |
|---|---|
| Highway/Direction of Travel | *I-95 SB* |
| From/To | *Seg 13-Bet Off & On Ramps* |
| Jurisdiction | |
| Analysis Year | *No-Build 2020* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | |
|---|---|---|---|---|
| Volume, V | *4800* | veh/h | Peak-Hour Factor, PHF | *0.95* |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *3* |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* |

## Calculate Flow Adjustments

| | | | |
|---|---|---|---|
| $f_p$ | *1.00* | $E_R$ | *1.2* |
| $E_T$ | *1.5* | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.985* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *3* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *70.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *1709* | pc/h/ln |
| S | *67.0* | mph |
| D = $v_p$ / S | *25.5* | pc/mi/ln |
| LOS | *C* | |

## Design (N)

Design (N)

| | | |
|---|---|---|
| Design LOS | | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | | pc/h/ln |
| S | | mph |
| D = $v_p$ / S | | pc/mi/ln |
| Required Number of Lanes, N | | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |



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# FREEWAY WEAVING WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency/Company | AECOM |
| Date Performed | |
| Analysis Time Period | PM |

## Site Information

| | |
|---|---|
| Freeway/Dir of Travel | I-95 SB |
| Weaving Segment Location | Seg 14- Bet Sample & Copans |
| Analysis Year | No-Build 2020 |

Project Description SW 10th Street SIMR

## Inputs

| | | | |
|---|---|---|---|
| Weaving configuration | One-Sided | Segment type | Freeway |
| Weaving number of lanes, N | 4 | Freeway minimum speed, $S_{MIN}$ | 15 |
| Weaving segment length, $L_S$ | 1650ft | Freeway maximum capacity, $C_{IFL}$ | 2400 |
| Freeway free-flow speed, FFS | 70 mph | Terrain type | Level |

## Conversions to pc/h Under Base Conditions

| | V (veh/h) | PHF | Truck (%) | RV (%) | $E_T$ | $E_R$ | $f_{HV}$ | $f_p$ | v (pc/h) |
|---|---|---|---|---|---|---|---|---|---|
| $V_{FF}$ | 4170 | 0.95 | 3 | 0 | 1.5 | 1.2 | 0.985 | 1.00 | 4455 |
| $V_{RF}$ | 1420 | 0.92 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 1559 |
| $V_{FR}$ | 630 | 0.92 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 692 |
| $V_{RR}$ | 0 | 0.95 | 0 | 0 | 1.5 | 1.2 | 1.000 | 1.00 | 0 |
| $V_{NW}$ | 4455 | | | | | | | V = | 6706 |
| $V_W$ | 2251 | | | | | | | | |
| VR | 0.336 | | | | | | | | |

## Configuration Characteristics

| | | | |
|---|---|---|---|
| Minimum maneuver lanes, $N_{WL}$ | 2 lc | Minimum weaving lane changes, $LC_{MIN}$ | 2251 lc/h |
| Interchange density, ID | 0.7 int/mi | Weaving lane changes, $LC_W$ | 2602 lc/h |
| Minimum RF lane changes, $LC_{RF}$ | 1 lc/pc | Non-weaving lane changes, $LC_{NW}$ | 1042 lc/h |
| Minimum FR lane changes, $LC_{FR}$ | 1 lc/pc | Total lane changes, $LC_{ALL}$ | 3644 lc/h |
| Minimum RR lane changes, $LC_{RR}$ | lc/pc | Non-weaving vehicle index, $I_{NW}$ | 515 |

## Weaving Segment Speed, Density, Level of Service, and Capacity

| | | | |
|---|---|---|---|
| Weaving segment flow rate, v | 6618 veh/h | Weaving intensity factor, W | 0.422 |
| Weaving segment capacity, $c_w$ | 7044 veh/h | Weaving segment speed, S | 48.1 mph |
| Weaving segment v/c ratio | 0.939 | Average weaving speed, $S_W$ | 53.7 mph |
| Weaving segment density, D | 34.8 pc/mi/ln | Average non-weaving speed, $S_{NW}$ | 45.7 mph |
| Level of Service, LOS | D | Maximum weaving length, $L_{MAX}$ | 5970 ft |

## Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

# FREEWAY WEAVING WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency/Company | AECOM |
| Date Performed | |
| Analysis Time Period | AM |

## Site Information

| | |
|---|---|
| Freeway/Dir of Travel | I-95 NB |
| Weaving Segment Location | Seg 1-Bet Copans & Sample |
| Analysis Year | No-Build 2040 |

Project Description SW 10th Street SIMR

## Inputs

| | | | |
|---|---|---|---|
| Weaving configuration | One-Sided | Segment type | Freeway |
| Weaving number of lanes, N | 4 | Freeway minimum speed, $S_{MIN}$ | 15 |
| Weaving segment length, $L_S$ | 1820ft | Freeway maximum capacity, $C_{IFL}$ | 2400 |
| Freeway free-flow speed, FFS | 70 mph | Terrain type | Level |

## Conversions to pc/h Under Base Conditions

| | V (veh/h) | PHF | Truck (%) | RV (%) | $E_T$ | $E_R$ | $f_{HV}$ | $f_p$ | v (pc/h) |
|---|---|---|---|---|---|---|---|---|---|
| $V_{FF}$ | 4755 | 0.95 | 3 | 0 | 1.5 | 1.2 | 0.985 | 1.00 | 5080 |
| $V_{RF}$ | 405 | 0.92 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 445 |
| $V_{FR}$ | 970 | 0.92 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 1065 |
| $V_{RR}$ | 0 | 0.95 | 0 | 0 | 1.5 | 1.2 | 1.000 | 1.00 | 0 |
| $V_{NW}$ | 5080 | | | | | | | V = | 6590 |
| $V_W$ | 1510 | | | | | | | | |
| VR | 0.229 | | | | | | | | |

## Configuration Characteristics

| | | | |
|---|---|---|---|
| Minimum maneuver lanes, $N_{WL}$ | 2 lc | Minimum weaving lane changes, $LC_{MIN}$ | 1510 lc/h |
| Interchange density, ID | 0.7 int/mi | Weaving lane changes, $LC_W$ | 1882 lc/h |
| Minimum RF lane changes, $LC_{RF}$ | 1 lc/pc | Non-weaving lane changes, $LC_{NW}$ | 1263 lc/h |
| Minimum FR lane changes, $LC_{FR}$ | 1 lc/pc | Total lane changes, $LC_{ALL}$ | 3145 lc/h |
| Minimum RR lane changes, $LC_{RR}$ | lc/pc | Non-weaving vehicle index, $I_{NW}$ | 647 |

## Weaving Segment Speed, Density, Level of Service, and Capacity

| | | | |
|---|---|---|---|
| Weaving segment flow rate, v | 6500 veh/h | Weaving intensity factor, W | 0.348 |
| Weaving segment capacity, $c_w$ | 8548 veh/h | Weaving segment speed, S | 52.2 mph |
| Weaving segment v/c ratio | 0.760 | Average weaving speed, $S_W$ | 55.8 mph |
| Weaving segment density, D | 31.6 pc/mi/ln | Average non-weaving speed, $S_{NW}$ | 51.2 mph |
| Level of Service, LOS | D | Maximum weaving length, $L_{MAX}$ | 4836 ft |

## Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

# BASIC FREEWAY SEGMENTS WORKSHEET

| General Information | | Site Information | |
|---|---|---|---|
| Analyst | | Highway/Direction of Travel | *I-95 NB* |
| Agency or Company | *AECOM* | From/To | *Seg 2-Bet Off & On from Sample* |
| Date Performed | | Jurisdiction | |
| Analysis Time Period | *AM* | Analysis Year | *No-Build 2040* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | |
|---|---|---|---|---|
| Volume, V | *5160* | veh/h | Peak-Hour Factor, PHF | *0.95* |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *3* |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* |

## Calculate Flow Adjustments

| | | | |
|---|---|---|---|
| $f_p$ | *1.00* | $E_R$ | *1.2* |
| $E_T$ | *1.5* | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.985* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *3* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *70.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *1838* | pc/h/ln |
| S | *65.3* | mph |
| D = $v_p$ / S | *28.2* | pc/mi/ln |
| LOS | *D* | |

## Design (N)

Design (N)

| | |
|---|---|
| Design LOS | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | pc/h/ln |
| S | mph |
| D = $v_p$ / S | pc/mi/ln |
| Required Number of Lanes, N | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |

# RAMPS AND RAMP JUNCTIONS WORKSHEET

## General Information

| | | | |
|---|---|---|---|
| Analyst | | Freeway/Dir of Travel | I-95 NB |
| Agency or Company | AECOM | Junction | Seg 3-On Ramp from Sample |
| Date Performed | | Jurisdiction | |
| Analysis Time Period | AM | Analysis Year | No-Build 2040 |

Project Description SW 10th Street SIMR

## Site Information

## Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

$L_{up}$ = ft

$V_u$ = veh/h

| | |
|---|---|
| Freeway Number of Lanes, N | 3 |
| Ramp Number of Lanes, N | 1 |
| Acceleration Lane Length, $L_A$ | 500 |
| Deceleration Lane Length $L_D$ | |
| Freeway Volume, $V_F$ | 5160 |
| Ramp Volume, $V_R$ | 1460 |
| Freeway Free-Flow Speed, $S_{FF}$ | 70.0 |
| Ramp Free-Flow Speed, $S_{FR}$ | 50.0 |

Downstream Adj Ramp

☑ Yes ☑ On

☐ No ☐ Off

$L_{down}$ = 1950 ft

$V_D$ = 920 veh/h

## Conversion to pc/h Under Base Conditions

| (pc/h) | V (Veh/hr) | PHF | Terrain | %Truck | %Rv | $f_{HV}$ | $f_p$ | v = V/PHF x $f_{HV}$ x $f_p$ |
|---|---|---|---|---|---|---|---|---|
| Freeway | 5160 | 0.95 | Level | 3 | 0 | 0.985 | 1.00 | 5513 |
| Ramp | 1460 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 1603 |
| UpStream | | | | | | | | |
| DownStream | 920 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 1010 |

**Merge Areas**

## Estimation of $v_{12}$

$V_{12} = V_F ( P_{FM} )$

$L_{EQ}$ = (Equation 13-6 or 13-7)

$P_{FM}$ = 0.591 using Equation (Exhibit 13-6)

$V_{12}$ = 3261 pc/h

$V_3$ or $V_{av34}$ 2252 pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☑ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☑ Yes ☐ No

If Yes,$V_{12a}$ = 3261 pc/h (Equation 13-16, 13-18, or 13-19)

## Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_{FO}$ | 7116 | Exhibit 13-8 | | No |

## Flow Entering Merge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{R12}$ | 4864 | Exhibit 13-8 | 4600:All | Yes |

## Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

$D_R$ = 39.5 (pc/mi/ln)

LOS = E (Exhibit 13-2)

## Speed Determination

$M_S$ = 0.776 (Exibit 13-11)

$S_R$= 48.3 mph (Exhibit 13-11)

$S_0$= 63.7 mph (Exhibit 13-11)

S = 52.3 mph (Exhibit 13-13)

**Diverge Areas**

## Estimation of $v_{12}$

$V_{12} = V_R + (V_F - V_R)P_{FD}$

$L_{EQ}$ = (Equation 13-12 or 13-13)

$P_{FD}$ = using Equation (Exhibit 13-7)

$V_{12}$ = pc/h

$V_3$ or $V_{av34}$ pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☐ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☐ No

If Yes,$V_{12a}$ = pc/h (Equation 13-16, 13-18, or 13-19)

## Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_F$ | | Exhibit 13-8 | | |
| $V_{FO} = V_F - V_R$ | | Exhibit 13-8 | | |
| $V_R$ | | Exhibit 13-10 | | |

## Flow Entering Diverge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{12}$ | | Exhibit 13-8 | | |

## Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

$D_R$ = (pc/mi/ln)

LOS = (Exhibit 13-2)

## Speed Determination

$D_s$ = (Exhibit 13-12)

$S_R$= mph (Exhibit 13-12)

$S_0$= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

# BASIC FREEWAY SEGMENTS WORKSHEET

| General Information | | Site Information | |
|---|---|---|---|
| Analyst | | Highway/Direction of Travel | *I-95 NB* |
| Agency or Company | *AECOM* | From/To | *Seg 4-Bet On from Sample & Exp* |
| Date Performed | | Jurisdiction | |
| Analysis Time Period | *AM* | Analysis Year | *No-Build 2040* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | |
|---|---|---|---|---|
| Volume, V | *6620* | veh/h | Peak-Hour Factor, PHF | *0.95* |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *3* |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* |

## Calculate Flow Adjustments

| | | | |
|---|---|---|---|
| $f_p$ | *1.00* | $E_R$ | *1.2* |
| $E_T$ | *1.5* | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.985* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *3* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *70.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *2358* | pc/h/ln |
| S | *54.4* | mph |
| D = $v_p$ / S | *43.3* | pc/mi/ln |
| LOS | *E* | |

## Design (N)

Design (N)

| | |
|---|---|
| Design LOS | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | pc/h/ln |
| S | mph |
| D = $v_p$ / S | pc/mi/ln |
| Required Number of Lanes, N | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |

# RAMPS AND RAMP JUNCTIONS WORKSHEET

## General Information

| | | | |
|---|---|---|---|
| Analyst | | Freeway/Dir of Travel | I-95 NB |
| Agency or Company | AECOM | Junction | Seg 5-On from Exp |
| Date Performed | | Jurisdiction | |
| Analysis Time Period | AM | Analysis Year | No-Build 2040 |

Project Description SW 10th Street SIMR

## Inputs

| Upstream Adj Ramp | | Freeway Number of Lanes, N | 3 | Downstream Adj Ramp | |
|---|---|---|---|---|---|
| ☐ Yes | ☐ On | Ramp Number of Lanes, N | 1 | ☑ Yes | ☐ On |
| ☑ No | ☐ Off | Acceleration Lane Length, $L_A$ | 600 | ☐ No | ☑ Off |
| $L_{up}$ = | ft | Deceleration Lane Length $L_D$ | | $L_{down}$ = | 5545 ft |
| $V_u$ = | veh/h | Freeway Volume, $V_F$ | 6620 | $V_D$ = | 1320 veh/h |
| | | Ramp Volume, $V_R$ | 920 | | |
| | | Freeway Free-Flow Speed, $S_{FF}$ | 70.0 | | |
| | | Ramp Free-Flow Speed, $S_{FR}$ | 50.0 | | |

## Conversion to pc/h Under Base Conditions

| (pc/h) | V (Veh/hr) | PHF | Terrain | %Truck | %Rv | $f_{HV}$ | $f_p$ | v = V/PHF x $f_{HV}$ x $f_p$ |
|---|---|---|---|---|---|---|---|---|
| Freeway | 6620 | 0.95 | Level | 3 | 0 | 0.985 | 1.00 | 7073 |
| Ramp | 920 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 1010 |
| UpStream | | | | | | | | |
| DownStream | 1320 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 1449 |

**Merge Areas**

## Estimation of $v_{12}$

$V_{12} = V_F ( P_{FM} )$

$L_{EQ}$ = 8337.17 (Equation 13-6 or 13-7)

$P_{FM}$ = 0.617 using Equation (Exhibit 13-6)

$V_{12}$ = 4367 pc/h

$V_3$ or $V_{av34}$ 2706 pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☑ Yes ☐ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☑ Yes ☐ No

If Yes,$V_{12a}$ = 4373 pc/h (Equation 13-16, 13-18, or 13-19)

## Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_{FO}$ | 8083 | Exhibit 13-8 | | Yes |

## Flow Entering Merge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{R12}$ | 5907 | Exhibit 13-8 | 4600:All | Yes |

## Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

$D_R$ = 47.3 (pc/mi/ln)

LOS = F (Exhibit 13-2)

## Speed Determination

$M_S$ = 1.695 (Exibit 13-11)

$S_R$= 22.5 mph (Exhibit 13-11)

$S_0$= 64.0 mph (Exhibit 13-11)

S = 27.3 mph (Exhibit 13-13)

**Diverge Areas**

## Estimation of $v_{12}$

$V_{12} = V_R + (V_F - V_R)P_{FD}$

$L_{EQ}$ = (Equation 13-12 or 13-13)

$P_{FD}$ = using Equation (Exhibit 13-7)

$V_{12}$ = pc/h

$V_3$ or $V_{av34}$ pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☐ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☐ No

If Yes,$V_{12a}$ = pc/h (Equation 13-16, 13-18, or 13-19)

## Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_F$ | | Exhibit 13-8 | | |
| $V_{FO} = V_F - V_R$ | | Exhibit 13-8 | | |
| $V_R$ | | Exhibit 13-10 | | |

## Flow Entering Diverge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{12}$ | | Exhibit 13-8 | | |

## Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

$D_R$ = (pc/mi/ln)

LOS = (Exhibit 13-2)

## Speed Determination

$D_s$ = (Exhibit 13-12)

$S_R$= mph (Exhibit 13-12)

$S_0$= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

# BASIC FREEWAY SEGMENTS WORKSHEET

| General Information | | Site Information | |
|---|---|---|---|
| Analyst | | Highway/Direction of Travel | *I-95 NB* |
| Agency or Company | *AECOM* | From/To | *Seg 6-Bet Exp On & Off to 10th* |
| Date Performed | | Jurisdiction | |
| Analysis Time Period | *AM* | Analysis Year | *No-Build 2040* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | |
|---|---|---|---|---|
| Volume, V | *7540* | veh/h | Peak-Hour Factor, PHF | *0.95* |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *3* |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* |

## Calculate Flow Adjustments

| | | | |
|---|---|---|---|
| $f_p$ | *1.00* | $E_R$ | *1.2* |
| $E_T$ | *1.5* | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.985* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *3* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *70.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *2685* | pc/h/ln |
| S | *44.4* | mph |
| D = $v_p$ / S | *60.4* | pc/mi/ln |
| LOS | *F* | |

## Design (N)

Design (N)

| | | |
|---|---|---|
| Design LOS | | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | | pc/h/ln |
| S | | mph |
| D = $v_p$ / S | | pc/mi/ln |
| Required Number of Lanes, N | | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |

# RAMPS AND RAMP JUNCTIONS WORKSHEET

## General Information

| | | | |
|---|---|---|---|
| Analyst | | Freeway/Dir of Travel | I-95 NB |
| Agency or Company | AECOM | Junction | Seg 7-Off Ramp to 10th St |
| Date Performed | | Jurisdiction | |
| Analysis Time Period | AM | Analysis Year | No-Build 2040 |

Project Description SW 10th Street SIMR

## Site Information

## Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

$L_{up}$ = ft

$V_u$ = veh/h

| | |
|---|---|
| Freeway Number of Lanes, N | 3 |
| Ramp Number of Lanes, N | 1 |
| Acceleration Lane Length, $L_A$ | |
| Deceleration Lane Length $L_D$ | 250 |
| Freeway Volume, $V_F$ | 7540 |
| Ramp Volume, $V_R$ | 1320 |
| Freeway Free-Flow Speed, $S_{FF}$ | 70.0 |
| Ramp Free-Flow Speed, $S_{FR}$ | 45.0 |

Downstream Adj Ramp

☑ Yes ☑ On

☐ No ☐ Off

$L_{down}$ = 1370 ft

$V_D$ = 1660 veh/h

## Conversion to pc/h Under Base Conditions

| (pc/h) | V (Veh/hr) | PHF | Terrain | %Truck | %Rv | $f_{HV}$ | $f_p$ | v = V/PHF x $f_{HV}$ x $f_p$ |
|---|---|---|---|---|---|---|---|---|
| Freeway | 7540 | 0.95 | Level | 3 | 0 | 0.985 | 1.00 | 8056 |
| Ramp | 1320 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 1449 |
| UpStream | | | | | | | | |
| DownStream | 1660 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 1822 |

**Merge Areas**

## Estimation of $v_{12}$

$V_{12} = V_F ( P_{FM} )$

$L_{EQ}$ = (Equation 13-6 or 13-7)

$P_{FM}$ = using Equation (Exhibit 13-6)

$V_{12}$ = pc/h

$V_3$ or $V_{av34}$ pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☐ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☐ No

If Yes,$V_{12a}$ = pc/h (Equation 13-16, 13-18, or 13-19)

## Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_{FO}$ | | Exhibit 13-8 | | |

## Flow Entering Merge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{R12}$ | | Exhibit 13-8 | | |

## Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

$D_R$ = (pc/mi/ln)

LOS = (Exhibit 13-2)

## Speed Determination

$M_S$ = (Exibit 13-11)

$S_R$= mph (Exhibit 13-11)

$S_0$= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

**Diverge Areas**

## Estimation of $v_{12}$

$V_{12} = V_R + (V_F - V_R)P_{FD}$

$L_{EQ}$ = (Equation 13-12 or 13-13)

$P_{FD}$ = 0.492 using Equation (Exhibit 13-7)

$V_{12}$ = 4699 pc/h

$V_3$ or $V_{av34}$ 3357 pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☑ Yes ☐ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☑ No

If Yes,$V_{12a}$ = 5356 pc/h (Equation 13-16, 13-18, or 13-19)

## Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_F$ | 8056 | Exhibit 13-8 | 7200 | Yes |
| $V_{FO} = V_F - V_R$ | 6607 | Exhibit 13-8 | 7200 | No |
| $V_R$ | 1449 | Exhibit 13-10 | 2100 | No |

## Flow Entering Diverge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{12}$ | 4699 | Exhibit 13-8 | 4400:All | Yes |

## Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

$D_R$ = 48.1 (pc/mi/ln)

LOS = F (Exhibit 13-2)

## Speed Determination

$D_s$ = 0.428 (Exhibit 13-12)

$S_R$= 58.0 mph (Exhibit 13-12)

$S_0$= 70.2 mph (Exhibit 13-12)

S = 61.6 mph (Exhibit 13-13)

# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency or Company | *AECOM* |
| Date Performed | |
| Analysis Time Period | *AM* |

## Site Information

| | |
|---|---|
| Highway/Direction of Travel | *I-95 NB* |
| From/To | *Seg 8-Bet Off & On 10th St* |
| Jurisdiction | |
| Analysis Year | *No-Build 2040* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | | |
|---|---|---|---|---|---|
| Volume, V | *6220* | veh/h | Peak-Hour Factor, PHF | *0.95* | |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *3* | |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* | |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* | |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* | |

## Calculate Flow Adjustments

| | | | |
|---|---|---|---|
| $f_p$ | *1.00* | $E_R$ | *1.2* |
| $E_T$ | *1.5* | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.985* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *3* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *70.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *2215* | pc/h/ln |
| S | *58.0* | mph |
| D = $v_p$ / S | *38.2* | pc/mi/ln |
| LOS | *E* | |

## Design (N)

Design (N)

| | |
|---|---|
| Design LOS | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | pc/h/ln |
| S | mph |
| D = $v_p$ / S | pc/mi/ln |
| Required Number of Lanes, N | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |

# RAMPS AND RAMP JUNCTIONS WORKSHEET

## General Information / Site Information

| | | | |
|---|---|---|---|
| Analyst | | Freeway/Dir of Travel | I-95 NB |
| Agency or Company | AECOM | Junction | Seg -On Ramp 10th St EB & WB |
| Date Performed | | Jurisdiction | |
| Analysis Time Period | AM | Analysis Year | No-Build 2040 |

Project Description SW 10th Street SIMR

## Inputs

| Upstream Adj Ramp | | Freeway Number of Lanes, N | 3 | Downstream Adj Ramp | |
|---|---|---|---|---|---|
| ☑ Yes | ☐ On | Ramp Number of Lanes, N | 1 | ☐ Yes | ☐ On |
| ☐ No | ☑ Off | Acceleration Lane Length, $L_A$ | 1345 | ☑ No | ☐ Off |
| $L_{up}$ = | 1370 ft | Deceleration Lane Length $L_D$ | | $L_{down}$ = | ft |
| $V_u$ = | 1320 veh/h | Freeway Volume, $V_F$ | 6220 | $V_D$ = | veh/h |
| | | Ramp Volume, $V_R$ | 1660 | | |
| | | Freeway Free-Flow Speed, $S_{FF}$ | 70.0 | | |
| | | Ramp Free-Flow Speed, $S_{FR}$ | 50.0 | | |

## Conversion to pc/h Under Base Conditions

| (pc/h) | V (Veh/hr) | PHF | Terrain | %Truck | %Rv | $f_{HV}$ | $f_p$ | v = V/PHF x $f_{HV}$ x $f_p$ |
|---|---|---|---|---|---|---|---|---|
| Freeway | 6220 | 0.95 | Level | 3 | 0 | 0.985 | 1.00 | 6646 |
| Ramp | 1660 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 1822 |
| UpStream | 1320 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 1449 |
| DownStream | | | | | | | | |

### Merge Areas

#### Estimation of $v_{12}$

$V_{12} = V_F ( P_{FM} )$

$L_{EQ}$ = 2622.33 (Equation 13-6 or 13-7)

$P_{FM}$ = 0.536 using Equation (Exhibit 13-6)

$V_{12}$ = 3563 pc/h

$V_3$ or $V_{av34}$ 3083 pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☑ Yes ☐ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☑ Yes ☐ No

If Yes,$V_{12a}$ = 3946 pc/h (Equation 13-16, 13-18, or 13-19)

#### Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_{FO}$ | 8468 | Exhibit 13-8 | | Yes |

#### Flow Entering Merge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{R12}$ | 5768 | Exhibit 13-8 | 4600:All | Yes |

#### Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

$D_R$ = 41.2 (pc/mi/ln)

LOS = F (Exhibit 13-2)

#### Speed Determination

$M_S$ = 1.434 (Exibit 13-11)

$S_R$= 29.8 mph (Exhibit 13-11)

$S_0$= 61.1 mph (Exhibit 13-11)

S = 35.7 mph (Exhibit 13-13)

### Diverge Areas

#### Estimation of $v_{12}$

$V_{12} = V_R + (V_F - V_R)P_{FD}$

$L_{EQ}$ = (Equation 13-12 or 13-13)

$P_{FD}$ = using Equation (Exhibit 13-7)

$V_{12}$ = pc/h

$V_3$ or $V_{av34}$ pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☐ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☐ No

If Yes,$V_{12a}$ = pc/h (Equation 13-16, 13-18, or 13-19)

#### Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_F$ | | Exhibit 13-8 | | |
| $V_{FO} = V_F - V_R$ | | Exhibit 13-8 | | |
| $V_R$ | | Exhibit 13-10 | | |

#### Flow Entering Diverge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{12}$ | | Exhibit 13-8 | | |

#### Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

$D_R$ = (pc/mi/ln)

LOS = (Exhibit 13-2)

#### Speed Determination

$D_s$ = (Exhibit 13-12)

$S_R$= mph (Exhibit 13-12)

$S_0$= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency or Company | *AECOM* |
| Date Performed | |
| Analysis Time Period | *AM* |

## Site Information

| | |
|---|---|
| Highway/Direction of Travel | *I-95 NB* |
| From/To | *Seg 10-Bet 10th St & Hillsboro* |
| Jurisdiction | |
| Analysis Year | *No-Build 2040* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | |
|---|---|---|---|---|
| Volume, V | *7880* | veh/h | Peak-Hour Factor, PHF | *0.95* |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *3* |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* |

## Calculate Flow Adjustments

| | | | |
|---|---|---|---|
| $f_p$ | *1.00* | $E_R$ | *1.2* |
| $E_T$ | *1.5* | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.985* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *3* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *70.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *2806* | pc/h/ln |
| S | *40.1* | mph |
| D = $v_p$ / S | *70.0* | pc/mi/ln |
| LOS | *F* | |

## Design (N)

Design (N)

| | | |
|---|---|---|
| Design LOS | | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | | pc/h/ln |
| S | | mph |
| D = $v_p$ / S | | pc/mi/ln |
| Required Number of Lanes, N | | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |

# RAMPS AND RAMP JUNCTIONS WORKSHEET

## General Information / Site Information

| | | | |
|---|---|---|---|
| Analyst | | Freeway/Dir of Travel | I-95 NB |
| Agency or Company | AECOM | Junction | Seg 11-Off Ramp Hillsboro EB |
| Date Performed | | Jurisdiction | |
| Analysis Time Period | AM | Analysis Year | No-Build 2040 |

Project Description SW 10th Street SIMR

## Inputs

| Upstream Adj Ramp | | Freeway Number of Lanes, N | 3 | Downstream Adj Ramp | |
|---|---|---|---|---|---|
| ☑ Yes | ☑ On | Ramp Number of Lanes, N | 1 | ☐ Yes | ☐ On |
| ☐ No | ☐ Off | Acceleration Lane Length, $L_A$ | | ☑ No | ☐ Off |
| $L_{up}$ = | 3085 ft | Deceleration Lane Length $L_D$ | 220 | $L_{down}$ = | ft |
| $V_u$ = | 1660 veh/h | Freeway Volume, $V_F$ | 7880 | $V_D$ = | veh/h |
| | | Ramp Volume, $V_R$ | 800 | | |
| | | Freeway Free-Flow Speed, $S_{FF}$ | 70.0 | | |
| | | Ramp Free-Flow Speed, $S_{FR}$ | 45.0 | | |

## Conversion to pc/h Under Base Conditions

| (pc/h) | V (Veh/hr) | PHF | Terrain | %Truck | %Rv | $f_{HV}$ | $f_p$ | $v = V/PHF \times f_{HV} \times f_p$ |
|---|---|---|---|---|---|---|---|---|
| Freeway | 7880 | 0.95 | Level | 3 | 0 | 0.985 | 1.00 | 8419 |
| Ramp | 800 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 878 |
| UpStream | 1660 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 1822 |
| DownStream | | | | | | | | |

**Merge Areas**

## Estimation of $v_{12}$

$V_{12} = V_F ( P_{FM} )$

$L_{EQ}$ = (Equation 13-6 or 13-7)

$P_{FM}$ = using Equation (Exhibit 13-6)

$V_{12}$ = pc/h

$V_3$ or $V_{av34}$ pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☐ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☐ No

If Yes, $V_{12a}$ = pc/h (Equation 13-16, 13-18, or 13-19)

## Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_{FO}$ | | Exhibit 13-8 | | |

## Flow Entering Merge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{R12}$ | | Exhibit 13-8 | | |

## Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

$D_R$ = (pc/mi/ln)

LOS = (Exhibit 13-2)

## Speed Determination

$M_S$ = (Exibit 13-11)

$S_R$ = mph (Exhibit 13-11)

$S_0$ = mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

**Diverge Areas**

## Estimation of $v_{12}$

$V_{12} = V_R + (V_F - V_R)P_{FD}$

$L_{EQ}$ = 9206.25 (Equation 13-12 or 13-13)

$P_{FD}$ = 0.509 using Equation (Exhibit 13-7)

$V_{12}$ = 4717 pc/h

$V_3$ or $V_{av34}$ 3702 pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☑ Yes ☐ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☑ Yes ☐ No

If Yes, $V_{12a}$ = 5719 pc/h (Equation 13-16, 13-18, or 13-19)

## Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_F$ | 8419 | Exhibit 13-8 | 7200 | Yes |
| $V_{FO} = V_F - V_R$ | 7541 | Exhibit 13-8 | 7200 | Yes |
| $V_R$ | 878 | Exhibit 13-10 | 2100 | No |

## Flow Entering Diverge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{12}$ | 4717 | Exhibit 13-8 | 4400:All | Yes |

## Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

$D_R$ = 51.5 (pc/mi/ln)

LOS = F (Exhibit 13-2)

## Speed Determination

$D_s$ = 0.377 (Exhibit 13-12)

$S_R$ = 59.4 mph (Exhibit 13-12)

$S_0$ = 70.2 mph (Exhibit 13-12)

S = 62.5 mph (Exhibit 13-13)

# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency or Company | *AECOM* |
| Date Performed | |
| Analysis Time Period | *AM* |

## Site Information

| | |
|---|---|
| Highway/Direction of Travel | *I-95 NB* |
| From/To | *Seg 12-Bet Off & On Hillsboro* |
| Jurisdiction | |
| Analysis Year | *No-Build 2040* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | | |
|---|---|---|---|---|---|
| Volume, V | *7080* | veh/h | Peak-Hour Factor, PHF | *0.95* | |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *3* | |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* | |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* | |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* | |

## Calculate Flow Adjustments

| | | | |
|---|---|---|---|
| $f_p$ | *1.00* | $E_R$ | *1.2* |
| $E_T$ | *1.5* | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.985* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *3* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *70.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *2521* | pc/h/ln |
| S | *49.8* | mph |
| D = $v_p$ / S | *50.7* | pc/mi/ln |
| LOS | *F* | |

## Design (N)

Design (N)

| | |
|---|---|
| Design LOS | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | pc/h/ln |
| S | mph |
| D = $v_p$ / S | pc/mi/ln |
| Required Number of Lanes, N | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |

# FREEWAY WEAVING WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency/Company | AECOM |
| Date Performed | |
| Analysis Time Period | AM |

## Site Information

| | |
|---|---|
| Freeway/Dir of Travel | I-95 NB |
| Weaving Segment Location | Seg 13-Bet On & Off Hillsboro |
| Analysis Year | No-Build 2040 |

Project Description SW 10th Street SIMR

## Inputs

| | | | |
|---|---|---|---|
| Weaving configuration | One-Sided | Segment type | Freeway |
| Weaving number of lanes, N | 4 | Freeway minimum speed, $S_{MIN}$ | 15 |
| Weaving segment length, $L_S$ | 790ft | Freeway maximum capacity, $C_{IFL}$ | 2400 |
| Freeway free-flow speed, FFS | 70 mph | Terrain type | Level |

## Conversions to pc/h Under Base Conditions

| | V (veh/h) | PHF | Truck (%) | RV (%) | $E_T$ | $E_R$ | $f_{HV}$ | $f_p$ | v (pc/h) |
|---|---|---|---|---|---|---|---|---|---|
| $V_{FF}$ | 6430 | 0.95 | 3 | 0 | 1.5 | 1.2 | 0.985 | 1.00 | 6870 |
| $V_{RF}$ | 660 | 0.92 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 725 |
| $V_{FR}$ | 650 | 0.92 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 714 |
| $V_{RR}$ | 0 | 0.95 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 0 |
| $V_{NW}$ | 6870 | | | | | | | V = | 8309 |
| $V_W$ | 1439 | | | | | | | | |
| VR | 0.173 | | | | | | | | |

## Configuration Characteristics

| | | | |
|---|---|---|---|
| Minimum maneuver lanes, $N_{WL}$ | 2 lc | Minimum weaving lane changes, $LC_{MIN}$ | 1439 lc/h |
| Interchange density, ID | 0.7 int/mi | Weaving lane changes, $LC_W$ | 1650 lc/h |
| Minimum RF lane changes, $LC_{RF}$ | 1 lc/pc | Non-weaving lane changes, $LC_{NW}$ | 1073 lc/h |
| Minimum FR lane changes, $LC_{FR}$ | 1 lc/pc | Total lane changes, $LC_{ALL}$ | 2723 lc/h |
| Minimum RR lane changes, $LC_{RR}$ | lc/pc | Non-weaving vehicle index, $I_{NW}$ | 380 |

## Weaving Segment Speed, Density, Level of Service, and Capacity

| | | | |
|---|---|---|---|
| Weaving segment flow rate, v | 8193 veh/h | Weaving intensity factor, W | 0.600 |
| Weaving segment capacity, $c_w$ | 8410 veh/h | Weaving segment speed, S | 49.6 mph |
| Weaving segment v/c ratio | 0.974 | Average weaving speed, $S_W$ | 49.4 mph |
| Weaving segment density, D | 41.9 pc/mi/ln | Average non-weaving speed, $S_{NW}$ | 49.7 mph |
| Level of Service, LOS | E | Maximum weaving length, $L_{MAX}$ | 4264 ft |

## Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

# BASIC FREEWAY SEGMENTS WORKSHEET

| General Information | | Site Information | |
|---|---|---|---|
| Analyst | | Highway/Direction of Travel | *I-95 NB* |
| Agency or Company | *AECOM* | From/To | *Seg 14-Bet Off & On Hillsboro* |
| Date Performed | | Jurisdiction | |
| Analysis Time Period | *AM* | Analysis Year | *No-Build 2040* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | |
|---|---|---|---|---|
| Volume, V | *7090* | veh/h | Peak-Hour Factor, PHF | *0.95* |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *3* |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* |
| DDHV = AADT x K x D | | veh/h | Grade % Length<br>Up/Down % | *mi* |

## Calculate Flow Adjustments

| | | | |
|---|---|---|---|
| $f_p$ | *1.00* | $E_R$ | *1.2* |
| $E_T$ | *1.5* | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.985* |

| Speed Inputs | | | Calc Speed Adj and FFS | | |
|---|---|---|---|---|---|
| Lane Width | | ft | | | |
| Rt-Side Lat. Clearance | | ft | $f_{LW}$ | | mph |
| Number of Lanes, N | *3* | | $f_{LC}$ | | mph |
| Total Ramp Density, TRD | | ramps/mi | TRD Adjustment | | mph |
| FFS (measured) | *70.0* | mph | FFS | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph | | | |

| LOS and Performance Measures | | | Design (N) | |
|---|---|---|---|---|
| Operational (LOS) | | | Design (N) | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *2525* | pc/h/ln | Design LOS | |
| S | *49.6* | mph | $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | pc/h/ln |
| D = $v_p$ / S | *50.9* | pc/mi/ln | S | mph |
| LOS | *F* | | D = $v_p$ / S | pc/mi/ln |
| | | | Required Number of Lanes, N | |

| Glossary | | Factor Location | |
|---|---|---|---|
| N - Number of lanes | S - Speed | $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| V - Hourly volume | D - Density | $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $v_p$ - Flow rate | FFS - Free-flow speed | $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS - Level of service | BFFS - Base free-flow speed | LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |
| DDHV - Directional design hour volume | | | |

# FREEWAY WEAVING WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency/Company | AECOM |
| Date Performed | |
| Analysis Time Period | AM |

## Site Information

| | |
|---|---|
| Freeway/Dir of Travel | I-95 NB |
| Weaving Segment Location | Seg 15-Bet On & Off to Exp |
| Analysis Year | No-Build 2040 |

Project Description SW 10th Street SIMR

## Inputs

| | | | |
|---|---|---|---|
| Weaving configuration | Two-Sided | Segment type | Freeway |
| Weaving number of lanes, N | 3 | Freeway minimum speed, $S_{MIN}$ | 15 |
| Weaving segment length, $L_S$ | 4665ft | Freeway maximum capacity, $C_{IFL}$ | 2400 |
| Freeway free-flow speed, FFS | 70 mph | Terrain type | Level |

## Conversions to pc/h Under Base Conditions

| | V (veh/h) | PHF | Truck (%) | RV (%) | $E_T$ | $E_R$ | $f_{HV}$ | $f_p$ | v (pc/h) |
|---|---|---|---|---|---|---|---|---|---|
| $V_{FF}$ | 5525 | 0.95 | 3 | 0 | 1.5 | 1.2 | 0.985 | 1.00 | 5903 |
| $V_{RF}$ | 635 | 0.92 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 697 |
| $V_{FR}$ | 1565 | 0.92 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 1718 |
| $V_{RR}$ | 175 | 0.92 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 192 |
| $V_{NW}$ | 8318 | | | | | | | V = | 8510 |
| $V_W$ | 192 | | | | | | | | |
| VR | 0.023 | | | | | | | | |

## Configuration Characteristics

| | | | |
|---|---|---|---|
| Minimum maneuver lanes, $N_{WL}$ | 0 lc | Minimum weaving lane changes, $LC_{MIN}$ | lc/h |
| Interchange density, ID | 0.7 int/mi | Weaving lane changes, $LC_W$ | lc/h |
| Minimum RF lane changes, $LC_{RF}$ | 0 lc/pc | Non-weaving lane changes, $LC_{NW}$ | lc/h |
| Minimum FR lane changes, $LC_{FR}$ | 0 lc/pc | Total lane changes, $LC_{ALL}$ | lc/h |
| Minimum RR lane changes, $LC_{RR}$ | 3 lc/pc | Non-weaving vehicle index, $I_{NW}$ | |

## Weaving Segment Speed, Density, Level of Service, and Capacity

| | | | |
|---|---|---|---|
| Weaving segment flow rate, v | 8398 veh/h | Weaving intensity factor, W | |
| Weaving segment capacity, $c_w$ | 6807 veh/h | Weaving segment speed, S | mph |
| Weaving segment v/c ratio | 1.234 | Average weaving speed, $S_W$ | mph |
| Weaving segment density, D | pc/mi/ln | Average non-weaving speed, $S_{NW}$ | mph |
| Level of Service, LOS | F | Maximum weaving length, $L_{MAX}$ | 5936 ft |

## Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency or Company | *AECOM* |
| Date Performed | |
| Analysis Time Period | *AM* |

## Site Information

| | |
|---|---|
| Highway/Direction of Travel | *I-95 NB* |
| From/To | *Seg 16-North of Hillsboro* |
| Jurisdiction | |
| Analysis Year | *No-Build 2040* |

Project Description *SW 10th STreet SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | | |
|---|---|---|---|---|---|
| Volume, V | *6160* | veh/h | Peak-Hour Factor, PHF | *0.95* | |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *4* | |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* | |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* | |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* | |

## Calculate Flow Adjustments

| | | | |
|---|---|---|---|
| $f_p$ | *1.00* | $E_R$ | *1.2* |
| $E_T$ | *1.5* | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.980* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *3* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *70.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *2205* | pc/h/ln |
| S | *58.3* | mph |
| D = $v_p$ / S | *37.8* | pc/mi/ln |
| LOS | *E* | |

## Design (N)

Design (N)

| | |
|---|---|
| Design LOS | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | pc/h/ln |
| S | mph |
| D = $v_p$ / S | pc/mi/ln |
| Required Number of Lanes, N | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |

# FREEWAY WEAVING WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency/Company | AECOM |
| Date Performed | |
| Analysis Time Period | PM |

## Site Information

| | |
|---|---|
| Freeway/Dir of Travel | I-95 NB |
| Weaving Segment Location | Seg 1-Bet Copans & Sample |
| Analysis Year | No-Build 2040 |

Project Description SW 10th Street SIMR

## Inputs

| | | | |
|---|---|---|---|
| Weaving configuration | One-Sided | Segment type | Freeway |
| Weaving number of lanes, N | 4 | Freeway minimum speed, $S_{MIN}$ | 15 |
| Weaving segment length, $L_S$ | 1820ft | Freeway maximum capacity, $C_{IFL}$ | 2400 |
| Freeway free-flow speed, FFS | 70 mph | Terrain type | Level |

## Conversions to pc/h Under Base Conditions

| | V (veh/h) | PHF | Truck (%) | RV (%) | $E_T$ | $E_R$ | $f_{HV}$ | $f_p$ | v (pc/h) |
|---|---|---|---|---|---|---|---|---|---|
| $V_{FF}$ | 4770 | 0.95 | 3 | 0 | 1.5 | 1.2 | 0.985 | 1.00 | 5096 |
| $V_{RF}$ | 480 | 0.92 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 527 |
| $V_{FR}$ | 1810 | 0.92 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 1987 |
| $V_{RR}$ | 0 | 0.95 | 0 | 0 | 1.5 | 1.2 | 1.000 | 1.00 | 0 |
| $V_{NW}$ | 5096 | | | | | | | V = | 7610 |
| $V_W$ | 2514 | | | | | | | | |
| VR | 0.330 | | | | | | | | |

## Configuration Characteristics

| | | | |
|---|---|---|---|
| Minimum maneuver lanes, $N_{WL}$ | 2 lc | Minimum weaving lane changes, $LC_{MIN}$ | lc/h |
| Interchange density, ID | 0.7 int/mi | Weaving lane changes, $LC_W$ | lc/h |
| Minimum RF lane changes, $LC_{RF}$ | 1 lc/pc | Non-weaving lane changes, $LC_{NW}$ | lc/h |
| Minimum FR lane changes, $LC_{FR}$ | 1 lc/pc | Total lane changes, $LC_{ALL}$ | lc/h |
| Minimum RR lane changes, $LC_{RR}$ | lc/pc | Non-weaving vehicle index, $I_{NW}$ | |

## Weaving Segment Speed, Density, Level of Service, and Capacity

| | | | |
|---|---|---|---|
| Weaving segment flow rate, v | 7511 veh/h | Weaving intensity factor, W | |
| Weaving segment capacity, $c_w$ | 7158 veh/h | Weaving segment speed, S | mph |
| Weaving segment v/c ratio | 1.049 | Average weaving speed, $S_W$ | mph |
| Weaving segment density, D | pc/mi/ln | Average non-weaving speed, $S_{NW}$ | mph |
| Level of Service, LOS | F | Maximum weaving length, $L_{MAX}$ | 5912 ft |

## Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

# BASIC FREEWAY SEGMENTS WORKSHEET

| General Information | | Site Information | |
|---|---|---|---|
| Analyst | | Highway/Direction of Travel | *I-95 NB* |
| Agency or Company | *AECOM* | From/To | *Seg 2-Bet Off & On from Sample* |
| Date Performed | | Jurisdiction | |
| Analysis Time Period | *PM* | Analysis Year | *No-Build 2040* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | |
|---|---|---|---|---|
| Volume, V | *5250* | veh/h | Peak-Hour Factor, PHF | *0.95* |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *3* |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* |

## Calculate Flow Adjustments

| | | | |
|---|---|---|---|
| $f_p$ | *1.00* | $E_R$ | *1.2* |
| $E_T$ | *1.5* | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.985* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *3* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *70.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *1870* | pc/h/ln |
| S | *64.8* | mph |
| D = $v_p$ / S | *28.9* | pc/mi/ln |
| LOS | *D* | |

## Design (N)

Design (N)

| | |
|---|---|
| Design LOS | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | pc/h/ln |
| S | mph |
| D = $v_p$ / S | pc/mi/ln |
| Required Number of Lanes, N | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |

# RAMPS AND RAMP JUNCTIONS WORKSHEET

## General Information

| | | | |
|---|---|---|---|
| Analyst | | Freeway/Dir of Travel | I-95 NB |
| Agency or Company | AECOM | Junction | Seg 3-On Ramp from Sample |
| Date Performed | | Jurisdiction | |
| Analysis Time Period | PM | Analysis Year | No-Build 2040 |

Project Description SW 10th Street SIMR

## Site Information

## Inputs

| Upstream Adj Ramp | | Freeway Number of Lanes, N | 3 | Downstream Adj Ramp | |
|---|---|---|---|---|---|
| ☐ Yes | ☐ On | Ramp Number of Lanes, N | 1 | ☑ Yes | ☑ On |
| ☑ No | ☐ Off | Acceleration Lane Length, $L_A$ | 500 | ☐ No | ☐ Off |
| $L_{up}$ = | ft | Deceleration Lane Length $L_D$ | | $L_{down}$ = | 1950 ft |
| $V_u$ = | veh/h | Freeway Volume, $V_F$ | 5250 | $V_D$ = | 770 veh/h |
| | | Ramp Volume, $V_R$ | 1150 | | |
| | | Freeway Free-Flow Speed, $S_{FF}$ | 70.0 | | |
| | | Ramp Free-Flow Speed, $S_{FR}$ | 50.0 | | |

## Conversion to pc/h Under Base Conditions

| (pc/h) | V (Veh/hr) | PHF | Terrain | %Truck | %Rv | $f_{HV}$ | $f_p$ | v = V/PHF x $f_{HV}$ x $f_p$ |
|---|---|---|---|---|---|---|---|---|
| Freeway | 5250 | 0.95 | Level | 3 | 0 | 0.985 | 1.00 | 5609 |
| Ramp | 1150 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 1262 |
| UpStream | | | | | | | | |
| DownStream | 770 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 845 |

## Merge Areas

### Estimation of $v_{12}$

$V_{12} = V_F ( P_{FM} )$

$L_{EQ}$ = (Equation 13-6 or 13-7)

$P_{FM}$ = 0.591 using Equation (Exhibit 13-6)

$V_{12}$ = 3318 pc/h

$V_3$ or $V_{av34}$ 2291 pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☑ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☑ Yes ☐ No

If Yes,$V_{12a}$ = 3318 pc/h (Equation 13-16, 13-18, or 13-19)

### Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_{FO}$ | 6871 | Exhibit 13-8 | | No |

### Flow Entering Merge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{R12}$ | 4580 | Exhibit 13-8 | 4600:All | No |

### Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

$D_R$ = 37.5 (pc/mi/ln)

LOS = E (Exhibit 13-2)

### Speed Determination

$M_S$ = 0.651 (Exibit 13-11)

$S_R$= 51.8 mph (Exhibit 13-11)

$S_0$= 63.6 mph (Exhibit 13-11)

S = 55.2 mph (Exhibit 13-13)

## Diverge Areas

### Estimation of $v_{12}$

$V_{12} = V_R + (V_F - V_R)P_{FD}$

$L_{EQ}$ = (Equation 13-12 or 13-13)

$P_{FD}$ = using Equation (Exhibit 13-7)

$V_{12}$ = pc/h

$V_3$ or $V_{av34}$ pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☐ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☐ No

If Yes,$V_{12a}$ = pc/h (Equation 13-16, 13-18, or 13-19)

### Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_F$ | | Exhibit 13-8 | | |
| $V_{FO} = V_F - V_R$ | | Exhibit 13-8 | | |
| $V_R$ | | Exhibit 13-10 | | |

### Flow Entering Diverge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{12}$ | | Exhibit 13-8 | | |

### Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

$D_R$ = (pc/mi/ln)

LOS = (Exhibit 13-2)

### Speed Determination

$D_s$ = (Exhibit 13-12)

$S_R$= mph (Exhibit 13-12)

$S_0$= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

# BASIC FREEWAY SEGMENTS WORKSHEET

| General Information | | Site Information | |
|---|---|---|---|
| Analyst | | Highway/Direction of Travel | *I-95 NB* |
| Agency or Company | *AECOM* | From/To | *Seg 4-Bet On from Sample & Exp* |
| Date Performed | | Jurisdiction | |
| Analysis Time Period | *PM* | Analysis Year | *No-Build 2040* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | |
|---|---|---|---|---|
| Volume, V | *6400* | veh/h | Peak-Hour Factor, PHF | *0.95* |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *3* |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* |
| DDHV = AADT x K x D | | veh/h | Grade % Length<br>Up/Down % | *mi* |

## Calculate Flow Adjustments

| | | | |
|---|---|---|---|
| $f_p$ | *1.00* | $E_R$ | *1.2* |
| $E_T$ | *1.5* | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.985* |

| Speed Inputs | | | Calc Speed Adj and FFS | | |
|---|---|---|---|---|---|
| Lane Width | | ft | | | |
| Rt-Side Lat. Clearance | | ft | $f_{LW}$ | | mph |
| Number of Lanes, N | *3* | | $f_{LC}$ | | mph |
| Total Ramp Density, TRD | | ramps/mi | TRD Adjustment | | mph |
| FFS (measured) | *70.0* | mph | FFS | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph | | | |

| LOS and Performance Measures | | | Design (N) | |
|---|---|---|---|---|
| Operational (LOS) | | | Design (N) | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *2279* | pc/h/ln | Design LOS | |
| S | *56.5* | mph | $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | pc/h/ln |
| D = $v_p$ / S | *40.3* | pc/mi/ln | S | mph |
| LOS | *E* | | D = $v_p$ / S | pc/mi/ln |
| | | | Required Number of Lanes, N | |

| Glossary | | Factor Location | |
|---|---|---|---|
| N - Number of lanes | S - Speed | $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| V - Hourly volume | D - Density | $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $v_p$ - Flow rate | FFS - Free-flow speed | $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS - Level of service | BFFS - Base free-flow speed | LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |
| DDHV - Directional design hour volume | | | |

# RAMPS AND RAMP JUNCTIONS WORKSHEET

## General Information

| | | | |
|---|---|---|---|
| Analyst | | Freeway/Dir of Travel | I-95 NB |
| Agency or Company | AECOM | Junction | Seg 5-On from Exp |
| Date Performed | | Jurisdiction | |
| Analysis Time Period | PM | Analysis Year | No-Build 2040 |

Project Description SW 10th Street SIMR

## Site Information

## Inputs

| Upstream Adj Ramp | | Downstream Adj Ramp |
|---|---|---|
| ☐ Yes ☐ On | Freeway Number of Lanes, N: 3 | ☑ Yes ☐ On |
| ☑ No ☐ Off | Ramp Number of Lanes, N: 1 | ☐ No ☑ Off |
| $L_{up}$ = ft | Acceleration Lane Length, $L_A$: 600 | $L_{down}$ = 5545 ft |
| $V_u$ = veh/h | Deceleration Lane Length $L_D$: | $V_D$ = 1590 veh/h |
| | Freeway Volume, $V_F$: 6400 | |
| | Ramp Volume, $V_R$: 770 | |
| | Freeway Free-Flow Speed, $S_{FF}$: 70.0 | |
| | Ramp Free-Flow Speed, $S_{FR}$: 50.0 | |

## Conversion to pc/h Under Base Conditions

| (pc/h) | V (Veh/hr) | PHF | Terrain | %Truck | %Rv | $f_{HV}$ | $f_p$ | v = V/PHF x $f_{HV}$ x $f_p$ |
|---|---|---|---|---|---|---|---|---|
| Freeway | 6400 | 0.95 | Level | 3 | 0 | 0.985 | 1.00 | 6838 |
| Ramp | 770 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 845 |
| UpStream | | | | | | | | |
| DownStream | 1590 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 1746 |

**Merge Areas**

## Estimation of $v_{12}$

$V_{12} = V_F ( P_{FM} )$

$L_{EQ}$ = 10046.03 (Equation 13-6 or 13-7)

$P_{FM}$ = 0.631 using Equation (Exhibit 13-6)

$V_{12}$ = 4318 pc/h

$V_3$ or $V_{av34}$ 2520 pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☑ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☑ Yes ☐ No

If Yes,$V_{12a}$ = 4318 pc/h (Equation 13-16, 13-18, or 13-19)

## Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_{FO}$ | 7683 | Exhibit 13-8 | | Yes |

## Flow Entering Merge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{R12}$ | 5681 | Exhibit 13-8 | 4600:All | Yes |

## Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

$D_R$ = 45.6 (pc/mi/ln)

LOS = F (Exhibit 13-2)

## Speed Determination

$M_S$ = 1.405 (Exibit 13-11)

$S_R$= 30.7 mph (Exhibit 13-11)

$S_0$= 64.6 mph (Exhibit 13-11)

S = 35.5 mph (Exhibit 13-13)

**Diverge Areas**

## Estimation of $v_{12}$

$V_{12} = V_R + (V_F - V_R)P_{FD}$

$L_{EQ}$ = (Equation 13-12 or 13-13)

$P_{FD}$ = using Equation (Exhibit 13-7)

$V_{12}$ = pc/h

$V_3$ or $V_{av34}$ pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☐ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☐ No

If Yes,$V_{12a}$ = pc/h (Equation 13-16, 13-18, or 13-19)

## Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_F$ | | Exhibit 13-8 | | |
| $V_{FO} = V_F - V_R$ | | Exhibit 13-8 | | |
| $V_R$ | | Exhibit 13-10 | | |

## Flow Entering Diverge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{12}$ | | Exhibit 13-8 | | |

## Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

$D_R$ = (pc/mi/ln)

LOS = (Exhibit 13-2)

## Speed Determination

$D_s$ = (Exhibit 13-12)

$S_R$= mph (Exhibit 13-12)

$S_0$= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency or Company | *AECOM* |
| Date Performed | |
| Analysis Time Period | *PM* |

## Site Information

| | |
|---|---|
| Highway/Direction of Travel | *I-95 NB* |
| From/To | *Seg 6-Bet Exp On & Off to 10th* |
| Jurisdiction | |
| Analysis Year | *No-Build 2040* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | | |
|---|---|---|---|---|---|
| Volume, V | *7170* | veh/h | Peak-Hour Factor, PHF | *0.95* | |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *3* | |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* | |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* | |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* | |

## Calculate Flow Adjustments

| | | | | |
|---|---|---|---|---|
| $f_p$ | *1.00* | | $E_R$ | *1.2* |
| $E_T$ | *1.5* | | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.985* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *3* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *70.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *2554* | pc/h/ln |
| S | *48.7* | mph |
| D = $v_p$ / S | *52.4* | pc/mi/ln |
| LOS | *F* | |

## Design (N)

Design (N)

| | |
|---|---|
| Design LOS | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | pc/h/ln |
| S | mph |
| D = $v_p$ / S | pc/mi/ln |
| Required Number of Lanes, N | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |

# RAMPS AND RAMP JUNCTIONS WORKSHEET

## General Information / Site Information

| | | | |
|---|---|---|---|
| Analyst | | Freeway/Dir of Travel | I-95 NB |
| Agency or Company | AECOM | Junction | Seg 7-Off Ramp to 10th St |
| Date Performed | | Jurisdiction | |
| Analysis Time Period | PM | Analysis Year | No-Build 2040 |

Project Description SW 10th Street SMIR

## Inputs

| Upstream Adj Ramp | | Freeway Number of Lanes, N | 3 | Downstream Adj Ramp | |
|---|---|---|---|---|---|
| ☐ Yes | ☐ On | Ramp Number of Lanes, N | 1 | ☑ Yes | ☑ On |
| ☑ No | ☐ Off | Acceleration Lane Length, $L_A$ | | ☐ No | ☐ Off |
| $L_{up}$ = | ft | Deceleration Lane Length $L_D$ | 250 | $L_{down}$ = | 130 ft |
| $V_u$ = | veh/h | Freeway Volume, $V_F$ | 7170 | $V_D$ = | 1320 veh/h |
| | | Ramp Volume, $V_R$ | 1590 | | |
| | | Freeway Free-Flow Speed, $S_{FF}$ | 70.0 | | |
| | | Ramp Free-Flow Speed, $S_{FR}$ | 45.0 | | |

## Conversion to pc/h Under Base Conditions

| (pc/h) | V (Veh/hr) | PHF | Terrain | %Truck | %Rv | $f_{HV}$ | $f_p$ | v = V/PHF x $f_{HV}$ x $f_p$ |
|---|---|---|---|---|---|---|---|---|
| Freeway | 7170 | 0.95 | Level | 3 | 0 | 0.985 | 1.00 | 7661 |
| Ramp | 1590 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 1746 |
| UpStream | | | | | | | | |
| DownStream | 1320 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 1449 |

**Merge Areas**

## Estimation of $v_{12}$

$V_{12} = V_F ( P_{FM} )$

$L_{EQ}$ = (Equation 13-6 or 13-7)

$P_{FM}$ = using Equation (Exhibit 13-6)

$V_{12}$ = pc/h

$V_3$ or $V_{av34}$ pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☐ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☐ No

If Yes,$V_{12a}$ = pc/h (Equation 13-16, 13-18, or 13-19)

## Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_{FO}$ | | Exhibit 13-8 | | |

## Flow Entering Merge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{R12}$ | | Exhibit 13-8 | | |

## Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

$D_R$ = (pc/mi/ln)

LOS = (Exhibit 13-2)

## Speed Determination

$M_S$ = (Exibit 13-11)

$S_R$= mph (Exhibit 13-11)

$S_0$= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

**Diverge Areas**

## Estimation of $v_{12}$

$V_{12} = V_R + (V_F - V_R)P_{FD}$

$L_{EQ}$ = (Equation 13-12 or 13-13)

$P_{FD}$ = 0.488 using Equation (Exhibit 13-7)

$V_{12}$ = 4633 pc/h

$V_3$ or $V_{av34}$ 3028 pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☑ Yes ☐ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☑ No

If Yes,$V_{12a}$ = 4961 pc/h (Equation 13-16, 13-18, or 13-19)

## Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_F$ | 7661 | Exhibit 13-8 | 7200 | Yes |
| $V_{FO} = V_F - V_R$ | 5915 | Exhibit 13-8 | 7200 | No |
| $V_R$ | 1746 | Exhibit 13-10 | 2100 | No |

## Flow Entering Diverge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{12}$ | 4633 | Exhibit 13-8 | 4400:All | Yes |

## Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

$D_R$ = 44.7 (pc/mi/ln)

LOS = F (Exhibit 13-2)

## Speed Determination

$D_s$ = 0.455 (Exhibit 13-12)

$S_R$= 57.3 mph (Exhibit 13-12)

$S_0$= 70.2 mph (Exhibit 13-12)

S = 61.2 mph (Exhibit 13-13)

# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency or Company | *AECOM* |
| Date Performed | |
| Analysis Time Period | *PM* |

## Site Information

| | |
|---|---|
| Highway/Direction of Travel | *I-95 NB* |
| From/To | *Seg 8-Bet Off & On 10th St* |
| Jurisdiction | |
| Analysis Year | *No-Build 2040* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | | |
|---|---|---|---|---|---|
| Volume, V | *5580* | veh/h | Peak-Hour Factor, PHF | *0.95* | |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *3* | |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* | |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* | |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* | |

## Calculate Flow Adjustments

| | | | |
|---|---|---|---|
| $f_p$ | *1.00* | $E_R$ | *1.2* |
| $E_T$ | *1.5* | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.985* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *3* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *70.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *1987* | pc/h/ln |
| S | *62.8* | mph |
| D = $v_p$ / S | *31.6* | pc/mi/ln |
| LOS | *D* | |

## Design (N)

Design (N)

| | |
|---|---|
| Design LOS | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | pc/h/ln |
| S | mph |
| D = $v_p$ / S | pc/mi/ln |
| Required Number of Lanes, N | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |

# RAMPS AND RAMP JUNCTIONS WORKSHEET

## General Information

| | | | |
|---|---|---|---|
| Analyst | | Freeway/Dir of Travel | I-95 NB |
| Agency or Company | AECOM | Junction | Seg 9-On Ramp 10th St EB & WB |
| Date Performed | | Jurisdiction | |
| Analysis Time Period | PM | Analysis Year | No-Build 2040 |

Project Description SW 10th Street SIMR

## Site Information

## Inputs

| Upstream Adj Ramp | | Freeway Number of Lanes, N | 3 | Downstream Adj Ramp | |
|---|---|---|---|---|---|
| ☑ Yes | ☐ On | Ramp Number of Lanes, N | 1 | ☐ Yes | ☐ On |
| ☐ No | ☑ Off | Acceleration Lane Length, $L_A$ | 1345 | ☑ No | ☐ Off |
| $L_{up}$ = | 1370 ft | Deceleration Lane Length $L_D$ | | $L_{down}$ = | ft |
| $V_u$ = | 1590 veh/h | Freeway Volume, $V_F$ | 5580 | $V_D$ = | veh/h |
| | | Ramp Volume, $V_R$ | 1320 | | |
| | | Freeway Free-Flow Speed, $S_{FF}$ | 70.0 | | |
| | | Ramp Free-Flow Speed, $S_{FR}$ | 50.0 | | |

## Conversion to pc/h Under Base Conditions

| (pc/h) | V (Veh/hr) | PHF | Terrain | %Truck | %Rv | $f_{HV}$ | $f_p$ | v = V/PHF x $f_{HV}$ x $f_p$ |
|---|---|---|---|---|---|---|---|---|
| Freeway | 5580 | 0.95 | Level | 3 | 0 | 0.985 | 1.00 | 5962 |
| Ramp | 1320 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 1449 |
| UpStream | 1590 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 1746 |
| DownStream | | | | | | | | |

**Merge Areas**

## Estimation of $v_{12}$

$V_{12} = V_F ( P_{FM} )$

$L_{EQ}$ = 2396.13 (Equation 13-6 or 13-7)

$P_{FM}$ = 0.550 using Equation (Exhibit 13-6)

$V_{12}$ = 3281 pc/h

$V_3$ or $V_{av34}$ 2681 pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☑ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☑ Yes ☐ No

If Yes,$V_{12a}$ = 3406 pc/h (Equation 13-16, 13-18, or 13-19)

## Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_{FO}$ | 7411 | Exhibit 13-8 | | Yes |

## Flow Entering Merge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{R12}$ | 4855 | Exhibit 13-8 | 4600:All | Yes |

## Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

$D_R$ = 34.2 (pc/mi/ln)

LOS = F (Exhibit 13-2)

## Speed Determination

$M_S$ = 0.687 (Exibit 13-11)

$S_R$= 50.8 mph (Exhibit 13-11)

$S_0$= 61.9 mph (Exhibit 13-11)

S = 54.1 mph (Exhibit 13-13)

**Diverge Areas**

## Estimation of $v_{12}$

$V_{12} = V_R + (V_F - V_R)P_{FD}$

$L_{EQ}$ = (Equation 13-12 or 13-13)

$P_{FD}$ = using Equation (Exhibit 13-7)

$V_{12}$ = pc/h

$V_3$ or $V_{av34}$ pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☐ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☐ No

If Yes,$V_{12a}$ = pc/h (Equation 13-16, 13-18, or 13-19)

## Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_F$ | | Exhibit 13-8 | | |
| $V_{FO} = V_F - V_R$ | | Exhibit 13-8 | | |
| $V_R$ | | Exhibit 13-10 | | |

## Flow Entering Diverge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{12}$ | | Exhibit 13-8 | | |

## Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

$D_R$ = (pc/mi/ln)

LOS = (Exhibit 13-2)

## Speed Determination

$D_s$ = (Exhibit 13-12)

$S_R$= mph (Exhibit 13-12)

$S_0$= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

# BASIC FREEWAY SEGMENTS WORKSHEET

| General Information | | Site Information | |
|---|---|---|---|
| Analyst | | Highway/Direction of Travel | *I-95 NB* |
| Agency or Company | *AECOM* | From/To | *Seg 10-Bet 10th St & Hillsboro* |
| Date Performed | | Jurisdiction | |
| Analysis Time Period | *PM* | Analysis Year | *No-Build 2040* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | |
|---|---|---|---|---|
| Volume, V | *6900* | veh/h | Peak-Hour Factor, PHF | *0.95* |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *3* |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* |

## Calculate Flow Adjustments

| | | | |
|---|---|---|---|
| $f_p$ | *1.00* | $E_R$ | *1.2* |
| $E_T$ | *1.5* | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.985* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *3* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *70.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *2457* | pc/h/ln |
| S | *51.7* | mph |
| D = $v_p$ / S | *47.6* | pc/mi/ln |
| LOS | *F* | |

## Design (N)

Design (N)

| | | |
|---|---|---|
| Design LOS | | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | | pc/h/ln |
| S | | mph |
| D = $v_p$ / S | | pc/mi/ln |
| Required Number of Lanes, N | | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |

# RAMPS AND RAMP JUNCTIONS WORKSHEET

## General Information

| | | | |
|---|---|---|---|
| Analyst | | Freeway/Dir of Travel | I-95 NB |
| Agency or Company | AECOM | Junction | Seg 11-Off Ramp Hillsboro EB |
| Date Performed | | Jurisdiction | |
| Analysis Time Period | PM | Analysis Year | No-Build 2040 |

Project Description SW 10th Street SIMR

## Inputs

| Upstream Adj Ramp | | Freeway Number of Lanes, N | 3 | Downstream Adj Ramp | |
|---|---|---|---|---|---|
| ☑ Yes | ☑ On | Ramp Number of Lanes, N | 1 | ☐ Yes | ☐ On |
| ☐ No | ☐ Off | Acceleration Lane Length, $L_A$ | | ☑ No | ☐ Off |
| $L_{up}$ = | 3085 ft | Deceleration Lane Length $L_D$ | 220 | $L_{down}$ = | ft |
| $V_u$ = | 1320 veh/h | Freeway Volume, $V_F$ | 6900 | $V_D$ = | veh/h |
| | | Ramp Volume, $V_R$ | 750 | | |
| | | Freeway Free-Flow Speed, $S_{FF}$ | 70.0 | | |
| | | Ramp Free-Flow Speed, $S_{FR}$ | 45.0 | | |

## Conversion to pc/h Under Base Conditions

| (pc/h) | V (Veh/hr) | PHF | Terrain | %Truck | %Rv | $f_{HV}$ | $f_p$ | v = V/PHF x $f_{HV}$ x $f_p$ |
|---|---|---|---|---|---|---|---|---|
| Freeway | 6900 | 0.95 | Level | 3 | 0 | 0.985 | 1.00 | 7372 |
| Ramp | 750 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 823 |
| UpStream | 1320 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 1449 |
| DownStream | | | | | | | | |

**Merge Areas**

## Estimation of $v_{12}$

$V_{12} = V_F ( P_{FM} )$

$L_{EQ}$ = (Equation 13-6 or 13-7)

$P_{FM}$ = using Equation (Exhibit 13-6)

$V_{12}$ = pc/h

$V_3$ or $V_{av34}$ pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☐ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☐ No

If Yes,$V_{12a}$ = pc/h (Equation 13-16, 13-18, or 13-19)

## Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_{FO}$ | | Exhibit 13-8 | | |

## Flow Entering Merge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{R12}$ | | Exhibit 13-8 | | |

## Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

$D_R$ = (pc/mi/ln)

LOS = (Exhibit 13-2)

## Speed Determination

$M_S$ = (Exibit 13-11)

$S_R$= mph (Exhibit 13-11)

$S_0$= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

**Diverge Areas**

## Estimation of $v_{12}$

$V_{12} = V_R + (V_F - V_R)P_{FD}$

$L_{EQ}$ = 8140.08 (Equation 13-12 or 13-13)

$P_{FD}$ = 0.538 using Equation (Exhibit 13-7)

$V_{12}$ = 4345 pc/h

$V_3$ or $V_{av34}$ 3027 pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☑ Yes ☐ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☑ No

If Yes,$V_{12a}$ = 4672 pc/h (Equation 13-16, 13-18, or 13-19)

## Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_F$ | 7372 | Exhibit 13-8 | 7200 | Yes |
| $V_{FO} = V_F - V_R$ | 6549 | Exhibit 13-8 | 7200 | No |
| $V_R$ | 823 | Exhibit 13-10 | 2100 | No |

## Flow Entering Diverge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{12}$ | 4345 | Exhibit 13-8 | 4400:All | No |

## Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

$D_R$ = 42.5 (pc/mi/ln)

LOS = F (Exhibit 13-2)

## Speed Determination

$D_s$ = 0.372 (Exhibit 13-12)

$S_R$= 59.6 mph (Exhibit 13-12)

$S_0$= 70.2 mph (Exhibit 13-12)

S = 63.1 mph (Exhibit 13-13)

# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency or Company | *AECOM* |
| Date Performed | |
| Analysis Time Period | *PM* |

## Site Information

| | |
|---|---|
| Highway/Direction of Travel | *I-95 NB* |
| From/To | *Seg 12-Bet Off & On Hillsboro* |
| Jurisdiction | |
| Analysis Year | *No-Build 2040* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | | |
|---|---|---|---|---|---|
| Volume, V | *6150* | veh/h | Peak-Hour Factor, PHF | *0.95* | |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *3* | |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* | |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* | |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* | |

## Calculate Flow Adjustments

| | | | |
|---|---|---|---|
| $f_p$ | *1.00* | $E_R$ | *1.2* |
| $E_T$ | *1.5* | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.985* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *3* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *70.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *2190* | pc/h/ln |
| S | *58.6* | mph |
| D = $v_p$ / S | *37.4* | pc/mi/ln |
| LOS | *E* | |

## Design (N)

Design (N)

| | |
|---|---|
| Design LOS | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | pc/h/ln |
| S | mph |
| D = $v_p$ / S | pc/mi/ln |
| Required Number of Lanes, N | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |

# FREEWAY WEAVING WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency/Company | AECOM |
| Date Performed | |
| Analysis Time Period | PM |

## Site Information

| | |
|---|---|
| Freeway/Dir of Travel | I-95 NB |
| Weaving Segment Location | Seg 13-Bet On & Off Hillsboro |
| Analysis Year | No-Build 2040 |

Project Description SW 10th Street SIMR

## Inputs

| | | | |
|---|---|---|---|
| Weaving configuration | One-Sided | Segment type | Freeway |
| Weaving number of lanes, N | 4 | Freeway minimum speed, $S_{MIN}$ | 15 |
| Weaving segment length, $L_S$ | 790ft | Freeway maximum capacity, $C_{IFL}$ | 2400 |
| Freeway free-flow speed, FFS | 70 mph | Terrain type | Level |

## Conversions to pc/h Under Base Conditions

| | V (veh/h) | PHF | Truck (%) | RV (%) | $E_T$ | $E_R$ | $f_{HV}$ | $f_p$ | v (pc/h) |
|---|---|---|---|---|---|---|---|---|---|
| $V_{FF}$ | 5460 | 0.95 | 3 | 0 | 1.5 | 1.2 | 0.985 | 1.00 | 5834 |
| $V_{RF}$ | 730 | 0.92 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 801 |
| $V_{FR}$ | 690 | 0.92 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 758 |
| $V_{RR}$ | 0 | 0.95 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 0 |
| $V_{NW}$ | 5834 | | | | | | | V = | 7393 |
| $V_W$ | 1559 | | | | | | | | |
| VR | 0.211 | | | | | | | | |

## Configuration Characteristics

| | | | |
|---|---|---|---|
| Minimum maneuver lanes, $N_{WL}$ | 2 lc | Minimum weaving lane changes, $LC_{MIN}$ | 1559 lc/h |
| Interchange density, ID | 0.7 int/mi | Weaving lane changes, $LC_W$ | 1770 lc/h |
| Minimum RF lane changes, $LC_{RF}$ | 1 lc/pc | Non-weaving lane changes, $LC_{NW}$ | 860 lc/h |
| Minimum FR lane changes, $LC_{FR}$ | 1 lc/pc | Total lane changes, $LC_{ALL}$ | 2630 lc/h |
| Minimum RR lane changes, $LC_{RR}$ | lc/pc | Non-weaving vehicle index, $I_{NW}$ | 323 |

## Weaving Segment Speed, Density, Level of Service, and Capacity

| | | | |
|---|---|---|---|
| Weaving segment flow rate, v | 7291 veh/h | Weaving intensity factor, W | 0.584 |
| Weaving segment capacity, $c_w$ | 8296 veh/h | Weaving segment speed, S | 49.9 mph |
| Weaving segment v/c ratio | 0.879 | Average weaving speed, $S_W$ | 49.7 mph |
| Weaving segment density, D | 37.1 pc/mi/ln | Average non-weaving speed, $S_{NW}$ | 49.9 mph |
| Level of Service, LOS | E | Maximum weaving length, $L_{MAX}$ | 4648 ft |

## Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

# BASIC FREEWAY SEGMENTS WORKSHEET

| General Information | | Site Information | |
|---|---|---|---|
| Analyst | | Highway/Direction of Travel | *I-95 NB* |
| Agency or Company | *AECOM* | From/To | *Seg 14-Bet Off & On Hillsboro* |
| Date Performed | | Jurisdiction | |
| Analysis Time Period | *PM* | Analysis Year | *No-Build 2040* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | |
|---|---|---|---|---|
| Volume, V | *6190* | veh/h | Peak-Hour Factor, PHF | *0.95* |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *3* |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* |

## Calculate Flow Adjustments

| | | | |
|---|---|---|---|
| $f_p$ | *1.00* | $E_R$ | *1.2* |
| $E_T$ | *1.5* | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.985* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *3* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *70.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *2205* | pc/h/ln |
| S | *58.3* | mph |
| D = $v_p$ / S | *37.8* | pc/mi/ln |
| LOS | *E* | |

## Design (N)

Design (N)

| | | |
|---|---|---|
| Design LOS | | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | | pc/h/ln |
| S | | mph |
| D = $v_p$ / S | | pc/mi/ln |
| Required Number of Lanes, N | | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |

# FREEWAY WEAVING WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency/Company | AECOM |
| Date Performed | |
| Analysis Time Period | PM |

## Site Information

| | |
|---|---|
| Freeway/Dir of Travel | I-95 NB |
| Weaving Segment Location | Seg 15-Bet On & Off to Exp |
| Analysis Year | No-Build 2040 |

Project Description SW 10th Street SIMR

## Inputs

| | | | |
|---|---|---|---|
| Weaving configuration | Two-Sided | Segment type | Freeway |
| Weaving number of lanes, N | 3 | Freeway minimum speed, $S_{MIN}$ | 15 |
| Weaving segment length, $L_S$ | 4665ft | Freeway maximum capacity, $C_{IFL}$ | 2400 |
| Freeway free-flow speed, FFS | 70 mph | Terrain type | Level |

## Conversions to pc/h Under Base Conditions

| | V (veh/h) | PHF | Truck (%) | RV (%) | $E_T$ | $E_R$ | $f_{HV}$ | $f_p$ | v (pc/h) |
|---|---|---|---|---|---|---|---|---|---|
| $V_{FF}$ | 5040 | 0.95 | 3 | 0 | 1.5 | 1.2 | 0.985 | 1.00 | 5385 |
| $V_{RF}$ | 610 | 0.92 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 670 |
| $V_{FR}$ | 1150 | 0.92 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 1263 |
| $V_{RR}$ | 130 | 0.92 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 143 |
| $V_{NW}$ | 7318 | | | | | | | V = | 7461 |
| $V_W$ | 143 | | | | | | | | |
| VR | 0.019 | | | | | | | | |

## Configuration Characteristics

| | | | |
|---|---|---|---|
| Minimum maneuver lanes, $N_{WL}$ | 0 lc | Minimum weaving lane changes, $LC_{MIN}$ | lc/h |
| Interchange density, ID | 0.7 int/mi | Weaving lane changes, $LC_W$ | lc/h |
| Minimum RF lane changes, $LC_{RF}$ | 0 lc/pc | Non-weaving lane changes, $LC_{NW}$ | lc/h |
| Minimum FR lane changes, $LC_{FR}$ | 0 lc/pc | Total lane changes, $LC_{ALL}$ | lc/h |
| Minimum RR lane changes, $LC_{RR}$ | 3 lc/pc | Non-weaving vehicle index, $I_{NW}$ | |

## Weaving Segment Speed, Density, Level of Service, and Capacity

| | | | |
|---|---|---|---|
| Weaving segment flow rate, v | 7360 veh/h | Weaving intensity factor, W | |
| Weaving segment capacity, $c_w$ | 6813 veh/h | Weaving segment speed, S | mph |
| Weaving segment v/c ratio | 1.080 | Average weaving speed, $S_W$ | mph |
| Weaving segment density, D | pc/mi/ln | Average non-weaving speed, $S_{NW}$ | mph |
| Level of Service, LOS | F | Maximum weaving length, $L_{MAX}$ | 5905 ft |

## Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency or Company | *AECOM* |
| Date Performed | *6/26/2017* |
| Analysis Time Period | *PM* |

## Site Information

| | |
|---|---|
| Highway/Direction of Travel | *I-95 NB* |
| From/To | *Seg 16-North of Hillsboro* |
| Jurisdiction | *FDOT D4* |
| Analysis Year | *No-Build 2040* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | | |
|---|---|---|---|---|---|
| Volume, V | *5650* | veh/h | Peak-Hour Factor, PHF | *0.95* | |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *3* | |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* | |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* | |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* | |

## Calculate Flow Adjustments

| | | | |
|---|---|---|---|
| $f_p$ | *1.00* | $E_R$ | *1.2* |
| $E_T$ | *1.5* | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.985* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *3* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *70.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *2012* | pc/h/ln |
| S | *62.4* | mph |
| D = $v_p$ / S | *32.3* | pc/mi/ln |
| LOS | *D* | |

## Design (N)

Design (N)

| | |
|---|---|
| Design LOS | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | pc/h/ln |
| S | mph |
| D = $v_p$ / S | pc/mi/ln |
| Required Number of Lanes, N | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |

# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency or Company | *AECOM* |
| Date Performed | |
| Analysis Time Period | *AM* |

## Site Information

| | |
|---|---|
| Highway/Direction of Travel | *I-95 SB* |
| From/To | *Seg 1-Bet Hillsboro & Palmetto* |
| Jurisdiction | |
| Analysis Year | *No-Build 2040* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | | |
|---|---|---|---|---|---|
| Volume, V | *4870* | veh/h | Peak-Hour Factor, PHF | *0.95* | |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *3* | |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* | |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* | |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* | |

## Calculate Flow Adjustments

| | | | |
|---|---|---|---|
| $f_p$ | *1.00* | $E_R$ | *1.2* |
| $E_T$ | *1.5* | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.985* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *3* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *70.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *1734* | pc/h/ln |
| S | *66.7* | mph |
| D = $v_p$ / S | *26.0* | pc/mi/ln |
| LOS | *D* | |

## Design (N)

Design (N)

| | | |
|---|---|---|
| Design LOS | | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | | pc/h/ln |
| S | | mph |
| D = $v_p$ / S | | pc/mi/ln |
| Required Number of Lanes, N | | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |



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# FREEWAY WEAVING WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency/Company | AECOM |
| Date Performed | |
| Analysis Time Period | AM |

## Site Information

| | |
|---|---|
| Freeway/Dir of Travel | I95/SB |
| Weaving Segment Location | Seg 2-Bet On from Exp & Off |
| Analysis Year | No-Build 2040 |

Project Description SW 10th Street SIMR

## Inputs

| | | | |
|---|---|---|---|
| Weaving configuration | Two-Sided | Segment type | Freeway |
| Weaving number of lanes, N | 3 | Freeway minimum speed, $S_{MIN}$ | 15 |
| Weaving segment length, $L_S$ | 5085ft | Freeway maximum capacity, $C_{IFL}$ | 2400 |
| Freeway free-flow speed, FFS | 70 mph | Terrain type | Level |

## Conversions to pc/h Under Base Conditions

| | V (veh/h) | PHF | Truck (%) | RV (%) | $E_T$ | $E_R$ | $f_{HV}$ | $f_p$ | v (pc/h) |
|---|---|---|---|---|---|---|---|---|---|
| $V_{FF}$ | 3585 | 0.95 | 3 | 0 | 1.5 | 1.2 | 0.985 | 1.00 | 3830 |
| $V_{RF}$ | 1265 | 0.92 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 1389 |
| $V_{FR}$ | 1285 | 0.92 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 1411 |
| $V_{RR}$ | 145 | 0.92 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 159 |
| $V_{NW}$ | 6630 | | | | | | | V = | 6789 |
| $V_W$ | 159 | | | | | | | | |
| VR | 0.023 | | | | | | | | |

## Configuration Characteristics

| | | | |
|---|---|---|---|
| Minimum maneuver lanes, $N_{WL}$ | 0 lc | Minimum weaving lane changes, $LC_{MIN}$ | 477 lc/h |
| Interchange density, ID | 0.7 int/mi | Weaving lane changes, $LC_W$ | 848 lc/h |
| Minimum RF lane changes, $LC_{RF}$ | 0 lc/pc | Non-weaving lane changes, $LC_{NW}$ | 3167 lc/h |
| Minimum FR lane changes, $LC_{FR}$ | 0 lc/pc | Total lane changes, $LC_{ALL}$ | 4015 lc/h |
| Minimum RR lane changes, $LC_{RR}$ | 3 lc/pc | Non-weaving vehicle index, $I_{NW}$ | 2360 |

## Weaving Segment Speed, Density, Level of Service, and Capacity

| | | | |
|---|---|---|---|
| Weaving segment flow rate, v | 6704 veh/h | Weaving intensity factor, W | 0.188 |
| Weaving segment capacity, $c_w$ | 6899 veh/h | Weaving segment speed, S | 55.8 mph |
| Weaving segment v/c ratio | 0.972 | Average weaving speed, $S_W$ | 61.3 mph |
| Weaving segment density, D | 40.5 pc/mi/ln | Average non-weaving speed, $S_{NW}$ | 55.7 mph |
| Level of Service, LOS | E | Maximum weaving length, $L_{MAX}$ | 5944 ft |

## Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency or Company | *AECOM* |
| Date Performed | |
| Analysis Time Period | *AM* |

## Site Information

| | |
|---|---|
| Highway/Direction of Travel | *I-95 SB* |
| From/To | *Seg 3-Bet Off & On Ramp* |
| Jurisdiction | |
| Analysis Year | *No-Build 2040* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | |
|---|---|---|---|---|
| Volume, V | *4850* | veh/h | Peak-Hour Factor, PHF | *0.95* |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *3* |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* |

## Calculate Flow Adjustments

| | | | |
|---|---|---|---|
| $f_p$ | *1.00* | $E_R$ | *1.2* |
| $E_T$ | *1.5* | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.985* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *3* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *70.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *1727* | pc/h/ln |
| S | *66.8* | mph |
| D = $v_p$ / S | *25.9* | pc/mi/ln |
| LOS | *C* | |

## Design (N)

Design (N)

| | | |
|---|---|---|
| Design LOS | | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | | pc/h/ln |
| S | | mph |
| D = $v_p$ / S | | pc/mi/ln |
| Required Number of Lanes, N | | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |

# RAMPS AND RAMP JUNCTIONS WORKSHEET

## General Information

| | | | |
|---|---|---|---|
| Analyst | | Freeway/Dir of Travel | I-95 SB |
| Agency or Company | AECOM | Junction | Seg 4-Merge from Hillsboro WB |
| Date Performed | | Jurisdiction | |
| Analysis Time Period | AM | Analysis Year | No-Build 2040 |

Project Description SW 10th Street SIMR

## Site Information

## Inputs

| Upstream Adj Ramp | | Freeway Number of Lanes, N | 3 | Downstream Adj Ramp | |
|---|---|---|---|---|---|
| ☑ Yes | ☐ On | Ramp Number of Lanes, N | 1 | ☐ Yes | ☐ On |
| ☐ No | ☑ Off | Acceleration Lane Length, $L_A$ | 950 | ☑ No | ☐ Off |
| $L_{up}$ = | 2175 ft | Deceleration Lane Length $L_D$ | | $L_{down}$ = | ft |
| $V_u$ = | 1430 veh/h | Freeway Volume, $V_F$ | 4850 | $V_D$ = | veh/h |
| | | Ramp Volume, $V_R$ | 750 | | |
| | | Freeway Free-Flow Speed, $S_{FF}$ | 70.0 | | |
| | | Ramp Free-Flow Speed, $S_{FR}$ | 50.0 | | |

## Conversion to pc/h Under Base Conditions

| (pc/h) | V (Veh/hr) | PHF | Terrain | %Truck | %Rv | $f_{HV}$ | $f_p$ | v = V/PHF x $f_{HV}$ x $f_p$ |
|---|---|---|---|---|---|---|---|---|
| Freeway | 4850 | 0.95 | Level | 3 | 0 | 0.985 | 1.00 | 5182 |
| Ramp | 750 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 823 |
| UpStream | 1430 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 1570 |
| DownStream | | | | | | | | |

**Merge Areas**

## Estimation of $v_{12}$

$V_{12} = V_F ( P_{FM} )$

$L_{EQ}$ = 1919.87 (Equation 13-6 or 13-7)

$P_{FM}$ = 0.604 using Equation (Exhibit 13-6)

$V_{12}$ = 3130 pc/h

$V_3$ or $V_{av34}$ 2052 pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☑ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☑ Yes ☐ No

If Yes,$V_{12a}$ = 3130 pc/h (Equation 13-16, 13-18, or 13-19)

## Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_{FO}$ | 6005 | Exhibit 13-8 | | No |

## Flow Entering Merge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{R12}$ | 3953 | Exhibit 13-8 | 4600:All | No |

## Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

$D_R$ = 30.0 (pc/mi/ln)

LOS = D (Exhibit 13-2)

## Speed Determination

$M_S$ = 0.429 (Exibit 13-11)

$S_R$= 58.0 mph (Exhibit 13-11)

$S_0$= 64.4 mph (Exhibit 13-11)

S = 60.0 mph (Exhibit 13-13)

**Diverge Areas**

## Estimation of $v_{12}$

$V_{12} = V_R + (V_F - V_R)P_{FD}$

$L_{EQ}$ = (Equation 13-12 or 13-13)

$P_{FD}$ = using Equation (Exhibit 13-7)

$V_{12}$ = pc/h

$V_3$ or $V_{av34}$ pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☐ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☐ No

If Yes,$V_{12a}$ = pc/h (Equation 13-16, 13-18, or 13-19)

## Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_F$ | | Exhibit 13-8 | | |
| $V_{FO} = V_F - V_R$ | | Exhibit 13-8 | | |
| $V_R$ | | Exhibit 13-10 | | |

## Flow Entering Diverge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{12}$ | | Exhibit 13-8 | | |

## Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

$D_R$ = (pc/mi/ln)

LOS = (Exhibit 13-2)

## Speed Determination

$D_s$ = (Exhibit 13-12)

$S_R$= mph (Exhibit 13-12)

$S_0$= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

# BASIC FREEWAY SEGMENTS WORKSHEET

| General Information | | Site Information | |
|---|---|---|---|
| Analyst | | Highway/Direction of Travel | *I-95 SB* |
| Agency or Company | *AECOM* | From/To | *Seg 5-Bet WB On & EB On Ramps* |
| Date Performed | | Jurisdiction | |
| Analysis Time Period | *AM* | Analysis Year | *No-Build 2040* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | |
|---|---|---|---|---|
| Volume, V | *5600* | veh/h | Peak-Hour Factor, PHF | *0.95* |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *3* |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* |

## Calculate Flow Adjustments

| | | | |
|---|---|---|---|
| $f_p$ | *1.00* | $E_R$ | *1.2* |
| $E_T$ | *1.5* | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.985* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *3* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *70.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *1994* | pc/h/ln |
| S | *62.7* | mph |
| D = $v_p$ / S | *31.8* | pc/mi/ln |
| LOS | *D* | |

## Design (N)

Design (N)

| | |
|---|---|
| Design LOS | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | pc/h/ln |
| S | mph |
| D = $v_p$ / S | pc/mi/ln |
| Required Number of Lanes, N | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |

# FREEWAY WEAVING WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency/Company | AECOM |
| Date Performed | |
| Analysis Time Period | AM |

## Site Information

| | |
|---|---|
| Freeway/Dir of Travel | I-95 SB |
| Weaving Segment Location | Seg 6- Bet Hillsboro & 10th St |
| Analysis Year | No-Build 2040 |

Project Description SW 10th Street SIMR

## Inputs

| | | | |
|---|---|---|---|
| Weaving configuration | One-Sided | Segment type | Freeway |
| Weaving number of lanes, N | 4 | Freeway minimum speed, $S_{MIN}$ | 15 |
| Weaving segment length, $L_S$ | 1830ft | Freeway maximum capacity, $C_{IFL}$ | 2400 |
| Freeway free-flow speed, FFS | 70 mph | Terrain type | Level |

## Conversions to pc/h Under Base Conditions

| | V (veh/h) | PHF | Truck (%) | RV (%) | $E_T$ | $E_R$ | $f_{HV}$ | $f_p$ | v (pc/h) |
|---|---|---|---|---|---|---|---|---|---|
| $V_{FF}$ | 4180 | 0.95 | 3 | 0 | 1.5 | 1.2 | 0.985 | 1.00 | 4466 |
| $V_{RF}$ | 890 | 0.92 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 977 |
| $V_{FR}$ | 1420 | 0.92 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 1559 |
| $V_{RR}$ | 0 | 0.95 | 0 | 0 | 1.5 | 1.2 | 1.000 | 1.00 | 0 |
| $V_{NW}$ | 4466 | | | | | | | V = | 7002 |
| $V_W$ | 2536 | | | | | | | | |
| VR | 0.362 | | | | | | | | |

## Configuration Characteristics

| | | | |
|---|---|---|---|
| Minimum maneuver lanes, $N_{WL}$ | 2 lc | Minimum weaving lane changes, $LC_{MIN}$ | lc/h |
| Interchange density, ID | 0.7 int/mi | Weaving lane changes, $LC_W$ | lc/h |
| Minimum RF lane changes, $LC_{RF}$ | 1 lc/pc | Non-weaving lane changes, $LC_{NW}$ | lc/h |
| Minimum FR lane changes, $LC_{FR}$ | 0 lc/pc | Total lane changes, $LC_{ALL}$ | lc/h |
| Minimum RR lane changes, $LC_{RR}$ | lc/pc | Non-weaving vehicle index, $I_{NW}$ | |

## Weaving Segment Speed, Density, Level of Service, and Capacity

| | | | |
|---|---|---|---|
| Weaving segment flow rate, v | 6911 veh/h | Weaving intensity factor, W | |
| Weaving segment capacity, $c_w$ | 6529 veh/h | Weaving segment speed, S | mph |
| Weaving segment v/c ratio | 1.058 | Average weaving speed, $S_W$ | mph |
| Weaving segment density, D | pc/mi/ln | Average non-weaving speed, $S_{NW}$ | mph |
| Level of Service, LOS | F | Maximum weaving length, $L_{MAX}$ | 6260 ft |

## Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency or Company | *AECOM* |
| Date Performed | |
| Analysis Time Period | *AM* |

## Site Information

| | |
|---|---|
| Highway/Direction of Travel | *I-95 SB* |
| From/To | *Seg 7-Bet Off & On Ramp* |
| Jurisdiction | |
| Analysis Year | *No-Build 2040* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | |
|---|---|---|---|---|
| Volume, V | *5070* | veh/h | Peak-Hour Factor, PHF | *0.95* |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *3* |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* |

## Calculate Flow Adjustments

| | | | |
|---|---|---|---|
| $f_p$ | *1.00* | $E_R$ | *1.2* |
| $E_T$ | *1.5* | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.985* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *3* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *70.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *1806* | pc/h/ln |
| S | *65.7* | mph |
| D = $v_p$ / S | *27.5* | pc/mi/ln |
| LOS | *D* | |

## Design (N)

Design (N)

| | |
|---|---|
| Design LOS | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | pc/h/ln |
| S | mph |
| D = $v_p$ / S | pc/mi/ln |
| Required Number of Lanes, N | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |

# RAMPS AND RAMP JUNCTIONS WORKSHEET

## General Information

| | | | |
|---|---|---|---|
| Analyst | | Freeway/Dir of Travel | I-95 SB |
| Agency or Company | AECOM | Junction | Seg 8-Merge from 10th St |
| Date Performed | | Jurisdiction | |
| Analysis Time Period | AM | Analysis Year | No-Build 2040 |

Project Description SW 10th Street SIMR

## Inputs

| Upstream Adj Ramp | | Freeway Number of Lanes, N | 3 | Downstream Adj Ramp | |
|---|---|---|---|---|---|
| ☑ Yes | ☐ On | Ramp Number of Lanes, N | 1 | ☐ Yes | ☐ On |
| ☐ No | ☑ Off | Acceleration Lane Length, $L_A$ | 1470 | ☑ No | ☐ Off |
| $L_{up}$ = | 2210 ft | Deceleration Lane Length $L_D$ | | $L_{down}$ = | ft |
| $V_u$ = | 1420 veh/h | Freeway Volume, $V_F$ | 5070 | $V_D$ = | veh/h |
| | | Ramp Volume, $V_R$ | 1550 | | |
| | | Freeway Free-Flow Speed, $S_{FF}$ | 70.0 | | |
| | | Ramp Free-Flow Speed, $S_{FR}$ | 50.0 | | |

## Conversion to pc/h Under Base Conditions

| (pc/h) | V (Veh/hr) | PHF | Terrain | %Truck | %Rv | $f_{HV}$ | $f_p$ | v = V/PHF x $f_{HV}$ x $f_p$ |
|---|---|---|---|---|---|---|---|---|
| Freeway | 5070 | 0.95 | Level | 3 | 0 | 0.985 | 1.00 | 5417 |
| Ramp | 1550 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 1702 |
| UpStream | 1420 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 1559 |
| DownStream | | | | | | | | |

### Merge Areas

#### Estimation of $v_{12}$

$V_{12} = V_F ( P_{FM} )$

$L_{EQ}$ = 2389.15 (Equation 13-6 or 13-7)

$P_{FM}$ = 0.607 using Equation (Exhibit 13-6)

$V_{12}$ = 3289 pc/h

$V_3$ or $V_{av34}$ 2128 pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☑ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☑ Yes ☐ No

If Yes,$V_{12a}$ = 3289 pc/h (Equation 13-16, 13-18, or 13-19)

#### Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_{FO}$ | 7119 | Exhibit 13-8 | | No |

#### Flow Entering Merge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{R12}$ | 4991 | Exhibit 13-8 | 4600:All | Yes |

#### Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

$D_R$ = 34.4 (pc/mi/ln)

LOS = D (Exhibit 13-2)

#### Speed Determination

$M_S$ = 0.748 (Exibit 13-11)

$S_R$= 49.1 mph (Exhibit 13-11)

$S_0$= 64.1 mph (Exhibit 13-11)

S = 52.8 mph (Exhibit 13-13)

### Diverge Areas

#### Estimation of $v_{12}$

$V_{12} = V_R + (V_F - V_R)P_{FD}$

$L_{EQ}$ = (Equation 13-12 or 13-13)

$P_{FD}$ = using Equation (Exhibit 13-7)

$V_{12}$ = pc/h

$V_3$ or $V_{av34}$ pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☐ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☐ No

If Yes,$V_{12a}$ = pc/h (Equation 13-16, 13-18, or 13-19)

#### Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_F$ | | Exhibit 13-8 | | |
| $V_{FO} = V_F - V_R$ | | Exhibit 13-8 | | |
| $V_R$ | | Exhibit 13-10 | | |

#### Flow Entering Diverge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{12}$ | | Exhibit 13-8 | | |

#### Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

$D_R$ = (pc/mi/ln)

LOS = (Exhibit 13-2)

#### Speed Determination

$D_s$ = (Exhibit 13-12)

$S_R$= mph (Exhibit 13-12)

$S_0$= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency or Company | *AECOM* |
| Date Performed | |
| Analysis Time Period | *AM* |

## Site Information

| | |
|---|---|
| Highway/Direction of Travel | *I-95 SB* |
| From/To | *Seg 9-Bet 10th & Exit to Exp* |
| Jurisdiction | |
| Analysis Year | *No-Build 2040* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | | |
|---|---|---|---|---|---|
| Volume, V | *6620* | veh/h | Peak-Hour Factor, PHF | *0.95* | |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *3* | |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* | |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* | |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* | |

## Calculate Flow Adjustments

| | | | | |
|---|---|---|---|---|
| $f_p$ | *1.00* | | $E_R$ | *1.2* |
| $E_T$ | *1.5* | | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.985* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *3* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *70.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *2358* | pc/h/ln |
| S | *54.4* | mph |
| D = $v_p$ / S | *43.3* | pc/mi/ln |
| LOS | *E* | |

## Design (N)

Design (N)

| | |
|---|---|
| Design LOS | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | pc/h/ln |
| S | mph |
| D = $v_p$ / S | pc/mi/ln |
| Required Number of Lanes, N | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |

# RAMPS AND RAMP JUNCTIONS WORKSHEET

## General Information

| | | | |
|---|---|---|---|
| Analyst | | Freeway/Dir of Travel | I-95 SB |
| Agency or Company | AECOM | Junction | Seg 10- Diverge to Express |
| Date Performed | | Jurisdiction | |
| Analysis Time Period | AM | Analysis Year | No-Build 2040 |

Project Description SW 10th Street SIMR

## Site Information

## Inputs

| Upstream Adj Ramp | | Freeway Number of Lanes, N | 3 | Downstream Adj Ramp | |
|---|---|---|---|---|---|
| ☑ Yes | ☑ On | Ramp Number of Lanes, N | 1 | ☐ Yes | ☐ On |
| ☐ No | ☐ Off | Acceleration Lane Length, $L_A$ | | ☑ No | ☐ Off |
| $L_{up}$ = | 6000 ft | Deceleration Lane Length $L_D$ | 300 | $L_{down}$ = | ft |
| $V_u$ = | 1550 veh/h | Freeway Volume, $V_F$ | 6620 | $V_D$ = | veh/h |
| | | Ramp Volume, $V_R$ | 950 | | |
| | | Freeway Free-Flow Speed, $S_{FF}$ | 70.0 | | |
| | | Ramp Free-Flow Speed, $S_{FR}$ | 45.0 | | |

## Conversion to pc/h Under Base Conditions

| (pc/h) | V (Veh/hr) | PHF | Terrain | %Truck | %Rv | $f_{HV}$ | $f_p$ | v = V/PHF x $f_{HV}$ x $f_p$ |
|---|---|---|---|---|---|---|---|---|
| Freeway | 6620 | 0.95 | Level | 3 | 0 | 0.985 | 1.00 | 7073 |
| Ramp | 950 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 1043 |
| UpStream | 1550 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 1702 |
| DownStream | | | | | | | | |

**Merge Areas**

## Estimation of $v_{12}$

$V_{12} = V_F ( P_{FM} )$

$L_{EQ}$ = (Equation 13-6 or 13-7)

$P_{FM}$ = using Equation (Exhibit 13-6)

$V_{12}$ = pc/h

$V_3$ or $V_{av34}$ pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☐ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☐ No

If Yes,$V_{12a}$ = pc/h (Equation 13-16, 13-18, or 13-19)

## Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_{FO}$ | | Exhibit 13-8 | | |

## Flow Entering Merge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{R12}$ | | Exhibit 13-8 | | |

## Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

$D_R$ = (pc/mi/ln)

LOS = (Exhibit 13-2)

## Speed Determination

$M_S$ = (Exibit 13-11)

$S_R$= mph (Exhibit 13-11)

$S_0$= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

**Diverge Areas**

## Estimation of $v_{12}$

$V_{12} = V_R + (V_F - V_R)P_{FD}$

$L_{EQ}$ = 11022.53 (Equation 13-12 or 13-13)

$P_{FD}$ = 0.535 using Equation (Exhibit 13-7)

$V_{12}$ = 4270 pc/h

$V_3$ or $V_{av34}$ 2803 pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☑ Yes ☐ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☑ No

If Yes,$V_{12a}$ = 4373 pc/h (Equation 13-16, 13-18, or 13-19)

## Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_F$ | 7073 | Exhibit 13-8 | 7200 | No |
| $V_{FO} = V_F - V_R$ | 6030 | Exhibit 13-8 | 7200 | No |
| $V_R$ | 1043 | Exhibit 13-10 | 2100 | No |

## Flow Entering Diverge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{12}$ | 4270 | Exhibit 13-8 | 4400:All | No |

## Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

$D_R$ = 41.0 (pc/mi/ln)

LOS = E (Exhibit 13-2)

## Speed Determination

$D_s$ = 0.392 (Exhibit 13-12)

$S_R$= 59.0 mph (Exhibit 13-12)

$S_0$= 71.0 mph (Exhibit 13-12)

S = 62.7 mph (Exhibit 13-13)

# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency or Company | *AECOM* |
| Date Performed | |
| Analysis Time Period | *AM* |

## Site Information

| | |
|---|---|
| Highway/Direction of Travel | *I-95 SB* |
| From/To | *Seg 11-Bet Off Exp Off Samples* |
| Jurisdiction | |
| Analysis Year | *No-Build 2040* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | |
|---|---|---|---|---|
| Volume, V | *5670* | veh/h | Peak-Hour Factor, PHF | *0.95* |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *3* |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* |

## Calculate Flow Adjustments

| | | | |
|---|---|---|---|
| $f_p$ | *1.00* | $E_R$ | *1.2* |
| $E_T$ | *1.5* | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.985* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *3* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *70.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *2019* | pc/h/ln |
| S | *62.2* | mph |
| D = $v_p$ / S | *32.4* | pc/mi/ln |
| LOS | *D* | |

## Design (N)

Design (N)

| | |
|---|---|
| Design LOS | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | pc/h/ln |
| S | mph |
| D = $v_p$ / S | pc/mi/ln |
| Required Number of Lanes, N | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |

# RAMPS AND RAMP JUNCTIONS WORKSHEET

## General Information

| | | | |
|---|---|---|---|
| Analyst | | Freeway/Dir of Travel | I-95 SB |
| Agency or Company | AECOM | Junction | Seg 12- Diverge to Sample Rd |
| Date Performed | | Jurisdiction | |
| Analysis Time Period | AM | Analysis Year | No-Build 2040 |

Project Description SW 10th Street SIMR

## Site Information

## Inputs

Upstream Adj Ramp

☑ Yes ☐ On

☐ No ☑ Off

$L_{up}$ = 2000 ft

$V_u$ = 950 veh/h

| | |
|---|---|
| Freeway Number of Lanes, N | 3 |
| Ramp Number of Lanes, N | 1 |
| Acceleration Lane Length, $L_A$ | |
| Deceleration Lane Length $L_D$ | 250 |
| Freeway Volume, $V_F$ | 5670 |
| Ramp Volume, $V_R$ | 1050 |
| Freeway Free-Flow Speed, $S_{FF}$ | 70.0 |
| Ramp Free-Flow Speed, $S_{FR}$ | 45.0 |

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

$L_{down}$ = ft

$V_D$ = veh/h

## Conversion to pc/h Under Base Conditions

| (pc/h) | V (Veh/hr) | PHF | Terrain | %Truck | %Rv | $f_{HV}$ | $f_p$ | v = V/PHF x $f_{HV}$ x $f_p$ |
|---|---|---|---|---|---|---|---|---|
| Freeway | 5670 | 0.95 | Level | 3 | 0 | 0.985 | 1.00 | 6058 |
| Ramp | 1050 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 1153 |
| UpStream | 950 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 1043 |
| DownStream | | | | | | | | |

**Merge Areas**

## Estimation of $v_{12}$

$V_{12} = V_F ( P_{FM} )$

$L_{EQ}$ = (Equation 13-6 or 13-7)

$P_{FM}$ = using Equation (Exhibit 13-6)

$V_{12}$ = pc/h

$V_3$ or $V_{av34}$ pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☐ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☐ No

If Yes, $V_{12a}$ = pc/h (Equation 13-16, 13-18, or 13-19)

## Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_{FO}$ | | Exhibit 13-8 | | |

## Flow Entering Merge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{R12}$ | | Exhibit 13-8 | | |

## Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

$D_R$ = (pc/mi/ln)

LOS = (Exhibit 13-2)

## Speed Determination

$M_S$ = (Exibit 13-11)

$S_R$ = mph (Exhibit 13-11)

$S_0$ = mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

**Diverge Areas**

## Estimation of $v_{12}$

$V_{12} = V_R + (V_F - V_R)P_{FD}$

$L_{EQ}$ = (Equation 13-12 or 13-13)

$P_{FD}$ = 0.556 using Equation (Exhibit 13-7)

$V_{12}$ = 3878 pc/h

$V_3$ or $V_{av34}$ 2180 pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☑ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☑ No

If Yes, $V_{12a}$ = pc/h (Equation 13-16, 13-18, or 13-19)

## Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_F$ | 6058 | Exhibit 13-8 | 7200 | No |
| $V_{FO} = V_F - V_R$ | 4905 | Exhibit 13-8 | 7200 | No |
| $V_R$ | 1153 | Exhibit 13-10 | 2100 | No |

## Flow Entering Diverge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{12}$ | 3878 | Exhibit 13-8 | 4400:All | No |

## Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

$D_R$ = 37.0 (pc/mi/ln)

LOS = E (Exhibit 13-2)

## Speed Determination

$D_s$ = 0.402 (Exhibit 13-12)

$S_R$ = 58.8 mph (Exhibit 13-12)

$S_0$ = 72.9 mph (Exhibit 13-12)

S = 62.8 mph (Exhibit 13-13)

# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency or Company | *AECOM* |
| Date Performed | |
| Analysis Time Period | *AM* |

## Site Information

| | |
|---|---|
| Highway/Direction of Travel | *I-95 SB* |
| From/To | *Seg 13-Bet Off & On Ramps* |
| Jurisdiction | |
| Analysis Year | *No-Build 2040* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | |
|---|---|---|---|---|
| Volume, V | *4620* | veh/h | Peak-Hour Factor, PHF | *0.95* |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *3* |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* |

## Calculate Flow Adjustments

| | | | |
|---|---|---|---|
| $f_p$ | *1.00* | $E_R$ | *1.2* |
| $E_T$ | *1.5* | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.985* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *3* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *70.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *1645* | pc/h/ln |
| S | *67.7* | mph |
| D = $v_p$ / S | *24.3* | pc/mi/ln |
| LOS | *C* | |

## Design (N)

Design (N)

| | | |
|---|---|---|
| Design LOS | | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | | pc/h/ln |
| S | | mph |
| D = $v_p$ / S | | pc/mi/ln |
| Required Number of Lanes, N | | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |

# FREEWAY WEAVING WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency/Company | AECOM |
| Date Performed | |
| Analysis Time Period | AM |

## Site Information

| | |
|---|---|
| Freeway/Dir of Travel | I-95 SB |
| Weaving Segment Location | Seg 14- Bet Sample & Copans |
| Analysis Year | No-Build 2040 |

Project Description SW 10th Street SIMR

## Inputs

| | | | |
|---|---|---|---|
| Weaving configuration | One-Sided | Segment type | Freeway |
| Weaving number of lanes, N | 4 | Freeway minimum speed, $S_{MIN}$ | 15 |
| Weaving segment length, $L_S$ | 1650ft | Freeway maximum capacity, $C_{IFL}$ | 2400 |
| Freeway free-flow speed, FFS | 70 mph | Terrain type | Level |

## Conversions to pc/h Under Base Conditions

| | V (veh/h) | PHF | Truck (%) | RV (%) | $E_T$ | $E_R$ | $f_{HV}$ | $f_p$ | v (pc/h) |
|---|---|---|---|---|---|---|---|---|---|
| $V_{FF}$ | 3915 | 0.95 | 3 | 0 | 1.5 | 1.2 | 0.985 | 1.00 | 4183 |
| $V_{RF}$ | 1970 | 0.92 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 2163 |
| $V_{FR}$ | 705 | 0.92 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 774 |
| $V_{RR}$ | 0 | 0.95 | 0 | 0 | 1.5 | 1.2 | 1.000 | 1.00 | 0 |
| $V_{NW}$ | 4183 | | | | | | | V = | 7120 |
| $V_W$ | 2937 | | | | | | | | |
| VR | 0.412 | | | | | | | | |

## Configuration Characteristics

| | | | |
|---|---|---|---|
| Minimum maneuver lanes, $N_{WL}$ | 2 lc | Minimum weaving lane changes, $LC_{MIN}$ | lc/h |
| Interchange density, ID | 0.7 int/mi | Weaving lane changes, $LC_W$ | lc/h |
| Minimum RF lane changes, $LC_{RF}$ | 1 lc/pc | Non-weaving lane changes, $LC_{NW}$ | lc/h |
| Minimum FR lane changes, $LC_{FR}$ | 1 lc/pc | Total lane changes, $LC_{ALL}$ | lc/h |
| Minimum RR lane changes, $LC_{RR}$ | lc/pc | Non-weaving vehicle index, $I_{NW}$ | 603 |

## Weaving Segment Speed, Density, Level of Service, and Capacity

| | | | |
|---|---|---|---|
| Weaving segment flow rate, v | 7029 veh/h | Weaving intensity factor, W | |
| Weaving segment capacity, $c_w$ | 5732 veh/h | Weaving segment speed, S | mph |
| Weaving segment v/c ratio | 1.226 | Average weaving speed, $S_W$ | mph |
| Weaving segment density, D | pc/mi/ln | Average non-weaving speed, $S_{NW}$ | mph |
| Level of Service, LOS | F | Maximum weaving length, $L_{MAX}$ | 6822 ft |

## Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency or Company | *AECOM* |
| Date Performed | |
| Analysis Time Period | *PM* |

## Site Information

| | |
|---|---|
| Highway/Direction of Travel | *I-95 SB* |
| From/To | *Seg 1-Bet Hillsboro & Palmetto* |
| Jurisdiction | |
| Analysis Year | *No-Build 2040* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | | |
|---|---|---|---|---|---|
| Volume, V | *5150* | veh/h | Peak-Hour Factor, PHF | *0.95* | |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *3* | |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* | |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* | |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* | |

## Calculate Flow Adjustments

| | | | |
|---|---|---|---|
| $f_p$ | *1.00* | $E_R$ | *1.2* |
| $E_T$ | *1.5* | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.985* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *3* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *70.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *1834* | pc/h/ln |
| S | *65.3* | mph |
| D = $v_p$ / S | *28.1* | pc/mi/ln |
| LOS | *D* | |

## Design (N)

Design (N)

| | | |
|---|---|---|
| Design LOS | | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | | pc/h/ln |
| S | | mph |
| D = $v_p$ / S | | pc/mi/ln |
| Required Number of Lanes, N | | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |

# FREEWAY WEAVING WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency/Company | AECOM |
| Date Performed | |
| Analysis Time Period | PM |

## Site Information

| | |
|---|---|
| Freeway/Dir of Travel | I-95 SB |
| Weaving Segment Location | Seg 2-Bet On from Exp & Off |
| Analysis Year | No-Build 2040 |

Project Description SW 10th Street SIMR

## Inputs

| | | | |
|---|---|---|---|
| Weaving configuration | Two-Sided | Segment type | Freeway |
| Weaving number of lanes, N | 3 | Freeway minimum speed, $S_{MIN}$ | 15 |
| Weaving segment length, $L_S$ | 5085ft | Freeway maximum capacity, $C_{IFL}$ | 2400 |
| Freeway free-flow speed, FFS | 70 mph | Terrain type | Level |

## Conversions to pc/h Under Base Conditions

| | V (veh/h) | PHF | Truck (%) | RV (%) | $E_T$ | $E_R$ | $f_{HV}$ | $f_p$ | v (pc/h) |
|---|---|---|---|---|---|---|---|---|---|
| $V_{FF}$ | 4010 | 0.95 | 3 | 0 | 1.5 | 1.2 | 0.985 | 1.00 | 4284 |
| $V_{RF}$ | 1460 | 0.92 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 1603 |
| $V_{FR}$ | 1140 | 0.92 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 1252 |
| $V_{RR}$ | 130 | 0.92 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 143 |
| $V_{NW}$ | 7139 | | | | | | | V = | 7282 |
| $V_W$ | 143 | | | | | | | | |
| VR | 0.020 | | | | | | | | |

## Configuration Characteristics

| | | | |
|---|---|---|---|
| Minimum maneuver lanes, $N_{WL}$ | 0 lc | Minimum weaving lane changes, $LC_{MIN}$ | lc/h |
| Interchange density, ID | 0.7 int/mi | Weaving lane changes, $LC_W$ | lc/h |
| Minimum RF lane changes, $LC_{RF}$ | 0 lc/pc | Non-weaving lane changes, $LC_{NW}$ | lc/h |
| Minimum FR lane changes, $LC_{FR}$ | 0 lc/pc | Total lane changes, $LC_{ALL}$ | lc/h |
| Minimum RR lane changes, $LC_{RR}$ | 3 lc/pc | Non-weaving vehicle index, $I_{NW}$ | |

## Weaving Segment Speed, Density, Level of Service, and Capacity

| | | | |
|---|---|---|---|
| Weaving segment flow rate, v | 7189 veh/h | Weaving intensity factor, W | |
| Weaving segment capacity, $c_w$ | 6907 veh/h | Weaving segment speed, S | mph |
| Weaving segment v/c ratio | 1.041 | Average weaving speed, $S_W$ | mph |
| Weaving segment density, D | pc/mi/ln | Average non-weaving speed, $S_{NW}$ | mph |
| Level of Service, LOS | F | Maximum weaving length, $L_{MAX}$ | 5909 ft |

## Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency or Company | *AECOM* |
| Date Performed | |
| Analysis Time Period | *PM* |

## Site Information

| | |
|---|---|
| Highway/Direction of Travel | *I-95 SB* |
| From/To | *Seg 3-Bet Off & On Ramp* |
| Jurisdiction | |
| Analysis Year | *No-Build 2040* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | | |
|---|---|---|---|---|---|
| Volume, V | *5470* | veh/h | Peak-Hour Factor, PHF | *0.95* | |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *3* | |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* | |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* | |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* | |

## Calculate Flow Adjustments

| | | | | |
|---|---|---|---|---|
| $f_p$ | *1.00* | | $E_R$ | *1.2* |
| $E_T$ | *1.5* | | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.985* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *3* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *70.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *1948* | pc/h/ln |
| S | *63.5* | mph |
| D = $v_p$ / S | *30.7* | pc/mi/ln |
| LOS | *D* | |

## Design (N)

Design (N)

| | | |
|---|---|---|
| Design LOS | | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | | pc/h/ln |
| S | | mph |
| D = $v_p$ / S | | pc/mi/ln |
| Required Number of Lanes, N | | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |

# RAMPS AND RAMP JUNCTIONS WORKSHEET

## General Information

| | | | |
|---|---|---|---|
| Analyst | | Freeway/Dir of Travel | I-95 SB |
| Agency or Company | AECOM | Junction | Seg 4-Merge from Hillsboro WB |
| Date Performed | | Jurisdiction | |
| Analysis Time Period | PM | Analysis Year | No-Build 2040 |

Project Description SW 10th Street SIMR

## Inputs

| Upstream Adj Ramp | | Freeway Number of Lanes, N | 3 | Downstream Adj Ramp | |
|---|---|---|---|---|---|
| ☑ Yes | ☐ On | Ramp Number of Lanes, N | 1 | ☐ Yes | ☐ On |
| ☐ No | ☑ Off | Acceleration Lane Length, $L_A$ | 950 | ☑ No | ☐ Off |
| $L_{up}$ = | 2175 ft | Deceleration Lane Length $L_D$ | | $L_{down}$ = | ft |
| $V_u$ = | 1270 veh/h | Freeway Volume, $V_F$ | 5470 | $V_D$ = | veh/h |
| | | Ramp Volume, $V_R$ | 890 | | |
| | | Freeway Free-Flow Speed, $S_{FF}$ | 70.0 | | |
| | | Ramp Free-Flow Speed, $S_{FR}$ | 50.0 | | |

## Conversion to pc/h Under Base Conditions

| (pc/h) | V (Veh/hr) | PHF | Terrain | %Truck | %Rv | $f_{HV}$ | $f_p$ | v = V/PHF x $f_{HV}$ x $f_p$ |
|---|---|---|---|---|---|---|---|---|
| Freeway | 5470 | 0.95 | Level | 3 | 0 | 0.985 | 1.00 | 5844 |
| Ramp | 890 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 977 |
| UpStream | 1270 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 1394 |
| DownStream | | | | | | | | |

**Merge Areas**

## Estimation of $v_{12}$

$V_{12} = V_F ( P_{FM} )$

$L_{EQ}$ = 2094.49 (Equation 13-6 or 13-7)

$P_{FM}$ = 0.604 using Equation (Exhibit 13-6)

$V_{12}$ = 3530 pc/h

$V_3$ or $V_{av34}$ 2314 pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☑ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☑ Yes ☐ No

If Yes,$V_{12a}$ = 3530 pc/h (Equation 13-16, 13-18, or 13-19)

## Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_{FO}$ | 6821 | Exhibit 13-8 | | No |

## Flow Entering Merge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{R12}$ | 4507 | Exhibit 13-8 | 4600:All | No |

## Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

$D_R$ = 34.2 (pc/mi/ln)

LOS = D (Exhibit 13-2)

## Speed Determination

$M_S$ = 0.580 (Exibit 13-11)

$S_R$= 53.8 mph (Exhibit 13-11)

$S_0$= 63.4 mph (Exhibit 13-11)

S = 56.7 mph (Exhibit 13-13)

**Diverge Areas**

## Estimation of $v_{12}$

$V_{12} = V_R + (V_F - V_R)P_{FD}$

$L_{EQ}$ = (Equation 13-12 or 13-13)

$P_{FD}$ = using Equation (Exhibit 13-7)

$V_{12}$ = pc/h

$V_3$ or $V_{av34}$ pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☐ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☐ No

If Yes,$V_{12a}$ = pc/h (Equation 13-16, 13-18, or 13-19)

## Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_F$ | | Exhibit 13-8 | | |
| $V_{FO} = V_F - V_R$ | | Exhibit 13-8 | | |
| $V_R$ | | Exhibit 13-10 | | |

## Flow Entering Diverge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{12}$ | | Exhibit 13-8 | | |

## Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

$D_R$ = (pc/mi/ln)

LOS = (Exhibit 13-2)

## Speed Determination

$D_s$ = (Exhibit 13-12)

$S_R$= mph (Exhibit 13-12)

$S_0$= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

# BASIC FREEWAY SEGMENTS WORKSHEET

| General Information | | Site Information | |
|---|---|---|---|
| Analyst | | Highway/Direction of Travel | *I-95 SB* |
| Agency or Company | *AECOM* | From/To | *Seg 5-Bet WB On & EB On Ramps* |
| Date Performed | | Jurisdiction | |
| Analysis Time Period | *PM* | Analysis Year | *No-Build 2040* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | |
|---|---|---|---|---|
| Volume, V | *6360* | veh/h | Peak-Hour Factor, PHF | *0.95* |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *3* |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* |

## Calculate Flow Adjustments

| | | | |
|---|---|---|---|
| $f_p$ | *1.00* | $E_R$ | *1.2* |
| $E_T$ | *1.5* | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.985* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *3* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *70.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *2265* | pc/h/ln |
| S | *56.8* | mph |
| D = $v_p$ / S | *39.8* | pc/mi/ln |
| LOS | *E* | |

## Design (N)

Design (N)

| | |
|---|---|
| Design LOS | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | pc/h/ln |
| S | mph |
| D = $v_p$ / S | pc/mi/ln |
| Required Number of Lanes, N | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |

# FREEWAY WEAVING WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency/Company | AECOM |
| Date Performed | |
| Analysis Time Period | PM |

## Site Information

| | |
|---|---|
| Freeway/Dir of Travel | I-95 SB |
| Weaving Segment Location | Seg 6- Bet Hillsboro & 10th St |
| Analysis Year | No-Build 2040 |

Project Description SW 10th Street SIMR

## Inputs

| | | | |
|---|---|---|---|
| Weaving configuration | One-Sided | Segment type | Freeway |
| Weaving number of lanes, N | 4 | Freeway minimum speed, $S_{MIN}$ | 15 |
| Weaving segment length, $L_S$ | 1830ft | Freeway maximum capacity, $C_{IFL}$ | 2400 |
| Freeway free-flow speed, FFS | 70 mph | Terrain type | Level |

## Conversions to pc/h Under Base Conditions

| | V (veh/h) | PHF | Truck (%) | RV (%) | $E_T$ | $E_R$ | $f_{HV}$ | $f_p$ | v (pc/h) |
|---|---|---|---|---|---|---|---|---|---|
| $V_{FF}$ | 4860 | 0.95 | 3 | 0 | 1.5 | 1.2 | 0.985 | 1.00 | 5193 |
| $V_{RF}$ | 830 | 0.92 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 911 |
| $V_{FR}$ | 1500 | 0.92 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 1647 |
| $V_{RR}$ | 0 | 0.95 | 0 | 0 | 1.5 | 1.2 | 1.000 | 1.00 | 0 |
| $V_{NW}$ | 5193 | | | | | | | V = | 7751 |
| $V_W$ | 2558 | | | | | | | | |
| VR | 0.330 | | | | | | | | |

## Configuration Characteristics

| | | | |
|---|---|---|---|
| Minimum maneuver lanes, $N_{WL}$ | 2 lc | Minimum weaving lane changes, $LC_{MIN}$ | lc/h |
| Interchange density, ID | 0.7 int/mi | Weaving lane changes, $LC_W$ | lc/h |
| Minimum RF lane changes, $LC_{RF}$ | 1 lc/pc | Non-weaving lane changes, $LC_{NW}$ | lc/h |
| Minimum FR lane changes, $LC_{FR}$ | 0 lc/pc | Total lane changes, $LC_{ALL}$ | lc/h |
| Minimum RR lane changes, $LC_{RR}$ | lc/pc | Non-weaving vehicle index, $I_{NW}$ | |

## Weaving Segment Speed, Density, Level of Service, and Capacity

| | | | |
|---|---|---|---|
| Weaving segment flow rate, v | 7649 veh/h | Weaving intensity factor, W | |
| Weaving segment capacity, $c_w$ | 7165 veh/h | Weaving segment speed, S | mph |
| Weaving segment v/c ratio | 1.067 | Average weaving speed, $S_W$ | mph |
| Weaving segment density, D | pc/mi/ln | Average non-weaving speed, $S_{NW}$ | mph |
| Level of Service, LOS | F | Maximum weaving length, $L_{MAX}$ | 5908 ft |

## Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".

# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency or Company | *AECOM* |
| Date Performed | |
| Analysis Time Period | *PM* |

## Site Information

| | |
|---|---|
| Highway/Direction of Travel | *I-95 SB* |
| From/To | *Seg 7-Bet Off & On Ramp* |
| Jurisdiction | |
| Analysis Year | *No-Build 2040* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | | |
|---|---|---|---|---|---|
| Volume, V | *5690* | veh/h | Peak-Hour Factor, PHF | *0.95* | |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *3* | |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* | |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* | |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* | |

## Calculate Flow Adjustments

| | | | | |
|---|---|---|---|---|
| $f_p$ | *1.00* | | $E_R$ | *1.2* |
| $E_T$ | *1.5* | | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.985* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *3* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *70.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *2026* | pc/h/ln |
| S | *62.1* | mph |
| D = $v_p$ / S | *32.6* | pc/mi/ln |
| LOS | *D* | |

## Design (N)

Design (N)

| | |
|---|---|
| Design LOS | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | pc/h/ln |
| S | mph |
| D = $v_p$ / S | pc/mi/ln |
| Required Number of Lanes, N | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |

# RAMPS AND RAMP JUNCTIONS WORKSHEET

## General Information

| | | | |
|---|---|---|---|
| Analyst | | Freeway/Dir of Travel | I-95 SB |
| Agency or Company | AECOM | Junction | Seg 8-Merge from 10th St |
| Date Performed | | Jurisdiction | |
| Analysis Time Period | PM | Analysis Year | No-Build 2040 |

Project Description SW 10th Street SIMR

## Inputs

| Upstream Adj Ramp | | Freeway Number of Lanes, N | 3 | Downstream Adj Ramp | |
|---|---|---|---|---|---|
| ☑ Yes | ☐ On | Ramp Number of Lanes, N | 1 | ☐ Yes | ☐ On |
| ☐ No | ☑ Off | Acceleration Lane Length, $L_A$ | 1470 | ☑ No | ☐ Off |
| $L_{up}$ = | 2210 ft | Deceleration Lane Length $L_D$ | | $L_{down}$ = | ft |
| $V_u$ = | 1500 veh/h | Freeway Volume, $V_F$ | 5690 | $V_D$ = | veh/h |
| | | Ramp Volume, $V_R$ | 1560 | | |
| | | Freeway Free-Flow Speed, $S_{FF}$ | 70.0 | | |
| | | Ramp Free-Flow Speed, $S_{FR}$ | 50.0 | | |

## Conversion to pc/h Under Base Conditions

| (pc/h) | V (Veh/hr) | PHF | Terrain | %Truck | %Rv | $f_{HV}$ | $f_p$ | v = V/PHF x $f_{HV}$ x $f_p$ |
|---|---|---|---|---|---|---|---|---|
| Freeway | 5690 | 0.95 | Level | 3 | 0 | 0.985 | 1.00 | 6079 |
| Ramp | 1560 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 1713 |
| UpStream | 1500 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 1647 |
| DownStream | | | | | | | | |

**Merge Areas**

## Estimation of $v_{12}$

$V_{12} = V_F ( P_{FM} )$

$L_{EQ}$ = 2533.17 (Equation 13-6 or 13-7)

$P_{FM}$ = 0.598 using Equation (Exhibit 13-6)

$V_{12}$ = 3636 pc/h

$V_3$ or $V_{av34}$ 2443 pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☑ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☑ Yes ☐ No

If Yes,$V_{12a}$ = 3636 pc/h (Equation 13-16, 13-18, or 13-19)

## Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_{FO}$ | 7792 | Exhibit 13-8 | | Yes |

## Flow Entering Merge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{R12}$ | 5349 | Exhibit 13-8 | 4600:All | Yes |

## Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

$D_R$ = 37.2 (pc/mi/ln)

LOS = F (Exhibit 13-2)

## Speed Determination

$M_S$ = 0.995 (Exibit 13-11)

$S_R$= 42.2 mph (Exhibit 13-11)

$S_0$= 62.6 mph (Exhibit 13-11)

S = 47.0 mph (Exhibit 13-13)

**Diverge Areas**

## Estimation of $v_{12}$

$V_{12} = V_R + (V_F - V_R)P_{FD}$

$L_{EQ}$ = (Equation 13-12 or 13-13)

$P_{FD}$ = using Equation (Exhibit 13-7)

$V_{12}$ = pc/h

$V_3$ or $V_{av34}$ pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☐ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☐ No

If Yes,$V_{12a}$ = pc/h (Equation 13-16, 13-18, or 13-19)

## Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_F$ | | Exhibit 13-8 | | |
| $V_{FO} = V_F - V_R$ | | Exhibit 13-8 | | |
| $V_R$ | | Exhibit 13-10 | | |

## Flow Entering Diverge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{12}$ | | Exhibit 13-8 | | |

## Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

$D_R$ = (pc/mi/ln)

LOS = (Exhibit 13-2)

## Speed Determination

$D_s$ = (Exhibit 13-12)

$S_R$= mph (Exhibit 13-12)

$S_0$= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency or Company | *AECOM* |
| Date Performed | |
| Analysis Time Period | *PM* |

## Site Information

| | |
|---|---|
| Highway/Direction of Travel | *I-95 SB* |
| From/To | *Seg 9-Bet 10th & Exit to Exp* |
| Jurisdiction | |
| Analysis Year | *No-Build 2040* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | | |
|---|---|---|---|---|---|
| Volume, V | *7250* | veh/h | Peak-Hour Factor, PHF | *0.95* | |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *3* | |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* | |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* | |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* | |

## Calculate Flow Adjustments

| | | | |
|---|---|---|---|
| $f_p$ | *1.00* | $E_R$ | *1.2* |
| $E_T$ | *1.5* | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.985* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *3* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *70.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *2582* | pc/h/ln |
| S | *47.8* | mph |
| D = $v_p$ / S | *54.0* | pc/mi/ln |
| LOS | *F* | |

## Design (N)

Design (N)

| | | |
|---|---|---|
| Design LOS | | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | | pc/h/ln |
| S | | mph |
| D = $v_p$ / S | | pc/mi/ln |
| Required Number of Lanes, N | | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |

# RAMPS AND RAMP JUNCTIONS WORKSHEET

## General Information / Site Information

| | | | |
|---|---|---|---|
| Analyst | | Freeway/Dir of Travel | I-95 SB |
| Agency or Company | AECOM | Junction | Seg 10- Diverge to Express |
| Date Performed | | Jurisdiction | |
| Analysis Time Period | PM | Analysis Year | No-Build 2040 |

Project Description SW 10th Street SIMR

## Inputs

| Upstream Adj Ramp | | Freeway Number of Lanes, N | 3 | Downstream Adj Ramp | |
|---|---|---|---|---|---|
| ☑ Yes | ☑ On | Ramp Number of Lanes, N | 1 | ☐ Yes | ☐ On |
| ☐ No | ☐ Off | Acceleration Lane Length, $L_A$ | | ☑ No | ☐ Off |
| $L_{up}$ = | 6000 ft | Deceleration Lane Length $L_D$ | 300 | $L_{down}$ = | ft |
| $V_u$ = | 1560 veh/h | Freeway Volume, $V_F$ | 7250 | $V_D$ = | veh/h |
| | | Ramp Volume, $V_R$ | 770 | | |
| | | Freeway Free-Flow Speed, $S_{FF}$ | 70.0 | | |
| | | Ramp Free-Flow Speed, $S_{FR}$ | 45.0 | | |

## Conversion to pc/h Under Base Conditions

| (pc/h) | V (Veh/hr) | PHF | Terrain | %Truck | %Rv | $f_{HV}$ | $f_p$ | v = V/PHF x $f_{HV}$ x $f_p$ |
|---|---|---|---|---|---|---|---|---|
| Freeway | 7250 | 0.95 | Level | 3 | 0 | 0.985 | 1.00 | 7746 |
| Ramp | 770 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 845 |
| UpStream | 1560 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 1713 |
| DownStream | | | | | | | | |

**Merge Areas**

## Estimation of $v_{12}$

$V_{12} = V_F ( P_{FM} )$

$L_{EQ}$ = (Equation 13-6 or 13-7)

$P_{FM}$ = using Equation (Exhibit 13-6)

$V_{12}$ = pc/h

$V_3$ or $V_{av34}$ pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☐ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☐ No

If Yes,$V_{12a}$ = pc/h (Equation 13-16, 13-18, or 13-19)

## Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_{FO}$ | | Exhibit 13-8 | | |

## Flow Entering Merge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{R12}$ | | Exhibit 13-8 | | |

## Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

$D_R$ = (pc/mi/ln)

LOS = (Exhibit 13-2)

## Speed Determination

$M_S$ = (Exibit 13-11)

$S_R$= mph (Exhibit 13-11)

$S_0$= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

**Diverge Areas**

## Estimation of $v_{12}$

$V_{12} = V_R + (V_F - V_R)P_{FD}$

$L_{EQ}$ = 9262.56 (Equation 13-12 or 13-13)

$P_{FD}$ = 0.527 using Equation (Exhibit 13-7)

$V_{12}$ = 4485 pc/h

$V_3$ or $V_{av34}$ 3261 pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☑ Yes ☐ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☑ No

If Yes,$V_{12a}$ = 5046 pc/h (Equation 13-16, 13-18, or 13-19)

## Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_F$ | 7746 | Exhibit 13-8 | 7200 | Yes |
| $V_{FO} = V_F - V_R$ | 6901 | Exhibit 13-8 | 7200 | No |
| $V_R$ | 845 | Exhibit 13-10 | 2100 | No |

## Flow Entering Diverge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{12}$ | 4485 | Exhibit 13-8 | 4400:All | Yes |

## Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

$D_R$ = 47.1 (pc/mi/ln)

LOS = F (Exhibit 13-2)

## Speed Determination

$D_s$ = 0.374 (Exhibit 13-12)

$S_R$= 59.5 mph (Exhibit 13-12)

$S_0$= 71.1 mph (Exhibit 13-12)

S = 62.8 mph (Exhibit 13-13)

# BASIC FREEWAY SEGMENTS WORKSHEET

| General Information | | Site Information | |
|---|---|---|---|
| Analyst | | Highway/Direction of Travel | *I-95 SB* |
| Agency or Company | *AECOM* | From/To | *Seg 11-Bet Off Exp Off Samples* |
| Date Performed | | Jurisdiction | |
| Analysis Time Period | *PM* | Analysis Year | *No-Build 2040* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | |
|---|---|---|---|---|
| Volume, V | *6480* | veh/h | Peak-Hour Factor, PHF | *0.95* |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *3* |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* |

## Calculate Flow Adjustments

| | | | |
|---|---|---|---|
| $f_p$ | *1.00* | $E_R$ | *1.2* |
| $E_T$ | *1.5* | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.985* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *3* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *70.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *2308* | pc/h/ln |
| S | *55.8* | mph |
| D = $v_p$ / S | *41.4* | pc/mi/ln |
| LOS | *E* | |

## Design (N)

Design (N)

| | |
|---|---|
| Design LOS | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | pc/h/ln |
| S | mph |
| D = $v_p$ / S | pc/mi/ln |
| Required Number of Lanes, N | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |

# RAMPS AND RAMP JUNCTIONS WORKSHEET

## General Information

| | | | |
|---|---|---|---|
| Analyst | | Freeway/Dir of Travel | I-95 SB |
| Agency or Company | AECOM | Junction | Seg 12- Diverge to Sample Rd |
| Date Performed | | Jurisdiction | |
| Analysis Time Period | PM | Analysis Year | No-Build 2040 |

Project Description SW 10th Street SIMR

## Site Information

## Inputs

Upstream Adj Ramp

☑ Yes ☐ On

☐ No ☑ Off

$L_{up}$ = 2000 ft

$V_u$ = 770 veh/h

| | |
|---|---|
| Freeway Number of Lanes, N | 3 |
| Ramp Number of Lanes, N | 1 |
| Acceleration Lane Length, $L_A$ | |
| Deceleration Lane Length $L_D$ | 250 |
| Freeway Volume, $V_F$ | 6480 |
| Ramp Volume, $V_R$ | 1310 |
| Freeway Free-Flow Speed, $S_{FF}$ | 70.0 |
| Ramp Free-Flow Speed, $S_{FR}$ | 45.0 |

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

$L_{down}$ = ft

$V_D$ = veh/h

## Conversion to pc/h Under Base Conditions

| (pc/h) | V (Veh/hr) | PHF | Terrain | %Truck | %Rv | $f_{HV}$ | $f_p$ | v = V/PHF x $f_{HV}$ x $f_p$ |
|---|---|---|---|---|---|---|---|---|
| Freeway | 6480 | 0.95 | Level | 3 | 0 | 0.985 | 1.00 | 6923 |
| Ramp | 1310 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 1438 |
| UpStream | 770 | 0.92 | Level | 2 | 0 | 0.990 | 1.00 | 845 |
| DownStream | | | | | | | | |

**Merge Areas**

## Estimation of $v_{12}$

$V_{12} = V_F ( P_{FM} )$

$L_{EQ}$ = (Equation 13-6 or 13-7)

$P_{FM}$ = using Equation (Exhibit 13-6)

$V_{12}$ = pc/h

$V_3$ or $V_{av34}$ pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☐ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☐ No

If Yes, $V_{12a}$ = pc/h (Equation 13-16, 13-18, or 13-19)

## Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_{FO}$ | | Exhibit 13-8 | | |

## Flow Entering Merge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{R12}$ | | Exhibit 13-8 | | |

## Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

$D_R$ = (pc/mi/ln)

LOS = (Exhibit 13-2)

## Speed Determination

$M_S$ = (Exibit 13-11)

$S_R$= mph (Exhibit 13-11)

$S_0$= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

**Diverge Areas**

## Estimation of $v_{12}$

$V_{12} = V_R + (V_F - V_R)P_{FD}$

$L_{EQ}$ = (Equation 13-12 or 13-13)

$P_{FD}$ = 0.521 using Equation (Exhibit 13-7)

$V_{12}$ = 4294 pc/h

$V_3$ or $V_{av34}$ 2629 pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☑ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☑ No

If Yes, $V_{12a}$ = pc/h (Equation 13-16, 13-18, or 13-19)

## Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_F$ | 6923 | Exhibit 13-8 | 7200 | No |
| $V_{FO} = V_F - V_R$ | 5485 | Exhibit 13-8 | 7200 | No |
| $V_R$ | 1438 | Exhibit 13-10 | 2100 | No |

## Flow Entering Diverge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{12}$ | 4294 | Exhibit 13-8 | 4400:All | No |

## Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

$D_R$ = 40.8 (pc/mi/ln)

LOS = E (Exhibit 13-2)

## Speed Determination

$D_s$ = 0.427 (Exhibit 13-12)

$S_R$= 58.0 mph (Exhibit 13-12)

$S_0$= 71.3 mph (Exhibit 13-12)

S = 62.1 mph (Exhibit 13-13)

# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency or Company | *AECOM* |
| Date Performed | |
| Analysis Time Period | *PM* |

## Site Information

| | |
|---|---|
| Highway/Direction of Travel | *I-95 SB* |
| From/To | *Seg 13-Bet Off & On Ramps* |
| Jurisdiction | |
| Analysis Year | *No-Build 2040* |

Project Description *SW 10th Street SIMR*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | |
|---|---|---|---|---|
| Volume, V | *5170* | veh/h | Peak-Hour Factor, PHF | *0.95* |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *3* |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* |

## Calculate Flow Adjustments

| | | | |
|---|---|---|---|
| $f_p$ | *1.00* | $E_R$ | *1.2* |
| $E_T$ | *1.5* | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *0.985* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *3* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *70.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *70.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *1841* | pc/h/ln |
| S | *65.2* | mph |
| D = $v_p$ / S | *28.2* | pc/mi/ln |
| LOS | *D* | |

## Design (N)

Design (N)

| | | |
|---|---|---|
| Design LOS | | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | | pc/h/ln |
| S | | mph |
| D = $v_p$ / S | | pc/mi/ln |
| Required Number of Lanes, N | | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |

# FREEWAY WEAVING WORKSHEET

## General Information

| | |
|---|---|
| Analyst | |
| Agency/Company | AECOM |
| Date Performed | |
| Analysis Time Period | PM |

## Site Information

| | |
|---|---|
| Freeway/Dir of Travel | I-95 SB |
| Weaving Segment Location | Seg 14- Bet Sample & Copans |
| Analysis Year | No-Build 2040 |

Project Description SW 10th Street SIMR

## Inputs

| | | | |
|---|---|---|---|
| Weaving configuration | One-Sided | Segment type | Freeway |
| Weaving number of lanes, N | 4 | Freeway minimum speed, $S_{MIN}$ | 15 |
| Weaving segment length, $L_S$ | 1650ft | Freeway maximum capacity, $C_{IFL}$ | 2400 |
| Freeway free-flow speed, FFS | 70 mph | Terrain type | Level |

## Conversions to pc/h Under Base Conditions

| | V (veh/h) | PHF | Truck (%) | RV (%) | $E_T$ | $E_R$ | $f_{HV}$ | $f_p$ | v (pc/h) |
|---|---|---|---|---|---|---|---|---|---|
| $V_{FF}$ | 4430 | 0.95 | 3 | 0 | 1.5 | 1.2 | 0.985 | 1.00 | 4733 |
| $V_{RF}$ | 1580 | 0.92 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 1735 |
| $V_{FR}$ | 740 | 0.92 | 2 | 0 | 1.5 | 1.2 | 0.990 | 1.00 | 812 |
| $V_{RR}$ | 0 | 0.95 | 0 | 0 | 1.5 | 1.2 | 1.000 | 1.00 | 0 |
| $V_{NW}$ | 4733 | | | | | | | V = | 7280 |
| $V_W$ | 2547 | | | | | | | | |
| VR | 0.350 | | | | | | | | |

## Configuration Characteristics

| | | | |
|---|---|---|---|
| Minimum maneuver lanes, $N_{WL}$ | 2 lc | Minimum weaving lane changes, $LC_{MIN}$ | lc/h |
| Interchange density, ID | 0.7 int/mi | Weaving lane changes, $LC_W$ | lc/h |
| Minimum RF lane changes, $LC_{RF}$ | 1 lc/pc | Non-weaving lane changes, $LC_{NW}$ | lc/h |
| Minimum FR lane changes, $LC_{FR}$ | 1 lc/pc | Total lane changes, $LC_{ALL}$ | lc/h |
| Minimum RR lane changes, $LC_{RR}$ | lc/pc | Non-weaving vehicle index, $I_{NW}$ | 655 |

## Weaving Segment Speed, Density, Level of Service, and Capacity

| | | | |
|---|---|---|---|
| Weaving segment flow rate, v | 7185 veh/h | Weaving intensity factor, W | |
| Weaving segment capacity, $c_w$ | 6758 veh/h | Weaving segment speed, S | mph |
| Weaving segment v/c ratio | 1.063 | Average weaving speed, $S_W$ | mph |
| Weaving segment density, D | pc/mi/ln | Average non-weaving speed, $S_{NW}$ | mph |
| Level of Service, LOS | F | Maximum weaving length, $L_{MAX}$ | 6125 ft |

## Notes

a. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments".
b. For volumes that exceed the weaving segment capacity, the level of service is "F".



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