

# APPENDICES

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

### APPENDIX I

#### CAPACITY ANALYSIS WORKSHEETS

#### (FREEWAYS)



| BASIC FREEWAY SEGMENTS WORKSHEET                                             |                             |                                  |                                                                                                   |                                        |     |
|------------------------------------------------------------------------------|-----------------------------|----------------------------------|---------------------------------------------------------------------------------------------------|----------------------------------------|-----|
| <b>General Information</b>                                                   |                             |                                  | <b>Site Information</b>                                                                           |                                        |     |
| Analyst                                                                      | MTD                         |                                  | Highway/Direction of Travel I-95 NB                                                               |                                        |     |
| Agency or Company                                                            | Pennoni                     |                                  | From/To Rt. 1 to Rt. 332                                                                          |                                        |     |
| Date Performed                                                               | 8/13/2015                   |                                  | Jurisdiction PennDOT                                                                              |                                        |     |
| Analysis Time Period                                                         | AM Peak                     |                                  | Analysis Year 2015                                                                                |                                        |     |
| Project Description Pre-Constructin Traffic Study                            |                             |                                  |                                                                                                   |                                        |     |
| <input checked="" type="checkbox"/> Oper.(LOS)                               |                             | <input type="checkbox"/> Des.(N) |                                                                                                   | <input type="checkbox"/> Planning Data |     |
| <b>Flow Inputs</b>                                                           |                             |                                  |                                                                                                   |                                        |     |
| Volume, V                                                                    | 3353                        | veh/h                            | Peak-Hour Factor, PHF                                                                             | 0.96                                   |     |
| AADT                                                                         |                             | veh/day                          | %Trucks and Buses, P <sub>T</sub>                                                                 | 6                                      |     |
| Peak-Hr Prop. of AADT, K                                                     |                             |                                  | %RVs, P <sub>R</sub>                                                                              | 0                                      |     |
| Peak-Hr Direction Prop, D                                                    |                             |                                  | General Terrain:                                                                                  | Level                                  |     |
| DDHV = AADT x K x D                                                          |                             | veh/h                            | Grade % Length                                                                                    | mi                                     |     |
|                                                                              |                             |                                  | Up/Down %                                                                                         |                                        |     |
| <b>Calculate Flow Adjustments</b>                                            |                             |                                  |                                                                                                   |                                        |     |
| f <sub>p</sub>                                                               | 1.00                        |                                  | E <sub>R</sub>                                                                                    | 1.2                                    |     |
| E <sub>T</sub>                                                               | 1.5                         |                                  | f <sub>HV</sub> = 1/[1+P <sub>T</sub> (E <sub>T</sub> - 1) + P <sub>R</sub> (E <sub>R</sub> - 1)] | 0.971                                  |     |
| <b>Speed Inputs</b>                                                          |                             |                                  | <b>Calc Speed Adj and FFS</b>                                                                     |                                        |     |
| Lane Width                                                                   | 12.0                        | ft                               |                                                                                                   |                                        |     |
| Rt-Side Lat. Clearance                                                       | 6.0                         | ft                               | f <sub>LW</sub>                                                                                   | 0.0                                    | mph |
| Number of Lanes, N                                                           | 2                           |                                  | f <sub>LC</sub>                                                                                   | 0.0                                    | mph |
| Total Ramp Density, TRD                                                      | 1.20                        | ramps/mi                         | TRD Adjustment                                                                                    | 3.8                                    | mph |
| FFS (measured)                                                               |                             | mph                              | FFS                                                                                               | 71.6                                   | mph |
| Base free-flow Speed, BFFS                                                   | 75.4                        | mph                              |                                                                                                   |                                        |     |
| <b>LOS and Performance Measures</b>                                          |                             |                                  | <b>Design (N)</b>                                                                                 |                                        |     |
| <u>Operational (LOS)</u>                                                     |                             |                                  | <u>Design (N)</u>                                                                                 |                                        |     |
| v <sub>p</sub> = (V or DDHV) / (PHF x N x f <sub>HV</sub> x f <sub>p</sub> ) |                             |                                  | Design LOS                                                                                        |                                        |     |
|                                                                              | 1799                        | pc/h/ln                          | v <sub>p</sub> = (V or DDHV) / (PHF x N x f <sub>HV</sub> x f <sub>p</sub> )                      |                                        |     |
| S                                                                            | 65.8                        | mph                              | S                                                                                                 |                                        |     |
| D = v <sub>p</sub> / S                                                       | 27.3                        | pc/mi/ln                         | D = v <sub>p</sub> / S                                                                            |                                        |     |
| LOS                                                                          | D                           |                                  | Required Number of Lanes, N                                                                       |                                        |     |
| <b>Glossary</b>                                                              |                             |                                  | <b>Factor Location</b>                                                                            |                                        |     |
| N - Number of lanes                                                          | S - Speed                   |                                  | E <sub>R</sub> - Exhibits 11-10, 11-12                                                            | f <sub>LW</sub> - Exhibit 11-8         |     |
| V - Hourly volume                                                            | D - Density                 |                                  | E <sub>T</sub> - Exhibits 11-10, 11-11, 11-13                                                     | f <sub>LC</sub> - Exhibit 11-9         |     |
| v <sub>p</sub> - Flow rate                                                   | FFS - Free-flow speed       |                                  | f <sub>p</sub> - Page 11-18                                                                       | TRD - Page 11-11                       |     |
| LOS - Level of service                                                       | BFFS - Base free-flow speed |                                  | LOS, S, FFS, v <sub>p</sub> - Exhibits 11-2, 11-3                                                 |                                        |     |
| DDHV - Directional design hour volume                                        |                             |                                  |                                                                                                   |                                        |     |

| BASIC FREEWAY SEGMENTS WORKSHEET                                             |                             |                                  |                                                                                                   |                                        |     |
|------------------------------------------------------------------------------|-----------------------------|----------------------------------|---------------------------------------------------------------------------------------------------|----------------------------------------|-----|
| <b>General Information</b>                                                   |                             |                                  | <b>Site Information</b>                                                                           |                                        |     |
| Analyst                                                                      | MTD                         |                                  | Highway/Direction of Travel I-95 SB                                                               |                                        |     |
| Agency or Company                                                            | Pennoni                     |                                  | From/To Rt. 1 to Rt. 332                                                                          |                                        |     |
| Date Performed                                                               | 8/13/2015                   |                                  | Jurisdiction PennDOT                                                                              |                                        |     |
| Analysis Time Period                                                         | AM Peak                     |                                  | Analysis Year 2015                                                                                |                                        |     |
| Project Description Pre-Constructin Traffic Study                            |                             |                                  |                                                                                                   |                                        |     |
| <input checked="" type="checkbox"/> Oper.(LOS)                               |                             | <input type="checkbox"/> Des.(N) |                                                                                                   | <input type="checkbox"/> Planning Data |     |
| <b>Flow Inputs</b>                                                           |                             |                                  |                                                                                                   |                                        |     |
| Volume, V                                                                    | 2380                        | veh/h                            | Peak-Hour Factor, PHF                                                                             | 0.97                                   |     |
| AADT                                                                         |                             | veh/day                          | %Trucks and Buses, P <sub>T</sub>                                                                 | 6                                      |     |
| Peak-Hr Prop. of AADT, K                                                     |                             |                                  | %RVs, P <sub>R</sub>                                                                              | 0                                      |     |
| Peak-Hr Direction Prop, D                                                    |                             |                                  | General Terrain:                                                                                  | Level                                  |     |
| DDHV = AADT x K x D                                                          |                             | veh/h                            | Grade % Length                                                                                    | mi                                     |     |
|                                                                              |                             |                                  | Up/Down %                                                                                         |                                        |     |
| <b>Calculate Flow Adjustments</b>                                            |                             |                                  |                                                                                                   |                                        |     |
| f <sub>p</sub>                                                               | 1.00                        |                                  | E <sub>R</sub>                                                                                    | 1.2                                    |     |
| E <sub>T</sub>                                                               | 1.5                         |                                  | f <sub>HV</sub> = 1/[1+P <sub>T</sub> (E <sub>T</sub> - 1) + P <sub>R</sub> (E <sub>R</sub> - 1)] | 0.971                                  |     |
| <b>Speed Inputs</b>                                                          |                             |                                  | <b>Calc Speed Adj and FFS</b>                                                                     |                                        |     |
| Lane Width                                                                   | 12.0                        | ft                               |                                                                                                   |                                        |     |
| Rt-Side Lat. Clearance                                                       | 6.0                         | ft                               | f <sub>LW</sub>                                                                                   | 0.0                                    | mph |
| Number of Lanes, N                                                           | 2                           |                                  | f <sub>LC</sub>                                                                                   | 0.0                                    | mph |
| Total Ramp Density, TRD                                                      | 1.00                        | ramps/mi                         | TRD Adjustment                                                                                    | 3.2                                    | mph |
| FFS (measured)                                                               |                             | mph                              | FFS                                                                                               | 72.2                                   | mph |
| Base free-flow Speed, BFFS                                                   | 75.4                        | mph                              |                                                                                                   |                                        |     |
| <b>LOS and Performance Measures</b>                                          |                             |                                  | <b>Design (N)</b>                                                                                 |                                        |     |
| <u>Operational (LOS)</u>                                                     |                             |                                  | <u>Design (N)</u>                                                                                 |                                        |     |
| v <sub>p</sub> = (V or DDHV) / (PHF x N x f <sub>HV</sub> x f <sub>p</sub> ) |                             |                                  | Design LOS                                                                                        |                                        |     |
|                                                                              | 1264                        | pc/h/ln                          | v <sub>p</sub> = (V or DDHV) / (PHF x N x f <sub>HV</sub> x f <sub>p</sub> )                      |                                        |     |
| S                                                                            | 70.0                        | mph                              | S                                                                                                 |                                        |     |
| D = v <sub>p</sub> / S                                                       | 18.1                        | pc/mi/ln                         | D = v <sub>p</sub> / S                                                                            |                                        |     |
| LOS                                                                          | C                           |                                  | Required Number of Lanes, N                                                                       |                                        |     |
| <b>Glossary</b>                                                              |                             |                                  | <b>Factor Location</b>                                                                            |                                        |     |
| N - Number of lanes                                                          | S - Speed                   |                                  | E <sub>R</sub> - Exhibits 11-10, 11-12                                                            | f <sub>LW</sub> - Exhibit 11-8         |     |
| V - Hourly volume                                                            | D - Density                 |                                  | E <sub>T</sub> - Exhibits 11-10, 11-11, 11-13                                                     | f <sub>LC</sub> - Exhibit 11-9         |     |
| v <sub>p</sub> - Flow rate                                                   | FFS - Free-flow speed       |                                  | f <sub>p</sub> - Page 11-18                                                                       | TRD - Page 11-11                       |     |
| LOS - Level of service                                                       | BFFS - Base free-flow speed |                                  | LOS, S, FFS, v <sub>p</sub> - Exhibits 11-2, 11-3                                                 |                                        |     |
| DDHV - Directional design hour volume                                        |                             |                                  |                                                                                                   |                                        |     |

| BASIC FREEWAY SEGMENTS WORKSHEET                                             |                             |                                  |                                                                                                   |                                        |     |
|------------------------------------------------------------------------------|-----------------------------|----------------------------------|---------------------------------------------------------------------------------------------------|----------------------------------------|-----|
| <b>General Information</b>                                                   |                             |                                  | <b>Site Information</b>                                                                           |                                        |     |
| Analyst                                                                      | MTD                         |                                  | Highway/Direction of Travel I-95 NB                                                               |                                        |     |
| Agency or Company                                                            | Pennoni                     |                                  | From/To Rt. 1 to Rt. 332                                                                          |                                        |     |
| Date Performed                                                               | 8/13/2015                   |                                  | Jurisdiction PennDOT                                                                              |                                        |     |
| Analysis Time Period                                                         | PM Peak                     |                                  | Analysis Year 2015                                                                                |                                        |     |
| Project Description Pre-Constructin Traffic Study                            |                             |                                  |                                                                                                   |                                        |     |
| <input checked="" type="checkbox"/> Oper.(LOS)                               |                             | <input type="checkbox"/> Des.(N) |                                                                                                   | <input type="checkbox"/> Planning Data |     |
| <b>Flow Inputs</b>                                                           |                             |                                  |                                                                                                   |                                        |     |
| Volume, V                                                                    | 2708                        | veh/h                            | Peak-Hour Factor, PHF                                                                             | 0.91                                   |     |
| AADT                                                                         |                             | veh/day                          | %Trucks and Buses, P <sub>T</sub>                                                                 | 2                                      |     |
| Peak-Hr Prop. of AADT, K                                                     |                             |                                  | %RVs, P <sub>R</sub>                                                                              | 0                                      |     |
| Peak-Hr Direction Prop, D                                                    |                             |                                  | General Terrain:                                                                                  | Level                                  |     |
| DDHV = AADT x K x D                                                          |                             | veh/h                            | Grade % Length                                                                                    | mi                                     |     |
|                                                                              |                             |                                  | Up/Down %                                                                                         |                                        |     |
| <b>Calculate Flow Adjustments</b>                                            |                             |                                  |                                                                                                   |                                        |     |
| f <sub>p</sub>                                                               | 1.00                        |                                  | E <sub>R</sub>                                                                                    | 1.2                                    |     |
| E <sub>T</sub>                                                               | 1.5                         |                                  | f <sub>HV</sub> = 1/[1+P <sub>T</sub> (E <sub>T</sub> - 1) + P <sub>R</sub> (E <sub>R</sub> - 1)] | 0.990                                  |     |
| <b>Speed Inputs</b>                                                          |                             |                                  | <b>Calc Speed Adj and FFS</b>                                                                     |                                        |     |
| Lane Width                                                                   | 12.0                        | ft                               |                                                                                                   |                                        |     |
| Rt-Side Lat. Clearance                                                       | 6.0                         | ft                               | f <sub>LW</sub>                                                                                   | 0.0                                    | mph |
| Number of Lanes, N                                                           | 2                           |                                  | f <sub>LC</sub>                                                                                   | 0.0                                    | mph |
| Total Ramp Density, TRD                                                      | 1.20                        | ramps/mi                         | TRD Adjustment                                                                                    | 3.8                                    | mph |
| FFS (measured)                                                               |                             | mph                              | FFS                                                                                               | 71.6                                   | mph |
| Base free-flow Speed, BFFS                                                   | 75.4                        | mph                              |                                                                                                   |                                        |     |
| <b>LOS and Performance Measures</b>                                          |                             |                                  | <b>Design (N)</b>                                                                                 |                                        |     |
| <u>Operational (LOS)</u>                                                     |                             |                                  | <u>Design (N)</u>                                                                                 |                                        |     |
| v <sub>p</sub> = (V or DDHV) / (PHF x N x f <sub>HV</sub> x f <sub>p</sub> ) |                             |                                  | Design LOS                                                                                        |                                        |     |
|                                                                              | 1503                        | pc/h/ln                          | v <sub>p</sub> = (V or DDHV) / (PHF x N x f <sub>HV</sub> x f <sub>p</sub> )                      |                                        |     |
| S                                                                            | 68.9                        | mph                              | S                                                                                                 |                                        |     |
| D = v <sub>p</sub> / S                                                       | 21.8                        | pc/mi/ln                         | D = v <sub>p</sub> / S                                                                            |                                        |     |
| LOS                                                                          | C                           |                                  | Required Number of Lanes, N                                                                       |                                        |     |
| <b>Glossary</b>                                                              |                             |                                  | <b>Factor Location</b>                                                                            |                                        |     |
| N - Number of lanes                                                          | S - Speed                   |                                  | E <sub>R</sub> - Exhibits 11-10, 11-12                                                            | f <sub>LW</sub> - Exhibit 11-8         |     |
| V - Hourly volume                                                            | D - Density                 |                                  | E <sub>T</sub> - Exhibits 11-10, 11-11, 11-13                                                     | f <sub>LC</sub> - Exhibit 11-9         |     |
| v <sub>p</sub> - Flow rate                                                   | FFS - Free-flow speed       |                                  | f <sub>p</sub> - Page 11-18                                                                       | TRD - Page 11-11                       |     |
| LOS - Level of service                                                       | BFFS - Base free-flow speed |                                  | LOS, S, FFS, v <sub>p</sub> - Exhibits 11-2, 11-3                                                 |                                        |     |
| DDHV - Directional design hour volume                                        |                             |                                  |                                                                                                   |                                        |     |

| <b>BASIC FREEWAY SEGMENTS WORKSHEET</b>                                                                                |           |          |                                                                                                         |        |    |
|------------------------------------------------------------------------------------------------------------------------|-----------|----------|---------------------------------------------------------------------------------------------------------|--------|----|
| <b>General Information</b>                                                                                             |           |          | <b>Site Information</b>                                                                                 |        |    |
| Analyst                                                                                                                | MTD       |          | Highway/Direction of Travel I-95 SB                                                                     |        |    |
| Agency or Company                                                                                                      | Pennoni   |          | From/To Rt. 1 to Rt. 332                                                                                |        |    |
| Date Performed                                                                                                         | 8/13/2015 |          | Jurisdiction PennDOT                                                                                    |        |    |
| Analysis Time Period                                                                                                   | PM Peak   |          | Analysis Year 2015                                                                                      |        |    |
| Project Description Pre-Constructin Traffic Study                                                                      |           |          |                                                                                                         |        |    |
| <input checked="" type="checkbox"/> Oper.(LOS) <input type="checkbox"/> Des.(N) <input type="checkbox"/> Planning Data |           |          |                                                                                                         |        |    |
| <b>Flow Inputs</b>                                                                                                     |           |          |                                                                                                         |        |    |
| Volume, V                                                                                                              | 3920      | veh/h    | Peak-Hour Factor, PHF                                                                                   | 0.96   |    |
| AADT                                                                                                                   |           | veh/day  | %Trucks and Buses, P <sub>T</sub>                                                                       | 4      |    |
| Peak-Hr Prop. of AADT, K                                                                                               |           |          | %RVs, P <sub>R</sub>                                                                                    | 0      |    |
| Peak-Hr Direction Prop, D                                                                                              |           |          | General Terrain:                                                                                        | Level  |    |
| DDHV = AADT x K x D                                                                                                    |           | veh/h    | Grade %                                                                                                 | Length | mi |
|                                                                                                                        |           |          | Up/Down %                                                                                               |        |    |
| <b>Calculate Flow Adjustments</b>                                                                                      |           |          |                                                                                                         |        |    |
| f <sub>p</sub>                                                                                                         | 1.00      |          | E <sub>R</sub>                                                                                          | 1.2    |    |
| E <sub>T</sub>                                                                                                         | 1.5       |          | f <sub>HV</sub> = 1/[1+P <sub>T</sub> (E <sub>T</sub> - 1) + P <sub>R</sub> (E <sub>R</sub> - 1)] 0.980 |        |    |
| <b>Speed Inputs</b>                                                                                                    |           |          | <b>Calc Speed Adj and FFS</b>                                                                           |        |    |
| Lane Width                                                                                                             | 12.0      | ft       |                                                                                                         |        |    |
| Rt-Side Lat. Clearance                                                                                                 | 6.0       | ft       |                                                                                                         |        |    |
| Number of Lanes, N                                                                                                     | 2         |          |                                                                                                         |        |    |
| Total Ramp Density, TRD                                                                                                | 1.00      | ramps/mi |                                                                                                         |        |    |
| FFS (measured)                                                                                                         |           | mph      |                                                                                                         |        |    |
| Base free-flow Speed, BFFS                                                                                             | 75.4      | mph      |                                                                                                         |        |    |
| <b>LOS and Performance Measures</b>                                                                                    |           |          | <b>Design (N)</b>                                                                                       |        |    |
| <u>Operational (LOS)</u>                                                                                               |           |          | <u>Design (N)</u>                                                                                       |        |    |
| v <sub>p</sub> = (V or DDHV) / (PHF x N x f <sub>HV</sub> x f <sub>p</sub> )                                           |           |          | Design LOS                                                                                              |        |    |
| S                                                                                                                      |           |          | v <sub>p</sub> = (V or DDHV) / (PHF x N x f <sub>HV</sub> x f <sub>p</sub> )                            |        |    |
| D = v <sub>p</sub> / S                                                                                                 |           |          | S                                                                                                       |        |    |
| LOS                                                                                                                    |           |          | D = v <sub>p</sub> / S                                                                                  |        |    |
|                                                                                                                        |           |          | Required Number of Lanes, N                                                                             |        |    |
| <b>Glossary</b>                                                                                                        |           |          | <b>Factor Location</b>                                                                                  |        |    |
| N - Number of lanes                                                                                                    |           |          | E <sub>R</sub> - Exhibits 11-10, 11-12                                                                  |        |    |
| V - Hourly volume                                                                                                      |           |          | E <sub>T</sub> - Exhibits 11-10, 11-11, 11-13                                                           |        |    |
| v <sub>p</sub> - Flow rate                                                                                             |           |          | f <sub>p</sub> - Page 11-18                                                                             |        |    |
| LOS - Level of service                                                                                                 |           |          | LOS, S, FFS, v <sub>p</sub> - Exhibits 11-2, 11-3                                                       |        |    |
| DDHV - Directional design hour volume                                                                                  |           |          | f <sub>LW</sub> - Exhibit 11-8                                                                          |        |    |
| S - Speed                                                                                                              |           |          | f <sub>LC</sub> - Exhibit 11-9                                                                          |        |    |
| D - Density                                                                                                            |           |          | TRD - Page 11-11                                                                                        |        |    |
| FFS - Free-flow speed                                                                                                  |           |          |                                                                                                         |        |    |
| BFFS - Base free-flow speed                                                                                            |           |          |                                                                                                         |        |    |

| BASIC FREEWAY SEGMENTS WORKSHEET                                       |                             |                                  |                                                                        |                                        |          |
|------------------------------------------------------------------------|-----------------------------|----------------------------------|------------------------------------------------------------------------|----------------------------------------|----------|
| <b>General Information</b>                                             |                             |                                  | <b>Site Information</b>                                                |                                        |          |
| Analyst                                                                | MTD                         |                                  | Highway/Direction of Travel I-95 NB                                    |                                        |          |
| Agency or Company                                                      | Pennoni                     |                                  | From/To Rt. 332 to Taylorsville Road                                   |                                        |          |
| Date Performed                                                         | 8/13/2015                   |                                  | Jurisdiction PennDOT                                                   |                                        |          |
| Analysis Time Period                                                   | AM Peak                     |                                  | Analysis Year 2015                                                     |                                        |          |
| Project Description Pre-Construction Traffic Study                     |                             |                                  |                                                                        |                                        |          |
| <input checked="" type="checkbox"/> Oper.(LOS)                         |                             | <input type="checkbox"/> Des.(N) |                                                                        | <input type="checkbox"/> Planning Data |          |
| <b>Flow Inputs</b>                                                     |                             |                                  |                                                                        |                                        |          |
| Volume, V                                                              | 3001                        | veh/h                            | Peak-Hour Factor, PHF                                                  | 0.96                                   |          |
| 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                                                         | mi                                     |          |
|                                                                        |                             |                                  | Up/Down %                                                              |                                        |          |
| <b>Calculate Flow Adjustments</b>                                      |                             |                                  |                                                                        |                                        |          |
| $f_p$                                                                  | 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                                  |          |
| <b>Speed Inputs</b>                                                    |                             |                                  | <b>Calc Speed Adj and FFS</b>                                          |                                        |          |
| Lane Width                                                             | 12.0                        | ft                               | $f_{LW}$                                                               | 0.0                                    | mph      |
| Rt-Side Lat. Clearance                                                 | 6.0                         | ft                               | $f_{LC}$                                                               | 0.0                                    | mph      |
| Number of Lanes, N                                                     | 2                           |                                  | TRD Adjustment                                                         | 5.0                                    | mph      |
| Total Ramp Density, TRD                                                | 1.70                        | ramps/mi                         | FFS                                                                    | 70.4                                   | mph      |
| FFS (measured)                                                         |                             | mph                              |                                                                        |                                        |          |
| Base free-flow Speed, BFFS                                             | 75.4                        | mph                              |                                                                        |                                        |          |
| <b>LOS and Performance Measures</b>                                    |                             |                                  | <b>Design (N)</b>                                                      |                                        |          |
| <u>Operational (LOS)</u>                                               |                             |                                  | <u>Design (N)</u>                                                      |                                        |          |
| $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ | 1594                        | pc/h/ln                          | $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ |                                        | pc/h/ln  |
| S                                                                      | 68.2                        | mph                              | S                                                                      |                                        | mph      |
| $D = v_p / S$                                                          | 23.4                        | pc/mi/ln                         | $D = v_p / S$                                                          |                                        | pc/mi/ln |
| LOS                                                                    | C                           |                                  | Required Number of Lanes, N                                            |                                        |          |
| <b>Glossary</b>                                                        |                             |                                  | <b>Factor Location</b>                                                 |                                        |          |
| 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                                                                                       |                             |          |                                                                                                         |        |                                |
|------------------------------------------------------------------------------------------------------------------------|-----------------------------|----------|---------------------------------------------------------------------------------------------------------|--------|--------------------------------|
| <b>General Information</b>                                                                                             |                             |          | <b>Site Information</b>                                                                                 |        |                                |
| Analyst                                                                                                                | MTD                         |          | Highway/Direction of Travel I-95 SB                                                                     |        |                                |
| Agency or Company                                                                                                      | Pennoni                     |          | From/To Rt. 332 to Taylorsville Road                                                                    |        |                                |
| Date Performed                                                                                                         | 8/13/2015                   |          | Jurisdiction PennDOT                                                                                    |        |                                |
| Analysis Time Period                                                                                                   | AM Peak                     |          | Analysis Year 2015                                                                                      |        |                                |
| Project Description Pre-Construction Traffic Study                                                                     |                             |          |                                                                                                         |        |                                |
| <input checked="" type="checkbox"/> Oper.(LOS) <input type="checkbox"/> Des.(N) <input type="checkbox"/> Planning Data |                             |          |                                                                                                         |        |                                |
| <b>Flow Inputs</b>                                                                                                     |                             |          |                                                                                                         |        |                                |
| Volume, V                                                                                                              | 1819                        | veh/h    | Peak-Hour Factor, PHF                                                                                   | 0.97   |                                |
| AADT                                                                                                                   |                             | veh/day  | %Trucks and Buses, P <sub>T</sub>                                                                       | 3      |                                |
| Peak-Hr Prop. of AADT, K                                                                                               |                             |          | %RVs, P <sub>R</sub>                                                                                    | 0      |                                |
| Peak-Hr Direction Prop, D                                                                                              |                             |          | General Terrain:                                                                                        | Level  |                                |
| DDHV = AADT x K x D                                                                                                    |                             | veh/h    | Grade %                                                                                                 | Length | mi                             |
|                                                                                                                        |                             |          | Up/Down %                                                                                               |        |                                |
| <b>Calculate Flow Adjustments</b>                                                                                      |                             |          |                                                                                                         |        |                                |
| f <sub>p</sub>                                                                                                         | 1.00                        |          | E <sub>R</sub>                                                                                          | 1.2    |                                |
| E <sub>T</sub>                                                                                                         | 1.5                         |          | f <sub>HV</sub> = 1/[1+P <sub>T</sub> (E <sub>T</sub> - 1) + P <sub>R</sub> (E <sub>R</sub> - 1)] 0.985 |        |                                |
| <b>Speed Inputs</b>                                                                                                    |                             |          | <b>Calc Speed Adj and FFS</b>                                                                           |        |                                |
| Lane Width                                                                                                             | 12.0                        | ft       |                                                                                                         |        |                                |
| Rt-Side Lat. Clearance                                                                                                 | 6.0                         | ft       |                                                                                                         |        |                                |
| Number of Lanes, N                                                                                                     | 2                           |          |                                                                                                         |        |                                |
| Total Ramp Density, TRD                                                                                                | 1.70                        | ramps/mi |                                                                                                         |        |                                |
| FFS (measured)                                                                                                         |                             | mph      |                                                                                                         |        |                                |
| Base free-flow Speed, BFFS                                                                                             | 75.4                        | mph      |                                                                                                         |        |                                |
| <b>LOS and Performance Measures</b>                                                                                    |                             |          | <b>Design (N)</b>                                                                                       |        |                                |
| Operational (LOS)                                                                                                      |                             |          | Design (N)                                                                                              |        |                                |
| v <sub>p</sub> = (V or DDHV) / (PHF x N x f <sub>HV</sub> )                                                            |                             |          | Design LOS                                                                                              |        |                                |
| 952                                                                                                                    | pc/h/ln                     |          | v <sub>p</sub> = (V or DDHV) / (PHF x N x f <sub>HV</sub> )                                             |        |                                |
| x f <sub>p</sub> )                                                                                                     |                             |          | pc/h/ln                                                                                                 |        |                                |
| S                                                                                                                      | 70.0                        | mph      | x f <sub>p</sub> )                                                                                      |        |                                |
| D = v <sub>p</sub> / S                                                                                                 | 13.6                        | pc/mi/ln | S                                                                                                       |        |                                |
| LOS                                                                                                                    | B                           |          | D = v <sub>p</sub> / S                                                                                  |        |                                |
|                                                                                                                        |                             |          | Required Number of Lanes, N                                                                             |        |                                |
| <b>Glossary</b>                                                                                                        |                             |          | <b>Factor Location</b>                                                                                  |        |                                |
| N - Number of lanes                                                                                                    | S - Speed                   |          | E <sub>R</sub> - Exhibits 11-10, 11-12                                                                  |        | f <sub>LW</sub> - Exhibit 11-8 |
| V - Hourly volume                                                                                                      | D - Density                 |          | E <sub>T</sub> - Exhibits 11-10, 11-11, 11-13                                                           |        | f <sub>LC</sub> - Exhibit 11-9 |
| v <sub>p</sub> - Flow rate                                                                                             | FFS - Free-flow speed       |          | f <sub>p</sub> - Page 11-18                                                                             |        | TRD - Page 11-11               |
| LOS - Level of service                                                                                                 | BFFS - Base free-flow speed |          | LOS, S, FFS, v <sub>p</sub> - Exhibits 11-2, 11-3                                                       |        |                                |
| DDHV - Directional design hour volume                                                                                  |                             |          |                                                                                                         |        |                                |

| BASIC FREEWAY SEGMENTS WORKSHEET                                             |                             |                                  |                                                                                                   |                                        |     |
|------------------------------------------------------------------------------|-----------------------------|----------------------------------|---------------------------------------------------------------------------------------------------|----------------------------------------|-----|
| <b>General Information</b>                                                   |                             |                                  | <b>Site Information</b>                                                                           |                                        |     |
| Analyst                                                                      | MTD                         |                                  | Highway/Direction of Travel I-95 NB                                                               |                                        |     |
| Agency or Company                                                            | Pennoni                     |                                  | From/To Rt. 332 to Taylorsville Road                                                              |                                        |     |
| Date Performed                                                               | 8/13/2015                   |                                  | Jurisdiction PennDOT                                                                              |                                        |     |
| Analysis Time Period                                                         | PM Peak                     |                                  | Analysis Year 2015                                                                                |                                        |     |
| Project Description Pre-Construction Traffic Study                           |                             |                                  |                                                                                                   |                                        |     |
| <input checked="" type="checkbox"/> Oper.(LOS)                               |                             | <input type="checkbox"/> Des.(N) |                                                                                                   | <input type="checkbox"/> Planning Data |     |
| <b>Flow Inputs</b>                                                           |                             |                                  |                                                                                                   |                                        |     |
| Volume, V                                                                    | 1920                        | veh/h                            | Peak-Hour Factor, PHF                                                                             | 0.92                                   |     |
| AADT                                                                         |                             | veh/day                          | %Trucks and Buses, P <sub>T</sub>                                                                 | 2                                      |     |
| Peak-Hr Prop. of AADT, K                                                     |                             |                                  | %RVs, P <sub>R</sub>                                                                              | 0                                      |     |
| Peak-Hr Direction Prop, D                                                    |                             |                                  | General Terrain:                                                                                  | Level                                  |     |
| DDHV = AADT x K x D                                                          |                             | veh/h                            | Grade % Length                                                                                    | mi                                     |     |
|                                                                              |                             |                                  | Up/Down %                                                                                         |                                        |     |
| <b>Calculate Flow Adjustments</b>                                            |                             |                                  |                                                                                                   |                                        |     |
| f <sub>p</sub>                                                               | 1.00                        |                                  | E <sub>R</sub>                                                                                    | 1.2                                    |     |
| E <sub>T</sub>                                                               | 1.5                         |                                  | f <sub>HV</sub> = 1/[1+P <sub>T</sub> (E <sub>T</sub> - 1) + P <sub>R</sub> (E <sub>R</sub> - 1)] | 0.990                                  |     |
| <b>Speed Inputs</b>                                                          |                             |                                  | <b>Calc Speed Adj and FFS</b>                                                                     |                                        |     |
| Lane Width                                                                   | 12.0                        | ft                               |                                                                                                   |                                        |     |
| Rt-Side Lat. Clearance                                                       | 6.0                         | ft                               | f <sub>LW</sub>                                                                                   | 0.0                                    | mph |
| Number of Lanes, N                                                           | 2                           |                                  | f <sub>LC</sub>                                                                                   | 0.0                                    | mph |
| Total Ramp Density, TRD                                                      | 1.70                        | ramps/mi                         | TRD Adjustment                                                                                    | 5.0                                    | mph |
| FFS (measured)                                                               |                             | mph                              | FFS                                                                                               | 70.4                                   | mph |
| Base free-flow Speed, BFFS                                                   | 75.4                        | mph                              |                                                                                                   |                                        |     |
| <b>LOS and Performance Measures</b>                                          |                             |                                  | <b>Design (N)</b>                                                                                 |                                        |     |
| <u>Operational (LOS)</u>                                                     |                             |                                  | <u>Design (N)</u>                                                                                 |                                        |     |
| v <sub>p</sub> = (V or DDHV) / (PHF x N x f <sub>HV</sub> x f <sub>p</sub> ) |                             |                                  | Design LOS                                                                                        |                                        |     |
|                                                                              | 1054                        | pc/h/ln                          | v <sub>p</sub> = (V or DDHV) / (PHF x N x f <sub>HV</sub> x f <sub>p</sub> )                      |                                        |     |
| S                                                                            | 70.0                        | mph                              | S                                                                                                 |                                        |     |
| D = v <sub>p</sub> / S                                                       | 15.1                        | pc/mi/ln                         | D = v <sub>p</sub> / S                                                                            |                                        |     |
| LOS                                                                          | B                           |                                  | Required Number of Lanes, N                                                                       |                                        |     |
| <b>Glossary</b>                                                              |                             |                                  | <b>Factor Location</b>                                                                            |                                        |     |
| N - Number of lanes                                                          | S - Speed                   |                                  | E <sub>R</sub> - Exhibits 11-10, 11-12                                                            | f <sub>LW</sub> - Exhibit 11-8         |     |
| V - Hourly volume                                                            | D - Density                 |                                  | E <sub>T</sub> - Exhibits 11-10, 11-11, 11-13                                                     | f <sub>LC</sub> - Exhibit 11-9         |     |
| v <sub>p</sub> - Flow rate                                                   | FFS - Free-flow speed       |                                  | f <sub>p</sub> - Page 11-18                                                                       | TRD - Page 11-11                       |     |
| LOS - Level of service                                                       | BFFS - Base free-flow speed |                                  | LOS, S, FFS, v <sub>p</sub> - Exhibits 11-2, 11-3                                                 |                                        |     |
| DDHV - Directional design hour volume                                        |                             |                                  |                                                                                                   |                                        |     |



| BASIC FREEWAY SEGMENTS WORKSHEET                            |                             |                                  |                                                                                                   |                                        |     |
|-------------------------------------------------------------|-----------------------------|----------------------------------|---------------------------------------------------------------------------------------------------|----------------------------------------|-----|
| <b>General Information</b>                                  |                             |                                  | <b>Site Information</b>                                                                           |                                        |     |
| Analyst                                                     | MTD                         |                                  | Highway/Direction of Travel I-95 SB                                                               |                                        |     |
| Agency or Company                                           | Pennoni                     |                                  | From/To Rt. 332 to Taylorsville Road                                                              |                                        |     |
| Date Performed                                              | 8/13/2015                   |                                  | Jurisdiction PennDOT                                                                              |                                        |     |
| Analysis Time Period                                        | PM Peak                     |                                  | Analysis Year 2015                                                                                |                                        |     |
| Project Description Pre-Construction Traffic Study          |                             |                                  |                                                                                                   |                                        |     |
| <input checked="" type="checkbox"/> Oper.(LOS)              |                             | <input type="checkbox"/> Des.(N) |                                                                                                   | <input type="checkbox"/> Planning Data |     |
| <b>Flow Inputs</b>                                          |                             |                                  |                                                                                                   |                                        |     |
| Volume, V                                                   | 3478                        | veh/h                            | Peak-Hour Factor, PHF                                                                             | 0.95                                   |     |
| AADT                                                        |                             | veh/day                          | %Trucks and Buses, P <sub>T</sub>                                                                 | 3                                      |     |
| Peak-Hr Prop. of AADT, K                                    |                             |                                  | %RVs, P <sub>R</sub>                                                                              | 0                                      |     |
| Peak-Hr Direction Prop, D                                   |                             |                                  | General Terrain:                                                                                  | Level                                  |     |
| DDHV = AADT x K x D                                         |                             | veh/h                            | Grade % Length                                                                                    | mi                                     |     |
|                                                             |                             |                                  | Up/Down %                                                                                         |                                        |     |
| <b>Calculate Flow Adjustments</b>                           |                             |                                  |                                                                                                   |                                        |     |
| f <sub>p</sub>                                              | 1.00                        |                                  | E <sub>R</sub>                                                                                    | 1.2                                    |     |
| E <sub>T</sub>                                              | 1.5                         |                                  | f <sub>HV</sub> = 1/[1+P <sub>T</sub> (E <sub>T</sub> - 1) + P <sub>R</sub> (E <sub>R</sub> - 1)] | 0.985                                  |     |
| <b>Speed Inputs</b>                                         |                             |                                  | <b>Calc Speed Adj and FFS</b>                                                                     |                                        |     |
| Lane Width                                                  | 12.0                        | ft                               |                                                                                                   |                                        |     |
| Rt-Side Lat. Clearance                                      | 6.0                         | ft                               | f <sub>LW</sub>                                                                                   | 0.0                                    | mph |
| Number of Lanes, N                                          | 2                           |                                  | f <sub>LC</sub>                                                                                   | 0.0                                    | mph |
| Total Ramp Density, TRD                                     | 1.70                        | ramps/mi                         | TRD Adjustment                                                                                    | 5.0                                    | mph |
| FFS (measured)                                              |                             | mph                              | FFS                                                                                               | 70.4                                   | mph |
| Base free-flow Speed, BFFS                                  | 75.4                        | mph                              |                                                                                                   |                                        |     |
| <b>LOS and Performance Measures</b>                         |                             |                                  | <b>Design (N)</b>                                                                                 |                                        |     |
| <u>Operational (LOS)</u>                                    |                             |                                  | <u>Design (N)</u>                                                                                 |                                        |     |
| v <sub>p</sub> = (V or DDHV) / (PHF x N x f <sub>HV</sub> ) |                             |                                  | Design LOS                                                                                        |                                        |     |
|                                                             | 1858                        | pc/h/ln                          | v <sub>p</sub> = (V or DDHV) / (PHF x N x f <sub>HV</sub> )                                       |                                        |     |
| x f <sub>p</sub> )                                          |                             |                                  | pc/h/ln                                                                                           |                                        |     |
| S                                                           | 65.0                        | mph                              | x f <sub>p</sub> )                                                                                |                                        |     |
| D = v <sub>p</sub> / S                                      | 28.6                        | pc/mi/ln                         | S                                                                                                 |                                        |     |
| LOS                                                         | D                           |                                  | D = v <sub>p</sub> / S                                                                            |                                        |     |
|                                                             |                             |                                  | pc/mi/ln                                                                                          |                                        |     |
|                                                             |                             |                                  | Required Number of Lanes, N                                                                       |                                        |     |
| <b>Glossary</b>                                             |                             |                                  | <b>Factor Location</b>                                                                            |                                        |     |
| N - Number of lanes                                         | S - Speed                   |                                  | E <sub>R</sub> - Exhibits 11-10, 11-12                                                            | f <sub>LW</sub> - Exhibit 11-8         |     |
| V - Hourly volume                                           | D - Density                 |                                  | E <sub>T</sub> - Exhibits 11-10, 11-11, 11-13                                                     | f <sub>LC</sub> - Exhibit 11-9         |     |
| v <sub>p</sub> - Flow rate                                  | FFS - Free-flow speed       |                                  | f <sub>p</sub> - Page 11-18                                                                       | TRD - Page 11-11                       |     |
| LOS - Level of service                                      | BFFS - Base free-flow speed |                                  | LOS, S, FFS, v <sub>p</sub> - Exhibits 11-2, 11-3                                                 |                                        |     |
| DDHV - Directional design hour volume                       |                             |                                  |                                                                                                   |                                        |     |

| BASIC FREEWAY SEGMENTS WORKSHEET                                             |                             |                                  |                                                                                                   |                                        |     |
|------------------------------------------------------------------------------|-----------------------------|----------------------------------|---------------------------------------------------------------------------------------------------|----------------------------------------|-----|
| <b>General Information</b>                                                   |                             |                                  | <b>Site Information</b>                                                                           |                                        |     |
| Analyst                                                                      | MTD                         |                                  | Highway/Direction of Travel I-95 NB                                                               |                                        |     |
| Agency or Company                                                            | Pennoni                     |                                  | From/To NJ Rt. 29 to Bear Tavern Road                                                             |                                        |     |
| Date Performed                                                               | 8/13/2015                   |                                  | Jurisdiction NJDOT                                                                                |                                        |     |
| Analysis Time Period                                                         | AM Peak                     |                                  | Analysis Year 2015                                                                                |                                        |     |
| Project Description Pre-Construction Traffic Study                           |                             |                                  |                                                                                                   |                                        |     |
| <input checked="" type="checkbox"/> Oper.(LOS)                               |                             | <input type="checkbox"/> Des.(N) |                                                                                                   | <input type="checkbox"/> Planning Data |     |
| <b>Flow Inputs</b>                                                           |                             |                                  |                                                                                                   |                                        |     |
| Volume, V                                                                    | 4310                        | veh/h                            | Peak-Hour Factor, PHF                                                                             | 0.95                                   |     |
| AADT                                                                         |                             | veh/day                          | %Trucks and Buses, P <sub>T</sub>                                                                 | 2                                      |     |
| Peak-Hr Prop. of AADT, K                                                     |                             |                                  | %RVs, P <sub>R</sub>                                                                              | 0                                      |     |
| Peak-Hr Direction Prop, D                                                    |                             |                                  | General Terrain:                                                                                  | Level                                  |     |
| DDHV = AADT x K x D                                                          |                             | veh/h                            | Grade % Length                                                                                    | mi                                     |     |
|                                                                              |                             |                                  | Up/Down %                                                                                         |                                        |     |
| <b>Calculate Flow Adjustments</b>                                            |                             |                                  |                                                                                                   |                                        |     |
| f <sub>p</sub>                                                               | 1.00                        |                                  | E <sub>R</sub>                                                                                    | 1.2                                    |     |
| E <sub>T</sub>                                                               | 1.5                         |                                  | f <sub>HV</sub> = 1/[1+P <sub>T</sub> (E <sub>T</sub> - 1) + P <sub>R</sub> (E <sub>R</sub> - 1)] | 0.990                                  |     |
| <b>Speed Inputs</b>                                                          |                             |                                  | <b>Calc Speed Adj and FFS</b>                                                                     |                                        |     |
| Lane Width                                                                   | 12.0                        | ft                               |                                                                                                   |                                        |     |
| Rt-Side Lat. Clearance                                                       | 6.0                         | ft                               | f <sub>LW</sub>                                                                                   | 0.0                                    | mph |
| Number of Lanes, N                                                           | 3                           |                                  | f <sub>LC</sub>                                                                                   | 0.0                                    | mph |
| Total Ramp Density, TRD                                                      | 1.80                        | ramps/mi                         | TRD Adjustment                                                                                    | 5.3                                    | mph |
| FFS (measured)                                                               |                             | mph                              | FFS                                                                                               | 70.1                                   | mph |
| Base free-flow Speed, BFFS                                                   | 75.4                        | mph                              |                                                                                                   |                                        |     |
| <b>LOS and Performance Measures</b>                                          |                             |                                  | <b>Design (N)</b>                                                                                 |                                        |     |
| <u>Operational (LOS)</u>                                                     |                             |                                  | <u>Design (N)</u>                                                                                 |                                        |     |
| v <sub>p</sub> = (V or DDHV) / (PHF x N x f <sub>HV</sub> x f <sub>p</sub> ) |                             |                                  | Design LOS                                                                                        |                                        |     |
|                                                                              | 1527                        | pc/h/ln                          | v <sub>p</sub> = (V or DDHV) / (PHF x N x f <sub>HV</sub> x f <sub>p</sub> )                      |                                        |     |
| S                                                                            | 68.8                        | mph                              | S                                                                                                 |                                        |     |
| D = v <sub>p</sub> / S                                                       | 22.2                        | pc/mi/ln                         | D = v <sub>p</sub> / S                                                                            |                                        |     |
| LOS                                                                          | C                           |                                  | Required Number of Lanes, N                                                                       |                                        |     |
| <b>Glossary</b>                                                              |                             |                                  | <b>Factor Location</b>                                                                            |                                        |     |
| N - Number of lanes                                                          | S - Speed                   |                                  | E <sub>R</sub> - Exhibits 11-10, 11-12                                                            | f <sub>LW</sub> - Exhibit 11-8         |     |
| V - Hourly volume                                                            | D - Density                 |                                  | E <sub>T</sub> - Exhibits 11-10, 11-11, 11-13                                                     | f <sub>LC</sub> - Exhibit 11-9         |     |
| v <sub>p</sub> - Flow rate                                                   | FFS - Free-flow speed       |                                  | f <sub>p</sub> - Page 11-18                                                                       | TRD - Page 11-11                       |     |
| LOS - Level of service                                                       | BFFS - Base free-flow speed |                                  | LOS, S, FFS, v <sub>p</sub> - Exhibits 11-2, 11-3                                                 |                                        |     |
| DDHV - Directional design hour volume                                        |                             |                                  |                                                                                                   |                                        |     |

| BASIC FREEWAY SEGMENTS WORKSHEET                            |                             |                                  |                                                                                                   |                                        |                                |
|-------------------------------------------------------------|-----------------------------|----------------------------------|---------------------------------------------------------------------------------------------------|----------------------------------------|--------------------------------|
| <b>General Information</b>                                  |                             |                                  | <b>Site Information</b>                                                                           |                                        |                                |
| Analyst                                                     | MTD                         |                                  | Highway/Direction of Travel I-95 SB                                                               |                                        |                                |
| Agency or Company                                           | Pennoni                     |                                  | From/To NJ Rt. 29 to Bear Tavern Road                                                             |                                        |                                |
| Date Performed                                              | 8/13/2015                   |                                  | Jurisdiction NJDOT                                                                                |                                        |                                |
| Analysis Time Period                                        | AM Peak                     |                                  | Analysis Year 2015                                                                                |                                        |                                |
| Project Description Pre-Construction Traffic Study          |                             |                                  |                                                                                                   |                                        |                                |
| <input checked="" type="checkbox"/> Oper.(LOS)              |                             | <input type="checkbox"/> Des.(N) |                                                                                                   | <input type="checkbox"/> Planning Data |                                |
| <b>Flow Inputs</b>                                          |                             |                                  |                                                                                                   |                                        |                                |
| Volume, V                                                   | 1772                        | veh/h                            | Peak-Hour Factor, PHF                                                                             | 0.97                                   |                                |
| AADT                                                        |                             | veh/day                          | %Trucks and Buses, P <sub>T</sub>                                                                 | 4                                      |                                |
| Peak-Hr Prop. of AADT, K                                    |                             |                                  | %RVs, P <sub>R</sub>                                                                              | 0                                      |                                |
| Peak-Hr Direction Prop, D                                   |                             |                                  | General Terrain:                                                                                  | Level                                  |                                |
| DDHV = AADT x K x D                                         |                             | veh/h                            | Grade % Length                                                                                    | mi                                     |                                |
|                                                             |                             |                                  | Up/Down %                                                                                         |                                        |                                |
| <b>Calculate Flow Adjustments</b>                           |                             |                                  |                                                                                                   |                                        |                                |
| f <sub>p</sub>                                              | 1.00                        |                                  | E <sub>R</sub>                                                                                    | 1.2                                    |                                |
| E <sub>T</sub>                                              | 1.5                         |                                  | f <sub>HV</sub> = 1/[1+P <sub>T</sub> (E <sub>T</sub> - 1) + P <sub>R</sub> (E <sub>R</sub> - 1)] | 0.980                                  |                                |
| <b>Speed Inputs</b>                                         |                             |                                  | <b>Calc Speed Adj and FFS</b>                                                                     |                                        |                                |
| Lane Width                                                  | 12.0                        | ft                               |                                                                                                   |                                        |                                |
| Rt-Side Lat. Clearance                                      | 6.0                         | ft                               | f <sub>LW</sub>                                                                                   | 0.0                                    | mph                            |
| Number of Lanes, N                                          | 3                           |                                  | f <sub>LC</sub>                                                                                   | 0.0                                    | mph                            |
| Total Ramp Density, TRD                                     | 1.80                        | ramps/mi                         | TRD Adjustment                                                                                    | 5.3                                    | mph                            |
| FFS (measured)                                              |                             | mph                              | FFS                                                                                               | 70.1                                   | mph                            |
| Base free-flow Speed, BFFS                                  | 75.4                        | mph                              |                                                                                                   |                                        |                                |
| <b>LOS and Performance Measures</b>                         |                             |                                  | <b>Design (N)</b>                                                                                 |                                        |                                |
| <u>Operational (LOS)</u>                                    |                             |                                  | <u>Design (N)</u>                                                                                 |                                        |                                |
| v <sub>p</sub> = (V or DDHV) / (PHF x N x f <sub>HV</sub> ) |                             |                                  | Design LOS                                                                                        |                                        |                                |
| v <sub>p</sub>                                              |                             | 621 pc/h/ln                      | v <sub>p</sub> = (V or DDHV) / (PHF x N x f <sub>HV</sub> )                                       |                                        | pc/h/ln                        |
| S                                                           |                             | 70.0 mph                         | x f <sub>p</sub> )                                                                                |                                        |                                |
| D = v <sub>p</sub> / S                                      |                             | 8.9 pc/mi/ln                     | S                                                                                                 |                                        | mph                            |
| LOS                                                         |                             | A                                | D = v <sub>p</sub> / S                                                                            |                                        | pc/mi/ln                       |
|                                                             |                             |                                  | Required Number of Lanes, N                                                                       |                                        |                                |
| <b>Glossary</b>                                             |                             |                                  | <b>Factor Location</b>                                                                            |                                        |                                |
| N - Number of lanes                                         | S - Speed                   |                                  | E <sub>R</sub> - Exhibits 11-10, 11-12                                                            |                                        | f <sub>LW</sub> - Exhibit 11-8 |
| V - Hourly volume                                           | D - Density                 |                                  | E <sub>T</sub> - Exhibits 11-10, 11-11, 11-13                                                     |                                        | f <sub>LC</sub> - Exhibit 11-9 |
| v <sub>p</sub> - Flow rate                                  | FFS - Free-flow speed       |                                  | f <sub>p</sub> - Page 11-18                                                                       |                                        | TRD - Page 11-11               |
| LOS - Level of service                                      | BFFS - Base free-flow speed |                                  | LOS, S, FFS, v <sub>p</sub> - Exhibits 11-2, 11-3                                                 |                                        |                                |
| DDHV - Directional design hour volume                       |                             |                                  |                                                                                                   |                                        |                                |

| BASIC FREEWAY SEGMENTS WORKSHEET                            |                             |                                  |                                                                                                   |                                        |     |
|-------------------------------------------------------------|-----------------------------|----------------------------------|---------------------------------------------------------------------------------------------------|----------------------------------------|-----|
| <b>General Information</b>                                  |                             |                                  | <b>Site Information</b>                                                                           |                                        |     |
| Analyst                                                     | MTD                         |                                  | Highway/Direction of Travel I-95 NB                                                               |                                        |     |
| Agency or Company                                           | Pennoni                     |                                  | From/To NJ Rt. 29 to Bear Tavern Road                                                             |                                        |     |
| Date Performed                                              | 8/13/2015                   |                                  | Jurisdiction NJDOT                                                                                |                                        |     |
| Analysis Time Period                                        | PM Peak                     |                                  | Analysis Year 2015                                                                                |                                        |     |
| Project Description Pre-Construction Traffic Study          |                             |                                  |                                                                                                   |                                        |     |
| <input checked="" type="checkbox"/> Oper.(LOS)              |                             | <input type="checkbox"/> Des.(N) |                                                                                                   | <input type="checkbox"/> Planning Data |     |
| <b>Flow Inputs</b>                                          |                             |                                  |                                                                                                   |                                        |     |
| Volume, V                                                   | 1753                        | veh/h                            | Peak-Hour Factor, PHF                                                                             | 0.97                                   |     |
| AADT                                                        |                             | veh/day                          | %Trucks and Buses, P <sub>T</sub>                                                                 | 2                                      |     |
| Peak-Hr Prop. of AADT, K                                    |                             |                                  | %RVs, P <sub>R</sub>                                                                              | 0                                      |     |
| Peak-Hr Direction Prop, D                                   |                             |                                  | General Terrain:                                                                                  | Level                                  |     |
| DDHV = AADT x K x D                                         |                             | veh/h                            | Grade % Length                                                                                    | mi                                     |     |
|                                                             |                             |                                  | Up/Down %                                                                                         |                                        |     |
| <b>Calculate Flow Adjustments</b>                           |                             |                                  |                                                                                                   |                                        |     |
| f <sub>p</sub>                                              | 1.00                        |                                  | E <sub>R</sub>                                                                                    | 1.2                                    |     |
| E <sub>T</sub>                                              | 1.5                         |                                  | f <sub>HV</sub> = 1/[1+P <sub>T</sub> (E <sub>T</sub> - 1) + P <sub>R</sub> (E <sub>R</sub> - 1)] | 0.990                                  |     |
| <b>Speed Inputs</b>                                         |                             |                                  | <b>Calc Speed Adj and FFS</b>                                                                     |                                        |     |
| Lane Width                                                  | 12.0                        | ft                               |                                                                                                   |                                        |     |
| Rt-Side Lat. Clearance                                      | 6.0                         | ft                               | f <sub>LW</sub>                                                                                   | 0.0                                    | mph |
| Number of Lanes, N                                          | 3                           |                                  | f <sub>LC</sub>                                                                                   | 0.0                                    | mph |
| Total Ramp Density, TRD                                     | 1.80                        | ramps/mi                         | TRD Adjustment                                                                                    | 5.3                                    | mph |
| FFS (measured)                                              |                             | mph                              | FFS                                                                                               | 70.1                                   | mph |
| Base free-flow Speed, BFFS                                  | 75.4                        | mph                              |                                                                                                   |                                        |     |
| <b>LOS and Performance Measures</b>                         |                             |                                  | <b>Design (N)</b>                                                                                 |                                        |     |
| <u>Operational (LOS)</u>                                    |                             |                                  | <u>Design (N)</u>                                                                                 |                                        |     |
| v <sub>p</sub> = (V or DDHV) / (PHF x N x f <sub>HV</sub> ) |                             |                                  | Design LOS                                                                                        |                                        |     |
|                                                             | 608                         | pc/h/ln                          | v <sub>p</sub> = (V or DDHV) / (PHF x N x f <sub>HV</sub> )                                       |                                        |     |
| x f <sub>p</sub> )                                          |                             |                                  | pc/h/ln                                                                                           |                                        |     |
| S                                                           | 70.0                        | mph                              | x f <sub>p</sub> )                                                                                |                                        |     |
| D = v <sub>p</sub> / S                                      | 8.7                         | pc/mi/ln                         | S                                                                                                 |                                        |     |
| LOS                                                         | A                           |                                  | D = v <sub>p</sub> / S                                                                            |                                        |     |
|                                                             |                             |                                  | pc/mi/ln                                                                                          |                                        |     |
|                                                             |                             |                                  | Required Number of Lanes, N                                                                       |                                        |     |
| <b>Glossary</b>                                             |                             |                                  | <b>Factor Location</b>                                                                            |                                        |     |
| N - Number of lanes                                         | S - Speed                   |                                  | E <sub>R</sub> - Exhibits 11-10, 11-12                                                            | f <sub>LW</sub> - Exhibit 11-8         |     |
| V - Hourly volume                                           | D - Density                 |                                  | E <sub>T</sub> - Exhibits 11-10, 11-11, 11-13                                                     | f <sub>LC</sub> - Exhibit 11-9         |     |
| v <sub>p</sub> - Flow rate                                  | FFS - Free-flow speed       |                                  | f <sub>p</sub> - Page 11-18                                                                       | TRD - Page 11-11                       |     |
| LOS - Level of service                                      | BFFS - Base free-flow speed |                                  | LOS, S, FFS, v <sub>p</sub> - Exhibits 11-2, 11-3                                                 |                                        |     |
| DDHV - Directional design hour volume                       |                             |                                  |                                                                                                   |                                        |     |

| BASIC FREEWAY SEGMENTS WORKSHEET                                             |                             |                                  |                                                                                                   |                                        |     |
|------------------------------------------------------------------------------|-----------------------------|----------------------------------|---------------------------------------------------------------------------------------------------|----------------------------------------|-----|
| <b>General Information</b>                                                   |                             |                                  | <b>Site Information</b>                                                                           |                                        |     |
| Analyst                                                                      | MTD                         |                                  | Highway/Direction of Travel I-95 SB                                                               |                                        |     |
| Agency or Company                                                            | Pennoni                     |                                  | From/To NJ Rt. 29 to Bear Tavern Road                                                             |                                        |     |
| Date Performed                                                               | 8/13/2015                   |                                  | Jurisdiction NJDOT                                                                                |                                        |     |
| Analysis Time Period                                                         | PM Peak                     |                                  | Analysis Year 2015                                                                                |                                        |     |
| Project Description Pre-Construction Traffic Study                           |                             |                                  |                                                                                                   |                                        |     |
| <input checked="" type="checkbox"/> Oper.(LOS)                               |                             | <input type="checkbox"/> Des.(N) |                                                                                                   | <input type="checkbox"/> Planning Data |     |
| <b>Flow Inputs</b>                                                           |                             |                                  |                                                                                                   |                                        |     |
| Volume, V                                                                    | 4286                        | veh/h                            | Peak-Hour Factor, PHF                                                                             | 0.95                                   |     |
| AADT                                                                         |                             | veh/day                          | %Trucks and Buses, P <sub>T</sub>                                                                 | 2                                      |     |
| Peak-Hr Prop. of AADT, K                                                     |                             |                                  | %RVs, P <sub>R</sub>                                                                              | 0                                      |     |
| Peak-Hr Direction Prop, D                                                    |                             |                                  | General Terrain:                                                                                  | Level                                  |     |
| DDHV = AADT x K x D                                                          |                             | veh/h                            | Grade % Length                                                                                    | mi                                     |     |
|                                                                              |                             |                                  | Up/Down %                                                                                         |                                        |     |
| <b>Calculate Flow Adjustments</b>                                            |                             |                                  |                                                                                                   |                                        |     |
| f <sub>p</sub>                                                               | 1.00                        |                                  | E <sub>R</sub>                                                                                    | 1.2                                    |     |
| E <sub>T</sub>                                                               | 1.5                         |                                  | f <sub>HV</sub> = 1/[1+P <sub>T</sub> (E <sub>T</sub> - 1) + P <sub>R</sub> (E <sub>R</sub> - 1)] | 0.990                                  |     |
| <b>Speed Inputs</b>                                                          |                             |                                  | <b>Calc Speed Adj and FFS</b>                                                                     |                                        |     |
| Lane Width                                                                   | 12.0                        | ft                               |                                                                                                   |                                        |     |
| Rt-Side Lat. Clearance                                                       | 6.0                         | ft                               | f <sub>LW</sub>                                                                                   | 0.0                                    | mph |
| Number of Lanes, N                                                           | 3                           |                                  | f <sub>LC</sub>                                                                                   | 0.0                                    | mph |
| Total Ramp Density, TRD                                                      | 1.80                        | ramps/mi                         | TRD Adjustment                                                                                    | 5.3                                    | mph |
| FFS (measured)                                                               |                             | mph                              | FFS                                                                                               | 70.1                                   | mph |
| Base free-flow Speed, BFFS                                                   | 75.4                        | mph                              |                                                                                                   |                                        |     |
| <b>LOS and Performance Measures</b>                                          |                             |                                  | <b>Design (N)</b>                                                                                 |                                        |     |
| <u>Operational (LOS)</u>                                                     |                             |                                  | <u>Design (N)</u>                                                                                 |                                        |     |
| v <sub>p</sub> = (V or DDHV) / (PHF x N x f <sub>HV</sub> x f <sub>p</sub> ) |                             |                                  | Design LOS                                                                                        |                                        |     |
|                                                                              | 1519                        | pc/h/ln                          | v <sub>p</sub> = (V or DDHV) / (PHF x N x f <sub>HV</sub> x f <sub>p</sub> )                      |                                        |     |
| S                                                                            | 68.8                        | mph                              | S                                                                                                 |                                        |     |
| D = v <sub>p</sub> / S                                                       | 22.1                        | pc/mi/ln                         | D = v <sub>p</sub> / S                                                                            |                                        |     |
| LOS                                                                          | C                           |                                  | Required Number of Lanes, N                                                                       |                                        |     |
| <b>Glossary</b>                                                              |                             |                                  | <b>Factor Location</b>                                                                            |                                        |     |
| N - Number of lanes                                                          | S - Speed                   |                                  | E <sub>R</sub> - Exhibits 11-10, 11-12                                                            | f <sub>LW</sub> - Exhibit 11-8         |     |
| V - Hourly volume                                                            | D - Density                 |                                  | E <sub>T</sub> - Exhibits 11-10, 11-11, 11-13                                                     | f <sub>LC</sub> - Exhibit 11-9         |     |
| v <sub>p</sub> - Flow rate                                                   | FFS - Free-flow speed       |                                  | f <sub>p</sub> - Page 11-18                                                                       | TRD - Page 11-11                       |     |
| LOS - Level of service                                                       | BFFS - Base free-flow speed |                                  | LOS, S, FFS, v <sub>p</sub> - Exhibits 11-2, 11-3                                                 |                                        |     |
| DDHV - Directional design hour volume                                        |                             |                                  |                                                                                                   |                                        |     |

| BASIC FREEWAY SEGMENTS WORKSHEET                                             |                             |                                  |                                                                                                   |                                        |     |
|------------------------------------------------------------------------------|-----------------------------|----------------------------------|---------------------------------------------------------------------------------------------------|----------------------------------------|-----|
| <b>General Information</b>                                                   |                             |                                  | <b>Site Information</b>                                                                           |                                        |     |
| Analyst                                                                      | MTD                         |                                  | Highway/Direction of Travel I-95 NB                                                               |                                        |     |
| Agency or Company                                                            | Pennoni                     |                                  | From/To Bear Tavern Rd to Scotch Rd                                                               |                                        |     |
| Date Performed                                                               | 8/14/2015                   |                                  | Jurisdiction NJDOT                                                                                |                                        |     |
| Analysis Time Period                                                         | AM Peak                     |                                  | Analysis Year 2015                                                                                |                                        |     |
| Project Description Pre-Construction Traffic Study                           |                             |                                  |                                                                                                   |                                        |     |
| <input checked="" type="checkbox"/> Oper.(LOS)                               |                             | <input type="checkbox"/> Des.(N) |                                                                                                   | <input type="checkbox"/> Planning Data |     |
| <b>Flow Inputs</b>                                                           |                             |                                  |                                                                                                   |                                        |     |
| Volume, V                                                                    | 4267                        | veh/h                            | Peak-Hour Factor, PHF                                                                             | 0.97                                   |     |
| AADT                                                                         |                             | veh/day                          | %Trucks and Buses, P <sub>T</sub>                                                                 | 2                                      |     |
| Peak-Hr Prop. of AADT, K                                                     |                             |                                  | %RVs, P <sub>R</sub>                                                                              | 0                                      |     |
| Peak-Hr Direction Prop, D                                                    |                             |                                  | General Terrain:                                                                                  | Level                                  |     |
| DDHV = AADT x K x D                                                          |                             | veh/h                            | Grade % Length                                                                                    | mi                                     |     |
|                                                                              |                             |                                  | Up/Down %                                                                                         |                                        |     |
| <b>Calculate Flow Adjustments</b>                                            |                             |                                  |                                                                                                   |                                        |     |
| f <sub>p</sub>                                                               | 1.00                        |                                  | E <sub>R</sub>                                                                                    | 1.2                                    |     |
| E <sub>T</sub>                                                               | 1.5                         |                                  | f <sub>HV</sub> = 1/[1+P <sub>T</sub> (E <sub>T</sub> - 1) + P <sub>R</sub> (E <sub>R</sub> - 1)] | 0.990                                  |     |
| <b>Speed Inputs</b>                                                          |                             |                                  | <b>Calc Speed Adj and FFS</b>                                                                     |                                        |     |
| Lane Width                                                                   | 12.0                        | ft                               |                                                                                                   |                                        |     |
| Rt-Side Lat. Clearance                                                       | 6.0                         | ft                               | f <sub>LW</sub>                                                                                   | 0.0                                    | mph |
| Number of Lanes, N                                                           | 3                           |                                  | f <sub>LC</sub>                                                                                   | 0.0                                    | mph |
| Total Ramp Density, TRD                                                      | 2.30                        | ramps/mi                         | TRD Adjustment                                                                                    | 6.5                                    | mph |
| FFS (measured)                                                               |                             | mph                              | FFS                                                                                               | 68.9                                   | mph |
| Base free-flow Speed, BFFS                                                   | 75.4                        | mph                              |                                                                                                   |                                        |     |
| <b>LOS and Performance Measures</b>                                          |                             |                                  | <b>Design (N)</b>                                                                                 |                                        |     |
| <u>Operational (LOS)</u>                                                     |                             |                                  | <u>Design (N)</u>                                                                                 |                                        |     |
| v <sub>p</sub> = (V or DDHV) / (PHF x N x f <sub>HV</sub> x f <sub>p</sub> ) |                             |                                  | Design LOS                                                                                        |                                        |     |
|                                                                              | 1481                        | pc/h/ln                          | v <sub>p</sub> = (V or DDHV) / (PHF x N x f <sub>HV</sub> x f <sub>p</sub> )                      |                                        |     |
| S                                                                            | 69.1                        | mph                              | S                                                                                                 |                                        |     |
| D = v <sub>p</sub> / S                                                       | 21.4                        | pc/mi/ln                         | D = v <sub>p</sub> / S                                                                            |                                        |     |
| LOS                                                                          | C                           |                                  | Required Number of Lanes, N                                                                       |                                        |     |
| <b>Glossary</b>                                                              |                             |                                  | <b>Factor Location</b>                                                                            |                                        |     |
| N - Number of lanes                                                          | S - Speed                   |                                  | E <sub>R</sub> - Exhibits 11-10, 11-12                                                            | f <sub>LW</sub> - Exhibit 11-8         |     |
| V - Hourly volume                                                            | D - Density                 |                                  | E <sub>T</sub> - Exhibits 11-10, 11-11, 11-13                                                     | f <sub>LC</sub> - Exhibit 11-9         |     |
| v <sub>p</sub> - Flow rate                                                   | FFS - Free-flow speed       |                                  | f <sub>p</sub> - Page 11-18                                                                       | TRD - Page 11-11                       |     |
| LOS - Level of service                                                       | BFFS - Base free-flow speed |                                  | LOS, S, FFS, v <sub>p</sub> - Exhibits 11-2, 11-3                                                 |                                        |     |
| DDHV - Directional design hour volume                                        |                             |                                  |                                                                                                   |                                        |     |

| BASIC FREEWAY SEGMENTS WORKSHEET                            |                             |                                  |                                                                                                   |                                        |     |
|-------------------------------------------------------------|-----------------------------|----------------------------------|---------------------------------------------------------------------------------------------------|----------------------------------------|-----|
| <b>General Information</b>                                  |                             |                                  | <b>Site Information</b>                                                                           |                                        |     |
| Analyst                                                     | MTD                         |                                  | Highway/Direction of Travel I-95 SB                                                               |                                        |     |
| Agency or Company                                           | Pennoni                     |                                  | From/To Bear Tavern Rd to Scotch Rd                                                               |                                        |     |
| Date Performed                                              | 8/14/2015                   |                                  | Jurisdiction NJDOT                                                                                |                                        |     |
| Analysis Time Period                                        | AM Peak                     |                                  | Analysis Year 2015                                                                                |                                        |     |
| Project Description Pre-Construction Traffic Study          |                             |                                  |                                                                                                   |                                        |     |
| <input checked="" type="checkbox"/> Oper.(LOS)              |                             | <input type="checkbox"/> Des.(N) |                                                                                                   | <input type="checkbox"/> Planning Data |     |
| <b>Flow Inputs</b>                                          |                             |                                  |                                                                                                   |                                        |     |
| Volume, V                                                   | 1953                        | veh/h                            | Peak-Hour Factor, PHF                                                                             | 0.92                                   |     |
| AADT                                                        |                             | veh/day                          | %Trucks and Buses, P <sub>T</sub>                                                                 | 8                                      |     |
| Peak-Hr Prop. of AADT, K                                    |                             |                                  | %RVs, P <sub>R</sub>                                                                              | 0                                      |     |
| Peak-Hr Direction Prop, D                                   |                             |                                  | General Terrain:                                                                                  | Level                                  |     |
| DDHV = AADT x K x D                                         |                             | veh/h                            | Grade % Length                                                                                    | mi                                     |     |
|                                                             |                             |                                  | Up/Down %                                                                                         |                                        |     |
| <b>Calculate Flow Adjustments</b>                           |                             |                                  |                                                                                                   |                                        |     |
| f <sub>p</sub>                                              | 1.00                        |                                  | E <sub>R</sub>                                                                                    | 1.2                                    |     |
| E <sub>T</sub>                                              | 1.5                         |                                  | f <sub>HV</sub> = 1/[1+P <sub>T</sub> (E <sub>T</sub> - 1) + P <sub>R</sub> (E <sub>R</sub> - 1)] | 0.962                                  |     |
| <b>Speed Inputs</b>                                         |                             |                                  | <b>Calc Speed Adj and FFS</b>                                                                     |                                        |     |
| Lane Width                                                  | 12.0                        | ft                               |                                                                                                   |                                        |     |
| Rt-Side Lat. Clearance                                      | 6.0                         | ft                               | f <sub>LW</sub>                                                                                   | 0.0                                    | mph |
| Number of Lanes, N                                          | 3                           |                                  | f <sub>LC</sub>                                                                                   | 0.0                                    | mph |
| Total Ramp Density, TRD                                     | 2.50                        | ramps/mi                         | TRD Adjustment                                                                                    | 7.0                                    | mph |
| FFS (measured)                                              |                             | mph                              | FFS                                                                                               | 68.4                                   | mph |
| Base free-flow Speed, BFFS                                  | 75.4                        | mph                              |                                                                                                   |                                        |     |
| <b>LOS and Performance Measures</b>                         |                             |                                  | <b>Design (N)</b>                                                                                 |                                        |     |
| <u>Operational (LOS)</u>                                    |                             |                                  | <u>Design (N)</u>                                                                                 |                                        |     |
| v <sub>p</sub> = (V or DDHV) / (PHF x N x f <sub>HV</sub> ) |                             |                                  | Design LOS                                                                                        |                                        |     |
|                                                             | 736                         | pc/h/ln                          | v <sub>p</sub> = (V or DDHV) / (PHF x N x f <sub>HV</sub> )                                       |                                        |     |
| x f <sub>p</sub> )                                          |                             |                                  | x f <sub>p</sub> )                                                                                |                                        |     |
| S                                                           | 70.0                        | mph                              | S                                                                                                 |                                        |     |
| D = v <sub>p</sub> / S                                      | 10.5                        | pc/mi/ln                         | D = v <sub>p</sub> / S                                                                            |                                        |     |
| LOS                                                         | A                           |                                  | Required Number of Lanes, N                                                                       |                                        |     |
| <b>Glossary</b>                                             |                             |                                  | <b>Factor Location</b>                                                                            |                                        |     |
| N - Number of lanes                                         | S - Speed                   |                                  | E <sub>R</sub> - Exhibits 11-10, 11-12                                                            | f <sub>LW</sub> - Exhibit 11-8         |     |
| V - Hourly volume                                           | D - Density                 |                                  | E <sub>T</sub> - Exhibits 11-10, 11-11, 11-13                                                     | f <sub>LC</sub> - Exhibit 11-9         |     |
| v <sub>p</sub> - Flow rate                                  | FFS - Free-flow speed       |                                  | f <sub>p</sub> - Page 11-18                                                                       | TRD - Page 11-11                       |     |
| LOS - Level of service                                      | BFFS - Base free-flow speed |                                  | LOS, S, FFS, v <sub>p</sub> - Exhibits 11-2, 11-3                                                 |                                        |     |
| DDHV - Directional design hour volume                       |                             |                                  |                                                                                                   |                                        |     |

| BASIC FREEWAY SEGMENTS WORKSHEET                            |           |                                  |                                                                                                   |                                        |          |
|-------------------------------------------------------------|-----------|----------------------------------|---------------------------------------------------------------------------------------------------|----------------------------------------|----------|
| <b>General Information</b>                                  |           |                                  | <b>Site Information</b>                                                                           |                                        |          |
| Analyst                                                     | MTD       |                                  | Highway/Direction of Travel I-95 NB                                                               |                                        |          |
| Agency or Company                                           | Pennoni   |                                  | From/To Bear Tavern Rd to Scotch Rd                                                               |                                        |          |
| Date Performed                                              | 8/14/2015 |                                  | Jurisdiction NJDOT                                                                                |                                        |          |
| Analysis Time Period                                        | PM Peak   |                                  | Analysis Year 2015                                                                                |                                        |          |
| Project Description Pre-Construction Traffic Study          |           |                                  |                                                                                                   |                                        |          |
| <input checked="" type="checkbox"/> Oper.(LOS)              |           | <input type="checkbox"/> Des.(N) |                                                                                                   | <input type="checkbox"/> Planning Data |          |
| <b>Flow Inputs</b>                                          |           |                                  |                                                                                                   |                                        |          |
| Volume, V                                                   | 2035      | veh/h                            | Peak-Hour Factor, PHF                                                                             | 0.99                                   |          |
| AADT                                                        |           | veh/day                          | %Trucks and Buses, P <sub>T</sub>                                                                 | 2                                      |          |
| Peak-Hr Prop. of AADT, K                                    |           |                                  | %RVs, P <sub>R</sub>                                                                              | 0                                      |          |
| Peak-Hr Direction Prop, D                                   |           |                                  | General Terrain:                                                                                  | Level                                  |          |
| DDHV = AADT x K x D                                         |           | veh/h                            | Grade % Length                                                                                    | mi                                     |          |
|                                                             |           |                                  | Up/Down %                                                                                         |                                        |          |
| <b>Calculate Flow Adjustments</b>                           |           |                                  |                                                                                                   |                                        |          |
| f <sub>p</sub>                                              | 1.00      |                                  | E <sub>R</sub>                                                                                    | 1.2                                    |          |
| E <sub>T</sub>                                              | 1.5       |                                  | f <sub>HV</sub> = 1/[1+P <sub>T</sub> (E <sub>T</sub> - 1) + P <sub>R</sub> (E <sub>R</sub> - 1)] | 0.990                                  |          |
| <b>Speed Inputs</b>                                         |           |                                  | <b>Calc Speed Adj and FFS</b>                                                                     |                                        |          |
| Lane Width                                                  | 12.0      | ft                               |                                                                                                   |                                        |          |
| Rt-Side Lat. Clearance                                      | 6.0       | ft                               | f <sub>LW</sub>                                                                                   | 0.0                                    | mph      |
| Number of Lanes, N                                          | 3         |                                  | f <sub>LC</sub>                                                                                   | 0.0                                    | mph      |
| Total Ramp Density, TRD                                     | 2.30      | ramps/mi                         | TRD Adjustment                                                                                    | 6.5                                    | mph      |
| FFS (measured)                                              |           | mph                              | FFS                                                                                               | 68.9                                   | mph      |
| Base free-flow Speed, BFFS                                  | 75.4      | mph                              |                                                                                                   |                                        |          |
| <b>LOS and Performance Measures</b>                         |           |                                  | <b>Design (N)</b>                                                                                 |                                        |          |
| <u>Operational (LOS)</u>                                    |           |                                  | <u>Design (N)</u>                                                                                 |                                        |          |
| v <sub>p</sub> = (V or DDHV) / (PHF x N x f <sub>HV</sub> ) |           |                                  | Design LOS                                                                                        |                                        |          |
| 692                                                         |           | pc/h/ln                          | v <sub>p</sub> = (V or DDHV) / (PHF x N x f <sub>HV</sub> )                                       |                                        | pc/h/ln  |
| x f <sub>p</sub> )                                          |           |                                  | x f <sub>p</sub> )                                                                                |                                        |          |
| S                                                           |           | 70.0 mph                         | S                                                                                                 |                                        | mph      |
| D = v <sub>p</sub> / S                                      |           | 9.9 pc/mi/ln                     | D = v <sub>p</sub> / S                                                                            |                                        | pc/mi/ln |
| LOS                                                         |           | A                                | Required Number of Lanes, N                                                                       |                                        |          |
| <b>Glossary</b>                                             |           |                                  | <b>Factor Location</b>                                                                            |                                        |          |
| N - Number of lanes                                         |           |                                  | E <sub>R</sub> - Exhibits 11-10, 11-12                                                            |                                        |          |
| S - Speed                                                   |           |                                  | f <sub>LW</sub> - Exhibit 11-8                                                                    |                                        |          |
| V - Hourly volume                                           |           |                                  | E <sub>T</sub> - Exhibits 11-10, 11-11, 11-13                                                     |                                        |          |
| D - Density                                                 |           |                                  | f <sub>LC</sub> - Exhibit 11-9                                                                    |                                        |          |
| v <sub>p</sub> - Flow rate                                  |           |                                  | f <sub>p</sub> - Page 11-18                                                                       |                                        |          |
| FFS - Free-flow speed                                       |           |                                  | TRD - Page 11-11                                                                                  |                                        |          |
| LOS - Level of service                                      |           |                                  | LOS, S, FFS, v <sub>p</sub> - Exhibits 11-2, 11-3                                                 |                                        |          |
| BFFS - Base free-flow speed                                 |           |                                  |                                                                                                   |                                        |          |
| DDHV - Directional design hour volume                       |           |                                  |                                                                                                   |                                        |          |



| BASIC FREEWAY SEGMENTS WORKSHEET                            |           |                                  |                                                                                                   |                                        |     |
|-------------------------------------------------------------|-----------|----------------------------------|---------------------------------------------------------------------------------------------------|----------------------------------------|-----|
| <b>General Information</b>                                  |           |                                  | <b>Site Information</b>                                                                           |                                        |     |
| Analyst                                                     | MTD       |                                  | Highway/Direction of Travel I-95 SB                                                               |                                        |     |
| Agency or Company                                           | Pennoni   |                                  | From/To Bear Tavern Rd to Scotch Rd                                                               |                                        |     |
| Date Performed                                              | 8/14/2015 |                                  | Jurisdiction NJDOT                                                                                |                                        |     |
| Analysis Time Period                                        | PM Peak   |                                  | Analysis Year 2015                                                                                |                                        |     |
| Project Description Pre-Construction Traffic Study          |           |                                  |                                                                                                   |                                        |     |
| <input checked="" type="checkbox"/> Oper.(LOS)              |           | <input type="checkbox"/> Des.(N) |                                                                                                   | <input type="checkbox"/> Planning Data |     |
| <b>Flow Inputs</b>                                          |           |                                  |                                                                                                   |                                        |     |
| Volume, V                                                   | 4109      | veh/h                            | Peak-Hour Factor, PHF                                                                             | 0.98                                   |     |
| AADT                                                        |           | veh/day                          | %Trucks and Buses, P <sub>T</sub>                                                                 | 3                                      |     |
| Peak-Hr Prop. of AADT, K                                    |           |                                  | %RVs, P <sub>R</sub>                                                                              | 0                                      |     |
| Peak-Hr Direction Prop, D                                   |           |                                  | General Terrain:                                                                                  | Level                                  |     |
| DDHV = AADT x K x D                                         |           | veh/h                            | Grade % Length                                                                                    | mi                                     |     |
|                                                             |           |                                  | Up/Down %                                                                                         |                                        |     |
| <b>Calculate Flow Adjustments</b>                           |           |                                  |                                                                                                   |                                        |     |
| f <sub>p</sub>                                              | 1.00      |                                  | E <sub>R</sub>                                                                                    | 1.2                                    |     |
| E <sub>T</sub>                                              | 1.5       |                                  | f <sub>HV</sub> = 1/[1+P <sub>T</sub> (E <sub>T</sub> - 1) + P <sub>R</sub> (E <sub>R</sub> - 1)] | 0.985                                  |     |
| <b>Speed Inputs</b>                                         |           |                                  | <b>Calc Speed Adj and FFS</b>                                                                     |                                        |     |
| Lane Width                                                  | 12.0      | ft                               |                                                                                                   |                                        |     |
| Rt-Side Lat. Clearance                                      | 6.0       | ft                               | f <sub>LW</sub>                                                                                   | 0.0                                    | mph |
| Number of Lanes, N                                          | 3         |                                  | f <sub>LC</sub>                                                                                   | 0.0                                    | mph |
| Total Ramp Density, TRD                                     | 2.50      | ramps/mi                         | TRD Adjustment                                                                                    | 7.0                                    | mph |
| FFS (measured)                                              |           | mph                              | FFS                                                                                               | 68.4                                   | mph |
| Base free-flow Speed, BFFS                                  | 75.4      | mph                              |                                                                                                   |                                        |     |
| <b>LOS and Performance Measures</b>                         |           |                                  | <b>Design (N)</b>                                                                                 |                                        |     |
| <u>Operational (LOS)</u>                                    |           |                                  | <u>Design (N)</u>                                                                                 |                                        |     |
| v <sub>p</sub> = (V or DDHV) / (PHF x N x f <sub>HV</sub> ) |           |                                  | Design LOS                                                                                        |                                        |     |
| 1419                                                        |           | pc/h/ln                          | v <sub>p</sub> = (V or DDHV) / (PHF x N x f <sub>HV</sub> )                                       |                                        |     |
| x f <sub>p</sub> )                                          |           |                                  | pc/h/ln                                                                                           |                                        |     |
| S                                                           |           | 69.4 mph                         | x f <sub>p</sub> )                                                                                |                                        |     |
| D = v <sub>p</sub> / S                                      |           | 20.4 pc/mi/ln                    | S                                                                                                 |                                        |     |
| LOS                                                         |           | C                                | D = v <sub>p</sub> / S                                                                            |                                        |     |
|                                                             |           |                                  | Required Number of Lanes, N                                                                       |                                        |     |
| <b>Glossary</b>                                             |           |                                  | <b>Factor Location</b>                                                                            |                                        |     |
| N - Number of lanes                                         |           |                                  | E <sub>R</sub> - Exhibits 11-10, 11-12                                                            |                                        |     |
| S - Speed                                                   |           |                                  | f <sub>LW</sub> - Exhibit 11-8                                                                    |                                        |     |
| V - Hourly volume                                           |           |                                  | E <sub>T</sub> - Exhibits 11-10, 11-11, 11-13                                                     |                                        |     |
| D - Density                                                 |           |                                  | f <sub>LC</sub> - Exhibit 11-9                                                                    |                                        |     |
| v <sub>p</sub> - Flow rate                                  |           |                                  | f <sub>p</sub> - Page 11-18                                                                       |                                        |     |
| FFS - Free-flow speed                                       |           |                                  | TRD - Page 11-11                                                                                  |                                        |     |
| LOS - Level of service                                      |           |                                  | LOS, S, FFS, v <sub>p</sub> - Exhibits 11-2, 11-3                                                 |                                        |     |
| BFFS - Base free-flow speed                                 |           |                                  |                                                                                                   |                                        |     |
| DDHV - Directional design hour volume                       |           |                                  |                                                                                                   |                                        |     |

| BASIC FREEWAY SEGMENTS WORKSHEET                                             |                             |                                  |                                                                                                   |                                        |     |
|------------------------------------------------------------------------------|-----------------------------|----------------------------------|---------------------------------------------------------------------------------------------------|----------------------------------------|-----|
| <b>General Information</b>                                                   |                             |                                  | <b>Site Information</b>                                                                           |                                        |     |
| Analyst                                                                      | MTD                         |                                  | Highway/Direction of Travel <i>Route 1 NB</i>                                                     |                                        |     |
| Agency or Company                                                            | Pennoni                     |                                  | From/To <i>US 13 to West Bridge Street</i>                                                        |                                        |     |
| Date Performed                                                               | 8/18/2015                   |                                  | Jurisdiction <i>PennDOT</i>                                                                       |                                        |     |
| Analysis Time Period                                                         | AM Peak                     |                                  | Analysis Year <i>2015</i>                                                                         |                                        |     |
| Project Description <i>Pre-Construction Traffic Study</i>                    |                             |                                  |                                                                                                   |                                        |     |
| <input checked="" type="checkbox"/> Oper.(LOS)                               |                             | <input type="checkbox"/> Des.(N) |                                                                                                   | <input type="checkbox"/> Planning Data |     |
| <b>Flow Inputs</b>                                                           |                             |                                  |                                                                                                   |                                        |     |
| Volume, V                                                                    | 4493                        | veh/h                            | Peak-Hour Factor, PHF                                                                             | 0.98                                   |     |
| AADT                                                                         |                             | veh/day                          | %Trucks and Buses, P <sub>T</sub>                                                                 | 4                                      |     |
| Peak-Hr Prop. of AADT, K                                                     |                             |                                  | %RVs, P <sub>R</sub>                                                                              | 0                                      |     |
| Peak-Hr Direction Prop, D                                                    |                             |                                  | General Terrain:                                                                                  | Level                                  |     |
| DDHV = AADT x K x D                                                          |                             | veh/h                            | Grade % Length                                                                                    | mi                                     |     |
|                                                                              |                             |                                  | Up/Down %                                                                                         |                                        |     |
| <b>Calculate Flow Adjustments</b>                                            |                             |                                  |                                                                                                   |                                        |     |
| f <sub>p</sub>                                                               | 1.00                        |                                  | E <sub>R</sub>                                                                                    | 1.2                                    |     |
| E <sub>T</sub>                                                               | 1.5                         |                                  | f <sub>HV</sub> = 1/[1+P <sub>T</sub> (E <sub>T</sub> - 1) + P <sub>R</sub> (E <sub>R</sub> - 1)] | 0.980                                  |     |
| <b>Speed Inputs</b>                                                          |                             |                                  | <b>Calc Speed Adj and FFS</b>                                                                     |                                        |     |
| Lane Width                                                                   | 12.0                        | ft                               | f <sub>LW</sub>                                                                                   | 0.0                                    | mph |
| Rt-Side Lat. Clearance                                                       | 5.0                         | ft                               | f <sub>LC</sub>                                                                                   | 0.6                                    | mph |
| Number of Lanes, N                                                           | 2                           |                                  | TRD Adjustment                                                                                    | 6.5                                    | mph |
| Total Ramp Density, TRD                                                      | 2.30                        | ramps/mi                         | FFS                                                                                               | 68.3                                   | mph |
| FFS (measured)                                                               |                             | mph                              |                                                                                                   |                                        |     |
| Base free-flow Speed, BFFS                                                   | 75.4                        | mph                              |                                                                                                   |                                        |     |
| <b>LOS and Performance Measures</b>                                          |                             |                                  | <b>Design (N)</b>                                                                                 |                                        |     |
| <u>Operational (LOS)</u>                                                     |                             |                                  | <u>Design (N)</u>                                                                                 |                                        |     |
| v <sub>p</sub> = (V or DDHV) / (PHF x N x f <sub>HV</sub> x f <sub>p</sub> ) |                             |                                  | Design LOS                                                                                        |                                        |     |
|                                                                              | 2338                        | pc/h/ln                          | v <sub>p</sub> = (V or DDHV) / (PHF x N x f <sub>HV</sub> x f <sub>p</sub> )                      |                                        |     |
| S                                                                            | 55.0                        | mph                              | S                                                                                                 |                                        |     |
| D = v <sub>p</sub> / S                                                       | 42.5                        | pc/mi/ln                         | D = v <sub>p</sub> / S                                                                            |                                        |     |
| LOS                                                                          | E                           |                                  | Required Number of Lanes, N                                                                       |                                        |     |
| <b>Glossary</b>                                                              |                             |                                  | <b>Factor Location</b>                                                                            |                                        |     |
| N - Number of lanes                                                          | S - Speed                   |                                  | E <sub>R</sub> - Exhibits 11-10, 11-12                                                            | f <sub>LW</sub> - Exhibit 11-8         |     |
| V - Hourly volume                                                            | D - Density                 |                                  | E <sub>T</sub> - Exhibits 11-10, 11-11, 11-13                                                     | f <sub>LC</sub> - Exhibit 11-9         |     |
| v <sub>p</sub> - Flow rate                                                   | FFS - Free-flow speed       |                                  | f <sub>p</sub> - Page 11-18                                                                       | TRD - Page 11-11                       |     |
| LOS - Level of service                                                       | BFFS - Base free-flow speed |                                  | LOS, S, FFS, v <sub>p</sub> - Exhibits 11-2, 11-3                                                 |                                        |     |
| DDHV - Directional design hour volume                                        |                             |                                  |                                                                                                   |                                        |     |

| BASIC FREEWAY SEGMENTS WORKSHEET                            |                             |                                  |                                                                                                   |                                        |     |
|-------------------------------------------------------------|-----------------------------|----------------------------------|---------------------------------------------------------------------------------------------------|----------------------------------------|-----|
| <b>General Information</b>                                  |                             |                                  | <b>Site Information</b>                                                                           |                                        |     |
| Analyst                                                     | MTD                         |                                  | Highway/Direction of Travel <i>Route 1 SB</i>                                                     |                                        |     |
| Agency or Company                                           | Pennoni                     |                                  | From/To <i>US 13 to West Bridge Street</i>                                                        |                                        |     |
| Date Performed                                              | 8/18/2015                   |                                  | Jurisdiction <i>PennDOT</i>                                                                       |                                        |     |
| Analysis Time Period                                        | AM Peak                     |                                  | Analysis Year <i>2015</i>                                                                         |                                        |     |
| Project Description <i>Pre-Construction Traffic Study</i>   |                             |                                  |                                                                                                   |                                        |     |
| <input checked="" type="checkbox"/> Oper.(LOS)              |                             | <input type="checkbox"/> Des.(N) |                                                                                                   | <input type="checkbox"/> Planning Data |     |
| <b>Flow Inputs</b>                                          |                             |                                  |                                                                                                   |                                        |     |
| Volume, V                                                   | 1458                        | veh/h                            | Peak-Hour Factor, PHF                                                                             | 0.96                                   |     |
| AADT                                                        |                             | veh/day                          | %Trucks and Buses, P <sub>T</sub>                                                                 | 1                                      |     |
| Peak-Hr Prop. of AADT, K                                    |                             |                                  | %RVs, P <sub>R</sub>                                                                              | 0                                      |     |
| Peak-Hr Direction Prop, D                                   |                             |                                  | General Terrain:                                                                                  | Level                                  |     |
| DDHV = AADT x K x D                                         |                             | veh/h                            | Grade %                                                                                           | Length                                 | mi  |
|                                                             |                             |                                  | Up/Down %                                                                                         |                                        |     |
| <b>Calculate Flow Adjustments</b>                           |                             |                                  |                                                                                                   |                                        |     |
| f <sub>p</sub>                                              | 1.00                        |                                  | E <sub>R</sub>                                                                                    | 1.2                                    |     |
| E <sub>T</sub>                                              | 1.5                         |                                  | f <sub>HV</sub> = 1/[1+P <sub>T</sub> (E <sub>T</sub> - 1) + P <sub>R</sub> (E <sub>R</sub> - 1)] | 0.995                                  |     |
| <b>Speed Inputs</b>                                         |                             |                                  | <b>Calc Speed Adj and FFS</b>                                                                     |                                        |     |
| Lane Width                                                  | 12.0                        | ft                               |                                                                                                   |                                        |     |
| Rt-Side Lat. Clearance                                      | 5.0                         | ft                               | f <sub>LW</sub>                                                                                   | 0.0                                    | mph |
| Number of Lanes, N                                          | 2                           |                                  | f <sub>LC</sub>                                                                                   | 0.6                                    | mph |
| Total Ramp Density, TRD                                     | 2.00                        | ramps/mi                         | TRD Adjustment                                                                                    | 5.8                                    | mph |
| FFS (measured)                                              |                             | mph                              | FFS                                                                                               | 69.0                                   | mph |
| Base free-flow Speed, BFFS                                  | 75.4                        | mph                              |                                                                                                   |                                        |     |
| <b>LOS and Performance Measures</b>                         |                             |                                  | <b>Design (N)</b>                                                                                 |                                        |     |
| <u>Operational (LOS)</u>                                    |                             |                                  | <u>Design (N)</u>                                                                                 |                                        |     |
| v <sub>p</sub> = (V or DDHV) / (PHF x N x f <sub>HV</sub> ) |                             |                                  | Design LOS                                                                                        |                                        |     |
|                                                             | 763                         | pc/h/ln                          | v <sub>p</sub> = (V or DDHV) / (PHF x N x f <sub>HV</sub> )                                       |                                        |     |
| x f <sub>p</sub> )                                          |                             |                                  | x f <sub>p</sub> )                                                                                |                                        |     |
| S                                                           | 70.0                        | mph                              | S                                                                                                 |                                        |     |
| D = v <sub>p</sub> / S                                      | 10.9                        | pc/mi/ln                         | D = v <sub>p</sub> / S                                                                            |                                        |     |
| LOS                                                         | A                           |                                  | Required Number of Lanes, N                                                                       |                                        |     |
| <b>Glossary</b>                                             |                             |                                  | <b>Factor Location</b>                                                                            |                                        |     |
| N - Number of lanes                                         | S - Speed                   |                                  | E <sub>R</sub> - Exhibits 11-10, 11-12                                                            | f <sub>LW</sub> - Exhibit 11-8         |     |
| V - Hourly volume                                           | D - Density                 |                                  | E <sub>T</sub> - Exhibits 11-10, 11-11, 11-13                                                     | f <sub>LC</sub> - Exhibit 11-9         |     |
| v <sub>p</sub> - Flow rate                                  | FFS - Free-flow speed       |                                  | f <sub>p</sub> - Page 11-18                                                                       | TRD - Page 11-11                       |     |
| LOS - Level of service                                      | BFFS - Base free-flow speed |                                  | LOS, S, FFS, v <sub>p</sub> - Exhibits 11-2, 11-3                                                 |                                        |     |
| DDHV - Directional design hour volume                       |                             |                                  |                                                                                                   |                                        |     |

| BASIC FREEWAY SEGMENTS WORKSHEET                                             |                             |                                  |                                                                                                   |                                        |     |
|------------------------------------------------------------------------------|-----------------------------|----------------------------------|---------------------------------------------------------------------------------------------------|----------------------------------------|-----|
| <b>General Information</b>                                                   |                             |                                  | <b>Site Information</b>                                                                           |                                        |     |
| Analyst                                                                      | MTD                         |                                  | Highway/Direction of Travel <i>Route 1 NB</i>                                                     |                                        |     |
| Agency or Company                                                            | Pennoni                     |                                  | From/To <i>US 13 to West Bridge Street</i>                                                        |                                        |     |
| Date Performed                                                               | 8/18/2015                   |                                  | Jurisdiction <i>PennDOT</i>                                                                       |                                        |     |
| Analysis Time Period                                                         | PM Peak                     |                                  | Analysis Year <i>2015</i>                                                                         |                                        |     |
| Project Description <i>Pre-Construction Traffic Study</i>                    |                             |                                  |                                                                                                   |                                        |     |
| <input checked="" type="checkbox"/> Oper.(LOS)                               |                             | <input type="checkbox"/> Des.(N) |                                                                                                   | <input type="checkbox"/> Planning Data |     |
| <b>Flow Inputs</b>                                                           |                             |                                  |                                                                                                   |                                        |     |
| Volume, V                                                                    | 2776                        | veh/h                            | Peak-Hour Factor, PHF                                                                             | 0.90                                   |     |
| AADT                                                                         |                             | veh/day                          | %Trucks and Buses, P <sub>T</sub>                                                                 | 1                                      |     |
| Peak-Hr Prop. of AADT, K                                                     |                             |                                  | %RVs, P <sub>R</sub>                                                                              | 0                                      |     |
| Peak-Hr Direction Prop, D                                                    |                             |                                  | General Terrain:                                                                                  | Level                                  |     |
| DDHV = AADT x K x D                                                          |                             | veh/h                            | Grade % Length                                                                                    | mi                                     |     |
|                                                                              |                             |                                  | Up/Down %                                                                                         |                                        |     |
| <b>Calculate Flow Adjustments</b>                                            |                             |                                  |                                                                                                   |                                        |     |
| f <sub>p</sub>                                                               | 1.00                        |                                  | E <sub>R</sub>                                                                                    | 1.2                                    |     |
| E <sub>T</sub>                                                               | 1.5                         |                                  | f <sub>HV</sub> = 1/[1+P <sub>T</sub> (E <sub>T</sub> - 1) + P <sub>R</sub> (E <sub>R</sub> - 1)] | 0.995                                  |     |
| <b>Speed Inputs</b>                                                          |                             |                                  | <b>Calc Speed Adj and FFS</b>                                                                     |                                        |     |
| Lane Width                                                                   | 12.0                        | ft                               | f <sub>LW</sub>                                                                                   | 0.0                                    | mph |
| Rt-Side Lat. Clearance                                                       | 5.0                         | ft                               | f <sub>LC</sub>                                                                                   | 0.6                                    | mph |
| Number of Lanes, N                                                           | 2                           |                                  | TRD Adjustment                                                                                    | 6.5                                    | mph |
| Total Ramp Density, TRD                                                      | 2.30                        | ramps/mi                         | FFS                                                                                               | 68.3                                   | mph |
| FFS (measured)                                                               |                             | mph                              |                                                                                                   |                                        |     |
| Base free-flow Speed, BFFS                                                   | 75.4                        | mph                              |                                                                                                   |                                        |     |
| <b>LOS and Performance Measures</b>                                          |                             |                                  | <b>Design (N)</b>                                                                                 |                                        |     |
| <u>Operational (LOS)</u>                                                     |                             |                                  | <u>Design (N)</u>                                                                                 |                                        |     |
| v <sub>p</sub> = (V or DDHV) / (PHF x N x f <sub>HV</sub> x f <sub>p</sub> ) |                             |                                  | Design LOS                                                                                        |                                        |     |
|                                                                              | 1550                        | pc/h/ln                          | v <sub>p</sub> = (V or DDHV) / (PHF x N x f <sub>HV</sub> x f <sub>p</sub> )                      |                                        |     |
| S                                                                            | 68.6                        | mph                              | S                                                                                                 |                                        |     |
| D = v <sub>p</sub> / S                                                       | 22.6                        | pc/mi/ln                         | D = v <sub>p</sub> / S                                                                            |                                        |     |
| LOS                                                                          | C                           |                                  | Required Number of Lanes, N                                                                       |                                        |     |
| <b>Glossary</b>                                                              |                             |                                  | <b>Factor Location</b>                                                                            |                                        |     |
| N - Number of lanes                                                          | S - Speed                   |                                  | E <sub>R</sub> - Exhibits 11-10, 11-12                                                            | f <sub>LW</sub> - Exhibit 11-8         |     |
| V - Hourly volume                                                            | D - Density                 |                                  | E <sub>T</sub> - Exhibits 11-10, 11-11, 11-13                                                     | f <sub>LC</sub> - Exhibit 11-9         |     |
| v <sub>p</sub> - Flow rate                                                   | FFS - Free-flow speed       |                                  | f <sub>p</sub> - Page 11-18                                                                       | TRD - Page 11-11                       |     |
| LOS - Level of service                                                       | BFFS - Base free-flow speed |                                  | LOS, S, FFS, v <sub>p</sub> - Exhibits 11-2, 11-3                                                 |                                        |     |
| DDHV - Directional design hour volume                                        |                             |                                  |                                                                                                   |                                        |     |

| BASIC FREEWAY SEGMENTS WORKSHEET                                       |                             |                                  |                                                                        |                                        |          |
|------------------------------------------------------------------------|-----------------------------|----------------------------------|------------------------------------------------------------------------|----------------------------------------|----------|
| <b>General Information</b>                                             |                             |                                  | <b>Site Information</b>                                                |                                        |          |
| Analyst                                                                | MTD                         |                                  | Highway/Direction of Travel <i>Route 1 SB</i>                          |                                        |          |
| Agency or Company                                                      | Pennoni                     |                                  | From/To <i>US 13 to West Bridge Street</i>                             |                                        |          |
| Date Performed                                                         | 8/18/2015                   |                                  | Jurisdiction <i>PennDOT</i>                                            |                                        |          |
| Analysis Time Period                                                   | PM Peak                     |                                  | Analysis Year <i>2015</i>                                              |                                        |          |
| Project Description <i>Pre-Construction Traffic Study</i>              |                             |                                  |                                                                        |                                        |          |
| <input checked="" type="checkbox"/> Oper.(LOS)                         |                             | <input type="checkbox"/> Des.(N) |                                                                        | <input type="checkbox"/> Planning Data |          |
| <b>Flow Inputs</b>                                                     |                             |                                  |                                                                        |                                        |          |
| Volume, V                                                              | 2629                        | veh/h                            | Peak-Hour Factor, PHF                                                  | 0.93                                   |          |
| AADT                                                                   |                             | veh/day                          | %Trucks and Buses, $P_T$                                               | 1                                      |          |
| Peak-Hr Prop. of AADT, K                                               |                             |                                  | %RVs, $P_R$                                                            | 0                                      |          |
| Peak-Hr Direction Prop, D                                              |                             |                                  | General Terrain:                                                       | <i>Level</i>                           |          |
| DDHV = AADT x K x D                                                    |                             | veh/h                            | Grade % Length                                                         | <i>mi</i>                              |          |
|                                                                        |                             |                                  | Up/Down %                                                              |                                        |          |
| <b>Calculate Flow Adjustments</b>                                      |                             |                                  |                                                                        |                                        |          |
| $f_p$                                                                  | 1.00                        |                                  | $E_R$                                                                  | 1.2                                    |          |
| $E_T$                                                                  | 1.5                         |                                  | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$                           | 0.995                                  |          |
| <b>Speed Inputs</b>                                                    |                             |                                  | <b>Calc Speed Adj and FFS</b>                                          |                                        |          |
| Lane Width                                                             | 12.0                        | ft                               | $f_{LW}$                                                               | 0.0                                    | mph      |
| Rt-Side Lat. Clearance                                                 | 5.0                         | ft                               | $f_{LC}$                                                               | 0.6                                    | mph      |
| Number of Lanes, N                                                     | 2                           |                                  | TRD Adjustment                                                         | 5.8                                    | mph      |
| Total Ramp Density, TRD                                                | 2.00                        | ramps/mi                         | FFS                                                                    | 69.0                                   | mph      |
| FFS (measured)                                                         |                             | mph                              |                                                                        |                                        |          |
| Base free-flow Speed, BFFS                                             | 75.4                        | mph                              |                                                                        |                                        |          |
| <b>LOS and Performance Measures</b>                                    |                             |                                  | <b>Design (N)</b>                                                      |                                        |          |
| <u>Operational (LOS)</u>                                               |                             |                                  | <u>Design (N)</u>                                                      |                                        |          |
| $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ | 1421                        | pc/h/ln                          | $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ |                                        | pc/h/ln  |
| S                                                                      | 69.4                        | mph                              | S                                                                      |                                        | mph      |
| $D = v_p / S$                                                          | 20.5                        | pc/mi/ln                         | $D = v_p / S$                                                          |                                        | pc/mi/ln |
| LOS                                                                    | C                           |                                  | Required Number of Lanes, N                                            |                                        |          |
| <b>Glossary</b>                                                        |                             |                                  | <b>Factor Location</b>                                                 |                                        |          |
| 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                                       |                             |                                  |                                                                        |                                        |          |
|------------------------------------------------------------------------|-----------------------------|----------------------------------|------------------------------------------------------------------------|----------------------------------------|----------|
| <b>General Information</b>                                             |                             |                                  | <b>Site Information</b>                                                |                                        |          |
| Analyst                                                                | MTD                         |                                  | Highway/Direction of Travel                                            | Route 1 NB                             |          |
| Agency or Company                                                      | Pennoni                     |                                  | From/To                                                                | Route 13 to Trenton Avenue             |          |
| Date Performed                                                         | 8/24/2015                   |                                  | Jurisdiction                                                           | PennDOT                                |          |
| Analysis Time Period                                                   | AM Peak                     |                                  | Analysis Year                                                          | 2015                                   |          |
| Project Description Pre-Construction Traffic Study                     |                             |                                  |                                                                        |                                        |          |
| <input checked="" type="checkbox"/> Oper.(LOS)                         |                             | <input type="checkbox"/> Des.(N) |                                                                        | <input type="checkbox"/> Planning Data |          |
| <b>Flow Inputs</b>                                                     |                             |                                  |                                                                        |                                        |          |
| Volume, V                                                              | 3476                        | veh/h                            | Peak-Hour Factor, PHF                                                  | 0.97                                   |          |
| AADT                                                                   |                             | veh/day                          | %Trucks and Buses, $P_T$                                               | 5                                      |          |
| 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                                                         | mi                                     |          |
|                                                                        |                             |                                  | Up/Down %                                                              |                                        |          |
| <b>Calculate Flow Adjustments</b>                                      |                             |                                  |                                                                        |                                        |          |
| $f_p$                                                                  | 1.00                        |                                  | $E_R$                                                                  | 1.2                                    |          |
| $E_T$                                                                  | 1.5                         |                                  | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$                           | 0.976                                  |          |
| <b>Speed Inputs</b>                                                    |                             |                                  | <b>Calc Speed Adj and FFS</b>                                          |                                        |          |
| Lane Width                                                             | 12.0                        | ft                               | $f_{LW}$                                                               | 0.0                                    | mph      |
| Rt-Side Lat. Clearance                                                 | 6.0                         | ft                               | $f_{LC}$                                                               | 0.0                                    | mph      |
| Number of Lanes, N                                                     | 2                           |                                  | TRD Adjustment                                                         | 5.8                                    | mph      |
| Total Ramp Density, TRD                                                | 2.00                        | ramps/mi                         | FFS                                                                    | 69.6                                   | mph      |
| FFS (measured)                                                         |                             | mph                              |                                                                        |                                        |          |
| Base free-flow Speed, BFFS                                             | 75.4                        | mph                              |                                                                        |                                        |          |
| <b>LOS and Performance Measures</b>                                    |                             |                                  | <b>Design (N)</b>                                                      |                                        |          |
| <u>Operational (LOS)</u>                                               |                             |                                  | <u>Design (N)</u>                                                      |                                        |          |
| $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ | 1837                        | pc/h/ln                          | $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ |                                        | pc/h/ln  |
| S                                                                      | 65.3                        | mph                              | S                                                                      |                                        | mph      |
| $D = v_p / S$                                                          | 28.1                        | pc/mi/ln                         | $D = v_p / S$                                                          |                                        | pc/mi/ln |
| LOS                                                                    | D                           |                                  | Required Number of Lanes, N                                            |                                        |          |
| <b>Glossary</b>                                                        |                             |                                  | <b>Factor Location</b>                                                 |                                        |          |
| 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                                       |                             |                                  |                                                                        |                                        |     |
|------------------------------------------------------------------------|-----------------------------|----------------------------------|------------------------------------------------------------------------|----------------------------------------|-----|
| <b>General Information</b>                                             |                             |                                  | <b>Site Information</b>                                                |                                        |     |
| Analyst                                                                | MTD                         |                                  | Highway/Direction of Travel <i>Route 1 SB</i>                          |                                        |     |
| Agency or Company                                                      | Pennoni                     |                                  | From/To <i>Route 13 to Trenton Avenue</i>                              |                                        |     |
| Date Performed                                                         | 8/24/2015                   |                                  | Jurisdiction <i>PennDOT</i>                                            |                                        |     |
| Analysis Time Period                                                   | AM Peak                     |                                  | Analysis Year <i>2015</i>                                              |                                        |     |
| Project Description <i>Pre-Construction Traffic Study</i>              |                             |                                  |                                                                        |                                        |     |
| <input checked="" type="checkbox"/> Oper.(LOS)                         |                             | <input type="checkbox"/> Des.(N) |                                                                        | <input type="checkbox"/> Planning Data |     |
| <b>Flow Inputs</b>                                                     |                             |                                  |                                                                        |                                        |     |
| Volume, V                                                              | 1628                        | veh/h                            | Peak-Hour Factor, PHF                                                  | 0.94                                   |     |
| 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                                 | mi  |
|                                                                        |                             |                                  | Up/Down %                                                              |                                        |     |
| <b>Calculate Flow Adjustments</b>                                      |                             |                                  |                                                                        |                                        |     |
| $f_p$                                                                  | 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                                  |     |
| <b>Speed Inputs</b>                                                    |                             |                                  | <b>Calc Speed Adj and FFS</b>                                          |                                        |     |
| Lane Width                                                             | 12.0                        | ft                               |                                                                        |                                        |     |
| Rt-Side Lat. Clearance                                                 | 6.0                         | ft                               | $f_{LW}$                                                               | 0.0                                    | mph |
| Number of Lanes, N                                                     | 2                           |                                  | $f_{LC}$                                                               | 0.0                                    | mph |
| Total Ramp Density, TRD                                                | 2.30                        | ramps/mi                         | TRD Adjustment                                                         | 6.5                                    | mph |
| FFS (measured)                                                         |                             | mph                              | FFS                                                                    | 68.9                                   | mph |
| Base free-flow Speed, BFFS                                             | 75.4                        | mph                              |                                                                        |                                        |     |
| <b>LOS and Performance Measures</b>                                    |                             |                                  | <b>Design (N)</b>                                                      |                                        |     |
| <u>Operational (LOS)</u>                                               |                             |                                  | <u>Design (N)</u>                                                      |                                        |     |
| $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ | 879                         | pc/h/ln                          | $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ |                                        |     |
| S                                                                      | 70.0                        | mph                              | S                                                                      |                                        |     |
| $D = v_p / S$                                                          | 12.6                        | pc/mi/ln                         | $D = v_p / S$                                                          |                                        |     |
| LOS                                                                    | B                           |                                  | Required Number of Lanes, N                                            |                                        |     |
| <b>Glossary</b>                                                        |                             |                                  | <b>Factor Location</b>                                                 |                                        |     |
| 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                                             |                             |                                  |                                                                                                   |                                        |     |
|------------------------------------------------------------------------------|-----------------------------|----------------------------------|---------------------------------------------------------------------------------------------------|----------------------------------------|-----|
| <b>General Information</b>                                                   |                             |                                  | <b>Site Information</b>                                                                           |                                        |     |
| Analyst                                                                      | MTD                         |                                  | Highway/Direction of Travel                                                                       | Route 1 NB                             |     |
| Agency or Company                                                            | Pennoni                     |                                  | From/To                                                                                           | Route 13 to Trenton Avenue             |     |
| Date Performed                                                               | 8/24/2015                   |                                  | Jurisdiction                                                                                      | PennDOT                                |     |
| Analysis Time Period                                                         | PM Peak                     |                                  | Analysis Year                                                                                     | 2015                                   |     |
| Project Description Pre-Construction Traffic Study                           |                             |                                  |                                                                                                   |                                        |     |
| <input checked="" type="checkbox"/> Oper.(LOS)                               |                             | <input type="checkbox"/> Des.(N) |                                                                                                   | <input type="checkbox"/> Planning Data |     |
| <b>Flow Inputs</b>                                                           |                             |                                  |                                                                                                   |                                        |     |
| Volume, V                                                                    | 2438                        | veh/h                            | Peak-Hour Factor, PHF                                                                             | 0.89                                   |     |
| AADT                                                                         |                             | veh/day                          | %Trucks and Buses, P <sub>T</sub>                                                                 | 1                                      |     |
| Peak-Hr Prop. of AADT, K                                                     |                             |                                  | %RVs, P <sub>R</sub>                                                                              | 0                                      |     |
| Peak-Hr Direction Prop, D                                                    |                             |                                  | General Terrain:                                                                                  | Level                                  |     |
| DDHV = AADT x K x D                                                          |                             | veh/h                            | Grade % Length                                                                                    | mi                                     |     |
|                                                                              |                             |                                  | Up/Down %                                                                                         |                                        |     |
| <b>Calculate Flow Adjustments</b>                                            |                             |                                  |                                                                                                   |                                        |     |
| f <sub>p</sub>                                                               | 1.00                        |                                  | E <sub>R</sub>                                                                                    | 1.2                                    |     |
| E <sub>T</sub>                                                               | 1.5                         |                                  | f <sub>HV</sub> = 1/[1+P <sub>T</sub> (E <sub>T</sub> - 1) + P <sub>R</sub> (E <sub>R</sub> - 1)] | 0.995                                  |     |
| <b>Speed Inputs</b>                                                          |                             |                                  | <b>Calc Speed Adj and FFS</b>                                                                     |                                        |     |
| Lane Width                                                                   | 12.0                        | ft                               | f <sub>LW</sub>                                                                                   | 0.0                                    | mph |
| Rt-Side Lat. Clearance                                                       | 6.0                         | ft                               | f <sub>LC</sub>                                                                                   | 0.0                                    | mph |
| Number of Lanes, N                                                           | 2                           |                                  | TRD Adjustment                                                                                    | 5.8                                    | mph |
| Total Ramp Density, TRD                                                      | 2.00                        | ramps/mi                         | FFS                                                                                               | 69.6                                   | mph |
| FFS (measured)                                                               |                             | mph                              |                                                                                                   |                                        |     |
| Base free-flow Speed, BFFS                                                   | 75.4                        | mph                              |                                                                                                   |                                        |     |
| <b>LOS and Performance Measures</b>                                          |                             |                                  | <b>Design (N)</b>                                                                                 |                                        |     |
| <u>Operational (LOS)</u>                                                     |                             |                                  | <u>Design (N)</u>                                                                                 |                                        |     |
| v <sub>p</sub> = (V or DDHV) / (PHF x N x f <sub>HV</sub> x f <sub>p</sub> ) |                             |                                  | Design LOS                                                                                        |                                        |     |
|                                                                              | 1377                        | pc/h/ln                          | v <sub>p</sub> = (V or DDHV) / (PHF x N x f <sub>HV</sub> x f <sub>p</sub> )                      |                                        |     |
| S                                                                            | 69.6                        | mph                              | S                                                                                                 |                                        |     |
| D = v <sub>p</sub> / S                                                       | 19.8                        | pc/mi/ln                         | D = v <sub>p</sub> / S                                                                            |                                        |     |
| LOS                                                                          | C                           |                                  | Required Number of Lanes, N                                                                       |                                        |     |
| <b>Glossary</b>                                                              |                             |                                  | <b>Factor Location</b>                                                                            |                                        |     |
| N - Number of lanes                                                          | S - Speed                   |                                  | E <sub>R</sub> - Exhibits 11-10, 11-12                                                            | f <sub>LW</sub> - Exhibit 11-8         |     |
| V - Hourly volume                                                            | D - Density                 |                                  | E <sub>T</sub> - Exhibits 11-10, 11-11, 11-13                                                     | f <sub>LC</sub> - Exhibit 11-9         |     |
| v <sub>p</sub> - Flow rate                                                   | FFS - Free-flow speed       |                                  | f <sub>p</sub> - Page 11-18                                                                       | TRD - Page 11-11                       |     |
| LOS - Level of service                                                       | BFFS - Base free-flow speed |                                  | LOS, S, FFS, v <sub>p</sub> - Exhibits 11-2, 11-3                                                 |                                        |     |
| DDHV - Directional design hour volume                                        |                             |                                  |                                                                                                   |                                        |     |



| BASIC FREEWAY SEGMENTS WORKSHEET                                       |                             |                                  |                                                                        |                                        |          |
|------------------------------------------------------------------------|-----------------------------|----------------------------------|------------------------------------------------------------------------|----------------------------------------|----------|
| <b>General Information</b>                                             |                             |                                  | <b>Site Information</b>                                                |                                        |          |
| Analyst                                                                | MTD                         |                                  | Highway/Direction of Travel <i>Route 1 SB</i>                          |                                        |          |
| Agency or Company                                                      | Pennoni                     |                                  | From/To <i>Route 13 to Trenton Avenue</i>                              |                                        |          |
| Date Performed                                                         | 8/24/2015                   |                                  | Jurisdiction <i>PennDOT</i>                                            |                                        |          |
| Analysis Time Period                                                   | PM Peak                     |                                  | Analysis Year <i>2015</i>                                              |                                        |          |
| Project Description <i>Pre-Construction Traffic Study</i>              |                             |                                  |                                                                        |                                        |          |
| <input checked="" type="checkbox"/> Oper.(LOS)                         |                             | <input type="checkbox"/> Des.(N) |                                                                        | <input type="checkbox"/> Planning Data |          |
| <b>Flow Inputs</b>                                                     |                             |                                  |                                                                        |                                        |          |
| Volume, V                                                              | 2916                        | veh/h                            | Peak-Hour Factor, PHF                                                  | 0.94                                   |          |
| AADT                                                                   |                             | veh/day                          | %Trucks and Buses, $P_T$                                               | 2                                      |          |
| Peak-Hr Prop. of AADT, K                                               |                             |                                  | %RVs, $P_R$                                                            | 0                                      |          |
| Peak-Hr Direction Prop, D                                              |                             |                                  | General Terrain:                                                       | <i>Level</i>                           |          |
| DDHV = AADT x K x D                                                    |                             | veh/h                            | Grade % Length                                                         | <i>mi</i>                              |          |
|                                                                        |                             |                                  | Up/Down %                                                              |                                        |          |
| <b>Calculate Flow Adjustments</b>                                      |                             |                                  |                                                                        |                                        |          |
| $f_p$                                                                  | 1.00                        |                                  | $E_R$                                                                  | 1.2                                    |          |
| $E_T$                                                                  | 1.5                         |                                  | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$                           | 0.990                                  |          |
| <b>Speed Inputs</b>                                                    |                             |                                  | <b>Calc Speed Adj and FFS</b>                                          |                                        |          |
| Lane Width                                                             | 12.0                        | ft                               | $f_{LW}$                                                               | 0.0                                    | mph      |
| Rt-Side Lat. Clearance                                                 | 6.0                         | ft                               | $f_{LC}$                                                               | 0.0                                    | mph      |
| Number of Lanes, N                                                     | 2                           |                                  | TRD Adjustment                                                         | 6.5                                    | mph      |
| Total Ramp Density, TRD                                                | 2.30                        | ramps/mi                         | FFS                                                                    | 68.9                                   | mph      |
| FFS (measured)                                                         |                             | mph                              |                                                                        |                                        |          |
| Base free-flow Speed, BFFS                                             | 75.4                        | mph                              |                                                                        |                                        |          |
| <b>LOS and Performance Measures</b>                                    |                             |                                  | <b>Design (N)</b>                                                      |                                        |          |
| <u>Operational (LOS)</u>                                               |                             |                                  | <u>Design (N)</u>                                                      |                                        |          |
| $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ | 1567                        | pc/h/ln                          | $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ |                                        | pc/h/ln  |
| S                                                                      | 68.4                        | mph                              | S                                                                      |                                        | mph      |
| $D = v_p / S$                                                          | 22.9                        | pc/mi/ln                         | $D = v_p / S$                                                          |                                        | pc/mi/ln |
| LOS                                                                    | C                           |                                  | Required Number of Lanes, N                                            |                                        |          |
| <b>Glossary</b>                                                        |                             |                                  | <b>Factor Location</b>                                                 |                                        |          |
| 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                                             |                             |                                  |                                                                                                   |                                        |     |
|------------------------------------------------------------------------------|-----------------------------|----------------------------------|---------------------------------------------------------------------------------------------------|----------------------------------------|-----|
| <b>General Information</b>                                                   |                             |                                  | <b>Site Information</b>                                                                           |                                        |     |
| Analyst                                                                      | MTD                         |                                  | Highway/Direction of Travel <i>Route 1 NB</i>                                                     |                                        |     |
| Agency or Company                                                            | Pennoni                     |                                  | From/To <i>Stony Hill Rd to S.R. 2029</i>                                                         |                                        |     |
| Date Performed                                                               | 8/18/2015                   |                                  | Jurisdiction <i>PennDOT</i>                                                                       |                                        |     |
| Analysis Time Period                                                         | AM Peak                     |                                  | Analysis Year <i>2015</i>                                                                         |                                        |     |
| Project Description <i>Pre-Construction Traffic Study</i>                    |                             |                                  |                                                                                                   |                                        |     |
| <input checked="" type="checkbox"/> Oper.(LOS)                               |                             | <input type="checkbox"/> Des.(N) |                                                                                                   | <input type="checkbox"/> Planning Data |     |
| <b>Flow Inputs</b>                                                           |                             |                                  |                                                                                                   |                                        |     |
| Volume, V                                                                    | 3146                        | veh/h                            | Peak-Hour Factor, PHF                                                                             | 0.92                                   |     |
| AADT                                                                         |                             | veh/day                          | %Trucks and Buses, P <sub>T</sub>                                                                 | 6                                      |     |
| Peak-Hr Prop. of AADT, K                                                     |                             |                                  | %RVs, P <sub>R</sub>                                                                              | 0                                      |     |
| Peak-Hr Direction Prop, D                                                    |                             |                                  | General Terrain:                                                                                  | <i>Level</i>                           |     |
| DDHV = AADT x K x D                                                          |                             | veh/h                            | Grade % Length                                                                                    | <i>mi</i>                              |     |
|                                                                              |                             |                                  | Up/Down %                                                                                         |                                        |     |
| <b>Calculate Flow Adjustments</b>                                            |                             |                                  |                                                                                                   |                                        |     |
| f <sub>p</sub>                                                               | 1.00                        |                                  | E <sub>R</sub>                                                                                    | 1.2                                    |     |
| E <sub>T</sub>                                                               | 1.5                         |                                  | f <sub>HV</sub> = 1/[1+P <sub>T</sub> (E <sub>T</sub> - 1) + P <sub>R</sub> (E <sub>R</sub> - 1)] | 0.971                                  |     |
| <b>Speed Inputs</b>                                                          |                             |                                  | <b>Calc Speed Adj and FFS</b>                                                                     |                                        |     |
| Lane Width                                                                   | 12.0                        | ft                               |                                                                                                   |                                        |     |
| Rt-Side Lat. Clearance                                                       | 6.0                         | ft                               | f <sub>LW</sub>                                                                                   | 0.0                                    | mph |
| Number of Lanes, N                                                           | 2                           |                                  | f <sub>LC</sub>                                                                                   | 0.0                                    | mph |
| Total Ramp Density, TRD                                                      | 2.00                        | ramps/mi                         | TRD Adjustment                                                                                    | 5.8                                    | mph |
| FFS (measured)                                                               |                             | mph                              | FFS                                                                                               | 69.6                                   | mph |
| Base free-flow Speed, BFFS                                                   | 75.4                        | mph                              |                                                                                                   |                                        |     |
| <b>LOS and Performance Measures</b>                                          |                             |                                  | <b>Design (N)</b>                                                                                 |                                        |     |
| <u>Operational (LOS)</u>                                                     |                             |                                  | <u>Design (N)</u>                                                                                 |                                        |     |
| v <sub>p</sub> = (V or DDHV) / (PHF x N x f <sub>HV</sub> x f <sub>p</sub> ) |                             |                                  | Design LOS                                                                                        |                                        |     |
|                                                                              | 1761                        | pc/h/ln                          | v <sub>p</sub> = (V or DDHV) / (PHF x N x f <sub>HV</sub> x f <sub>p</sub> )                      |                                        |     |
| S                                                                            | 66.3                        | mph                              | S                                                                                                 |                                        |     |
| D = v <sub>p</sub> / S                                                       | 26.5                        | pc/mi/ln                         | D = v <sub>p</sub> / S                                                                            |                                        |     |
| LOS                                                                          | D                           |                                  | Required Number of Lanes, N                                                                       |                                        |     |
| <b>Glossary</b>                                                              |                             |                                  | <b>Factor Location</b>                                                                            |                                        |     |
| N - Number of lanes                                                          | S - Speed                   |                                  | E <sub>R</sub> - Exhibits 11-10, 11-12                                                            | f <sub>LW</sub> - Exhibit 11-8         |     |
| V - Hourly volume                                                            | D - Density                 |                                  | E <sub>T</sub> - Exhibits 11-10, 11-11, 11-13                                                     | f <sub>LC</sub> - Exhibit 11-9         |     |
| v <sub>p</sub> - Flow rate                                                   | FFS - Free-flow speed       |                                  | f <sub>p</sub> - Page 11-18                                                                       | TRD - Page 11-11                       |     |
| LOS - Level of service                                                       | BFFS - Base free-flow speed |                                  | LOS, S, FFS, v <sub>p</sub> - Exhibits 11-2, 11-3                                                 |                                        |     |
| DDHV - Directional design hour volume                                        |                             |                                  |                                                                                                   |                                        |     |

| BASIC FREEWAY SEGMENTS WORKSHEET                                                                                       |                             |          |                                                                                                   |                                |     |
|------------------------------------------------------------------------------------------------------------------------|-----------------------------|----------|---------------------------------------------------------------------------------------------------|--------------------------------|-----|
| <b>General Information</b>                                                                                             |                             |          | <b>Site Information</b>                                                                           |                                |     |
| Analyst                                                                                                                | MTD                         |          | Highway/Direction of Travel <i>Route 1 SB</i>                                                     |                                |     |
| Agency or Company                                                                                                      | Pennoni                     |          | From/To <i>Stony Hill Rd to S.R. 2029</i>                                                         |                                |     |
| Date Performed                                                                                                         | 8/18/2015                   |          | Jurisdiction <i>PennDOT</i>                                                                       |                                |     |
| Analysis Time Period                                                                                                   | AM Peak                     |          | Analysis Year <i>2015</i>                                                                         |                                |     |
| Project Description <i>Pre-Construction Traffic Study</i>                                                              |                             |          |                                                                                                   |                                |     |
| <input checked="" type="checkbox"/> Oper.(LOS) <input type="checkbox"/> Des.(N) <input type="checkbox"/> Planning Data |                             |          |                                                                                                   |                                |     |
| <b>Flow Inputs</b>                                                                                                     |                             |          |                                                                                                   |                                |     |
| Volume, V                                                                                                              | 2196                        | veh/h    | Peak-Hour Factor, PHF                                                                             | 0.93                           |     |
| AADT                                                                                                                   |                             | veh/day  | %Trucks and Buses, P <sub>T</sub>                                                                 | 6                              |     |
| Peak-Hr Prop. of AADT, K                                                                                               |                             |          | %RVs, P <sub>R</sub>                                                                              | 0                              |     |
| Peak-Hr Direction Prop, D                                                                                              |                             |          | General Terrain:                                                                                  | <i>Level</i>                   |     |
| DDHV = AADT x K x D                                                                                                    |                             | veh/h    | Grade % Length                                                                                    | <i>mi</i>                      |     |
|                                                                                                                        |                             |          | Up/Down %                                                                                         |                                |     |
| <b>Calculate Flow Adjustments</b>                                                                                      |                             |          |                                                                                                   |                                |     |
| f <sub>p</sub>                                                                                                         | 1.00                        |          | E <sub>R</sub>                                                                                    | 1.2                            |     |
| E <sub>T</sub>                                                                                                         | 1.5                         |          | f <sub>HV</sub> = 1/[1+P <sub>T</sub> (E <sub>T</sub> - 1) + P <sub>R</sub> (E <sub>R</sub> - 1)] | 0.971                          |     |
| <b>Speed Inputs</b>                                                                                                    |                             |          | <b>Calc Speed Adj and FFS</b>                                                                     |                                |     |
| Lane Width                                                                                                             | 12.0                        | ft       |                                                                                                   |                                |     |
| Rt-Side Lat. Clearance                                                                                                 | 6.0                         | ft       | f <sub>LW</sub>                                                                                   | 0.0                            | mph |
| Number of Lanes, N                                                                                                     | 2                           |          | f <sub>LC</sub>                                                                                   | 0.0                            | mph |
| Total Ramp Density, TRD                                                                                                | 2.00                        | ramps/mi | TRD Adjustment                                                                                    | 5.8                            | mph |
| FFS (measured)                                                                                                         |                             | mph      | FFS                                                                                               | 69.6                           | mph |
| Base free-flow Speed, BFFS                                                                                             | 75.4                        | mph      |                                                                                                   |                                |     |
| <b>LOS and Performance Measures</b>                                                                                    |                             |          | <b>Design (N)</b>                                                                                 |                                |     |
| <u>Operational (LOS)</u>                                                                                               |                             |          | <u>Design (N)</u>                                                                                 |                                |     |
| v <sub>p</sub> = (V or DDHV) / (PHF x N x f <sub>HV</sub> x f <sub>p</sub> )                                           |                             |          | Design LOS                                                                                        |                                |     |
|                                                                                                                        | 1216                        | pc/h/ln  | v <sub>p</sub> = (V or DDHV) / (PHF x N x f <sub>HV</sub> x f <sub>p</sub> )                      |                                |     |
| S                                                                                                                      | 70.0                        | mph      | S                                                                                                 |                                |     |
| D = v <sub>p</sub> / S                                                                                                 | 17.4                        | pc/mi/ln | D = v <sub>p</sub> / S                                                                            |                                |     |
| LOS                                                                                                                    | B                           |          | Required Number of Lanes, N                                                                       |                                |     |
| <b>Glossary</b>                                                                                                        |                             |          | <b>Factor Location</b>                                                                            |                                |     |
| N - Number of lanes                                                                                                    | S - Speed                   |          | E <sub>R</sub> - Exhibits 11-10, 11-12                                                            | f <sub>LW</sub> - Exhibit 11-8 |     |
| V - Hourly volume                                                                                                      | D - Density                 |          | E <sub>T</sub> - Exhibits 11-10, 11-11, 11-13                                                     | f <sub>LC</sub> - Exhibit 11-9 |     |
| v <sub>p</sub> - Flow rate                                                                                             | FFS - Free-flow speed       |          | f <sub>p</sub> - Page 11-18                                                                       | TRD - Page 11-11               |     |
| LOS - Level of service                                                                                                 | BFFS - Base free-flow speed |          | LOS, S, FFS, v <sub>p</sub> - Exhibits 11-2, 11-3                                                 |                                |     |
| DDHV - Directional design hour volume                                                                                  |                             |          |                                                                                                   |                                |     |

| BASIC FREEWAY SEGMENTS WORKSHEET                            |                             |                                  |                                                                                                   |                                        |     |
|-------------------------------------------------------------|-----------------------------|----------------------------------|---------------------------------------------------------------------------------------------------|----------------------------------------|-----|
| <b>General Information</b>                                  |                             |                                  | <b>Site Information</b>                                                                           |                                        |     |
| Analyst                                                     | MTD                         |                                  | Highway/Direction of Travel <i>Route 1 NB</i>                                                     |                                        |     |
| Agency or Company                                           | Pennoni                     |                                  | From/To <i>Stony Hill Rd to S.R. 2029</i>                                                         |                                        |     |
| Date Performed                                              | 8/18/2015                   |                                  | Jurisdiction <i>PennDOT</i>                                                                       |                                        |     |
| Analysis Time Period                                        | PM Peak                     |                                  | Analysis Year <i>2015</i>                                                                         |                                        |     |
| Project Description <i>Pre-Construction Traffic Study</i>   |                             |                                  |                                                                                                   |                                        |     |
| <input checked="" type="checkbox"/> Oper.(LOS)              |                             | <input type="checkbox"/> Des.(N) |                                                                                                   | <input type="checkbox"/> Planning Data |     |
| <b>Flow Inputs</b>                                          |                             |                                  |                                                                                                   |                                        |     |
| Volume, V                                                   | 2567                        | veh/h                            | Peak-Hour Factor, PHF                                                                             | 0.95                                   |     |
| AADT                                                        |                             | veh/day                          | %Trucks and Buses, P <sub>T</sub>                                                                 | 3                                      |     |
| Peak-Hr Prop. of AADT, K                                    |                             |                                  | %RVs, P <sub>R</sub>                                                                              | 0                                      |     |
| Peak-Hr Direction Prop, D                                   |                             |                                  | General Terrain:                                                                                  | <i>Level</i>                           |     |
| DDHV = AADT x K x D                                         |                             | veh/h                            | Grade % Length                                                                                    | <i>mi</i>                              |     |
|                                                             |                             |                                  | Up/Down %                                                                                         |                                        |     |
| <b>Calculate Flow Adjustments</b>                           |                             |                                  |                                                                                                   |                                        |     |
| f <sub>p</sub>                                              | 1.00                        |                                  | E <sub>R</sub>                                                                                    | 1.2                                    |     |
| E <sub>T</sub>                                              | 1.5                         |                                  | f <sub>HV</sub> = 1/[1+P <sub>T</sub> (E <sub>T</sub> - 1) + P <sub>R</sub> (E <sub>R</sub> - 1)] | 0.985                                  |     |
| <b>Speed Inputs</b>                                         |                             |                                  | <b>Calc Speed Adj and FFS</b>                                                                     |                                        |     |
| Lane Width                                                  | 12.0                        | ft                               |                                                                                                   |                                        |     |
| Rt-Side Lat. Clearance                                      | 6.0                         | ft                               | f <sub>LW</sub>                                                                                   | 0.0                                    | mph |
| Number of Lanes, N                                          | 2                           |                                  | f <sub>LC</sub>                                                                                   | 0.0                                    | mph |
| Total Ramp Density, TRD                                     | 2.00                        | ramps/mi                         | TRD Adjustment                                                                                    | 5.8                                    | mph |
| FFS (measured)                                              |                             | mph                              | FFS                                                                                               | 69.6                                   | mph |
| Base free-flow Speed, BFFS                                  | 75.4                        | mph                              |                                                                                                   |                                        |     |
| <b>LOS and Performance Measures</b>                         |                             |                                  | <b>Design (N)</b>                                                                                 |                                        |     |
| <u>Operational (LOS)</u>                                    |                             |                                  | <u>Design (N)</u>                                                                                 |                                        |     |
| v <sub>p</sub> = (V or DDHV) / (PHF x N x f <sub>HV</sub> ) |                             |                                  | Design LOS                                                                                        |                                        |     |
|                                                             | 1371                        | pc/h/ln                          | v <sub>p</sub> = (V or DDHV) / (PHF x N x f <sub>HV</sub> )                                       |                                        |     |
| x f <sub>p</sub> )                                          |                             |                                  | pc/h/ln                                                                                           |                                        |     |
| S                                                           | 69.7                        | mph                              | S                                                                                                 |                                        |     |
| D = v <sub>p</sub> / S                                      | 19.7                        | pc/mi/ln                         | D = v <sub>p</sub> / S                                                                            |                                        |     |
| LOS                                                         | C                           |                                  | Required Number of Lanes, N                                                                       |                                        |     |
| <b>Glossary</b>                                             |                             |                                  | <b>Factor Location</b>                                                                            |                                        |     |
| N - Number of lanes                                         | S - Speed                   |                                  | E <sub>R</sub> - Exhibits 11-10, 11-12                                                            | f <sub>LW</sub> - Exhibit 11-8         |     |
| V - Hourly volume                                           | D - Density                 |                                  | E <sub>T</sub> - Exhibits 11-10, 11-11, 11-13                                                     | f <sub>LC</sub> - Exhibit 11-9         |     |
| v <sub>p</sub> - Flow rate                                  | FFS - Free-flow speed       |                                  | f <sub>p</sub> - Page 11-18                                                                       | TRD - Page 11-11                       |     |
| LOS - Level of service                                      | BFFS - Base free-flow speed |                                  | LOS, S, FFS, v <sub>p</sub> - Exhibits 11-2, 11-3                                                 |                                        |     |
| DDHV - Directional design hour volume                       |                             |                                  |                                                                                                   |                                        |     |

| BASIC FREEWAY SEGMENTS WORKSHEET                                                                                       |                             |          |                                                                                                   |                                |     |
|------------------------------------------------------------------------------------------------------------------------|-----------------------------|----------|---------------------------------------------------------------------------------------------------|--------------------------------|-----|
| <b>General Information</b>                                                                                             |                             |          | <b>Site Information</b>                                                                           |                                |     |
| Analyst                                                                                                                | MTD                         |          | Highway/Direction of Travel <i>Route 1 SB</i>                                                     |                                |     |
| Agency or Company                                                                                                      | Pennoni                     |          | From/To <i>Stony Hill Rd to S.R. 2029</i>                                                         |                                |     |
| Date Performed                                                                                                         | 8/18/2015                   |          | Jurisdiction <i>PennDOT</i>                                                                       |                                |     |
| Analysis Time Period                                                                                                   | PM Peak                     |          | Analysis Year <i>2015</i>                                                                         |                                |     |
| Project Description <i>Pre-Construction Traffic Study</i>                                                              |                             |          |                                                                                                   |                                |     |
| <input checked="" type="checkbox"/> Oper.(LOS) <input type="checkbox"/> Des.(N) <input type="checkbox"/> Planning Data |                             |          |                                                                                                   |                                |     |
| <b>Flow Inputs</b>                                                                                                     |                             |          |                                                                                                   |                                |     |
| Volume, V                                                                                                              | 3421                        | veh/h    | Peak-Hour Factor, PHF                                                                             | 0.98                           |     |
| AADT                                                                                                                   |                             | veh/day  | %Trucks and Buses, P <sub>T</sub>                                                                 | 2                              |     |
| Peak-Hr Prop. of AADT, K                                                                                               |                             |          | %RVs, P <sub>R</sub>                                                                              | 0                              |     |
| Peak-Hr Direction Prop, D                                                                                              |                             |          | General Terrain:                                                                                  | <i>Level</i>                   |     |
| DDHV = AADT x K x D                                                                                                    |                             | veh/h    | Grade % Length                                                                                    | <i>mi</i>                      |     |
|                                                                                                                        |                             |          | Up/Down %                                                                                         |                                |     |
| <b>Calculate Flow Adjustments</b>                                                                                      |                             |          |                                                                                                   |                                |     |
| f <sub>p</sub>                                                                                                         | 1.00                        |          | E <sub>R</sub>                                                                                    | 1.2                            |     |
| E <sub>T</sub>                                                                                                         | 1.5                         |          | f <sub>HV</sub> = 1/[1+P <sub>T</sub> (E <sub>T</sub> - 1) + P <sub>R</sub> (E <sub>R</sub> - 1)] | 0.990                          |     |
| <b>Speed Inputs</b>                                                                                                    |                             |          | <b>Calc Speed Adj and FFS</b>                                                                     |                                |     |
| Lane Width                                                                                                             | 12.0                        | ft       |                                                                                                   |                                |     |
| Rt-Side Lat. Clearance                                                                                                 | 6.0                         | ft       | f <sub>LW</sub>                                                                                   | 0.0                            | mph |
| Number of Lanes, N                                                                                                     | 2                           |          | f <sub>LC</sub>                                                                                   | 0.0                            | mph |
| Total Ramp Density, TRD                                                                                                | 2.00                        | ramps/mi | TRD Adjustment                                                                                    | 5.8                            | mph |
| FFS (measured)                                                                                                         |                             | mph      | FFS                                                                                               | 69.6                           | mph |
| Base free-flow Speed, BFFS                                                                                             | 75.4                        | mph      |                                                                                                   |                                |     |
| <b>LOS and Performance Measures</b>                                                                                    |                             |          | <b>Design (N)</b>                                                                                 |                                |     |
| <u>Operational (LOS)</u>                                                                                               |                             |          | <u>Design (N)</u>                                                                                 |                                |     |
| v <sub>p</sub> = (V or DDHV) / (PHF x N x f <sub>HV</sub> x f <sub>p</sub> )                                           |                             |          | Design LOS                                                                                        |                                |     |
|                                                                                                                        | 1763                        | pc/h/ln  | v <sub>p</sub> = (V or DDHV) / (PHF x N x f <sub>HV</sub> x f <sub>p</sub> )                      |                                |     |
| S                                                                                                                      | 66.3                        | mph      | S                                                                                                 |                                |     |
| D = v <sub>p</sub> / S                                                                                                 | 26.6                        | pc/mi/ln | D = v <sub>p</sub> / S                                                                            |                                |     |
| LOS                                                                                                                    | D                           |          | Required Number of Lanes, N                                                                       |                                |     |
| <b>Glossary</b>                                                                                                        |                             |          | <b>Factor Location</b>                                                                            |                                |     |
| N - Number of lanes                                                                                                    | S - Speed                   |          | E <sub>R</sub> - Exhibits 11-10, 11-12                                                            | f <sub>LW</sub> - Exhibit 11-8 |     |
| V - Hourly volume                                                                                                      | D - Density                 |          | E <sub>T</sub> - Exhibits 11-10, 11-11, 11-13                                                     | f <sub>LC</sub> - Exhibit 11-9 |     |
| v <sub>p</sub> - Flow rate                                                                                             | FFS - Free-flow speed       |          | f <sub>p</sub> - Page 11-18                                                                       | TRD - Page 11-11               |     |
| LOS - Level of service                                                                                                 | BFFS - Base free-flow speed |          | LOS, S, FFS, v <sub>p</sub> - Exhibits 11-2, 11-3                                                 |                                |     |
| DDHV - Directional design hour volume                                                                                  |                             |          |                                                                                                   |                                |     |

| BASIC FREEWAY SEGMENTS WORKSHEET                                             |                             |                                  |                                                                                                   |                                        |     |
|------------------------------------------------------------------------------|-----------------------------|----------------------------------|---------------------------------------------------------------------------------------------------|----------------------------------------|-----|
| <b>General Information</b>                                                   |                             |                                  | <b>Site Information</b>                                                                           |                                        |     |
| Analyst                                                                      | MTD                         |                                  | Highway/Direction of Travel <i>Route 1 NB</i>                                                     |                                        |     |
| Agency or Company                                                            | Pennoni                     |                                  | From/To <i>S.R. 2029 to I-95</i>                                                                  |                                        |     |
| Date Performed                                                               | 8/18/2015                   |                                  | Jurisdiction <i>PennDOT</i>                                                                       |                                        |     |
| Analysis Time Period                                                         | AM Peak                     |                                  | Analysis Year <i>2015</i>                                                                         |                                        |     |
| Project Description <i>Pre-Construction Traffic Study</i>                    |                             |                                  |                                                                                                   |                                        |     |
| <input checked="" type="checkbox"/> Oper.(LOS)                               |                             | <input type="checkbox"/> Des.(N) |                                                                                                   | <input type="checkbox"/> Planning Data |     |
| <b>Flow Inputs</b>                                                           |                             |                                  |                                                                                                   |                                        |     |
| Volume, V                                                                    | 3697                        | veh/h                            | Peak-Hour Factor, PHF                                                                             | 0.92                                   |     |
| AADT                                                                         |                             | veh/day                          | %Trucks and Buses, P <sub>T</sub>                                                                 | 6                                      |     |
| Peak-Hr Prop. of AADT, K                                                     |                             |                                  | %RVs, P <sub>R</sub>                                                                              | 0                                      |     |
| Peak-Hr Direction Prop, D                                                    |                             |                                  | General Terrain:                                                                                  | <i>Level</i>                           |     |
| DDHV = AADT x K x D                                                          |                             | veh/h                            | Grade % Length                                                                                    | <i>mi</i>                              |     |
|                                                                              |                             |                                  | Up/Down %                                                                                         |                                        |     |
| <b>Calculate Flow Adjustments</b>                                            |                             |                                  |                                                                                                   |                                        |     |
| f <sub>p</sub>                                                               | 1.00                        |                                  | E <sub>R</sub>                                                                                    | 1.2                                    |     |
| E <sub>T</sub>                                                               | 1.5                         |                                  | f <sub>HV</sub> = 1/[1+P <sub>T</sub> (E <sub>T</sub> - 1) + P <sub>R</sub> (E <sub>R</sub> - 1)] | 0.971                                  |     |
| <b>Speed Inputs</b>                                                          |                             |                                  | <b>Calc Speed Adj and FFS</b>                                                                     |                                        |     |
| Lane Width                                                                   | 12.0                        | ft                               |                                                                                                   |                                        |     |
| Rt-Side Lat. Clearance                                                       | 6.0                         | ft                               | f <sub>LW</sub>                                                                                   | 0.0                                    | mph |
| Number of Lanes, N                                                           | 2                           |                                  | f <sub>LC</sub>                                                                                   | 0.0                                    | mph |
| Total Ramp Density, TRD                                                      | 1.70                        | ramps/mi                         | TRD Adjustment                                                                                    | 5.0                                    | mph |
| FFS (measured)                                                               |                             | mph                              | FFS                                                                                               | 70.4                                   | mph |
| Base free-flow Speed, BFFS                                                   | 75.4                        | mph                              |                                                                                                   |                                        |     |
| <b>LOS and Performance Measures</b>                                          |                             |                                  | <b>Design (N)</b>                                                                                 |                                        |     |
| <u>Operational (LOS)</u>                                                     |                             |                                  | <u>Design (N)</u>                                                                                 |                                        |     |
| v <sub>p</sub> = (V or DDHV) / (PHF x N x f <sub>HV</sub> x f <sub>p</sub> ) |                             |                                  | v <sub>p</sub> = (V or DDHV) / (PHF x N x f <sub>HV</sub> x f <sub>p</sub> )                      |                                        |     |
| S                                                                            | 61.2                        | mph                              | S                                                                                                 |                                        |     |
| D = v <sub>p</sub> / S                                                       | 33.8                        | pc/mi/ln                         | D = v <sub>p</sub> / S                                                                            |                                        |     |
| LOS                                                                          | D                           |                                  | Required Number of Lanes, N                                                                       |                                        |     |
| <b>Glossary</b>                                                              |                             |                                  | <b>Factor Location</b>                                                                            |                                        |     |
| N - Number of lanes                                                          | S - Speed                   |                                  | E <sub>R</sub> - Exhibits 11-10, 11-12                                                            | f <sub>LW</sub> - Exhibit 11-8         |     |
| V - Hourly volume                                                            | D - Density                 |                                  | E <sub>T</sub> - Exhibits 11-10, 11-11, 11-13                                                     | f <sub>LC</sub> - Exhibit 11-9         |     |
| v <sub>p</sub> - Flow rate                                                   | FFS - Free-flow speed       |                                  | f <sub>p</sub> - Page 11-18                                                                       | TRD - Page 11-11                       |     |
| LOS - Level of service                                                       | BFFS - Base free-flow speed |                                  | LOS, S, FFS, v <sub>p</sub> - Exhibits 11-2, 11-3                                                 |                                        |     |
| DDHV - Directional design hour volume                                        |                             |                                  |                                                                                                   |                                        |     |

| BASIC FREEWAY SEGMENTS WORKSHEET                                             |                             |                                  |                                                                                                   |                                        |     |
|------------------------------------------------------------------------------|-----------------------------|----------------------------------|---------------------------------------------------------------------------------------------------|----------------------------------------|-----|
| <b>General Information</b>                                                   |                             |                                  | <b>Site Information</b>                                                                           |                                        |     |
| Analyst                                                                      | MTD                         |                                  | Highway/Direction of Travel <i>Route 1 SB</i>                                                     |                                        |     |
| Agency or Company                                                            | Pennoni                     |                                  | From/To <i>S.R. 2029 to I-95</i>                                                                  |                                        |     |
| Date Performed                                                               | 8/18/2015                   |                                  | Jurisdiction <i>PennDOT</i>                                                                       |                                        |     |
| Analysis Time Period                                                         | AM Peak                     |                                  | Analysis Year <i>2015</i>                                                                         |                                        |     |
| Project Description <i>Pre-Construction Traffic Study</i>                    |                             |                                  |                                                                                                   |                                        |     |
| <input checked="" type="checkbox"/> Oper.(LOS)                               |                             | <input type="checkbox"/> Des.(N) |                                                                                                   | <input type="checkbox"/> Planning Data |     |
| <b>Flow Inputs</b>                                                           |                             |                                  |                                                                                                   |                                        |     |
| Volume, V                                                                    | 2950                        | veh/h                            | Peak-Hour Factor, PHF                                                                             | 0.97                                   |     |
| AADT                                                                         |                             | veh/day                          | %Trucks and Buses, P <sub>T</sub>                                                                 | 7                                      |     |
| Peak-Hr Prop. of AADT, K                                                     |                             |                                  | %RVs, P <sub>R</sub>                                                                              | 0                                      |     |
| Peak-Hr Direction Prop, D                                                    |                             |                                  | General Terrain:                                                                                  | <i>Level</i>                           |     |
| DDHV = AADT x K x D                                                          |                             | veh/h                            | Grade % Length                                                                                    | <i>mi</i>                              |     |
|                                                                              |                             |                                  | Up/Down %                                                                                         |                                        |     |
| <b>Calculate Flow Adjustments</b>                                            |                             |                                  |                                                                                                   |                                        |     |
| f <sub>p</sub>                                                               | 1.00                        |                                  | E <sub>R</sub>                                                                                    | 1.2                                    |     |
| E <sub>T</sub>                                                               | 1.5                         |                                  | f <sub>HV</sub> = 1/[1+P <sub>T</sub> (E <sub>T</sub> - 1) + P <sub>R</sub> (E <sub>R</sub> - 1)] | 0.966                                  |     |
| <b>Speed Inputs</b>                                                          |                             |                                  | <b>Calc Speed Adj and FFS</b>                                                                     |                                        |     |
| Lane Width                                                                   | 12.0                        | ft                               |                                                                                                   |                                        |     |
| Rt-Side Lat. Clearance                                                       | 6.0                         | ft                               | f <sub>LW</sub>                                                                                   | 0.0                                    | mph |
| Number of Lanes, N                                                           | 2                           |                                  | f <sub>LC</sub>                                                                                   | 0.0                                    | mph |
| Total Ramp Density, TRD                                                      | 1.50                        | ramps/mi                         | TRD Adjustment                                                                                    | 4.5                                    | mph |
| FFS (measured)                                                               |                             | mph                              | FFS                                                                                               | 70.9                                   | mph |
| Base free-flow Speed, BFFS                                                   | 75.4                        | mph                              |                                                                                                   |                                        |     |
| <b>LOS and Performance Measures</b>                                          |                             |                                  | <b>Design (N)</b>                                                                                 |                                        |     |
| <u>Operational (LOS)</u>                                                     |                             |                                  | <u>Design (N)</u>                                                                                 |                                        |     |
| v <sub>p</sub> = (V or DDHV) / (PHF x N x f <sub>HV</sub> x f <sub>p</sub> ) |                             |                                  | Design LOS                                                                                        |                                        |     |
|                                                                              | 1574                        | pc/h/ln                          | v <sub>p</sub> = (V or DDHV) / (PHF x N x f <sub>HV</sub> x f <sub>p</sub> )                      |                                        |     |
| S                                                                            | 68.4                        | mph                              | S                                                                                                 |                                        |     |
| D = v <sub>p</sub> / S                                                       | 23.0                        | pc/mi/ln                         | D = v <sub>p</sub> / S                                                                            |                                        |     |
| LOS                                                                          | C                           |                                  | Required Number of Lanes, N                                                                       |                                        |     |
| <b>Glossary</b>                                                              |                             |                                  | <b>Factor Location</b>                                                                            |                                        |     |
| N - Number of lanes                                                          | S - Speed                   |                                  | E <sub>R</sub> - Exhibits 11-10, 11-12                                                            | f <sub>LW</sub> - Exhibit 11-8         |     |
| V - Hourly volume                                                            | D - Density                 |                                  | E <sub>T</sub> - Exhibits 11-10, 11-11, 11-13                                                     | f <sub>LC</sub> - Exhibit 11-9         |     |
| v <sub>p</sub> - Flow rate                                                   | FFS - Free-flow speed       |                                  | f <sub>p</sub> - Page 11-18                                                                       | TRD - Page 11-11                       |     |
| LOS - Level of service                                                       | BFFS - Base free-flow speed |                                  | LOS, S, FFS, v <sub>p</sub> - Exhibits 11-2, 11-3                                                 |                                        |     |
| DDHV - Directional design hour volume                                        |                             |                                  |                                                                                                   |                                        |     |

| BASIC FREEWAY SEGMENTS WORKSHEET                                             |                             |                                  |                                                                                                   |                                        |     |
|------------------------------------------------------------------------------|-----------------------------|----------------------------------|---------------------------------------------------------------------------------------------------|----------------------------------------|-----|
| <b>General Information</b>                                                   |                             |                                  | <b>Site Information</b>                                                                           |                                        |     |
| Analyst                                                                      | MTD                         |                                  | Highway/Direction of Travel <i>Route 1 NB</i>                                                     |                                        |     |
| Agency or Company                                                            | Pennoni                     |                                  | From/To <i>S.R. 2029 to I-95</i>                                                                  |                                        |     |
| Date Performed                                                               | 8/18/2015                   |                                  | Jurisdiction <i>PennDOT</i>                                                                       |                                        |     |
| Analysis Time Period                                                         | PM Peak                     |                                  | Analysis Year <i>2015</i>                                                                         |                                        |     |
| Project Description <i>Pre-Construction Traffic Study</i>                    |                             |                                  |                                                                                                   |                                        |     |
| <input checked="" type="checkbox"/> Oper.(LOS)                               |                             | <input type="checkbox"/> Des.(N) |                                                                                                   | <input type="checkbox"/> Planning Data |     |
| <b>Flow Inputs</b>                                                           |                             |                                  |                                                                                                   |                                        |     |
| Volume, V                                                                    | 3346                        | veh/h                            | Peak-Hour Factor, PHF                                                                             | 0.97                                   |     |
| AADT                                                                         |                             | veh/day                          | %Trucks and Buses, P <sub>T</sub>                                                                 | 3                                      |     |
| Peak-Hr Prop. of AADT, K                                                     |                             |                                  | %RVs, P <sub>R</sub>                                                                              | 0                                      |     |
| Peak-Hr Direction Prop, D                                                    |                             |                                  | General Terrain:                                                                                  | <i>Level</i>                           |     |
| DDHV = AADT x K x D                                                          |                             | veh/h                            | Grade % Length                                                                                    | <i>mi</i>                              |     |
|                                                                              |                             |                                  | Up/Down %                                                                                         |                                        |     |
| <b>Calculate Flow Adjustments</b>                                            |                             |                                  |                                                                                                   |                                        |     |
| f <sub>p</sub>                                                               | 1.00                        |                                  | E <sub>R</sub>                                                                                    | 1.2                                    |     |
| E <sub>T</sub>                                                               | 1.5                         |                                  | f <sub>HV</sub> = 1/[1+P <sub>T</sub> (E <sub>T</sub> - 1) + P <sub>R</sub> (E <sub>R</sub> - 1)] | 0.985                                  |     |
| <b>Speed Inputs</b>                                                          |                             |                                  | <b>Calc Speed Adj and FFS</b>                                                                     |                                        |     |
| Lane Width                                                                   | 12.0                        | ft                               |                                                                                                   |                                        |     |
| Rt-Side Lat. Clearance                                                       | 6.0                         | ft                               | f <sub>LW</sub>                                                                                   | 0.0                                    | mph |
| Number of Lanes, N                                                           | 2                           |                                  | f <sub>LC</sub>                                                                                   | 0.0                                    | mph |
| Total Ramp Density, TRD                                                      | 1.70                        | ramps/mi                         | TRD Adjustment                                                                                    | 5.0                                    | mph |
| FFS (measured)                                                               |                             | mph                              | FFS                                                                                               | 70.4                                   | mph |
| Base free-flow Speed, BFFS                                                   | 75.4                        | mph                              |                                                                                                   |                                        |     |
| <b>LOS and Performance Measures</b>                                          |                             |                                  | <b>Design (N)</b>                                                                                 |                                        |     |
| <u>Operational (LOS)</u>                                                     |                             |                                  | <u>Design (N)</u>                                                                                 |                                        |     |
| v <sub>p</sub> = (V or DDHV) / (PHF x N x f <sub>HV</sub> x f <sub>p</sub> ) |                             |                                  | Design LOS                                                                                        |                                        |     |
|                                                                              | 1751                        | pc/h/ln                          | v <sub>p</sub> = (V or DDHV) / (PHF x N x f <sub>HV</sub> x f <sub>p</sub> )                      |                                        |     |
| S                                                                            | 66.5                        | mph                              | S                                                                                                 |                                        |     |
| D = v <sub>p</sub> / S                                                       | 26.3                        | pc/mi/ln                         | D = v <sub>p</sub> / S                                                                            |                                        |     |
| LOS                                                                          | D                           |                                  | Required Number of Lanes, N                                                                       |                                        |     |
| <b>Glossary</b>                                                              |                             |                                  | <b>Factor Location</b>                                                                            |                                        |     |
| N - Number of lanes                                                          | S - Speed                   |                                  | E <sub>R</sub> - Exhibits 11-10, 11-12                                                            | f <sub>LW</sub> - Exhibit 11-8         |     |
| V - Hourly volume                                                            | D - Density                 |                                  | E <sub>T</sub> - Exhibits 11-10, 11-11, 11-13                                                     | f <sub>LC</sub> - Exhibit 11-9         |     |
| v <sub>p</sub> - Flow rate                                                   | FFS - Free-flow speed       |                                  | f <sub>p</sub> - Page 11-18                                                                       | TRD - Page 11-11                       |     |
| LOS - Level of service                                                       | BFFS - Base free-flow speed |                                  | LOS, S, FFS, v <sub>p</sub> - Exhibits 11-2, 11-3                                                 |                                        |     |
| DDHV - Directional design hour volume                                        |                             |                                  |                                                                                                   |                                        |     |



| BASIC FREEWAY SEGMENTS WORKSHEET                                             |                             |                                  |                                                                                                   |                                        |     |
|------------------------------------------------------------------------------|-----------------------------|----------------------------------|---------------------------------------------------------------------------------------------------|----------------------------------------|-----|
| <b>General Information</b>                                                   |                             |                                  | <b>Site Information</b>                                                                           |                                        |     |
| Analyst                                                                      | MTD                         |                                  | Highway/Direction of Travel <i>Route 1 SB</i>                                                     |                                        |     |
| Agency or Company                                                            | Pennoni                     |                                  | From/To <i>S.R. 2029 to I-95</i>                                                                  |                                        |     |
| Date Performed                                                               | 8/18/2015                   |                                  | Jurisdiction <i>PennDOT</i>                                                                       |                                        |     |
| Analysis Time Period                                                         | PM Peak                     |                                  | Analysis Year <i>2015</i>                                                                         |                                        |     |
| Project Description <i>Pre-Construction Traffic Study</i>                    |                             |                                  |                                                                                                   |                                        |     |
| <input checked="" type="checkbox"/> Oper.(LOS)                               |                             | <input type="checkbox"/> Des.(N) |                                                                                                   | <input type="checkbox"/> Planning Data |     |
| <b>Flow Inputs</b>                                                           |                             |                                  |                                                                                                   |                                        |     |
| Volume, V                                                                    | 4074                        | veh/h                            | Peak-Hour Factor, PHF                                                                             | 0.90                                   |     |
| AADT                                                                         |                             | veh/day                          | %Trucks and Buses, P <sub>T</sub>                                                                 | 2                                      |     |
| Peak-Hr Prop. of AADT, K                                                     |                             |                                  | %RVs, P <sub>R</sub>                                                                              | 0                                      |     |
| Peak-Hr Direction Prop, D                                                    |                             |                                  | General Terrain:                                                                                  | <i>Level</i>                           |     |
| DDHV = AADT x K x D                                                          |                             | veh/h                            | Grade % Length                                                                                    | <i>mi</i>                              |     |
|                                                                              |                             |                                  | Up/Down %                                                                                         |                                        |     |
| <b>Calculate Flow Adjustments</b>                                            |                             |                                  |                                                                                                   |                                        |     |
| f <sub>p</sub>                                                               | 1.00                        |                                  | E <sub>R</sub>                                                                                    | 1.2                                    |     |
| E <sub>T</sub>                                                               | 1.5                         |                                  | f <sub>HV</sub> = 1/[1+P <sub>T</sub> (E <sub>T</sub> - 1) + P <sub>R</sub> (E <sub>R</sub> - 1)] | 0.990                                  |     |
| <b>Speed Inputs</b>                                                          |                             |                                  | <b>Calc Speed Adj and FFS</b>                                                                     |                                        |     |
| Lane Width                                                                   | 12.0                        | ft                               |                                                                                                   |                                        |     |
| Rt-Side Lat. Clearance                                                       | 6.0                         | ft                               | f <sub>LW</sub>                                                                                   | 0.0                                    | mph |
| Number of Lanes, N                                                           | 2                           |                                  | f <sub>LC</sub>                                                                                   | 0.0                                    | mph |
| Total Ramp Density, TRD                                                      | 1.50                        | ramps/mi                         | TRD Adjustment                                                                                    | 4.5                                    | mph |
| FFS (measured)                                                               |                             | mph                              | FFS                                                                                               | 70.9                                   | mph |
| Base free-flow Speed, BFFS                                                   | 75.4                        | mph                              |                                                                                                   |                                        |     |
| <b>LOS and Performance Measures</b>                                          |                             |                                  | <b>Design (N)</b>                                                                                 |                                        |     |
| <u>Operational (LOS)</u>                                                     |                             |                                  | <u>Design (N)</u>                                                                                 |                                        |     |
| v <sub>p</sub> = (V or DDHV) / (PHF x N x f <sub>HV</sub> x f <sub>p</sub> ) |                             |                                  | Design LOS                                                                                        |                                        |     |
|                                                                              | 2286                        | pc/h/ln                          | v <sub>p</sub> = (V or DDHV) / (PHF x N x f <sub>HV</sub> x f <sub>p</sub> )                      |                                        |     |
| S                                                                            | 56.3                        | mph                              | S                                                                                                 |                                        |     |
| D = v <sub>p</sub> / S                                                       | 40.6                        | pc/mi/ln                         | D = v <sub>p</sub> / S                                                                            |                                        |     |
| LOS                                                                          | E                           |                                  | Required Number of Lanes, N                                                                       |                                        |     |
| <b>Glossary</b>                                                              |                             |                                  | <b>Factor Location</b>                                                                            |                                        |     |
| N - Number of lanes                                                          | S - Speed                   |                                  | E <sub>R</sub> - Exhibits 11-10, 11-12                                                            | f <sub>LW</sub> - Exhibit 11-8         |     |
| V - Hourly volume                                                            | D - Density                 |                                  | E <sub>T</sub> - Exhibits 11-10, 11-11, 11-13                                                     | f <sub>LC</sub> - Exhibit 11-9         |     |
| v <sub>p</sub> - Flow rate                                                   | FFS - Free-flow speed       |                                  | f <sub>p</sub> - Page 11-18                                                                       | TRD - Page 11-11                       |     |
| LOS - Level of service                                                       | BFFS - Base free-flow speed |                                  | LOS, S, FFS, v <sub>p</sub> - Exhibits 11-2, 11-3                                                 |                                        |     |
| DDHV - Directional design hour volume                                        |                             |                                  |                                                                                                   |                                        |     |