

Character: A string of alphanumeric characters that are bracketed by single quotes (e.g., 'SR 1 – NB Lanes')

Integer: A number with no decimal point (e.g., 12)

Real: A number with a decimal point separating the whole number portion from the fractional number portion (e.g., 234.16)

| File Management   |           |  |
|---|-----------|--|
| <b>MET:</b>   | -         | Pathway label  |
| <b>'*.met'</b>  | Character | Name of file containing preprocessed meteorology <sup>a</sup>  |
| <b>OUT:</b>   | -         | Pathway label  |
| <b>'*.out'</b>  | Character | Name of file containing model printout <sup>b</sup>  |
| <b>ETS:</b>   | -         | Pathway label  |
| <b>'*.ets'</b>  | Character | Name of file containing ETS data <sup>b</sup>  |
| <b>MSG:</b>   | -         | Pathway label  |
| <b>'*.msg'</b>  | Character | Name of file containing simulation errors and other messages <sup>b</sup>  |
| <b>PST1</b>   | -         | Pathway label  |
| <b>'*.pst'</b>  | Character | Name of file containing concurrent model results in post format of 24-hour averages for PM <sub>2.5</sub> , PM <sub>10</sub> , and OTHER or 1-hour averages for CO and NO <sub>2</sub> <sup>b</sup>  |
| <b>PST2</b>   | -         | Pathway label  |
| <b>'*.pst'</b>  | Character | Name of file containing concurrent model results in post format of annual averages for PM <sub>2.5</sub> , PM <sub>10</sub> , NO <sub>2</sub> , and OTHER or 8-hour averages for CO <sup>b</sup>   |
| <b>PLT1</b>   | -         | Pathway label  |
| <b>'*.plt'</b>  | Character | Name of file containing high value model results in plot format of average quarterly 24-hour for PM <sub>2.5</sub> ; 6 <sup>th</sup> highest 24-hour for PM-10; 24-hour for OTHER; 2 <sup>nd</sup> highest 1-hour for CO; or average 8 <sup>th</sup> highest 1-hour for NO <sub>2</sub> <sup>b</sup> |
| <b>PLT2</b>   | -         | Pathway label  |
| <b>'*.plt'</b>  | Character | Name of file containing high value model results in plot format of average annual for PM <sub>2.5</sub> , PM-10, and OTHER or 2 <sup>nd</sup> highest 8-hour for CO <sup>b</sup>   |
| <sup>a</sup> User-created file; <sup>b</sup> CAL3QHCR-generated file – distinct file names including the extension must be used for the CAL3QHCR-generated files or the model run will end in error |           |  |

## NOTES:

- File Management
  - Use a descriptive root file name
  - Enter the full name of the path for files outside the CAL3QHCR application folder (e.g., C:\DIR\SUBDIR\NAME.EXT)
  - The full path name is optional for files within the CAL3QHCR application folder
  - To instruct the program not to produce a specific post or plot file, specify ' ' as the name

| Program Control & Site Variables |           |   |
|----------------------------------|-----------|---|
| <b>#1:</b>                       | -         | Pathway label   |
| <b>'JOB'</b>                     | Character | Job title/description, up to 40 characters  |
| <b>ATIM</b>                      | Real      | Run averaging time (min)  |
| <b>Z0</b>                        | Real      | Surface roughness (or roughness length) (cm)  |
| <b>VS</b>                        | Real      | Settling velocity (cm/s)  |
| <b>VD</b>                        | Real      | Deposition velocity (cm/s)  |
| <b>NR</b>                        | Integer   | Number of receptors   |
| <b>SCAL</b>                      | Real      | Scale conversion factor, user units to meters   |
| <b>IOPT</b>                      | Integer   | Output units, 1 = feet; 0 = meters  |
|                                  |           |   |
| <b>#2:</b>                       | -         | Pathway label   |
| <b>'RUN'</b>                     | Character | Run title/description, up to 40 characters  |
| <b>NL</b>                        | Integer   | Number of links   |
| <b>JTIER</b>                     | Integer   | Tier approach, 1 = Tier I; 2 = Tier II  |
| <b>'MODE'</b>                    | Character | Pollutant (units), 'CO' = CO (ppm); 'PM2.5' = PM <sub>2.5</sub> (µg/m <sup>3</sup> );<br>'PM-10' = PM <sub>10</sub> (µg/m <sup>3</sup> ); 'NO2' = NO <sub>2</sub> (µg/m <sup>3</sup> );<br>'OTHER' = OTHER (µg/m <sup>3</sup> ) |
| <b>FLINK</b>                     | Integer   | Print link contributions, 1 = YES; 0 = NO   |
| <b>FAMB</b>                      | Integer   | Include background concentrations in results, 1 = YES; 0 = NO   |
| <b>'RU'</b>                      | Character | Land use selection, 'R' = Rural; 'U' = Urban  |
|                                  |           |   |
| <b>#3:</b>                       | -         | Pathway label   |
| <b>STRMO</b>                     | Integer   | Processing start month  |
| <b>STRDY</b>                     | Integer   | Processing start day  |
| <b>STRYR</b>                     | Integer   | Processing start year   |
| <b>ENDMO</b>                     | Integer   | Processing end month  |
| <b>ENDDY</b>                     | Integer   | Processing end day  |
| <b>ENDYR</b>                     | Integer   | Processing end year   |

## NOTES:

- Pathway #1:
  - Averaging time should be 60 min, since predictions are performed for a 1-hour period
  - Surface roughness should be within the range of 3 cm to 400 cm
  - Settling velocity should be 0 cm/s to reflect negligible gravitational settling
  - Deposition velocity should be 0 cm/s to reflect negligible deposition effects

## Pathway #2:

- Specify a Tier II approach (JTIER = 2) to account for hourly variations in emissions and meteorology
- Specify MODE = 'PM2.5' for PM<sub>2.5</sub> analysis or 'PM-10' for PM<sub>10</sub> analyses
- Do not include background PM concentrations in the model runs
- Background concentrations are determined separately as described in Module 6
- Background concentrations are then added to model results to calculate design values
- For determining whether land use is rural or urban, refer to PM Hot-spot Guidance, Section 7.5.5
- Pathway #3:
  - Processing start and end dates should match the start and end dates of the preprocessed meteorology
  - Typically, the start month and day are January 1 (01,01) and the end month and day are December 31 (12,31)
  - 5 years of off-site meteorology are generally required, which can be processed in a single simulation (e.g., 01,01,06,12,31,10)
  - If available, use met files prepared for regulatory applications by the air agency
  - Wind speeds should be at least 1 m/s

| Receptor Locations                                       |           |                                       |
|--|-----------|---------------------------------------|
| #4:  | -         | Pathway label                         |
| 'RCP'  | Character | Receptor name, up to 20 characters    |
| XR   | Real      | X-coordinate of receptor (user units) |
| YR   | Real      | Y-coordinate of receptor (user units) |
| ZR   | Real      | Z-coordinate of receptor (user units) |
| *** Repeat in succession for each Receptor = 1 to NR *** |           |                                       |

## NOTES:

- Pathway #4:
  - User units are defined by the SCAL parameter entered on the Pathway #1 record
  - Receptors should always be located outside of the mixing zone (link width)
  - Receptor height should represent the typical ground-level breathing height of 1.8 m (5.9 ft) or less
  - Guidance on the placement of receptors is described in Module 3

| Emissions, Traffic, & Signalization Patterns |         |   |
|--|---------|---|
| <b>#5:</b>                                   | -       | Pathway label   |
| <b>PMOY1</b><br>to<br><b>PMOY12</b>          | Integer | <p>Month of year patterns for ETS values; assigned in the order:<br/>Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec</p> <p>An example distinguishing four seasonal patterns by quarter:<br/>1,1,1,2,2,2,3,3,3,4,4,4</p> <p>Up to 12 monthly patterns may be assigned</p>   |
| <b>#6:</b>                                   | -       | Pathway label   |
| <b>PHOD1</b><br>to<br><b>PHOD24</b>          | Integer | <p>Hour of day patterns for ETS values; assigned in the order:<br/>1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24</p> <p>An example distinguishing four hourly patterns to represent the morning peak, midday, afternoon peak, and overnight:<br/>1,1,1,1,1,1,2,2,2,3,3,3,3,3,3,3,4,4,4,1,1,1,1,1</p> <p>Up to 24 hourly patterns may be assigned</p> |
| <b>#7:</b>                                   | -       | Pathway label   |
| <b>PDOW1</b><br>to<br><b>PDOW7</b>           | Integer | <p>Day of week patterns for ETS values; assigned in the order:<br/>Mon Tue Wed Thu Fri Sat Sun</p> <p>An example distinguishing weekday and weekend travel:<br/>1,1,1,1,1,2,2</p> <p>Up to 7 daily patterns may be assigned</p>   |

## NOTES:

- Pathway #5:
  - For PM hot-spot analyses, quarterly emissions and traffic activities are generally defined; e.g., MOVES output for:

| MOVES<br>Month | MOVES<br>monthID | CAL3QHCR<br>PMOY Range |
|----------------|------------------|------------------------|
| January        | 1                | PMOY1 – PMOY3          |
| April          | 4                | PHOD4 – PMOY6          |
| July           | 7                | PMOY7 – PMOY9          |
| October        | 10               | PMOY10 – PMOY12        |

- If MOVES was run for more than the four representative months for each calendar quarter as suggested in the PM Hot-spot Guidance, the data should be assigned to the appropriate months using PMOY

- Pathway #6:
  - For PM hot-spot analyses, morning peak, midday, afternoon peak, and overnight emissions and traffic activities are generally defined; e.g., MOVES output for:

| <b>MOVES<br/>Hour Beginning</b> | <b>MOVES<br/>hourID</b> | <b>CAL3QHCR<br/>PHOD Range</b>    |
|---------------------------------|-------------------------|-----------------------------------|
| 12 am                           | 1                       | PHOD1 – PHOD6;<br>PHOD20 – PHOD24 |
| 6 am                            | 7                       | PHOD7 – PHOD9                     |
| 12 pm                           | 13                      | PHOD10 – PHOD16                   |
| 6 pm                            | 19                      | PHOD17 – PHOD19                   |

- If MOVES was run for more than the four representative hours for each different time period as suggested in the PM Hot-spot Guidance, the data should be assigned to the appropriate hours using PHOD
- Pathway #7:
  - For PM hot-spot analyses, emissions and traffic activities are generally defined for a typical weekday; i.e., one pattern for all seven days
  - If MOVES was run to differentiate weekday and weekend emissions, the data should be assigned to the appropriate days using PDOW

| <b>Background Concentrations</b>   |      |   |
|--|------|---|
| <b>#8:</b>   | -    | Pathway label   |
| <b>BKG</b>   | Real | Hourly ambient background concentrations (ppm for CO; $\mu\text{g}/\text{m}^3$ for PM <sub>2.5</sub> , PM <sub>10</sub> , NO <sub>2</sub> , and OTHER) for each month of year ETS pattern |
| <b>*** Repeat in succession for each of hour of day ETS pattern, then for each day of week ETS pattern ***</b> |      |   |

## NOTES:

- Pathway #8:
  - Hourly ambient background concentration should be set to zero
  - Background concentrations are determined separately as described in Module 6
  - Background concentrations are then added to model results to calculate design values as described in Module 7

| Link Configurations   |           |  |
|---|-----------|--|
| <b>#9:</b>  | -         | Pathway label  |
| <b>'LNK'</b>  | Character | Link name, up to 20 characters   |
| <b>'IQ'</b>   | Character | Traffic flow, 'F' = free-flow link; 'Q' = queue link   |
| <b>'TYP'</b>  | Character | Link type, 'AG' = at-grade; 'FL' = fill; 'BR' = bridge; and 'DP' = depressed   |
| <b>XL1</b>  | Real      | Link X-coordinate start point (user units)   |
| <b>YL1</b>  | Real      | Link Y-coordinate start point (user units)   |
| <b>XL2</b>  | Real      | Link X-coordinate end point (user units)   |
| <b>YL2</b>  | Real      | Link Y-coordinate end point (user units)   |
| <b>SH</b>   | Real      | Source height (user units)   |
| <b>WL</b>   | Real      | Mixing zone width (user units)   |
| <b>NLANES</b>   | Integer   | Number of travel lanes for queue link (required only if IQ = 'Q')  |
|   |           |  |
| <b>#10:</b>   | -         | Pathway label  |
| <b>VPHL</b>   | Real      | Hourly traffic volume (veh/hr) for each month of year ETS pattern  |
| <b>EFL</b>  | Real      | Hourly emission factor (g/veh-mi) for each month of ETS pattern  |
| <b>*** Repeat in succession for each of hour of day ETS pattern, then for each day of week ETS pattern ***</b>                  |           |  |
|   |           |  |
| <b>#11:</b>   | -         | Pathway label (required only if IQ = 'Q')  |
| <b>CAVG</b>   | Real      | Average total signal cycle length (s) for each month of year ETS pattern   |
| <b>RAVG</b>   | Real      | Average red signal cycle length (s) for each month of ETS pattern  |
| <b>YFAC</b>   | Real      | Clearance lost time (s) for each month of ETS pattern  |
| <b>*** Repeat in succession for each of hour of day ETS pattern, then for each day of week ETS pattern ***</b>                  |           |  |
|   |           |  |
| <b>#12:</b>   | -         | Pathway label (required only if IQ = 'Q')  |
| <b>SFR</b>  | Real      | Saturation flow rate (vphpl) for each month of year ETS pattern  |
| <b>ST</b>   | Real      | Signal type for each month of ETS pattern, 1 = pre-timed; 2 = average; and 3 = semi-actuated                           |
| <b>AT</b>   | Real      | Arrival rate for each month of ETS pattern, 1 = worst; 2 = below average; 3 = average; 4 = above average; and 5 = best |
| <b>*** Repeat in succession for each of hour of day ETS pattern, then for each day of week ETS pattern ***</b>                  |           |  |
|   |           |  |
| <b>*** Repeat #9 &amp; #10 in succession for each Link = 1 to NL; include #11 &amp; #12 in the sequence for queue links ***</b> |           |  |

## NOTES:

- Pathway #9:
  - A new link is required when there is a change in link width, link orientation, traffic volume, travel speed, or emission factor
  - For a succession of links, the start coordinates of the next link usually equals the end coordinates of the prior link, i.e., no gaps or overlaps
  - In most cases, a link type of at-grade ('AG') and a source height of 0 m should be used
  - Source height should be within  $\pm 10$  m ( $\pm 32$  ft)
  - Mixing zone width is defined as the width of the travelled roadway plus 3 m (10 ft) on either side
  - Link length must always be greater than the mixing zone width
  - Specify free-flow link traffic flow (IQ = 'F')
  - Do not specify queue link traffic flow (IQ = 'Q') as the queuing algorithm in CAL3QHCR should not be used for PM hot-spot analyses
  - Idling vehicles should be accounted for by reflecting idle activity patterns in the MOVES modeling
- Pathway #10:
  - Hourly traffic volume and emission factors are applied uniformly to the entire link length
  - Emission factors are defined as g/veh-mi
    - Use the latest version of MOVES; specify the "Emission Rates" option
  - All relevant pollutants and processes should be summed for a single "rateperdistance" emission factor per link
    - MOVES post-processing scripts are available to complete this step as described in Module 2
- Pathway #11 (not recommended for PM hot-spot analyses):
  - For clearance lost time, a default value of 2 s may be used in the absence of locally derived values
- Pathway #12 (not recommended for PM hot-spot analyses):
  - For saturation flow rate, a default value of ~1800 vehicles per hour (based on the *Highway Capacity Manual 2010* for an urban intersection) may be used in the absence of locally derived values
  - For signal type, a default value of 1 (pre-timed) may be used in the absence of locally derived values
  - For arrival rate, a default value of 3 (average progression) may be used in the absence of locally derived values