ADDENDUM

TO THE

USER'S GUIDE TO CAL3QHC VERSION 2.0

(CAL3QHCR USER'S GUIDE)

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PREFACE

CAL3QHCR is an enhanced version of CAL3QHC and includes the same basic algorithms as in CAL3QHC. However, CAL3QHCR has not undergone the same degree of public review and comment as CAL3QHC, a required screening model. Use of CAL3QHCR, as a refined approach may be considered on a case-by-case basis as noted in Section 6.2.2 of the Guideline on Air Quality Models (See Reference 1).

** CAUTION: The main dispersion algorithms for this model are Gaussian and they may not produce valid average concentration results for situations where wind speeds are below 1.0 m/s.

Abstract

CAL3QHCR has been created by enhancing the basic algorithms of CAL3QHC to: 1) allow the capability to process a year of hourly meteorological, Carbon Monoxide (CO) or Particulate Matter (PM) emissions, traffic, and signalization data, 2) incorporate the complete ISCST2 mixing height algorithm, 3) allow the capability to vary traffic related input variables by hour of the week, and 4) incorporate various concentration averaging algorithms. The technical description of CAL3QHC found in the main body of the CAL3QHC user's guide is applicable to CAL3QHCR. Additional technical description and procedures for running CAL3QHCR, including CAL3QHCR test case examples can be found in this addendum.

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CAL3QHCR USER'S GUIDE

1.0 INTRODUCTION

CAL3QHCR is an enhanced, but separate, version of CAL3QHC. CAL3QHCR has been programmed to process up to a year of hourly meteorological (MET), and vehicular emissions, traffic volume, and signalization (ETS) data in one run using the basic algorithms from CAL3QHC. Daily to seasonal runs can also be made with CAL3QHCR, whereas CAL3QHC was designed to process one hour of ETS and MET data.

Flexibility has been built into CAL3QHCR to allow a two tiered approach. These two approaches are enhancements to the basic approach used in CAL3QHC. In the first approach, called Tier I, a full year of hourly MET data are entered into CAL3QHCR in place of the one hour of artificial MET data that are commonly entered into CAL3QHC. One hour of ETS data are also entered as is done when using CAL3QHC.

In the second approach, called Tier II, the same MET data as used in the Tier I approach are entered into the model. The ETS data however, are more detailed and reflect traffic conditions for each hour of a week. CAL3QHCR reads the ETS data as up to 7 sets of hourly ETS data (in the form of diurnal patterns) and processes the data into a week of hourly ETS data. The weekly ETS data are synchronized to the day of the week of the meteorological data year. The weekly traffic conditions are assumed to be the same for each week throughout the modeled period.

While CAL3QHC only prints maximum hourly averages, CAL3QHCR calculates 1-hour and running 8-hour averaged CO or 24-hour and annual block averaged PM concentrations as indicated in Reference 2. In addition, CAL3QHCR output contains: 1) a table of calm wind durations with their respective frequencies, 2) identification of truncated queues due to queues exceeding the physical constraints of the intersection, 3) optional link contribution results for each printed average, and 4) optional use of variable ambient background concentration data in calculating the various maxima concentrations. This output, when produced by either of the two tier approaches, provides a more detailed synopsis of MET and traffic conditions on air quality than could be derived from CAL3QHC.

2.0 TECHNICAL BACKGROUND

Pertinent information to the technical understanding of CAL3QHCR is available in the CAL3QHC user's guide (See Reference 3). Additional information is supplied in this section. The user is advised to read the CAL3QHC user's guide and this addendum before attempting to run CAL3QHCR.

CAL3QHCR uses the same basic algorithms from CAL3QHC and is also consistent with the ISCST2 mixing height algorithms. These algorithms have been enhanced for processing up to a year of hourly MET and ETS data. Read and write statements have been modified and other statements have been added so that a year of MET and ETS data can be read by CAL3QHCR using ASCII (text) format. The input data are in free format except for the MET data which is read using a fixed format. Therefore, single quotes have to be placed around text such as titles and names unless commas are placed between all names and values. The column justified placement of names and numbers is not critical.

It is assumed that the week to week variation in hourly traffic volumes will be minimal between an hour of one day of one week and the same hour of the same day of another week within the run. Using this assumption, CAL3QHCR processes up to a week of hourly ETS data from the input file and then uses that weekly set of processed ETS data for each week of the entire run. For a Tier I approach, the program uses the same hour of ETS data for every hour in the week. For Tier II cases, the program reads from 1 to 7 24-hour patterns. The patterns are used to fill the week. For Tier II runs of less than a week, one or more of the input ETS patterns can be used to fill the remaining days of the week without affecting model results (See the IPATRY definition in Table 3-2).

From the MET data dates, and the starting and ending dates entered, the program synchronizes the input ETS data with a particular day of the week. This is so a Sunday set of ETS values is not used with a Monday set of MET data. The input ETS variable data are read from the input file and written to the first of two working files. The first working file (ET1) serves as a base from which the program reads, organizes, and processes the input ETS data into a full week of data. The processed data is saved to a second working file. The processed ETS data in the second working file (ET2) is used by the main program in making concentration calculations. After the completion of each week on Sunday, the program will "rewind" to the beginning of the file and begin reading Monday's ETS data.

CAL3QHCR also has the capability to be used as an analysis tool for high concentration episodes or for examining the effects changing MET and traffic conditions have on concentrations. The

minimum data processing time is one 24-hour day ending at midnight.

Calm wind conditions (<1 m/s) are processed according to guidance (See Reference 4). The CALMPRO (Dated 84152) algorithms from the ISC2 models have been added to the main program. When a calm wind condition exists, a calm wind flag is set, the hourly concentrations are set to 0.0, and the hourly ambient background concentration is not used in any calculations for that hour. The annual or period average is calculated by summing each valid (non-calm) 1-hour average concentration and dividing by the total number of non-calm hours or 75 percent of the total number of hours in the period, whichever is greater.

The CAL3QHCR mixing height algorithms were enhanced by incorporating the full ISCST2 mixing height algorithms into the model. The CAL3QHC mixing height algorithms parallel those used in ISCST2 for stability classes A through C and in part, D. By incorporating the full ISCST2 mixing height algorithms into the CAL3QHCR, stability classes D, E and F are now consistent between these two models. Stability class G values are converted to stability class F values (See Reference 5).

The model is capable of being used in both rural and urban locales. A switch in the model allows the user to select for the locale being modeled by setting a switch to "U" for urban locales or to "R" for rural locales.. Guidance on classifying areas as rural or urban is discussed in Section 8.2.8 of Reference 1. If the switch is set to "U", the model reads urban mixing height values from the MET data file and assumes that stability classes E and F values can not exist in an urban environment close to the ground. Therefore, any stability class E or F values read from the MET data set are converted to D stability class for areas classified as urban. If the switch is set to "R", rural mixing height values are read and stability classes A through F are used.

The algorithms from the program, CHAVG (See Reference 6), were copied into CAL3QHCR and modified for calculating and printing CO or PM National Ambient Air Quality Standard averages only. CHAVG can calculate average concentrations for up to five end-to-end (block) and five running average periods for each file of hourly concentrations entered. In CAL3QHCR, the CHAVG end to end (block) average period algorithms were essentially left intact but the number of averaging periods were reduced from 5 to 3. Only the 1-hour, 24-hour, and annual (or period of concern, whichever is less) block average periods were retained.

Of the five running average periods algorithms copied into CAL3QHCR, only the 8-hour running average period algorithm was retained. CAL3QHCR calculates the 9 highest 8-hour running averages for each receptor in subroutine RNRK. Of these 9

averages, one average will be the maximum and at least one of the other averages will not overlap one of the higher averages. CAL3QHCR outputs the highest and the second highest running nonoverlapping values for each receptor. The other seven values are either lower in value or overlap the higher values.

If the input FAMB flag is set to "1" or "0", the program will respectively include or exclude the ambient background concentration value for each hour in the calculations producing the various maxima averages. For a Tier I analysis, the ambient background concentrations is entered as a fixed value that is used for every hour. For a Tier II analysis, similar to the ETS data, the ambient background is entered as 1 to 7 hourly varying patterns.

Sometimes the distance from one intersection to the next is so short that the queue calculated by the model extends into the next intersection. When this occurs, an internal queue truncation flag is set to "Y" and the traffic length is truncated at the queue end point length, which should be entered as the beginning of the next intersection. When the queue calculated by the model does not extend into the next intersection as determined by the queue end points, the internal flag is set to "N" and no truncation occurs. The flag, along with various link variables and constants are written to a LNK file (see p.3-38).

> CAUTION: Unlike CAL3QHC where the queue link end points simply defines the direction of the queue, the queue link end points in CAL3QHCR are used to define the maximum length of each queue as described in the above paragraph.

3.0 USER'S INSTRUCTIONS

3.1 INPUT DATA PREPARATION

There are three major types of data sets that have to be prepared before using CAL3QHCR. These data sets contain the MET, ETS, and the input control data, respectively.

3.1.1 Meteorological Data Preparation

Use of representative meteorological data that has been collected on-site is preferred (See Reference 7). However, if on-site data is not available, National Weather Service (NWS) data, representative of the area being modeled, is acceptable. If NWS data is used, the model must be run for 5 consecutive meteorological years (see Section 9.3.1 of Reference 1). On-site data, with its potential for being gathered from a low threshold speed anemometer, can provide better wind speed resolution in the low wind speed ranges than NWS data. Wind data gathered from on-site can provide a better resolution of the wind flow in the local area.

On-site data needs to be processed through the Meteorological Processor for Regulatory Models (MPRM) program. NWS data can be processed through the MPRM, PCRAMMET, or RAMMET programs (See Reference 8 and 9). The PCRAMMET output is in binary format. The program, BINTOASC, which is part of the ISCST2 Met file conversion utilities on the TTN (See Reference 10), converts the binary PCRAMMET output to ASCII format. Since BINTOASC does not provide any spacing between the date and hour values in its ASCII output format, the data can not be read using free format. The MET data are read by CAL3QHCR using the fixed format in Table 3-1. Wind flow is the direction the wind is blowing toward (i.e. 90 degrees is to the east).

3.1.2 Emissions, Traffic, and Signalization Data Preparation

The same type of ETS data collected for CAL3QHC is also used in CAL3QHCR. The amount of ETS data prepared depends upon the approach to be used. A Tier I approach uses only one hour of ETS data. This is the same ETS data that is used for a CAL3QHC run.

A Tier II approach uses a much more extensive ETS data set for which the minimum unit is called a diurnal traffic pattern or pattern for short. A pattern consists of 24 hours of hourly ETS data. A pattern can be used to represent the traffic flow for a given day, group of days, or non sequential group of days. CAL3QHCR is capable of processing up to 7 patterns, one for each day of the week. It is assumed that the traffic patterns during one week are the same throughout the year or the period of time being modeled.

Table 3-1

Meteorological Data Input Format

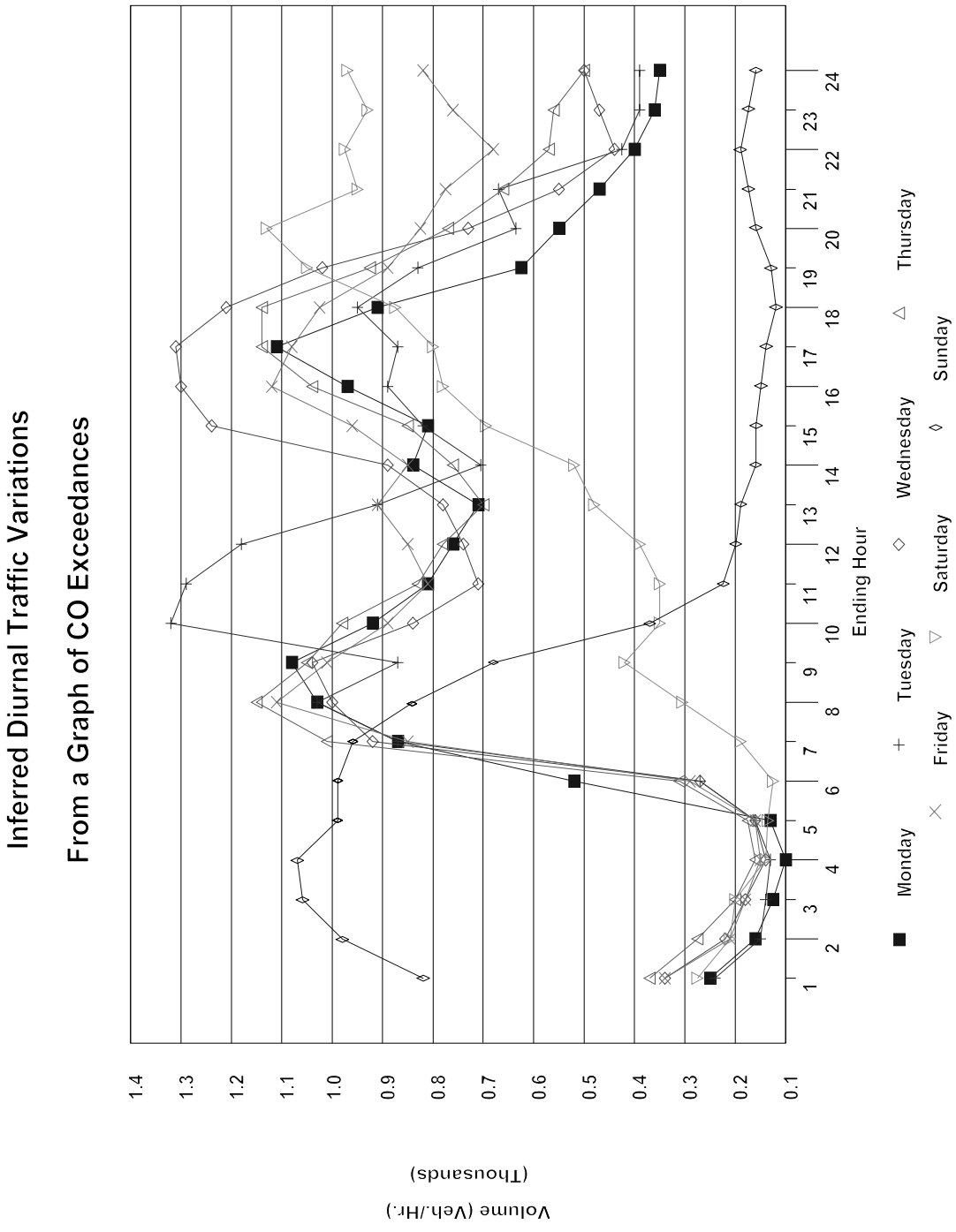
Variable	Format	Columns
Year (last 2 digits)	I2	1-2
Month	I2	3-4
Day	I2	5-6
Hour ending	I2	7-8
Wind flow Vector (deg.)	F9.4	9-17
Wind Speed (m/s)	F9.4	18-26
Ambient Temperature (K)	F6.1	27-32
Stability Class (A=1, F=6)	I2	33-34
Rural Mixing Height (m)	F7.1	35-41
Urban Mixing Height (m)	F7.1	42-48

However, this assumption may not be entirely true. Seasonal adjustments can be made to the traffic emissions of the ETS data by running the Mobile model for the season in question and then running CAL3QHCR for that season. Adjustments can also be made to any of the other link variables. CAL3QHCR is capable of being run for any given day, consecutive days, or season of a year. Several seasons can be run to complete a full year of modeling.

Depicted in Figure 3-1 is an inferred graph of traffic volume at an intersection for each hour of a typical week based on a year of CO exceedances. The graph was created assuming each traffic volume is directly related to each respective CO exceedance value. This simplistic assumption should not be used in deriving traffic volumes. There are many factors that can affect this relationship such as differences in stability class, wind speed, wind direction, mixing height, traffic flow, signalization, etc. This graph was intended to be used for discussion purposes only. Users need to collect their own data based on the traffic volumes at each intersection to be modeled.

CAL3QHCR assumes that the hourly traffic volumes for one week are the same as the hourly traffic volumes for the rest of

Figure 3-1


Inferred Diurnal Traffic Variations
From a Graph of CO Exceedances
Volume (Veh./Hr.)
(Thousands)
1.4
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
Ending Hour
Monday
Tuesday
Wednesday
Thursday
Friday
Saturday
Sunday

the weeks in a year or season. In this hypothetical figure, the 5 weekday patterns are similar to one another; almost to the point where one pattern could possibly be used to represent the pattern for all 5 weekdays. The 2 weekend patterns are very different from each other and from the weekday patterns. In this case, a pattern would be needed for each weekend day. Therefore, for a Tier II approach, a minimum of 3 ETS data patterns could be used in this case. Seven ETS data patterns would provide better resolution for some of the variations seen in the day to day weekday patterns.

The ETS data is collected, formatted, and added to the input control file. The ETS data are divided into two sections. The first section contains all the link constant data and the second section contains the link variable data. The data names and definitions, data formatting, and an input control file example displaying the ETS data are respectively shown in Tables 3-2 through 3-4.

Not all of the values in the first section are true constants. There may be some situations where traffic conditions for a link and/or the number of lanes may change during a 24 hour period. Some of these changes in configuration occur when: 1) the number of lanes for a queue link change to allow additional vehicles to turn, 2) a queue link becomes a free flow link due to a ban on turning left or right, and 3) the direction of traffic flow reverses to allow increased inbound traffic flow in the morning and increased outbound flow in the afternoon. An additional link entry will have to be added for each change in the 'constant' configuration. For those periods when a particular link configuration is not used, the vehicular traffic volume needs to be set to 0.00. If a link configuration changes on the half hour, two constant link entries are needed and the hourly traffic volume for each link configuration is prorated. Each traffic volume value, in this case, would be multiplied by 0.5 (30 minutes of usage divided by the 60 minute data period).

For example, if the following link constant and variable lines define a customarily non reversing traffic pattern for one link, (See Tables 3-2 through 3-4 for format structure)

```
   1  1
'Main St.NB Appr.   ' 'AG'    10. -1000.    10.     0.  0. 40.
    .
    .
    .
   1  1500.   41.6
```

and a decision is made to reverse the traffic flow on the link 30 minutes into an hour of a particular day, the above entry would then become:

```
   1  1
'Main St.NB Appr.    ' 'AG'    10. -1000.    10.     0.  0. 40.
   2  1
'Main St.SB Dep.     ' 'AG'    10.     0.    10. -1000.  0. 40.
    .
    .
with the volume entries prior to the hour of flow reversal:
   1  1500.   41.6
   2     0.   41.6
    .
with the volume entries during the hour of flow reversal:
   1   750.   41.6
   2   750.   41.6
    .
and with the volume entries after the hour of flow reversal:
   1     0.   41.6
   2  1500.   41.6
```

There are several points to observe: 1) the end points are reversed for the 'second' link, 2) the second link is treated as a separate link even though it is explicitly linked to the first link, 3) when not in use for a particular direction, the hourly link volume is set to 0.0, and 4) the reversed link becomes a fixed part of the link constants even for those days where there is no reversal. There may even be a day or two where all the hourly volumes for the reversed link are set at 0.0 because the traffic is not reversed on those days (such as a weekend). In order to have hourly or daily changes in traffic links, a Tier II analysis would need to be performed.

The second section contains all the hourly link variable data such as traffic volume, emission factors, signalization timing, etc. It is in this section that each hourly traffic volume for each link can be adjusted or set to 0.0. The main program will bypass each link that has its hourly traffic volume set to zero.

3.1.3 Input Control File Preparation

The input control file is very similar to the input control file structure for CAL3QHC. In addition to the values found in a CAL3QHC input file, CAL3QHCR contains starting and stopping dates, meteorological data identification values, several flags and switches, and pattern assignment numbers.

Input control file preparation involves the same procedures as for CAL3QHC. In addition, the preparer needs to enter the execution start and stop dates, the meteorological data identification values, the type of approach to be performed (Tier I or II), and the pollutant to be modeled (CO or PM).

The most difficult part in preparing the input will be in entering the ETS variable data for a Tier II approach. Seven pattern assignment numbers are read through the array IPATRY. Each value in the IPATRY array represents a day of the week with the first pattern number assigned to Monday and the last value assigned to Sunday (See Table 3-2). The fifth pattern number is assigned to Friday. Each value corresponds to a pattern to be read. If a "1" is entered for a particular day, then the first 24 hour pattern in the input file is associated with that day. If a "5" is entered for another day, then the fifth 24-hour pattern is associated with that day. If the highest value is "6", then six patterns need to be entered into the input control file. Each pattern needs to be in numerical order with pattern 1 first, 2 second, 3 third, and so forth. The minimum number of patterns is 1 and the maximum number is 7.

For a Tier II approach, the preparer needs to know how many patterns have been assembled and how the patterns are to be assigned to each day of a week. For instance, if a user entered 3 patterns, the user could assign pattern 2 to Tuesday and Thursday and pattern 3 to Saturday. Pattern 1 could be assigned to the other days of the week. If the first day of a requested start date were a Saturday, pattern 3 would be the first ETS pattern used in the calculations. If the first day of a requested start date were a Thursday, pattern 2 would be the first ETS pattern used in the calculations. The program automatically calculates the name of the first day of the year and automatically uses each pattern accordingly.

Each hour of each pattern begins with the hour ending value and an ambient background concentration value (AMB). Each hour of each pattern is entered consecutively followed by the associated ETS variable data. An AMB value must follow the hour ending value. The AMB value can be 0.0.

3.2 INPUT/OUTPUT VARIABLE NAMES, DESCRIPTIONS, AND FILE FORMATS

The input/output variable names, descriptions, and file formats are listed below. The input control file format is listed before the output file formats. The input names below are also used to define the output formats.

3.2.1 CAL3QHCR Input Control File Format

The input control file format consists of different types of variables or records. Table 3-2 identifies each variable or record type and its purpose. An example is given with each type of input.

Table 3-2

CAL3QHCR Input/Output Record Names and Descriptions

Note: All character strings need to be between single quotes. All variables must be entered even if optional in CAL3QHC.

Record Name	Description
JOB	Run title or description. Up to 40 characters are allowed. Example: 'Main & Market - Year 2000'
ATIM	Run averaging time (minutes). Normally set to 60 minutes. Example: 60
ZO	Roughness length (cm). Example: 175
VS	Settling velocity (cm/s) Example: 0.0
VD	Deposition velocity (cm/s) Example: 0.0
NR	Number of receptors. Maximum 60. Example: 10
SCAL	Units to meters conversion factor. Example: 0.3048
IOPT	Output units expressed in feet (1) or meters (0). Example: 1
START	Gregorian start processing date in month, day, year format. Year must equal END year. Example: 1 1 64
END	Gregorian end processing date in month, day, year format. Year must equal START year. Example: 12 31 64
METSF	Meteorological data surface station number. Example: 94823
METSYR	Meteorological surface data year. Example: 64
METUA	Meteorological data upper air station number. Example: 94824
METUYR	Meteorological upper air data year. Example: 64
FLINK	Print link contributions flag (Yes = 1, NO = 0).
FAMB	Print table of concentrations with average hourly ambient background concentrations included in the average calculations. (Yes = 1, No = 0).

Table 3-2 Cont'd

CAL3QHCR Input/Output Record Names and Descriptions

Record Name	Description
RU	Rural(R)/Urban(U) switch . Example: 'R' When 'U' is selected, stability classes E and F are equated to D.
RCP	Receptor name. Up to 20 characters allowed. Example: 'NE corner'
XR	Receptor X-coordinate (user units). Example: 40.3
YR	Receptor Y-coordinate (user units). Example: -33.5
ZR	Receptor Z-coordinate (user units). Example: 6.0
JTIER	Specifies whether the program will perform a Tier I (1) or II (2) approach. Example: 2
MODE	Specifies whether the data has been prepared for CO ('C') or PM ('P') calculations. Example: 'P'
IPATRY	A pattern contains 24 hourly sets of ETS values. Seven numbers, which assign a pattern to a day of the week, are always entered. For Tier I approaches, the pattern numbers are all 1s. For Tier II approaches, a pattern number needs to be assigned to each day of week. Monday is in the first position. Sunday is in the last position. M Tu W Th F S Sunday Example: 1 1 1 1 1 2 2 In this example, only two patterns need to be included in the input. Pattern 1 is an array of data that represents the hourly Monday through Friday ETS patterns. Pattern 2 is used to represent the weekend traffic. The example could have been: 1 2 3 4 5 6 7, to represent an unique pattern for each day of the week.
RUN	Title or description of the intersection. Up to 40 characters are allowed. Example: 'Main & Market - Progressive Timing'
NUMLNK	Number of Links to be processed. Example: 9
COD	Link number. Example: 3

Table 3-2 Cont'd

CAL3QHCR Input/Output Record Names and Descriptions

Record Name	Description
IQ	Free flow link (1) or Queue link (2). Example: 2
LNK	Link name. Up to 20 characters are allowed. Example: 'Northbound Queue'
TYP	Link highway type. Two character input. Example: 'AG'
X1	Link X - coordinate start point (User's units) Example: -10.3
X2	Link X - coordinate end point (User's units) Represents end point defining the maximum link length. Queue traffic will not extend beyond this point. See Caution statement on p.2-3. Example: -1243.3
Y1	Link Y - coordinate start point (User's units) Example: 34.2
Y2	Link Y - coordinate end point (User's units) Represents end point defining the maximum link length. Queue traffic will not extend beyond this point. See Caution statement on p.2-3. Example: 543.2
SH	Source height (User's units). Example: 0
WL	Mixing zone width (User's units). Example: 40
NLANE	Number of queuing lanes. Example: 4
HE	Hour ending. Example: 17
AMB	Hourly ambient background concentration (PPM for CO, microgram/m^3 for PM). Example: 5.0
VPHL	Hourly average free flow traffic volume (veh/hr). Example: 1500
EFL	Free flow emission factor (g/veh-mi). Example: 41.6
CAVG	Traffic light cycle time (seconds). Example: 90
RAVG	Red light duration time (seconds). Example: 40
YFAC	Portion of yellow time not used for vehicle movement (seconds). Example: 1

Table 3-2 Cont'd

CAL3QHCR Input/Output Record Names and Descriptions

Record Name	Description
IV	Queue traffic volume (veh/hr). Example: 1200
IDLFAC	Idle time emission factor (g/veh-hr). Example: 735.2
SFR	Saturation flow volume (veh/hr/lane). Example: 1600 (A 0 entry is set to 1600 by the main program.)
ST	Signal type. Enter 1 for pretimed, 2 for actuated, 3 for semiactuated. Example: 2 (A 0 entry is set to 1 by the main program.)
AT	Arrival rate. Enter 1 for worst progression, 2 for below average progression, 3 for average progression, 4 for above average progression, and 5 for best progression. Example: 4 (A 0 entry is set to 3 by the main program.)
YEAR*	Data year. Example: 64
DAY*	Data day of the week. Example: 2 (Tuesday)
HE*	Data hour. Example: 10

* These variables apply to the format of the ET2 output file shown in Table 3-5.

Table 3-3

CAL3QHCR Data Input Sequence

Placement in file

```
JOB, ATIM, ZO, VS, VD, NR, SCAL, IOPT              First line
START, END                                         Second line
METSF, METSYR, METUA, METUYR                       Third line
FLINK, FAMB, RU                                    Fourth Line
RCP, XR, YR, ZR                                    Fifth line
.
.    (This last line is repeated; once for each receptor.)
.
JTIER, MODE                                        Sixth
IPATRY                                             Seventh
RUN, NUMLNK                                        Eighth
COD, IQ                                            Ninth line
(if IQ = 1)
  LNK, TYP, X1, Y1, X2, Y2, SH, WL                 Tenth line
(if IQ = 2)
  LNK, TYP, X1, Y1, X2, Y2, SH, WL, NLANE          Tenth line
.
.   (The ninth and tenth lines are repeated; once for each
     link.)
.
HE, AMB                                            Eleventh line
(if IQ = 1)
  COD, VPHL, EFL                                   Twelfth line
(if IQ = 2)
  COD, CAVG, RAVG, YFAC, IV, IDLFAC, SFR, ST, AT   Twelfth line
.
. (The twelfth line is repeated for each link depending on IQ.)
.
   *** End of Tier I input ***

     (For Tier II input, the eleventh and twelfth lines are
     repeated 24 times for each 24 hour traffic pattern.  A
     pattern needs to be entered for each day of a week that has
     an unique diurnal traffic flow.)

   *** End of Tier II input ***
```

Table 3-4

CAL3QHCR Input Structure

```
'EXAMPLE - TWO WAY INTERSECTION (EX-1)'  60. 175.  0. 0.  6  0.3048 1
 1 1 64  12 31 64
 94823  64  94823 64
 1 1 'R'
'REC 1 (SE CORNER)  '        45.      -35.      6.0
'REC 2 (SW CORNER)  '       -45.      -35.      6.0
'REC 3 (NW CORNER)  '       -45.       35.      6.0
'REC 4 (NE CORNER)  '        45.       35.      6.0
'REC 5 (E MID-MAIN) '        45.     -150.      6.0
'REC 6 (W MID-MAIN) '       -45.     -150.      6.0
2 'C'
1 1 1 1 1 2 3
'MAIN ST. AND LOCAL ST. INTERSECTION'       7
   1  1
'Main St.NB Appr.   ' 'AG'    10. -1000.    10.     0.    0.  40.
   2  2
'Main St.NB Queue   ' 'AG'    10.   -10.    10. -1000.    0.  20.0   2
   3  1
'Main St.NB Dep.    ' 'AG'    10.     0.    10.  1000.    0.  40.
   4  1
'Main St.SB Appr.   ' 'AG'   -10.  1000.   -10.     0.    0.  40.
   5  2
'Main St.SB Queue   ' 'AG'   -10.    10.   -10.  1000.    0.  20.0   2
   6  1
'Main St.SB Dep.    ' 'AG'   -10.     0.   -10. -1000.    0.  40.
   7  1
'Local St.Appr.Lnk. ' 'AG' -1000.     0.     0.     0.    0.  40.
  1  5.00
    1  1500.0    41.6
    2    90        40       3.0 1500 735.00 1600 1 3
    3  1500.0    41.6
    4  1200.0    41.6
    5    90        40       3.0 1200 735.00 1600 1 3
    6  1200.0    41.6
    7  1000.0    41.6
.
.   (end of Tier I input or end of first hour of first Tier II pattern.)
.
24 5.0
   1  1500.   41.6
   2    90        40       1.0 1500 735.00    0 0 0
   3  1500.   41.6
   4  1200.   41.6
   5    90        40       1.0 1200 735.00    0 0 0
   6  1200.   41.6
   7  1000.   41.6
.
.   (end of first pattern, start of second pattern)
.
01 5.0
.
.
24 5.0   (end of last or seventh pattern, whichever comes first.)
    *** End of Tier II input ***
```

3.2.2 CAL3QHCR Output File Formats

Four types of output files are generated by CAL3QHCR. The first two file types contain ETS data. In the test case examples, these two file types have the file extensions ET1 and ET2. They should be regarded as temporary storage files. After each run, these two file types can be reviewed, if need be, and then deleted.

The ET1 file type is used to echo the ETS variable data from the input file to a temporary storage file with the ET1 extension to the filename. The ET1 data is then read and preprocessed in the subroutine, CPRE. For a Tier I approach, the data are preprocessed into a week of constant hourly ETS data. CPRE adds the MET data year followed by an integer representing a day of the week. Both values are prefixed to each line containing the hour ending and AMB values. The ending hour values are incremented from 1 to 24 for each day and the days of the week are incremented from 1 to 7. The preprocessed data are stored in an ET2 file for later use by the main program. This process has helped to simplify the program coding which uses the ET2 file as a virtual memory storage area.

For a Tier II approach, the ETS data patterns from the input file are copied into the ET1 file and are then preprocessed and stored in the ET2 file according to the pattern assignment in the array, IPATRY. The maximum number of patterns CAL3QHCR expects to find in the input file and in the ET1 file is the maximum value found in the IPATRY array. A total of seven patterns can be copied into the ET2 file according to the order set by the IPATRY array. For example, if the IPATRY values were entered as 1 2 3 1 2 3 4 in the input control file, a maximum of four diurnal data patterns would be read into the ET1 file from the input file. CAL3QHCR would then place the patterns in the ET2 file according to the order specified by the IPATRY array. The subroutine, CPRE, would read the first, second, and third patterns from the ET1 file, add the appropriate year and day of the week values, store the patterns sequentially in the ET2 file, rewind to the beginning of the ET1 file, and then read the first, second, third, and fourth patterns, add the appropriate year and day values, and store those four patterns after the first three patterns. There would then be a total of seven patterns representing traffic patterns for Monday through Sunday, where pattern 1 would be for Monday, pattern 2 for Tuesday, pattern 3 for Wednesday, pattern 1 for Thursday, pattern 2 for Friday, pattern 3 for Saturday, and pattern 4 for Sunday.

Listed in Table 3-5 is the ETS variable data sequence in the ET2 file by record name and position in the file. The structure of the ET2 file is almost the same as the ETS variable data sections of the input control file.

Table 3-5

ET2 Date File Structure

Record Name	Placement in file
YEAR, DAY, HE, AMB	First line
(if IQ = 1)	
COD, VPHL, EFL	Second line
(if IQ = 2)	
COD, CAVG, RAVG, YFAC, IV, IDLFAC, SFR, ST, AT	Second line
.	
. (The first line is repeated for each hour and day of a week.)	
. (The second line follows each first line. The second line	
. is repeated for each link depending on IQ.)	
.	

There are two other files. One file is the main output file and contains a summary of the input data, the calculated concentration results, optionally selected link contribution results, and a table of calm wind duration and frequency of duration data. The other file contains an output file of processed link variable data. An example is shown on page 3-38.

The main output file structure is a merger of the CAL3QHC structure and the CHAVG output structure (See Reference 6). Additional lines of printout have been added to echo the additional data entered through the input control file. This includes the type of Tier approach, pollutant name, whether ambient background concentrations have been included in the averages, the meteorological stations, and the assignment of diurnal patterns. (See Table 3-6).

In the model results section, the output is similar to the CAL3QHC model results output. However, two additional lines of data have been added. The first line of data contains the maximum hourly concentrations for each receptor determined from the sum of each hourly concentration added to the respective hourly ambient background concentration. The line is prefixed by a "MAX+BKG". The second line of data contains the respective hourly averaged ambient background concentrations. The line is prefixed with a " - BKG". The maximum hourly concentration without the background component follow on the next line and are prefixed by a "MAX". Note that like CAL3QHC, the wind output is direction, the angle the wind is coming from (i.e. 90 degrees is from the east).

The output section is based on the CHAVG output file structure and begins with a group of notes explaining some of the characteristics of the output formats that follow. This includes adding asterisks beside maximum values, specifying the Julian day and ending hour of each value printed and the number of calm winds that occurred during the averaging period for each value.

Table 3-6

CAL3QHCR Output File Example

CAL3QHCR (Dated: 95221)

```
    DATE :  8/10/95
 PAGE:  1
    TIME : 18: 0:30

    JOB: EXAMPLE - TWO WAY INTERSECTION (EX-1)                    RUN: MAIN ST. AND LOCAL ST.
INTERSECTION

      ===================
      General Information
      ===================

        Run start date:  1/ 1/64    Julian:   1
              end date: 12/31/64    Julian: 366

        A Tier 2 approach was used for input data preparation.

        The MODE flag has been set to C for calculating CO averages.

        Ambient background concentrations are included in the averages below.


      Site & Meteorological Constants
      -------------------------------
        VS =    .0 CM/S       VD =    .0 CM/S       Z0 = 175. CM     ATIM =  60.

          Met. Sfc. Sta. Id & Yr = 94823    64
          Upper Air Sta. Id & Yr = 94823    64

        Urban mixing heights were processed.

        In 1964, Julian day 1 is a Wednesday.

        The patterns from the input file
        have been assigned as follows:

          Pattern # 1 is assigned to Monday.
          Pattern # 1 is assigned to Tuesday.
          Pattern # 1 is assigned to Wednesday.
          Pattern # 1 is assigned to Thursday.
          Pattern # 1 is assigned to Friday.
          Pattern # 2 is assigned to Saturday.
          Pattern # 3 is assigned to Sunday.

      Link Data Constants - (Variable data in *.LNK file)
      -------------------
```

LINK DESCRIPTION	LINK COORDINATES (FT) X1	Y1	X2	Y2	LENGTH (FT)	BRG (DEG)	TYPE	H (FT)	W (FT)	NLANES
1. Main St.NB Appr.	10.0	-1000.0	10.0	.0	1000.	360.	AG	.0	40.0	2
2. Main St.NB Queue	10.0	-10.0	10.0	-1000.0	990.	180.	AG	.0	20.0	2
3. Main St.NB Dep.	10.0	.0	10.0	1000.0	1000.	360.	AG	.0	40.0	2
4. Main St.SB Appr.	-10.0	1000.0	-10.0	.0	1000.	180.	AG	.0	40.0	2
5. Main St.SB Queue	-10.0	10.0	-10.0	1000.0	990.	360.	AG	.0	20.0	2
6. Main St.SB Dep.	-10.0	.0	-10.0	-1000.0	1000.	180.	AG	.0	40.0	2
7. Local St.Appr.Lnk.	-1000.0	.0	.0	.0	1000.	90.	AG	.0	40.0	2

JOB: EXAMPLE - TWO WAY INTERSECTION (EX-1) RUN: MAIN ST. AND LOCAL ST. INTERSECTION

Link Data Constants - (Variable data in *.LNK file)

LINK DESCRIPTION	LINK COORDINATES (FT) X1	Y1	X2	Y2	LENGTH (FT)	BRG (DEG)	TYPE	H (FT)	W (FT)	NLANES
8. Local St.Queue Lnk.	-20.0	.0	-1000.0	.0	980.	270.	AG	.0	20.0	2
9. Local St.Dep.Lnk.	.0	.0	1000.0	.0	1000.	90.	AG	.0	40.0	

Receptor Data

RECEPTOR	COORDINATES (FT) X	Y	Z
1. REC 1 (SE CORNER)	45.0	-35.0	6.0
2. REC 2 (SW CORNER)	-45.0	-35.0	6.0
3. REC 3 (NW CORNER)	-45.0	35.0	6.0
4. REC 4 (NE CORNER)	45.0	35.0	6.0
5. REC 5 (E MID-MAIN)	45.0	-150.0	6.0
6. REC 6 (W MID-MAIN)	-45.0	-150.0	6.0
7. REC 7 (N MID-LOCAL)	-150.0	35.0	6.0
8. REC 8 (S MID-LOCAL)	-150.0	-35.0	6.0

Model Results

Remarks : In search of the wind direction corresponding to the maximum concentration, only the first direction, of the directions with the same maximum concentrations, is indicated as the maximum.

MAXIMUM HOURLY CONCENTRATIONS WITH ANY AMBIENT BACKGROUND CONCENTRATIONS (BKG) ADDED (PPM)

	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8
MAX+BKG	13.1	13.4	15.8	11.7	11.3	10.9	13.3	11.1
- BKG	5.0	5.1	5.0	5.0	5.1	5.0	5.1	5.1
MAX	8.1	8.3	10.8	6.7	6.2	5.9	8.2	6.0
WIND DIR	283	16	151	195	315	151	138	63
JULIAN	218	217	258	48	311	258	158	138
HOUR	7	17	8	7	18	8	22	2

JOB: EXAMPLE - TWO WAY INTERSECTION (EX-1) RUN: MAIN ST. AND LOCAL ST. INTERSECTION

THE HIGHEST CONCENTRATION OF 15.78 PPM OCCURRED AT RECEPTOR REC3 .

JOB: EXAMPLE - TWO WAY INTERSECTION (EX-1) RUN: MAIN ST. AND LOCAL ST. INTERSECTION

==========
Output Section
==========

NOTES PERTAINING TO THE REPORT

1. THE HIGHEST AVERAGE IN EACH OF THE FIRST TWO COLUMNS OF EACH TABLE BELOW ARE SUFFIXED BY AN ASTERISK (*).
FOR PM OUTPUT, THERE IS ONLY ONE COLUMN AND ASTERISK FOR THE ANNUAL AVERAGE/PERIOD OF CONCERN TABLE.

2. THE NUMBERS IN PARENTHESES ARE THE JULIAN DAY AND ENDING HOUR FOR THE PRECEDING AVERAGE.

3. THE NUMBER OF CALM HOURS USED IN PRODUCING EACH AVERAGE ARE PREFIXED BY A C.

PRIMARY AVERAGES.

MAXIMUM 8-HOUR RUNNING NONOVERLAPPING AVERAGE CONCENTRATIONS
IN PARTS PER MILLION (PPM),
INCLUDING AMBIENT BACKGROUND CONCENTRATIONS.

Receptor	Highest			Second highest		
Number	Conc	Ending Day Hr	Calm	Conc	Ending Day Hr	Calm
1	9.42	(54, 4)	C 1	9.38	(311,23)	C 2
2	9.51	(138, 4)	C 0	9.10	(180, 5)	C 1
3	9.61*	(329,14)	C 2	9.53*	(320, 2)	C 2
4	8.59	(299, 3)	C 2	8.39	(363,20)	C 1
5	8.30	(292, 5)	C 1	8.29	(309,20)	C 2
6	8.23	(138, 4)	C 0	8.00	(180, 6)	C 1
7	8.81	(338,14)	C 0	8.68	(103, 3)	C 0
8	8.84	(306, 3)	C 0	8.39	(138, 4)	C 0

FIVE HIGHEST 1-HOUR END-TO-END AVERAGE CONCENTRATIONS IN PARTS PER MILLION
INCLUDING AMBIENT BACKGROUND CONCENTRATIONS.

Rcptr	Highest			Second Highest			Third Highest			Fourth Highest			Fifth Highest		
No.	Conc	Ending Day Hr	Calm	Conc	Ending Day Hr	Calm	Conc	Ending Day Hr	Calm	Conc	Ending Day Hr	Calm	Conc	Ending Day Hr	Calm
1	13.07	(218, 7)	C 0	12.40	(201, 1)	C 0	12.06	(237, 6)	C 0	11.88	(299, 3)	C 0	11.38	(92, 8)	C 0
2	13.37	(217,17)	C 0	12.64	(41,14)	C 0	12.58	(138, 3)	C 0	12.48	(50, 8)	C 0	12.27	(180, 4)	C 0
3	15.78*	(258, 8)	C 0	14.89*	(22, 9)	C 0	13.78	(158,22)	C 0	13.47	(128, 7)	C 0	13.17	(300, 7)	C 0
4	11.67	(48, 7)	C 0	11.67	(324,17)	C 0	11.58	(111,18)	C 0	11.57	(43, 7)	C 0	11.07	(314, 7)	C 0
5	11.28	(311,18)	C 0	10.97	(48, 7)	C 0	10.87	(107, 7)	C 0	10.77	(43, 7)	C 0	10.60	(279,10)	C 0
6	10.88	(258, 8)	C 0	9.97	(217,17)	C 0	9.87	(300, 7)	C 0	9.78	(138, 3)	C 0	9.64	(41,14)	C 0
7	13.28	(158,22)	C 0	13.18	(258, 8)	C 0	11.27	(181, 7)	C 0	11.27	(72, 7)	C 0	11.17	(248, 7)	C 0
8	11.09	(138, 2)	C 0	10.89	(137,23)	C 0	10.88	(305,22)	C 0	10.77	(194, 4)	C 0	10.76	(247, 6)	C 0

LINK CONTRIBUTION TABLES

MAXIMUM 8-HOUR AVERAGED LINK CONTRIBUTIONS
IN PARTS PER MILLION (PPM)
INCLUDING AMBIENT BACKGROUND CONCENTRATIONS.

Rcptr No.	Total Conc	Ending Day Hr	Ambient Backgnd	Total Link	Link +1	Link +2	Link +3	Link +4	Link +5	Link +6	Link +7	Link +8	Link +9
1	9.42	(54, 4)	5.09	4.33	.73	1.53	.01	.01	.03	.40	.51	1.03	.07
2	9.51	(138, 4)	5.09	4.43	.15	.16	.58	.52	.86	.30	.44	1.28	.14
3	9.61	(329,14)	5.01	4.60	.40	.58	.27	.38	.80	.35	.35	1.15	.32
4	8.59	(299, 3)	5.09	3.50	.03	.00	.63	.37	.88	.07	.47	.97	.08
5	8.30	(292, 5)	5.09	3.21	.71	1.51	.00	.01	.01	.43	.19	.34	.00
6	8.23	(138, 4)	5.09	3.14	.47	.94	.24	.19	.24	.65	.06	.19	.16
7	8.81	(338,14)	5.01	3.80	.26	.48	.03	.03	.06	.25	.54	2.10	.06
8	8.84	(306, 3)	5.09	3.75	.06	.14	.23	.19	.43	.05	.53	1.98	.16

SECOND HIGHEST 8-HOUR AVERAGED LINK CONTRIBUTIONS
IN PARTS PER MILLION (PPM)
INCLUDING AMBIENT BACKGROUND CONCENTRATIONS.

Rcptr No.	Total Conc	Ending Day Hr	Ambient Backgnd	Total Link	Link +1	Link +2	Link +3	Link +4	Link +5	Link +6	Link +7	Link +8	Link +9
1	9.38	(311,23)	5.09	4.28	.58	1.53	.15	.15	.30	.28	.38	.75	.15
2	9.10	(180, 5)	5.09	4.01	.17	.33	.49	.44	.84	.31	.33	1.04	.06
3	9.53	(320, 2)	5.09	4.43	.32	.53	.42	.52	1.30	.27	.20	.68	.20
4	8.39	(363,20)	5.06	3.33	.03	.01	.69	.40	1.03	.03	.36	.73	.06
5	8.29	(309,20)	5.06	3.23	.63	1.18	.25	.20	.25	.28	.10	.25	.08
6	8.00	(180, 6)	5.08	2.91	.51	1.07	.16	.11	.14	.66	.04	.07	.14
7	8.68	(103, 3)	5.09	3.59	.19	.34	.14	.13	.25	.13	.50	1.65	.28
8	8.39	(138, 4)	5.09	3.30	.01	.01	.29	.25	.24	.01	.55	1.91	.03

MAXIMUM 1-HOUR AVERAGED LINK CONTRIBUTIONS
IN PARTS PER MILLION (PPM)
INCLUDING AMBIENT BACKGROUND CONCENTRATIONS.

Rcptr No.	Total Conc	Ending Day Hr	Ambient Backgnd	Total Link	Link +1	Link +2	Link +3	Link +4	Link +5	Link +6	Link +7	Link +8	Link +9
1	13.07	(218, 7)	4.97	8.10	1.20	2.20	.10	.10	.10	.70	1.10	2.40	.20
2	13.37	(217,17)	5.07	8.30	.00	.00	1.20	1.30	2.10	.20	.80	2.70	.00
3	15.78	(258, 8)	4.98	10.80	1.50	3.00	.10	.50	.30	1.30	1.00	3.00	.10
4	11.67	(48, 7)	4.97	6.70	1.70	3.00	.20	.00	.00	1.00	.00	.00	.80
5	11.28	(311,18)	5.08	6.20	1.30	2.70	.00	.00	.10	.80	.30	1.00	.00
6	10.88	(258, 8)	4.98	5.90	1.60	2.50	.00	.00	.00	1.80	.00	.00	.00
7	13.28	(158,22)	5.08	8.20	.60	1.10	.00	.00	.00	.60	1.10	4.80	.00

LINK CONTRIBUTION TABLES

MAXIMUM 1-HOUR AVERAGED LINK CONTRIBUTIONS
IN PARTS PER MILLION (PPM)
INCLUDING AMBIENT BACKGROUND CONCENTRATIONS.

Rcptr No.	Total Conc	Ending Day Hr	Ambient Backgnd	Total Link	Link +1	Link +2	Link +3	Link +4	Link +5	Link +6	Link +7	Link +8	Link +9
8	11.09	(138, 2)	5.09	6.00	.10	.10	.40	.30	.70	.10	.90	3.20	.20

SECOND HIGHEST 1-HOUR AVERAGED LINK CONTRIBUTIONS
IN PARTS PER MILLION (PPM)
INCLUDING AMBIENT BACKGROUND CONCENTRATIONS.

Rcptr No.	Total Conc	Ending Day Hr	Ambient Backgnd	Total Link	Link +1	Link +2	Link +3	Link +4	Link +5	Link +6	Link +7	Link +8	Link +9
1	12.40	(201, 1)	5.10	7.30	1.00	2.00	.10	.20	.30	.50	.80	2.10	.30
2	12.64	(41,14)	5.04	7.60	.00	.00	1.10	1.10	2.00	.20	.60	2.60	.00
3	14.89	(22, 9)	4.99	9.90	1.50	1.70	.00	.10	.00	1.60	.90	4.10	.00
4	11.67	(324,17)	5.07	6.60	.00	.00	1.20	.70	1.60	.00	1.00	2.00	.10
5	10.97	(48, 7)	4.97	6.00	1.90	3.10	.00	.00	.00	1.00	.00	.00	.00
6	9.97	(217,17)	5.07	4.90	.50	.90	.70	.50	.70	.90	.20	.40	.10
7	13.18	(258, 8)	4.98	8.20	.80	1.00	.00	.00	.00	.70	1.20	4.50	.00
8	10.89	(137,23)	5.09	5.80	.00	.00	.40	.40	.80	.00	.80	3.40	.00

CALM DURATION FREQUENCY

Hours of Consecutive Calm Winds	Frequency of Occurrence	(Julian day/hour ending) of Significant Occurrences
1	188	(7,13)(11, 5)(11,13)(21,24)(23,19)(29, 5)(31, 3)(31, 6)(34,24)(35, 6) (40,18)(42,23)(43, 5)(46, 2)(46,14)(48, 5)(54, 2)(54, 6)(56, 2)(59, 8) (62, 6)(62,23)(71,19)(72,23)(73, 4)(73, 8)(76, 8)(83, 4)(84,23)(85, 1) (105, 7)(110,18)(111,20)(125, 5)(126, 2)(126, 4)(132,21)(136, 8)(137, 4)(137, 6) (143,21)(144, 1)(154, 4)(154, 6)(156, 6)(158, 1)(160,24)(164, 1)(169, 6)(174, 4) (174,20)(175,21)(179, 6)(180, 5)(180,24)(182, 3)(182, 6)(184, 1)(188, 7)(188,24) (190, 2)(190,24)(191, 4)(191, 6)(192, 1)(192, 6)(193, 3)(193,23)(195,24)(198, 8) (199,20)(201,21)(201,24)(202, 2)(202, 5)(202,23)(203, 6)(204, 2)(204, 5)(204, 7) (205,22)(205,24)(206, 2)(206, 4)(210, 5)(212, 2)(214, 9)(214,21)(214,23)(215, 2) (215, 4)(215,21)(228,23)(230, 3)(233, 4)(238, 5)(239,22)(240, 2)(242, 3)(242,21) (242,23)(243, 1)(243,23)(244, 2)(244, 5)(246,22)(246,24)(247, 7)(248, 5)(250,22) (253,21)(255, 1)(257,24)(258, 3)(259,24)(260,21)(261, 1)(261, 6)(261, 8)(261,21) (261,24)(262, 3)(262, 7)(263, 1)(263, 3)(266, 4)(267, 3)(270, 1)(270, 5)(271,21) (273,14)(273,20)(276, 8)(277, 1)(280,23)(285, 8)(285,19)(288,19)(288,22)(289, 7) (289,18)(289,20)(289,24)(291,18)(292, 4)(292, 8)(294, 6)(297,23)(299, 4)(300, 6) (300, 8)(301, 4)(301, 7)(301,19)(302, 5)(306, 7)(306,15)(306,20)(307, 2)(308, 7) (308,22)(309,17)(311,19)(311,21)(312,18)(312,21)(314, 5)(315, 1)(319,11)(319,21) (320,20)(324,15)(329, 4)(329, 6)(336, 8)(338,21)(338,23)(339,11)(344,19)(344,21) (346, 8)(347, 5)(347,16)(356,19)(356,21)(357, 1)(357,23)(363,19)
2	55	(23,24)(24, 3)(29, 8)(36,18)(43, 3)(46, 6)(48,22)(49, 3)(102, 3)(111,24) (125,23)(136, 6)(139, 2)(139, 6)(156, 3)(157,21)(174,23)(193, 1)(196, 4)(198, 6) (198,23)(200,23)(203, 2)(203,22)(205, 1)(205, 5)(205, 8)(208,23)(222,24)(242, 6) (247, 3)(249,24)(250, 3)(250, 6)(250, 9)(261, 4)(262,20)(262,23)(272, 1)(279, 5) (281, 7)(286, 7)(288, 8)(289, 1)(299, 2)(301,23)(302, 2)(302,23)(306,23)(328,22) (329, 9)(344,24)(355,24)(356, 8)(361,10)
3	27	(18,23)(45,24)(49, 7)(53, 7)(102, 7)(107, 2)(144, 6)(160, 7)(180,22)(183, 2) (193, 7)(194, 3)(199,24)(202,21)(209, 4)(218, 3)(228, 7)(230, 7)(243, 6)(280, 5) (281, 3)(289, 5)(301, 2)(312, 7)(320, 4)(329,19)(356, 4)
4	12	(87,24)(170, 2)(198, 3)(209,24)(233, 1)(248, 1)(254,23)(269,23)(280, 1)(300,22) (312, 3)(320, 9)
5	12	(142,24)(143, 6)(147, 2)(169, 4)(178, 7)(188, 4)(189, 6)(228, 3)(254, 6)(286,23) (295, 1)(307, 8)
6	6	(59, 6)(199, 6)(238, 2)(259, 3)(288, 5)(298, 6)
7	3	(229, 7)(286, 3)(310, 2)
9	2	(220, 6)(252, 5)
10	3	(253, 7)(305, 9)(309, 9)

Program terminated normally

Following the notes, there are two tables of either CO or PM average concentration maxima and secondary maxima. The maxima in each table are based on the National Ambient Air Quality Standards. For CO concentration output, the running 8-hour maximum and the second high running nonoverlapping values are printed for each receptor. This is followed by a table of the 5 highest 1-hour averages for each receptor. The maximum and the highest of the second highest in each table are flagged with an asterisk. Each asterisk follows its associated value. Also printed with each concentration is the ending Julian day and hour of the period in which each concentration was calculated. This is further followed by a "C" and the number of calm hours that occurred during each concentration's averaging period. The output averaging algorithms are based on published guidelines (See Reference 2). If FAMB has been set to "1", any hourly ambient background concentrations that were entered through the input control file, were included in the output average calculations.

If the FLINK flag is set to 1, a table of link contributions is printed for each column of maximum and second highest concentration values. If FAMB is also set to 1, the link contributions will contain the respective average ambient background concentration. In the above table, FLINK and FAMB were both set to 1.

For PM concentration output, CAL3QHCR displays the top 5 24-hour block averaged concentrations for each receptor. Each block occurs from midnight to midnight. The output table format is the same as that for CO concentrations.

Example of PM concentration output:

PRIMARY AND SECONDARY AVERAGES.

FIVE HIGHEST 24-HOUR END-TO-END AVERAGE CONCENTRATIONS IN MICROGRAMS/M**3
INCLUDING AMBIENT BACKGROUND CONCENTRATIONS.

Rcptr No.	Highest Conc	Highest Ending Day Hr	Highest Ending Calm	Second Highest Conc	Second Highest Ending Day Hr	Second Highest Ending Calm	Third Highest Conc	Third Highest Ending Day Hr	Third Highest Ending Calm	Fourth Highest Conc	Fourth Highest Ending Day Hr	Fourth Highest Ending Calm	Fifth Highest Conc	Fifth Highest Ending Day Hr	Fifth Highest Ending Calm
1	137.30	(177,24)	C 0	135.95	(232,24)	C 3	135.67	(311,24)	C 3	132.71	(169,24)	C 7	132.16	(279,24)	C 5
2	151.09	(190,24)	C 2	148.26	(338,24)	C 2	144.49	(344,24)	C 4	144.04	(202,24)	C 6	143.98	(251,24)	C 4
3	163.32*	(338,24)	C 2	154.04*	(24,24)	C 2	153.45	(329,24)	C 7	152.31	(209,24)	C 7	151.37	(345,24)	C 0
4	145.84	(314,24)	C 1	141.90	(182,24)	C 3	141.17	(347,24)	C 2	136.33	(302,24)	C 5	134.14	(43,24)	C 3
5	121.54	(177,24)	C 0	120.53	(232,24)	C 3	119.46	(182,24)	C 3	118.24	(314,24)	C 1	117.98	(311,24)	C 3
6	136.40	(338,24)	C 2	130.57	(344,24)	C 4	129.95	(190,24)	C 2	125.86	(202,24)	C 6	125.85	(251,24)	C 4
7	115.96	(338,24)	C 2	114.44	(24,24)	C 2	111.57	(345,24)	C 0	110.71	(329,24)	C 7	109.25	(31,24)	C 2
8	109.29	(190,24)	C 2	103.93	(202,24)	C 6	103.91	(251,24)	C 4	102.78	(49,24)	C 5	101.23	(246,24)	C 2

If the FAMB flag is set to 1, each averaged ambient background concentration will be added to the respective averaged concentrations. Be aware that if the ambient background concentrations are not constant from hour to hour and the same data is run with FAMB set equal to 1 and then run with FAMB equal to 0, the time and place of various maxima values are likely to be different between the two runs.

After the 24-hour averages are printed, a table with one column of PM annual averages is printed next. If the processing period is less than a year, then the period average is printed instead of an annual average. Again, the highest average is identified by an asterisk. The annual or period average is calculated by summing each valid (non-calm) 1-hour average concentration and dividing by the total number of non-calm hours or 75 percent of the total number of hours in the period, whichever is greater.

Example of an annual/period of concern average PM concentration output:

THE HIGHEST ANNUAL AVERAGE CONCENTRATIONS
IN MICROGRAMS/M**3
INCLUDING AMBIENT BACKGROUND CONCENTRATIONS.

Receptor Number	Maximum Conc	Ending Day Hr	Calm
1	89.15	(366,24)	C 592
2	83.25	(366,24)	C 592
3	86.51	(366,24)	C 592
4	92.41*	(366,24)	C 592
5	82.13	(366,24)	C 592
6	76.24	(366,24)	C 592
7	71.59	(366,24)	C 592
8	68.33	(366,24)	C 592

After the CO or PM averages are printed, a table of Calm Duration Frequency is then printed (See Table 3-6). The duration of consecutive calm winds, in hours, is printed first followed by its respective frequency of occurrence over the period of concern. In Table 3-6, there are 188 1-hour calm episodes. The ending Julian day and hour of each calm episode is printed. If an episode of a specific length does not occur, the duration and frequency values are not printed. For example, there were no 8 hour long episodes so there were no 8 hour values printed. Calm episode durations are limited to 24 consecutive hours. Any part of a duration over 24-hours in length is considered to be part of the next episode. A duration of 72 hours of consecutive calm wind hours would be treated as 3 24-hour episodes.

3.3 Execution Statements

Before executing CAL3QHCR, the user is advised that the contents of the variable link data and the summary output file printouts span approximately 127 columns. Before printing either of these two files, the user is advised to set their printer font and margins accordingly. A non-kerning font (eg Courier) set at 16.67 cpi or higher, with left and right margins set for 3/4 inch or less, works well with standard 8.5" wide x 11" high paper.

The following is an example of an execution line followed by definitions of the filename extensions:

```
CAL3QHCR a.INP pit-64.MET a.ET1 a.ET2 a.OUT a.LNK

   where: INP - Input control file
          MET - Meteorological data input file
          ET1 - Preprocessed ETS data file
          ET2 - Postprocessed ETS data output file
          OUT - Output summary file
          LNK - Variable link data output file
```

3.4 TEST CASE EXAMPLES

An example of how to emulate a CAL3QHC run for CO using CAL3QHCR is documented in Section 3.4.1. A CAL3QHCR CO Tier I and Tier II test case are shown below in Sections 3.4.2 and 3.4.3. The results of both CO test cases are discussed in Section 3.4.4. A PM-10 Tier I and Tier II test case are shown below in Sections 3.4.5 and 3.4.6. The results of both PM-10 test cases are discussed in Section 3.4.7.

3.4.1 Emulating CAL3QHC For CO

CAL3QHC Test Case 1 (CTC1), as well as other CAL3QHC test cases, can be reproduced using CAL3QHCR. The same link and receptor data are used. The CAL3QHCR model is setup to perform a Tier I approach. However, a full Tier I approach is not followed. Instead, only 2 full days (48 hours) of artificially generated MET data set are used in place of a set of real MET data. For CTC1, the artificial MET data set consists of: wind speeds set to only 1.0 m/s, wind flows set to sequentially entered whole multiples of 10 degrees (180 degrees clockwise through 360 degrees to 180 degrees), stability classes set to 4 (D stability class), and mixing heights set to 1000.0 meters, to emulate the MET data that would normally be used by CAL3QHC. Since CAL3QHCR is run for two 24 hour blocks, the wind flow sequence begins again with the 36^{th} hour (180 degrees) and ends at the 48^{th} hour with a wind flow of 290 degrees. The end result is that CAL3QHCR can emulate CAL3QHC results with the new set of features that have been added to the model.

The following is a copy of the CAL3QHCR data input file used to emulate the CAL3QHC Test Case 1:

Note: The MET data identifiers have been set to 99999 and 99 as a way of flagging this data as an artificial MET data set. The starting, ending, and MET year has to be the same value (eg 99).

```
'EXAMPLE - TWO WAY INTERSECTION (EX-1)'  60. 175.  0. 0.  8  0.3048 1
 1 1 99 1 2 99
 99999  99  99999 99
 0 0 'U'
'REC 1 (SE CORNER)  '        45.      -35.      6.0
'REC 2 (SW CORNER)  '       -45.      -35.      6.0
'REC 3 (NW CORNER)  '       -45.       35.      6.0
'REC 4 (NE CORNER)  '        45.       35.      6.0
'REC 5 (E MID-MAIN) '        45.     -150.      6.0
'REC 6 (W MID-MAIN) '       -45.     -150.      6.0
'REC 7 (N MID-LOCAL)'      -150.       35.      6.0
'REC 8 (S MID-LOCAL)'      -150.      -35.      6.0
1 'C'
1 1 1 1 1 1 1
'MAIN ST. AND LOCAL ST. INTERSECTION'       9
   1  1
'Main St.NB Appr.   ' 'AG'    10. -1000.    10.     0.    0.  40.
   2  2
'Main St.NB Queue   ' 'AG'    10.   -10.    10. -1000.    0.  20.0   2
   3  1
'Main St.NB Dep.    ' 'AG'    10.     0.    10.  1000.    0.  40.
   4  1
'Main St.SB Appr.   ' 'AG'   -10.  1000.   -10.     0.    0.  40.
   5  2
'Main St.SB Queue   ' 'AG'   -10.    10.   -10.  1000.    0.  20.0   2
   6  1
'Main St.SB Dep.    ' 'AG'   -10.     0.   -10. -1000.    0.  40.
   7  1
'Local St.Appr.Lnk. ' 'AG' -1000.     0.     0.     0.    0.  40.
   8  2
'Local St.Queue Lnk.' 'AG'   -20.     0. -1000.     0.    0.  20.0   2
   9  1
'Local St.Dep.Lnk.  ' 'AG'     0.     0.  1000.     0.    0.  40.
01 0.0
   1  1500.   41.6
   2    90        40       3.0 1500 735.00    0 0 0
   3  1500.   41.6
   4  1200.   41.6
   5    90        40       3.0 1200 735.00    0 0 0
   6  1200.   41.6
   7  1000.   41.6
   8    90        50       3.0 1000 735.00    0 0 0
   9  1000.   41.6
```

The following is a copy of the MET data set used to emulate CAL3QHC Test Case 1:

Caution: CAL3QHC accepts wind direction (the angle the wind is coming from) input only while CAL3QHCR accepts wind flow (the angle the wind is blowing toward) input only, a difference of 180 degrees. Since this set of data is for input into CAL3QHCR, the second column of numbers needs to contain wind flow values. Note: both CAL3QHC and CAL3QHCR output wind direction.

```
 99999 99 99999 99
99010101   180.0      1.0  285.5 4 1000.0 1000.0
99010102   190.0      1.0  285.5 4 1000.0 1000.0
99010103   200.0      1.0  285.5 4 1000.0 1000.0
99010104   210.0      1.0  285.5 4 1000.0 1000.0
99010105   220.0      1.0  285.5 4 1000.0 1000.0
99010106   230.0      1.0  285.5 4 1000.0 1000.0
99010107   240.0      1.0  285.5 4 1000.0 1000.0
99010108   250.0      1.0  285.5 4 1000.0 1000.0
99010109   260.0      1.0  285.5 4 1000.0 1000.0
99010110   270.0      1.0  285.5 4 1000.0 1000.0
99010111   280.0      1.0  285.5 4 1000.0 1000.0
99010112   290.0      1.0  285.5 4 1000.0 1000.0
99010113   300.0      1.0  285.5 4 1000.0 1000.0
99010114   310.0      1.0  285.5 4 1000.0 1000.0
99010115   320.0      1.0  285.5 4 1000.0 1000.0
99010116   330.0      1.0  285.5 4 1000.0 1000.0
99010117   340.0      1.0  285.5 4 1000.0 1000.0
99010118   350.0      1.0  285.5 4 1000.0 1000.0
99010119   360.0      1.0  285.5 4 1000.0 1000.0
99010120    10.0      1.0  285.5 4 1000.0 1000.0
99010121    20.0      1.0  285.5 4 1000.0 1000.0
99010122    30.0      1.0  285.5 4 1000.0 1000.0
99010123    40.0      1.0  285.5 4 1000.0 1000.0
99010124    50.0      1.0  285.5 4 1000.0 1000.0
99010201    60.0      1.0  285.5 4 1000.0 1000.0
99010202    70.0      1.0  285.5 4 1000.0 1000.0
99010203    80.0      1.0  285.5 4 1000.0 1000.0
99010204    90.0      1.0  285.5 4 1000.0 1000.0
99010205   100.0      1.0  285.5 4 1000.0 1000.0
99010206   110.0      1.0  285.5 4 1000.0 1000.0
99010207   120.0      1.0  285.5 4 1000.0 1000.0
99010208   130.0      1.0  285.5 4 1000.0 1000.0
99010209   140.0      1.0  285.5 4 1000.0 1000.0
99010210   150.0      1.0  285.5 4 1000.0 1000.0
99010211   160.0      1.0  285.5 4 1000.0 1000.0
99010212   170.0      1.0  285.5 4 1000.0 1000.0
99010213   180.0      1.0  285.5 4 1000.0 1000.0
99010214   190.0      1.0  285.5 4 1000.0 1000.0
99010215   200.0      1.0  285.5 4 1000.0 1000.0
99010216   210.0      1.0  285.5 4 1000.0 1000.0
99010217   220.0      1.0  285.5 4 1000.0 1000.0
99010218   230.0      1.0  285.5 4 1000.0 1000.0
99010219   240.0      1.0  285.5 4 1000.0 1000.0
99010220   250.0      1.0  285.5 4 1000.0 1000.0
99010221   260.0      1.0  285.5 4 1000.0 1000.0
```

```
99010222   270.0      1.0  285.5 4 1000.0 1000.0
99010223   280.0      1.0  285.5 4 1000.0 1000.0
99010224   290.0      1.0  285.5 4 1000.0 1000.0
```

The following is the CAL3QHCR summary output file:

CAL3QHCR (Dated: 95221)

DATE : 8/10/95 PAGE: 1
TIME : 17:26:14

JOB: EXAMPLE - TWO WAY INTERSECTION (EX-1) RUN: MAIN ST. AND LOCAL ST. INTERSECTION

==========
General Information
==========

Run start date: 1/ 1/99 Julian: 1
end date: 1/ 2/99 Julian: 2

A Tier 1 approach was used for input data preparation.

The MODE flag has been set to C for calculating CO averages.

Ambient background concentrations are excluded from the averages below.

Site & Meteorological Constants

VS = .0 CM/S VD = .0 CM/S Z0 = 175. CM ATIM = 60.

Met. Sfc. Sta. Id & Yr = 99999 99
Upper Air Sta. Id & Yr = 99999 99

Urban mixing heights were processed.

In 1999, Julian day 1 is a Friday.

Link Data Constants - (Variable data in *.LNK file)

LINK DESCRIPTION	LINK COORDINATES (FT) X1	Y1	X2	Y2	LENGTH (FT)	BRG (DEG)	TYPE	H (FT)	W (FT)	NLANES
1. Main St.NB Appr.	10.0	-1000.0	10.0	.0	1000.	360.	AG	.0	40.0	
2. Main St.NB Queue	10.0	-10.0	10.0	-1000.0	990.	180.	AG	.0	20.0	2
3. Main St.NB Dep.	10.0	.0	10.0	1000.0	1000.	360.	AG	.0	40.0	
4. Main St.SB Appr.	-10.0	1000.0	-10.0	.0	1000.	180.	AG	.0	40.0	
5. Main St.SB Queue	-10.0	10.0	-10.0	1000.0	990.	360.	AG	.0	20.0	2
6. Main St.SB Dep.	-10.0	.0	-10.0	-1000.0	1000.	180.	AG	.0	40.0	
7. Local St.Appr.Lnk.	-1000.0	.0	.0	.0	1000.	90.	AG	.0	40.0	
8. Local St.Queue Lnk.	-20.0	.0	-1000.0	.0	980.	270.	AG	.0	20.0	2
9. Local St.Dep.Lnk.	.0	.0	1000.0	.0	1000.	90.	AG	.0	40.0	

JOB: EXAMPLE - TWO WAY INTERSECTION (EX-1) RUN: MAIN ST. AND LOCAL ST. INTERSECTION

Receptor Data

RECEPTOR	COORDINATES (FT) X	Y	Z
1. REC 1 (SE CORNER)	45.0	-35.0	6.0
2. REC 2 (SW CORNER)	-45.0	-35.0	6.0
3. REC 3 (NW CORNER)	-45.0	35.0	6.0
4. REC 4 (NE CORNER)	45.0	35.0	6.0
5. REC 5 (E MID-MAIN)	45.0	-150.0	6.0
6. REC 6 (W MID-MAIN)	-45.0	-150.0	6.0
7. REC 7 (N MID-LOCAL)	-150.0	35.0	6.0
8. REC 8 (S MID-LOCAL)	-150.0	-35.0	6.0

Model Results

Remarks : In search of the wind direction corresponding to the maximum concentration, only the first direction, of the directions with the same maximum concentrations, is indicated as the maximum.

MAXIMUM HOURLY CONCENTRATIONS WITH ANY AMBIENT BACKGROUND CONCENTRATIONS (BKG) ADDED (PPM)

	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8
MAX+BKG	10.8	11.6	11.4	9.4	9.8	6.9	9.0	9.0
- BKG	.0	.0	.0	.0	.0	.0	.0	.0
MAX	10.8	11.6	11.4	9.4	9.8	6.9	9.0	9.0
WIND DIR	290	20	160	250	330	20	120	60
JULIAN	2	1	1	2	2	1	1	1
HOUR	6	3	17	2	10	3	13	7

THE HIGHEST CONCENTRATION OF 11.60 PPM OCCURRED AT RECEPTOR REC2 .

==========
Output Section
==========

NOTES PERTAINING TO THE REPORT

1. THE HIGHEST AVERAGE IN EACH OF THE FIRST TWO COLUMNS OF EACH TABLE BELOW ARE SUFFIXED BY AN ASTERISK (*).
   FOR PM OUTPUT, THERE IS ONLY ONE COLUMN AND ASTERISK FOR THE ANNUAL AVERAGE/PERIOD OF CONCERN TABLE.

2. THE NUMBERS IN PARENTHESES ARE THE JULIAN DAY AND ENDING HOUR FOR THE PRECEDING AVERAGE.

3. THE NUMBER OF CALM HOURS USED IN PRODUCING EACH AVERAGE ARE PREFIXED BY A C.

PRIMARY AVERAGES.

MAXIMUM 8-HOUR RUNNING NONOVERLAPPING AVERAGE CONCENTRATIONS
IN PARTS PER MILLION (PPM),
EXCLUDING AMBIENT BACKGROUND CONCENTRATIONS.

Receptor	Highest			Second highest		
Number	Conc	Ending Day Hr	Calm	Conc	Ending Day Hr	Calm
1	9.00	(2,10)	C 0	7.70	(2,13)	C 0
2	8.79	(2,18)	C 0	8.66*	(1, 8)	C 0
3	9.30*	(1,19)	C 0	7.74	(1,24)	C 0
4	8.14	(2, 4)	C 0	6.84	(2, 1)	C 0
5	8.22	(2,12)	C 0	6.55	(2, 6)	C 0
6	6.29	(2,21)	C 0	6.29	(1, 9)	C 0
7	7.91	(1,18)	C 0	5.74	(1,14)	C 0
8	7.76	(1, 9)	C 0	7.76	(2,21)	C 0

FIVE HIGHEST 1-HOUR END-TO-END AVERAGE CONCENTRATIONS IN PARTS PER MILLION
EXCLUDING AMBIENT BACKGROUND CONCENTRATIONS.

Rcptr	Highest			Second Highest			Third Highest			Fourth Highest			Fifth Highest		
No.	Conc	Ending Day Hr	Calm	Conc	Ending Day Hr	Calm	Conc	Ending Day Hr	Calm	Conc	Ending Day Hr	Calm	Conc	Ending Day Hr	Calm
1	10.80	(2, 6)	C 0	10.70	(2, 5)	C 0	9.90	(2, 7)	C 0	9.20	(2, 4)	C 0	8.60	(2, 8)	C 0
2	11.60*	(1, 3)	C 0	11.60*	(2,15)	C 0	11.30	(1, 2)	C 0	11.30	(2,14)	C 0	10.10	(1, 4)	C 0
3	11.40	(1,17)	C 0	10.80	(1,18)	C 0	10.60	(1,16)	C 0	9.40	(1,15)	C 0	8.70	(1,19)	C 0
4	9.40	(2, 2)	C 0	9.40	(2, 3)	C 0	8.40	(1,21)	C 0	8.20	(2, 1)	C 0	8.20	(2, 4)	C 0
5	9.80	(2,10)	C 0	9.40	(2, 9)	C 0	9.30	(2,11)	C 0	8.40	(2, 8)	C 0	7.70	(2,12)	C 0
6	6.90	(1, 3)	C 0	6.90	(1, 4)	C 0	6.90	(2,15)	C 0	6.90	(2,16)	C 0	6.70	(1, 2)	C 0
7	9.00	(1,13)	C 0	9.00	(1,14)	C 0	8.50	(1,15)	C 0	8.20	(1,12)	C 0	8.20	(2,24)	C 0
8	9.00	(1, 7)	C 0	9.00	(2,19)	C 0	8.90	(1, 6)	C 0	8.90	(2,18)	C 0	8.30	(1, 5)	C 0

CALM DURATION FREQUENCY

Hours of Consecutive Calm Winds	Frequency of Occurrence	(Julian day/hour ending) of Significant Occurrences

No calm wind hours were encountered during this processing period.

Program terminated normally

3.4.2 CO Test Case 1 - Tier I Example

Test Case 1 is a CO Tier I approach test case. The input control file is almost exactly the same file as that used with the emulation run in Section 3.4.1. Only the input years, the MET data file, FLINK, and FAMB values are different. In this test case, the MET data set is the Pittsburgh 1964 data that is often used with model test cases. This MET data set is available as part of the PREPFILE.ZIP package from the SCRAM BBS on the OAQPS TTN (See Reference 10).

CAL3QHCR Input:

```
'EXAMPLE - TWO WAY INTERSECTION (EX-1)'  60. 175.  0. 0.  8  0.3048 1
 1 1 64  12 31 64
 94823  64  94823 64
 1 1 'U'
'REC 1 (SE CORNER)  '        45.      -35.      6.0
'REC 2 (SW CORNER)  '       -45.      -35.      6.0
'REC 3 (NW CORNER)  '       -45.       35.      6.0
'REC 4 (NE CORNER)  '        45.       35.      6.0
'REC 5 (E MID-MAIN) '        45.     -150.      6.0
'REC 6 (W MID-MAIN) '       -45.     -150.      6.0
'REC 7 (N MID-LOCAL)'      -150.       35.      6.0
'REC 8 (S MID-LOCAL)'      -150.      -35.      6.0
1 'C'
1 1 1 1 1 1 1
'MAIN ST. AND LOCAL ST. INTERSECTION'        9
   1  1
'Main St.NB Appr.   ' 'AG'    10. -1000.    10.     0.    0.  40.
   2  2
'Main St.NB Queue   ' 'AG'    10.   -10.    10. -1000.    0.  20.0   2
   3  1
'Main St.NB Dep.    ' 'AG'    10.     0.    10.  1000.    0.  40.
   4  1
'Main St.SB Appr.   ' 'AG'   -10.  1000.   -10.     0.    0.  40.
   5  2
'Main St.SB Queue   ' 'AG'   -10.    10.   -10.  1000.    0.  20.0   2
   6  1
'Main St.SB Dep.    ' 'AG'   -10.     0.   -10. -1000.    0.  40.
   7  1
'Local St.Appr.Lnk. ' 'AG' -1000.     0.     0.     0.    0.  40.
   8  2
'Local St.Queue Lnk.' 'AG'   -20.     0. -1000.     0.    0.  20.0   2
   9  1
'Local St.Dep.Lnk.  ' 'AG'     0.     0.  1000.     0.    0.  40.
  1  5.00
    1  1500.0    41.6
    2    90        40       3.0 1500 735.00 1600 1 3
    3  1500.0    41.6
    4  1200.0    41.6
    5    90        40       3.0 1200 735.00 1600 1 3
    6  1200.0    41.6
    7  1000.0    41.6
    8    90        50       3.0 1000 735.00 1600 1 3
    9  1000.0    41.6
```

CAL3QHCR Output:

CAL3QHCR (Dated: 95221)

DATE : 8/10/95 PAGE: 1
TIME : 17:33:34

JOB: EXAMPLE - TWO WAY INTERSECTION (EX-1) RUN: MAIN ST. AND LOCAL ST. INTERSECTION

==========
General Information
==========

Run start date: 1/ 1/64 Julian: 1
end date: 12/31/64 Julian: 366

A Tier 1 approach was used for input data preparation.

The MODE flag has been set to C for calculating CO averages.

Ambient background concentrations are included in the averages below.

Site & Meteorological Constants

VS = .0 CM/S VD = .0 CM/S Z0 = 175. CM ATIM = 60.

Met. Sfc. Sta. Id & Yr = 94823 64
Upper Air Sta. Id & Yr = 94823 64

Urban mixing heights were processed.

In 1964, Julian day 1 is a Wednesday.

Link Data Constants - (Variable data in *.LNK file)

LINK DESCRIPTION	LINK COORDINATES (FT) X1	Y1	X2	Y2	LENGTH (FT)	BRG (DEG)	TYPE	H (FT)	W (FT)	NLANES
1. Main St.NB Appr.	10.0	-1000.0	10.0	.0	1000.	360.	AG	.0	40.0	
2. Main St.NB Queue	10.0	-10.0	10.0	-1000.0	990.	180.	AG	.0	20.0	2
3. Main St.NB Dep.	10.0	.0	10.0	1000.0	1000.	360.	AG	.0	40.0	
4. Main St.SB Appr.	-10.0	1000.0	-10.0	.0	1000.	180.	AG	.0	40.0	
5. Main St.SB Queue	-10.0	10.0	-10.0	1000.0	990.	360.	AG	.0	20.0	2
6. Main St.SB Dep.	-10.0	.0	-10.0	-1000.0	1000.	180.	AG	.0	40.0	
7. Local St.Appr.Lnk.	-1000.0	.0	.0	.0	1000.	90.	AG	.0	40.0	
8. Local St.Queue Lnk.	-20.0	.0	-1000.0	.0	980.	270.	AG	.0	20.0	2
9. Local St.Dep.Lnk.	.0	.0	1000.0	.0	1000.	90.	AG	.0	40.0	

Receptor Data

RECEPTOR	COORDINATES (FT) X	Y	Z
1. REC 1 (SE CORNER)	45.0	-35.0	6.0
2. REC 2 (SW CORNER)	-45.0	-35.0	6.0
3. REC 3 (NW CORNER)	-45.0	35.0	6.0
4. REC 4 (NE CORNER)	45.0	35.0	6.0
5. REC 5 (E MID-MAIN)	45.0	-150.0	6.0
6. REC 6 (W MID-MAIN)	-45.0	-150.0	6.0
7. REC 7 (N MID-LOCAL)	-150.0	35.0	6.0
8. REC 8 (S MID-LOCAL)	-150.0	-35.0	6.0

Model Results

Remarks : In search of the wind direction corresponding
to the maximum concentration, only the first
direction, of the directions with the same maximum
concentrations, is indicated as the maximum.

MAXIMUM HOURLY CONCENTRATIONS WITH ANY AMBIENT BACKGROUND CONCENTRATIONS (BKG) ADDED
(PPM)

	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8
MAX+BKG	12.6	13.0	15.7	11.6	14.7	10.6	13.6	11.3
- BKG	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
MAX	7.6	8.0	10.7	6.6	9.7	5.6	8.6	6.3
WIND DIR	285	19	168	228	328	80	138	80
JULIAN	182	41	22	159	154	306	158	306
HOUR	2	14	9	20	1	24	22	24

THE HIGHEST CONCENTRATION OF 15.70 PPM OCCURRED AT RECEPTOR REC3 .

==========
Output Section
==========

NOTES PERTAINING TO THE REPORT

1. THE HIGHEST AVERAGE IN EACH OF THE FIRST TWO COLUMNS OF EACH TABLE BELOW ARE SUFFIXED BY AN ASTERISK (*).
FOR PM OUTPUT, THERE IS ONLY ONE COLUMN AND ASTERISK FOR THE ANNUAL AVERAGE/PERIOD OF CONCERN TABLE.

2. THE NUMBERS IN PARENTHESES ARE THE JULIAN DAY AND ENDING HOUR FOR THE PRECEDING AVERAGE.

3. THE NUMBER OF CALM HOURS USED IN PRODUCING EACH AVERAGE ARE PREFIXED BY A C.

PRIMARY AVERAGES.

MAXIMUM 8-HOUR RUNNING NONOVERLAPPING AVERAGE CONCENTRATIONS
IN PARTS PER MILLION (PPM),
INCLUDING AMBIENT BACKGROUND CONCENTRATIONS.

Receptor Number	Highest Conc	Highest Ending Day Hr	Highest Calm	Second highest Conc	Second highest Ending Day Hr	Second highest Calm
1	10.17	(311,23)	C 2	10.01	(314, 6)	C 1
2	9.95	(273, 6)	C 0	9.90	(260, 6)	C 1
3	11.54*	(161, 4)	C 1	10.85*	(329, 7)	C 2
4	9.46	(22, 6)	C 1	9.40	(181, 5)	C 2
5	9.66	(178, 1)	C 0	9.19	(35, 8)	C 1
6	8.75	(262, 5)	C 2	8.53	(49, 1)	C 2
7	10.08	(270, 7)	C 2	10.08	(329, 7)	C 2
8	9.52	(262, 5)	C 2	9.05	(234, 3)	C 0

FIVE HIGHEST 1-HOUR END-TO-END AVERAGE CONCENTRATIONS IN PARTS PER MILLION
INCLUDING AMBIENT BACKGROUND CONCENTRATIONS.

Rcptr No.	Highest Conc	Highest Ending Day Hr	Highest Calm	Second Highest Conc	Second Highest Ending Day Hr	Second Highest Calm	Third Highest Conc	Third Highest Ending Day Hr	Third Highest Calm	Fourth Highest Conc	Fourth Highest Ending Day Hr	Fourth Highest Calm	Fifth Highest Conc	Fifth Highest Ending Day Hr	Fifth Highest Calm
1	12.60	(182, 2)	C 0	12.60	(237, 6)	C 0	12.60	(297,24)	C 0	12.50	(154, 1)	C 0	12.50	(155, 3)	C 0
2	13.00	(41,14)	C 0	12.90	(217,17)	C 0	12.80	(209, 5)	C 0	12.70	(7,12)	C 0	12.70	(180, 4)	C 0
3	15.70*	(22, 9)	C 0	15.50*	(258, 8)	C 0	14.00	(158,22)	C 0	12.80	(111,19)	C 0	12.80	(129, 3)	C 0
4	11.60	(159,20)	C 0	11.60	(45,20)	C 0	11.60	(166,22)	C 0	11.60	(178,24)	C 0	11.50	(11, 7)	C 0
5	14.70	(154, 1)	C 0	11.80	(174, 5)	C 0	11.70	(159,20)	C 0	11.70	(177,23)	C 0	11.60	(42,24)	C 0
6	10.60	(306,24)	C 0	10.30	(107, 3)	C 0	10.30	(160,22)	C 0	10.20	(158,22)	C 0	10.10	(154, 2)	C 0
7	13.60	(158,22)	C 0	13.50	(107, 3)	C 0	12.70	(258, 8)	C 0	12.60	(154, 2)	C 0	11.90	(313,13)	C 0
8	11.30	(306,24)	C 0	11.10	(49, 4)	C 0	11.10	(102, 8)	C 0	11.10	(345, 1)	C 0	11.00	(24, 4)	C 0

LINK CONTRIBUTION TABLES

MAXIMUM 8-HOUR AVERAGED LINK CONTRIBUTIONS
IN PARTS PER MILLION (PPM)
INCLUDING AMBIENT BACKGROUND CONCENTRATIONS.

Rcptr No.	Total Conc	Ending Day Hr	Ambient Backgnd	Total Link	Link +1	Link +2	Link +3	Link +4	Link +5	Link +6	Link +7	Link +8	Link +9
1	10.17	(311,23)	5.00	5.17	.82	1.53	.15	.13	.30	.43	.57	1.05	.18
2	9.95	(273, 6)	5.00	4.95	.00	.00	.63	.71	.94	.06	.55	2.06	.00
3	11.54	(161, 4)	5.00	6.54	.76	1.17	.23	.43	.73	.73	.57	1.63	.30
4	9.46	(22, 6)	5.00	4.46	.61	.79	.51	.29	.73	.34	.27	.53	.39
5	9.66	(178, 1)	5.00	4.66	1.09	1.99	.04	.04	.06	.63	.21	.61	.00
6	8.75	(262, 5)	5.00	3.75	.82	1.63	.05	.03	.05	.88	.00	.02	.27
7	10.08	(270, 7)	5.00	5.08	.38	.75	.00	.00	.00	.35	.75	2.83	.02
8	9.52	(262, 5)	5.00	4.52	.12	.22	.30	.25	.38	.12	.63	2.25	.25

SECOND HIGHEST 8-HOUR AVERAGED LINK CONTRIBUTIONS
IN PARTS PER MILLION (PPM)
INCLUDING AMBIENT BACKGROUND CONCENTRATIONS.

Rcptr No.	Total Conc	Ending Day Hr	Ambient Backgnd	Total Link	Link +1	Link +2	Link +3	Link +4	Link +5	Link +6	Link +7	Link +8	Link +9
1	10.01	(314, 6)	5.00	5.01	1.00	1.99	.03	.06	.07	.57	.39	.83	.09
2	9.90	(260, 6)	5.00	4.90	.01	.00	.70	.73	1.26	.11	.49	1.59	.01
3	10.85	(329, 7)	5.00	5.85	.55	.85	.38	.58	1.17	.43	.43	.98	.47
4	9.40	(181, 5)	5.00	4.40	.55	.87	.62	.22	.37	.43	.28	.60	.47
5	9.19	(35, 8)	5.00	4.19	1.10	2.17	.00	.00	.00	.66	.11	.14	.00
6	8.53	(49, 1)	5.00	3.53	.85	1.40	.05	.02	.03	.93	.02	.02	.22
7	10.08	(329, 7)	5.00	5.08	.33	.53	.07	.08	.15	.28	.73	2.73	.17
8	9.05	(234, 3)	5.00	4.05	.13	.21	.23	.20	.41	.11	.59	1.97	.20

MAXIMUM 1-HOUR AVERAGED LINK CONTRIBUTIONS
IN PARTS PER MILLION (PPM)
INCLUDING AMBIENT BACKGROUND CONCENTRATIONS.

Rcptr No.	Total Conc	Ending Day Hr	Ambient Backgnd	Total Link	Link +1	Link +2	Link +3	Link +4	Link +5	Link +6	Link +7	Link +8	Link +9
1	12.60	(182, 2)	5.00	7.60	1.10	2.20	.10	.10	.10	.60	1.00	2.20	.20
2	13.00	(41,14)	5.00	8.00	.00	.00	1.20	1.20	2.10	.20	.70	2.60	.00
3	15.70	(22, 9)	5.00	10.70	1.60	2.20	.00	.10	.00	1.70	1.00	4.10	.00
4	11.60	(159,20)	5.00	6.60	.70	1.10	1.10	.30	.40	.70	.50	1.00	.80
5	14.70	(154, 1)	5.00	9.70	1.90	4.00	.20	.30	.50	1.00	.40	1.30	.10
6	10.60	(306,24)	5.00	5.60	1.20	2.70	.00	.00	.00	1.30	.00	.00	.40
7	13.60	(158,22)	5.00	8.60	.70	1.30	.00	.00	.00	.60	1.20	4.80	.00

LINK CONTRIBUTION TABLES

MAXIMUM 1-HOUR AVERAGED LINK CONTRIBUTIONS
IN PARTS PER MILLION (PPM)
INCLUDING AMBIENT BACKGROUND CONCENTRATIONS.

Rcptr No.	Total Conc	Ending Day Hr	Ambient Backgnd	Total Link	Link +1	Link +2	Link +3	Link +4	Link +5	Link +6	Link +7	Link +8	Link +9
8	11.30	(306,24)	5.00	6.30	.30	.60	.30	.20	.40	.30	.80	2.60	.80

SECOND HIGHEST 1-HOUR AVERAGED LINK CONTRIBUTIONS
IN PARTS PER MILLION (PPM)
INCLUDING AMBIENT BACKGROUND CONCENTRATIONS.

Rcptr No.	Total Conc	Ending Day Hr	Ambient Backgnd	Total Link	Link +1	Link +2	Link +3	Link +4	Link +5	Link +6	Link +7	Link +8	Link +9
1	12.60	(237, 6)	5.00	7.60	1.10	2.20	.10	.10	.10	.60	1.00	2.20	.20
2	12.90	(217,17)	5.00	7.90	.00	.00	1.20	1.20	2.00	.10	.70	2.70	.00
3	15.50	(258, 8)	5.00	10.50	1.40	2.90	.10	.50	.30	1.20	1.00	3.00	.10
4	11.60	(45,20)	5.00	6.60	.00	.00	1.10	.60	1.40	.10	1.00	2.20	.20
5	11.80	(174, 5)	5.00	6.80	1.40	2.70	.20	.20	.40	.70	.30	.80	.10
6	10.30	(107, 3)	5.00	5.30	1.30	2.70	.00	.00	.00	1.30	.00	.00	.00
7	13.50	(107, 3)	5.00	8.50	.50	1.10	.10	.10	.20	.40	1.20	4.60	.30
8	11.10	(49, 4)	5.00	6.10	.00	.00	.40	.40	.90	.00	.90	3.40	.10

JOB: EXAMPLE - TWO WAY INTERSECTION (EX-1) RUN: MAIN ST. AND LOCAL ST. INTERSECTION

CALM DURATION FREQUENCY

Hours of Consecutive Calm Winds	Frequency of Occurrence	(Julian day/hour ending) of Significant Occurrences
1	188	(7,13)(11, 5)(11,13)(21,24)(23,19)(29, 5)(31, 3)(31, 6)(34,24)(35, 6) (40,18)(42,23)(43, 5)(46, 2)(46,14)(48, 5)(54, 2)(54, 6)(56, 2)(59, 8) (62, 6)(62,23)(71,19)(72,23)(73, 4)(73, 8)(76, 8)(83, 4)(84,23)(85, 1) (105, 7)(110,18)(111,20)(125, 5)(126, 2)(126, 4)(132,21)(136, 8)(137, 4)(137, 6) (143,21)(144, 1)(154, 4)(154, 6)(156, 6)(158, 1)(160,24)(164, 1)(169, 6)(174, 4) (174,20)(175,21)(179, 6)(180, 5)(180,24)(182, 3)(182, 6)(184, 1)(188, 7)(188,24) (190, 2)(190,24)(191, 4)(191, 6)(192, 1)(192, 6)(193, 3)(193,23)(195,24)(198, 8) (199,20)(201,21)(201,24)(202, 2)(202, 5)(202,23)(203, 6)(204, 2)(204, 5)(204, 7) (205,22)(205,24)(206, 2)(206, 4)(210, 5)(212, 2)(214, 9)(214,21)(214,23)(215, 2) (215, 4)(215,21)(228,23)(230, 3)(233, 4)(238, 5)(239,22)(240, 2)(242, 3)(242,21) (242,23)(243, 1)(243,23)(244, 2)(244, 5)(246,22)(246,24)(247, 7)(248, 5)(250,22) (253,21)(255, 1)(257,24)(258, 3)(259,24)(260,21)(261, 1)(261, 6)(261, 8)(261,21) (261,24)(262, 3)(262, 7)(263, 1)(263, 3)(266, 4)(267, 3)(270, 1)(270, 5)(271,21) (273,14)(273,20)(276, 8)(277, 1)(280,23)(285, 8)(285,19)(288,19)(288,22)(289, 7) (289,18)(289,20)(289,24)(291,18)(292, 4)(292, 8)(294, 6)(297,23)(299, 4)(300, 6) (300, 8)(301, 4)(301, 7)(301,19)(302, 5)(306, 7)(306,15)(306,20)(307, 2)(308, 7) (308,22)(309,17)(311,19)(311,21)(312,18)(312,21)(314, 5)(315, 1)(319,11)(319,21) (320,20)(324,15)(329, 4)(329, 6)(336, 8)(338,21)(338,23)(339,11)(344,19)(344,21) (346, 8)(347, 5)(347,16)(356,19)(356,21)(357, 1)(357,23)(363,19)
2	55	(23,24)(24, 3)(29, 8)(36,18)(43, 3)(46, 6)(48,22)(49, 3)(102, 3)(111,24) (125,23)(136, 6)(139, 2)(139, 6)(156, 3)(157,21)(174,23)(193, 1)(196, 4)(198, 6) (198,23)(200,23)(203, 2)(203,22)(205, 1)(205, 5)(205, 8)(208,23)(222,24)(242, 6) (247, 3)(249,24)(250, 3)(250, 6)(250, 9)(261, 4)(262,20)(262,23)(272, 1)(279, 5) (281, 7)(286, 7)(288, 8)(289, 1)(299, 2)(301,23)(302, 2)(302,23)(306,23)(328,22) (329, 9)(344,24)(355,24)(356, 8)(361,10)
3	27	(18,23)(45,24)(49, 7)(53, 7)(102, 7)(107, 2)(144, 6)(160, 7)(180,22)(183, 2) (193, 7)(194, 3)(199,24)(202,21)(209, 4)(218, 3)(228, 7)(230, 7)(243, 6)(280, 5) (281, 3)(289, 5)(301, 2)(312, 7)(320, 4)(329,19)(356, 4)
4	12	(87,24)(170, 2)(198, 3)(209,24)(233, 1)(248, 1)(254,23)(269,23)(280, 1)(300,22) (312, 3)(320, 9)
5	12	(142,24)(143, 6)(147, 2)(169, 4)(178, 7)(188, 4)(189, 6)(228, 3)(254, 6)(286,23) (295, 1)(307, 8)
6	6	(59, 6)(199, 6)(238, 2)(259, 3)(288, 5)(298, 6)
7	3	(229, 7)(286, 3)(310, 2)
9	2	(220, 6)(252, 5)
10	3	(253, 7)(305, 9)(309, 9)

Program terminated normally

The following three files are examples of the LNK, ET1, and ET2 files for Test Case 1. These files can be viewed or printed using a standard text editor.

LNK file:

CAL3QHCR (Dated: 95221)

DATE : 8/10/95 PAGE: 1
TIME : 17:33:34 LINK DATA VARIABLES

JOB: EXAMPLE - TWO WAY INTERSECTION (EX-1) RUN: MAIN ST. AND LOCAL ST. INTERSECTION

LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (FT) X1	Y1	X2	Y2	LENGTH (FT)	BRG (DEG)	TYPE	VPH	EF (G/MI)	H (FT)	W (FT)	V/C	QUEUE (VEH)	TRUNC
1. Main St.NB Appr.	10.0	-1000.0	10.0	.0	1000.	360.	AG	1500.0	41.6	.0	40.0			
2. Main St.NB Queue	10.0	-10.0	10.0	-238.5	229.	180.	AG	1752.4	100.0	.0	20.0	.94	11.6	NO
3. Main St.NB Dep.	10.0	.0	10.0	1000.0	1000.	360.	AG	1500.0	41.6	.0	40.0			
4. Main St.SB Appr.	-10.0	1000.0	-10.0	.0	1000.	180.	AG	1200.0	41.6	.0	40.0			
5. Main St.SB Queue	-10.0	10.0	-10.0	141.2	131.	360.	AG	1752.4	100.0	.0	20.0	.75	6.7	NO
6. Main St.SB Dep.	-10.0	.0	-10.0	-1000.0	1000.	180.	AG	1200.0	41.6	.0	40.0			
7. Local St.Appr.Lnk.	-1000.0	.0	.0	.0	1000.	90.	AG	1000.0	41.6	.0	40.0			
8. Local St.Queue Lnk.	-20.0	.0	-165.4	.0	145.	270.	AG	2190.5	100.0	.0	20.0	.80	7.4	NO
9. Local St.Dep.Lnk.	.0	.0	1000.0	.0	1000.	90.	AG	1000.0	41.6	.0	40.0			

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
2. Main St.NB Queue	90	40	3.0	1500	1600	735.0	1	3
5. Main St.SB Queue	90	40	3.0	1200	1600	735.0	1	3
8. Local St.Queue Lnk.	90	50	3.0	1000	1600	735.0	1	3

ET1 file:

```
          1        5.00
    1  1500.0    41.6
    2    90        40       3.0 1500 735.00 1600 1 3
    3  1500.0    41.6
    4  1200.0    41.6
    5    90        40       3.0 1200 735.00 1600 1 3
    6  1200.0    41.6
    7  1000.0    41.6
    8    90        50       3.0 1000 735.00 1600 1 3
    9  1000.0    41.6
    .
    .     (The hourly set of data above is repeated 23 additional
          times to form one 24-hour pattern.)
    .
```

ET2 file:

```
 64  1  1  5.00
    1  1500.0    41.6
    2    90        40       3.0 1500 735.00 1600 1 3
    3  1500.0    41.6
    4  1200.0    41.6
    5    90        40       3.0 1200 735.00 1600 1 3
    6  1200.0    41.6
    7  1000.0    41.6
    8    90        50       3.0 1000 735.00 1600 1 3
    9  1000.0    41.6
 .
 . (Day 1, hours 2 through 23 are the same except for hour
 .  values.)
 .
 64  1 24  5.00
    1  1500.0    41.6
    2    90        40       3.0 1500 735.00 1600 1 3
    3  1500.0    41.6
    4  1200.0    41.6
    5    90        40       3.0 1200 735.00 1600 1 3
    6  1200.0    41.6
    7  1000.0    41.6
    8    90        50       3.0 1000 735.00 1600 1 3
    9  1000.0    41.6
 64  2  1  5.00
    1  1500.0    41.6
    2    90        40       3.0 1500 735.00 1600 1 3
    3  1500.0    41.6
    4  1200.0    41.6
    5    90        40       3.0 1200 735.00 1600 1 3
    6  1200.0    41.6
    7  1000.0    41.6
    8    90        50       3.0 1000 735.00 1600 1 3
```

```
   9  1000.0    41.6
.
.  (Day 2)
.
64  2 24  5.00
   1  1500.0    41.6
   2    90        40       3.0 1500 735.00 1600 1 3
   3  1500.0    41.6
   4  1200.0    41.6
   5    90        40       3.0 1200 735.00 1600 1 3
   6  1200.0    41.6
   7  1000.0    41.6
   8    90        50       3.0 1000 735.00 1600 1 3
   9  1000.0    41.6
64  3  1  5.00
   1  1500.0    41.6
   2    90        40       3.0 1500 735.00 1600 1 3
   3  1500.0    41.6
   4  1200.0    41.6
   5    90        40       3.0 1200 735.00 1600 1 3
   6  1200.0    41.6
   7  1000.0    41.6
   8    90        50       3.0 1000 735.00 1600 1 3
   9  1000.0    41.6
.
.  (Days 3 through 7)
.
64  7 24  5.00
   1  1500.0    41.6
   2    90        40       3.0 1500 735.00 1600 1 3
   3  1500.0    41.6
   4  1200.0    41.6
   5    90        40       3.0 1200 735.00 1600 1 3
   6  1200.0    41.6
   7  1000.0    41.6
   8    90        50       3.0 1000 735.00 1600 1 3
   9  1000.0    41.6
```

3.4.3 CO Test Case 2 - Tier II Example

Test Case 2 is an example of a Tier II approach for CO and is based on test case 1. For test case II, the traffic volumes and ambient background concentrations have been varied on an hourly basis. The traffic volumes have been derived using the volumes in Figure 3-1. The background was varied over a very small range (4.87 to 5.14 ppm).

The following are the input and summary output files for Test Case 2:

Input:

```
'EXAMPLE - TWO WAY INTERSECTION (EX-1)'  60. 175.  0. 0.  8  0.3048 1
 1 1 64 12 31 64
 94823  64  94823 64
 1 1 'U'
'REC 1 (SE CORNER)  '        45.      -35.      6.0
'REC 2 (SW CORNER)  '       -45.      -35.      6.0
'REC 3 (NW CORNER)  '       -45.       35.      6.0
'REC 4 (NE CORNER)  '        45.       35.      6.0
'REC 5 (E MID-MAIN) '        45.     -150.      6.0
'REC 6 (W MID-MAIN) '       -45.     -150.      6.0
'REC 7 (N MID-LOCAL)'      -150.       35.      6.0
'REC 8 (S MID-LOCAL)'      -150.      -35.      6.0
2 'C'
1 1 1 1 1 2 3
'MAIN ST. AND LOCAL ST. INTERSECTION'       9
   1  1
'Main St.NB Appr.   ' 'AG'    10. -1000.    10.     0.    0.  40.
   2  2
'Main St.NB Queue   ' 'AG'    10.   -10.    10. -1000.    0.  20.0   2
   3  1
'Main St.NB Dep.    ' 'AG'    10.     0.    10.  1000.    0.  40.
   4  1
'Main St.SB Appr.   ' 'AG'   -10.  1000.   -10.     0.    0.  40.
   5  2
'Main St.SB Queue   ' 'AG'   -10.    10.   -10.  1000.    0.  20.0   2
   6  1
'Main St.SB Dep.    ' 'AG'   -10.     0.   -10. -1000.    0.  40.
   7  1
'Local St.Appr.Lnk. ' 'AG' -1000.     0.     0.     0.    0.  40.
   8  2
'Local St.Queue Lnk.' 'AG'   -20.     0. -1000.     0.    0.  20.0   2
   9  1
'Local St.Dep.Lnk.  ' 'AG'     0.     0.  1000.     0.    0.  40.
 1   4.91
   1   300.0      41.6
   2    90  40  3.0      300 735.0  0 0 0
   3   300.0      41.6
   4   240.0      41.6
   5    90  40  3.0      240 735.0  0 0 0
   6   240.0      41.6
   7   200.0      41.6
   8    90  50  3.0      200 735.0  0 0 0
   9   200.0      41.6
 2   4.92
   1   270.0      41.6
```

```
   2    90  40  3.0      270 735.0  0 0 0
   3   270.0      41.6
   4   216.0      41.6
   5    90  40  3.0      216 735.0  0 0 0
   6   216.0      41.6
   7   180.0      41.6
   8    90  50  3.0      180 735.0  0 0 0
   9   180.0      41.6
3   4.93
   1   225.0      41.6
   2    90  40  3.0      225 735.0  0 0 0
   3   225.0      41.6
   4   180.0      41.6
   5    90  40  3.0      180 735.0  0 0 0
   6   180.0      41.6
   7   150.0      41.6
   8    90  50  3.0      150 735.0  0 0 0
   9   150.0      41.6
4   4.94
   1   240.0      41.6
   2    90  40  3.0      239 735.0  0 0 0
   3   240.0      41.6
   4   192.0      41.6
   5    90  40  3.0      191 735.0  0 0 0
   6   192.0      41.6
   7   160.0      41.6
   8    90  50  3.0      159 735.0  0 0 0
   9   160.0      41.6
5   4.95
   1   450.0      41.6
   2    90  40  3.0      450 735.0  0 0 0
   3   450.0      41.6
   4   360.0      41.6
   5    90  40  3.0      360 735.0  0 0 0
   6   360.0      41.6
   7   300.0      41.6
   8    90  50  3.0      300 735.0  0 0 0
   9   300.0      41.6
6   4.96
   1  1350.0      41.6
   2    90  40  3.0     1349 735.0  0 0 0
   3  1350.0      41.6
   4  1080.0      41.6
   5    90  40  3.0     1079 735.0  0 0 0
   6  1080.0      41.6
   7   900.0      41.6
   8    90  50  3.0      899 735.0  0 0 0
   9   900.0      41.6
7   4.97
   1  1650.0      41.6
   2    90  40  3.0     1650 735.0  0 0 0
   3  1650.0      41.6
   4  1320.0      41.6
   5    90  40  3.0     1320 735.0  0 0 0
   6  1320.0      41.6
   7  1100.0      41.6
   8    90  50  3.0     1100 735.0  0 0 0
   9  1100.0      41.6
8   4.98
   1  1575.0      41.6
   2    90  40  3.0     1574 735.0  0 0 0
   3  1575.0      41.6
```

```
   4  1260.0      41.6
   5    90  40  3.0     1259 735.0  0 0 0
   6  1260.0      41.6
   7  1050.0      41.6
   8    90  50  3.0     1049 735.0  0 0 0
   9  1050.0      41.6
 9   4.99
   1  1350.0      41.6
   2    90  40  3.0     1349 735.0  0 0 0
   3  1350.0      41.6
   4  1080.0      41.6
   5    90  40  3.0     1079 735.0  0 0 0
   6  1080.0      41.6
   7   900.0      41.6
   8    90  50  3.0      899 735.0  0 0 0
   9   900.0      41.6
10   5.00
   1  1275.0      41.6
   2    90  40  3.0     1275 735.0  0 0 0
   3  1275.0      41.6
   4  1020.0      41.6
   5    90  40  3.0     1020 735.0  0 0 0
   6  1020.0      41.6
   7   850.0      41.6
   8    90  50  3.0      850 735.0  0 0 0
   9   850.0      41.6
11   5.01
   1  1125.0      41.6
   2    90  40  3.0     1125 735.0  0 0 0
   3  1125.0      41.6
   4   900.0      41.6
   5    90  40  3.0      900 735.0  0 0 0
   6   900.0      41.6
   7   750.0      41.6
   8    90  50  3.0      750 735.0  0 0 0
   9   750.0      41.6
12   5.02
   1  1200.0      41.6
   2    90  40  3.0     1200 735.0  0 0 0
   3  1200.0      41.6
   4   960.0      41.6
   5    90  40  3.0      960 735.0  0 0 0
   6   960.0      41.6
   7   800.0      41.6
   8    90  50  3.0      800 735.0  0 0 0
   9   800.0      41.6
13   5.03
   1  1200.0      41.6
   2    90  40  3.0     1200 735.0  0 0 0
   3  1200.0      41.6
   4   960.0      41.6
   5    90  40  3.0      960 735.0  0 0 0
   6   960.0      41.6
   7   800.0      41.6
   8    90  50  3.0      800 735.0  0 0 0
   9   800.0      41.6
14   5.04
   1  1350.0      41.6
   2    90  40  3.0     1349 735.0  0 0 0
   3  1350.0      41.6
   4  1080.0      41.6
   5    90  40  3.0     1079 735.0  0 0 0
```

```
   6  1080.0      41.6
   7   900.0      41.6
   8    90  50  3.0       899 735.0  0 0 0
   9   900.0      41.6
15   5.05
   1  1500.0      41.6
   2    90  40  3.0      1500 735.0  0 0 0
   3  1500.0      41.6
   4  1200.0      41.6
   5    90  40  3.0      1200 735.0  0 0 0
   6  1200.0      41.6
   7  1000.0      41.6
   8    90  50  3.0      1000 735.0  0 0 0
   9  1000.0      41.6
16   5.06
   1  1650.0      41.6
   2    90  40  3.0      1650 735.0  0 0 0
   3  1650.0      41.6
   4  1320.0      41.6
   5    90  40  3.0      1320 735.0  0 0 0
   6  1320.0      41.6
   7  1100.0      41.6
   8    90  50  3.0      1100 735.0  0 0 0
   9  1100.0      41.6
17   5.07
   1  1575.0      41.6
   2    90  40  3.0      1574 735.0  0 0 0
   3  1575.0      41.6
   4  1260.0      41.6
   5    90  40  3.0      1259 735.0  0 0 0
   6  1260.0      41.6
   7  1050.0      41.6
   8    90  50  3.0      1049 735.0  0 0 0
   9  1050.0      41.6
18   5.08
   1  1500.0      41.6
   2    90  40  3.0      1500 735.0  0 0 0
   3  1500.0      41.6
   4  1200.0      41.6
   5    90  40  3.0      1200 735.0  0 0 0
   6  1200.0      41.6
   7  1000.0      41.6
   8    90  50  3.0      1000 735.0  0 0 0
   9  1000.0      41.6
19   5.09
   1  1200.0      41.6
   2    90  40  3.0      1200 735.0  0 0 0
   3  1200.0      41.6
   4   960.0      41.6
   5    90  40  3.0       960 735.0  0 0 0
   6   960.0      41.6
   7   800.0      41.6
   8    90  50  3.0       800 735.0  0 0 0
   9   800.0      41.6
20   5.10
   1   900.0      41.6
   2    90  40  3.0       900 735.0  0 0 0
   3   900.0      41.6
   4   720.0      41.6
   5    90  40  3.0       720 735.0  0 0 0
   6   720.0      41.6
   7   600.0      41.6
```

```
   8    90  50  3.0      600 735.0  0 0 0
   9   600.0      41.6
21   5.11
   1   825.0      41.6
   2    90  40  3.0      825 735.0  0 0 0
   3   825.0      41.6
   4   660.0      41.6
   5    90  40  3.0      660 735.0  0 0 0
   6   660.0      41.6
   7   550.0      41.6
   8    90  50  3.0      550 735.0  0 0 0
   9   550.0      41.6
22   5.12
   1   750.0      41.6
   2    90  40  3.0      750 735.0  0 0 0
   3   750.0      41.6
   4   600.0      41.6
   5    90  40  3.0      600 735.0  0 0 0
   6   600.0      41.6
   7   500.0      41.6
   8    90  50  3.0      500 735.0  0 0 0
   9   500.0      41.6
23   5.13
   1   675.0      41.6
   2    90  40  3.0      674 735.0  0 0 0
   3   675.0      41.6
   4   540.0      41.6
   5    90  40  3.0      539 735.0  0 0 0
   6   540.0      41.6
   7   450.0      41.6
   8    90  50  3.0      449 735.0  0 0 0
   9   450.0      41.6
24   5.14
   1   450.0      41.6
   2    90  40  3.0      450 735.0  0 0 0
   3   450.0      41.6
   4   360.0      41.6
   5    90  40  3.0      360 735.0  0 0 0
   6   360.0      41.6
   7   300.0      41.6
   8    90  50  3.0      300 735.0  0 0 0
   9   300.0      41.6
 1   5.01
   1   350.0      41.6
   2    90  40  3.0      350 735.0  0 0 0
   3   350.0      41.6
   4   280.0      41.6
   5    90  40  3.0      280 735.0  0 0 0
   6   280.0      41.6
   7   233.3      41.6
   8    90  50  3.0      233 735.0  0 0 0
   9   233.3      41.6
 2   5.02
   1   400.0      41.6
   2    90  40  3.0      399 735.0  0 0 0
   3   400.0      41.6
   4   320.0      41.6
   5    90  40  3.0      319 735.0  0 0 0
   6   320.0      41.6
   7   266.7      41.6
   8    90  50  3.0      266 735.0  0 0 0
   9   266.7      41.6
```

```
3   5.03
  1   450.0      41.6
  2    90  40  3.0      450 735.0  0 0 0
  3   450.0      41.6
  4   360.0      41.6
  5    90  40  3.0      360 735.0  0 0 0
  6   360.0      41.6
  7   300.0      41.6
  8    90  50  3.0      300 735.0  0 0 0
  9   300.0      41.6
4   5.04
  1   500.0      41.6
  2    90  40  3.0      499 735.0  0 0 0
  3   500.0      41.6
  4   400.0      41.6
  5    90  40  3.0      399 735.0  0 0 0
  6   400.0      41.6
  7   333.3      41.6
  8    90  50  3.0      333 735.0  0 0 0
  9   333.3      41.6
5   5.05
  1   550.0      41.6
  2    90  40  3.0      550 735.0  0 0 0
  3   550.0      41.6
  4   440.0      41.6
  5    90  40  3.0      440 735.0  0 0 0
  6   440.0      41.6
  7   366.7      41.6
  8    90  50  3.0      366 735.0  0 0 0
  9   366.7      41.6
6   5.06
  1   600.0      41.6
  2    90  40  3.0      599 735.0  0 0 0
  3   600.0      41.6
  4   480.0      41.6
  5    90  40  3.0      479 735.0  0 0 0
  6   480.0      41.6
  7   400.0      41.6
  8    90  50  3.0      399 735.0  0 0 0
  9   400.0      41.6
7   5.07
  1   650.0      41.6
  2    90  40  3.0      650 735.0  0 0 0
  3   650.0      41.6
  4   520.0      41.6
  5    90  40  3.0      520 735.0  0 0 0
  6   520.0      41.6
  7   433.3      41.6
  8    90  50  3.0      433 735.0  0 0 0
  9   433.3      41.6
8   5.08
  1   700.0      41.6
  2    90  40  3.0      699 735.0  0 0 0
  3   700.0      41.6
  4   560.0      41.6
  5    90  40  3.0      559 735.0  0 0 0
  6   560.0      41.6
  7   466.7      41.6
  8    90  50  3.0      466 735.0  0 0 0
  9   466.7      41.6
9   5.09
  1   750.0      41.6
```

```
   2    90  40  3.0      750 735.0  0 0 0
   3   750.0      41.6
   4   600.0      41.6
   5    90  40  3.0      600 735.0  0 0 0
   6   600.0      41.6
   7   500.0      41.6
   8    90  50  3.0      500 735.0  0 0 0
   9   500.0      41.6
10   5.10
   1   800.0      41.6
   2    90  40  3.0      799 735.0  0 0 0
   3   800.0      41.6
   4   640.0      41.6
   5    90  40  3.0      639 735.0  0 0 0
   6   640.0      41.6
   7   533.3      41.6
   8    90  50  3.0      533 735.0  0 0 0
   9   533.3      41.6
11   5.09
   1   850.0      41.6
   2    90  40  3.0      849 735.0  0 0 0
   3   850.0      41.6
   4   680.0      41.6
   5    90  40  3.0      679 735.0  0 0 0
   6   680.0      41.6
   7   566.7      41.6
   8    90  50  3.0      566 735.0  0 0 0
   9   566.7      41.6
12   5.08
   1   900.0      41.6
   2    90  40  3.0      899 735.0  0 0 0
   3   900.0      41.6
   4   720.0      41.6
   5    90  40  3.0      719 735.0  0 0 0
   6   720.0      41.6
   7   600.0      41.6
   8    90  50  3.0      599 735.0  0 0 0
   9   600.0      41.6
13   5.07
   1   950.0      41.6
   2    90  40  3.0      949 735.0  0 0 0
   3   950.0      41.6
   4   760.0      41.6
   5    90  40  3.0      759 735.0  0 0 0
   6   760.0      41.6
   7   633.3      41.6
   8    90  50  3.0      633 735.0  0 0 0
   9   633.3      41.6
14   5.06
   1  1000.0      41.6
   2    90  40  3.0      999 735.0  0 0 0
   3  1000.0      41.6
   4   800.0      41.6
   5    90  40  3.0      799 735.0  0 0 0
   6   800.0      41.6
   7   666.7      41.6
   8    90  50  3.0      666 735.0  0 0 0
   9   666.7      41.6
15   5.05
   1  1050.0      41.6
   2    90  40  3.0     1049 735.0  0 0 0
   3  1050.0      41.6
```

```
   4   840.0      41.6
   5    90  40  3.0      839 735.0  0 0 0
   6   840.0      41.6
   7   700.0      41.6
   8    90  50  3.0      699 735.0  0 0 0
   9   700.0      41.6
16   5.06
   1  1100.0      41.6
   2    90  40  3.0     1099 735.0  0 0 0
   3  1100.0      41.6
   4   880.0      41.6
   5    90  40  3.0      879 735.0  0 0 0
   6   880.0      41.6
   7   733.3      41.6
   8    90  50  3.0      733 735.0  0 0 0
   9   733.3      41.6
17   5.07
   1  1150.0      41.6
   2    90  40  3.0     1149 735.0  0 0 0
   3  1150.0      41.6
   4   920.0      41.6
   5    90  40  3.0      919 735.0  0 0 0
   6   920.0      41.6
   7   766.7      41.6
   8    90  50  3.0      766 735.0  0 0 0
   9   766.7      41.6
18   5.08
   1  1200.0      41.6
   2    90  40  3.0     1199 735.0  0 0 0
   3  1200.0      41.6
   4   960.0      41.6
   5    90  40  3.0      959 735.0  0 0 0
   6   960.0      41.6
   7   800.0      41.6
   8    90  50  3.0      799 735.0  0 0 0
   9   800.0      41.6
19   5.09
   1  1250.0      41.6
   2    90  40  3.0     1249 735.0  0 0 0
   3  1250.0      41.6
   4  1000.0      41.6
   5    90  40  3.0      999 735.0  0 0 0
   6  1000.0      41.6
   7   833.3      41.6
   8    90  50  3.0      833 735.0  0 0 0
   9   833.3      41.6
20   5.10
   1  1300.0      41.6
   2    90  40  3.0     1299 735.0  0 0 0
   3  1300.0      41.6
   4  1040.0      41.6
   5    90  40  3.0     1039 735.0  0 0 0
   6  1040.0      41.6
   7   866.7      41.6
   8    90  50  3.0      866 735.0  0 0 0
   9   866.7      41.6
21   5.09
   1  1350.0      41.6
   2    90  40  3.0     1349 735.0  0 0 0
   3  1350.0      41.6
   4  1080.0      41.6
   5    90  40  3.0     1079 735.0  0 0 0
```

```
   6  1080.0      41.6
   7   900.0      41.6
   8    90  50  3.0       899 735.0  0 0 0
   9   900.0      41.6
22   5.08
   1  1400.0      41.6
   2    90  40  3.0      1399 735.0  0 0 0
   3  1400.0      41.6
   4  1120.0      41.6
   5    90  40  3.0      1119 735.0  0 0 0
   6  1120.0      41.6
   7   933.3      41.6
   8    90  50  3.0       933 735.0  0 0 0
   9   933.3      41.6
23   5.09
   1  1450.0      41.6
   2    90  40  3.0      1449 735.0  0 0 0
   3  1450.0      41.6
   4  1160.0      41.6
   5    90  40  3.0      1159 735.0  0 0 0
   6  1160.0      41.6
   7   966.7      41.6
   8    90  50  3.0       966 735.0  0 0 0
   9   966.7      41.6
24   5.10
   1  1500.0      41.6
   2    90  40  3.0      1499 735.0  0 0 0
   3  1500.0      41.6
   4  1200.0      41.6
   5    90  40  3.0      1199 735.0  0 0 0
   6  1200.0      41.6
   7  1000.0      41.6
   8    90  50  3.0       999 735.0  0 0 0
   9  1000.0      41.6
 1   5.10
   1  1500.0      41.6
   2    90  40  3.0      1500 735.0  0 0 0
   3  1500.0      41.6
   4  1200.0      41.6
   5    90  40  3.0      1200 735.0  0 0 0
   6  1200.0      41.6
   7  1000.0      41.6
   8    90  50  3.0      1000 735.0  0 0 0
   9  1000.0      41.6
 2   5.09
   1  1500.0      41.6
   2    90  40  3.0      1500 735.0  0 0 0
   3  1500.0      41.6
   4  1200.0      41.6
   5    90  40  3.0      1200 735.0  0 0 0
   6  1200.0      41.6
   7  1000.0      41.6
   8    90  50  3.0      1000 735.0  0 0 0
   9  1000.0      41.6
 3   5.08
   1  1481.3      41.6
   2    90  40  3.0      1481 735.0  0 0 0
   3  1481.3      41.6
   4  1185.0      41.6
   5    90  40  3.0      1185 735.0  0 0 0
   6  1185.0      41.6
   7   987.5      41.6
```

```
  8    90  50  3.0      987 735.0  0 0 0
  9   987.5      41.6
4   5.07
  1  1312.5      41.6
  2    90  40  3.0     1312 735.0  0 0 0
  3  1312.5      41.6
  4  1050.0      41.6
  5    90  40  3.0     1050 735.0  0 0 0
  6  1050.0      41.6
  7   875.0      41.6
  8    90  50  3.0      875 735.0  0 0 0
  9   875.0      41.6
5   5.06
  1  1143.8      41.6
  2    90  40  3.0     1143 735.0  0 0 0
  3  1143.8      41.6
  4   915.0      41.6
  5    90  40  3.0      914 735.0  0 0 0
  6   915.0      41.6
  7   762.5      41.6
  8    90  50  3.0      762 735.0  0 0 0
  9   762.5      41.6
6   5.05
  1   975.0      41.6
  2    90  40  3.0      974 735.0  0 0 0
  3   975.0      41.6
  4   780.0      41.6
  5    90  40  3.0      779 735.0  0 0 0
  6   780.0      41.6
  7   650.0      41.6
  8    90  50  3.0      649 735.0  0 0 0
  9   650.0      41.6
7   5.04
  1   806.3      41.6
  2    90  40  3.0      806 735.0  0 0 0
  3   806.3      41.6
  4   645.0      41.6
  5    90  40  3.0      645 735.0  0 0 0
  6   645.0      41.6
  7   537.5      41.6
  8    90  50  3.0      537 735.0  0 0 0
  9   537.5      41.6
8   5.03
  1   637.5      41.6
  2    90  40  3.0      637 735.0  0 0 0
  3   637.5      41.6
  4   510.0      41.6
  5    90  40  3.0      510 735.0  0 0 0
  6   510.0      41.6
  7   425.0      41.6
  8    90  50  3.0      425 735.0  0 0 0
  9   425.0      41.6
9   5.02
  1   468.8      41.6
  2    90  40  3.0      468 735.0  0 0 0
  3   468.8      41.6
  4   375.0      41.6
  5    90  40  3.0      375 735.0  0 0 0
  6   375.0      41.6
  7   312.5      41.6
  8    90  50  3.0      312 735.0  0 0 0
  9   312.5      41.6
```

```
10   5.01
   1   230.0      41.6
   2    90  40  3.0      230 735.0  0 0 0
   3   230.0      41.6
   4   184.0      41.6
   5    90  40  3.0      184 735.0  0 0 0
   6   184.0      41.6
   7   153.3      41.6
   8    90  50  3.0      153 735.0  0 0 0
   9   153.3      41.6
11   5.00
   1   239.1      41.6
   2    90  40  3.0      239 735.0  0 0 0
   3   239.1      41.6
   4   191.3      41.6
   5    90  40  3.0      191 735.0  0 0 0
   6   191.3      41.6
   7   159.4      41.6
   8    90  50  3.0      159 735.0  0 0 0
   9   159.4      41.6
12   4.99
   1   246.7      41.6
   2    90  40  3.0      246 735.0  0 0 0
   3   246.7      41.6
   4   197.3      41.6
   5    90  40  3.0      197 735.0  0 0 0
   6   197.3      41.6
   7   164.4      41.6
   8    90  50  3.0      164 735.0  0 0 0
   9   164.4      41.6
13   4.98
   1   253.1      41.6
   2    90  40  3.0      253 735.0  0 0 0
   3   253.1      41.6
   4   202.5      41.6
   5    90  40  3.0      202 735.0  0 0 0
   6   202.5      41.6
   7   168.7      41.6
   8    90  50  3.0      168 735.0  0 0 0
   9   168.7      41.6
14   4.97
   1   258.6      41.6
   2    90  40  3.0      258 735.0  0 0 0
   3   258.6      41.6
   4   206.9      41.6
   5    90  40  3.0      206 735.0  0 0 0
   6   206.9      41.6
   7   172.4      41.6
   8    90  50  3.0      172 735.0  0 0 0
   9   172.4      41.6
15   4.96
   1   263.3      41.6
   2    90  40  3.0      263 735.0  0 0 0
   3   263.3      41.6
   4   210.7      41.6
   5    90  40  3.0      210 735.0  0 0 0
   6   210.7      41.6
   7   175.6      41.6
   8    90  50  3.0      175 735.0  0 0 0
   9   175.6      41.6
16   4.95
   1   267.5      41.6
```

```
   2    90  40  3.0      267 735.0  0 0 0
   3   267.5      41.6
   4   214.0      41.6
   5    90  40  3.0      213 735.0  0 0 0
   6   214.0      41.6
   7   178.3      41.6
   8    90  50  3.0      178 735.0  0 0 0
   9   178.3      41.6
17   4.94
   1   271.2      41.6
   2    90  40  3.0      271 735.0  0 0 0
   3   271.2      41.6
   4   216.9      41.6
   5    90  40  3.0      216 735.0  0 0 0
   6   216.9      41.6
   7   180.8      41.6
   8    90  50  3.0      180 735.0  0 0 0
   9   180.8      41.6
18   4.93
   1   274.4      41.6
   2    90  40  3.0      274 735.0  0 0 0
   3   274.4      41.6
   4   219.6      41.6
   5    90  40  3.0      219 735.0  0 0 0
   6   219.6      41.6
   7   183.0      41.6
   8    90  50  3.0      182 735.0  0 0 0
   9   183.0      41.6
19   4.92
   1   277.4      41.6
   2    90  40  3.0      277 735.0  0 0 0
   3   277.4      41.6
   4   221.9      41.6
   5    90  40  3.0      221 735.0  0 0 0
   6   221.9      41.6
   7   184.9      41.6
   8    90  50  3.0      184 735.0  0 0 0
   9   184.9      41.6
20   4.91
   1   280.0      41.6
   2    90  40  3.0      280 735.0  0 0 0
   3   280.0      41.6
   4   224.0      41.6
   5    90  40  3.0      224 735.0  0 0 0
   6   224.0      41.6
   7   186.7      41.6
   8    90  50  3.0      186 735.0  0 0 0
   9   186.7      41.6
21   4.90
   1   282.4      41.6
   2    90  40  3.0      282 735.0  0 0 0
   3   282.4      41.6
   4   225.9      41.6
   5    90  40  3.0      225 735.0  0 0 0
   6   225.9      41.6
   7   188.3      41.6
   8    90  50  3.0      188 735.0  0 0 0
   9   188.3      41.6
22   4.89
   1   284.5      41.6
   2    90  40  3.0      284 735.0  0 0 0
   3   284.5      41.6
```

```
   4   227.6      41.6
   5    90  40  3.0      227 735.0  0 0 0
   6   227.6      41.6
   7   189.7      41.6
   8    90  50  3.0      189 735.0  0 0 0
   9   189.7      41.6
23   4.88
   1   286.5      41.6
   2    90  40  3.0      286 735.0  0 0 0
   3   286.5      41.6
   4   229.2      41.6
   5    90  40  3.0      229 735.0  0 0 0
   6   229.2      41.6
   7   191.0      41.6
   8    90  50  3.0      191 735.0  0 0 0
   9   191.0      41.6
24   4.87
   1   288.3      41.6
   2    90  40  3.0      288 735.0  0 0 0
   3   288.3      41.6
   4   230.7      41.6
   5    90  40  3.0      230 735.0  0 0 0
   6   230.7      41.6
   7   192.2      41.6
   8    90  50  3.0      192 735.0  0 0 0
   9   192.2      41.6
```

CAL3QHCR Summary Output:

CAL3QHCR (Dated: 95221)

DATE : 8/10/95
PAGE: 1
TIME : 18: 0:30

JOB: EXAMPLE - TWO WAY INTERSECTION (EX-1) RUN: MAIN ST. AND LOCAL ST. INTERSECTION

==========
General Information
==========

Run start date: 1/ 1/64 Julian: 1
end date: 12/31/64 Julian: 366

A Tier 2 approach was used for input data preparation.

The MODE flag has been set to C for calculating CO averages.

Ambient background concentrations are included in the averages below.

Site & Meteorological Constants

VS = .0 CM/S VD = .0 CM/S Z0 = 175. CM ATIM = 60.

Met. Sfc. Sta. Id & Yr = 94823 64
Upper Air Sta. Id & Yr = 94823 64

Urban mixing heights were processed.

In 1964, Julian day 1 is a Wednesday.

The patterns from the input file
have been assigned as follows:

Pattern # 1 is assigned to Monday.
Pattern # 1 is assigned to Tuesday.
Pattern # 1 is assigned to Wednesday.
Pattern # 1 is assigned to Thursday.
Pattern # 1 is assigned to Friday.
Pattern # 2 is assigned to Saturday.
Pattern # 3 is assigned to Sunday.

Link Data Constants - (Variable data in *.LNK file)

LINK DESCRIPTION	LINK COORDINATES (FT) X1	Y1	X2	Y2	LENGTH (FT)	BRG (DEG)	TYPE	H (FT)	W (FT)	NLANES
1. Main St.NB Appr.	10.0	-1000.0	10.0	.0	1000.	360.	AG	.0	40.0	
2. Main St.NB Queue	10.0	-10.0	10.0	-1000.0	990.	180.	AG	.0	20.0	2
3. Main St.NB Dep.	10.0	.0	10.0	1000.0	1000.	360.	AG	.0	40.0	
4. Main St.SB Appr.	-10.0	1000.0	-10.0	.0	1000.	180.	AG	.0	40.0	
5. Main St.SB Queue	-10.0	10.0	-10.0	1000.0	990.	360.	AG	.0	20.0	2
6. Main St.SB Dep.	-10.0	.0	-10.0	-1000.0	1000.	180.	AG	.0	40.0	
7. Local St.Appr.Lnk.	-1000.0	.0	.0	.0	1000.	90.	AG	.0	40.0	

Link Data Constants - (Variable data in *.LNK file)

LINK DESCRIPTION	LINK COORDINATES (FT) X1	Y1	X2	Y2	LENGTH (FT)	BRG (DEG)	TYPE	H (FT)	W (FT)	NLANES
8. Local St.Queue Lnk.	-20.0	.0	-1000.0	.0	980.	270.	AG	.0	20.0	2
9. Local St.Dep.Lnk.	.0	.0	1000.0	.0	1000.	90.	AG	.0	40.0	

Receptor Data

RECEPTOR	COORDINATES (FT) X	Y	Z
1. REC 1 (SE CORNER)	45.0	-35.0	6.0
2. REC 2 (SW CORNER)	-45.0	-35.0	6.0
3. REC 3 (NW CORNER)	-45.0	35.0	6.0
4. REC 4 (NE CORNER)	45.0	35.0	6.0
5. REC 5 (E MID-MAIN)	45.0	-150.0	6.0
6. REC 6 (W MID-MAIN)	-45.0	-150.0	6.0
7. REC 7 (N MID-LOCAL)	-150.0	35.0	6.0
8. REC 8 (S MID-LOCAL)	-150.0	-35.0	6.0

Model Results

Remarks : In search of the wind direction corresponding
to the maximum concentration, only the first
direction, of the directions with the same maximum
concentrations, is indicated as the maximum.

* MAXIMUM HOURLY CONCENTRATIONS WITH ANY AMBIENT BACKGROUND CONCENTRATIONS (BKG) ADDED (PPM)

	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8
MAX+BKG	13.1	13.4	15.8	11.7	11.3	10.9	13.3	11.1
- BKG	5.0	5.1	5.0	5.0	5.1	5.0	5.1	5.1
MAX	8.1	8.3	10.8	6.7	6.2	5.9	8.2	6.0
WIND DIR	283	16	151	195	315	151	138	63
JULIAN	218	217	258	48	311	258	158	138
HOUR	7	17	8	7	18	8	22	2

THE HIGHEST CONCENTRATION OF 15.78 PPM OCCURRED AT RECEPTOR REC3 .

==========
Output Section
==========

NOTES PERTAINING TO THE REPORT

1. THE HIGHEST AVERAGE IN EACH OF THE FIRST TWO COLUMNS OF EACH TABLE BELOW ARE SUFFIXED BY AN ASTERISK (*).
FOR PM OUTPUT, THERE IS ONLY ONE COLUMN AND ASTERISK FOR THE ANNUAL AVERAGE/PERIOD OF CONCERN TABLE.

2. THE NUMBERS IN PARENTHESES ARE THE JULIAN DAY AND ENDING HOUR FOR THE PRECEDING AVERAGE.

3. THE NUMBER OF CALM HOURS USED IN PRODUCING EACH AVERAGE ARE PREFIXED BY A C.

PRIMARY AVERAGES.

MAXIMUM 8-HOUR RUNNING NONOVERLAPPING AVERAGE CONCENTRATIONS
IN PARTS PER MILLION (PPM),
INCLUDING AMBIENT BACKGROUND CONCENTRATIONS.

Receptor Number	Highest Conc	Highest Ending Day Hr	Highest Calm	Second highest Conc	Second highest Ending Day Hr	Second highest Calm
1	9.42	(54, 4)	C 1	9.38	(311,23)	C 2
2	9.51	(138, 4)	C 0	9.10	(180, 5)	C 1
3	9.61*	(329,14)	C 2	9.53*	(320, 2)	C 2
4	8.59	(299, 3)	C 2	8.39	(363,20)	C 1
5	8.30	(292, 5)	C 1	8.29	(309,20)	C 2
6	8.23	(138, 4)	C 0	8.00	(180, 6)	C 1
7	8.81	(338,14)	C 0	8.68	(103, 3)	C 0
8	8.84	(306, 3)	C 0	8.39	(138, 4)	C 0

FIVE HIGHEST 1-HOUR END-TO-END AVERAGE CONCENTRATIONS IN PARTS PER MILLION
INCLUDING AMBIENT BACKGROUND CONCENTRATIONS.

Rcptr No.	Highest Conc	Highest Ending Day Hr	Highest Calm	Second Highest Conc	Second Highest Ending Day Hr	Second Highest Calm	Third Highest Conc	Third Highest Ending Day Hr	Third Highest Calm	Fourth Highest Conc	Fourth Highest Ending Day Hr	Fourth Highest Calm	Fifth Highest Conc	Fifth Highest Ending Day Hr	Fifth Highest Calm
1	13.07	(218, 7)	C 0	12.40	(201, 1)	C 0	12.06	(237, 6)	C 0	11.88	(299, 3)	C 0	11.38	(92, 8)	C 0
2	13.37	(217,17)	C 0	12.64	(41,14)	C 0	12.58	(138, 3)	C 0	12.48	(50, 8)	C 0	12.27	(180, 4)	C 0
3	15.78*	(258, 8)	C 0	14.89*	(22, 9)	C 0	13.78	(158,22)	C 0	13.47	(128, 7)	C 0	13.17	(300, 7)	C 0
4	11.67	(48, 7)	C 0	11.67	(324,17)	C 0	11.58	(111,18)	C 0	11.57	(43, 7)	C 0	11.07	(314, 7)	C 0
5	11.28	(311,18)	C 0	10.97	(48, 7)	C 0	10.87	(107, 7)	C 0	10.77	(43, 7)	C 0	10.60	(279,10)	C 0
6	10.88	(258, 8)	C 0	9.97	(217,17)	C 0	9.87	(300, 7)	C 0	9.78	(138, 3)	C 0	9.64	(41,14)	C 0
7	13.28	(158,22)	C 0	13.18	(258, 8)	C 0	11.27	(181, 7)	C 0	11.27	(72, 7)	C 0	11.17	(248, 7)	C 0
8	11.09	(138, 2)	C 0	10.89	(137,23)	C 0	10.88	(305,22)	C 0	10.77	(194, 4)	C 0	10.76	(247, 6)	C 0

LINK CONTRIBUTION TABLES

MAXIMUM 8-HOUR AVERAGED LINK CONTRIBUTIONS
IN PARTS PER MILLION (PPM)
INCLUDING AMBIENT BACKGROUND CONCENTRATIONS.

Rcptr No.	Total Conc	Ending Day Hr	Ambient Backgnd	Total Link	Link +1	Link +2	Link +3	Link +4	Link +5	Link +6	Link +7	Link +8	Link +9
1	9.42	(54, 4)	5.09	4.33	.73	1.53	.01	.01	.03	.40	.51	1.03	.07
2	9.51	(138, 4)	5.09	4.43	.15	.16	.58	.52	.86	.30	.44	1.28	.14
3	9.61	(329,14)	5.01	4.60	.40	.58	.27	.38	.80	.35	.35	1.15	.32
4	8.59	(299, 3)	5.09	3.50	.03	.00	.63	.37	.88	.07	.47	.97	.08
5	8.30	(292, 5)	5.09	3.21	.71	1.51	.00	.01	.01	.43	.19	.34	.00
6	8.23	(138, 4)	5.09	3.14	.47	.94	.24	.19	.24	.65	.06	.19	.16
7	8.81	(338,14)	5.01	3.80	.26	.48	.03	.03	.06	.25	.54	2.10	.06
8	8.84	(306, 3)	5.09	3.75	.06	.14	.23	.19	.43	.05	.53	1.98	.16

SECOND HIGHEST 8-HOUR AVERAGED LINK CONTRIBUTIONS
IN PARTS PER MILLION (PPM)
INCLUDING AMBIENT BACKGROUND CONCENTRATIONS.

Rcptr No.	Total Conc	Ending Day Hr	Ambient Backgnd	Total Link	Link +1	Link +2	Link +3	Link +4	Link +5	Link +6	Link +7	Link +8	Link +9
1	9.38	(311,23)	5.09	4.28	.58	1.53	.15	.15	.30	.28	.38	.75	.15
2	9.10	(180, 5)	5.09	4.01	.17	.33	.49	.44	.84	.31	.33	1.04	.06
3	9.53	(320, 2)	5.09	4.43	.32	.53	.42	.52	1.30	.27	.20	.68	.20
4	8.39	(363,20)	5.06	3.33	.03	.01	.69	.40	1.03	.03	.36	.73	.06
5	8.29	(309,20)	5.06	3.23	.63	1.18	.25	.20	.25	.28	.10	.25	.08
6	8.00	(180, 6)	5.08	2.91	.51	1.07	.16	.11	.14	.66	.04	.07	.14
7	8.68	(103, 3)	5.09	3.59	.19	.34	.14	.13	.25	.13	.50	1.65	.28
8	8.39	(138, 4)	5.09	3.30	.01	.01	.29	.25	.24	.01	.55	1.91	.03

MAXIMUM 1-HOUR AVERAGED LINK CONTRIBUTIONS
IN PARTS PER MILLION (PPM)
INCLUDING AMBIENT BACKGROUND CONCENTRATIONS.

Rcptr No.	Total Conc	Ending Day Hr	Ambient Backgnd	Total Link	Link +1	Link +2	Link +3	Link +4	Link +5	Link +6	Link +7	Link +8	Link +9
1	13.07	(218, 7)	4.97	8.10	1.20	2.20	.10	.10	.10	.70	1.10	2.40	.20
2	13.37	(217,17)	5.07	8.30	.00	.00	1.20	1.30	2.10	.20	.80	2.70	.00
3	15.78	(258, 8)	4.98	10.80	1.50	3.00	.10	.50	.30	1.30	1.00	3.00	.10
4	11.67	(48, 7)	4.97	6.70	1.70	3.00	.20	.00	.00	1.00	.00	.00	.80
5	11.28	(311,18)	5.08	6.20	1.30	2.70	.00	.00	.10	.80	.30	1.00	.00
6	10.88	(258, 8)	4.98	5.90	1.60	2.50	.00	.00	.00	1.80	.00	.00	.00
7	13.28	(158,22)	5.08	8.20	.60	1.10	.00	.00	.00	.60	1.10	4.80	.00

LINK CONTRIBUTION TABLES

MAXIMUM 1-HOUR AVERAGED LINK CONTRIBUTIONS
IN PARTS PER MILLION (PPM)
INCLUDING AMBIENT BACKGROUND CONCENTRATIONS.

Rcptr No.	Total Conc	Ending Day Hr	Ambient Backgnd	Total Link	Link +1	Link +2	Link +3	Link +4	Link +5	Link +6	Link +7	Link +8	Link +9
8	11.09	(138, 2)	5.09	6.00	.10	.10	.40	.30	.70	.10	.90	3.20	.20

SECOND HIGHEST 1-HOUR AVERAGED LINK CONTRIBUTIONS
IN PARTS PER MILLION (PPM)
INCLUDING AMBIENT BACKGROUND CONCENTRATIONS.

Rcptr No.	Total Conc	Ending Day Hr	Ambient Backgnd	Total Link	Link +1	Link +2	Link +3	Link +4	Link +5	Link +6	Link +7	Link +8	Link +9
1	12.40	(201, 1)	5.10	7.30	1.00	2.00	.10	.20	.30	.50	.80	2.10	.30
2	12.64	(41,14)	5.04	7.60	.00	.00	1.10	1.10	2.00	.20	.60	2.60	.00
3	14.89	(22, 9)	4.99	9.90	1.50	1.70	.00	.10	.00	1.60	.90	4.10	.00
4	11.67	(324,17)	5.07	6.60	.00	.00	1.20	.70	1.60	.00	1.00	2.00	.10
5	10.97	(48, 7)	4.97	6.00	1.90	3.10	.00	.00	.00	1.00	.00	.00	.00
6	9.97	(217,17)	5.07	4.90	.50	.90	.70	.50	.70	.90	.20	.40	.10
7	13.18	(258, 8)	4.98	8.20	.80	1.00	.00	.00	.00	.70	1.20	4.50	.00
8	10.89	(137,23)	5.09	5.80	.00	.00	.40	.40	.80	.00	.80	3.40	.00

CALM DURATION FREQUENCY

Hours of Consecutive Calm Winds	Frequency of Occurrence	(Julian day/hour ending) of Significant Occurrences
1	188	(7,13)(11, 5)(11,13)(21,24)(23,19)(29, 5)(31, 3)(31, 6)(34,24)(35, 6) (40,18)(42,23)(43, 5)(46, 2)(46,14)(48, 5)(54, 2)(54, 6)(56, 2)(59, 8) (62, 6)(62,23)(71,19)(72,23)(73, 4)(73, 8)(76, 8)(83, 4)(84,23)(85, 1) (105, 7)(110,18)(111,20)(125, 5)(126, 2)(126, 4)(132,21)(136, 8)(137, 4)(137, 6) (143,21)(144, 1)(154, 4)(154, 6)(156, 6)(158, 1)(160,24)(164, 1)(169, 6)(174, 4) (174,20)(175,21)(179, 6)(180, 5)(180,24)(182, 3)(182, 6)(184, 1)(188, 7)(188,24) (190, 2)(190,24)(191, 4)(191, 6)(192, 1)(192, 6)(193, 3)(193,23)(195,24)(198, 8) (199,20)(201,21)(201,24)(202, 2)(202, 5)(202,23)(203, 6)(204, 2)(204, 5)(204, 7) (205,22)(205,24)(206, 2)(206, 4)(210, 5)(212, 2)(214, 9)(214,21)(214,23)(215, 2) (215, 4)(215,21)(228,23)(230, 3)(233, 4)(238, 5)(239,22)(240, 2)(242, 3)(242,21) (242,23)(243, 1)(243,23)(244, 2)(244, 5)(246,22)(246,24)(247, 7)(248, 5)(250,22) (253,21)(255, 1)(257,24)(258, 3)(259,24)(260,21)(261, 1)(261, 6)(261, 8)(261,21) (261,24)(262, 3)(262, 7)(263, 1)(263, 3)(266, 4)(267, 3)(270, 1)(270, 5)(271,21) (273,14)(273,20)(276, 8)(277, 1)(280,23)(285, 8)(285,19)(288,19)(288,22)(289, 7) (289,18)(289,20)(289,24)(291,18)(292, 4)(292, 8)(294, 6)(297,23)(299, 4)(300, 6) (300, 8)(301, 4)(301, 7)(301,19)(302, 5)(306, 7)(306,15)(306,20)(307, 2)(308, 7) (308,22)(309,17)(311,19)(311,21)(312,18)(312,21)(314, 5)(315, 1)(319,11)(319,21) (320,20)(324,15)(329, 4)(329, 6)(336, 8)(338,21)(338,23)(339,11)(344,19)(344,21) (346, 8)(347, 5)(347,16)(356,19)(356,21)(357, 1)(357,23)(363,19)
2	55	(23,24)(24, 3)(29, 8)(36,18)(43, 3)(46, 6)(48,22)(49, 3)(102, 3)(111,24) (125,23)(136, 6)(139, 2)(139, 6)(156, 3)(157,21)(174,23)(193, 1)(196, 4)(198, 6) (198,23)(200,23)(203, 2)(203,22)(205, 1)(205, 5)(205, 8)(208,23)(222,24)(242, 6) (247, 3)(249,24)(250, 3)(250, 6)(250, 9)(261, 4)(262,20)(262,23)(272, 1)(279, 5) (281, 7)(286, 7)(288, 8)(289, 1)(299, 2)(301,23)(302, 2)(302,23)(306,23)(328,22) (329, 9)(344,24)(355,24)(356, 8)(361,10)
3	27	(18,23)(45,24)(49, 7)(53, 7)(102, 7)(107, 2)(144, 6)(160, 7)(180,22)(183, 2) (193, 7)(194, 3)(199,24)(202,21)(209, 4)(218, 3)(228, 7)(230, 7)(243, 6)(280, 5) (281, 3)(289, 5)(301, 2)(312, 7)(320, 4)(329,19)(356, 4)
4	12	(87,24)(170, 2)(198, 3)(209,24)(233, 1)(248, 1)(254,23)(269,23)(280, 1)(300,22) (312, 3)(320, 9)
5	12	(142,24)(143, 6)(147, 2)(169, 4)(178, 7)(188, 4)(189, 6)(228, 3)(254, 6)(286,23) (295, 1)(307, 8)
6	6	(59, 6)(199, 6)(238, 2)(259, 3)(288, 5)(298, 6)
7	3	(229, 7)(286, 3)(310, 2)
9	2	(220, 6)(252, 5)
10	3	(253, 7)(305, 9)(309, 9)

Program terminated normally

3.4.4 Discussion of CO Test Case Results

Presented below is a summary table of the CAL3QHCR CO Tier I and II results. The results do not include ambient background concentrations. The Tier I results were produced using constant traffic volume data while the Tier II results were produced using varying traffic volume data based on Figure 1. The emission factors for both test cases are from the Mobile 4.1 emissions model for calendar year 1990 with no Inspection/Maintenance or Anti-tampering Controls.

CAL3QHCR Tier I (TI) vs Tier II (TII) CO Results
(Averages in PPM)

	CAL3QHCR							
	8-Hour Running				1-Hour Block			
	Maximum		High 2nd High		Maximum		High 2nd High	
Rcp	Averages		NonOverlapping		Averages		Averages	
No.	TI	TII	TI	TII	TI	TII	TI	TII
1	5.2	4.3	5.0	4.3	7.6	8.1	7.6	7.3
2	5.0	4.4	4.9	4.0	8.0	8.3	7.9	7.6
3	6.5*	4.6*	5.9*	4.4*	10.7*	10.8*	10.5*	9.9*
4	4.5	3.5	4.4	3.3	6.6	6.7	6.6	6.6
5	4.7	3.2	4.2	3.2	9.7	6.2	6.8	6.0
6	3.8	3.1	3.5	2.9	5.6	5.9	5.3	4.9
7	5.1	3.8	5.1	3.6	8.6	8.2	8.5	8.2
8	4.5	3.8	4.1	3.3	6.3	6.0	5.1	5.8

* represents the highest average in the respective column

Note that the higher maximum 1-hour average for Tier II is due to some individual hours having higher traffic volumes in Tier II than the constant traffic volume used in Tier I. The Tier II maximum 8-hour average is 71% of the Tier I maximum 8-hour average. The results of the second high running nonoverlapping 8-hour averages shows the maximum Tier II average at 75% of the maximum Tier I average. If background had been included, the Tier II second high 8-hour maximum result would be 88% of that obtained using Tier I.

3.4.5 PM-10 Test Case 1 - Tier I Example

Presented below is an example of a PM-10 Tier I test case for intersection modeling. The same MET and some of the ETS data from the previous Tier I CO test case were used in constructing the input for this example. A draft copy of the PART5 emission factor model was used in determining the PM-10 emission factors (See Reference 11). Since PART5 does not contain idle emission factors and the majority of paved road PM-10 emissions are from reintrained road dust and not tailpipe idle emissions, queue links were not utilized in this example. The PART5 emission factor utilized was 2.96 grams per vehicle-mile, which is representative of a vehicle fleet with an average weight of 3 tons and a silt loading of 0.5 grams per meter squared.

PM-10 Input:

```
'EXAMPLE OF PM-10 ROADWAY HOT SPOT' 60. 175. 0. 0. 8 0.3048 1
 1 1 64  12 31 64
 94823 64  94823 64
 1 1 'U'
'REC 1 (SE MIDPOINT)'        45.      -35.      6.0
'REC 2 (SW MIDPOINT)'       -45.      -35.      6.0
'REC 3 (NW MIDPOINT)'       -45.       35.      6.0
'REC 4 (NE MIDPOINT)'        45.       35.      6.0
'REC 5 (E MID-MAIN) '        45.     -150.      6.0
'REC 6 (W MID-MAIN) '       -45.     -150.      6.0
'REC 7 (N FAR-MAIN) '      -150.       35.      6.0
'REC 8 (S FAR-MAIN) '      -150.      -35.      6.0
1 'p'
1 1 1 1 1 1 1
'MAIN ST. BETWEEN DISTANT INTERSECTIONS'       3
   1  1
'Main St.NB Appr/Dep' 'AG'    10. -1000.    10.  1000.    0.  40.
   2  1
'Main St.SB Appr/Dep' 'AG'   -10.  1000.   -10. -1000.    0.  40.
   3  1
'Local St.Appr./Dep ' 'AG' -1000.     0.  1000.     0.    0.  40.
  1  50.0
    1  1500.0    2.96
    2  1200.0    2.96
    3  1000.0    2.96
```

The PM summary output file has the same basic format as a CO summary output file. The averaging periods are for 24-hour and annual block averages instead of for 8-hour running and 1-hour block averages. The concentration results are expressed in units of micrograms per cubic meter (ug/m**3).

In the Maximum 24-hour Average Concentration section of the following output file, several of the average ambient background concentration values are listed as 47.22 even though a constant

background value of 50 was input to the model. This occurs when the number of non calm winds during the 24-hour averaging period is less than 18 hours. According to guidance (see Reference 4), 18 hours (75% of 24 hours) or the number of non calm hours, whichever is greater, is used as the divisor to derive the 24 hour average concentration. There were episodes of only 17 non calm hours. For these episodes, the average ambient background concentration was derived as: ((17 hours * 50.0 background)/ 18 hours = 47.22). The following is the summary output file for the above input file:

```
                                                CAL3QHCR (Dated: 95221)

DATE :  8/10/95                                                                 PAGE:  1
TIME : 17:49:31

JOB: EXAMPLE OF PM-10 ROADWAY HOT SPOT                  RUN: MAIN ST. BETWEEN DISTANT INTERSECTIONS

  ==================
  General Information
  ==================

    Run start date:  1/ 1/64    Julian:   1
          end date: 12/31/64    Julian: 366

    A Tier 1 approach was used for input data preparation.

    The MODE flag has been set to p for calculating PM averages.

    Ambient background concentrations are included in the averages below.


  Site & Meteorological Constants
  -------------------------------
    VS =    .0 CM/S       VD =    .0 CM/S       Z0 = 175. CM     ATIM =  60.

      Met. Sfc. Sta. Id & Yr = 94823    64
      Upper Air Sta. Id & Yr = 94823    64

    Urban mixing heights were processed.

    In 1964, Julian day 1 is a Wednesday.


  Link Data Constants - (Variable data in *.LNK file)
  -------------------

   LINK DESCRIPTION     *         LINK COORDINATES (FT)          *   LENGTH   BRG  TYPE    H     W  NLANES
                        *     X1        Y1        X2        Y2   *    (FT)   (DEG)       (FT)  (FT)
------------------------*----------------------------------------*-----------------------------------------
 1. Main St.NB Appr/Dep *     10.0   -1000.0      10.0    1000.0 *    2000.   360.  AG     .0  40.0
 2. Main St.SB Appr/Dep *    -10.0    1000.0     -10.0   -1000.0 *    2000.   180.  AG     .0  40.0
 3. Local St.Appr./Dep  *  -1000.0        .0    1000.0        .0 *    2000.    90.  AG     .0  40.0

  Receptor Data
  -------------

                             *          COORDINATES (FT)
        RECEPTOR             *         X          Y          Z
      -----------------------*---------------------------------
        1. REC 1 (SE MIDPOINT)  *       45.0      -35.0        6.0
        2. REC 2 (SW MIDPOINT)  *      -45.0      -35.0        6.0
        3. REC 3 (NW MIDPOINT)  *      -45.0       35.0        6.0
        4. REC 4 (NE MIDPOINT)  *       45.0       35.0        6.0
        5. REC 5 (E MID-MAIN)   *       45.0     -150.0        6.0
```

Receptor Data

RECEPTOR	COORDINATES (FT) X	Y	Z
6. REC 6 (W MID-MAIN)	-45.0	-150.0	6.0
7. REC 7 (N FAR-MAIN)	-150.0	35.0	6.0
8. REC 8 (S FAR-MAIN)	-150.0	-35.0	6.0

Model Results

Remarks : In search of the wind direction corresponding to the maximum concentration, only the first direction, of the directions with the same maximum concentrations, is indicated as the maximum.

* MAXIMUM HOURLY CONCENTRATIONS WITH ANY AMBIENT BACKGROUND CONCENTRATIONS (BKG) ADDED
(MICROGRAMS/M**3)

	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8
MAX+BKG	413.0	381.9	424.8	392.0	356.4	330.8	273.6	269.7
- BKG	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
MAX	363.0	331.9	374.8	342.0	306.4	280.8	223.6	219.7
WIND DIR	328	80	168	228	328	168	107	80
JULIAN	154	306	22	159	154	22	154	306
HOUR	1	24	9	20	1	9	2	24

THE HIGHEST CONCENTRATION OF 424.80 UG/M**3 OCCURRED AT RECEPTOR REC3 .

JOB: EXAMPLE OF PM-10 ROADWAY HOT SPOT RUN: MAIN ST. BETWEEN DISTANT INTERSECTIONS

==========
Output Section
==========

NOTES PERTAINING TO THE REPORT

1. THE HIGHEST AVERAGE IN EACH OF THE FIRST TWO COLUMNS OF EACH TABLE BELOW ARE SUFFIXED BY AN ASTERISK (*).
FOR PM OUTPUT, THERE IS ONLY ONE COLUMN AND ASTERISK FOR THE ANNUAL AVERAGE/PERIOD OF CONCERN TABLE.

2. THE NUMBERS IN PARENTHESES ARE THE JULIAN DAY AND ENDING HOUR FOR THE PRECEDING AVERAGE.

3. THE NUMBER OF CALM HOURS USED IN PRODUCING EACH AVERAGE ARE PREFIXED BY A C.

PRIMARY AND SECONDARY AVERAGES.

FIVE HIGHEST 24-HOUR END-TO-END AVERAGE CONCENTRATIONS IN MICROGRAMS/M**3
INCLUDING AMBIENT BACKGROUND CONCENTRATIONS.

Rcptr	Highest Ending			Second Highest Ending			Third Highest Ending			Fourth Highest Ending			Fifth Highest Ending		
No.	Conc	Day Hr	Calm	Conc	Day Hr	Calm	Conc	Day Hr	Calm	Conc	Day Hr	Calm	Conc	Day Hr	Calm
1	196.38	(177,24)	C 0	178.59	(232,24)	C 3	177.51	(182,24)	C 3	177.39	(53,24)	C 3	176.60	(34,24)	C 1
2	200.57	(306,24)	C 5	187.68	(338,24)	C 2	186.04	(251,24)	C 4	185.94	(110,24)	C 1	185.09	(190,24)	C 2
3	227.72*	(329,24)	C 7	210.02*	(338,24)	C 2	199.89	(306,24)	C 5	198.02	(345,24)	C 0	193.29	(31,24)	C 2
4	196.67	(347,24)	C 2	193.69	(182,24)	C 3	193.37	(314,24)	C 1	183.94	(201,24)	C 2	176.70	(181,24)	C 0
5	169.35	(177,24)	C 0	162.26	(182,24)	C 3	158.53	(347,24)	C 2	156.34	(314,24)	C 1	155.45	(232,24)	C 3
6	172.72	(338,24)	C 2	169.21	(306,24)	C 5	168.78	(110,24)	C 1	166.03	(329,24)	C 7	159.74	(251,24)	C 4
7	156.59	(329,24)	C 7	142.61	(338,24)	C 2	138.97	(266,24)	C 1	138.35	(345,24)	C 0	137.26	(306,24)	C 5
8	138.01	(306,24)	C 5	128.90	(251,24)	C 4	128.86	(190,24)	C 2	126.20	(246,24)	C 2	125.38	(49,24)	C 5

THE HIGHEST ANNUAL AVERAGE CONCENTRATIONS
IN MICROGRAMS/M**3
INCLUDING AMBIENT BACKGROUND CONCENTRATIONS.

Receptor Number	Maximum Conc	Ending Day Hr	Calm
1	112.22	(366,24)	C 592
2	104.33	(366,24)	C 592
3	109.10	(366,24)	C 592
4	117.00*	(366,24)	C 592
5	100.80	(366,24)	C 592
6	92.91	(366,24)	C 592
7	84.87	(366,24)	C 592
8	80.09	(366,24)	C 592

LINK CONTRIBUTION TABLES

MAXIMUM 24-HOUR AVERAGED LINK CONTRIBUTIONS
IN MICROGRAMS/M**3
INCLUDING AMBIENT BACKGROUND CONCENTRATIONS.

Rcptr No.	Total Conc	Ending Day Hr	Ambient Backgnd	Total Link	Link +1	Link +2	Link +3
1	196.38	(177,24)	50.00	146.38	66.84	38.97	40.56
2	200.57	(306,24)	50.00	150.57	53.77	56.47	40.33
3	227.72	(329,24)	47.22	180.49	56.81	62.24	61.44
4	196.67	(347,24)	50.00	146.67	70.00	38.37	38.30
5	169.35	(177,24)	50.00	119.35	66.83	38.95	13.57
6	172.72	(338,24)	50.00	122.72	56.79	60.88	5.06
7	156.59	(329,24)	47.22	109.37	25.31	22.44	61.62
8	138.01	(306,24)	50.00	88.01	25.07	22.13	40.81

SECOND HIGHEST 24-HOUR AVERAGED LINK CONTRIBUTIONS
IN MICROGRAMS/M**3
INCLUDING AMBIENT BACKGROUND CONCENTRATIONS.

Rcptr No.	Total Conc	Ending Day Hr	Ambient Backgnd	Total Link	Link +1	Link +2	Link +3
1	178.59	(232,24)	50.00	128.59	59.52	34.55	34.51
2	187.68	(338,24)	50.00	137.68	56.86	60.93	19.88
3	210.02	(338,24)	50.00	160.02	56.90	60.96	42.15
4	193.69	(182,24)	50.00	143.69	67.34	40.04	36.31
5	162.26	(182,24)	50.00	112.26	67.19	39.91	5.16
6	169.21	(306,24)	50.00	119.21	53.72	56.43	9.05
7	142.61	(338,24)	50.00	92.61	26.71	23.60	42.31
8	128.90	(251,24)	50.00	78.90	21.37	18.92	38.60

MAXIMUM ANNUAL AVERAGED LINK CONTRIBUTIONS
IN MICROGRAMS/M**3
INCLUDING AMBIENT BACKGROUND CONCENTRATIONS.

Rcptr No.	Total Conc	Ending Day Hr	Ambient Backgnd	Total Link	Link +1	Link +2	Link +3
1	112.22	(366,24)	50.00	62.22	29.29	16.72	16.21
2	104.33	(366,24)	50.00	54.33	17.86	20.27	16.20
3	109.10	(366,24)	50.00	59.10	17.88	20.28	20.95
4	117.00	(366,24)	50.00	67.00	29.30	16.73	20.97
5	100.80	(366,24)	50.00	50.80	29.24	16.68	4.88
6	92.91	(366,24)	50.00	42.91	17.82	20.23	4.87
7	84.87	(366,24)	50.00	34.87	7.34	6.62	20.91

LINK CONTRIBUTION TABLES

MAXIMUM ANNUAL AVERAGED LINK CONTRIBUTIONS
IN MICROGRAMS/M**3
INCLUDING AMBIENT BACKGROUND CONCENTRATIONS.

Rcptr No.	Total Conc	Ending Day Hr	Ambient Backgnd	Total Link	Link +1	Link +2	Link +3
8	80.09	(366,24)	50.00	30.09	7.33	6.60	16.16

CALM DURATION FREQUENCY

Hours of Consecutive Calm Winds	Frequency of Occurrence	(Julian day/hour ending) of Significant Occurrences
1	188	(7,13)(11, 5)(11,13)(21,24)(23,19)(29, 5)(31, 3)(31, 6)(34,24)(35, 6) (40,18)(42,23)(43, 5)(46, 2)(46,14)(48, 5)(54, 2)(54, 6)(56, 2)(59, 8) (62, 6)(62,23)(71,19)(72,23)(73, 4)(73, 8)(76, 8)(83, 4)(84,23)(85, 1) (105, 7)(110,18)(111,20)(125, 5)(126, 2)(126, 4)(132,21)(136, 8)(137, 4)(137, 6) (143,21)(144, 1)(154, 4)(154, 6)(156, 6)(158, 1)(160,24)(164, 1)(169, 6)(174, 4) (174,20)(175,21)(179, 6)(180, 5)(180,24)(182, 3)(182, 6)(184, 1)(188, 7)(188,24) (190, 2)(190,24)(191, 4)(191, 6)(192, 1)(192, 6)(193, 3)(193,23)(195,24)(198, 8) (199,20)(201,21)(201,24)(202, 2)(202, 5)(202,23)(203, 6)(204, 2)(204, 5)(204, 7) (205,22)(205,24)(206, 2)(206, 4)(210, 5)(212, 2)(214, 9)(214,21)(214,23)(215, 2) (215, 4)(215,21)(228,23)(230, 3)(233, 4)(238, 5)(239,22)(240, 2)(242, 3)(242,21) (242,23)(243, 1)(243,23)(244, 2)(244, 5)(246,22)(246,24)(247, 7)(248, 5)(250,22) (253,21)(255, 1)(257,24)(258, 3)(259,24)(260,21)(261, 1)(261, 6)(261, 8)(261,21) (261,24)(262, 3)(262, 7)(263, 1)(263, 3)(266, 4)(267, 3)(270, 1)(270, 5)(271,21) (273,14)(273,20)(276, 8)(277, 1)(280,23)(285, 8)(285,19)(288,19)(288,22)(289, 7) (289,18)(289,20)(289,24)(291,18)(292, 4)(292, 8)(294, 6)(297,23)(299, 4)(300, 6) (300, 8)(301, 4)(301, 7)(301,19)(302, 5)(306, 7)(306,15)(306,20)(307, 2)(308, 7) (308,22)(309,17)(311,19)(311,21)(312,18)(312,21)(314, 5)(315, 1)(319,11)(319,21) (320,20)(324,15)(329, 4)(329, 6)(336, 8)(338,21)(338,23)(339,11)(344,19)(344,21) (346, 8)(347, 5)(347,16)(356,19)(356,21)(357, 1)(357,23)(363,19)
2	55	(23,24)(24, 3)(29, 8)(36,18)(43, 3)(46, 6)(48,22)(49, 3)(102, 3)(111,24) (125,23)(136, 6)(139, 2)(139, 6)(156, 3)(157,21)(174,23)(193, 1)(196, 4)(198, 6) (198,23)(200,23)(203, 2)(203,22)(205, 1)(205, 5)(205, 8)(208,23)(222,24)(242, 6) (247, 3)(249,24)(250, 3)(250, 6)(250, 9)(261, 4)(262,20)(262,23)(272, 1)(279, 5) (281, 7)(286, 7)(288, 8)(289, 1)(299, 2)(301,23)(302, 2)(302,23)(306,23)(328,22) (329, 9)(344,24)(355,24)(356, 8)(361,10)
3	27	(18,23)(45,24)(49, 7)(53, 7)(102, 7)(107, 2)(144, 6)(160, 7)(180,22)(183, 2) (193, 7)(194, 3)(199,24)(202,21)(209, 4)(218, 3)(228, 7)(230, 7)(243, 6)(280, 5) (281, 3)(289, 5)(301, 2)(312, 7)(320, 4)(329,19)(356, 4)
4	12	(87,24)(170, 2)(198, 3)(209,24)(233, 1)(248, 1)(254,23)(269,23)(280, 1)(300,22) (312, 3)(320, 9)
5	12	(142,24)(143, 6)(147, 2)(169, 4)(178, 7)(188, 4)(189, 6)(228, 3)(254, 6)(286,23) (295, 1)(307, 8)
6	6	(59, 6)(199, 6)(238, 2)(259, 3)(288, 5)(298, 6)
7	3	(229, 7)(286, 3)(310, 2)
9	2	(220, 6)(252, 5)
10	3	(253, 7)(305, 9)(309, 9)

Program terminated normally

3.4.6 PM-10 Test Case 2 - Tier II Example

The PM-10 Tier II test case example uses the same inputs as the Tier I PM-10 test case except the traffic volumes have been varied on an hourly basis as they were for the CO Tier II test case. Background was held constant at 50 micrograms per meter cubed.

PM-10 Tier II Input File:

```
'EXAMPLE - TWO WAY INTERSECTION (EX-1)'  60. 175.  0. 0.  8  0.3048 1
 1 1 64 12 31 64
 94823  64  94823 64
 1 1 'U'
'REC 1 (SE CORNER)  '        45.      -35.      6.0
'REC 2 (SW CORNER)  '       -45.      -35.      6.0
'REC 3 (NW CORNER)  '       -45.       35.      6.0
'REC 4 (NE CORNER)  '        45.       35.      6.0
'REC 5 (E MID-MAIN) '        45.     -150.      6.0
'REC 6 (W MID-MAIN) '       -45.     -150.      6.0
'REC 7 (N MID-LOCAL)'      -150.       35.      6.0
'REC 8 (S MID-LOCAL)'      -150.      -35.      6.0
2 'p'
1 1 1 1 1 2 3
'MAIN ST. AND LOCAL ST. INTERSECTION'       3
   1  1
'Main St.NB Appr/Dep' 'AG'    10. -1000.    10.  1000.    0.  40.
   2  1
'Main St.SB Appr/Dep' 'AG'   -10.  1000.   -10. -1000.    0.  40.
   3  1
'Local St.Appr.Dep. ' 'AG' -1000.     0.  1000.     0.    0.  40.
 1  50.0
   1   300.0      2.96
   2   240.0      2.96
   3   200.0      2.96
 2  50.00
   1   270.0      2.96
   2   216.0      2.96
   3   180.0      2.96
 3  50.00
   1   225.0      2.96
   2   180.0      2.96
   3   150.0      2.96
 4  50.00
   1   240.0      2.96
   2   192.0      2.96
   3   160.0      2.96
 5  50.00
   1   450.0      2.96
   2   360.0      2.96
   3   300.0      2.96
 6  50.00
   1  1350.0      2.96
```

```
   2  1080.0      2.96
   3   900.0      2.96
 7  50.00
   1  1650.0      2.96
   2  1320.0      2.96
   3  1100.0      2.96
 8  50.00
   1  1575.0      2.96
   2  1260.0      2.96
   3  1050.0      2.96
 9  50.00
   1  1350.0      2.96
   2  1080.0      2.96
   3   900.0      2.96
10  50.00
   1  1275.0      2.96
   2  1020.0      2.96
   3   850.0      2.96
11  50.00
   1  1125.0      2.96
   2   900.0      2.96
   3   750.0      2.96
12  50.00
   1  1200.0      2.96
   2   960.0      2.96
   3   800.0      2.96
13  50.00
   1  1200.0      2.96
   2   960.0      2.96
   3   800.0      2.96
14  50.00
   1  1350.0      2.96
   2  1080.0      2.96
   3   900.0      2.96
15  50.00
   1  1500.0      2.96
   2  1200.0      2.96
   3  1000.0      2.96
16  50.00
   1  1650.0      2.96
   2  1320.0      2.96
   3  1100.0      2.96
17  50.00
   1  1575.0      2.96
   2  1260.0      2.96
   3  1050.0      2.96
18  50.00
   1  1500.0      2.96
   2  1200.0      2.96
   3  1000.0      2.96
19  50.00
   1  1200.0      2.96
```

```
    2   960.0       2.96
    3   800.0       2.96
20   50.00
    1   900.0       2.96
    2   720.0       2.96
    3   600.0       2.96
21   50.00
    1   825.0       2.96
    2   660.0       2.96
    3   550.0       2.96
22   50.00
    1   750.0       2.96
    2   600.0       2.96
    3   500.0       2.96
23   50.00
    1   675.0       2.96
    2   540.0       2.96
    3   450.0       2.96
24   50.00
    1   450.0       2.96
    2   360.0       2.96
    3   300.0       2.96
 1   50.00
    1   350.0       2.96
    2   280.0       2.96
    3   233.3       2.96
 2   50.00
    1   400.0       2.96
    2   320.0       2.96
    3   266.7       2.96
 3   50.00
    1   450.0       2.96
    2   360.0       2.96
    3   300.0       2.96
 4   50.00
    1   500.0       2.96
    2   400.0       2.96
    3   333.3       2.96
 5   50.00
    1   550.0       2.96
    2   440.0       2.96
    3   366.7       2.96
 6   50.00
    1   600.0       2.96
    2   480.0       2.96
    3   400.0       2.96
 7   50.00
    1   650.0       2.96
    2   520.0       2.96
    3   433.3       2.96
 8   50.00
    1   700.0       2.96
```

```
   2   560.0      2.96
   3   466.7      2.96
 9  50.00
   1   750.0      2.96
   2   600.0      2.96
   3   500.0      2.96
10  50.00
   1   800.0      2.96
   2   640.0      2.96
   3   533.3      2.96
11  50.00
   1   850.0      2.96
   2   680.0      2.96
   3   566.7      2.96
12  50.00
   1   900.0      2.96
   2   720.0      2.96
   3   600.0      2.96
13  50.00
   1   950.0      2.96
   2   760.0      2.96
   3   633.3      2.96
14  50.00
   1  1000.0      2.96
   2   800.0      2.96
   3   666.7      2.96
15  50.00
   1  1050.0      2.96
   2   840.0      2.96
   3   700.0      2.96
16  50.00
   1  1100.0      2.96
   2   880.0      2.96
   3   733.3      2.96
17  50.00
   1  1150.0      2.96
   2   920.0      2.96
   3   766.7      2.96
18  50.00
   1  1200.0      2.96
   2   960.0      2.96
   3   800.0      2.96
19  50.00
   1  1250.0      2.96
   2  1000.0      2.96
   3   833.3      2.96
20  50.00
   1  1300.0      2.96
   2  1040.0      2.96
   3   866.7      2.96
21  50.00
   1  1350.0      2.96
```

```
   2  1080.0      2.96
   3   900.0      2.96
22  50.00
   1  1400.0      2.96
   2  1120.0      2.96
   3   933.3      2.96
23  50.00
   1  1450.0      2.96
   2  1160.0      2.96
   3   966.7      2.96
24  50.00
   1  1500.0      2.96
   2  1200.0      2.96
   3  1000.0      2.96
 1  50.00
   1  1500.0      2.96
   2  1200.0      2.96
   3  1000.0      2.96
 2  50.00
   1  1500.0      2.96
   2  1200.0      2.96
   3  1000.0      2.96
 3  50.00
   1  1481.3      2.96
   2  1185.0      2.96
   3   987.5      2.96
 4  50.00
   1  1312.5      2.96
   2  1050.0      2.96
   3   875.0      2.96
 5  50.00
   1  1143.8      2.96
   2   915.0      2.96
   3   762.5      2.96
 6  50.00
   1   975.0      2.96
   2   780.0      2.96
   3   650.0      2.96
 7  50.00
   1   806.3      2.96
   2   645.0      2.96
   3   537.5      2.96
 8  50.00
   1   637.5      2.96
   2   510.0      2.96
   3   425.0      2.96
 9  50.00
   1   468.8      2.96
   2   375.0      2.96
   3   312.5      2.96
10  50.00
   1   230.0      2.96
```

```
    2   184.0       2.96
    3   153.3       2.96
11   50.00
    1   239.1       2.96
    2   191.3       2.96
    3   159.4       2.96
12   50.00
    1   246.7       2.96
    2   197.3       2.96
    3   164.4       2.96
13   50.00
    1   253.1       2.96
    2   202.5       2.96
    3   168.7       2.96
14   50.00
    1   258.6       2.96
    2   206.9       2.96
    3   172.4       2.96
15   50.00
    1   263.3       2.96
    2   210.7       2.96
    3   175.6       2.96
16   50.00
    1   267.5       2.96
    2   214.0       2.96
    3   178.3       2.96
17   50.00
    1   271.2       2.96
    2   216.9       2.96
    3   180.8       2.96
18   50.00
    1   274.4       2.96
    2   219.6       2.96
    3   183.0       2.96
19   50.00
    1   277.4       2.96
    2   221.9       2.96
    3   184.9       2.96
20   50.00
    1   280.0       2.96
    2   224.0       2.96
    3   186.7       2.96
21   50.00
    1   282.4       2.96
    2   225.9       2.96
    3   188.3       2.96
22   50.00
    1   284.5       2.96
    2   227.6       2.96
    3   189.7       2.96
23   50.00
    1   286.5       2.96
```

```
    2   229.2       2.96
    3   191.0       2.96
24   50.00
    1   288.3       2.96
    2   230.7       2.96
    3   192.2       2.96
```

The following is the CAL3QHCR PM-10 Tier II output file:

CAL3QHCR (Dated: 95221)

DATE : 8/10/95 PAGE: 1
TIME : 18:15:32

JOB: EXAMPLE - TWO WAY INTERSECTION (EX-1) RUN: MAIN ST. AND LOCAL ST. INTERSECTION

==========
General Information
==========

Run start date: 1/ 1/64 Julian: 1
end date: 12/31/64 Julian: 366

A Tier 2 approach was used for input data preparation.

The MODE flag has been set to p for calculating PM averages.

Ambient background concentrations are included in the averages below.

Site & Meteorological Constants

VS = .0 CM/S VD = .0 CM/S Z0 = 175. CM ATIM = 60.

Met. Sfc. Sta. Id & Yr = 94823 64
Upper Air Sta. Id & Yr = 94823 64

Urban mixing heights were processed.

In 1964, Julian day 1 is a Wednesday.

The patterns from the input file
have been assigned as follows:

Pattern # 1 is assigned to Monday.
Pattern # 1 is assigned to Tuesday.
Pattern # 1 is assigned to Wednesday.
Pattern # 1 is assigned to Thursday.
Pattern # 1 is assigned to Friday.
Pattern # 2 is assigned to Saturday.
Pattern # 3 is assigned to Sunday.

Link Data Constants - (Variable data in *.LNK file)

LINK DESCRIPTION	LINK COORDINATES (FT) X1	Y1	X2	Y2	LENGTH (FT)	BRG (DEG)	TYPE	H (FT)	W (FT)	NLANES
1. Main St.NB Appr/Dep	10.0	-1000.0	10.0	1000.0	2000.	360.	AG	.0	40.0	
2. Main St.SB Appr/Dep	-10.0	1000.0	-10.0	-1000.0	2000.	180.	AG	.0	40.0	
3. Local St.Appr.Dep.	-1000.0	.0	1000.0	.0	2000.	90.	AG	.0	40.0	

Receptor Data

RECEPTOR	COORDINATES (FT) X	Y	Z
1. REC 1 (SE CORNER)	45.0	-35.0	6.0
2. REC 2 (SW CORNER)	-45.0	-35.0	6.0
3. REC 3 (NW CORNER)	-45.0	35.0	6.0
4. REC 4 (NE CORNER)	45.0	35.0	6.0
5. REC 5 (E MID-MAIN)	45.0	-150.0	6.0
6. REC 6 (W MID-MAIN)	-45.0	-150.0	6.0
7. REC 7 (N MID-LOCAL)	-150.0	35.0	6.0
8. REC 8 (S MID-LOCAL)	-150.0	-35.0	6.0

Model Results

Remarks : In search of the wind direction corresponding to the maximum concentration, only the first direction, of the directions with the same maximum concentrations, is indicated as the maximum.

MAXIMUM HOURLY CONCENTRATIONS WITH ANY AMBIENT BACKGROUND CONCENTRATIONS (BKG) ADDED
(MICROGRAMS/M**3)

	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8
MAX+BKG	318.4	336.2	427.4	358.6	286.3	331.6	263.7	216.5
- BKG	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
MAX	268.4	286.2	377.4	308.6	236.3	281.6	213.7	166.5
WIND DIR	283	16	151	195	195	151	151	83
JULIAN	218	217	258	48	48	258	258	154
HOUR	7	17	8	7	7	8	8	7

THE HIGHEST CONCENTRATION OF 427.40 UG/M**3 OCCURRED AT RECEPTOR REC3 .

==========
Output Section
==========

NOTES PERTAINING TO THE REPORT

1. THE HIGHEST AVERAGE IN EACH OF THE FIRST TWO COLUMNS OF EACH TABLE BELOW ARE SUFFIXED BY AN ASTERISK (*).
FOR PM OUTPUT, THERE IS ONLY ONE COLUMN AND ASTERISK FOR THE ANNUAL AVERAGE/PERIOD OF CONCERN TABLE.

2. THE NUMBERS IN PARENTHESES ARE THE JULIAN DAY AND ENDING HOUR FOR THE PRECEDING AVERAGE.

3. THE NUMBER OF CALM HOURS USED IN PRODUCING EACH AVERAGE ARE PREFIXED BY A C.

PRIMARY AND SECONDARY AVERAGES.

FIVE HIGHEST 24-HOUR END-TO-END AVERAGE CONCENTRATIONS IN MICROGRAMS/M**3
INCLUDING AMBIENT BACKGROUND CONCENTRATIONS.

Rcptr	Highest Ending			Second Highest Ending			Third Highest Ending			Fourth Highest Ending			Fifth Highest Ending		
No.	Conc	Day Hr	Calm	Conc	Day Hr	Calm	Conc	Day Hr	Calm	Conc	Day Hr	Calm	Conc	Day Hr	Calm
1	137.30	(177,24)	C 0	135.95	(232,24)	C 3	135.67	(311,24)	C 3	132.71	(169,24)	C 7	132.16	(279,24)	C 5
2	151.09	(190,24)	C 2	148.26	(338,24)	C 2	144.49	(344,24)	C 4	144.04	(202,24)	C 6	143.98	(251,24)	C 4
3	163.32*	(338,24)	C 2	154.04*	(24,24)	C 2	153.45	(329,24)	C 7	152.31	(209,24)	C 7	151.37	(345,24)	C 0
4	145.84	(314,24)	C 1	141.90	(182,24)	C 3	141.17	(347,24)	C 2	136.33	(302,24)	C 5	134.14	(43,24)	C 3
5	121.54	(177,24)	C 0	120.53	(232,24)	C 3	119.46	(182,24)	C 3	118.24	(314,24)	C 1	117.98	(311,24)	C 3
6	136.40	(338,24)	C 2	130.57	(344,24)	C 4	129.95	(190,24)	C 2	125.86	(202,24)	C 6	125.85	(251,24)	C 4
7	115.96	(338,24)	C 2	114.44	(24,24)	C 2	111.57	(345,24)	C 0	110.71	(329,24)	C 7	109.25	(31,24)	C 2
8	109.29	(190,24)	C 2	103.93	(202,24)	C 6	103.91	(251,24)	C 4	102.78	(49,24)	C 5	101.23	(246,24)	C 2

THE HIGHEST ANNUAL AVERAGE CONCENTRATIONS
IN MICROGRAMS/M**3
INCLUDING AMBIENT BACKGROUND CONCENTRATIONS.

Receptor Number	Maximum Conc	Ending Day Hr	Calm
1	89.15	(366,24)	C 592
2	83.25	(366,24)	C 592
3	86.51	(366,24)	C 592
4	92.41*	(366,24)	C 592
5	82.13	(366,24)	C 592
6	76.24	(366,24)	C 592
7	71.59	(366,24)	C 592
8	68.33	(366,24)	C 592

LINK CONTRIBUTION TABLES

MAXIMUM 24-HOUR AVERAGED LINK CONTRIBUTIONS
IN MICROGRAMS/M**3
INCLUDING AMBIENT BACKGROUND CONCENTRATIONS.

Rcptr No.	Total Conc	Ending Day Hr	Ambient Backgnd	Total Link	Link +1	Link +2	Link +3
1	137.30	(177,24)	50.00	87.30	40.45	23.38	23.47
2	151.09	(190,24)	50.00	101.09	33.16	36.27	31.65
3	163.32	(338,24)	50.00	113.32	40.11	42.77	30.44
4	145.84	(314,24)	50.00	95.84	42.75	24.97	28.11
5	121.54	(177,24)	50.00	71.54	40.48	23.38	7.68
6	136.40	(338,24)	50.00	86.40	40.01	42.71	3.67
7	115.96	(338,24)	50.00	65.96	18.79	16.59	30.59
8	109.29	(190,24)	50.00	59.29	14.60	12.99	31.70

SECOND HIGHEST 24-HOUR AVERAGED LINK CONTRIBUTIONS
IN MICROGRAMS/M**3
INCLUDING AMBIENT BACKGROUND CONCENTRATIONS.

Rcptr No.	Total Conc	Ending Day Hr	Ambient Backgnd	Total Link	Link +1	Link +2	Link +3
1	135.95	(232,24)	50.00	85.95	40.27	23.26	22.42
2	148.26	(338,24)	50.00	98.26	40.07	42.75	15.44
3	154.04	(24,24)	50.00	104.04	34.22	35.86	33.95
4	141.90	(182,24)	50.00	91.90	42.18	24.98	24.75
5	120.53	(232,24)	50.00	70.53	40.35	23.32	6.87
6	130.57	(344,24)	50.00	80.57	33.55	39.40	7.62
7	114.44	(24,24)	50.00	64.44	16.09	14.17	34.18
8	103.93	(202,24)	50.00	53.93	14.73	13.06	26.14

MAXIMUM ANNUAL AVERAGED LINK CONTRIBUTIONS
IN MICROGRAMS/M**3
INCLUDING AMBIENT BACKGROUND CONCENTRATIONS.

Rcptr No.	Total Conc	Ending Day Hr	Ambient Backgnd	Total Link	Link +1	Link +2	Link +3
1	89.15	(366,24)	50.00	39.15	18.61	10.61	9.93
2	83.25	(366,24)	50.00	33.25	10.91	12.42	9.92
3	86.51	(366,24)	50.00	36.51	10.91	12.43	13.16
4	92.41	(366,24)	50.00	42.41	18.62	10.61	13.18
5	82.13	(366,24)	50.00	32.13	18.58	10.58	2.97
6	76.24	(366,24)	50.00	26.24	10.88	12.40	2.96
7	71.59	(366,24)	50.00	21.58	4.44	4.01	13.14

LINK CONTRIBUTION TABLES

MAXIMUM ANNUAL AVERAGED LINK CONTRIBUTIONS
IN MICROGRAMS/M**3
INCLUDING AMBIENT BACKGROUND CONCENTRATIONS.

Rcptr No.	Total Conc	Ending Day Hr	Ambient Backgnd	Total Link	Link +1	Link +2	Link +3
8	68.33	(366,24)	50.00	18.33	4.43	4.00	9.90

CALM DURATION FREQUENCY

Hours of Consecutive Calm Winds	Frequency of Occurrence	(Julian day/hour ending) of Significant Occurrences
1	188	(7,13)(11, 5)(11,13)(21,24)(23,19)(29, 5)(31, 3)(31, 6)(34,24)(35, 6) (40,18)(42,23)(43, 5)(46, 2)(46,14)(48, 5)(54, 2)(54, 6)(56, 2)(59, 8) (62, 6)(62,23)(71,19)(72,23)(73, 4)(73, 8)(76, 8)(83, 4)(84,23)(85, 1) (105, 7)(110,18)(111,20)(125, 5)(126, 2)(126, 4)(132,21)(136, 8)(137, 4)(137, 6) (143,21)(144, 1)(154, 4)(154, 6)(156, 6)(158, 1)(160,24)(164, 1)(169, 6)(174, 4) (174,20)(175,21)(179, 6)(180, 5)(180,24)(182, 3)(182, 6)(184, 1)(188, 7)(188,24) (190, 2)(190,24)(191, 4)(191, 6)(192, 1)(192, 6)(193, 3)(193,23)(195,24)(198, 8) (199,20)(201,21)(201,24)(202, 2)(202, 5)(202,23)(203, 6)(204, 2)(204, 5)(204, 7) (205,22)(205,24)(206, 2)(206, 4)(210, 5)(212, 2)(214, 9)(214,21)(214,23)(215, 2) (215, 4)(215,21)(228,23)(230, 3)(233, 4)(238, 5)(239,22)(240, 2)(242, 3)(242,21) (242,23)(243, 1)(243,23)(244, 2)(244, 5)(246,22)(246,24)(247, 7)(248, 5)(250,22) (253,21)(255, 1)(257,24)(258, 3)(259,24)(260,21)(261, 1)(261, 6)(261, 8)(261,21) (261,24)(262, 3)(262, 7)(263, 1)(263, 3)(266, 4)(267, 3)(270, 1)(270, 5)(271,21) (273,14)(273,20)(276, 8)(277, 1)(280,23)(285, 8)(285,19)(288,19)(288,22)(289, 7) (289,18)(289,20)(289,24)(291,18)(292, 4)(292, 8)(294, 6)(297,23)(299, 4)(300, 6) (300, 8)(301, 4)(301, 7)(301,19)(302, 5)(306, 7)(306,15)(306,20)(307, 2)(308, 7) (308,22)(309,17)(311,19)(311,21)(312,18)(312,21)(314, 5)(315, 1)(319,11)(319,21) (320,20)(324,15)(329, 4)(329, 6)(336, 8)(338,21)(338,23)(339,11)(344,19)(344,21) (346, 8)(347, 5)(347,16)(356,19)(356,21)(357, 1)(357,23)(363,19)
2	55	(23,24)(24, 3)(29, 8)(36,18)(43, 3)(46, 6)(48,22)(49, 3)(102, 3)(111,24) (125,23)(136, 6)(139, 2)(139, 6)(156, 3)(157,21)(174,23)(193, 1)(196, 4)(198, 6) (198,23)(200,23)(203, 2)(203,22)(205, 1)(205, 5)(205, 8)(208,23)(222,24)(242, 6) (247, 3)(249,24)(250, 3)(250, 6)(250, 9)(261, 4)(262,20)(262,23)(272, 1)(279, 5) (281, 7)(286, 7)(288, 8)(289, 1)(299, 2)(301,23)(302, 2)(302,23)(306,23)(328,22) (329, 9)(344,24)(355,24)(356, 8)(361,10)
3	27	(18,23)(45,24)(49, 7)(53, 7)(102, 7)(107, 2)(144, 6)(160, 7)(180,22)(183, 2) (193, 7)(194, 3)(199,24)(202,21)(209, 4)(218, 3)(228, 7)(230, 7)(243, 6)(280, 5) (281, 3)(289, 5)(301, 2)(312, 7)(320, 4)(329,19)(356, 4)
4	12	(87,24)(170, 2)(198, 3)(209,24)(233, 1)(248, 1)(254,23)(269,23)(280, 1)(300,22) (312, 3)(320, 9)
5	12	(142,24)(143, 6)(147, 2)(169, 4)(178, 7)(188, 4)(189, 6)(228, 3)(254, 6)(286,23) (295, 1)(307, 8)
6	6	(59, 6)(199, 6)(238, 2)(259, 3)(288, 5)(298, 6)
7	3	(229, 7)(286, 3)(310, 2)
9	2	(220, 6)(252, 5)
10	3	(253, 7)(305, 9)(309, 9)

Program terminated normally

3.4.7 Discussion of PM-10 Test Case Results

Presented below is a summary table of the CAL3QHCR Tier I and II results. The results do not include ambient background concentrations. The Tier I results were produced using constant traffic volume data while the Tier II results were produced using varying traffic volume data based on Figure 1. The emission factor for both cases was constant at 2.96 grams per vehicle-mile from the draft PART5 emission factor model (see Reference 11).

CAL3QHCR Tier I (TI) vs Tier II (TII) PM-10 Results
(Averages in Micrograms/meter cubed)

	CAL3QHCR					
	24-Hour Block				Maximum	
	Maximum		Second		Annual	
Rcp	Averages		Highest		Averages	
No.	TI	TII	TI	TII	TI	TII
1	146.38	87.30	128.59	85.95	62.22	39.15
2	150.57	101.09	137.68	98.26	54.33	33.25
3	180.49*	113.32*	160.02*	104.04*	59.10	36.51
4	146.67	95.84	143.69	91.90	67.00*	42.41*
5	119.35	71.54	112.26	70.53	50.80	32.13
6	122.72	86.40	119.21	80.57	42.91	26.24
7	109.37	65.96	92.61	64.44	34.87	21.58
8	88.01	59.29	78.90	53.93	30.09	18.33

*represents the highest average in the respective column

The Tier II maximum 24-hour block average is 63 percent of the Tier I maximum 24-hour block average. The results of the second high block 24-hour average shows the maximum Tier II average at 65 percent of the maximum Tier I average. Thus, for this example, Tier II results in maximum 24-hour concentration estimates which are about 65 percent of those obtained using Tier I. Also the Tier II maximum annual average is 63 percent of the Tier I maximum annual average.

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