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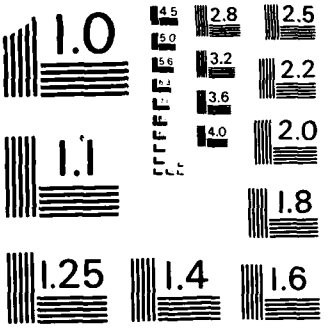

# A PRELIMINARY ASSESSMENT OF POLLUTION FROM PASSENGER CARS AND BUSES AT STAPLETON INTERNATIONAL AIRPORT

U. S. Department of Transportation
FEDERAL AVIATION ADMINISTRATION
Office of Environment and Energy
Washington, D. C., 20591







H. M. Segal

July 1986

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16. Abstract

This report summarizes the results of an air quality modeling exercise for Stapleton International Airport. The analysis identifies the impact of automobiles and mini-buses on air quality at the airport. Concentrations of Carbon Monoxide were estimated at seven receptors placed at critical locations in the terminal area. The Graphical Input Microcomputer Model was used in this screening analysis.

The following assumptions were used in the analysis:

1. vehicle activity = maximum
2. wind speed = 1 meter per second
3. wind directions = 270 and 240 degrees
4. temperature = 0 degrees F, and
5. Pasquill/Gifford stability class was "D".

The maximum one hour concentration at the most critical receptor was 26 mg/m3. The one hour National Ambient Air Quality Standard for Carbon Monoxide is 40 mg/m3.

| 17. Key Words | 18. Distribution Statement |
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# A PRELIMINARY ASSESSMENT OF POLLUTION FROM PASSENGER CARS AND BUSES AT STAPLETON INTERNATIONAL AIRPORT

A series of modeling runs was made to calculate the concentrations of pollutants from motor vehicles operating at Stapleton International Airport (DEN). The Graphical Input Microcomputer Model (GIMM), which was demonstrated to Environmental Protection Agency (EPA), Federal Aviation Administration (FAA), Airport Authority, and Colorado State personnel on April 2-4, was employed in this analysis. This model and its scenario were modified to reflect comments by state personnel at the April 2 meeting. As a result, there are now three route scenarios: one for the main traffic flow at the airport, and the other two for mini-bus travel to the north and south parking and car rental areas. In addition the model now incorporates the high altitude version of the Mobile III emissions model.

In addition to evaluating the environmental impact of motor vehicles, the model has the capability to evaluate the environmental impact of aircraft. This capability was not exercised because persons at the April 2 meeting seemed to be primarily interested in passenger vehicle and mini-bus flow around the airport terminal.

The entire analysis is for screening purposes only and includes extreme conditions for all parameters. The status of the GIMM model (1) is that it is in the advanced stages of development but is not fully validated. Initial validation checks have been made and full validation is expected by January 1987.

Results are summarized for the main pollutant of concern at airports - carbon monoxide (CO). However, emission rates and concentrations for all five criteria pollutants are listed. Emission data for the carbon monoxide, hydrocarbons and nitrogen oxides criteria pollutants were extracted directly from the latest version of AP-42 (2). However, emission data for the remaining pollutants, sulfur oxides and particulates, were not well defined in this document. Their values were obtained from an earlier version of AP-42 and telephone contacts with appropriate industrial personnel.

Three scenarios are reported; one for the main vehicular travel (primarily autos) (Figures 1-3), and the others for mini-bus travel to the airport's south (Figures 4-6) and north (Figures 7-9) parking and car rental areas. Each scenario report has the following format:

1. an airport map showing the route traversed

2. a printout of results for a wind direction of 270 degrees

3. a printout of results for a wind direction of 240 degrees

Roadway numbers are displayed on the map near each roadway. The seven receptors are identified by Roman numerals I thru VII. Vehicular activity is noted on the right side of each map. Maximum concentrations occur at

receptors I, II, and III. Concentrations at these receptors for each scenario are plotted in Figure 10 which also lists the meteorological and vehicle activity assumptions of all computer runs. Total concentrations from passenger, ancillary and mini-bus vehicles are obtained by adding up the corresponding receptor values of all three scenarios.

PASSENGER AND ANCILLARY VEHICLE FLOW
(STAPLETON INTERNATIONAL AIRPORT)

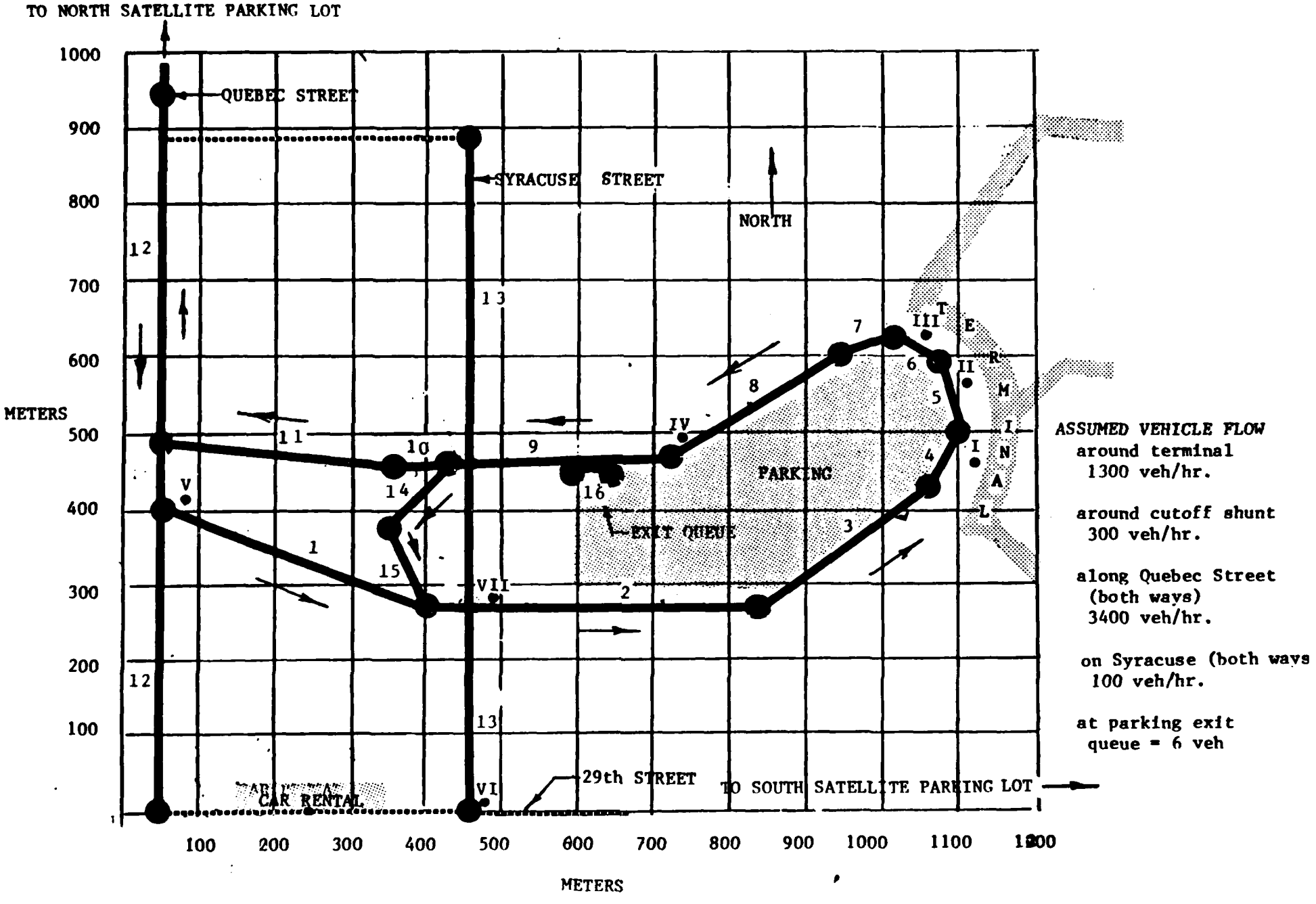



Figure 1

PASSENGER AND ANCILLARY VEHICLE POLLUTION ON ROUTES AROUND
DENVER INTERNATIONAL AIRPORT

Temperature = 0 degrees F.
Wind Direction = 270 degrees

EMISSION REPORT (ROADWAYS)
JUN-18- (1400 HR.)

| INPUTS | | | | | | | | | | | | OUTPUTS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COORDINATES OF SOURCES (M) ORIGIN AT (0 , 0) | | | | INITIAL PARAMETERS(M) | | | (MOBILE 3) | | | | EMISSION RATES | | | | |
| ROAD # | X1 | Y1 | X2 | Y2 | SIG Z | SIG Y | PLUME HT. | CARS/HR | MPH | %COLD START | TEMP (F) | YEAR | GM/SEC CO | HC | NOX | SOX | PART |
| 1 | 46, | 397. | 398, | 263 | 1.5 | 3 | 1 | 1000 | 30 | 010 | 0 | 1986 | 4.81E00 | 4.45E-1 | 2.49E-1 | 5.87E-4 | 2.02E-2 |
| 2 | 398, | 264 | 844, | 263 | 1.5 | 3 | 1 | 1300 | 30 | 010 | 0 | 1986 | 7.40E00 | 6.86E-1 | 3.83E-1 | 9.01E-4 | 3.11E-2 |
| 3 | 842, | 261 | 1057, | 424 | 1.5 | 3 | 1 | 1300 | 20 | 010 | 0 | 1986 | 6.58E00 | 5.58E-1 | 2.06E-1 | 5.45E-4 | 1.88E-2 |
| 4 | 1056, | 422 | 1102, | 501 | 1.5 | 3 | 1 | 1300 | 5 | 010 | 0 | 1986 | 6.43E00 | 4.90E-1 | 7.60E-2 | 1.85E-4 | 6.37E-3 |
| 5 | 1099, | 501 | 1069, | 590 | 1.5 | 3 | 1 | 1300 | 5 | 010 | 0 | 1986 | 6.61E00 | 5.04E-1 | 7.81E-2 | 1.90E-4 | 6.56E-3 |
| 6 | 1071, | 591 | 1005, | 622 | 1.5 | 3 | 1 | 1300 | 5 | 010 | 0 | 1986 | 5.13E00 | 3.91E-1 | 6.06E-2 | 1.47E-4 | 5.07E-3 |
| 7 | 1005, | 622 | 936, | 594 | 1.5 | 3 | 1 | 1300 | 5 | 010 | 0 | 1986 | 5.11E00 | 3.89E-1 | 6.04E-2 | 1.46E-4 | 5.07E-3 |
| 8 | 938, | 594 | 718, | 460 | 1.5 | 3 | 1 | 1300 | 20 | 010 | 0 | 1986 | 6.28E00 | 5.33E-1 | 1.97E-1 | 5.20E-4 | 1.81E-2 |
| 9 | 718, | 460 | 436, | 450 | 1.5 | 3 | 1 | 1300 | 30 | 010 | 0 | 1986 | 4.68E00 | 4.34E-1 | 2.42E-1 | 5.71E-4 | 1.97E-2 |
| 10 | 432, | 459 | 343, | 445 | 1.5 | 3 | 1 | 1000 | 30 | 010 | 0 | 1986 | 1.15E00 | 1.07E-1 | 5.95E-2 | 1.40E-4 | 4.85E-3 |
| 11 | 343, | 444 | 51, | 474 | 1.5 | 3 | 1 | 1000 | 35 | 010 | 0 | 1986 | 3.25E00 | 3.13E-1 | 2.00E-1 | 4.57E-4 | 1.58E-2 |
| 12 | 53, | 873 | 47, | 0 | 1.5 | 3 | 1 | 3400 | 35 | 010 | 0 | 1986 | 3.28E01 | 3.16E00 | 2.02E00 | 4.60E-3 | 1.60E-1 |
| 13 | 452, | 874 | 460, | 0 | 1.5 | 3 | 1 | 100 | 30 | 010 | 0 | 1986 | 1.12E00 | 1.03E-1 | 5.77E-2 | 1.36E-4 | 4.69E-3 |
| 14 | 431, | 458 | 350, | 364 | 1.5 | 3 | 1 | 300 | 30 | 010 | 0 | 1986 | 4.75E-1 | 4.40E-2 | 2.46E-2 | 5.77E-5 | 2.00E-3 |
| 15 | 351, | 363 | 399, | 260 | 1.5 | 3 | 1 | 300 | 30 | 010 | 0 | 1986 | 4.35E-1 | 4.03E-2 | 2.25E-2 | 5.33E-5 | 1.84E-3 |
| 16 | 600, | 460 | 635, | 460 | 1.5 | 3 | 1 | QUEUE | 0 | 010 | 0 | 1986 | 3.23E00 | 2.43E-1 | 3.77E-2 | 8.75E-5 | 3.03E-3 |
| | | | | | | | | | | | | TOTAL | 9.55E01 | 8.44E00 | 3.99E00 | 9.32E-3 | 3.23E-1 |

DISPERSION REPORT

| INPUTS | | | | | | | OUTPUT | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | HR | W/S M/S | WD DEG | P/G A=1 | RECEPTOR NO. | X | Y | CONCENTRATION GM/M^3 CO | HC | NOX | SOX | PART |
| JUN-18-86 | 14 | 1 | 270 | 4 | 1 | 1117 | 456 | 1.76E-2 | 1.39E-3 | 3.23E-4 | 7.74E-7 | 2.67E-5 |
| JUN-18-86 | 14 | 1 | 270 | 4 | 2 | 1105 | 560 | 2.09E-2 | 1.63E-3 | 3.23E-4 | 7.87E-7 | 2.72E-5 |
| JUN-18-86 | 14 | 1 | 270 | 4 | 3 | 1043 | 610 | 1.82E-2 | 1.41E-3 | 2.67E-4 | 6.46E-7 | 2.24E-5 |
| JUN-18-86 | 14 | 1 | 270 | 4 | 4 | 735 | 488 | 4.04E-3 | 3.56E-4 | 1.68E-4 | 3.88E-7 | 1.34E-5 |
| JUN-18-86 | 14 | 1 | 270 | 4 | 5 | 82 | 406 | 7.78E-3 | 7.49E-4 | 4.79E-4 | 1.09E-6 | 3.78E-5 |
| JUN-18-86 | 14 | 1 | 270 | 4 | 6 | 477 | 12 | 9.95E-4 | 9.43E-5 | 5.73E-5 | 1.32E-7 | 4.57E-6 |
| JUN-18-86 | 14 | 1 | 270 | 4 | 7 | 484 | 278 | 3.47E-3 | 3.25E-4 | 1.89E-4 | 4.40E-7 | 1.52E-5 |

Figure 2

**PASSENGER AND ANCILLARY VEHICLE POLLUTION ON ROUTES AROUND DENVER INTERNATIONAL AIRPORT**

**Temperature = 0 degrees F.**
**Wind Direction = 290**

EMISSION REPORT (ROADWAYS)
JUN-16- (1400 HR.)

| INPUTS | | | | | | | | | | | | OUTPUTS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COORDINATES OF SOURCES (M) ORIGIN AT (0 , 0) | | | | INITIAL PARAMETERS(M) | | | (MOBILE 3) | | | | | EMISSION RATES | | | | |
| ROAD # | X1 | Y1 | X2 | Y2 | SIG Z | SIG Y | PLUME HT. | CARS/HR | MPH | %COLD START | TEMP (F) | YEAR | GM/SEC CO | HC | NOX | SOX | PART |
| 1 | 46, | 397 | 398, | 263 | 1.5 | 3 | 1 | 1000 | 30 | 010 | 0 | 1986 | 4.81E00 | 4.45E-1 | 2.49E-1 | 5.87E-4 | 2.11E-2 |
| 2 | 398, | 264 | 844, | 263 | 1.5 | 3 | 1 | 1300 | 30 | 010 | 0 | 1986 | 7.40E00 | 6.86E-1 | 3.83E-1 | 9.01E-4 | 3.11E-2 |
| 3 | 842, | 261 | 1057, | 424 | 1.5 | 3 | 1 | 1300 | 20 | 010 | 0 | 1986 | 6.58E00 | 5.58E-1 | 2.06E-1 | 5.45E-4 | 1.88E-2 |
| 4 | 1056, | 422 | 1102, | 501 | 1.5 | 3 | 1 | 1300 | 5 | 010 | 0 | 1986 | 6.43E00 | 4.90E-1 | 7.60E-2 | 1.85E-4 | 6.37E-3 |
| 5 | 1099, | 501 | 1069, | 590 | 1.5 | 3 | 1 | 1300 | 5 | 010 | 0 | 1986 | 6.61E00 | 5.04E-1 | 7.81E-2 | 1.90E-4 | 6.56E-3 |
| 6 | 1071, | 591 | 1005, | 622 | 1.5 | 3 | 1 | 1300 | 5 | 010 | 0 | 1986 | 5.13E00 | 3.91E-1 | 6.06E-2 | 1.47E-4 | 5.07E-3 |
| 7 | 1005, | 622 | 938, | 594 | 1.5 | 3 | 1 | 1300 | 5 | 010 | 0 | 1986 | 5.11E00 | 3.89E-1 | 6.04E-2 | 1.46E-4 | 5.07E-3 |
| 8 | 938, | 594 | 718, | 460 | 1.5 | 3 | 1 | 1300 | 20 | 010 | 0 | 1986 | 6.28E00 | 5.33E-1 | 1.97E-1 | 5.20E-4 | 1.80E-2 |
| 9 | 718, | 460 | 436, | 450 | 1.5 | 3 | 1 | 1300 | 30 | 010 | 0 | 1986 | 4.68E00 | 4.34E-1 | 2.42E-1 | 5.71E-4 | 1.97E-2 |
| 10 | 432, | 459 | 343, | 445 | 1.5 | 3 | 1 | 1000 | 30 | 010 | 0 | 1986 | 1.15E00 | 1.07E-1 | 5.95E-2 | 1.40E-4 | 4.85E-3 |
| 11 | 343, | 444 | 51, | 474 | 1.5 | 3 | 1 | 1000 | 35 | 010 | 0 | 1986 | 3.25E00 | 3.13E-1 | 2.00E-1 | 4.57E-4 | 1.55E-2 |
| 12 | 53, | 873 | 47, | 0 | 1.5 | 3 | 1 | 3400 | 35 | 010 | 0 | 1986 | 3.28E00 | 3.16E00 | 2.02E00 | 4.60E-3 | 1.60E-1 |
| 13 | 452, | 874 | 460, | 0 | 1.5 | 3 | 1 | 100 | 30 | 010 | 0 | 1986 | 1.12E00 | 1.03E-1 | 5.77E-2 | 1.36E-4 | 4.69E-3 |
| 14 | 431, | 459 | 350, | 364 | 1.5 | 3 | 1 | 300 | 30 | 010 | 0 | 1986 | 4.75E-1 | 4.40E-2 | 2.46E-2 | 5.77E-5 | 2.00E-3 |
| 15 | 351, | 363 | 399, | 260 | 1.5 | 3 | 1 | 300 | 30 | 010 | 0 | 1986 | 4.35E-1 | 4.03E-2 | 2.25E-2 | 5.33E-5 | 1.84E-3 |
| 16 | 600, | 460 | 635, | 460 | 1.5 | 3 | 1 | QUEUE | 0 | 010 | 0 | 1986 | 3.23E00 | 2.43E-1 | 3.77E-2 | 8.75E-5 | 3.03E-3 |
| | | | | | | | | | | | | TOTAL | 9.55E01 | 8.44E00 | 3.98E00 | 9.32E-3 | 3.23E-1 |

DISPERSION REPORT

| INPUTS | | | | | | OUTPUT | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | HR | W/S -M/S | WD DEG | P/G A=1 | RECEPTOR NO. | X | Y | CONCENTRATION GM/M^3 CO | HC | NOX | SOX | PART |
| JUN-18-86 | 14 | 1 | 240 | 4 | 1 | 1116 | 459 | 1.12E-2 | 8.77E-4 | 1.83E-4 | 4.49E-7 | 1.55E-5 |
| JUN-18-86 | 14 | 1 | 240 | 4 | 2 | 1106 | 563 | 1.82E-2 | 1.40E-3 | 2.68E-4 | 6.26E-7 | 2.17E-5 |
| JUN-18-86 | 14 | 1 | 240 | 4 | 3 | 1052 | 627 | 2.48E-2 | 1.93E-3 | 3.96E-4 | 9.67E-7 | 3.34E-5 |
| JUN-18-86 | 14 | 1 | 240 | 4 | 4 | 735 | 491 | 6.56E-3 | 5.92E-4 | 3.84E-4 | 7.12E-7 | 2.46E-5 |
| JUN-18-86 | 14 | 1 | 240 | 4 | 5 | 84 | 410 | 1.06E-2 | 1.01E-3 | 6.21E-4 | 1.42E-6 | 4.93E-5 |
| JUN-18-86 | 14 | 1 | 240 | 4 | 6 | 480 | 11 | 1.97E-4 | 1.83E-5 | 1.82E-5 | 2.40E-8 | 8.30E-7 |
| JUN-18-86 | 14 | 1 | 240 | 4 | 7 | 485 | 280 | 1.10E-3 | 1.04E-4 | 6.41E-5 | 1.47E-7 | 5.10E-6 |

Figure 3

DIESEL BUS ROUTES
SOUTH ACCESS - PASSENGER PARKING AND CAR RENTAL
(STAPLETON INTERNATIONAL AIRPORT)

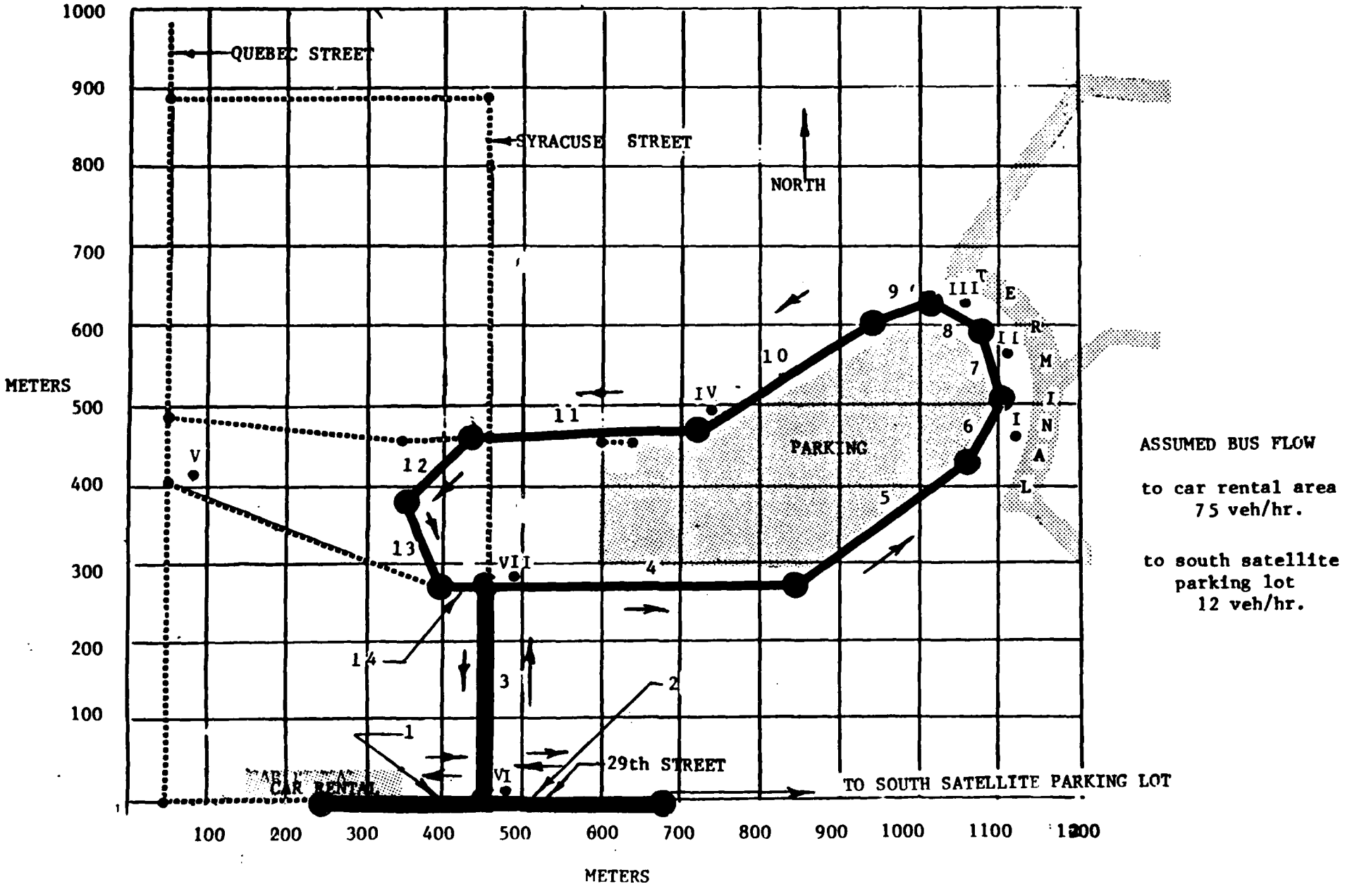



Figure 4

BUS POLLUTION ON ROUTES TO
CAR RENTAL AND SOUTH PARKING AREAS

Temperature = 0 degrees F.
Wind Direction = 270 degrees

EMISSION REPORT (ROADWAYS)
JUN-19- (1400 HR.)

| INPUTS | | | | | | | | | | | | OUTPUTS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COORDINATES OF SOURCES (M) ORIGIN AT (0 , 0) | | | | INITIAL PARAMETERS(M) | | | (MOBILE 3) | | | | EMISSION RATES | | | | |
| ROAD # | X1 | Y1 | X2 | Y2 | SIG Z | SIG Y | PLUME HT. | CARS/ HR | MPH | %COLD START | TEMP (F) | YEAR | GM/SEC CO | HC | NOX | SOX | PART |
| 1 | 245. | 0 | 457. | 0 | 1.5 | 3 | 1 | 150 | 20 | 000 | 0 | 1986 | 4.22E-1 | 3.35E-2 | 1.85E-2 | 4.95E-5 | 1.71E-3 |
| 2 | 456. | 0 | 670. | 0 | 1.5 | 3 | 1 | 24 | 20 | 000 | 0 | 1986 | 6.82E-2 | 5.41E-3 | 2.98E-3 | 7.99E-6 | 2.76E-4 |
| 3 | 459. | 0 | 456. | 267 | 1.5 | 3 | 1 | 174 | 30 | 000 | 0 | 1986 | 4.19E-1 | 3.82E-2 | 3.03E-2 | 7.23E-5 | 2.50E-3 |
| 4 | 456. | 266 | 841. | 264 | 1.5 | 3 | 1 | 87 | 30 | 000 | 0 | 1986 | 3.02E-1 | 2.75E-2 | 2.19E-2 | 5.20E-5 | 1.80E-3 |
| 5 | 843. | 267 | 1063. | 427 | 1.5 | 3 | 1 | 87 | 20 | 000 | 0 | 1986 | 3.14E-1 | 2.49E-2 | 1.37E-2 | 3.68E-5 | 1.27E-3 |
| 6 | 1061. | 424 | 1106. | 504 | 1.5 | 3 | 1 | 87 | 5 | 000 | 0 | 1986 | 3.06E-1 | 1.95E-2 | 5.06E-3 | 1.24E-5 | 4.28E-4 |
| 7 | 1106. | 505 | 1077. | 592 | 1.5 | 3 | 1 | 87 | 5 | 000 | 0 | 1986 | 3.06E-1 | 1.95E-2 | 5.06E-3 | 1.24E-5 | 4.28E-4 |
| 8 | 1077. | 591 | 1013. | 622 | 1.5 | 3 | 1 | 87 | 5 | 000 | 0 | 1986 | 2.37E-1 | 1.51E-2 | 3.92E-3 | 9.61E-6 | 3.33E-4 |
| 9 | 1009. | 620 | 943. | 597 | 1.5 | 3 | 1 | 87 | 5 | 000 | 0 | 1986 | 2.33E-1 | 1.49E-2 | 3.86E-3 | 9.45E-6 | 3.27E-4 |
| 10 | 942. | 597 | 717. | 463 | 1.5 | 3 | 1 | 87 | 20 | 000 | 0 | 1986 | 3.02E-1 | 2.40E-2 | 1.32E-2 | 3.55E-5 | 1.22E-3 |
| 11 | 717. | 462 | 435. | 457 | 1.5 | 3 | 1 | 87 | 30 | 000 | 0 | 1986 | 2.21E-1 | 2.02E-2 | 1.60E-2 | 3.81E-5 | 1.32E-3 |
| 12 | 435. | 459 | 351. | 370 | 1.5 | 3 | 1 | 87 | 30 | 000 | 0 | 1986 | 9.60E-2 | 8.74E-3 | 6.95E-3 | 1.65E-5 | 5.71E-4 |
| 13 | 348. | 370 | 394. | 263 | 1.5 | 3 | 1 | 87 | 30 | 000 | 0 | 1986 | 9.14E-2 | 8.32E-3 | 6.61E-3 | 1.57E-5 | 5.42E-4 |
| 14 | 398. | 267 | 453. | 266 | 1.5 | 3 | 1 | 87 | 30 | 000 | 0 | 1986 | 4.32E-2 | 3.93E-3 | 3.12E-3 | 7.42E-6 | 2.57E-4 |
| | | | | | | | | | | | | TOTAL | 3.36E00 | 2.64E-1 | 1.51E-1 | 3.76E-4 | 1.30E-2 |

DISPERSION REPORT

| INPUTS | | | | | | OUTPUT | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | HR | W/S M/S | WD DEG | P/G A=1 | RECEPTOR | CONCENTRATION GM/M^3 | | | | | |
| | | | | | NO. | X | Y | CO | HC | NOX | SOX | PART |
| JUN-19-86 | 14 | 1 | 270 | 4 | 1 | 1119 | 454 | 7.46E-4 | 4.94E-5 | 1.61E-5 | 3.93E-8 | 1.36E-6 |
| JUN-19-86 | 14 | 1 | 270 | 4 | 2 | 1109 | 556 | 1.10E-3 | 7.12E-5 | 2.06E-5 | 5.11E-8 | 1.76E-6 |
| JUN-19-86 | 14 | 1 | 270 | 4 | 3 | 1056 | 624 | 9.51E-4 | 6.09E-5 | 1.61E-5 | 3.97E-8 | 1.37E-6 |
| JUN-19-86 | 14 | 1 | 270 | 4 | 4 | 738 | 487 | 7.18E-5 | 6.54E-6 | 5.20E-6 | 1.24E-8 | 4.27E-7 |
| JUN-19-86 | 14 | 1 | 270 | 4 | 5 | 83 | 410 | 0.00E00 | 0.00E00 | 0.00E00 | 0.00E00 | 0.00E00 |
| JUN-19-86 | 14 | 1 | 270 | 4 | 6 | 476 | 12 | 9.99E-4 | 8.50E-5 | 5.76E-5 | 1.44E-7 | 4.97E-6 |
| JUN-19-86 | 14 | 1 | 270 | 4 | 7 | 484 | 279 | 1.40E-4 | 1.28E-5 | 1.01E-5 | 2.41E-8 | 8.32E-7 |

Figure 5

## BUS POLLUTION ON ROUTES TO CAR RENTAL AND SOUTH PARKING AREAS

**Temperature = 0 degrees F.**
**Wind Direction = 240 degrees**

EMISSION REPORT (ROADWAYS)
JUN-19- (1400 HR.)

| INPUTS | | | | | | | | | | | | OUTPUTS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COORDINATES OF SOURCES (M) ORIGIN AT (0 , 0) | | | | INITIAL PARAMETERS(M) | | | (MOBILE 3) | | | | EMISSION RATES | | | | |
| LOAD # | X1 | Y1 | X2 | Y2 | SIG Z | SIG Y | PLUME HT. | CARS/ HR | MPH | %COLD START | TEMP (F) | YEAR | GM/SEC CO | HC | NOX | SOX | PART |
| 1 | 245. | 0 | 457. | 0 | 1.5 | 3 | 1 | 150 | 20 | 000 | 0 | 1986 | 4.22E-1 | 3.35E-2 | 1.85E-2 | 4.95E-5 | 1.71E-3 |
| 2 | 456. | 0 | 670. | 0 | 1.5 | 3 | 1 | 24 | 20 | 000 | 0 | 1986 | 6.82E-2 | 5.41E-3 | 2.98E-3 | 7.99E-6 | 2.76E-4 |
| 3 | 459. | 0 | 456. | 267 | 1.5 | 3 | 1 | 174 | 30 | 000 | 0 | 1986 | 4.19E-1 | 3.82E-2 | 3.03E-2 | 7.23E-5 | 2.50E-3 |
| 4 | 456. | 266 | 841. | 264 | 1.5 | 3 | 1 | 87 | 30 | 000 | 0 | 1986 | 3.02E-1 | 2.75E-2 | 2.19E-2 | 5.20E-5 | 1.80E-3 |
| 5 | 843. | 267 | 1063. | 427 | 1.5 | 3 | 1 | 87 | 20 | 000 | 0 | 1986 | 3.14E-1 | 2.49E-2 | 1.37E-2 | 3.68E-5 | 1.27E-3 |
| 6 | 1061. | 424 | 1106. | 504 | 1.5 | 3 | 1 | 87 | 5 | 000 | 0 | 1986 | 3.06E-1 | 1.95E-2 | 5.06E-3 | 1.24E-5 | 4.28E-4 |
| 7 | 1106. | 505 | 1077. | 592 | 1.5 | 3 | 1 | 87 | 5 | 000 | 0 | 1986 | 3.06E-1 | 1.95E-2 | 5.06E-3 | 1.24E-5 | 4.28E-4 |
| 8 | 1077. | 591 | 1013. | 622 | 1.5 | 3 | 1 | 87 | 5 | 000 | 0 | 1986 | 2.37E-1 | 1.51E-2 | 3.92E-3 | 9.61E-6 | 3.33E-4 |
| 9 | 1009. | 620 | 943. | 597 | 1.5 | 3 | 1 | 87 | 5 | 000 | 0 | 1986 | 2.33E-1 | 1.49E-2 | 3.86E-3 | 9.45E-6 | 3.27E-4 |
| 10 | 942. | 597 | 717. | 463 | 1.5 | 3 | 1 | 87 | 20 | 000 | 0 | 1986 | 3.02E-1 | 2.40E-2 | 1.32E-2 | 3.55E-5 | 1.22E-3 |
| 11 | 717. | 462 | 435. | 457 | 1.5 | 3 | 1 | 87 | 30 | 000 | 0 | 1986 | 2.21E-1 | 2.02E-2 | 1.60E-2 | 3.81E-5 | 1.32E-3 |
| 12 | 435. | 457 | 351. | 370 | 1.5 | 3 | 1 | 87 | 30 | 000 | 0 | 1986 | 9.60E-2 | 8.74E-3 | 6.95E-3 | 1.65E-5 | 5.71E-4 |
| 13 | 348. | 370 | 394. | 263 | 1.5 | 3 | 1 | 87 | 30 | 000 | 0 | 1986 | 9.14E-2 | 8.32E-3 | 6.61E-3 | 1.57E-5 | 5.42E-4 |
| 14 | 398. | 267 | 453. | 266 | 1.5 | 3 | 1 | 87 | 30 | 000 | 0 | 1986 | 4.32E-2 | 3.93E-3 | 3.12E-3 | 7.42E-6 | 2.57E-4 |
| | | | | | | | | | | | | TOTAL | 3.36E00 | 2.64E-1 | 1.51E-1 | 3.76E-4 | 1.30E-2 |

DISPERSION REPORT

| INPUTS | | | | | | | OUTPUT | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | HR | W/S M/S | WD DEG | P/G A=1 | RECEPTOR NO. | X | Y | CONCENTRATION GM/M^3 CO | HC | NOX | SOX | PART |
| JUN-19-86 | 14 | 1 | 240 | 4 | 1 | 1122 | 456 | 6.56E-4 | 4.87E-5 | 2.32E-5 | 5.99E-8 | 2.07E-6 |
| JUN-19-86 | 14 | 1 | 240 | 4 | 2 | 1113 | 561 | 9.41E-4 | 6.22E-5 | 2.00E-5 | 4.89E-8 | 1.69E-6 |
| JUN-19-86 | 14 | 1 | 240 | 4 | 3 | 1058 | 625 | 1.16E-3 | 7.66E-5 | 2.45E-5 | 6.06E-8 | 2.10E-6 |
| JUN-19-86 | 14 | 1 | 240 | 4 | 4 | 741 | 491 | 2.28E-4 | 2.08E-5 | 1.65E-5 | 3.92E-8 | 1.36E-6 |
| JUN-19-86 | 14 | 1 | 240 | 4 | 5 | 84 | 411 | 0.00E00 | 0.00E00 | 0.00E00 | 0.00E00 | 0.00E00 |
| JUN-19-86 | 14 | 1 | 240 | 4 | 6 | 478 | 12 | 8.45E-4 | 7.07E-5 | 4.58E-5 | 1.16E-7 | 4.01E-6 |
| JUN-19-86 | 14 | 1 | 240 | 4 | 7 | 488 | 279 | 3.33E-4 | 3.03E-5 | 2.41E-5 | 5.74E-8 | 1.98E-6 |

Figure 6

DIESEL BUS ROUTES
NORTH SATELLITE PARKING LOT
(STAPLETON INTERNATIONAL AIRPORT)

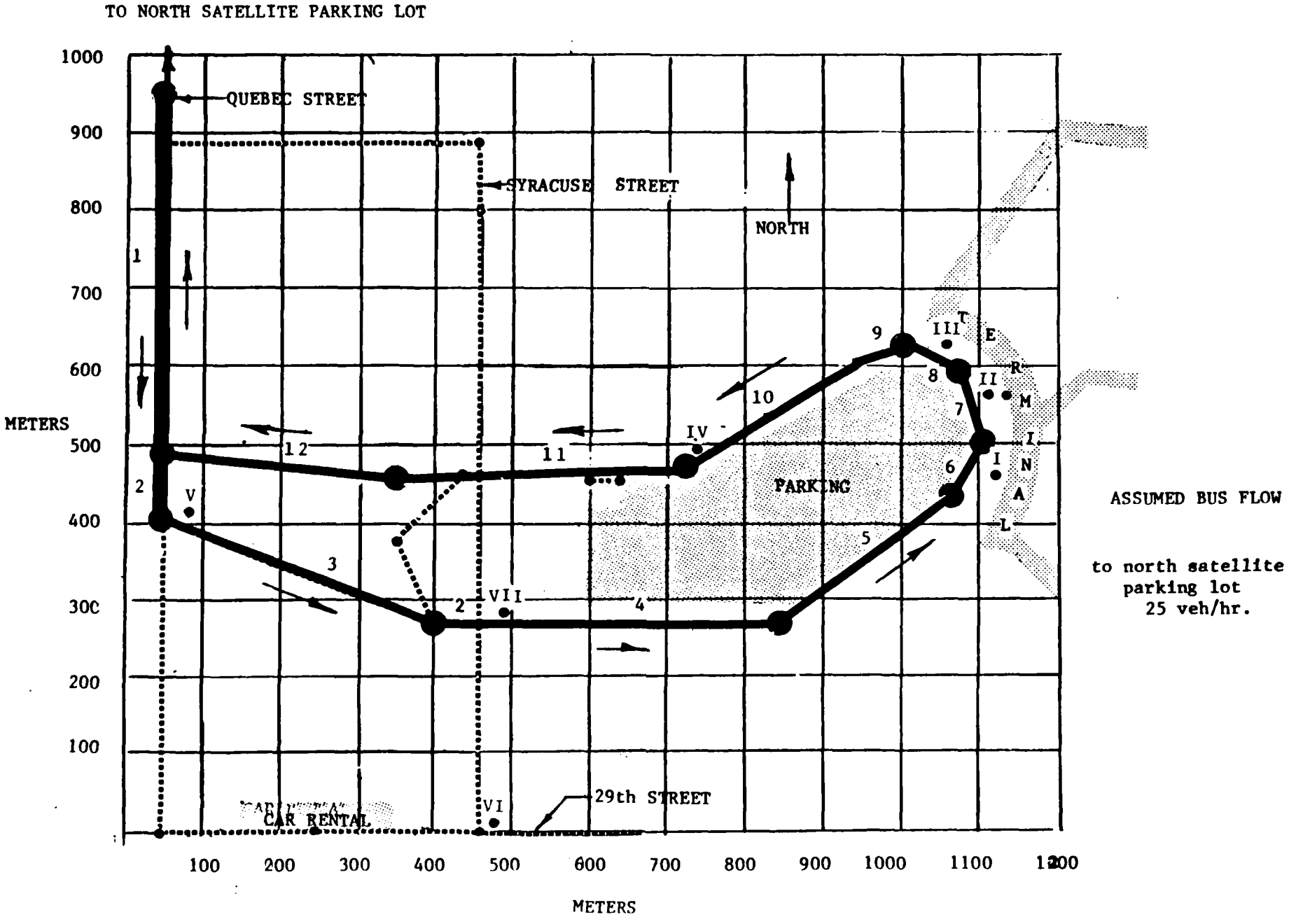



Figure 7

BUS POLLUTION ON ROUTES TO
NORTH SATELLITE PARKING AREAS

Temperature = 0 degrees F.
Wind Direction = 270 degrees

EMISSION REPORT (ROADWAYS)
JUN-23- (1400 HR.)

| INPUTS | | | | | | | | | | | | OUTPUTS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COORDINATES OF SOURCES (M) ORIGIN AT (0 . 0) | | | | INITIAL PARAMETERS(M) | | | (MOBILE 3) | | | | | EMISSION RATES | | | | |
| RD # | X1 | Y1 | X2 | Y2 | SIG Z | SIG Y | PLUME HT. | CARS/HR | MPH | %COLD START | TEMP (F) | YEAR | GM/SEC CO | HC | NOX | SOX | PART |
| 1 | 55. | 950 | 53. | 483 | 1.5 | 3 | 1 | 50 | 35 | 000 | 0 | 1986 | 1.82E-1 | 1.76E-2 | 1.57E-2 | 3.61E-5 | 1.25E-3 |
| 2 | 50. | 485 | 50. | 403 | 1.5 | 3 | 1 | 25 | 35 | 000 | 0 | 1986 | 1.60E-2 | 1.55E-3 | 1.38E-3 | 3.17E-6 | 1.10E-4 |
| 3 | 50. | 404 | 397. | 267 | 1.5 | 3 | 1 | 25 | 30 | 000 | 0 | 1986 | 8.41E-2 | 7.66E-3 | 6.09E-3 | 1.45E-5 | 5.01E-4 |
| 4 | 398. | 266 | 842. | 266 | 1.5 | 3 | 1 | 25 | 30 | 000 | 0 | 1986 | 1.00E-1 | 9.12E-3 | 7.24E-3 | 1.73E-5 | 5.96E-4 |
| 5 | 841. | 266 | 1062. | 429 | 1.5 | 3 | 1 | 25 | 20 | 000 | 0 | 1986 | 9.11E-2 | 7.23E-3 | 3.99E-3 | 1.07E-5 | 3.68E-4 |
| 6 | 1063. | 429 | 1102. | 504 | 1.5 | 3 | 1 | 25 | 5 | 000 | 0 | 1986 | 8.10E-2 | 5.16E-3 | 1.34E-3 | 3.30E-6 | 1.14E-4 |
| 7 | 1103. | 507 | 1077. | 594 | 1.5 | 3 | 1 | 25 | 5 | 000 | 0 | 1986 | 8.70E-2 | 5.55E-3 | 1.44E-3 | 3.52E-6 | 1.22E-4 |
| 8 | 1076. | 594 | 1008. | 626 | 1.5 | 3 | 1 | 25 | 5 | 000 | 0 | 1986 | 7.20E-2 | 4.59E-3 | 1.19E-3 | 2.92E-6 | 1.01E-4 |
| 9 | 1008. | 625 | 941. | 601 | 1.5 | 3 | 1 | 25 | 5 | 000 | 0 | 1986 | 6.82E-2 | 4.35E-3 | 1.13E-3 | 2.77E-6 | 9.54E-5 |
| 10 | 942. | 602 | 717. | 466 | 1.5 | 3 | 1 | 25 | 20 | 000 | 0 | 1986 | 8.73E-2 | 6.92E-3 | 3.82E-3 | 1.02E-5 | 3.52E-4 |
| 11 | 717. | 466 | 346. | 453 | 1.5 | 3 | 1 | 25 | 30 | 000 | 0 | 1986 | 8.37E-2 | 7.62E-3 | 6.06E-3 | 1.44E-5 | 4.98E-4 |
| 12 | 346. | 454 | 50. | 484 | 1.5 | 3 | 1 | 25 | 35 | 000 | 0 | 1986 | 5.80E-2 | 5.62E-3 | 5.01E-3 | 1.16E-5 | 4.03E-4 |
| | | | | | | | | | | | | TOTAL | 1.01E00 | 8.30E-2 | 5.44E-2 | 1.30E-4 | 4.51E-3 |

DISPERSION REPORT

| INPUTS | | | | | | OUTPUT | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| DATE | HR | W/S M/S | WD DEG | P/G A=1 | RECEPTOR NO. | X | Y | CONCENTRATION GM/M^3 CO | HC | NOX | SOX | PART |
| JUN-23-86 | 14 | 1 | 270 | 4 | 1 | 1120 | 459 | 2.18E-4 | 1.48E-5 | 5.52E-6 | 1.34E-8 | 4.62E-7 |
| JUN-23-86 | 14 | 1 | 270 | 4 | 2 | 1109 | 564 | 3.01E-4 | 1.99E-5 | 6.24E-6 | 1.54E-8 | 5.31E-7 |
| JUN-23-86 | 14 | 1 | 270 | 4 | 3 | 1056 | 627 | 3.15E-4 | 2.04E-5 | 5.91E-6 | 1.44E-8 | 4.98E-7 |
| JUN-23-86 | 14 | 1 | 270 | 4 | 4 | 736 | 491 | 3.73E-5 | 3.50E-6 | 2.93E-6 | 6.87E-9 | 2.38E-7 |
| JUN-23-86 | 14 | 1 | 270 | 4 | 5 | 81 | 411 | 3.87E-5 | 3.75E-6 | 3.34E-6 | 7.68E-9 | 2.66E-7 |
| JUN-23-86 | 14 | 1 | 270 | 4 | 6 | 477 | 10 | 0.00E00 | 0.00E00 | 0.00E00 | 0.00E00 | 0.00E00 |
| JUN-23-86 | 14 | 1 | 270 | 4 | 7 | 487 | 280 | 3.10E-5 | 2.82E-6 | 2.24E-6 | 5.34E-9 | 1.85E-7 |



Figure 8

## BUS POLLUTION ON ROUTES TO NORTH SATELLITE PARKING AREAS

Temperature = 0 degrees F.
Wind Direction = 240 degrees

### EMISSION REPORT (ROADWAYS)
JUN-23- (1400 HR.)

| INPUTS | | | | | | | | | | | | OUTPUTS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COORDINATES OF SOURCES (M) ORIGIN AT (0 , 0) | | | | INITIAL PARAMETERS(M) | | | (MOBILE 3) | | | | EMISSION RATES | | | | |
| ROAD # | X1 | Y1 | X2 | Y2 | SIG Z | SIG Y | PLUME HT. | CARS/ HR | MPH | %COLD START | TEMP (F) | YEAR | GM/SEC CO | HC | NOX | SOX | PART |
| 1 | 55, | 950 | 53, | 483 | 1.5 | 3 | 1 | 50 | 35 | 000 | 0 | 1986 | 1.82E-1 | 1.76E-2 | 1.57E-2 | 3.61E-5 | 1.25E-3 |
| 2 | 50, | 485 | 50, | 403 | 1.5 | 3 | 1 | 25 | 35 | 000 | 0 | 1986 | 1.60E-2 | 1.55E-3 | 1.38E-3 | 3.17E-6 | 1.10E-4 |
| 3 | 50, | 404 | 397, | 267 | 1.5 | 3 | 1 | 25 | 30 | 000 | 0 | 1986 | 8.41E-2 | 7.66E-3 | 6.09E-3 | 1.45E-5 | 5.01E-4 |
| 4 | 398, | 266 | 842, | 266 | 1.5 | 3 | 1 | 25 | 30 | 000 | 0 | 1986 | 1.00E-1 | 9.12E-3 | 7.24E-3 | 1.73E-5 | 5.96E-4 |
| 5 | 841, | 266 | 1062, | 429 | 1.5 | 3 | 1 | 25 | 20 | 000 | 0 | 1986 | 9.11E-2 | 7.23E-3 | 3.99E-3 | 1.07E-5 | 3.69E-4 |
| 6 | 1063, | 429 | 1102, | 504 | 1.5 | 3 | 1 | 25 | 5 | 000 | 0 | 1986 | 8.10E-2 | 5.16E-3 | 1.34E-3 | 3.30E-6 | 1.14E-4 |
| 7 | 1103, | 507 | 1077, | 594 | 1.5 | 3 | 1 | 25 | 5 | 000 | 0 | 1986 | 8.70E-2 | 5.55E-3 | 1.44E-3 | 3.52E-6 | 1.22E-4 |
| 8 | 1076, | 594 | 1008, | 626 | 1.5 | 3 | 1 | 25 | 5 | 000 | 0 | 1986 | 7.20E-2 | 4.59E-3 | 1.19E-3 | 2.92E-6 | 1.01E-4 |
| 9 | 1006, | 625 | 941, | 601 | 1.5 | 3 | 1 | 25 | 5 | 000 | 0 | 1986 | 6.82E-2 | 4.35E-3 | 1.13E-3 | 2.77E-6 | 9.54E-5 |
| 10 | 942, | 602 | 717, | 466 | 1.5 | 3 | 1 | 25 | 20 | 000 | 0 | 1986 | 8.73E-2 | 6.92E-3 | 3.82E-3 | 1.02E-5 | 3.52E-4 |
| 11 | 717, | 466 | 346, | 453 | 1.5 | 3 | 1 | 25 | 30 | 000 | 0 | 1986 | 8.37E-2 | 7.62E-3 | 6.06E-3 | 1.44E-5 | 4.96E-4 |
| 12 | 346, | 454 | 50, | 484 | 1.5 | 3 | 1 | 25 | 35 | 000 | 0 | 1986 | 5.80E-2 | 5.62E-3 | 5.01E-3 | 1.16E-5 | 4.00E-4 |
| | | | | | | | | | | | | TOTAL | 1.01E00 | 8.30E-2 | 5.44E-2 | 1.30E-4 | 4.51E-3 |

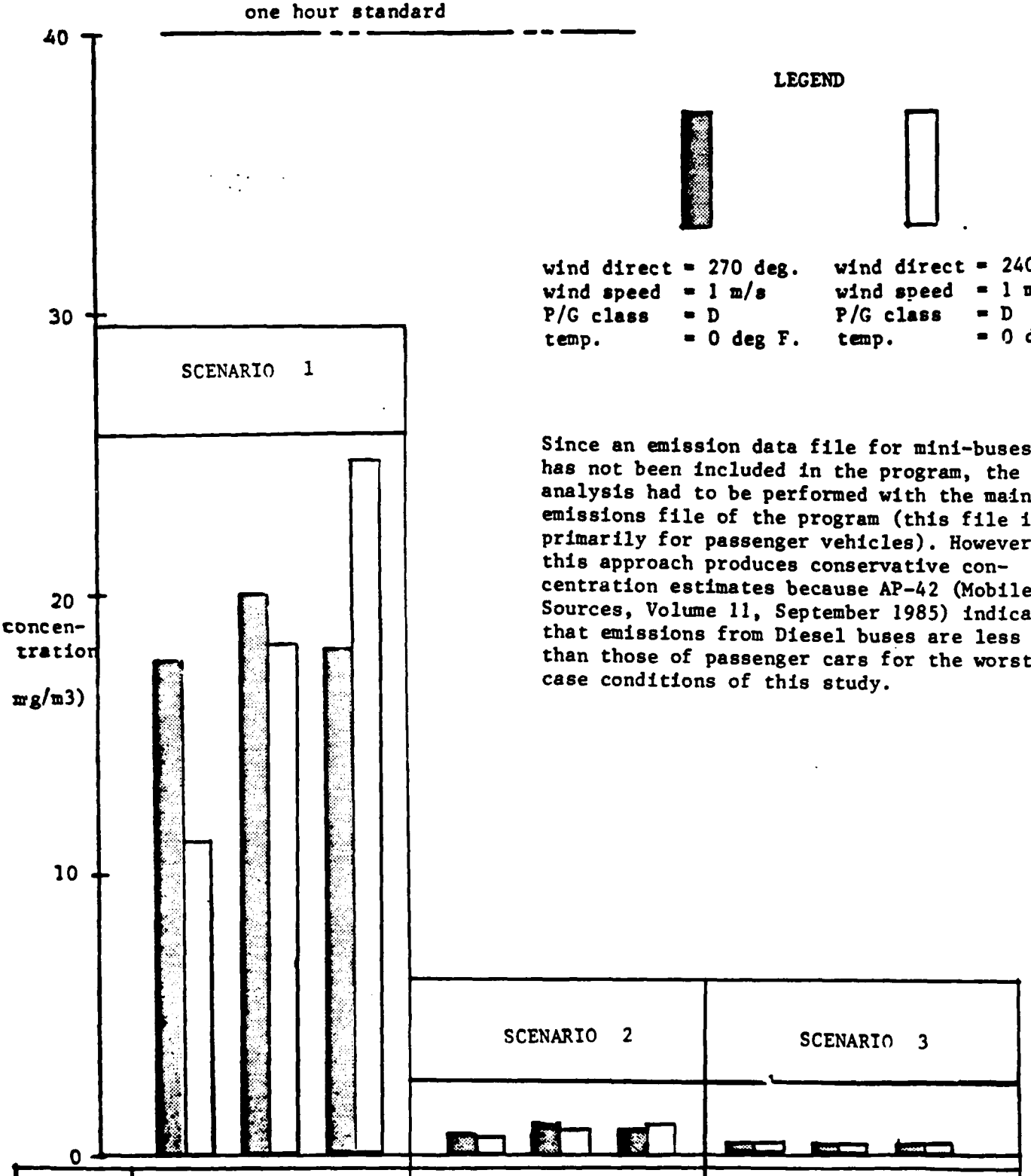
### DISPERSION REPORT

| INPUTS | | | | | | OUTPUT | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| DATE | HR | W/S M/S | WD DEG | P/G A=1 | RECEPTOR NO. | X | Y | CONCENTRATION GM/M^3 CO | HC | NOX | SOX | PART |
| JUN-23-86 | 14 | 1 | 240 | 4 | 1 | 1120 | 458 | 1.65E-4 | 1.21E-5 | 5.47E-6 | 1.42E-8 | 4.88E-7 |
| JUN-23-86 | 14 | 1 | 240 | 4 | 2 | 1109 | 564 | 2.74E-4 | 1.78E-5 | 5.14E-6 | 1.25E-8 | 4.33E-7 |
| JUN-23-86 | 14 | 1 | 240 | 4 | 3 | 1056 | 626 | 3.34E-4 | 2.19E-5 | 6.74E-6 | 1.67E-8 | 5.75E-7 |
| JUN-23-86 | 14 | 1 | 240 | 4 | 4 | 736 | 490 | 7.63E-5 | 6.95E-6 | 5.52E-6 | 1.31E-8 | 4.54E-7 |
| JUN-23-86 | 14 | 1 | 240 | 4 | 5 | 84 | 410 | 7.31E-5 | 6.67E-6 | 5.32E-6 | 1.26E-8 | 4.37E-7 |
| JUN-23-86 | 14 | 1 | 240 | 4 | 6 | 477 | 13 | 0.00E00 | 0.00E00 | 0.00E00 | 0.00E00 | 0.00E00 |
| JUN-23-86 | 14 | 1 | 240 | 4 | 7 | 489 | 278 | 1.34E-7 | 1.22E-8 | 9.70E-9 | 0.00E00 | 0.00E00 |

Figure 9

CARBON MONOXIDE POLLUTION FROM VEHICLES NEAR THE TERMINAL AT STAPLETON INTERNATIONAL AIRPORT

(worst case scenario)




Since an emission data file for mini-buses has not been included in the program, the bus analysis had to be performed with the main emissions file of the program (this file is primarily for passenger vehicles). However, this approach produces conservative concentration estimates because AP-42 (Mobile Sources, Volume 11, September 1985) indicates that emissions from Diesel buses are less than those of passenger cars for the worst case conditions of this study.

| RECEPTOR | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 |
|---|---|---|---|---|---|---|---|---|---|
| SOURCE | passenger plus ancillary vehicles | | | buses (south) | | | buses (north) | | |
| ACTIVITY | 1300 veh/hr. | | | 87 veh/hr. | | | 25 veh/hr. | | |

Figure 10

## REFERENCES

1. H. M. Segal; "Microcomputer Graphics in Atmospheric Dispersion Modeling"; Journal of the Air Pollution Control Association"; 23:6; June 1983

2. "Compilation of Air Pollution Emission Factors"; Volume II-Mobile Sources; AP-42 - Fourth Edition; Environmental Protection Agency-Motor Vehicle Emission Laboratory; Ann Arbor, MI.; September 1985

END

DTIC

8-86