United States
Environmental Protection
Agency

Region 7
324 East Eleventh St.
Kansas City, Mo. 64106

Air Branch

EPA 907/9-84-007
September 1984

PA

Carbon Monoxide

Final

Nonattainment Study For Wichita, Kansas

CARBON MONOXIDE NONATTAINMENT STUDY FOR WICHITA, KANSAS

by

PEDCo Environmental, Inc.
11499 Chester Road
Cincinnati, Ohio 45246-0100

Contract No. 68-02-3512
Work Assignment No. 73
PN 3525-73

Project Officer

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September 1984

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ACKNOWLEDGMENT

This report was prepared under the direction of Mr. Larry Hacker of the Air Branch of Region VII in Kansas City, Missouri. Mr. George Schewe of the PEDCo office in Cincinnati, Ohio, was the author under the direction of Mr. Keith Rosbury of the PEDCo office in Denver, Colorado. Additional assistance was provided by Mr. Joseph Carvitti on the traffic analysis and Mr. Jeffrey Winget in all computer simulations.

Also appreciated was the aid and assistance of Ms. Joyce Hart of the Wichita Metropolitan Area Planning Department and Messrs. William McKinley and Robert Mielke of the Wichita Department of Operations and Maintenance for the traffic data and information provided for downtown Wichita.

DISCLAIMER

This report was furnished to the United States Environmental Protection Agency by PEDCo Environmental, Inc., Cincinnati, Ohio 45246, in fulfillment of Contract Number 68-02-3512. The opinions, findings and conclusions expressed are those of the authors and not necessarily those of the Environmental Protection Agency or of cooperating agencies. Mention of company or product names is not to be considered as an endorsement by the Environmental Protection Agency.

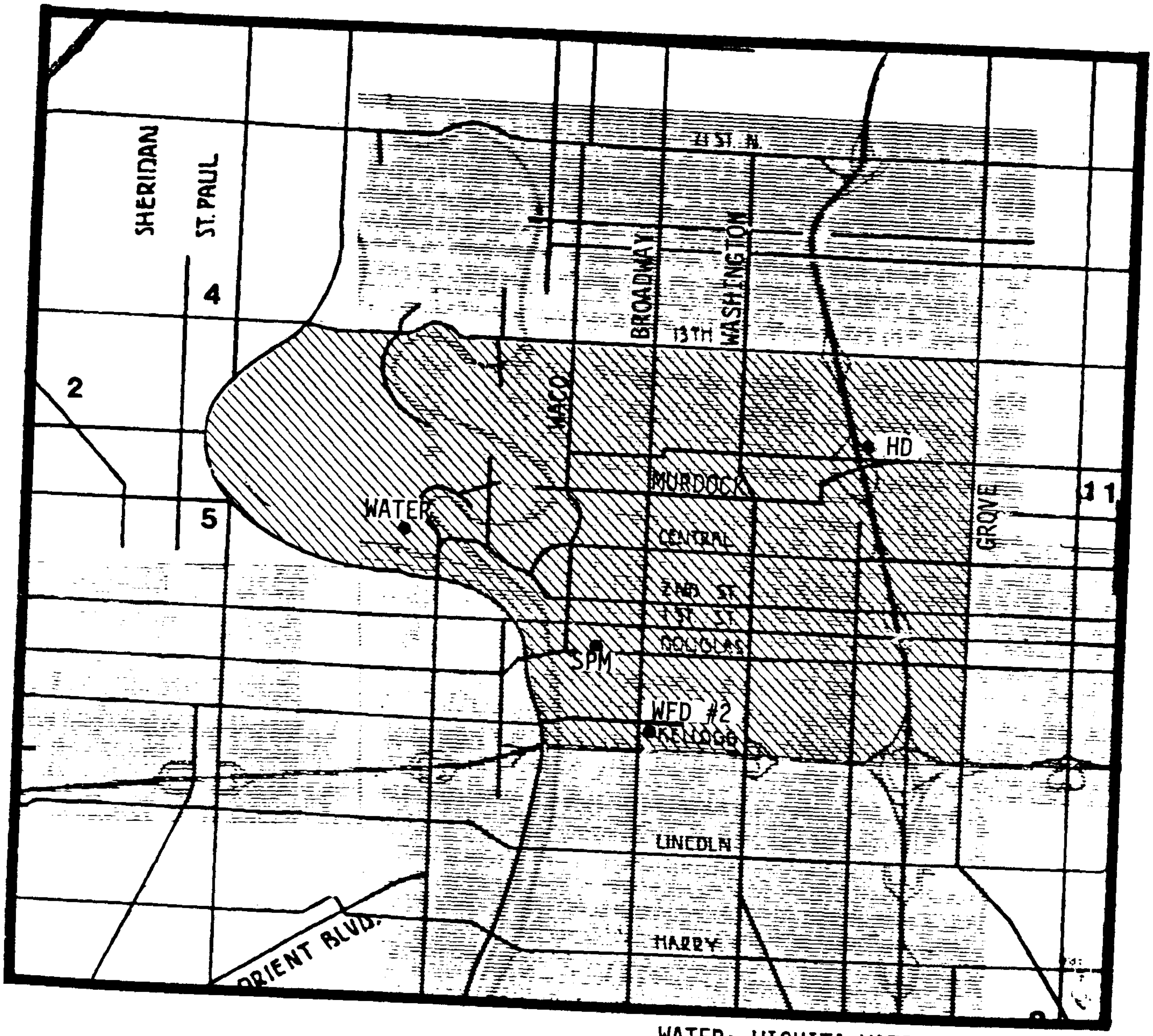
SECTION 1

INTRODUCTION

Two of the three existing carbon monoxide (CO) monitors near the central business district (CBD) of Wichita, Kansas, showed exceedances of the 8-hour National Ambient Air Quality Standard (NAAQS) during the period extending from 1974 to 1982. As a result, a fully-approved State Implementation Plan for CO was implemented in Wichita. Since 1982, no exceedances have been detected at either of these monitors (the Health Department or Fire Department No. 2). Because of these previous exceedances, however, a portion of Wichita was designated as a nonattainment area for CO (failing to meet the NAAQS for CO). EPA requested that the SIP be reviewed because they believed that CO violations were still occurring. These revisions should demonstrate both a reduction in CO emissions and a subsequent reduction in ambient CO concentrations. The nonattainment area is bounded by 13th Street on the north, Grove Street on the east, Kellogg on the south, and the Big Arkansas River on the west. Figure 1 shows this CO nonattainment area and the locations of the two permanent CO monitors.

In 1983, an additional CO monitor, a Special Purpose Monitor (SPM), was installed in the central business district (Figure 1) as a check on the attainment progress of the area. This monitor has shown exceedances of the 8-hour NAAQS, whereas the two permanent monitoring sites have not. The SPM site exceedances have all occurred on Friday or Saturday nights when vehicular traffic is heavy as a result of "cruising" by persons of high school and college age.

The Special Purpose Monitor, which is located at 111 West Douglas Street, has operated continuously since its installation.



WATER: WICHITA WATER PLANT
WFD #2: WICHITA FIRE DEPARTMENT NO.2
H.D.: HEALTH DEPARTMENT
SPM : SPECIAL PURPOSE MONITOR

Figure 1. Carbon monoxide nonattainment area and existing CO monitor in Wichita, Kansas.

This monitor meets the general guidelines for the horizontal and vertical placement of a CO probe (40 CFR 58, Appendix E). The following shows these guidelines versus the SPM siting:

- Distance from edge of nearest traffic lane

  Guideline - 2m to 10m
  SPM - 3.05m

- Distance from intersection street corridor

  Guideline - minimum of 10m
  SPM - 27.4m

- Vertical placement

  Guideline - 3 ± 0.5m
  SPM - 3.05m

The only notable difference between the actual SPM site and the recommended siting is the distance from the intersection. The guidelines strongly recommend a midblock location of CO monitors in downtown areas rather than near intersections. The SPM site is much closer to the intersection of Main and Douglas Streets than to midblock.

For the area in question to be able to show attainment, the Wichita implementation plan must be revised to demonstrate that concentrations of CO at the SPM will be less than the NAAQS by 1987. This analysis allows for any transportation control measures (TCM's) that have already affected traffic flow and/or CO emissions in the nonattainment area. For example, the 1987 analysis considers the impact of the projected Federal Motor Vehicle Control Program on CO emissions.

The plan to demonstrate attainment by 1987 includes detailed dispersion modeling, which first compares existing monitored CO concentrations with estimated values (model evaluation) and then estimates the 1987 CO concentrations. The following sections describe the dispersion modeling, emissions estimates, and the resulting CO concentration projections, both for the SPM site and for an alternative site (in an attempt to establish a CBD site that is not directly affected by the cruising phenomenon).

SECTION 2

AMBIENT CO CONCENTRATIONS

2.1 AMBIENT CO LEVELS

Concentrations of CO at the SPM site exceeded the 8-hour NAAQS (10 mg/m^3) a total of 10 times in 1983 and have exceeded it once thus far in 1984. Table 1 shows these concentrations and when they occurred. As shown, the noncomplying concentrations are well distributed throughout the year and have ranged from 10.2 mg/m^3 to 12.2 mg/m^3. The distribution of values is very atypical (e.g., one would expect to find the maximum 8-hour value in one of the winter months, whereas it occurred in August). This distribution indicates that either the meteorological conditions or variations in traffic volumes and patterns (or both) may have offset the normal variation in CO emissions, which are temperature-dependent. Urban background CO concentration (the concentrations against which all dispersion modeling calculations were compared) also may have varied.

TABLE 1. CONCENTRATION OF CO EXCEEDING THE 8-HOUR NAAQS AT THE WICHITA SPECIAL PURPOSE MONITOR

Eight-hour concentration, mg/m^3	Ending day, date	Ending hour
11.0	Sunday, 1-16-83	3 a.m.
10.5	Friday, 3-4-83	12 p.m.
11.1	Friday, 4-15-83	12 p.m.
10.7	Saturday, 7-23-83	1 a.m.
10.8	Sunday, 7-24-83	3 a.m.
12.2	Saturday, 8-6-83	4 a.m.
11.5	Saturday, 9-3-83	3 a.m.
10.2	Saturday, 10-8-83	1 a.m.
11.6	Sunday, 10-16-83	3 a.m.
11.8	Saturday, 10-29-83	1 a.m.
11.0	Sunday, 1-8-84	4 a.m.

Examination of attendance records at the nearby Century II Convention Center indicated that events occurred on 8 of the 11 dates with high CO concentrations. The attendance per event ranged from a minimum of 500 persons to 3300 persons, who arrived and departed over a limited time span, i.e., immediately before and after the event. An examination of the 8-hour periods of high concentrations shows that no single hour of measurements could be associated with attendance at a Century II event and that the concentrations were high over a longer period of time than expected with an influx of traffic for a particular event.

Based on the assumption that ambient concentrations are not directly related to Century II activities alone, it was further assumed that nighttime street cruising (observed visually and appearing in street counts) was a primary contributor to the high ambient CO concentrations.

2.2 IMPACT OF 1979 CO CONTROL STRATEGY

In 1979 an SIP for CO was implemented in Wichita. As of May 31, 1984, 11 transportation control measures (TCM's) had been committed.

1. Voluntary I/M
2. Improved traffic flow - Grove Street
3. Improved traffic flow - 1st/2nd Street Bridge
4. Improved traffic flow - 2nd Street
5. Transit - 26 new buses
6. Rideshare program
7. Alternate fuel use in county, city and school vehicles
8. Transit service improvements
9. Signal improvements
10. On-street parking restrictions, Phase I--not implemented
11. On-street parking restrictions, Phase II--not implemented

Since 1982 no exceedances of the CO NAAQS have been detected at the three permanent CO monitoring sites (see Figure 1). This improvement can possibly be attributed to the implementation of the first nine TCM's. Of concern in this analysis, however, is the SPM site that continued to have exceedances of the 8-hour

NAAQS. Of all the TCM's proposed in the SIP, only the voluntary I/M Program will have an effect on the late-night cruising phenomena. Other TCM's are primarily effective during peak-hour periods in the morning and afternoon.

SECTION 3

MODELING METHODOLOGY

3.1 OVERVIEW

The basic modeling methodology used in this analysis combines the use of Mobile-3 emission factors (EPA-460/3-84-002, Ann Arbor, Michigan, June 1984) with the CALINE-3 highway dispersion model (FNWA/CA/TL-79/23, Sacramento, California, November 1979) into a microscale analysis. Because the emission factors estimated by MOBILE-3 are given per vehicle (moving) and per vehicle-minute (idling), traffic volumes, speeds, queuing lengths, and delay times were also calculated or estimated. Inputs to the MOBILE-3 program include temperature, inspection/maintenance parameters, cold/hot start percentages, year of analysis, vehicle speed, vehicle class mix, and model year distribution within each vehicle class.

Source characterization consists of dividing nearby roadways and intersections into individual through and queuing links. Because this is primarily a microscale analysis (only the intersection and midblock streets in the immediate vicinity are modeled; all other contributions are considered urban background), the CO concentrations reflect small changes in traffic volumes and flow.

One-hour dispersion modeling of specific events is very difficult given the uncertainty in emissions, source characteristics, vehicle movement, and the complex flow of the downwind roadway plumes. Rather than attempting to use Wichita airport meteorological data, worst-case conditions were assumed with a varying wind-roadway angle. The worst-case one-hour CO concentrations (including background) were converted to 8-hour estimates by using a persistence factor of 0.7 (as recommended by

Volume 10, EPA-450/4-77-001, October 1977). This factor includes some implicit meteorological variability and permits comparison with the 8-hour measured CO concentrations. (Further detail regarding modeling procedures are given Subsection 3.2.)

3.2 TRAFFIC AND STREET CHARACTERIZATION

The Wichita Department of Operations and Maintenance provided 1983 traffic counts and signal cycle timing for the streets and intersections near the SPM site. (The signal and phase timing represents the most up-to-date signalization used in the downtown area.) The average daily traffic (ADT) counts for the downtown area (shown in Figure 2) indicate that the intersection at Main and Douglas has high traffic volumes on all four legs.

Hourly traffic distribution taken on July 13 and 14, 1984, from the permanent traffic counter on Main Street (just south of Douglas) and from a temporary counter located on Douglas (just west of Main) confirms the high traffic volumes associated with late-night cruising. Traffic counts during the period from 8:00 p.m. to 2:00 a.m. are often greater than 50 to 60 percent of the weekday peak hour (which normally occurs from 5:00 to 6:00 p.m.), and on Saturday the counts are greater than for any individual daytime hour. Appendix A shows the individual hourly traffic counts used for the analysis of the streets near the SPM site and for the proposed CO monitor site.

The expected growth in vehicle miles traveled (VMT) was used to estimate the potential growth in traffic volumes on each street. These estimates (made by KDOT with a travel demand model in a March 1980 dispersion modeling study of vehicle miles traveled in Wichita in 1982 and the year 2000) were used with a straight-line approximation to estimate the growth rate from 1983 to 1987. The resulting growth rate of 1.0639 was used to estimate 1987 through-traffic volumes on all streets modeled. No growth projections were made for queuing traffic volumes (they

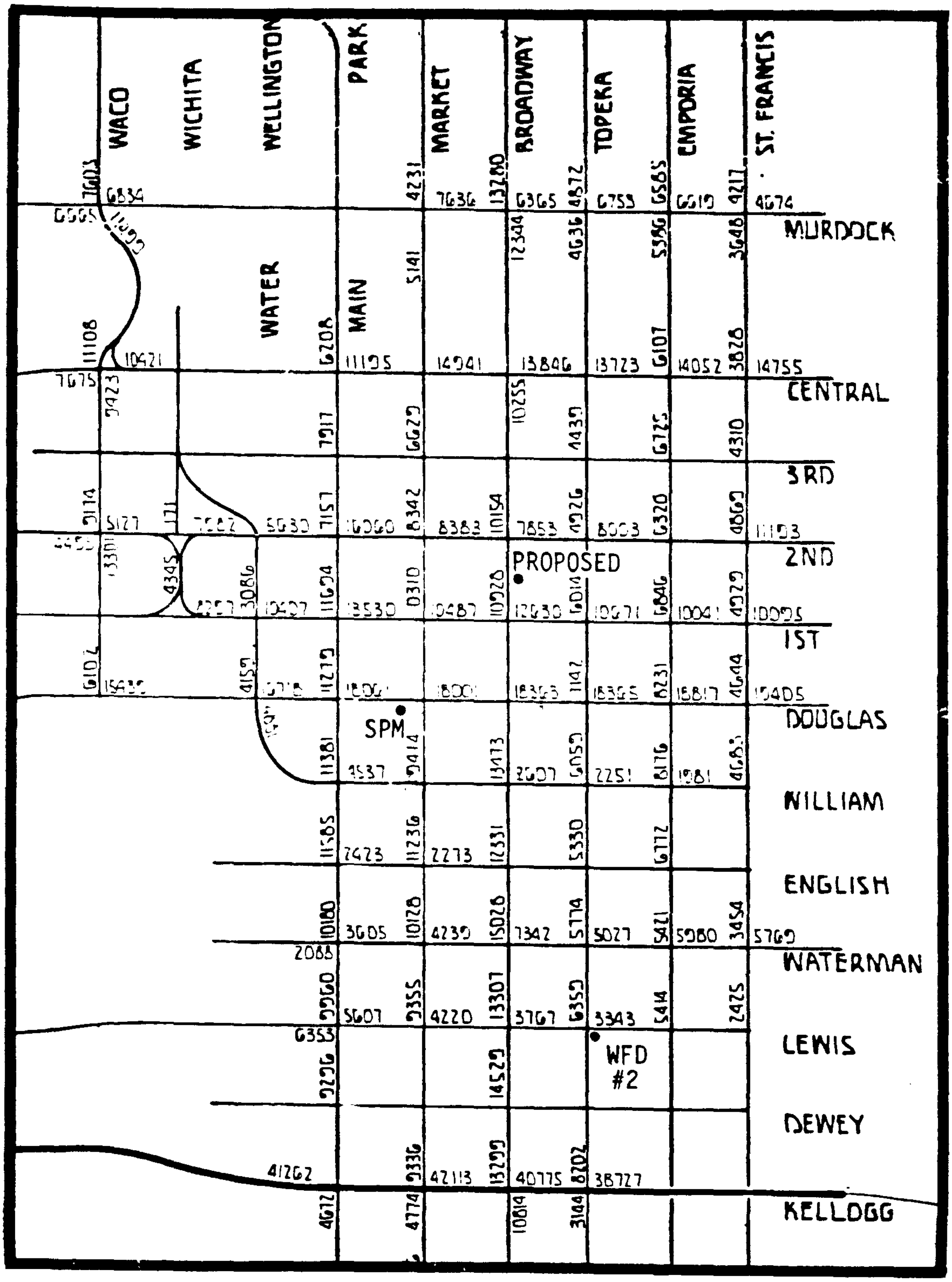


Figure 2. Average daily traffic volumes for streets in the vicinity of the SPM and WFD No. 2 monitoring sites.

are calculated for the purpose of estimating total queue emissions). The assumption made throughout this analysis is that the projected vehicular volumes will not exceed street capacities and that queue lengths will not change significantly.

Each leg of the intersection(s) was divided into smaller links as appropriate. These model links represented traffic traveling through the intersection at representative speeds. They also represented vehicle queues where appropriate. If a left-hand turn lane had vehicles left over from a green light cycle, or if differences arose between queuing in different lanes, more links were used to simulate the intersection leg. (Individual links are described in subsequent chapters.)

3.3 CO EMISSION CHARACTERIZATION

Emissions from a vehicle traveling through an intersection or street without experiencing delay were calculated directly by MOBILE-3. For queuing vehicles, the idling CO emissions calculated by MOBILE-3 were combined with the approximate vehicle length (4.35 m/veh) to determine the emissions per unit length per second per lane. This information combined with the number of lanes and the delay in each queue yields a total emission estimate for the queue. For inputing this emission estimate into the CALINE-3 model (which requires both an emission rate and vehicle count), an arbitrary emission rate of 100 g/mi was set. Based on the total emissions and 100 g/mi, a vehicle-per-hour count was estimated for use in CALINE-3.

The use of the MOBILE-3 emissions model is dependent on a number of factors, each of which is discussed in the following subsections.

3.3.1 Year of Analysis

For this modeling analysis, CO emissions were estimated for 1983 and 1987. The 1983 estimates were made to correspond with the year of most of the 8-hour CO violations at the special purpose monitor. The purpose of the 1987 estimates was to estimate the CO emissions (and related ambient air quality impacts) for the year when attainment must be demonstrated.

3.3.2 Route Speeds

Estimates were made for route speeds of 10, 15, 20, and 25 miles per hour, which correspond with speeds estimated for the streets and intersections in the subject analysis.

3.3.3 Vehicle Mix

The MOBILE-3 default mix of vehicle types is not applicable for analysis of the SPM site because of the late-night period and nature of the cruising phenomenon. In a previous modeling study (Wichita Carbon Monoxide Dispersion Modeling Study, Update, October 1981), the Kansas Department of Transportation suggests the following vehicle mix for arterial and collector streets:

LDV	LDT1	LDT2	HDG	LDDV	LDDT	HDD	MC
0.777	0.089	0.089	0.030	0.0	0.0	0.010	0.005

Because heavy-duty vehicles were not observed during cruising periods, these percentages were redistributed to the LDV, LDT, and LDD classes, and the following distribution was used in this analysis for Main and Douglas Streets:

LDV	LDT1	LDT2	HDG	LDDV	LDDT	HDD	MC
0.797	0.094	0.094	0.0	0.01	0.0	0.0	0.005

These distributions were used in both the base year (1983) and projection year (1987) analyses.

For the alternate intersection analysis and proposed monitoring site, the KDOT vehicle mix was assumed to be representative of peak hour traffic (peak hour was modeled as the worst case because the cruising pattern is such that cruising does not affect this site).

3.3.4 Vehicle Registrations

The vehicle age distribution observed by PEDCo during a Friday night cruising period (July 13-14, 1984) was skewed toward somewhat older vehicles. The effect of this was accounted for by adjusting the national average mix in MOBILE-3 for LDV and LDDV classes. The adjustment involved moving the age of 10 percent of the vehicles back 2 years each year starting with the current year. This resulted in fewer new cars on the downtown Wichita streets during the late-night periods.

The national averages of vehicle registrations for the proposed monitor locations during peak-hour traffic were believed to be representative and were used in the MOBILE-3 calculations. These vehicle registrations were used in both the base year (1983) and projection year (1987) analyses.

3.3.5 Vehicle Mileage Accrual Distributions

Because of the lack of local information, the national averages contained in the MOBILE-3 model were used for vehicle mileage accrual distributions for both the base year and projection year emission calculations.

3.3.6 Ambient Air Temperatures

Temperatures are discussed under meteorological considerations; however, because CO emissions are a direct function of ambient temperature, they are summarized here. Two cases (January and July) are reviewed and analyzed for both the baseline and projection years. In an attempt to correlate the modeled and measured CO concentrations, average temperatures were documented during selected high CO events. Temperatures for each 8-hour period were taken from Local Climatological Data, Wichita, Kansas, 1983. During the period January 15-16, 1983, the average temperature was 24°F; during the August 5-6, 1983, period (the maximum in 1983), the average temperature was 80°F. These two average temperatures were used in both the baseline and projection year analyses.

3.3.7 Cold Start/Hot Start Percentages

In the absence of local data to support specific cold- and hot-start percentages, the following Federal Test Procedure percentages were used, as specified in the MOBILE-3 user manual:

20.6 percent cold start of noncatalyst LDV
27.3 percent hot start of catalyst LDV
20.6 percent cold start of catalyst LDV

These values were used in both the baseline and projection year calculations.

3.3.8 Inspection/Maintenance Credits

The city of Wichita currently conducts a voluntary inspection/maintenance (I/M) program. A total of 68,777 cars were tested from April 1981 to June 1984. Because the program is voluntary, it is difficult to assess the overall pass/fail percentage (i.e., stringency level) within the context of the entire Wichita vehicle fleet. Even though the fail rate in 1983 was 35.4 percent,* only 1954 of the 5513 cars that failed returned for a retest. Of these, 785 failed a second time. The effect of voluntary inspection, therefore, was to have 1169 vehicles repaired, which represents a 7.5 percent stringency level. The lowest stringency level option available in MOBILE-3 is 10 percent, which was selected as representative of Wichita's voluntary program, given the other uncertainties in projecting the program on the overall vehicle fleet.

Only the LDV class was assumed to be affected by I/M. The idling test at the 3 percent CO/300 ppm HC level was assumed to be in effect. These assumptions were used for both the baseline and projection year analyses.

3.4 METEOROLOGY

Inasmuch as event-by-event modeling of specific CO measurements is nearly impossible because of uncertainties in the emissions, traffic, and meteorology at a particular site, a worst-case modeling analysis was performed in an attempt to model the

*Wichita TCM Summary, July 13, 1984, in a letter from Robert Eye, Kansas Department of Health and Welfare, to Carl Walker, EPA Region VII.

maximum concentrations of CO. Rather than use specific airport meteorological data, which might not be totally representative of the urban core, and because site-specific data were unavailable, worst-case conditions modified by local measurements were applied. For most of the dates showing high CO concentrations at the SPM, the local climatological summaries from the airport and from the Wichita Health Department indicated windspeeds of about 1.5 m/s or greater. Only for the August 5-6, 1983, exceedance did windspeeds measure about 1 m/s. Thus, a windspeed of 1.5 m/s is used for the January analysis, and 1.0 m/s for the July analysis.

Other conditions include a mixing height of 100 meters (conservative nighttime mixing height), neutral stability class (4) for the urban area, and multiple wind angles at 10 degree intervals. An 8-hour average to 1-hour average ratio of 0.7 was used as a persistance factor throughout the analysis.

3.5 CALINE-3 MODEL

The CALINE-3 Model was used to simulate the dispersion of CO emission plumes from vehicles on roadways. Each roadway was broken into through traffic links and queuing vehicles as appropriate. The coordinates and the width of each link were input to the model. All links near the SPM and proposed monitor sites were modeled coincidentally to obtain a total roadway impact as well as to ascertain each link's contribution to the total concentration. Traffic volumes of all through vehicles and MOBILE-3 emission factors were used for each through link. Volumes and emissions for 1983 were input for the base year, and growth-adjusted volumes and MOBILE-3 projected emissions were input for 1987. Queue-link traffic volumes were adjusted to reflect idling CO emissions projected by MOBILE-3 for 1987.

Deposition and settling velocities were assumed to be 0.0 because CO is a gaseous emission. The averaging time was 60 minutes. A surface roughness of 321 cm is assigned to the analysis area, which is consistent with the CALINE-3 guidance for surface roughness for a central business district. The coordinates and the vertical displacement of the SPM site and the proposed site were input as appropriate. Meteorological conditions were assigned as discussed in Section 3.4. Background concentrations are discussed in Section 3.6.

Results obtained from the CALINE-3 Model were given as 1-hour CO concentrations in parts per million. For calculation of the 8-hour concentrations (in mg/m^3), the 1-hour values (in ppm) were divided by a conversion factor of 0.875 and multiplied by the 1-hour to 8-hour persistence factor of 0.7.

3.6 URBAN BACKGROUND CONCENTRATIONS

Because the SPM site and the proposed monitoring site are both located in an urban area and because the extent of the analyses described herein is microscaled spatially and temporally (only nearby roadways are considered), the background concentration must reflect the overall CO concentrations in what is termed an urban background. This type of background must reflect much more than just the natural background; it must also reflect the upwind contributions from other CO sources in the area during the same time period.

Examination of the three permanent monitor sites shown in Figure 1 and the average wind direction during high CO concentrations at the proposed new SPM site (generally from the south) indicates that the Wichita Fire Department No. 2 (WFD No. 2) CO monitor may be appropriate to serve as an urban background site. This site is near the intersection of Lewis and Topeka, about four blocks south and three blocks east of the SPM site. It is far enough from the urban core and from major thoroughfares to prevent the monitor from being subject to high direct CO impacts from any major roadway. The WFD No. 2 monitor is also generally upwind of the SPM site during high CO periods, and it is nestled in an area that is impacted by a major portion of the CO emissions in Wichita.

For the purpose of this analysis, the CO concentrations at the WFD No. 2 monitor were the best suited to represent urban background concentrations. The highest concentrations during each of the analysis months (January and July) were selected on the basis of the highest value for the season (which included any exceedance periods in December, January, and February and June, July, and August). Table 2 presents the selected WFD No. 2 concentration and its 1-hour counterpart in parts per million for input to the CALINE-3 Model for both 1983 and 1987. A 1987 background concentration of CO was obtained by adjusting the measured 1983 values by multiplying them by the VMT growth rate (1.0639) and by the approximate 1983 to 1987 MOBILE-3 emission ratio (0.75). (At speeds varying from 10 to 25 miles per hour, the ratio actually varies from about 0.7 to 0.73; the factor of 0.75 was chosen to provide a conservative estimate.)

TABLE 2. URBAN BACKGROUND CONCENTRATIONS AS DERIVED FROM WFD No. 2

Month of analysis	Date of measurement	8-hour concentration, mg/m^3	1-hour concentration, ppm	1983 1-hour background concentration, ppm	1987 8-hour background concentration, ppm
January	1-16-83	2.6	3.7	3.3	2.8
July	8-6-83	1.2	1.7	1.5	1.2

SECTION 4

ANALYSIS OF THE SPECIAL PURPOSE MONITOR

As shown in Figure 3, the special purpose monitor is located at 111 West Douglas Street, near the intersection of Main and Douglas Streets. The approximate route of the late Friday and Saturday night cruising is also shown in this figure. Traffic moves in both directions on Douglas Street. The loop for the return trips from the west are to proceed south on Main and around Century II Drive or north on Water, east on 1st, and south on Main. The east return loop is made by going south on St. Francis, west on William, and north on Emporia.

Onsite observations (on the evening of July 13, 1984) indicated heavy congestion in both directions on Douglas Street. The heaviest congestion was in the center lanes next to the median. Of primary concern in this analysis is the impact of the intersection at Main and Douglas on the SPM site. With this in mind, queuing vehicles were also observed during this period. Table 3 presents the results for each leg of the intersection (Main and Douglas). This table also shows the number of vehicles selected for this analysis as being representative of each queue and the estimated queue length for each lane.

The intersection at Main and Douglas was modeled to estimate the impact of CO emissions on the Special Purpose Monitor. Figure 4 shows the roadway configuration and the location of the SPM. Each leg of the intersection was broken into through and queue roadway links. Queuing vehicles were represented by short

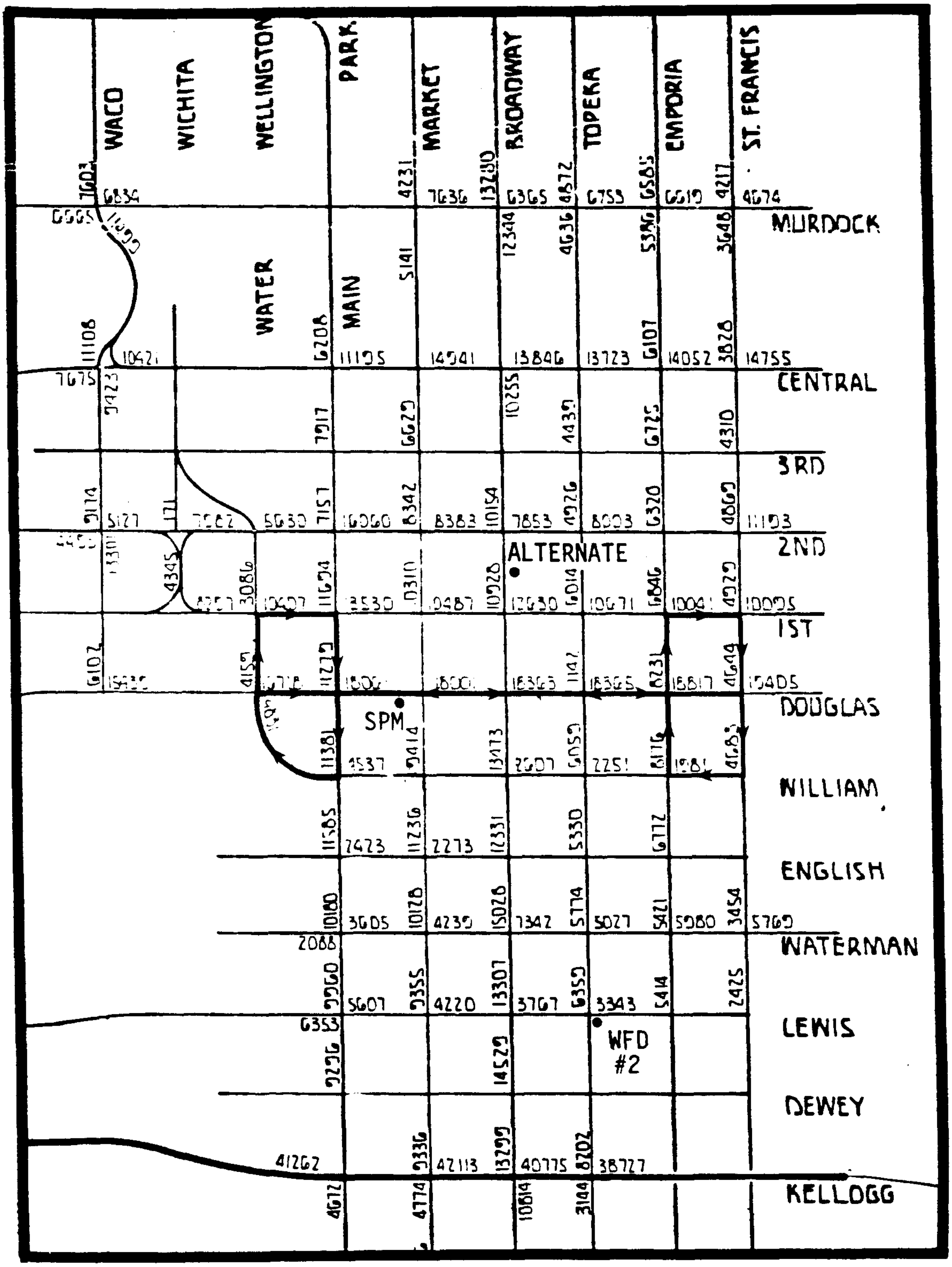


Figure 3. Location of SPM site and approximate route of Friday and Saturday night street congestion and dragging.

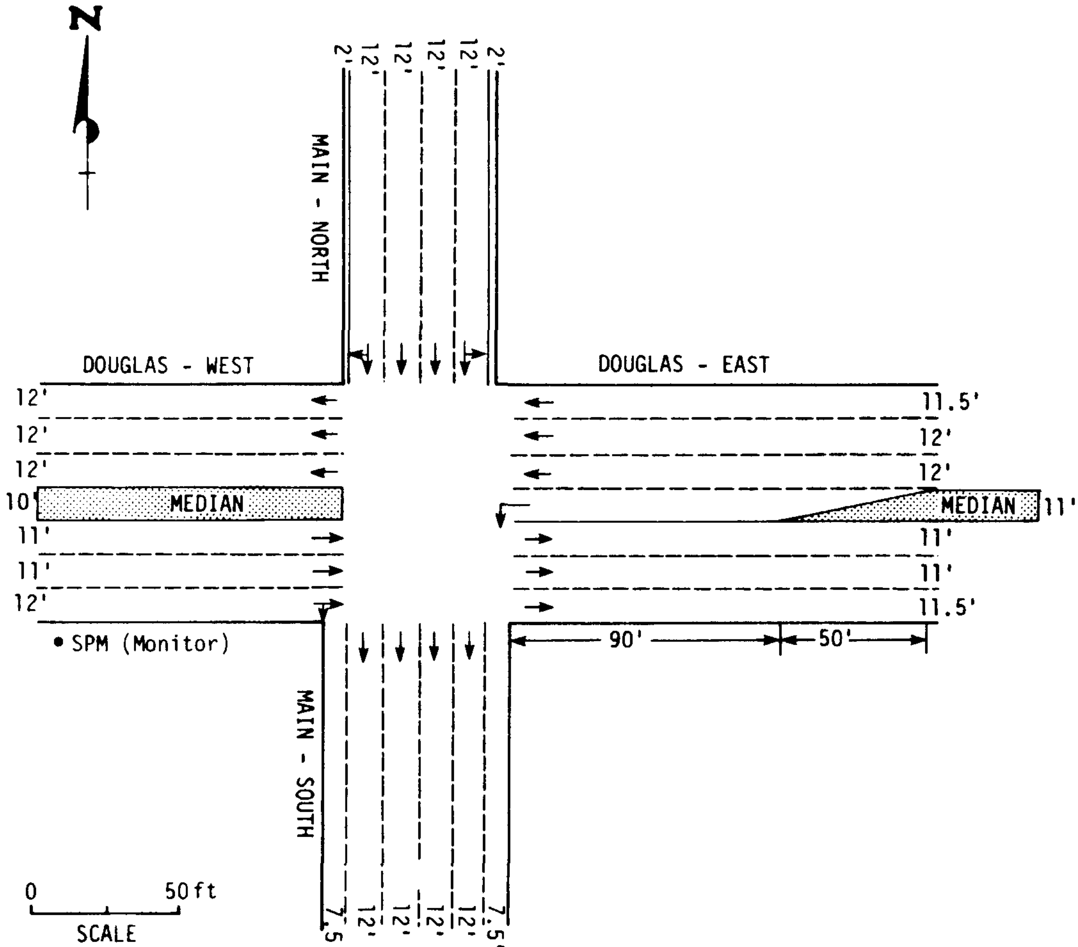


Figure 4. Intersection at Main and Douglas in Wichita showing traffic direction and the location of the Special Purpose Monitor.

TABLE 3. QUEUE ANALYSIS FOR THE INTERSECTION AT MAIN AND DOUGLAS

Intersection leg	Lanes	Cars in queue	Modeled queue number	Modeled queue length, m
Main, north	3 west	1-5	3	13.1
Main, north	1 left turn	10-15	12	52.2
Main, south	No queue			
Douglas, east				
westbound	2 west	1-5	3	13.1
	1 left	12-16	15	65.4
eastbound	Near median	30-40	38	165.0
Douglas, west	Near median	10-13	12	52.3
eastbound	Center	6-8	7	30.5
	Right turn	1-3	2	8.7

links equal in length to those described in Table 4. Where vehicles moved from one queue to a subsequent queue (i.e., were delayed more than one total signal cycle), additional end-to-end links were constructed. These are shown along with x and y coordinates in Figure 5, where the center of the intersection is considered to be the center of the coordinate system (0,0).

In a like manner, the through traffic was characterized by links extending into the intersection and arbitrarily assigned a length of 300 m. Figure 6 shows these links and the end coordinates of each link.

The signal cycle time for the intersection is 60 seconds during the off-peak hours when the cruising occurs. The green light at Main Street lasts 25.2 seconds. Westbound left-turning and through traffic on Douglas has a green light for 34.8 seconds (9 seconds for left turns) and eastbound Douglas traffic has 25.8 seconds of green light.

Vehicle counts for the streets were obtained from a permanent monitor located on Main Street south of the intersection (assumed to be applicable to both the north and south legs because the ADT on both legs is nearly identical; see Figure 2). Traffic volumes for Douglas were obtained from ADT averages and from a temporary

TABLE 4. LINK CHARACTERISTICS AND ESTIMATED CO EMISSIONS AT 24°F FOR MAIN AT DOUGLAS

Link	Identification	Type	Speed, mph	Number of lanes	Year	Delay time, s	Delay time, %	Emission rate, μg/m-s per lane	Emission factor, g/mi	Traffic volume, vph[a]
A	Main N-5B	Through	25	4	1983	NA	NA	NA	49.68	668
					1987	NA	NA	NA	36.49	711
B	Main S-5B	Through	25	4	1983	NA	NA	NA	49.68	668
					1987	NA	NA	NA	36.49	711
C	Doug W-WB	Through	20	3	1983	NA	NA	NA	62.17	554
					1987	NA	NA	NA	45.97	589
D	Doug E-WB3	Through	10	3	1983	NA	NA	NA	112.25	599
					1987	NA	NA	NA	79.13	637
E	Doug W-WB2	Through	10	2	1983	NA	NA	NA	112.75	599
					1987	NA	NA	NA	79.13	637
F	Doug W-EB	Through	15	3	1983	NA	NA	NA	79.92	572
					1987	NA	NA	NA	58.64	609
G	Main E-EB	Through	10	2	1983	NA	NA	NA	112.75	618
					1987	NA	NA	NA	79.13	658
H	Main N,L1-3	Queue	NA	3	1983	34.8	0.58	67,468	100.0	3909
					1987	34.8	0.58	50,401	100.0	2920
I	Main N, L4	Queue	NA	1	1983	34.8	0.58	22,489	100.0	1303
					1987	34.8	0.58	16,800	100.0	973
J	Doug E, L2-3	Queue	NA	2	1983	25.2	0.42	32,571	100.0	1887
					1987	25.2	0.42	24,332	100.0	1410
K	Doug E, left-1	Queue	NA	1	1983	51.0	0.85	32,959	100.0	1910
					1987	51.0	0.85	24,621	100.0	1426
L	Doug E, left-1,2B	Queue	NA	1	1983	60.0	1.00	38,775	100.0	2247
					1987	60.0	1.00	28,966	100.0	1678
M	Doug E, left-2B	Queue	NA	1	1983	60.0	1.00	38,775	100.0	2247
					1987	60.0	1.00	28,966	100.0	1678
N	Doug W, left-3	Queue	NA	1	1983	34.2	0.57	22,102	100.0	1281
					1987	34.2	0.57	16,511	100.0	957
O	Doug W, left-2	Queue	NA	1	1983	34.2	0.57	22,102	100.0	1281
					1987	34.2	0.57	16,511	100.0	957
P	Doug W, left-1	Queue	NA	1	1983	34.2	0.57	22,102	100.0	1281
					1987	34.2	0.57	16,511	100.0	957
Q	Doug E, left-5	Queue	NA	1	1983	60.0	1.00	38,775	100.0	2247
					1987	60.0	1.00	28,966	100.0	1678
R	Doug W, left-3 ext.	Queue	NA	1	1983	60.0	1.00	38,775	100.0	2247
					1987	60.0	1.00	28,966	100.0	1678

[a]vph = vehicles per hour.

	X_1	Y_1	X_2	Y_2
Link H	-1.8	14.2	-1.8	27.3
Link I	5.5	14.2	5.5	66.4
Link J	9.6	7.0	22.7	7.0
Link K	9.6	1.7	31.4	1.7
Link L	31.4	1.7	53.2	5.2
Link N	-9.6	-1.68	-48.8	-1.68
Link O	-9.6	-5.02	-40.1	-5.02
Link P	-9.6	-8.53	-18.3	-8.53
Link M	53.2	5.2	75.0	5.2
Link Q	22.7	-1.68	150.	-1.68
Link R	-48.8	-1.68	-61.9	-1.68

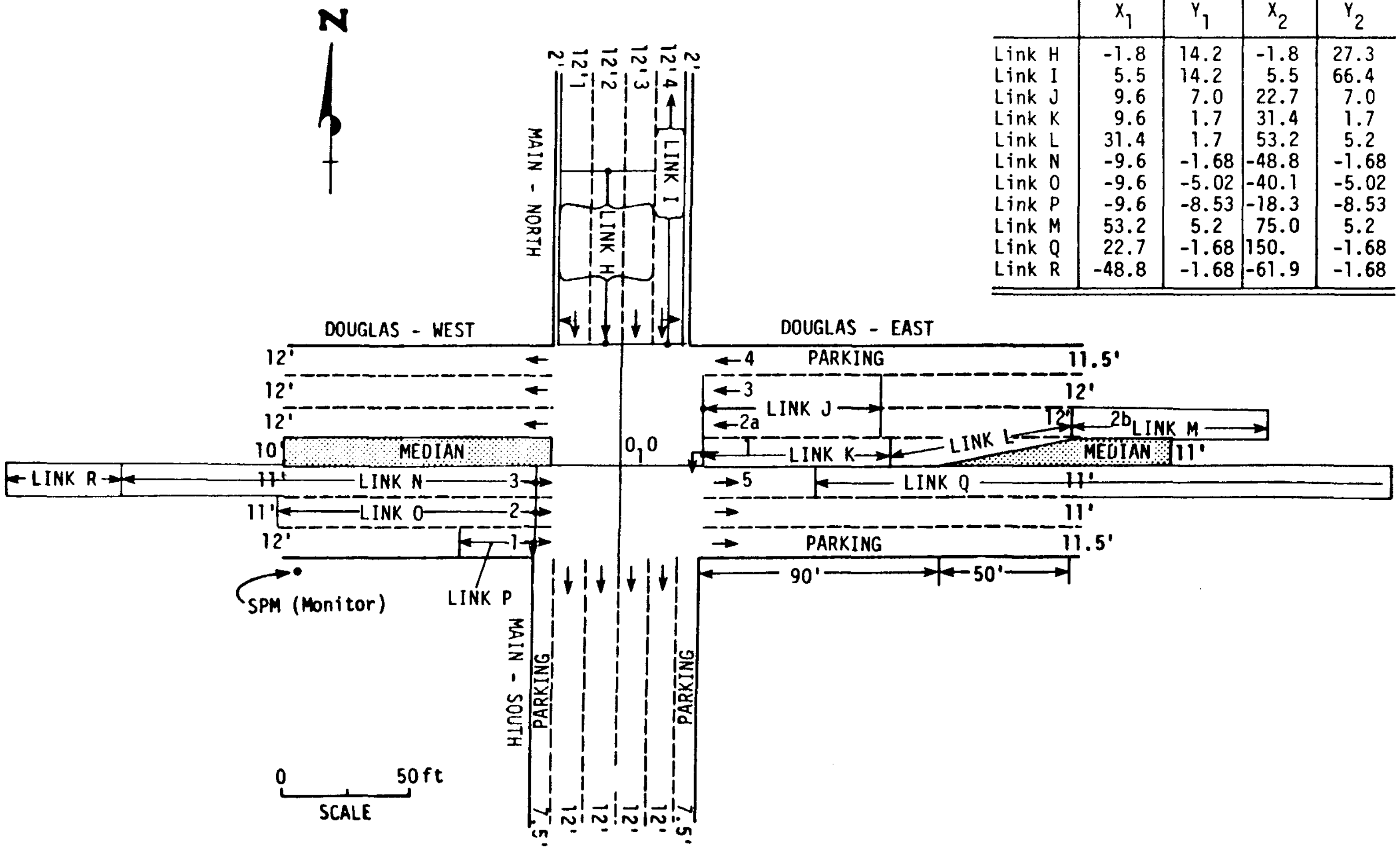
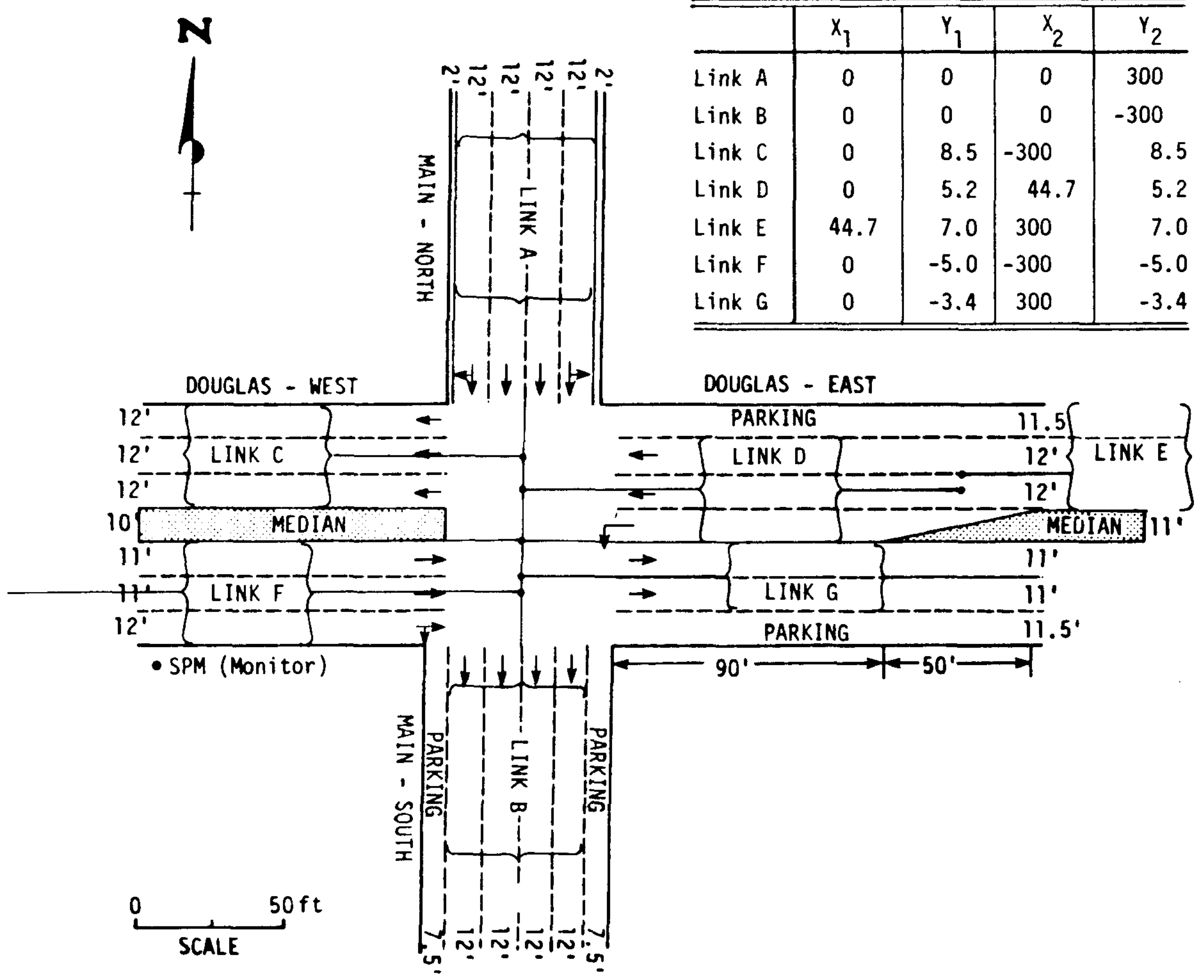


Figure 5. Queue link layout at the intersection of Main and Douglas.



	X_1	Y_1	X_2	Y_2
Link A	0	0	0	300
Link B	0	0	0	-300
Link C	0	8.5	-300	8.5
Link D	0	5.2	44.7	5.2
Link E	44.7	7.0	300	7.0
Link F	0	-5.0	-300	-5.0
Link G	0	-3.4	300	-3.4

Figure 6. Through roadway link layout at the intersection of Main and Douglas.

counter placed on the western leg of Douglas from July 13, 1984 to July 15, 1984. Volumes on the east leg were estimated by adjusting the east leg volumes by the ratio of the ADT for the east leg and west leg (east leg ADT = 18061; west leg ADT = 16,718; ratio = 1.08). In all cases the traffic volumes between the hours of 8:00 p.m. and 4:00 a.m. were reviewed, and the peak-hour traffic was selected for analysis regardless of whether the hours coincided.

Each link was characterized according to EPA Region I Mobile Source Modeling Procedures, which include the queuing link analysis as outlined here and in Section 3.3 for idling emission consideration. (See Appendix for an example calculation.) Tables 4 and 5 present the individual link characteristics for both a January and July modeling analysis, respectively, for 1983 and 1987. The inclusion of growth rates and temperature-dependent CO emission factors is evident in the tables.

The selected meteorological conditions were a 1.5 m/s windspeed for January and 1.0 m/s for July, neutral stability, and a 100-m mixing height. Wind direction was varied from 270 degrees (from the west) to 90 degrees (from the east) in 10-degree intervals from west to north back to east.

Background concentrations were assigned to the CALINE-3 modeling as described in Section 3.6.

Table 6 presents the results of this 1983 worst-case 1-hour CO analysis at the SPM site in parts per million. These values are much lower than the 1-hour NAAQS (35 ppm). The highest concentrations occurred with winds from 70 degrees (east northeast). The maximum 1-hour CO concentrations were 13.4 ppm in January 1983 and 13.9 ppm in July 1983. Conversion of these values to milligrams per cubic meter (by dividing by 0.875) and to 8-hour averages (by multipling by 0.7) yields maximum 8-hour concentrations of 10.7 mg/m^3 and 11.1 mg/m^3 for January and July 1983, respectively. A comparison of these values with the measured 8-hour CO concentrations of 11.0 mg/m^3 in January and

TABLE 5. LINK CHARACTERISTICS AND ESTIMATED CO EMISSIONS AT 80°F FOR MAIN AT DOUGLAS

Link	Identification	Type	Speed, mph	Number of lanes	Year	Delay time, s	Delay time, %	Emission rate, µg/m-s per lane	Emission factor, g/mi	Traffic volume, vph
A	Main N-5B	Through	25	4	1983	NA	NA	NA	28.69	668
					1987	NA	NA	NA	18.16	711
B	Main S-5B	Through	25	4	1983	NA	NA	NA	28.69	668
					1987	NA	NA	NA	18.16	711
C	Doug W-WB	Through	20	3	1983	NA	NA	NA	35.83	554
					1987	NA	NA	NA	22.91	589
D	Doug E-WB3	Through	10	3	1983	NA	NA	NA	66.03	599
					1987	NA	NA	NA	40.40	637
E	Doug W-WB2	Through	10	2	1983	NA	NA	NA	66.03	599
					1987	NA	NA	NA	40.40	637
F	Doug W-EB	Through	15	3	1983	NA	NA	NA	46.18	572
					1987	NA	NA	NA	29.40	609
G	Main E-EB	Through	10	2	1983	NA	NA	NA	66.03	618
					1987	NA	NA	NA	40.40	658
H	Main N,L1-3	Queue	NA	3	1983	34.8	0.58	67,468	100.0	3909
					1987	34.8	0.58	50,401	100.0	2920
I	Main N, L4	Queue	NA	1	1983	34.8	0.58	22,489	100.0	1303
					1987	34.8	0.58	16,800	100.0	973
J	Doug E, L2-3	Queue	NA	2	1983	25.2	0.42	32,571	100.0	1887
					1987	25.2	0.42	24,332	100.0	1410
K	Doug E, left-1	Queue	NA	1	1983	51.0	0.85	32,959	100.0	1910
					1987	51.0	0.85	24,621	100.0	1426
L	Doug E, left-1,2B	Queue	NA	1	1983	60.0	1.00	38,775	100.0	2247
					1987	60.0	1.00	28,966	100.0	1678
M	Doug E, left-2B	Queue	NA	1	1983	60.0	1.00	38,775	100.0	2247
					1987	60.0	1.00	28,966	100.0	1678
N	Doug W, L3	Queue	NA	1	1983	34.2	0.57	22,102	100.0	1281
					1987	34.2	0.57	16,511	100.0	957
O	Doug W, L2	Queue	NA	1	1983	34.2	0.57	22,102	100.0	1281
					1987	34.2	0.57	16,511	100.0	957
P	Doug W, L1	Queue	NA	1	1983	34.2	0.57	22,102	100.0	1281
					1987	34.2	0.57	16,511	100.0	957
Q	Doug E, LS	Queue	NA	1	1983	60.0	1.00	38,775	100.0	2247
					1987	60.0	1.00	28,966	100.0	1678
R	Doug W, L3 Ext	Queue	NA	1	1983	60.0	1.00	38,775	100.0	2247
					1987	60.0	1.00	28,966	100.0	1678

TABLE 6. ESTIMATED CONCENTRATIONS OF CO FOR THE BASE YEAR 1983 AT THE SPECIAL PURPOSE MONITOR

Wind direction, degrees	1-hour CO concentration,[a] ppm		8-hour CO concentration,[b] mg/m^3	
	January 1983	July 1983	January 1983	July 1983
270	5.3	3.3	4.2	2.6
280	6.3	4.4	5.0	3.5
290	7.0	5.5	5.6	4.4
300	7.3	6.2	5.8	5.0
310	7.4	6.7	5.9	5.4
320	7.6	6.7	6.1	5.4
330	7.3	6.7	5.8	5.4
340	7.4	6.6	5.9	5.3
350	7.7	7.0	6.2	5.6
360	8.1	7.6	6.5	6.1
10	8.6	8.3	6.9	6.6
20	9.4	9.4	7.5	7.5
30	10.6	10.8	8.5	8.6
40	11.5	12.0	9.2	9.6
50	12.4	13.0	9.9	10.4
60	12.8	13.6	10.2	10.9
70	13.4[c]	13.9[c]	10.7[c]	11.1[c]
80	12.7	12.7	10.2	10.2
90	9.8	9.5	7.8	7.6

[a]CALINE-3 output.

[b]Derived by use of conversion and persistence factors.

[c]Maximum concentrations.

12.2 mg/m^3 in August indicates that the modeled concentrations are within about 2 to 9 percent of the measured values. Further calibration was performed to account for the range of agreement between the modeled and measured 8-hour CO concentrations by simply adding the difference to the maximum estimated concentrations.

The CALINE-3 and projected MOBILE-3 CO emissions were used to estimate 8-hour concentrations at the SPM site in 1987. Based on the 1983 to 1987 growth rates and emission and traffic characteristics discussed previously for the projection year analysis, 1-hour CO concentrations were calculated. Table 7 presents both the 1-hour and 8-hour CO concentrations at the SMP site, including projected background concentrations from the WFD No. 2 monitor.

As shown in Table 7, the projected SPM concentrations are less than the 8-hour NAAQS (10 mg/m^3), which indicates that the nonattainment area will be in compliance by 1987. Based on the worst case (July 1983), the modeling value was 1.1 mg/m^3 less than the measured value of 12.2 mg/m^3 (August 6, 1983) at the SPM site. This 1.1 mg/m^3 was added to the highest 8-hour concentration (8.2 mg/m^3) to "calibrate" the modeling. The calibrated 1987 8-hour concentration (9.3 mg/m^3) is less than the NAAQS. Using the difference between the modeled January 1983 value of 10.7 mg/m^3 and the January 16, 1983, measured value of 11.0 mg/m^3 (i.e., 0.3 mg/m^3) results in a calibrated 1987 8-hour CO concentration of 8.5 mg/m^3. Thus, both the January and July 1987 modeling show that the SPM site will be less than the NAAQS (10 mg/m^3).

TABLE 7. ESTIMATED CONCENTRATIONS OF CO FOR THE PROJECTION YEAR 1987 AT THE SPECIAL PURPOSE MONITOR

Wind direction, degrees	1-hour CO concentration,[a] ppm		8-hour CO concentration,[b] mg/m^3	
	January 1987	July 1987	January 1987	July 1987
270	4.3	2.5	3.4	2.0
280	5.1	3.3	4.1	2.6
290	5.5	4.1	4.4	3.3
300	5.8	4.6	4.6	3.7
310	6.0	5.0	4.8	4.0
320	6.1	5.0	4.9	4.0
330	5.8	4.8	4.6	3.8
340	5.9	5.0	4.7	4.0
350	6.0	5.3	4.8	4.2
360	6.4	5.6	5.1	4.5
10	6.8	6.2	5.4	5.0
20	7.3	7.0	5.8	5.6
30	8.1	8.0	6.5	6.4
40	9.0	8.9	7.2	7.1
50	9.5	9.7	7.6	7.8
60	10.2[c]	10.1	8.2[c]	8.1
70	10.2[c]	10.3[c]	8.2[c]	8.2[c]
80	9.8	9.3	7.8	7.4
90	7.8	6.9	6.2	5.5

[a]CALINE-3 output.

[b]Derived by use of conversion and persistence factors.

[c]Maximum concentrations.

SECTION 5

ALTERNATE CO RECEPTOR SITE ANALYSIS

An alternate CO receptor site location was necessary to estimate typical downtown concentrations apart from those found in the nighttime cruising area on Douglas Street. Reviews of the cruising route eliminated most of Douglas Street and several associated cross streets as possible alternative receptor sites. Based on the high volume of traffic on Broadway in both directions and the need for locating the monitor at least one block from the cruising route (to minimize the nighttime cruising effects on CO concentrations), a site was selected on Broadway one and a half blocks north of Douglas, between 1st and 2nd Streets. Figure 7 shows the proposed monitoring site with respect to the two nearby intersections. The proposed monitor would be 12 feet from the curb at a height of 10 feet and situated at the midblock between 1st and 2nd Streets (consistent with 40 CFR 58 Appendix E).

Estimates of traffic volumes and hourly variations in such volumes were obtained from the Wichita Department of Operations and Maintenance (WDOM), as were the number, dimensions, and directions of each traffic lane as shown in Figure 7. The peak hour was determined to be 5:00 to 6:00 p.m. on both 1st and 2nd Streets and between 12:00 noon and 1:00 p.m. on Broadway. Because the peak-hour traffic on 1st Street was much higher than the peak-hour traffic on Broadway (and the difference between 12:00 noon to 1:00 p.m. and 5:00 to 6:00 p.m. traffic on Broadway was less than 10 percent), the 5:00 to 6:00 p.m. peak hour was used in the worst-case 1-hour dispersion modeling. (The effects of cruising are assumed to be minimal at this location; thus, the focus is on peak-hour analysis.)

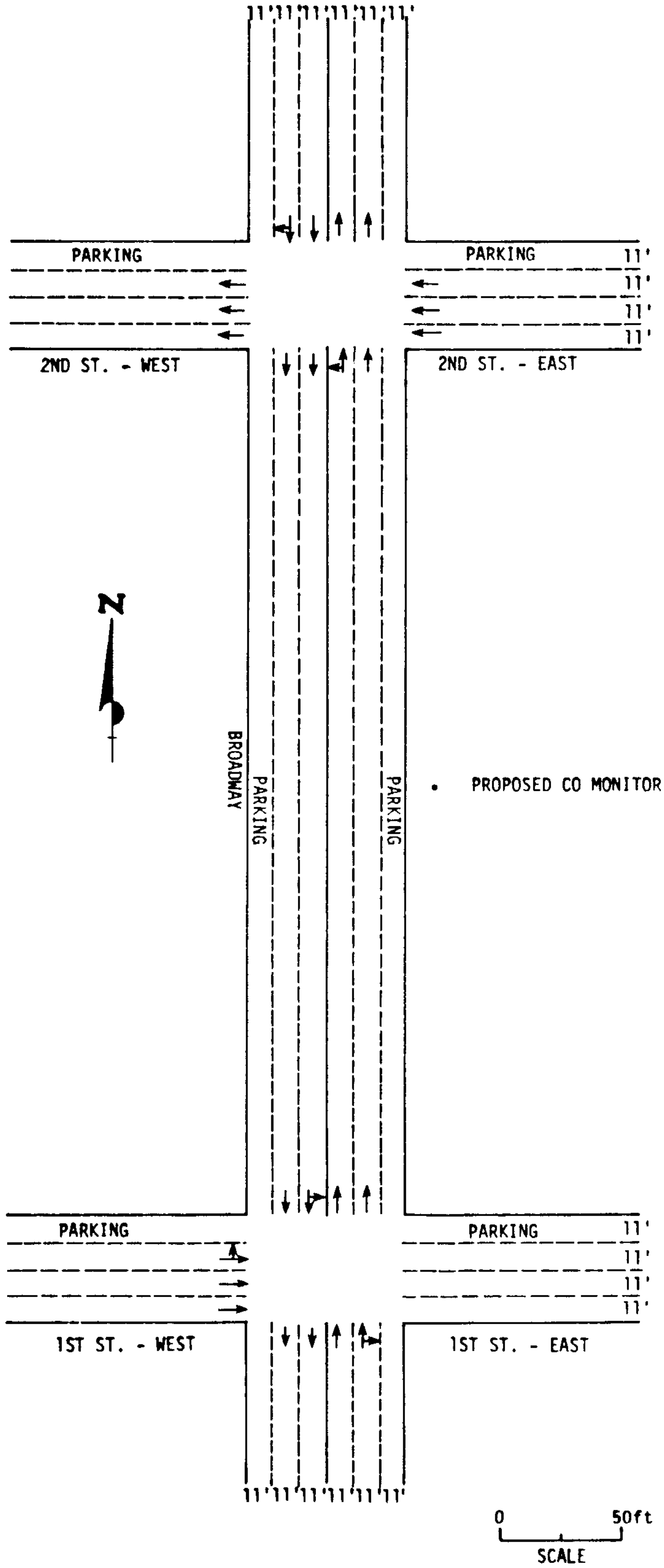


Figure 7. Alternate CO monitoring site and nearby streets and intersections.

Hourly traffic volumes were available for Broadway and 1st, but only ADT was available for 2nd Street. The ratio of peak hours to ADT volumes on 1st was used to calculate the peak-hour volumes for each leg of 2nd street.

As shown in Figure 7, traffic moves in two directions on Broadway, west only on 2nd, and east only on 1st. Queues develop on specific legs only. Best estimates by the WDOM of queues that develop during peak hours are presented in Table 8 along with the length of the queue. Figure 8 presents the analysis area and the queue links as input to the CALINE-3 Model.

TABLE 8. QUEUE ANALYSIS FOR THE INTERSECTIONS AT BROADWAY AND 1ST AND BROADWAY AND 2ND

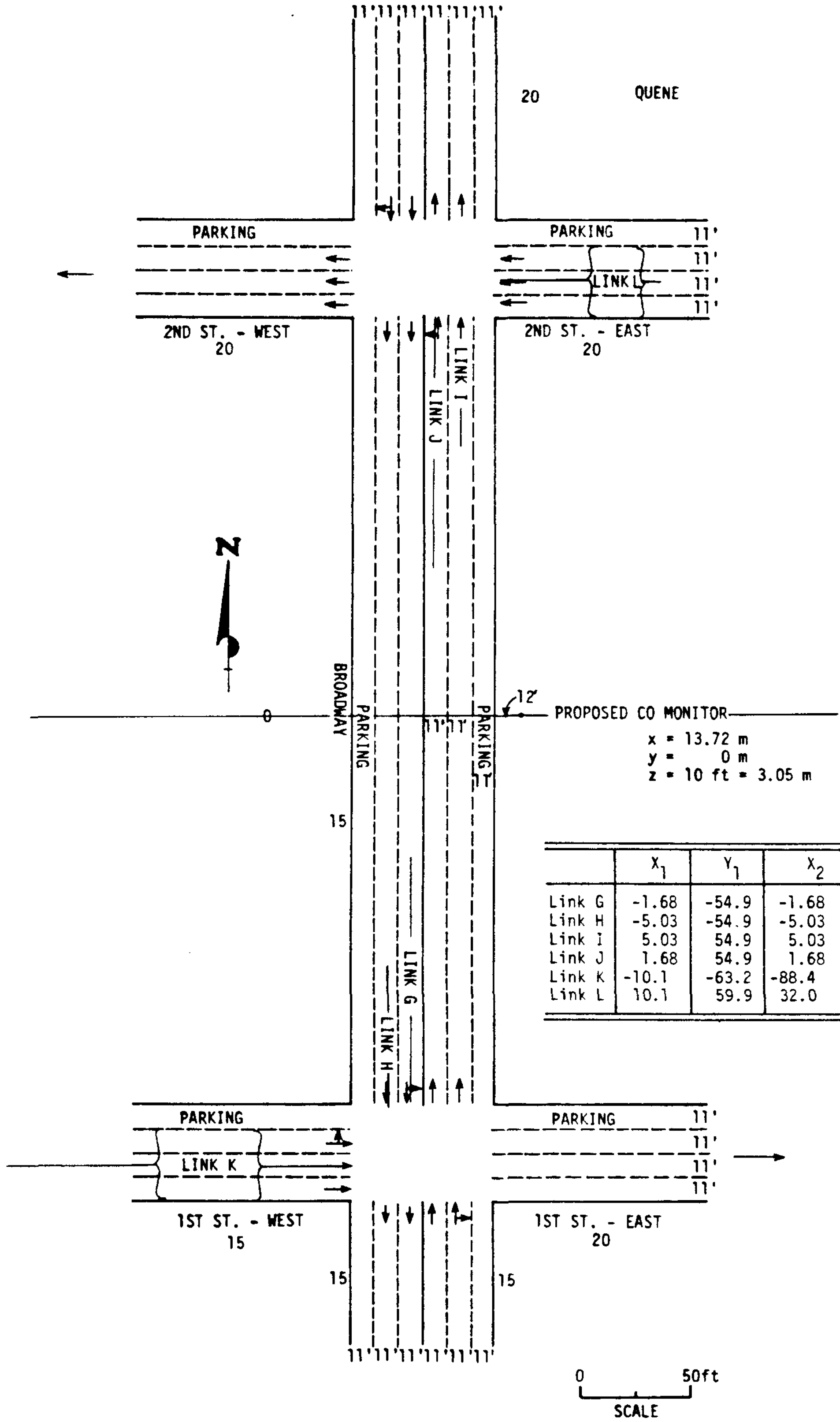
Intersection leg	Lanes	Cars in queue	Modeled queue number	Modeled queue length, m
Broadway, northbound	Left-turn	7-8	8	34.8
	Right-turn	3-4	4	17.4
Broadway, southbound	Left	7-8	8	34.8
	Right-through	3-4	4	17.4
1st, eastbound	3 lanes	15-20	18	78.3
2nd, westbound	3 lanes	4-5	5	21.8

Through-traffic links were characterized in a similar manner and are shown in Figure 9. A 50-50 directional split was assumed for traffic on Broadway during peak hours. The maximum length given to the east-west through links was 100 m.

The total cycle time for signals at each of the two intersections is 65 seconds. The lengths of the green lights for each phase were as follows:

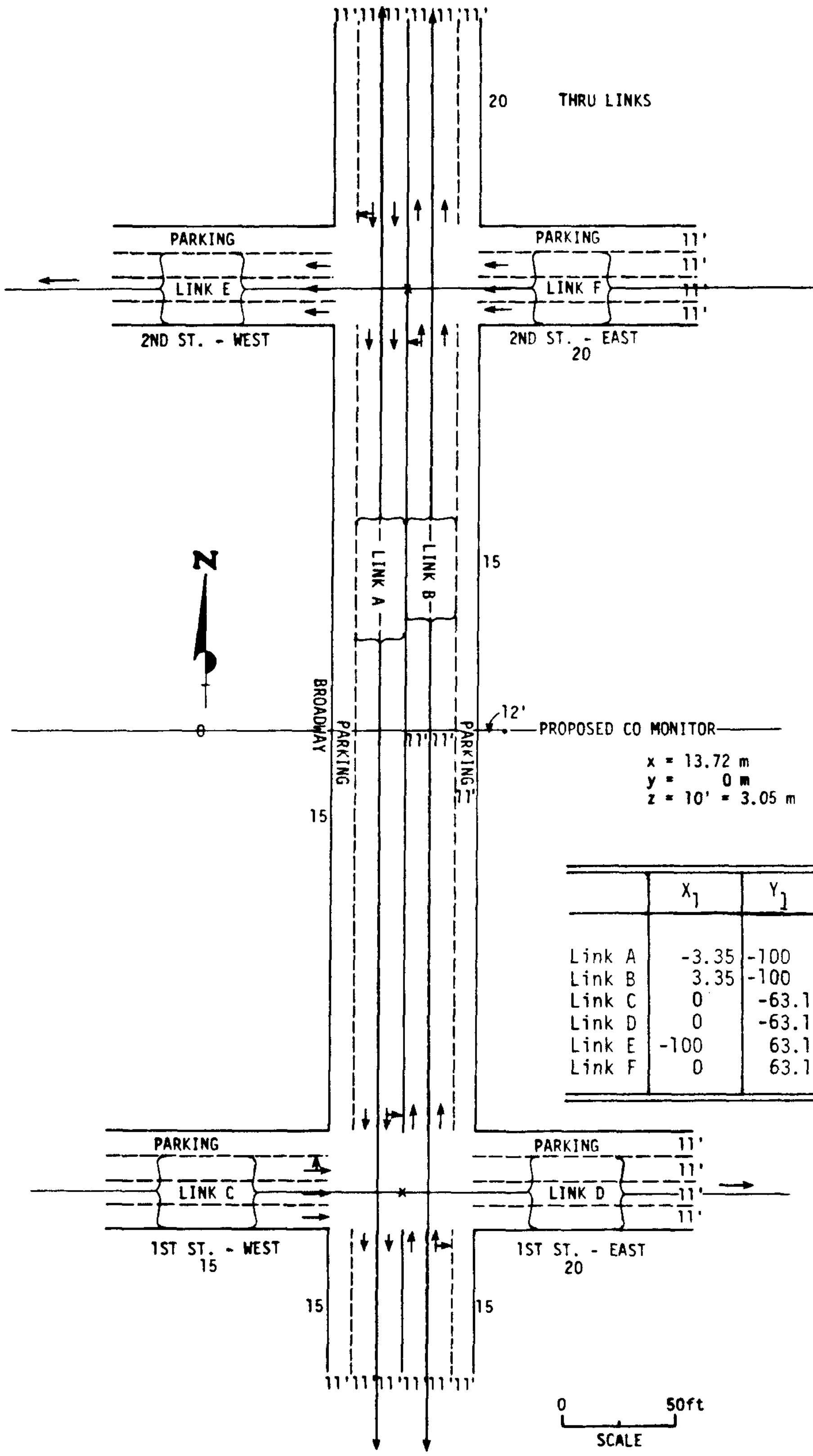
Broadway and 1st	
Broadway, southbound left:	10.4 s
Broadway, north-south:	23.4 s
1st, eastbound:	31.2 s

Broadway and 1st	
Broadway, northbound left:	9.1 s
Broadway, north-south:	29.9 s
2nd, westbound:	26.0 s



	X_1	Y_1	X_2	Y_2	W
Link G	-1.68	-54.9	-1.68	-20.1	3.35+6 = 10.0
Link H	-5.03	-54.9	-5.03	-37.5	3.35+6 = 10.0
Link I	5.03	54.9	5.03	37.5	10.0
Link J	1.68	54.9	1.68	20.1	10.0
Link K	-10.1	-63.2	-88.4	-63.2	16.1
Link L	10.1	59.9	32.0	59.9	16.1

Figure 8. Queue links near the alternate monitor on Broadway, 1st, and 2nd Streets



	X_1	Y_1	X_2	Y_2	W
Link A	-3.35	-100	-3.35	100	12.7
Link B	3.35	-100	-3.35	100	12.7
Link C	0	-63.1	-100	-63.1	16.1
Link D	0	-63.1	100	-63.1	16.1
Link E	-100	63.1	0	63.1	16.1
Link F	0	63.1	100	63.1	16.1

Figure 9. Through roadway links near the alternate monitor on Broadway, 1st, and 2nd Streets.

These two intersections were modeled by using the seasonally adjusted and yearly adjusted (for 1987) peak hour traffic volumes to describe the vehicle flow on the streets. Each through and queue link shown in Figures 8 and 9 was characterized as to speed, number of lanes, and emission rates according to EPA Region I Mobile Source Modeling Procedures. Tables 9 and 10 present the individual link characteristics for January and July modeling analyses, respectively, for 1983 and 1987. Growth rates in VMT, reductions in CO emissions in future years, and dependence of temperature are included in the tables.

As described in Section 3.4, selected worst-case meteorological conditions were as follows: a 1.5 m/s windspeed in January and a 1.0 m/s windspeed in July, neutral stability, and a 100-m mixing height. Wind direction was varied in 10-degree increments from south at 180 degrees to northeast at 40 degrees. Background concentrations (as discussed in Section 3.6) were seasonally and yearly adjusted in the same manner as for the SPM site analysis.

Table 11 presents the results of the microscale CALINE-3 dispersion modeling analysis for 1983 January and July conditions. The maximum 8-hour concentrations of CO at the alternate monitoring site are 6.3 mg/m^3 in January and 5.9 mg/m^3 in July. Both of these maximums are associated with a southwest (210 degrees) wind. If the calibration factors from the baseline SPM analysis are considered (0.3 mg/m^3 in January and 1.1 mg/m^3 in July), the resulting concentration estimates are 6.6 and 7.0 mg/m^3, respectively. These values are less than the NAAQS.

Eight-hour concentrations were also estimated for 1987 by use of growth projection and emission techniques similar to those described in the SPM site analysis. Table 12 presents the 1-hour CALINE-3 CO concentration estimates and the derived 8-hour values. Estimated maximum 8-hour CO concentrations for January and July 1987 were 5.0 and 4.2 mg/m^3, respectively. If the calibration factors from the SPM analysis (0.3 mg/m^3 in January; 1.1 mg/m^3 in July) are considered, the maximum estimated CO concentrations are 5.3 and 5.3 mg/m^3 for both January and July, 1987.

TABLE 9. LINK CHARACTERISTICS AND ESTIMATED CO EMISSIONS AT 24°F FOR BROADWAY AT 1ST AND BROADWAY AT 2ND

Link	Identification	Type	Speed, mph	Number of lanes	Year	Delay time, s	Delay time, %	Emission rate, μg/m-s per lane	Emission factor, g/mi	Traffic volume, vph
A	Broad SBND	Through	15	2	1983	NA	NA	NA	83.3	390
					1987	NA	NA	NA	61.3	415
B	Broad NBND	Through	15	2	1983	NA	NA	NA	83.3	390
					1987	NA	NA	NA	61.3	415
C	1st W, EBND	Through	15	3	1983	NA	NA	NA	83.3	1017
					1987	NA	NA	NA	61.3	1082
D	1st E, EBND	Through	15	3	1983	NA	NA	NA	83.3	1293
					1987	NA	NA	NA	61.3	1375
E	2nd W, WBND	Through	20	3	1983	NA	NA	NA	64.1	858
					1987	NA	NA	NA	47.6	913
F	2nd E, WBND	Through	20	3	1983	NA	NA	NA	64.1	762
					1987	NA	NA	NA	47.6	811
G	Broad S, left	Queue	NA	1	1983	56.6	0.87	30,867	100.0	1788
				1	1987	56.6	0.87	22,233	100.0	1288
H	Broad S, Thru	Queue	NA	1	1983	31.2	0.48	17,030	100.0	987
				1	1987	31.2	0.48	12,267	100.0	711
I	Broad N, thru	Queue	NA	1	1983	26.0	0.40	14,192	100.0	822
				1	1987	26.0	0.40	10,222	100.0	592
J	Broad N, left	Queue	NA	1	1983	55.9	0.86	30,512	100.0	1768
				1	1987	55.9	0.86	21,978	100.0	1273
K	1st EBND	Queue	NA	3	1983	33.8	0.52	55,349	100.0	3207
				3	1987	33.8	0.52	39,867	100.0	2310
L	2nd WBND	Queue	NA	3	1983	39.0	0.6	63,862	100.0	3700
				3	1987	39.0	0.6	46,000	100.0	2665

TABLE 10. LINK CHARACTERISTICS AND ESTIMATED CO EMISSIONS AT 80°F FOR BROADWAY AT 1ST AND BROADWAY AT 2ND

Link	Identification	Type	Speed, mph	Number of lanes	Year	Delay time, sec.	Delay time, %	Emission rate, µg/m-s per lane	Emission factor g/mi	Traffic volume, vph
A	Broad SBND	Through	15	2	1983	NA	NA	NA	52.2	390
					1987	NA	NA	NA	34.3	415
B	Broad NBND	Through	15	2	1983	NA	NA	NA	52.2	390
					1987	NA	NA	NA	34.3	415
C	1st W, EBND	Through	15	3	1983	NA	NA	NA	52.2	1017
					1987	NA	NA	NA	34.3	1082
D	1st E, EBND	Through	15	3	1983	NA	NA	NA	52.2	1293
					1987	NA	NA	NA	34.3	1375
E	2nd W, WBND	Through	20	3	1983	NA	NA	NA	40.2	858
					1987	NA	NA	NA	26.4	913
F	2nd E, WBND	Through	20	3	1983	NA	NA	NA	40.2	762
					1987	NA	NA	NA	26.4	811
G	Broad S, left	Queue	NA	1	1983	56.6	0.87	30,867	100.0	1788
				1	1987	56.6	0.87	22,233	100.0	1288
H	Broad S, thru	Queue	NA	1	1983	31.2	0.48	17,030	100.0	987
				1	1987	31.2	0.48	12,267	100.0	711
I	Broad N, thru	Queue	NA	1	1983	26.0	0.40	14,192	100.0	822
				1	1987	26.0	0.40	10,222	100.0	592
J	Broad N, left	Queue	NA	1	1983	55.9	0.86	30,512	100.0	1768
				1	1987	55.9	0.86	21,978	100.0	1273
K	1st EBND	Queue	NA	3	1983	33.8	0.52	55,349	100.0	3207
				3	1987	33.8	0.52	39,867	100.0	2310
L	2nd WBND	Queue	NA	3	1983	39.0	0.6	63,862	100.0	3700
				3	1987	39.0	0.6	46,000	100.0	2665

TABLE 11. ESTIMATED CONCENTRATIONS OF CO FOR THE BASE YEAR 1983 AT THE ALTERNATE MONITORING SITE

Wind direction, degrees	1-hour CO concentrations,[a] ppm		8-hour CO concentrations,[b] mg/m^3	
	January 1983	July 1983	January 1983	July 1983
180	5.6	4.2	4.5	3.4
190	6.9	5.5	5.5	4.4
200	7.7	6.8	6.2	5.4
210	7.9[c]	7.4[c]	6.3[c]	5.9[c]
220	7.5	6.7	6.0	5.4
230	6.7	5.7	5.4	4.6
240	5.5	4.3	4.4	3.4
250	4.8	3.2	3.8	2.6
260	4.3	2.6	3.4	2.1
270	4.2	2.4	3.4	1.9
280	4.2	2.4	3.4	1.9
290	4.3	2.6	3.4	2.1
300	4.5	2.8	3.6	2.2
310	5.1	3.3	4.1	2.6
320	5.8	4.2	4.6	3.4
330	6.4	5.1	5.1	4.1
340	6.9	6.0	5.5	4.8
350	7.2	6.1	5.8	4.9
360	6.7	6.0	5.4	4.8
10	6.3	5.4	5.0	4.3
20	5.9	5.0	4.7	4.0
30	5.4	4.3	4.3	3.4
40	4.9	3.5	3.9	2.8

[a]CALINE-3 output.

[b]Derived by use of conversion and persistence factors.

[c]Maximum concentrations.

TABLE 12. ESTIMATED CONCENTRATIONS FOR CO FOR THE PROJECTION YEAR 1987 AT THE ALTERNATE MONITORING SITE

Wind direction, degrees	1-hour CO concentrations,[a] ppm		8-hour CO concentrations,[b] mg/m^3	
	January 1987	July 1987	January 1987	July 1987
180	4.6	3.0	3.7	2.4
190	5.4	4.1	4.3	3.3
200	6.1	5.0	4.9	4.0
210	6.2[c]	5.2[c]	5.0[c]	4.2[c]
220	5.9	4.9	4.7	3.9
230	5.3	4.3	4.2	3.4
240	4.5	3.2	3.6	2.6
250	3.8	2.4	3.0	1.9
260	3.6	1.9	2.9	1.5
270	3.5	1.8	2.8	1.4
280	3.5	1.8	2.8	1.4
290	3.6	1.9	2.9	1.5
300	3.8	2.0	3.0	1.6
310	4.2	2.5	3.4	2.0
320	4.6	3.1	3.7	2.5
330	5.2	3.7	4.2	3.0
340	5.7	4.5	4.6	3.6
350	5.6	4.6	4.5	3.7
360	5.4	4.2	4.3	3.4
10	5.1	3.9	4.1	3.1
20	4.6	3.6	3.7	2.9
30	4.3	3.2	3.4	2.6
40	3.9	2.7	3.1	2.2

[a]CALINE-3 output.

[b]Derived by use of conversion and persistence factors.

[c]Maximum concentrations.

Estimates indicate that the alternate monitoring site will yield 8-hour CO concentrations that generally somewhat exceed 50 percent of the 8-hour NAAQS (10 mg/m^3). The alternate site is such that nighttime cruising should not influence the monitor significantly, but it is close enough to the central business district to be considered representative of downtown ambient air.

SECTION 6

CONCLUSIONS AND RECOMMENDATIONS

6.1 CONCLUSIONS

Two conclusions were drawn from the dispersion modeling analysis of the streets affecting the special purpose monitor at 111 W. Douglas. The first was that the combination of MOBILE-3 CO emission factors (queuing and delay) and the CALINE-3 Model provided a reasonable modeling methodology. Considering the great variability in emission and source characteristics and the influencing meteorological conditions, the model-versus-monitor maximum 8-hour concentrations compared quite well, i.e., within 2 to 9 percent (underestimates by the model).

The second conclusion was that, based on the representativeness of the 1983 modeled concentrations at the SPM site, the SPM site will show NAAQS attainment by 1987. The maximum 8-hour concentrations estimated for 1987 and calibrated by 1983 model/monitor comparisons were 8.5 mg/m^3 (January) and 9.3 mg/m^3 (July). Thus, the results of this modeling analysis should be included as part of the State Implementation Plan for CO in Wichita in addition to the Transportation Control Measures already presented.

An alternate monitoring site proposed in this analysis was located midblock on Broadway between 1st and 2nd Streets. A microscale analysis (similar to the SPM site analysis) that determined the impact of nearby streets on the proposed monitor was used to evaluate CO concentrations with respect to this model. Concentrations of CO were estimated to be about 60 percent of the 8-hour NAAQS in 1983 and to decrease to about 50 percent by 1987. This monitor is believed to yield more representative measurements of downtown air quality because it is affected less by the downtown nighttime cruising phenomenon but is situated on a main downtown street in the urban core.

6.2 RECOMMENDATIONS

Although the dispersion modeling performed in the vicinity of the SPM site showed attainment of the CO NAAQS by 1987, this attainment may be possible at an earlier date if additional TCM's are implemented. The primary focus of any additional TCM's should be with regard to the weekend nighttime cruising problem. Improvements in number of vehicles, traffic flow, signalization, etc. will decrease CO emissions on and near Douglas Street and should contribute to reaching acceptable CO levels prior to the projected 1987 attainment date.

Possible alternative TCM's for reducing the downtown cruising problem include:

1. Ban left turns from Douglas to Main. This would decrease queue lengths on both westbound and eastbound Douglas.

2. Make Douglas Street one-way. Even if cruising persisted, the problem would be diluted.

3. Barricade certain downtown streets on weekend nights. Only specific streets would need to be blocked to disperse nighttime cruising; e.g., Douglas between Main and Market and between Broadway and Topeka. All north-south streets would remain open.

4. Add traffic police to critical intersections to improve traffic flow.

5. Require special licensing for use of area.

While these potential solutions to improving urban core air quality range from possible to improbable, they do represent alternatives. Of particular use may be the first recommendation banning left turns from Douglas to Main. This will reduce queueing on Douglas at Main Street, which should in turn improve overall traffic flow even during nighttime cruising conditions. Further review of the overall implications of these suggested TCM's is necessary before implementation would be advised.

Other TCM's such as anti-tampering and anti-fuel switching are probably not warranted at this time. Because the area is projected to be in compliance by 1987, the recommendations given here are somewhat more reasonable and cost-effective when compared with areawide emission and fuel control programs.

APPENDIX A

TRAFFIC COUNTS FOR MAIN, DOUGLAS,
BROADWAY, AND FIRST STREETS

DEPARTMENT OF OPERATIONS AND MAINTENANCE
TRAFFIC ENGINEERING

TRAFFIC RECORD

STREET INVENTORY SYSTEM

SIS420CO

(CHECK ONE)

DON'T USE [ ] [ ][ ][ ][ ][ ] [ ][ ][ ][ ][ ] [ ] [9 0] TRAN [ ]

PEDESTRIAN [ ] P

VEHICLE [ ] V

START: HOUR 3pm DATE: YR 19 84 MO 07 DA 13 COUNTER NUMBER H

STOP: HOUR 8am DATE: YR 19 84 MO 07 DA 16

STREET ON Douglas E B

LOCATION N E Main

24 HOUR TOTAL 77569 FACTOR ______ 24 HOUR AVERAGE TRAFFIC ______

DAY OF WEEK	SUN	MON	TUE	WED	THU	FRI	SAT	PEAK HR
DATE	7/15	7/16				7/13	7/14	
HOUR				AM				
12-1	456	66					482	
1-2	463	23					375	
2-3	354	12					318	
3-4	295	13					182	
4-5	108	18					104	
5-6	31	36					38	
6-7	23	151					41	
7-8	46	491					108	
8-9	33						236	
9-10	116						287	
10-11	154						409	
11-12	177						424	
				PM				
12-1	317						456	
1-2	313						484	
2-3	275					110	372	
3-4	252					433	318	
4-5	221					583	284	
5-6	243					565	317	
6-7	222					291	222	
7-8	195					313	302	
8-9	241					295	245	
9-10	238					468	447	
10-11	250					572	533	
11-12	146					503	539	
TOTAL	5103	810				4133	7523	
% AVG WK DAY								

SURFACE TYPE 2 lane CONDITION ______

REMARKS ______

284-01-010
(Rev. 4/81) See Procedure SIS-15

SIGNED [illegible]

TRAFFIC RECORD

DEPARTMENT OF OPERATIONS AND MAINTENANCE
TRAFFIC ENGINEERING
STREET INVENTORY SYSTEM

SIS420CO

(CHECK ONE)

DON'T USE

☐ ☐☐☐☐☐ ☐☐☐☐☐ ☐ 9 0 TRAN ☐

PEDESTRIAN ☐ P

VEHICLE ☑ V

START: HOUR 3pm DATE: YR 19 84 MO 07 DA 13 COUNTER NUMBER 6

STOP: HOUR 8am DATE: YR 19 84 MO 07 DA 16

STREET ON Douglas W.B.

LOCATION W of Main

24 HOUR TOTAL 19996 FACTOR ☐☐☐ 24 HOUR AVERAGE TRAFFIC ________

DAY OF WEEK	SUN	MON	TUE	WED	THU	FRI	SAT	PEAK HR
DATE	7/15	7/16				7/13	7/14	
HOUR				AM				
12-1	459	69					420	
1-2	422	36					407	
2-3	431	19					381	
3-4	236	22					167	
4-5	80	22					62	
5-6	34	46					33	
6-7	40	114					63	
7-8	84	510					111	
8-9	86						220	
9-10	169						314	
10-11	197						445	
11-12	221						483	
				PM				
12-1	317						471	
1-2	281						445	
2-3	281					~~143~~	414	
3-4	285					952	433	
4-5	255					1065	362	
5-6	246					1029	321	
6-7	232					492	259	
7-8	231					362	324	
8-9	215					338	318	
9-10	235					519	410	
10-11	214					527	489	
11-12	132					554	454	
TOTAL	5431	838				5981	7746	
% AVG WK DAY								

SURFACE TYPE 2 lane CONDITION ________

REMARKS ________

284-01-010
(Rev. 4/81) See Procedure SIS-15

SIGNED Anderson

CONTINUOUS TRAFFIC COUNT STATION - WEEKLY TRAFFIC SUMMARY

KANSAS DEPARTMENT OF TRANSPORTATION
BUREAU OF TRANSPORTATION PLANNING

STATION NUMBER 5-630-9000-70

WEEK BEGINNING MONDAY NOVEMBER 7, 1983

DAY / DATE	MON 11- 7	TUE 11- 8	WED 11- 9	THU 11-10	FRI 11-11	SAT 11-12	SUN 11-13	TOTAL
HOUR								
12- 1 AM	54	103	115	129	139	480	442	1462
1- 2 AM	26	49	46	53	79	322	379	954
2- 3 AM	29	35	27	33	28	229	219	600
3- 4 AM	22	23	24	29	32	112	107	350
4- 5 AM	23	27	19	36	25	35	56	221
5- 6 AM	39	41	34	62	44	44	38	302
6- 7 AM	193	165	214	199	192	88	12	1063
7- 8 AM	775	795	733	795	501	179	91	3869
8- 9 AM	968	1018	756	1107	823	367	109	5148
9-10 AM	749	908	835	958	782	432	190	4854
10-11 AM	928	818	900	1068	741	562	171	5188
11-12 AM	1047	975	1150	1168	924*	701	253	6218
12- 1 PM	1141	1081	1143	1353	1002	717	509	6946
1- 2 PM	1071	1036	1041	1162	878	651	556	6395
2- 3 PM	1023	872	1036	1126	799	606	471	5933
3- 4 PM	1076	1062	1052	1241	684	611	633	6559
4- 5 PM	1337	1303	1313	1540	957	472	383	7305
5- 6 PM	1347	1246	1424	1460	982	387	339	7185
6- 7 PM	556	515	636	597	485	317	325	3431
7- 8 PM	434	409	376	447	638	472	276	3052
8- 9 PM	281	266	345	333	550	492	287	2554
9-10 PM	281	243	266	304	563	475	168	2300
10-11 PM	178	219	228	259	583	562	152	2181
11-12 PM	117	153	189	207	556	556	133	1911
TOTAL	13696	13362	13902	15666	13187	9869	6299	85981
% DAY IS OF WEEK	111.5	108.8	113.2	127.5	107.4	80.3	51.3	700.0

REMARKS: * INDICATES REVISED HOURLY VOLUME.

CONTINUOUS TRAFFIC COUNT STATION - WEEKLY TRAFFIC SUMMARY

KANSAS DEPARTMENT OF TRANSPORTATION
BUREAU OF TRANSPORTATION PLANNING

STATION NUMBER 5-630-9000-70

WEEK BEGINNING MONDAY DECEMBER 5, 1983

DAY / DATE / HOUR	MON 12- 5	TUE 12- 6	WED 12- 7	THU 12- 8	FRI 12- 9	SAT 12-10	SUN 12-11	TOTAL
12- 1 AM	60	87	74	134	125	499	512	1491
1- 2 AM	49	53	54	83	66	352	423	1080
2- 3 AM	19	19	35	34	41	269	241	658
3- 4 AM	14	22	22	38	35	144	127	402
4- 5 AM	22	20	36	37	31	38	23	207
5- 6 AM	44	31	42	41	35	37	27	257
6- 7 AM	242	202	213	246	215	91	63	1272
7- 8 AM	778	725	698	764	831	211	87	4094
8- 9 AM	1037	1011	1005	1005	1054	364	102	5578
9-10 AM	861	741	798	860	869	549	222	4900
10-11 AM	925	711	800	972	934	768	261	5371
11-12 AM	1279	830	831	1163	1152	881	280	6416
12- 1 PM	1401	920	1121	1154	1334	732	551	7213
1- 2 PM	1278	848	1086	1047	1261	905	501	6926
2- 3 PM	1112	689	979	943	1175	769	676	6343
3- 4 PM	1151	834	992	1139	1151	697	486	6450
4- 5 PM	1524	1303	1358	1327	1631	561	419	8123
5- 6 PM	1448	1556	1330	1387	1559	527	453	8260
6- 7 PM	661	664	594	684	686	478	311	4078
7- 8 PM	471	706	441	469	490	710	227	3514
8- 9 PM	212	420	378	349	513	477	245	2594
9-10 PM	234	232	337	334	466	513	177	2293
10-11 PM	189	235	229	223	605	586	151	2218
11-12 PM	119	187	132	175	633	617	120	1983
TOTAL	15164	13056	13585	14608	16892	11775	6681	91761
% DAY IS OF WEEK	115.7	99.6	103.6	111.4	128.9	89.8	51.0	700.0

REMARKS:
* INDICATES REVISED HOURLY VOLUME.

CONTINUOUS TRAFFIC COUNT STATION - WEEKLY TRAFFIC SUMMARY

KANSAS DEPARTMENT OF TRANSPORTATION
BUREAU OF TRANSPORTATION PLANNING

STATION NUMBER 5-630-9000-70

WEEK BEGINNING MONDAY JANUARY 9, 1984

DAY DATE	MON 1-9	TUE 1-10	WED 1-11	THU 1-12	FRI 1-13	SAT 1-14	SUN 1-15	TOTAL
HOUR								
12- 1 AM	57	93	105	69	96	516	412	1329
1- 2 AM	33	43	41	42	53	364	325	901
2- 3 AM	16	32	29	46	45	172	235	575
3- 4 AM	17	24	24	22	24	109	105	325
4- 5 AM	31	24	20	22	30	46	43	226
5- 6 AM	45	43	42	40	46	20	28	264
6- 7 AM	240	224	244	227	200	88	78	1361
7- 8 AM	943	893	783	970	914	157	112	4699
8- 9 AM	997	961	1025	1066	1045	323	125	5532
9-10 AM	794	865	795	860	808	424	240	4729
10-11 AM	899	824	842	910	922	675	221	5293
11-12 AM	1080	1124	1114	1038	1185	718	246	6510
12- 1 PM	1273	1154	1173	1165	1365	704	413	7247
1- 2 PM	1194	1145	1149	1133	1240	706	372	6939
2- 3 PM	1035	1055	956	1007	1151	624	740	6612
3- 4 PM	1214	1148	1091	1156	1304	678	433	7014
4- 5 PM	1474	1357	1381	1371	*1625	536	337	8121
5- 6 PM	1468	1520	1454	1381	*1607	431	300	8201
6- 7 PM	575	623	700	579	617	404	240	3738
7- 8 PM	482	403	616	420	493	813	197	3424
8- 9 PM	239	258	382	315	449	422	190	2255
9-10 PM	245	255	323	274	573	474	128	2276
10-11 PM	191	207	274	244	628	487	119	2150
11-12 PM	150	170	215	182	668	531	108	2004
TOTAL	14572	14523	14810	14550	17149	10504	5757	91865
% DAY IS OF WEEK	111.0	110.7	112.9	110.8	130.7	80.0	43.9	700.0

REMARKS: * INDICATES REVISED HOURLY VOLUME.

CONTINUOUS TRAFFIC COUNT STATION - WEEKLY TRAFFIC SUMMARY

KANSAS DEPARTMENT OF TRANSPORTATION
BUREAU OF TRANSPORTATION PLANNING

STATION NUMBER 5-630-9[illegible]00-70

WEEK BEGINNING MONDAY FEBRUARY 20, 1984

DAY DATE / HOUR	MON 2-20	TUE 2-21	WED 2-22	THU 2-23	FRI 2-24	SAT 2-25	SUN 2-26	TOTAL
12- 1 AM	49	77	69	110	114	462	367	1277
1- 2 AM	35	53	42	49	11	319	360	869
2- 3 AM	26	24	40	36	40	236	240	642
3- 4 AM	13	11	20	21	30	76	138	309
4- 5 AM	19	35	30	30	23	33	61	231
5- 6 AM	37	47	30	41	47	37	33	272
6- 7 AM	172	212	219	208	201	92	48	1152
7- 8 AM	553	852	832	829	922	285	90	4363
8- 9 AM	719	1035	997	920	1105	431	84	5291
9-10 AM	588	1010	766	718	885	496	153	4616
10-11 AM	717	986	805	777	908	643	215	5051
11-12 AM	777	1121	1075	910	1183	717	239	6022
12- 1 PM	900	1256	1210	1150	1385	890	477	7268
1- 2 PM	861	1250	1081	1076	1252	777	798	7095
2- 3 PM	776	997	959	995	1176	852	442	6197
3- 4 PM	812	1179	994	1088	1306	715	426	6570
4- 5 PM	961	1338	1309	1385	1546	562	328	7429
5- 6 PM	999	1402	1293	1392	1518	478	296	7378
6- 7 PM	416	623	596	630	635	352	299	3551
7- 8 PM	315	414	403	472	443	334	474	2855
8- 9 PM	202	303	358	318	443	383	130	2137
9-10 PM	232	243	279	358	529	445	115	2201
10-11 PM	209	215	240	256	551	475	121	2067
11-12 PM	116	141	151	150	576	411	115	1660
TOTAL	10504	14824	13818	13928	16829	10501	6049	86453
% DAY IS OF WEEK	85.0	120.1	111.9	112.7	136.3	85.0	49.0	700.0

REMARKS: * INDICATES REVISED HOURLY VOLUME.

CONTINUOUS TRAFFIC COUNT STATION - WEEKLY TRAFFIC SUMMARY

KANSAS DEPARTMENT OF TRANSPORTATION
BUREAU OF TRANSPORTATION PLANNING

STATION NUMBER 5-630-9000-70

WEEK BEGINNING MONDAY MARCH 5, 1984

HOUR / DAY DATE	MON 3- 5	TUE 3- 6	WED 3- 7	THU 3- 8	FRI 3- 9	SAT 3-10	SUN 3-11	TOTAL
12- 1 AM	38	91	104	105	123	449	470	1360
1- 2 AM	48	43	55	85	37	359	337	964
2- 3 AM	18	22	23	22	38	204	314	641
3- 4 AM	16	24	23	3	28	146	135	375
4- 5 AM	19	30	20	17	23	49	44	202
5- 6 AM	41	47	37	63	42	37	25	292
6- 7 AM	208	202	205	207	212	92	54	1180
7- 8 AM	872	842	857	822	871	199	94	4557
8- 9 AM	1045	1021	1036	991	1050	311	103	5557
9-10 AM	830	885	824	737	818	381	205	4680
10-11 AM	1029	891	885	812	955	543	279	5394
11-12 AM	1170	1023	1170	998	1130	677	343	6519
12- 1 PM	1380	1275	1223	1203	1275	823	710	7889
1- 2 PM	1215	1114	1131	1082	1270	813	607	7232
2- 3 PM	1122	1007	996	1064	1114	807	597	6707
3- 4 PM	1278	1058	1117	1122	1227	779	719	7300
4- 5 PM	1399	1245	1343	1395	1479	609	435	7905
5- 6 PM	1467	1428	1410	1422	1560	523	377	8187
6- 7 PM	641	640	706	727	698	451	297	4160
7- 8 PM	414	444	523	514	559	674	241	3369
8- 9 PM	301	294	370	344	567	444	208	2528
9-10 PM	269	263	291	324	549	498	164	2358
10-11 PM	202	214	245	230	538	535	139	2103
11-12 PM	178	158	181	215	568	578	131	2009
TOTAL	15200	14261	14775	14504	16739	10981	7028	93488
% DAY IS OF WEEK	113.8	106.8	110.6	108.6	125.4	82.2	52.6	700.0

REMARKS:
* INDICATES REVISED HOURLY VOLUME.

TRAFFIC RECORD

DEPARTMENT OF OPERATIONS & MAINTENANCE
TRAFFIC OPERATIONS & MAINTENANCE DIVISION
STREET INVENTORY SYSTEM
AVERAGE DAILY TRAFFIC COUNTS

DON'T USE [ ] [ ] [ ] [9 0] TRAN [ ]

(CHECK ONE)
PEDESTRIAN [ ] P
VEHICLE [X] V

START: HOUR 3pm DATE: YR 19 83 MO 05 DA 25 COUNTER NUMBER 5

STOP: HOUR 3pm DATE: YR 19 83 MO 05 DA 26

STREET ON Broadway

LOCATION BET. 1ST AND 2ND

24 HOUR TOTAL 12857 FACTOR 085 24 HOUR AVERAGE TRAFFIC 10928

DAY OF WEEK	SUN	MON	TUE	WED	THU	FRI	SAT	PEAK HR
DATE				5-25	5-26			
HOUR				AM				
12-1					163			
1-2					90			
2-3					68			
3-4					60			
4-5					48			
5-6					80			
6-7					223			
7-8					1012			
8-9					704			
9-10					707			
10-11					781			
11-12					953			45 1PM
				PM			45-1	274
12-1					1063	12		279
1-2					1035			270
2-3					903			251
3-4				926				1074
4-5				910				
5-6				917				
6-7				519				
7-8				510				
8-9				433				
9-10				460				
10-11				390				
11-12				247				
TOTAL				5334	7523			
% AVG WK DAY								

SURFACE TYPE 4 lane BT CONDITION

REMARKS 83 year count

(Rev.)

284-01-010 April 27, 1983 SIGNED Terri Greene

TRAFFIC RECORD

DEPARTMENT OF OPERATIONS & MAINTENANCE
TRAFFIC OPERATIONS & MAINTENANCE DIVISION
STREET INVENTORY SYSTEM
AVERAGE DAILY TRAFFIC COUNTS

DON'T USE: [ ] 1 [ ] 2-6 [ ] 7-11 [ ] 12 [9 0] 13-14 TRAN [ ] 15

(CHECK ONE)
PEDESTRIAN [ ] P (16)
VEHICLE [X] V (16)

START: HOUR 3pm DATE: YR 19 83 (18-19) MO 06 (20-21) DA 01 (22-23) COUNTER NUMBER [I] (17)

STOP: HOUR 3pm DATE: YR 19 83 MO 06 DA 02

STREET ON FIRST STREET

LOCATION BET. MARKET AND BROADWAY (24-53)

24 HOUR TOTAL 12194 (54-58) FACTOR 086 (59-62) 24 HOUR AVERAGE TRAFFIC 10487

DAY OF WEEK	SUN	MON	TUE	WED	THU	FRI	SAT	PEAK HR
DATE				6-1	6-2			
HOUR				AM				
12-1					109			
1-2					47			
2-3					47			
3-4					23			
4-5					21			
5-6					69			
6-7					326			
7-8					910			
8-9					880			
9-10					716			
10-11					706			
11-12					896			
				PM				
12-1					910			1P
1-2					893			
2-3					892		5:30	
3-4				802			4:30	281
4-5				1070				307
5-6				1183				391
6-7				489				344
7-8				334				1329
8-9				251				
9-10				245				
10-11				235				
11-12				146				
TOTAL				4745	7449			
% AVG WK DAY								

SURFACE TYPE 3 LANE BT CONDITION ____

REMARKS 83 FLOW COUNT

(Rev.)
284-01-010 April 27, 1983

SIGNED T. GREENE

TRAFFIC RECORD

DEPARTMENT OF PUBLIC WORKS
TRAFFIC ENGINEERING
STREET INVENTORY SYSTEM

SIS420CO

DON'T USE: [ ] [ ] [ ] [9 0] TRAN [ ]

(CHECK ONE)
PEDESTRIAN [ ] P
VEHICLE [✓] V

START: HOUR 2 PM DATE: YR 19 83 MO 05 DA 23

COUNTER NUMBER [ ]

STOP: HOUR 2 PM DATE: YR 19 83 MO 05 DA 24

STREET ON 1st Street

LOCATION BET TOPEKA & BRDWY

24 HOUR TOTAL 15036 FACTOR 0.84 24 HOUR AVERAGE TRAFFIC 12630

DAY OF WEEK	SUN	MON	TUE	WED	THU	FRI	SAT	PEAK HR
DATE		5/23	5/24					
HOUR				AM				
12-1			130					
1-2			52					
2-3			39					
3-4			37					
4-5			27					
5-6			94				7:15-8:15 AM	271
6-7			392					315
7-8			1135					344
8-9			958					276
9-10			768					1206
10-11			814					
11-12			984					
				PM				
12-1			1148					
1-2			1092					
2-3		1001						
3-4		1130				4:30-5:30 PM		437
4-5		1491						411
5-6		1539						567
6-7		654						392
7-8		405						1807
8-9		271						
9-10		365						
10-11		340						
11-12		170						
TOTAL		7366	7670					
% AVG WK DAY								

SURFACE TYPE 3-Lane BT CONDITION

REMARKS '83 Flow Count

(Rev.)
KJ-010 11-6-75 See Procedure SIS-15

SIGNED M. Collins

APPENDIX B

EXAMPLE CALCULATION OF IDLE AND QUEUE EMISSION FACTORS

Idle Emission Factors for CO - Example Calculations

1983: CO idle emissions = 10.12 g/veh min

To convert to emissions per length per time per land multiply idle emissions by unit conversions and divide by average vehicle length:

$$(10.12 \text{ g/veh min}) \left(\frac{1 \times 10^6 \ \mu g}{g}\right) \left(\frac{\text{min}}{60 \text{ sec}}\right) \left(\frac{\text{veh}}{4.35 \text{ m}}\right) = 38774.8 \ \mu g/\text{m sec land}$$

Total emissions (Q_1) are obtained by multiplying by the number of lanes in the queue and the delay time percentage:

$$Q_1 = (38774.8 \ \mu g/\text{m sec lane}) \ (\text{No. lanes}) \ (\text{percent red time})$$

Noting that this Q_1 is the same as the resulting total link emissions in CALINE-3 and that the equation used in Caline-3 is:

$$Q_1 = (0.1726) \ (EF) \ (VPH)$$

where:

EF is the CO emission factor is g/mi
VPH is the number of vehicles per hour

Because Q_1 is calculated above for queue links but CALINE-3 requires EF and VPH to be input, EF is arbitrarily specified at 100 g/mi and VPH is calculated:

$$VPH = \left(\frac{}{.1726}\right) \left(\frac{Q_1}{100 \text{ g/mi}}\right)$$

Specifying these EF and VPH as inputs to CALINE-3 results in the appropriate emissions assigned to the queuing links.

APPENDIX C

MOBILE-3 CALCULATIONS
MAIN AND DOUGLAS

**** MAIN AND DOUGLAS THRU 10,25 MPH JANUARY-JULY ****

I/M PROGRAM SELECTED:

START YEAR (JANUARY 1):	1981
PRE-1981 MYR STRINGENCY RATE:	10%
MECHANIC TRAINING PROGRAM?:	NO
FIRST MODEL YEAR COVERED:	1968
LAST MODEL YEAR COVERED:	2020
VEHICLE TYPES COVERED:	LDGV
1981 & LATER MYR TEST TYPE:	IDLE
1981 & LATER MYR TEST CUTPOINTS:	3.0% ICO / 300 PPM IHC

TOTAL HC EMISSION FACTORS INCLUDE EVAPORATIVE HC EMISSION FACTORS.

USER SUPPLIED VEH REGISTRATION DISTRIBUTIONS.

CAL. YEAR: 1983 I/M PROGRAM: YES AMBIENT TEMP: 24.0 (F) REGION: LOW

ANTI-TAM. PROGRAM: NO OPERATING MODE: 20.6 / 27.3 / 20.6 ALTITUDE: 500. FT.

VEH. TYPE:	LDGV	LDGT1	LDGT2	LDGT	HDGV	LDDV	LDDT	HDDV	MC	ALL VEH
VEH. SPEEDS:	25.0	25.0	25.0		25.0	25.0	25.0	25.0	25.0	
VMT MIX:	.797	.094	.094		.000	.010	.000	.000	.005	
COMPOSITE EMISSION FACTORS (GM/MILE)										
EXHAUST CO:	43.88	75.57	79.28	77.43	.00	1.01	.00	.00	28.91	49.68
HOT STABILIZED IDLE EMISSION FACTORS (GM/MIN)										
IDLE CO:	10.23	10.21	10.61	10.41	.00	.18	.00	.00	2.79	10.12

USER SUPPLIED VEH REGISTRATION DISTRIBUTIONS.

CAL. YEAR: 1987 I/M PROGRAM: YES AMBIENT TEMP: 24.0 (F) REGION: LOW

ANTI-TAM. PROGRAM: NO OPERATING MODE: 20.6 / 27.3 / 20.6 ALTITUDE: 500. FT.

VEH. TYPE:	LDGV	LDGT1	LDGT2	LDGT	HDGV	LDDV	LDDT	HDDV	MC	ALL VEH
VEH. SPEEDS:	25.0	25.0	25.0		25.0	25.0	25.0	25.0	25.0	
VMT MIX:	.797	.094	.094		.000	.010	.000	.000	.005	
COMPOSITE EMISSION FACTORS (GM/MILE)										
EXHAUST CO:	30.63	65.51	61.43	63.47	.00	1.03	.00	.00	27.32	36.49
HOT STABILIZED IDLE EMISSION FACTORS (GM/MIN)										
IDLE CO:	7.89	6.75	6.65	6.70	.00	.19	.00	.00	2.52	7.56

USER SUPPLIED VEH REGISTRATION DISTRIBUTIONS.
CAL. YEAR: 1983 I/M PROGRAM: YES AMBIENT TEMP: 80.0 (F) REGION: LOW
ANTI-TAM. PROGRAM: NO OPERATING MODE: 20.6 / 27.3 / 20.6 ALTITUDE: 500. FT.

VEH. TYPE:	LDGV	LDGT1	LDGT2	LDGT	HDGV	LDDV	LDDT	HDDV	MC	ALL VEH
VEH. SPEEDS:	25.0	25.0	25.0		25.0	25.0	25.0	25.0	25.0	
VMT MIX:	.797	.094	.094		.000	.010	.000	.000	.005	
COMPOSITE EMISSION FACTORS (GM/MILE)										
EXHAUST CO:	24.58	44.96	50.77	47.87	.00	1.01	.00	.00	18.07	28.69
HOT STABILIZED IDLE EMISSION FACTORS (GM/MIN)										
IDLE CO:	10.23	10.21	10.61	10.41	.00	.18	.00	.00	2.79	10.12

USER SUPPLIED VEH REGISTRATION DISTRIBUTIONS.
CAL. YEAR: 1987 I/M PROGRAM: YES AMBIENT TEMP: 80.0 (F) REGION: LOW
ANTI-TAM. PROGRAM: NO OPERATING MODE: 20.6 / 27.3 / 20.6 ALTITUDE: 500. FT.

VEH. TYPE:	LDGV	LDGT1	LDGT2	LDGT	HDGV	LDDV	LDDT	HDDV	MC	ALL VEH
VEH. SPEEDS:	25.0	25.0	25.0		25.0	25.0	25.0	25.0	25.0	
VMT MIX:	.797	.094	.094		.000	.010	.000	.000	.005	
COMPOSITE EMISSION FACTORS (GM/MILE)										
EXHAUST CO:	13.96	36.15	37.67	36.91	.00	1.03	.00	.00	16.50	18.16
HOT STABILIZED IDLE EMISSION FACTORS (GM/MIN)										
IDLE CO:	7.89	6.75	6.65	6.70	.00	.19	.00	.00	2.52	7.56

USER SUPPLIED VEH REGISTRATION DISTRIBUTIONS.
CAL. YEAR: 1983 I/M PROGRAM: YES AMBIENT TEMP: 24.0 (F) REGION: LOW
ANTI-TAM. PROGRAM: NO OPERATING MODE: 20.6 / 27.3 / 20.6 ALTITUDE: 500. FT.

VEH. TYPE:	LDGV	LDGT1	LDGT2	LDGT	HDGV	LDDV	LDDT	HDDV	MC	ALL VEH
VEH. SPEEDS:	10.0	10.0	10.0		10.0	10.0	10.0	10.0	10.0	
VMT MIX:	.797	.094	.094		.000	.010	.000	.000	.005	
COMPOSITE EMISSION FACTORS (GM/MILE)										
EXHAUST CO:	97.67	169.91	197.21	183.56	.00	2.34	.00	.00	74.07	112.75
HOT STABILIZED IDLE EMISSION FACTORS (GM/MIN)										
IDLE CO:	10.23	10.21	10.61	10.41	.00	.18	.00	.00	2.79	10.12

USER SUPPLIED VEH REGISTRATION DISTRIBUTIONS.

CAL. YEAR: 1987 I/M PROGRAM: YES AMBIENT TEMP: 24.0 (F) REGION: LOW

ANTI-TAM. PROGRAM: NO OPERATING MODE: 20.6 / 27.3 / 20.6 ALTITUDE: 500. FT.

VEH. TYPE:	LDGV	LDGT1	LDGT2	LDGT	HDGV	LDDV	LDDT	HDDV	MC	ALL VEH
VEH. SPEEDS:	10.0	10.0	10.0		10.0	10.0	10.0	10.0	10.0	
VMT MIX:	.797	.094	.094		.000	.010	.000	.000	.005	
COMPOSITE EMISSION FACTORS (GM/MILE)										
EXHAUST CO:	64.15	145.03	148.85	146.94	.00	2.38	.00	.00	70.03	79.13
HOT STABILIZED IDLE EMISSION FACTORS (GM/MIN)										
IDLE CO:	7.89	6.75	6.65	6.70	.00	.19	.00	.00	2.52	7.56

USER SUPPLIED VEH REGISTRATION DISTRIBUTIONS.

CAL. YEAR: 1983 I/M PROGRAM: YES AMBIENT TEMP: 80.0 (F) REGION: LOW

ANTI-TAM. PROGRAM: NO OPERATING MODE: 20.6 / 27.3 / 20.6 ALTITUDE: 500. FT.

VEH. TYPE:	LDGV	LDGT1	LDGT2	LDGT	HDGV	LDDV	LDDT	HDDV	MC	ALL VEH
VEH. SPEEDS:	10.0	10.0	10.0		10.0	10.0	10.0	10.0	10.0	
VMT MIX:	.797	.094	.094		.000	.010	.000	.000	.005	
COMPOSITE EMISSION FACTORS (GM/MILE)										
EXHAUST CO:	55.76	101.57	125.48	113.52	.00	2.34	.00	.00	46.04	56.03
HOT STABILIZED IDLE EMISSION FACTORS (GM/MIN)										
100:>P 100										
HOT STABILIZED IDLE EMISSION FACTORS (GM/MIN)										
IDLE CO:	10.23	10.21	10.61	10.41	.00	.18	.00	.00	2.79	10.12

USER SUPPLIED VEH REGISTRATION DISTRIBUTIONS.

CAL. YEAR: 1987 I/M PROGRAM: YES AMBIENT TEMP: 80.0 (F) REGION: LOW

ANTI-TAM. PROGRAM: NO OPERATING MODE: 20.6 / 27.3 / 20.6 ALTITUDE: 500. FT.

VEH. TYPE:	LDGV	LDGT1	LDGT2	LDGT	HDGV	LDDV	LDDT	HDDV	MC	ALL VEH
VEH. SPEEDS:	10.0	10.0	10.0		10.0	10.0	10.0	10.0	10.0	
VMT MIX:	.797	.094	.094		.000	.010	.000	.000	.005	
COMPOSITE EMISSION FACTORS (GM/MILE)										
EXHAUST CO:	30.08	80.79	91.50	86.14	.00	2.38	.00	.00	42.26	40.40
HOT STABILIZED IDLE EMISSION FACTORS (GM/MIN)										
IDLE CO:	7.89	6.75	6.65	6.70	.00	.19	.00	.00	2.52	7.56

**** MAIN AND DOUGLAS THRU 15,20 MPH JANUARY-JULY ****

I/M PROGRAM SELECTED:

START YEAR (JANUARY 1):	1981
PRE-1981 MYR STRINGENCY RATE:	10%
MECHANIC TRAINING PROGRAM?:	NO
FIRST MODEL YEAR COVERED:	1968
LAST MODEL YEAR COVERED:	2020
VEHICLE TYPES COVERED:	LDGV
1981 & LATER MYR TEST TYPE:	IDLE
1981 & LATER MYR TEST CUTPOINTS:	3.0% ICO / 300 PPM IHC

TOTAL HC EMISSION FACTORS INCLUDE EVAPORATIVE HC EMISSION FACTORS.

USER SUPPLIED VEH REGISTRATION DISTRIBUTIONS.

CAL. YEAR: 1983 I/M PROGRAM: YES AMBIENT TEMP: 24.0 (F) REGION: LOW

ANTI-TAM. PROGRAM: NO OPERATING MODE: 20.6 / 27.3 / 20.6 ALTITUDE: 500. FT.

VEH. TYPE:	LDGV	LDGT1	LDGT2	LDGT	HDGV	LDDV	LDDT	HDDV	MC	ALL VEH
VEH. SPEEDS:	20.0	20.0	20.0		20.0	20.0	20.0	20.0	20.0	
VMT MIX:	.797	.094	.094		.000	.010	.000	.000	.005	
COMPOSITE EMISSION FACTORS (GM/MILE)										
EXHAUST CO:	54.77	94.64	100.38	97.51	.00	1.28	.00	.00	36.06	62.17
HOT STABILIZED IDLE EMISSION FACTORS (GM/MIN)										
IDLE CO:	10.23	10.21	10.61	10.41	.00	.18	.00	.00	2.79	10.12

USER SUPPLIED VEH REGISTRATION DISTRIBUTIONS.

CAL. YEAR: 1987 I/M PROGRAM: YES AMBIENT TEMP: 24.0 (F) REGION: LOW

ANTI-TAM. PROGRAM: NO OPERATING MODE: 20.6 / 27.3 / 20.6 ALTITUDE: 500. FT.

VEH. TYPE:	LDGV	LDGT1	LDGT2	LDGT	HDGV	LDDV	LDDT	HDDV	MC	ALL VEH
VEH. SPEEDS:	20.0	20.0	20.0		20.0	20.0	20.0	20.0	20.0	
VMT MIX:	.797	.094	.094		.000	.010	.000	.000	.005	
COMPOSITE EMISSION FACTORS (GM/MILE)										
EXHAUST CO:	38.37	83.04	78.67	80.86	.00	1.30	.00	.00	34.23	45.97
HOT STABILIZED IDLE EMISSION FACTORS (GM/MIN)										
IDLE CO:	7.89	6.75	6.65	6.70	.00	.19	.00	.00	2.52	7.56

USER SUPPLIED VEH REGISTRATION DISTRIBUTIONS.

CAL. YEAR: 1983 I/M PROGRAM: YES AMBIENT TEMP: 80.0 (F) REGION: LOW

ANTI-TAM. PROGRAM: NO OPERATING MODE: 20.6 / 27.3 / 20.6 ALTITUDE: 500. FT.

VEH. TYPE:	LDGV	LDGT1	LDGT2	LDGT	HDGV	LDDV	LDDT	HDDV	MC	ALL VEH
VEH. SPEEDS:	20.0	20.0	20.0		20.0	20.0	20.0	20.0	20.0	
VMT MIX:	.797	.094	.094		.000	.010	.000	.000	.005	
COMPOSITE EMISSION FACTORS (GM/MILE)										
EXHAUST CO:	30.62	56.13	64.03	60.08	.00	1.28	.00	.00	22.50	35.83
HOT STABILIZED IDLE EMISSION FACTORS (GM/MIN)										
IDLE CO:	10.23	10.21	10.61	10.41	.00	.18	.00	.00	2.79	10.12

USER SUPPLIED VEH REGISTRATION DISTRIBUTIONS.

CAL. YEAR: 1987 I/M PROGRAM: YES AMBIENT TEMP: 80.0 (F) REGION: LOW

ANTI-TAM. PROGRAM: NO OPERATING MODE: 20.6 / 27.3 / 20.6 ALTITUDE: 500. FT.

VEH. TYPE:	LDGV	LDGT1	LDGT2	LDGT	HDGV	LDDV	LDDT	HDDV	MC	ALL VEH
VEH. SPEEDS:	20.0	20.0	20.0		20.0	20.0	20.0	20.0	20.0	
VMT MIX:	.797	.094	.094		.000	.010	.000	.000	.005	
COMPOSITE EMISSION FACTORS (GM/MILE)										
EXHAUST CO:	17.51	45.79	48.18	46.98	.00	1.30	.00	.00	20.67	22.91
HOT STABILIZED IDLE EMISSION FACTORS (GM/MIN)										
IDLE CO:	7.89	6.75	6.65	6.70	.00	.19	.00	.00	2.52	7.56

USER SUPPLIED VEH REGISTRATION DISTRIBUTIONS.

CAL. YEAR: 1983 I/M PROGRAM: YES AMBIENT TEMP: 24.0 (F) REGION: LOW

ANTI-TAM. PROGRAM: NO OPERATING MODE: 20.6 / 27.3 / 20.6 ALTITUDE: 500. FT.

VEH. TYPE:	LDGV	LDGT1	LDGT2	LDGT	HDGV	LDDV	LDDT	HDDV	MC	ALL VEH
VEH. SPEEDS:	15.0	15.0	15.0		15.0	15.0	15.0	15.0	15.0	
VMT MIX:	.797	.094	.094		.000	.010	.000	.000	.005	
COMPOSITE EMISSION FACTORS (GM/MILE)										
EXHAUST CO:	69.98	121.19	132.90	127.04	.00	1.69	.00	.00	47.95	79.92
HOT STABILIZED IDLE EMISSION FACTORS (GM/MIN)										
IDLE CO:	10.23	10.21	10.61	10.41	.00	.18	.00	.00	2.79	10.12

USER SUPPLIED VEH REGISTRATION DISTRIBUTIONS.

CAL. YEAR: 1987 I/M PROGRAM: YES AMBIENT TEMP: 24.0 (F) REGION: LOW

ANTI-TAM. PROGRAM: NO OPERATING MODE: 20.6 / 27.3 / 20.6 ALTITUDE: 500. FT.

VEH. TYPE:	LDGV	LDGT1	LDGT2	LDGT	HDGV	LDDV	LDDT	HDDV	MC	ALL VEH
VEH. SPEEDS:	15.0	15.0	15.0		15.0	15.0	15.0	15.0	15.0	
VMT MIX:	.797	.094	.094		.000	.010	.000	.000	.005	
COMPOSITE EMISSION FACTORS (GM/MILE)										
EXHAUST CO:	48.50	106.55	103.89	105.22	.00	1.72	.00	.00	45.51	58.68
HOT STABILIZED IDLE EMISSION FACTORS (GM/MIN)										
IDLE CO:	7.89	6.75	6.65	6.70	.00	.19	.00	.00	2.52	7.56

USER SUPPLIED VEH REGISTRATION DISTRIBUTIONS.

CAL. YEAR: 1983 I/M PROGRAM: YES AMBIENT TEMP: 80.0 (F) REGION: LOW

ANTI-TAM. PROGRAM: NO OPERATING MODE: 20.6 / 27.3 / 20.6 ALTITUDE: 500. FT.

VEH. TYPE:	LDGV	LDGT1	LDGT2	LDGT	HDGV	LDDV	LDDT	HDDV	MC	ALL VEH
VEH. SPEEDS:	15.0	15.0	15.0		15.0	15.0	15.0	15.0	15.0	
VMT MIX:	.797	.094	.094		.000	.010	.000	.000	.005	
COMPOSITE EMISSION FACTORS (GM/MILE)										
EXHAUST CO:	39.27	71.92	84.55	78.23	.00	1.69	.00	.00	29.86	45.13
HOT STABILIZED IDLE EMISSION FACTORS (GM/MIN)										
IDLE CO:	10.23	10.21	10.61	10.41	.00	.18	.00	.00	2.79	10.12

USER SUPPLIED VEH REGISTRATION DISTRIBUTIONS.

CAL. YEAR: 1987 I/M PROGRAM: YES AMBIENT TEMP: 80.0 (F) REGION: LOW

ANTI-TAM. PROGRAM: NO OPERATING MODE: 20.6 / 27.3 / 20.6 ALTITUDE: 500. FT.

VEH. TYPE:	LDGV	LDGT1	LDGT2	LDGT	HDGV	LDDV	LDDT	HDDV	MC	ALL VEH
VEH. SPEEDS:	15.0	15.0	15.0		15.0	15.0	15.0	15.0	15.0	
VMT MIX:	.797	.094	.094		.000	.010	.000	.000	.005	
COMPOSITE EMISSION FACTORS (GM/MILE)										
EXHAUST CO:	22.25	58.86	63.62	61.24	.00	1.72	.00	.00	27.47	25.40
HOT STABILIZED IDLE EMISSION FACTORS (GM/MIN)										
IDLE CO:	7.89	6.75	6.65	6.70	.00	.19	.00	.00	2.52	7.56

APPENDIX D

MOBILE-3 CALCULATIONS
BROADWAY, 1ST, AND 2ND STREETS

**** BROADWAY - 1ST-2ND : WICHITA ****

I/M PROGRAM SELECTED:

START YEAR (JANUARY 1):	1981
PRE-1981 MYR STRINGENCY RATE:	10%
MECHANIC TRAINING PROGRAM?:	NO
FIRST MODEL YEAR COVERED:	1968
LAST MODEL YEAR COVERED:	1999
VEHICLE TYPES COVERED:	LDGV
1981 & LATER MYR TEST TYPE:	IDLE
1981 & LATER MYR TEST CUTPOINTS:	3.0% ICO / 300 PPM IHC

TOTAL HC EMISSION FACTORS INCLUDE EVAPORATIVE HC EMISSION FACTORS.

CAL. YEAR: 1983   I/M PROGRAM: YES   AMBIENT TEMP: 24.0 (F)   REGION: LOW
ANTI-TAM. PROGRAM: NO   OPERATING MODE: 20.6 / 27.3 / 20.6   ALTITUDE: 500. FT.

VEH. TYPE:	LDGV	LDGT1	LDGT2	LDGT	HDGV	LDDV	LDDT	HDDV	MC	ALL VEH
VEH. SPEEDS:	15.0	15.0	15.0		15.0	15.0	15.0	15.0	15.0	
VMT MIX:	.657	.131	.088		.040	.016	.004	.057	.007	
COMPOSITE EMISSION FACTORS (GM/MILE)										
EXHAUST CO:	68.67	121.19	132.90	125.89	230.96	1.68	2.19	17.69	47.95	83.26
HOT STABILIZED IDLE EMISSION FACTORS (GM/MIN)										
IDLE CO:	10.01	10.21	10.61	10.37	8.73	.18	.34	.89	2.79	9.26

CAL. YEAR: 1987   I/M PROGRAM: YES   AMBIENT TEMP: 24.0 (F)   REGION: LOW
ANTI-TAM. PROGRAM: NO   OPERATING MODE: 20.6 / 27.3 / 20.6   ALTITUDE: 500. FT.

VEH. TYPE:	LDGV	LDGT1	LDGT2	LDGT	HDGV	LDDV	LDDT	HDDV	MC	ALL VEH
VEH. SPEEDS:	15.0	15.0	15.0		15.0	15.0	15.0	15.0	15.0	
VMT MIX:	.647	.124	.087		.040	.031	.012	.051	.007	
COMPOSITE EMISSION FACTORS (GM/MILE)										
EXHAUST CO:	47.73	106.55	103.89	105.46	172.82	1.71	2.00	15.54	45.51	61.27
HOT STABILIZED IDLE EMISSION FACTORS (GM/MIN)										
IDLE CO:	7.71	6.75	6.65	6.71	4.97	.19	.35	.86	2.52	6.67

CAL. YEAR: 1983 I/M PROGRAM: YES AMBIENT TEMP: 80.0 (F) REGION: LOW

ANTI-TAM. PROGRAM: NO OPERATING MODE: 20.6 / 27.3 / 20.6 ALTITUDE: 500. FT.

VEH. TYPE:	LDGV	LDGT1	LDGT2	LDGT	HDGV	LDDV	LDDT	HDDV	MC	ALL VEH
VEH. SPEEDS:	15.0	15.0	15.0		15.0	15.0	15.0	15.0	15.0	
VMT MIX:	.657	.131	.088		.040	.016	.004	.057	.007	
COMPOSITE EMISSION FACTORS (GM/MILE)										
EXHAUST CO:	38.23	71.92	84.55	76.99	223.77	1.68	2.19	17.69	29.86	52.17
HOT STABILIZED IDLE EMISSION FACTORS (GM/MIN)										
IDLE CO:	10.01	10.21	10.61	10.37	8.73	.18	.34	.89	2.79	9.26

CAL. YEAR: 1987 I/M PROGRAM: YES AMBIENT TEMP: 80.0 (F) REGION: LOW

ANTI-TAM. PROGRAM: NO OPERATING MODE: 20.6 / 27.3 / 20.6 ALTITUDE: 500. FT.

VEH. TYPE:	LDGV	LDGT1	LDGT2	LDGT	HDGV	LDDV	LDDT	HDDV	MC	ALL VEH
VEH. SPEEDS:	15.0	15.0	15.0		15.0	15.0	15.0	15.0	15.0	
VMT MIX:	.647	.124	.087		.040	.031	.012	.051	.007	
COMPOSITE EMISSION FACTORS (GM/MILE)										
EXHAUST CO:	21.67	58.86	63.62	60.83	157.62	1.71	2.00	15.54	27.47	34.27
HOT STABILIZED IDLE EMISSION FACTORS (GM/MIN)										
IDLE CO:	7.71	6.75	6.65	6.71	4.97	.19	.35	.86	2.52	6.67

CAL. YEAR: 1983 I/M PROGRAM: YES AMBIENT TEMP: 24.0 (F) REGION: LOW

ANTI-TAM. PROGRAM: NO OPERATING MODE: 20.6 / 27.3 / 20.6 ALTITUDE: 500. FT.

VEH. TYPE:	LDGV	LDGT1	LDGT2	LDGT	HDGV	LDDV	LDDT	HDDV	MC	ALL VEH
VEH. SPEEDS:	20.0	20.0	20.0		20.0	20.0	20.0	20.0	20.0	
VMT MIX:	.657	.131	.088		.040	.016	.004	.057	.007	
COMPOSITE EMISSION FACTORS (GM/MILE)										
EXHAUST CO:	53.75	94.64	100.38	96.94	171.53	1.27	1.66	13.36	36.06	54.41
HOT STABILIZED IDLE EMISSION FACTORS (GM/MIN)										
IDLE CO:	10.01	10.21	10.61	10.37	8.73	.18	.34	.89	2.79	9.26

CAL. YEAR: 1987 I/M PROGRAM: YES AMBIENT TEMP: 24.0 (F) REGION: LOW
ANTI-TAM. PROGRAM: NO OPERATING MODE: 20.6 / 27.3 / 20.6 ALTITUDE: 500. FT.

VEH. TYPE:	LDGV	LDGT1	LDGT2	LDGT	HDGV	LDDV	LDDT	HDDV	MC	ALL VEH
VEH. SPEEDS:	20.0	20.0	20.0		20.0	20.0	20.0	20.0	20.0	
VMT MIX:	.647	.124	.087		.040	.031	.012	.051	.007	
COMPOSITE EMISSION FACTORS (GM/MILE)										
EXHAUST CO:	37.79	83.04	78.67	81.24	128.35	1.29	1.51	11.74	34.23	47.64
HOT STABILIZED IDLE EMISSION FACTORS (GM/MIN)										
IDLE CO:	7.71	6.75	6.65	6.71	4.97	.19	.35	.86	2.52	6.67

CAL. YEAR: 1983 I/M PROGRAM: YES AMBIENT TEMP: 80.0 (F) REGION: LOW
ANTI-TAM. PROGRAM: NO OPERATING MODE: 20.6 / 27.3 / 20.6 ALTITUDE: 500. FT.

VEH. TYPE:	LDGV	LDGT1	LDGT2	LDGT	HDGV	LDDV	LDDT	HDDV	MC	ALL VEH
VEH. SPEEDS:	20.0	20.0	20.0		20.0	20.0	20.0	20.0	20.0	
VMT MIX:	.657	.131	.088		.040	.016	.004	.057	.007	
COMPOSITE EMISSION FACTORS (GM/MILE)										
EXHAUST CO:	29.81	56.13	64.03	59.30	166.19	1.27	1.66	13.36	22.50	40.16
HOT STABILIZED IDLE EMISSION FACTORS (GM/MIN)										
IDLE CO:	10.01	10.21	10.61	10.37	8.73	.18	.34	.89	2.79	9.26

CAL. YEAR: 1987 I/M PROGRAM: YES AMBIENT TEMP: 80.0 (F) REGION: LOW
ANTI-TAM. PROGRAM: NO OPERATING MODE: 20.6 / 27.3 / 20.6 ALTITUDE: 500. FT.

VEH. TYPE:	LDGV	LDGT1	LDGT2	LDGT	HDGV	LDDV	LDDT	HDDV	MC	ALL VEH
VEH. SPEEDS:	20.0	20.0	20.0		20.0	20.0	20.0	20.0	20.0	
VMT MIX:	.647	.124	.087		.040	.031	.012	.051	.007	
COMPOSITE EMISSION FACTORS (GM/MILE)										
EXHAUST CO:	17.06	45.79	48.18	46.78	117.06	1.29	1.51	11.74	20.67	26.43
HOT STABILIZED IDLE EMISSION FACTORS (GM/MIN)										
IDLE CO:	7.71	6.75	6.65	6.71	4.97	.19	.35	.86	2.52	6.67

APPENDIX E

CALINE-3 CONCENTRATIONS FOR WORST CASE WIND DIRECTION AT THE SPECIAL PURPOSE MONITOR

JOB: WICHITA, KANSAS CO SIP STUDY 3525-73 RUN: MAIN AND DOUGLAS 1983 JANUARY

I. SITE VARIABLES

U = 1.5 M/S	CLAS = 4 (D)	VS = .0 CM/S	ATIM = 60. MINUTES	MIXH = 100. M
BRG = 70. DEGREES	Z0 = 321. CM	VD = .0 CM/S	AMB = 3.3 PPM	

II. LINK VARIABLES

LINK DESCRIPTION	*	X1	Y1	X2	Y2	*	LINK LENGTH (M)	LINK BRG (DEG)	TYPE	VPH	EF (G/MI)	H (M)	W (M)
		LINK COORDINATES (M)											
A. MAIN N STHBND THRU A	*	0.	0.	0.	300.	*	300.	360.	AG	668.	49.7	.5	20.6
B. MAIN S STHBND THRU B	*	0.	0.	0.	-300.	*	300.	180.	AG	668.	49.7	.5	20.6
C. DOUG W WSTBND THRU C	*	0.	9.	-300.	9.	*	300.	270.	AG	554.	62.2	.5	17.0
D. DOUG E WBND 3 THRU D	*	0.	5.	45.	5.	*	45.	90.	AG	599.	113.0	.5	16.7
E. DOUG E WBND 2 THRU E	*	45.	7.	300.	7.	*	255.	90.	AG	599.	113.0	.5	13.3
F. DOUG W EBND THRU F	*	0.	-5.	-300.	-5.	*	300.	270.	AG	572.	79.9	.5	16.4
G. DOUG E EBND THRU G	*	0.	-3.	300.	-3.	*	300.	90.	AG	618.	113.0	.5	12.7
H. MAIN N QUE LANE1-3 H	*	-2.	14.	-2.	31.	*	17.	360.	AG	3909.	100.0	.5	17.0
I. MAIN N QUE LANE 4 I	*	6.	14.	6.	66.	*	52.	360.	AG	1303.	100.0	.5	10.0
J. DOUG E QUE LANE2-3 J	*	10.	7.	23.	7.	*	13.	90.	AG	1547.	100.0	.5	13.0
K. DOUG E QUE LANE 1L K	*	10.	2.	31.	2.	*	22.	90.	AG	1910.	100.0	.5	10.0
L. DOUG E QUE LANE 25 L	*	31.	2.	53.	5.	*	22.	81.	AG	2247.	100.0	.5	10.0
M. DOUG E QUE LANE 25 M	*	53.	5.	75.	5.	*	22.	90.	AG	2247.	100.0	.5	10.0
N. DOUG W QUE LANE 3 N	*	-10.	-2.	-49.	-2.	*	39.	270.	AG	1281.	100.0	.5	10.0
O. DOUG W QUE LANE 2 O	*	-10.	-5.	-40.	-5.	*	31.	270.	AG	1281.	100.0	.5	10.0
P. DOUG W QUE LANE 1 P	*	-10.	-9.	-20.	-9.	*	10.	270.	AG	1281.	100.0	.5	10.0
Q. DOUG E QUE LANE 5 Q	*	23.	-2.	150.	-2.	*	127.	90.	AG	2247.	100.0	.5	10.0
R. DOUG W QUE LN 3 EX R	*	-49.	-2.	-62.	-2.	*	13.	270.	AG	2247.	100.0	.5	10.0

JOB: WICHITA, KANSAS CO SIP STUDY 3525-73 RUN: MAIN AND DOUGLAS 1983 JANUARY

I. SITE VARIABLES

U = 1.5 M/S CLAS = 4 (D) VS = .0 CM/S ATIM = 60. MINUTES MIXH = 100. M
BRG = 70. DEGREES Z0 = 321. CM VD = .0 CM/S AMB = 3.3 PPM

III. RECEPTOR LOCATIONS AND MODEL RESULTS

RECEPTOR	COORDINATES (M) X	Y	Z	TOTAL + AMB (PPM)
1. SPECIAL CO MONITOR	-37.	-13.	3.1	13.4

JOB: WICHITA, KANSAS CO SIP STUDY 3525-73 RUN: MAIN AND DOUGLAS 1983 JANUARY

I. SITE VARIABLES

U = 1.5 M/S CLAS = 4 (D) VS = .0 CM/S ATIM = 60. MINUTES MIXH = 100. M
BRG = 70. DEGREES Z0 = 321. CM VD = .0 CM/S AMB = 3.3 PPM

IV. MODEL RESULTS (RECEPTOR-LINK MATRIX)

RECEPTOR	*	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
		CO/LINK (PPM)																	
1. SPECIAL CO MONITOR	*	.2	.2	.2	.5	.3	1.0	.6	.4	.2	.4	.6	.4	.2	1.2	2.0	.7	1.0	.0

JOB: WICHITA, KANSAS CO SIP STUDY 3525-73 RUN: MAIN AND DOUGLAS JANUARY 1987

I. SITE VARIABLES

U = 1.5 M/S CLAS = 4 (D) VS = .0 CM/S ATIM = 60. MINUTES MIXH = 100. M
BRG = 70. DEGREES Z0 = 321. CM VD = .0 CM/S AMB = 2.8 PPM

II. LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	LINK LENGTH (M)	LINK BRG (DEG)	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. MAIN N STHBND THRU A	0.	0.	0.	300.	300.	360.	AG	711.	36.5	.5	20.6
B. MAIN S STHBND THRU B	0.	0.	0.	-300.	300.	180.	AG	711.	36.5	.5	20.6
C. DOUG W WSTBND THRU C	0.	9.	-300.	9.	300.	270.	AG	589.	46.0	.5	17.0
D. DOUG E WBND 3 THRU D	0.	5.	45.	5.	45.	90.	AG	637.	79.1	.5	16.7
E. DOUG E WBND 2 THRU E	45.	7.	300.	7.	255.	90.	AG	637.	79.1	.5	13.3
F. DOUG W EBND THRU F	0.	-5.	-300.	-5.	300.	270.	AG	609.	58.7	.5	16.4
G. DOUG E EBND THRU G	0.	-3.	300.	-3.	300.	90.	AG	658.	79.1	.5	12.7
H. MAIN N QUE LANE1-3 H	-2.	14.	-2.	31.	17.	360.	AG	2920.	100.0	.5	17.0
I. MAIN N QUE LANE 4 I	6.	14.	6.	66.	52.	360.	AG	973.	100.0	.5	10.0
J. DOUG E QUE LANE2-3 J	10.	7.	23.	7.	13.	90.	AG	1410.	100.0	.5	13.0
K. DOUG E QUE LANE 1L K	10.	2.	31.	2.	22.	90.	AG	1426.	100.0	.5	10.0
L. DOUG E QUE LANE 2B L	31.	2.	53.	5.	22.	81.	AG	1678.	100.0	.5	10.0
M. DOUG E QUE LANE 2B M	53.	5.	75.	5.	22.	90.	AG	1675.	100.0	.5	10.0
N. DOUG W QUE LANE 3 N	-10.	-2.	-49.	-2.	39.	270.	AG	457.	100.0	.5	10.0
O. DOUG W QUE LANE 2 O	-10.	-5.	-40.	-5.	31.	270.	AG	957.	100.0	.5	10.0
P. DOUG W QUE LANE 1 P	-10.	-9.	-20.	-9.	10.	270.	AG	957.	100.0	.5	10.0
Q. DOUG E QUE LANE 5 Q	23.	-2.	150.	-2.	127.	90.	AG	1678.	100.0	.5	10.0
R. DOUG W QUE LN 3 EX R	-49.	-2.	-62.	-2.	13.	270.	AG	1678.	100.0	.5	10.0

JOB: WICHITA, KANSAS CO SIP STUDY 3525-73 RUN: MAIN AND DOUGLAS JANUARY 1987

I. SITE VARIABLES

U = 1.5 M/S CLAS = 4 (D) VS = .0 CM/S ATIM = 60. MINUTES MIXH = 100. M
BRG = 70. DEGREES Z0 = 321. CM VD = .0 CM/S AMB = 2.8 PPM

III. RECEPTOR LOCATIONS AND MODEL RESULTS

RECEPTOR	COORDINATES (M) X	Y	Z	TOTAL + AMB (PPM)
1. SPECIAL CO MONITOR	-37.	-13.	3.1	10.2

JOB: WICHITA, KANSAS CO SIP STUDY 3525-73 RUN: MAIN AND DOUGLAS JANUARY 1987

I. SITE VARIABLES

```
 U = 1.5 M/S          CLAS =   4 (D)     VS =   .0 CM/S     ATIM = 60. MINUTES      MIXH = 100. M
BRG = 70. DEGREES       Z0 = 321. CM     VD =   .0 CM/S      AMB = 2.8 PPM
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IV. MODEL RESULTS (RECEPTOR-LINK MATRIX)

RECEPTOR	CO/LINK (PPM) A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1. SPECIAL CO MONITOR	.1	.1	.1	.3	.2	.8	.5	.3	.1	.3	.4	.3	.2	.9	1.5	.5	.8	.0

JOB: WICHITA, KANSAS CO SIP STUDY 3525-73 RUN: MAIN AND DOUGLAS JULY 1983

I. SITE VARIABLES

U = 1.0 M/S CLAS = 4 (D) VS = .0 CM/S ATIM = 60. MINUTES MIXH = 100. M
BRG = 70. DEGREES Z0 = 321. CM VD = .0 CM/S AMB = 1.5 PPM

II. LINK VARIABLES

LINK DESCRIPTION	X1	Y1	X2	Y2	LINK LENGTH (M)	LINK BRG (DEG)	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. MAIN N STHBND THRU A	0.	0.	0.	300.	300.	360.	AG	668.	28.7	.5	20.6
B. MAIN S STHBND THRU B	0.	0.	0.	-300.	300.	180.	AG	668.	28.7	.5	20.6
C. DOUG W WSTBND THRU C	0.	9.	-300.	9.	300.	270.	AG	554.	35.8	.5	17.0
D. DOUG E WBND 3 THRU D	0.	5.	45.	5.	45.	90.	AG	599.	66.0	.5	16.7
E. DOUG E WBND 2 THRU E	45.	7.	300.	7.	255.	90.	AG	599.	66.0	.5	13.3
F. DOUG W EBND THRU F	0.	-5.	-300.	-5.	300.	270.	AG	572.	46.2	.5	16.4
G. DOUG E EBND THRU G	0.	-3.	300.	-3.	300.	90.	AG	618.	66.0	.5	12.7
H. MAIN N QUE LANE1-3 H	-2.	14.	-2.	31.	17.	360.	AG	5909.	100.0	.5	17.0
I. MAIN N QUE LANE 4 I	6.	14.	6.	66.	52.	360.	AG	1303.	100.0	.5	10.0
J. DOUG E QUE LANE2-3 J	10.	7.	23.	7.	13.	90.	AG	1887.	100.0	.5	13.0
K. DOUG E QUE LANE 1L K	10.	2.	31.	2.	22.	90.	AG	1910.	100.0	.5	10.0
L. DOUG E QUE LANE 2R L	31.	2.	53.	5.	22.	81.	AG	2247.	100.0	.5	10.0
M. DOUG E QUE LANE 2B M	53.	5.	75.	5.	22.	90.	AG	2247.	100.0	.5	10.0
N. DOUG W QUE LANE 3 N	-10.	-2.	-49.	-2.	39.	270.	AG	1281.	100.0	.5	10.0
O. DOUG W QUE LANE 2 O	-10.	-5.	-40.	-5.	31.	270.	AG	1281.	100.0	.5	10.0
P. DOUG W QUE LANE 1 P	-10.	-9.	-20.	-9.	10.	270.	AG	1281.	100.0	.5	10.0
Q. DOUG E QUE LANE 5 Q	23.	-2.	150.	-2.	127.	90.	AG	2247.	100.0	.5	10.0
R. DOUG W QUE LN 3 EX R	-49.	-2.	-62.	-2.	13.	270.	AG	2247.	100.0	.5	10.0

JOB: WICHITA, KANSAS CO SIP STUDY 3525-73 RUN: MAIN AND DOUGLAS JULY 1983

I. SITE VARIABLES

E-19

U = 1.0 M/S CLAS = 4 (D) VS = .0 CM/S ATIM = 60. MINUTES MIXH = 100. M
BRG = 70. DEGREES ZO = 321. CM VD = .0 CM/S AMB = 1.5 PPM

III. RECEPTOR LOCATIONS AND MODEL RESULTS

RECEPTOR	COORDINATES (M) X	Y	Z	TOTAL + AMB (PPM)
1. SPECIAL CO MONITOR	-37.	-13.	3.1	13.9

JOB: WICHITA, KANSAS CO SIP STUDY 3525-73 RUN: MAIN AND DOUGLAS JULY 1983

I. SITE VARIABLES

U = 1.0 M/S CLAS = 4 (D) VS = .0 CM/S ATIM = 60. MINUTES MIXH = 100. M
BRG = 70. DEGREES Z0 = 321. CM VD = .0 CM/S AMB = 1.5 PPM

IV. MODEL RESULTS (RECEPTOR-LINK MATRIX)

RECEPTOR	*	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
		CO/LINK (PPM)																	
1. SPECIAL CO MONITOR	*	.1	.1	.1	.4	.3	.8	.5	.6	.3	.6	.8	.6	.3	1.7	2.9	.9	1.4	.0

JOB: WICHITA, KANSAS CO SIP STUDY 3525-73 RUN: MAIN AND DOUGLAS JULY 1987

I. SITE VARIABLES

U = 1.0 M/S CLAS = 4 (D) VS = .0 CM/S ATIM = 60. MINUTES MIXH = 100. M
BRG = 70. DEGREES ZO = 321. CM VD = .0 CM/S AMB = 1.2 PPM

II. LINK VARIABLES

LINK DESCRIPTION	X1	Y1	X2	Y2	LINK LENGTH (M)	LINK BRG (DEG)	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. MAIN N STHBND THRU A	0.	0.	0.	300.	300.	360.	AG	711.	18.2	.5	20.6
B. MAIN S STHBND THRU B	0.	0.	0.	-300.	300.	180.	AG	711.	18.2	.5	20.6
C. DOUG W WSTBND THRU C	0.	9.	-300.	9.	300.	270.	AG	589.	22.9	.5	17.0
D. DOUG E WBND 3 THRU D	0.	5.	45.	5.	45.	90.	AG	637.	40.4	.5	16.7
E. DOUG E WBND 2 THRU E	45.	7.	300.	7.	255.	90.	AG	637.	40.4	.5	13.3
F. DOUG W EBND THRU F	0.	-5.	-300.	-5.	300.	270.	AG	609.	29.4	.5	16.4
G. DOUG E EBND THRU G	0.	-3.	300.	-3.	300.	90.	AG	659.	40.4	.5	12.7
H. MAIN N QUE LANE1-3 H	-2.	14.	-2.	31.	17.	360.	AG	2920.	100.0	.5	17.0
I. MAIN N QUE LANE 4 I	6.	14.	6.	66.	52.	360.	AG	973.	100.0	.5	10.0
J. DOUG E QUE LANE2-3 J	10.	7.	23.	7.	13.	90.	AG	1410.	100.0	.5	13.0
K. DOUG E QUE LANE 1L K	10.	2.	31.	2.	22.	90.	AG	1426.	100.0	.5	10.0
L. DOUG E QUE LANE 2S L	31.	2.	53.	5.	22.	81.	AG	1678.	100.0	.5	10.0
M. DOUG E QUE LANE 2R M	53.	5.	75.	5.	22.	90.	AG	1678.	100.0	.5	10.0
N. DOUG W QUE LANE 3 N	-10.	-2.	-49.	-2.	39.	270.	AG	957.	100.0	.5	10.0
O. DOUG W QUE LANE 2 O	-10.	-5.	-40.	-5.	31.	270.	AG	957.	100.0	.5	10.0
P. DOUG W QUE LANE 1 P	-10.	-9.	-20.	-9.	10.	270.	AG	957.	100.0	.5	10.0
Q. DOUG E QUE LANE 5 Q	23.	-2.	150.	-2.	127.	90.	AG	1678.	100.0	.5	10.0
R. DOUG W QUE LN 3 EX R	-49.	-2.	-62.	-2.	13.	270.	AG	1678.	100.0	.5	10.0

JOB: WICHITA, KANSAS CO SIP STUDY 3525-73 RUN: MAIN AND DOUGLAS JULY 1987

I. SITE VARIABLES

U = 1.0 M/S CLAS = 4 (D) VS = .0 CM/S ATIM = 60. MINUTES MIXH = 100. M
BRG = 70. DEGREES ZO = 321. CM VD = .0 CM/S AMB = 1.2 PPM

III. RECEPTOR LOCATIONS AND MODEL RESULTS

RECEPTOR	COORDINATES (M) X	Y	Z	TOTAL + AMB (PPM)
1. SPECIAL CO MONITOR	-37.	-13.	3.1	10.3

JOB: WICHITA, KANSAS CO SIP STUDY 3525-73 RUN: MAIN AND DOUGLAS JULY 1987

I. SITE VARIABLES

U = 1.0 M/S CLAS = 4 (D) VS = .0 CM/S ATIM = 60. MINUTES MIXH = 100. M
BRG = 70. DEGREES Z0 = 321. CM VD = .0 CM/S AMB = 1.2 PPM

IV. MODEL RESULTS (RECEPTOR-LINK MATRIX)

RECEPTOR	*	CO/LINK (PPM) A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1. SPECIAL CO MONITOR	*	.1	.1	.1	.2	.2	.5	.3	.4	.2	.4	.6	.4	.3	1.3	2.2	.7	1.1	.0

APPENDIX F

CALINE-3 CONCENTRATIONS FOR WORST CASE WIND DIRECTION AT THE ALTERNATE MONITOR

JOB: WICHITA, KANSAS CO SIP STUDY 3525-73 RUN: BROADWAY BTWN 1ST AND 2ND JANUARY 1983

I. SITE VARIABLES

U = 1.5 M/S	CLAS = 4 (D)	VS = .0 CM/S	ATIM = 60. MINUTES
BRG = 210. DEGREES	Z0 = 321. CM	VD = .0 CM/S	AMB = 3.3 PPM

MIXH = 100. M

F-2

II. LINK VARIABLES

LINK DESCRIPTION	*	LINK COORDINATES (M) X1	Y1	X2	Y2	*	LINK LENGTH (M)	LINK BRG (DEG)	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. BROADWAY SBND THRU A	*	-3.	-100.	-3.	100.	*	200.	360.	AG	390.	83.3	.5	12.7
B. BROADWAY NBND THRU B	*	3.	-100.	3.	100.	*	200.	360.	AG	390.	83.3	.5	12.7
C. 1ST WST EBND THRU C	*	0.	-63.	100.	-63.	*	100.	90.	AG	1017.	63.3	.5	16.1
D. 1ST EST EBND THRU D	*	0.	-63.	100.	-63.	*	100.	90.	AG	1293.	83.3	.5	16.1
E. 2ND WST WBND THRU E	*	-100.	63.	0.	63.	*	100.	90.	AG	858.	64.1	.5	16.1
F. 2ND EST WBND THRU F	*	0.	63.	100.	63.	*	100.	90.	AG	762.	64.1	.5	16.1
G. BRDWAY S LEFT QUE G	*	-2.	-55.	-2.	-20.	*	35.	360.	AG	1788.	100.0	.5	10.0
H. BRDWAY S THROQUE H	*	-5.	-55.	-5.	-38.	*	17.	360.	AG	987.	100.0	.5	10.0
I. BRDWAY N THROQUE I	*	5.	55.	5.	38.	*	17.	180.	AG	822.	100.0	.5	10.0
J. BRDWAY N LEFT QUE J	*	2.	55.	2.	20.	*	35.	180.	AG	1768.	100.0	.5	10.0
K. 1ST WST QUE K	*	-10.	-63.	-88.	-63.	*	78.	270.	AG	3207.	100.0	.5	16.1
L. 2ND EST QUE L	*	10.	60.	62.	60.	*	52.	90.	AG	3700.	100.0	.5	16.1

JOB: WICHITA, KANSAS CO SIP STUDY 3525-73 RUN: BROADWAY BTWN 1ST AND 2ND JANUARY 1983

I. SITE VARIABLES

U = 1.5 M/S CLAS = 4 (D) VS = .0 CM/S ATIM = 60. MINUTES MIXH = 100. M
BRG = 210. DEGREES Z0 = 321. CM VD = .0 CM/S AMB = 3.3 PPM

III. RECEPTOR LOCATIONS AND MODEL RESULTS

RECEPTOR	COORDINATES (M) X	Y	Z	TOTAL + AMB (PPM)
1. PROPOSED CBD MONITOR	14.	0.	3.1	7.9

JOB: WICHITA, KANSAS CO SIP STUDY 3525-73 RUN: BROADWAY BTWN 1ST AND 2ND JANUARY 1983

I. SITE VARIABLES

U = 1.5 M/S
BRG = 210. DEGREES
CLAS = 4 (D)
ZO = 321. CM
VS = .0 CM/S
VD = .0 CM/S
ATIM = 60. MINUTES
AMB = 3.3 PPM
MIXH = 100. M

IV. MODEL RESULTS (RECEPTOR-LINK MATRIX)

RECEPTOR	*	A	B	C	D	E	F	G	H	I	J	K	L
		CO/LINK (PPM)											
1. PROPOSED CBD MONITOR	*	.5	.7	.1	.1	.0	.0	1.4	.3	.0	.0	1.5	.0

JOB: WICHITA, KANSAS CO SIP STUDY 3525-73 RUN: BROADWAY BTWN 1ST AND 2ND JANUARY 1987

I. SITE VARIABLES

U = 1.5 M/S	CLAS = 4 (D)	VS = .0 CM/S	ATIM = 60. MINUTES	MIXH = 100. M
BRG = 210. DEGREES	Z0 = 321. CM	VD = .0 CM/S	AMB = 2.6 PPM	

II. LINK VARIABLES

LINK DESCRIPTION		X1	Y1	X2	Y2	LINK LENGTH (M)	LINK BRG (DEG)	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. BROADWAY SBND THRU	A	-3.	-100.	-3.	100.	200.	360.	AG	415.	61.3	.5	12.7
B. BROADWAY NBND THRU	B	3.	-100.	3.	100.	200.	360.	AG	415.	61.3	.5	12.7
C. 1ST WST EBND THRU	C	0.	-63.	100.	-63.	100.	90.	AG	1082.	61.3	.5	16.1
D. 1ST EST EBND THRU	D	0.	-63.	100.	-63.	100.	90.	AG	1375.	61.3	.5	16.1
E. 2ND WST WBND THRU	E	-100.	63.	0.	63.	100.	90.	AG	913.	47.6	.5	16.1
F. 2ND EST WBND THRU	F	0.	63.	100.	63.	100.	90.	AG	811.	47.6	.5	16.1
G. BRDWAY S LEFT QUE	G	-2.	-55.	-2.	-20.	35.	360.	AG	1288.	100.0	.5	10.0
H. BRDWAY S THRUQUE	H	-5.	-55.	-5.	-38.	17.	360.	AG	711.	100.0	.5	10.0
I. BRDWAY N THRUQUE	I	5.	55.	5.	38.	17.	180.	AG	592.	100.0	.5	10.0
J. BRDWAY N LEFT QUE	J	2.	55.	2.	20.	35.	180.	AG	1273.	100.0	.5	10.0
K. 1ST WST QUE	K	-10.	-63.	-88.	-63.	78.	270.	AG	2310.	100.0	.5	16.1
L. 2ND EST QUE	L	10.	60.	62.	60.	52.	90.	AG	2665.	100.0	.5	16.1

JOB: WICHITA, KANSAS CO SIP STUDY 3525-73 RUN: BROADWAY BTWN 1ST AND 2ND JANUARY 1987

I. SITE VARIABLES

```
  U = 1.5 M/S          CLAS =   4  (D)     VS =  .0 CM/S    ATIM = 60. MINUTES      MIXH = 100. M
BRG = 210. DEGREES       Z0 = 321. CM      VD =  .0 CM/S     AMB = 2.8 PPM
```


III. RECEPTOR LOCATIONS AND MODEL RESULTS

RECEPTOR	COORDINATES (M) X	Y	Z	TOTAL + AMB (PPM)
1. PROPOSED CBD MONITOR	14.	0.	3.1	6.2

JOB: WICHITA, KANSAS CO SIP STUDY 3525-73 RUN: BROADWAY BTWN 1ST AND 2ND JANUARY 1987

I. SITE VARIABLES

```
  U =  1.5 M/S          CLAS =   4  (D)       VS =    .0 CM/S     ATIM =  60. MINUTES       MIXH =  100. M
BRG = 210. DEGREES        Z0 = 321. CM        VD =    .0 CM/S      AMB =  2.8 PPM
```

IV. MODEL RESULTS (RECEPTOR-LINK MATRIX)

RECEPTOR	*	A	B	C	D	E	F	G	H	I	J	K	L
		CO/LINK (PPM)											
1. PROPOSED CHD MONITOR	*	.4	.6	.0	.1	.0	.0	1.0	.2	.0	.0	1.1	.0

JOB: WICHITA, KANSAS CO SIP STUDY 3525-73 RUN: BROADWAY BTWN 1ST AND 2ND JULY 1983

I. SITE VARIABLES

U = 1.0 M/S CLAS = 4 (D) VS = .0 CM/S ATIM = 60. MINUTES MIXH = 100. M
BRG = 210. DEGREES ZO = 321. CM VD = .0 CM/S AMB = 1.5 PPM

II. LINK VARIABLES

E-8

LINK DESCRIPTION	X1	Y1	X2	Y2	LINK LENGTH (M)	LINK BRG (DEG)	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. BROADWAY SBND THRU A	-3.	-100.	-3.	100.	200.	360.	AG	390.	52.2	.5	12.7
B. BROADWAY NBND THRU B	3.	-100.	3.	100.	200.	360.	AG	390.	52.2	.5	12.7
C. 1ST WST EBND THRU C	0.	-63.	100.	-63.	100.	90.	AG	1017.	52.2	.5	16.1
D. 1ST EST EBND THRU D	0.	-63.	100.	-63.	100.	90.	AG	1293.	52.2	.5	16.1
E. 2ND WST WBND THRU E	-100.	63.	0.	63.	100.	90.	AG	658.	40.2	.5	16.1
F. 2ND EST WBND THRU F	0.	63.	100.	63.	100.	90.	AG	762.	40.2	.5	16.1
G. BRDWAY S LEFT QUE G	-2.	-55.	-2.	-20.	35.	360.	AG	1788.	100.0	.5	10.0
H. BRDWAY S THRUQUE H	-5.	-55.	-5.	-38.	17.	360.	AG	987.	100.0	.5	10.0
I. BRDWAY N THRUQUE I	5.	55.	5.	38.	17.	180.	AG	622.	100.0	.5	10.0
J. BRDWAY N LEFT QUE J	2.	55.	2.	20.	35.	180.	AG	1768.	100.0	.5	10.0
K. 1ST WST QUE K	-10.	-63.	-88.	-63.	78.	270.	AG	3207.	100.0	.5	16.1
L. 2ND EST QUE L	10.	60.	62.	60.	52.	90.	AG	3700.	100.0	.5	16.1

JOB: WICHITA, KANSAS CO SIP STUDY 3525-73 RUN: BROADWAY BTWN 1ST AND 2ND JULY 1983

I. SITE VARIABLES

U = 1.0 M/S CLAS = 4 (D) VS = .0 CM/S ATIM = 60. MINUTES MIXH = 100. M
BRG = 210. DEGREES Z0 = 321. CM VD = .0 CM/S AMB = 1.5 PPM

F-9

III. RECEPTOR LOCATIONS AND MODEL RESULTS

RECEPTOR	COORDINATES (M) X	Y	Z	TOTAL + AMB (PPM)
1. PROPOSED CBD MONITOR	14.	0.	3.1	7.4

CALINE3: CALIFORNIA LINE SOURCE DISPERSION MODEL - SEPTEMBER, 1979 VERSION

JOB: WICHITA, KANSAS CO SIP STUDY 3525-73 RUN: BROADWAY BTWN 1ST AND 2ND JULY 1983

I. SITE VARIABLES

U = 1.0 M/S CLAS = 4 (D) VS = .0 CM/S ATIM = 60. MINUTES MIXH = 100. M
BRG = 210. DEGREES ZO = 321. CM VD = .0 CM/S AMB = 1.5 PPM

IV. MODEL RESULTS (RECEPTOR-LINK MATRIX)

RECEPTOR	*	CO/LINK (PPM) A	B	C	D	E	F	G	H	I	J	K	L
1. PROPOSED CBD MONITOR	*	.5	.6	.1	.1	.0	.0	2.1	.4	.0	.0	2.1	.0

JOB: WICHITA, KANSAS CO SIP STUDY 3525-73 RUN: BROADWAY BTWN 1ST AND 2ND JULY 1987

I. SITE VARIABLES

U = 1.0 M/S CLAS = 4 (D) VS = .0 CM/S ATIM = 60. MINUTES MIXH = 100. M
BRG = 210. DEGREES Z0 = 321. CM VD = .0 CM/S AMB = 1.2 PPM

II. LINK VARIABLES

LINK DESCRIPTION	X1	Y1	X2	Y2	LINK LENGTH (M)	LINK BRG (DEG)	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. BROADWAY SBND THRU A	-3.	-100.	-3.	100.	200.	360.	AG	415.	34.3	.5	12.7
B. BROADWAY NBND THRU B	3.	-100.	3.	100.	200.	360.	AG	415.	34.3	.5	12.7
C. 1ST WST EBND THRU C	0.	-63.	100.	-63.	100.	90.	AG	1082.	34.3	.5	16.1
D. 1ST EST EBND THRU D	0.	-63.	100.	-63.	100.	90.	AG	1375.	34.3	.5	16.1
E. 2ND WST WBND THRU E	-100.	63.	0.	63.	100.	90.	AG	913.	26.4	.5	16.1
F. 2ND EST WBND THRU F	0.	63.	100.	63.	100.	90.	AG	811.	26.4	.5	16.1
G. BRDWAY S LEFT QUE G	-2.	-55.	-2.	-20.	35.	360.	AG	1288.	100.0	.5	10.0
H. BRDWAY S THRUQUE H	-5.	-55.	-5.	-38.	17.	360.	AG	711.	100.0	.5	10.0
I. BRDWAY N THRUQUE I	5.	55.	5.	38.	17.	180.	AG	592.	100.0	.5	10.0
J. BRDWAY N LEFT QUE J	2.	55.	2.	20.	35.	180.	AG	1273.	100.0	.5	10.0
K. 1ST WST QUE K	-10.	-63.	-88.	-63.	78.	270.	AG	2310.	100.0	.5	16.1
L. 2ND EST QUE L	10.	60.	62.	60.	52.	90.	AG	2665.	100.0	.5	16.1

JOB: WICHITA, KANSAS CO SIP STUDY 3525-73 RUN: BROADWAY BTWN 1ST AND 2ND JULY 1987

I. SITE VARIABLES

```
  U = 1.0 M/S            CLAS =   4  (D)        VS =   .0 CM/S     ATIM = 60. MINUTES        MIXH = 100. M
BRG = 210. DEGREES         Z0 = 321. CM         VD =   .0 CM/S      AMB = 1.2 PPM
```

III. RECEPTOR LOCATIONS AND MODEL RESULTS

RECEPTOR	COORDINATES (M) X	Y	Z	TOTAL + AMB (PPM)
1. PROPOSED CHP MONITOR	14.	0.	3.1	5.2

JOB: WICHITA, KANSAS CO SIP STUDY 3525-73 RUN: BROADWAY BTWN 1ST AND 2ND JULY 1987

I. SITE VARIABLES

U = 1.0 M/S CLAS = 4 (D) VS = .0 CM/S ATIM = 60. MINUTES MIXH = 100. M
BRG = 210. DEGREES Z0 = 321. CM VD = .0 CM/S AMB = 1.2 PPM

IV. MODEL RESULTS (RECEPTOR-LINK MATRIX)

RECEPTOR	CO/LINK (PPM) A	B	C	D	E	F	G	H	I	J	K	L
1. PROPOSED CBD MONITOR	.3	.4	.0	.0	.0	.0	1.5	.3	.0	.0	1.5	.0

TECHNICAL REPORT DATA
(Please read Instructions on the reverse before completing)

1. REPORT NO. EPA-907/9-84-007	2.	3. RECIPIENT'S ACCESSION NO.
4. TITLE AND SUBTITLE Carbon Monoxide Nonattainment Study for Wichita, Kansas		5. REPORT DATE September 1984
		6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S)		8. PERFORMING ORGANIZATION REPORT NO.
9. PERFORMING ORGANIZATION NAME AND ADDRESS		10. PROGRAM ELEMENT NO.
		11. CONTRACT/GRANT NO. 68-02=3512
12. SPONSORING AGENCY NAME AND ADDRESS Environmental Protection Agency, Region VII Air Branch 324 East 11th Street Kansas City, Missouri 64106		13. TYPE OF REPORT AND PERIOD COVERED Final
		14. SPONSORING AGENCY CODE
15. SUPPLEMENTARY NOTES		

16. ABSTRACT

In order to comply with the NAAQS for CO in Wichita, Kansas, a special study was necessary to demonstrate that a special purpose monitor (SPM) located on Douglas Street would give results less than the NAAQS by 1987. The SPM site is located near the urban core in an area characterized by high nighttime traffic volumes and congested traffic flow. Exceedances of the 8-hour NAAQS were measured in 1983 and early 1984. A dispersion modeling analysis was performed using the CALINE-3 Model for dispersion, the MOBILE-3 Model for vehicle emissions, and local or national traffic and ambient conditions. Background concentrations were derived from other monitors in the area. Results of modeling the SPM site for baseline (1983) emissions indicate agreement within about 10 percent of maximum measured CO concentrations. For 1987 the SPM is projected to be in compliance. An alternate CO receptor location was proposed on Broadway in order to avoid the downtown cruising phenomena and to offer a more representative site for evaluating the attainment/nonattainment status of Wichita. Results indicate CO concentrations less than the NAAQS in 1983 and about half of the NAAQS in 1987. Transportation control measures are recommended to decrease the time needed to achieve compliance at the SPM site.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Air Pollution Mathematical Model Carbon Monoxide		

18. DISTRIBUTION STATEMENT	19. SECURITY CLASS *(This Report)*	21. NO. OF PAGES
	20. SECURITY CLASS *(This page)*	22. PRICE

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