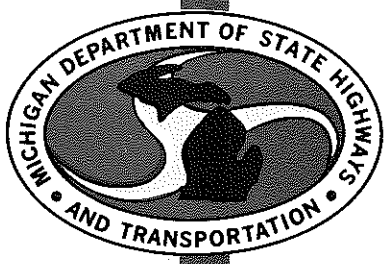
AIR QUALITY REPORT FOR
M 51 RELOCATION - BERRIEN COUNTY



TESTING AND RESEARCH DIVISION
RESEARCH LABORATORY SECTION

AIR QUALITY REPORT FOR M 51 RELOCATION - BERRIEN COUNTY

Research Laboratory Section
Testing and Research Division
Research Project 77 AP-14(A)
Research Report No. R-1104 (909R)

Michigan Department of Transportation
Hannes Meyers, Jr., Chairman;
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John P. Woodford, Acting Director
Lansing, January 1979

This report presents air quality information for a proposed section of M 51 in Berrien and Cass Counties as shown in Figure 1. Seven alternate alignments are considered. All of the alternates except an eastern bypass begin in Niles Township, Berrien County and end in the City of Niles. The eastern bypass begins at existing M 51 in Cass County and goes south to M 60. Meteorological data, estimates of pollution levels that might occur adjacent to the existing roadway, and proposed alternate roadways, along with estimates of the total pollutant burden for the various alternates, are included.

Terrain and Demography

The terrain surrounding the City of Niles is flat to gently rolling, so that dispersion of air pollutants is not hindered. Niles has a population of 12,988 according to the 1970 census. The population densities in people per square mile of the counties involved are Berrien 157 and Cass 86.

Meteorology

Meteorological conditions in Michigan are generally good for dispersion and dilution of air pollutants. According to air pollution publication AP 101, U. S. Environmental Protection Agency, 1972 (p 96) there are few days with a high meteorological potential for air pollution. Figure 2 shows a 36-point bar graph of wind speed and direction occurrences at the Kalamazoo City Weather Station. Hourly weather data (6 a.m. to 11 p.m. only recorded) were obtained from the National Climatic Center at Asheville, N. C. for the years 1967 through 1971 and a one day in three day sampling of the hourly data with a random start each year was used to prepare meteorological data. Figure 3 is a 12-point wind rose obtained by condensing the 36-point wind data.

Figure 4 shows the distribution of wind speeds observed. Wind speeds are greater than 5 mph more than 90 percent of the time. The most probable daytime wind speed was found to be 12 mph.

Existing Ambient Air Quality

No data are available to establish presently existing air quality in the area of this project; however, estimates of background carbon monoxide that exist in other small urban areas similar to Niles are: 1 to 3 mg/cu m for a maximum eight-hour concentration, and 4 to 8 mg/cu m for a maximum one-hour concentration. These estimates were supplied by the Michigan Department of Natural Resources, Air Pollution Control Division.

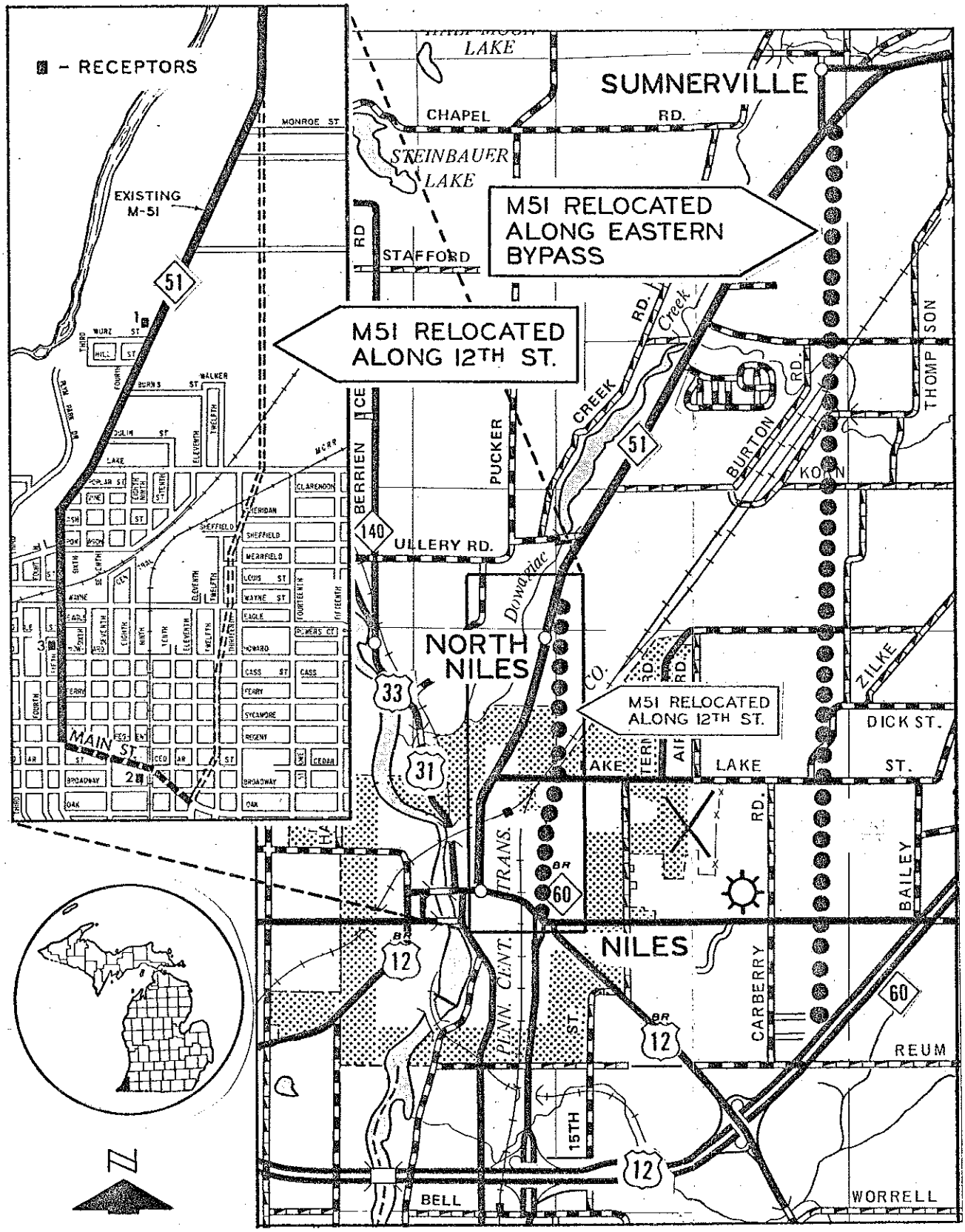

Figure 1. Proposed M 51 in Berrien and Cass Counties. Insert shows existing M 51 and alternates in the City of Niles and Niles Township.

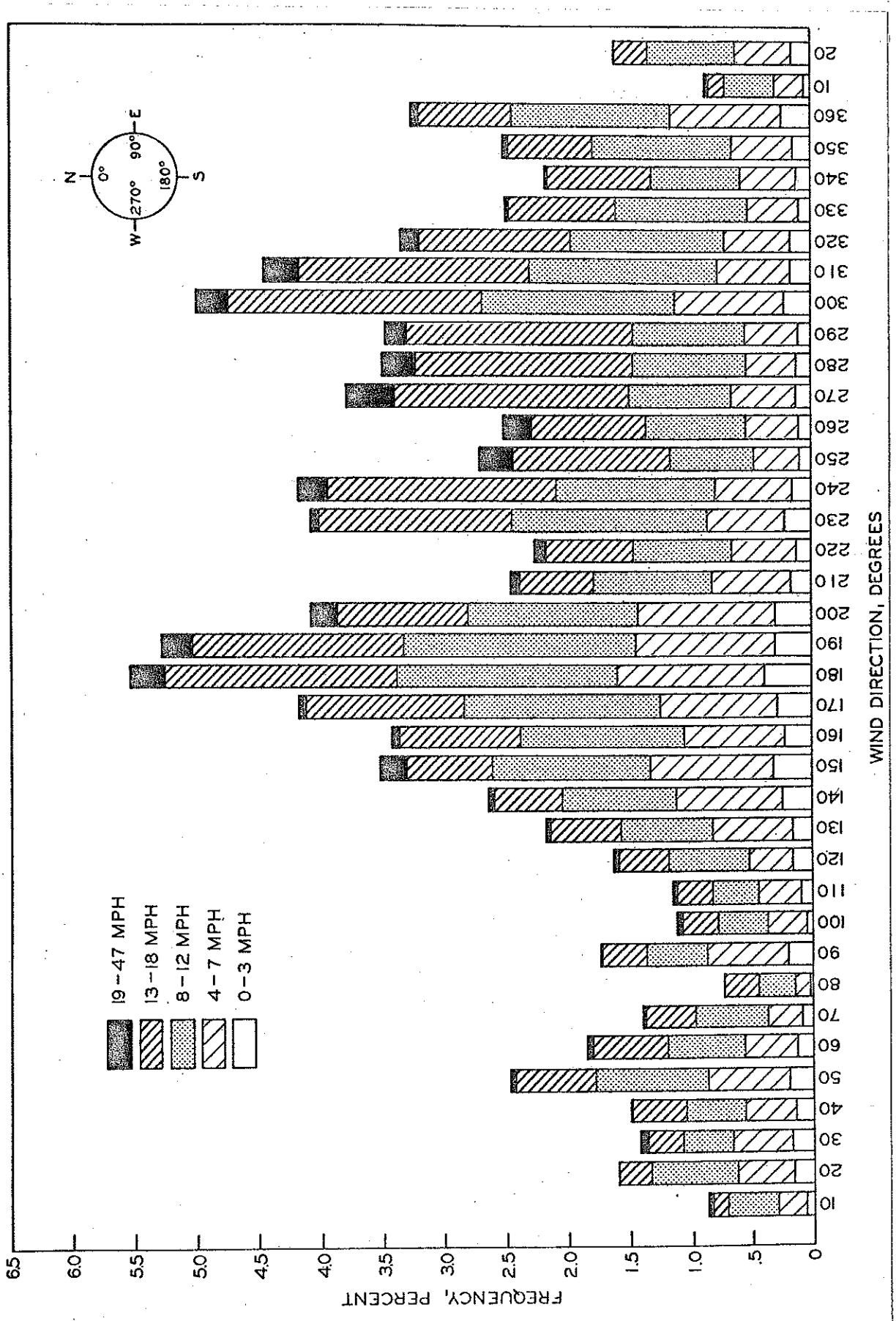

Figure 2. Wind speed and direction occurrences at Kalamazoo city weather station, 6 a.m. to 11 p.m.

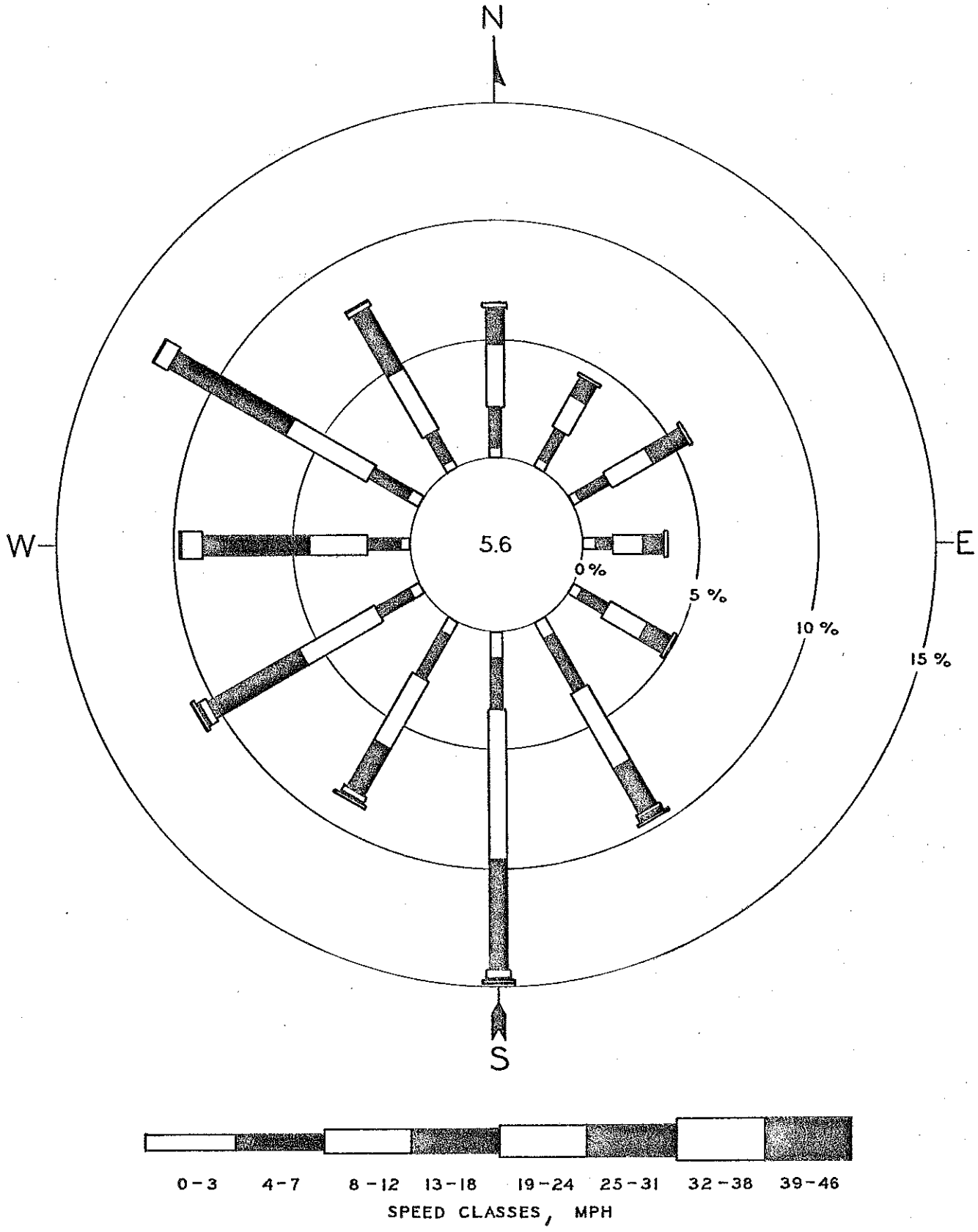

Figure 3. Frequency of wind direction and speed, percent (calms distributed).

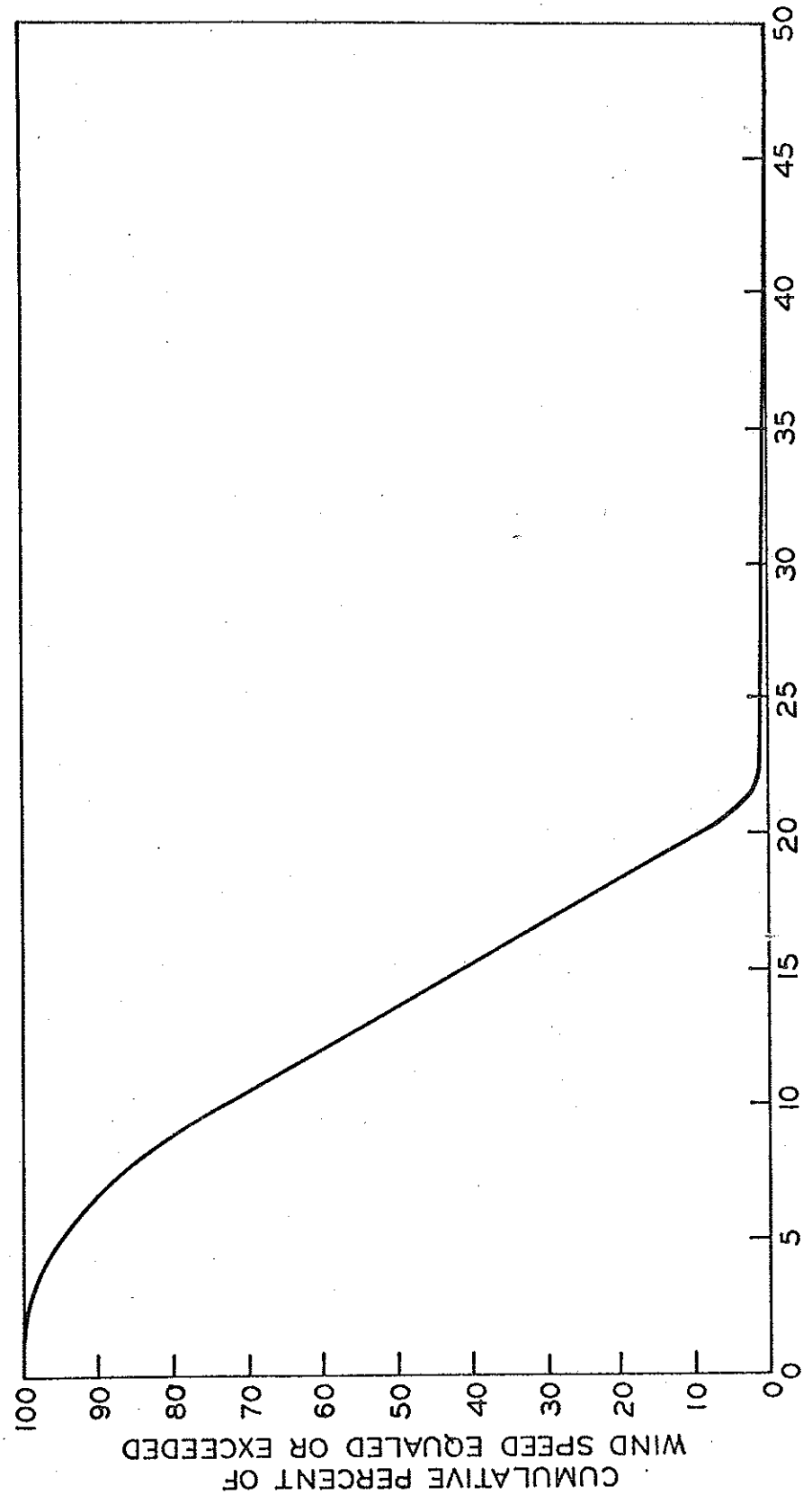

Figure 4. Wind speed distribution at Kalamazoo city weather station.

Pollution Estimates

Estimates of carbon monoxide concentrations were made at a height of 5 ft (1.5 m) above the roadway. A mathematical model based on the Gaussian diffusion equation, modified for a line source, was used[1]. Inputs to the model include wind speed and direction, traffic volumes, vehicle emission factors, and design of the highway.

Carbon monoxide concentrations were estimated for:

1) Alternate alignments identified as follows:

Do Nothing (DN) - existing roadways.

Low Cost Capital Improvement (LCCI) - Fifth St (existing M 51) widened to four 11-ft lanes within existing 66 ft of right-of-way. Main St widened to five 11-ft lanes within existing 78 ft of right-of-way.

Alternates 1 and 2 - M 51 Reconstructed Along Fifth St (existing M 51). Five 12-ft lanes along existing alignment in 120 ft of right-of-way from Main St to the city limits (north of Wurz St) and in 150 ft of right-of-way from the city limits to the end of the project (north of Pucker St). Alternate 1 widening would occur to the west of existing Fifth St, Alternate 2 widening would occur to the east of existing Fifth St. Main St would be widened to five 11-ft lanes within existing 78 ft of right-of-way.

Alternates 3 and 4 - M 51 Relocated Along Twelfth St. Five 12-ft lanes in 120 ft of right-of-way from Main St to the city limits and in 150 ft of right-of-way from the city limits to the end of the project (north of Pucker St). Alternate 3 widening would occur to the west of existing Twelfth St, Alternate 4 widening would occur to the east of existing Twelfth St. Main St would be widened to five 11-ft lanes within existing 78 ft of right-of-way.

Eastern Bypass (EB) - One 24-ft roadway in 150 ft of right-of-way. Assumes no change in existing Main St and Fifth St (existing M 51) alignments.

2) At the estimated distance from the edge of the roadway to the nearest receptor for each alternate: DN (22 ft); LCCI (11 ft); Alternates 1, 2, 3, and 4 (30 ft); EB (63 ft).

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[1] Beaton, J. L., Ranzieri, A. J., Shirley, E. C., and Skog, J. B., "Mathematical Approach to Estimating Highway Impact on Air Quality," Prepared by California Division of Highways, Report No. FHWA-RD-72-36. CALINE 2 modification, programmed March 1975, was used.

3) The intersection of Main St, a major cross street, and M 51, at a distance of 22 ft from the edge of the M 51 roadway and 11 ft from the edge of Main St for the DN case, and 11 ft from the edge of the M 51 roadway also for the LCCI case and for Alternates 1, 2, 3, and 4. These are the estimated distances to the nearest possible receptor. Alternate EB does not intersect Main St.

4) At three sensitive receptors described later.

5) The years 1980, 1985, and 2000.

Information used as input to the model consisted of:

1) Vehicle emission factors shown in the following table, were calculated using "Mobile Source Emission Factors," March 1978, U. S. Environmental Protection Agency. Emission factors were calculated at temperatures of 30 and 60 F with 20 percent of the vehicles in a cold start condition, 27 percent of the vehicles in a hot start condition, and the remainder of the vehicles in a hot operation mode.

EMISSION FACTORS FOR
CARBON MONOXIDE, g/mi

Temp.	Traffic Projection Year	Average Vehicle Speed, mph									
		10 (2)*	10 (5)	15 (2)	15 (5)	25 (2)	25 (3)	30 (2)	30 (3)	30 (4)	50 (4)
30 F	1980	--	119.8	79.6	83.7	--	--	44.9	45.6	46.3	33.2
	1985	--	62.4	41.4	45.0	--	29.0	24.0	--	25.5	18.7
	2000	36.7	39.6	--	--	18.2	18.8	--	--	16.6	12.3
60 F	1980	--	98.1	63.9	68.6	--	--	35.6	36.4	37.2	26.4
	1985	--	52.3	34.1	37.9	--	24.1	19.6	--	21.2	15.5
	2000	30.9	34.0	--	--	15.4	16.0	--	--	14.2	10.5

* (0) Percent heavy duty vehicles.

Vehicle age mix data used were for Michigan registrations and average annual miles driven for various age vehicles were national estimates from "Mobile Source Emission Factors."

2) Estimated yearly hour peak (4:00 p.m. to 5:00 p.m.), traffic volumes. Traffic estimates are shown in Table 1.

3) Meteorological Conditions.

a) Worst meteorological conditions were taken as a 2.2 mph (1 m/sec) wind parallel to the roadway, under atmospheric stability class D.

TABLE 1

TRAFFIC ESTIMATES FOR PROPOSED M 51 AND ONE MAJOR CROSS STREET (MAIN ST) IN THE CITY OF NILES AND NILES TOWNSHIP

Location	Traffic Projection Year	Alternate				
		Do Nothing	Low Cost Capital Improvement	1 and 2	3 and 4	Eastern Bypass
M 51	1980	1,920(10)	1,920(15)	1,920(15)	1,520(30)	1,520(50)
	1985	2,070(10)	2,070(15)	2,070(15)	1,650(30)	1,650(50)
	2000	2,540(10)	2,540(10)	2,540(10)	2,140(30)	2,140(50)
Main St	1980	2,190(30)	2,190(30)	2,190(30)	1,920(30)	1,920(30)
	1985	2,390(25)	2,390(25)	2,390(25)	2,110(30)	2,110(30)
	2000	2,550(25)	2,550(25)	2,550(25)	2,330(25)	2,330(25)
Fifth St After M 51 is Relocated Along Twelfth St	1980	---	---	---	1,370(15)	---
	1985	---	---	---	1,480(15)	---
	2000	---	---	---	1,810(10)	---
Fifth St After M 51 is Relocated Along Eastern Bypass	1980	---	---	---	---	1,370(15)
	1985	---	---	---	---	1,480(15)
	2000	---	---	---	---	1,810(10)

Commercial Vehicles:

Alternates - Do Nothing, Low Cost Capital Improvement, 1 and 2 - M 51, 5 percent; Main St, 3 percent

Alternates 3 and 4 - M 51, 4 percent; Main St, 3 percent; Fifth St, 2 percent

Eastern Bypass - M 51, 4 percent; Main St, 3 percent; Fifth St, 2 percent

000 = Yearly peak hour traffic, vehicles per hour

(00) = Average traffic speeds, mph

b) Most probable meteorological conditions, a 12 mph wind at 180 degrees under atmospheric stability class D.

4) Road Profile. All alternates are at grade.

5) Roadway Widths. The widths for each of the alternates are described in Item 1, under carbon monoxide concentrations, on page 6.

All estimates of carbon monoxide levels represent one-hour concentrations and are in addition to existing background levels. Table 2 presents estimates of carbon monoxide, excluding background, at the nearest receptor to the roadway for the highest traffic volume section within each alternate and for Main St. Also included in Table 2 are estimates of carbon monoxide adjacent to the M 51/Main St intersection, Fifth St (present M 51) if M 51 is relocated along Twelfth St, and for Fifth St (present M 51) and Main St if M 51 is relocated along the eastern bypass.

Comparison of Estimates with Air Quality Standards

a) One-hour carbon monoxide standard - 40 mg/cu m (36 ppm)

The maximum estimated one-hour concentrations of carbon monoxide for the various alternates are shown in the following table, including concentrations adjacent to the Main St intersection. The highest carbon monoxide concentration estimated, which includes 8 mg/cu m background, is 28.2 mg/cu m. All carbon monoxide estimates are below the 40 mg/cu m standard.

ONE HOUR CO CONCENTRATIONS, mg/cu m

Location	Alternates				
	Do Nothing	Low Cost Capital Improvement	1 and 2	3 and 4	Eastern Bypass
Roadway Only	17.7	16.9	11.7	5.1	3.1
Main St Intersection	20.2	20.3	15.1	10.7	---
Roadway Plus 4 to 8 mg/cu m Background	21.7-25.7	20.9-24.9	15.7-19.7	9.1-13.1	7.1-11.1
Main St Intersection Plus Background	24.2-28.2	24.3-28.3	19.1-23.1	14.7-18.7	---

TABLE 2
ESTIMATES OF CARBON MONOXIDE FROM THE ROADWAY
(Not Including Background)

Location	Traffic Projection Year	Worst Condition, Parallel Wind, 1 m/sec, Stability D, Peak Traffic					Most Probable Condition,[1] Stability D, Peak Traffic				
		Alternates[2]					Alternates[2]				
		Do Nothing	Low Cost Capital Improvement	1 and 2	3 and 4	Eastern Bypass	Do Nothing	Low Cost Capital Improvement	1 and 2	3 and 4	Eastern Bypass
M 51	1980	17.7	16.9	11.7	5.1	3.1	3.3	3.1	2.2	1.0	0.6
	1985	10.0	9.8	6.8	3.1	1.9	1.9	1.8	1.3	0.6	0.4
	2000	7.8	10.6	7.4	2.6	1.6	1.4	2.0	1.4	0.5	0.3
Main St	1980	7.9	10.5	10.5	9.1	6.9	0.5	0.7	0.7	0.6	0.5
	1985	5.5	7.3	7.3	5.3	4.8	0.4	0.5	0.5	0.4	0.4
	2000	3.8	5.0	5.0	4.5	3.3	0.3	0.4	0.4	0.3	0.3
Adjacent to M 51/ Main St Intersection[3]	1980	20.2	20.3	15.1	10.7	---	---	---	---	---	---
	1985	11.7	12.2	9.2	6.2	---	---	---	---	---	---
	2000	9.0	12.3	9.1	5.3	---	---	---	---	---	---
Fifth St if M 51 is Relocated Along Twelfth St	1980	--	--	--	8.4	---	---	---	---	1.6	---
	1985	--	--	--	4.7	---	---	---	---	0.9	---
	2000	--	--	--	5.1	---	---	---	---	1.0	---
Fifth St if M 51 is Relocated Along Eastern Bypass	1980	--	--	--	--	8.4	---	---	---	---	1.6
	1985	--	--	--	--	4.7	---	---	---	---	0.9
	2000	--	--	--	--	5.1	---	---	---	---	1.0

[1] Most probable wind: 12 mph; angle between wind direction and roadway direction, 0 degrees for M 51, 75 degrees for Main St.

[2] Alternates 1 and 2 - M 51 reconstruction along Fifth St; Alternates 3 and 4 - M 51 relocated along Twelfth St; Eastern Bypass - M 51 relocated along an eastern bypass route.

[3] The worst condition for the Main St intersection was found to be the wind parallel to M 51 and 90 degrees to Main St for Alternates Do Nothing, Low Cost Capital Improvement, and 1 and 2; and the wind parallel to Main St and 90 degrees to M 51 for Alternates 3 and 4. The Eastern Bypass does not intersect Main St.

b) Eight-hour carbon monoxide air quality standard - 10 mg/cu m (9 ppm)

The Federal Highway Administration's report "Project Level Considerations to Assure Adequate Air Quality Analyses" suggests a technique for determining the eight-hour carbon monoxide concentrations from the one-hour concentrations.

$$\frac{V_8}{V_1} \times (\text{1-hr CO concentration}) \times P = \text{8-hr CO concentration}$$

where V_8 = average hourly traffic volume in both directions during the eight-hour period of interest.

V_1 = peak hour traffic volume in both directions

P = one to eight-hour meteorological persistence factor for the eight-hour period.

A value of $P = 0.6$ is suggested unless data are available to calculate a persistence factor for the proposed highway project.

If this technique is used to calculate the eight-hour carbon monoxide level in 1980 for each alternate, and also adjacent to the Main St intersection the highest eight-hour concentration from the roadway for the various alternates are:

Do Nothing $= \frac{680 \text{ vehicles per hour}}{1,920 \text{ vehicles per hour}} \times 17.7 \text{ mg/cu m} \times 0.6 =$

3.8 mg/cu m

Low Cost Capital Improvement $= \frac{680 \text{ vehicles per hour}}{1,920 \text{ vehicles per hour}} \times 16.9 \text{ mg/cu m} \times 0.6 =$

3.6 mg/cu m

Alternates 1 and 2 $= \frac{680 \text{ vehicles per hour}}{1,920 \text{ vehicles per hour}} \times 11.7 \text{ mg/cu m} \times 0.6 =$

2.5 mg/cu m

Alternates 3 and 4 $= \frac{540 \text{ vehicles per hour}}{1,520 \text{ vehicles per hour}} \times 5.1 \text{ mg/cu m} \times 0.6 =$

1.1 mg/cu m

Eastern Bypass $= \frac{540 \text{ vehicles per hour}}{1,520 \text{ vehicles per hour}} \times 3.1 \text{ mg/cu m} \times 0.6 =$

0.7 mg/cu m

The highest eight-hour concentration adjacent to the Main St intersection for the various alternates are:

Do Nothing $= \frac{680+1,130 \text{ vehicles per hour}}{1,920+2,190 \text{ vehicles per hour}} \times 20.2 \text{ mg/cu m} \times 0.6 =$

5.3 mg/cu m

Low Cost Capital Improvement $= \frac{680+1,130 \text{ vehicles per hour}}{1,920+2,190 \text{ vehicles per hour}} \times 20.3 \text{ mg/cu m} \times 0.6 =$

5.4 mg/cu m

Alternates 1 and 2 $= \frac{680+1,130 \text{ vehicles per hour}}{1,920+2,190 \text{ vehicles per hour}} \times 15.1 \text{ mg/cu m} \times 0.6 =$

4.0 mg/cu m

Alternates 3 and 4 $= \frac{540+990 \text{ vehicles per hour}}{1,520+1,920 \text{ vehicles per hour}} \times 10.7 \text{ mg/cu m} \times 0.6 =$

2.9 mg/cu m

Estimated eight-hour concentrations for carbon monoxide, including 1 to 3 mg/cu m background are shown in the following table for the various alternates. All of the estimates are below the eight-hour air quality standard. For the years 1985 and 2000 the carbon monoxide concentrations are estimated to be much lower than 1980 concentrations due to vehicle exhaust controls required by Federal law.

EIGHT HOUR AVERAGE CARBON MONOXIDE CONCENTRATIONS INCLUDING BACKGROUND, mg/cu m

Location	Alternates				
	Do Nothing	Low Cost Capital Improvement	1 and 2	3 and 4	Eastern Bypass
Road Only	4.8-6.8	4.6-6.6	3.5-5.5	2.1-4.1	1.7-3.7
Main St Intersection	6.3-8.3	6.4-8.4	5.0-7.0	3.9-5.9	---

The estimated concentrations of carbon monoxide including existing estimated background adjacent to all of the alternates of the proposed roadway are within national air quality standards. Alternates 1 and 2, 3 and 4, and EB offer a significant reduction in carbon monoxide levels over DN, with Alternates 3 and 4 and EB offering the greatest reduction. The LCCI alternate offers a slight reduction in carbon monoxide over DN except at the Main St intersection where there is no significant difference. The project is consistent with the State implementation plan for meeting national air quality standards for carbon monoxide.

Additional Information for Receptor Sites

Concentrations of carbon monoxide were estimated at two schools, and a playground near the proposed route (Fig. 1). The locations are as follows:

1) The school located near Wurz St approximately 60 ft west of the existing M 51 right-of-way.

2) The school located approximately 100 ft south of the existing Main St right-of-way.

3) The playground located in the southwest quadrant of the intersection of existing M 51 and Eagle St. The playground extends to the right-of-way.

Estimated worst case levels of carbon monoxide from the roadway under peak traffic conditions, with a 2.2 mph (1 m/sec) wind blowing parallel to the roadway (Main St for Receptor 2) under stability D for each receptor for DN, LCCI, and Alternates 1 and 2, are shown in Table 3. Alternates 3 and 4 and EB are a considerable distance from the above receptors so would have no significant influence on carbon monoxide levels in their proximity. The highest one-hour carbon monoxide concentration from any of the alternates at the nearest receptor is 25.7 mg/cu m, including the maximum one-hour background of 8 mg/cu m. The highest eight-hour carbon monoxide concentration is 6.8 mg/cu m including the maximum eight-hour background of 3 mg/cu m. Both concentrations are below the Federal air quality standard.

Total Pollutant Burden Analysis

A total pollutant burden analysis for carbon monoxide, hydrocarbons, and oxides of nitrogen is included for each of the alternates for the years 1980, 1985, and 2000. Information used included:

1) Vehicle emission factors calculated as described previously in Item (1), under information used as input to the model.

2) Estimates of daily vehicle miles traveled, average vehicle speeds, and percent heavy duty vehicles (Table 4).

The total pollutant burden data are presented in Table 5 and show a reduction in all pollutants for all proposed alternates over the Do Nothing alternate with Alternates 3 and 4, and Eastern Bypass showing the greatest reduction.

TABLE 3
CARBON MONOXIDE, mg/cu m

Receptor	Traffic Projection Year	Alternates			
		Do Nothing	Low Cost Capital Improvement	M 51 Reconstruction Along Fifth St	
				1	2
Edge of School Grounds	1980	17.7	16.9	11.7	11.7
	1985	10.0	9.8	6.8	6.8
	2000	7.8	10.6	7.4	7.4
School Building	1980	14.2	9.4	10.4	9.4
	1985	8.0	5.5	6.0	5.4
	2000	6.2	5.9	6.5	5.9
Edge of School Grounds	1980	7.9	10.5	10.5	10.5
	1985	5.5	7.3	7.3	7.3
	2000	3.8	5.0	5.0	5.0
School Building	1980	6.0	5.7	5.7	5.7
	1985	4.2	4.0	4.0	4.0
	2000	2.9	2.7	2.7	2.7
Edge of Playground	1980	17.7	16.9	11.7	11.7
	1985	10.0	9.8	6.8	6.8
	2000	7.8	10.6	7.4	7.4

TABLE 4
TRAFFIC ESTIMATES FOR M 51 TOTAL POLLUTANT BURDEN (MESOSCALE) ANALYSIS

Roadway	Do Nothing			Low Cost Capital Improvement and Alternate 1 and 2 [1]			Alternate 3 and 4 [2]			Eastern Bypass [3]	
	1980	1985	2000	1980	1985	2000	1980	1985	2000	1985	2000
M 51											
Main to Sycamore	1,130	1,250	1,770	1,130	1,250	1,770	3,230	3,610	5,090		
VMT	10	10	10	20	20	20	30	30	30		
Average Speed	5	5	5	5	5	5	6	6	6		
Percent Commercial											
Sycamore to Wayne											
VMT	3,940	4,570	7,120	3,940	4,570	7,120	4,200	4,700	6,620		
Average Speed	10	10	10	20	20	20	30	30	30		
Percent Commercial	6	6	6	6	6	6	6	6	6		
Wayne to Lake											
VMT	6,060	6,920	10,460	6,060	6,920	10,460	4,620	5,160	7,220		
Average Speed	10	10	10	20	20	20	30	30	30		
Percent Commercial	5	5	5	5	5	5	7	7	7		
Lake to Francis											
VMT	21,030	23,740	34,960	21,030	23,740	34,960	12,510	14,200	20,930		
Average Speed	10	10	10	20	20	20	30	30	30		
Percent Commercial	6	6	6	6	6	6	7	7	7		
Francis to Pucker											
VMT	5,710	6,590	10,280	5,710	6,590	10,280	5,710	6,590	10,280		
Average Speed	10	10	10	20	20	20	30	30	30		
Percent Commercial	8	8	8	8	8	8	8	8	8		
Pucker to End of Project											
VMT	1,420	1,640	2,530	1,420	1,640	2,530	1,420	1,640	2,530		
Average Speed	10	10	10	20	20	20	30	30	30		
Percent Commercial	9	9	9	9	9	9	9	9	9		
Main St											
Fifth to Ninth											
VMT	5,270	6,030	7,010	5,270	6,030	7,010	4,350	4,990	5,780		
Average Speed	30	30	30	30	30	30	30	30	30		
Percent Commercial	5	5	5	5	5	5	3	3	3		
Eastern Bypass											
M 60 to BR 60											
VMT										3,100	4,800
Average Speed										50	50
Percent Commercial										6	6
BR 60 to Lake											
VMT										4,600	7,000
Average Speed										50	50
Percent Commercial										7	7
Lake to Terminal											
VMT										3,500	5,400
Average Speed										50	50
Percent Commercial										8	8
Terminal to Existing M 51											
VMT										10,100	15,600
Average Speed										50	50
Percent Commercial										9	9

[1] Alternate 1 and 2 - M 51 reconstruction along Fifth St
[2] Alternate 3 and 4 - M 51 relocated along Twelfth St
[3] VMT data not available for 1980

TABLE 5
ESTIMATES OF TOTAL POLLUTANT BURDEN

Traffic Projection Year	Alternate	Pollutant (tons/day)					
		Carbon Monoxide		Hydro-carbons		Oxides of Nitrogen	
		30 F [1]	60 F	30 F	60 F	30 F	60 F
1980	Do Nothing	5.55	4.57	0.50	0.44	0.16	0.16
	Low Cost Capital Improvement	3.21	2.63	0.31	0.28	0.16	0.16
	1 and 2 [2]	3.21	2.63	0.31	0.28	0.16	0.16
	3 and 4 [3]	1.91	1.56	0.20	0.18	0.15	0.15
1985	Do Nothing	3.34	2.82	0.32	0.28	0.13	0.13
	Low Cost Capital Improvement	2.20	1.87	0.21	0.18	0.15	0.15
	1 and 2	2.20	1.87	0.21	0.18	0.15	0.15
	3 and 4	1.23	1.04	0.12	0.10	0.12	0.12
	Eastern Bypass [4]	0.50	0.43	0.04	0.04	0.08	0.08
2000	Do Nothing	3.15	2.72	0.36	0.31	0.14	0.14
	Low Cost Capital Improvement	1.94	1.69	0.21	0.18	0.15	0.15
	1 and 2	1.94	1.69	0.21	0.18	0.15	0.15
	3 and 4	1.16	1.01	0.12	0.10	0.14	0.14
	Eastern Bypass	0.51	0.45	0.05	0.04	0.10	0.10

[1] Ambient air temperature
[2] Alternate 1 and 2 - M 51 reconstructed along Fifth St
[3] Alternate 3 and 4 - M 51 relocated along Twelfth St
[4] Eastern Bypass - M 51 relocated along eastern bypass