FINAL REPORT
CONTROL STRATEGIES FOR
SET II POLLUTANTS
KANSAS CITY IAQCR
AND
S. CENTRAL KANSAS AQCR

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S. CENTRAL KANSAS AQCR

Prepared For

The Environmental Protection Agency
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SUMMARY

Strategies for Set II pollutants were run for the South Central Kansas AQCR and the Kansas City Interstate AQCR. The Summary Tables are included herein (Tables 1 and 2). The "Additional Controls" used in the strategy consisted of the Proposed Kansas Regulations (summarized in Appendix 1) only. Missouri does not propose emission standards for Set II pollutants. Thus no "Additional Controls" were put on the Missouri Portion of the KCIAQCR. In short, the strategies used to compile the Summary Tables are as follows:

KANSAS CITY IAQCR

Strategy 1	Kansas and Missouri-Federal Motor Vehicle Standard only
Strategy 2	Missouri-Federal Motor Vehicle Standard only
	Kansas-Federal Motor Vehicle Standard and proposed Kansas regulations

SOUTH CENTRAL AQCR

Strategy 1	Federal Motor Vehicle Standard only
Strategy 2	Federal Motor Vehicle Standard and proposed Kansas regulations

As the Summary Tables show, both regions will meet the Federal Ambient Air Quality Standards by 1975 under

Strategy 1 with the exception of carbon monoxide in the KCIAQCR. Even under Strategy 2, the standard will not be met in that region.

A third strategy was used which imposed a 90% reduction on process sources in Missouri. While that approach reduced 1975 emissions by 7.7 tons per year, it is not significant in the overall picture. The resultant overall reduction is 33% which is very close to the 1975 reduction using Strategy 2. The calculations for Strategy 3 are attached (Appendix 2).

The methodology used in calculating the emissions required to meet the Federal Ambient Air Quality Standards is attached (Appendix 3).

The calculations for Strategies 1 and 2 are attached (Appendix 4) and the rational for determining control rates, growth rates and the motor vehicle emission rates, all of which are used in the calculations, are in the body of this report.

In general, the Federal Air Quality Standards will be met in both regions by 1975 without the imposition of controls on stationary sources. The Kansas City AQCR will not meet the carbon monoxide standard until sometime in 1976, with or without controls on stationary sources, and therefore it will be necessary to seek a two-year extension under Sec. 51.30 of EPA's regulations, (36 FR 22405).

TABLE

SUMMARY OF CONTROL STRATEGY ANALYSIS

S. CENTRAL (WICHITA) AIR QUALITY CONTROL REGION

	Air Quality Standard $\mu g/m^3$	Existing Measured Concentration $\mu g/m^3$	Existing Emissions	Emissions Required to Achieve Standards	Emissions After Application of Federal Motor Vehicle Program		Emissions After Application of Any Additional Control Measures	
					1975	1977	1975	1977
CO[a]	40, 1 Hr, 10, 8 Hr.	5.1^b	280,400	-	188,000	138,000	188,000	138,000
Oxidants	160	190^c	$71,300^e$	59,900	48,500	40,700	42,700	37,800
NO_x	100	99^d	75,300	-	74,600	67,900	73,000	67,100

a) Concentration in mg/m^3
b) Second highest 8 hr. average
c) Second highest 1 hr. average; highest 1 hr. average = 210 $\mu g/m^3$
d) Annual arithmetic mean (NASN data from 7-70 to 7-71)
e) Hydrocarbons

TABLE 2

SUMMARY OF CONTROL STRATEGY ANALYSIS

KANSAS CITY   AIR QUALITY CONTROL REGION

	Air Quality Standard $\mu g/m^3$	Existing Measured Concentration $\mu g/m^3$	Existing Emissions	Emissions Required to Achieve Standards	Emissions After Application of Federal Motor Vehicle Program		Emissions After Application of Any Additional Control Measures	
					1975	1977	1975	1977
CO^a	40, 1 Hr 10, 8 Hr	16.6 a,c	689,200	414,000	475,000	344,000	475,000	344,000
Oxidants	160	168^d	186,400 f	181,000	142,000	127,000	136,000	121,000
NO_x	100	57 e	306,400	-	346,000	349,000	346,000	346,000

a) Concentration in mg/m^3

b) Based on 8 hr. value

c) Second highest 8 hr. average same as highest 8 hr. average

d) Second highest 1 hr. average; highest 1 hr. average = 200 $\mu g/m^3$

e) Annual arithmetic mean (NASN data from 7-70 to 7-71)

f) Hydrocarbons

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EMISSIONS DATA

S. Central AQCR

The emission data on which the strategies are based were obtained from the Kansas Statewide Inventory[a] and represent emissions for the base year 1970.

Kansas City IAQCR

The emission data on which the strategies are based were obtained from Appendix D[b] and represent emissions for the base year 1970.

(a) Statewide Inventory for Air Pollution Emissions,
     State of Kansas, 1970, Final Report.
     PEDCo Environmental Specialists Inc. Cincinnati,
     Ohio. December 31, 1971.

(b) Compilation of Appendix D for Kansas City Air
     Quality Control Region , Final Report. PEDCo
     Environmental Specialists Inc. Cincinnati, Ohio.
     December 27, 1971.

GROWTH DATA

General

Emissions for each AQCR were separated into basic categories. It was determined that each category will increase its uncontrolled emissions in direct proportion to some single demographic factor. This relationship is as follows:

Category	Demographic Factor
Industrial & Commercial Fuel	Manufacturing employees
Power Plants	Generating Capacity
Process Losses	Manufacturing employees
Solid Waste Disposal	Population
Gasoline Handling	Manufacturing employees
Solvent Emissions	Manufacturing employees
Agricultural Burning	Population

Emissions not falling into one of the above categories were listed as miscellaneous and were assigned a growth rate of zero. These sources are vessels, railroads, and residential fuel burning.

Table 12. GROWTH RATES FOR S. CENTRAL AQCR

Demographic Factor	Growth Rate % per yr.	Source
Mfg. employees	0.56	Wichita-Sedgwick Co. Metro. Plan. Dept., p.13
Population	1.20	Wichita-Sedgwick Co. Metro. Plan. Dept., P.13
Generating Capacity	6.00	Private communication with Jack E. Alumbaugh, Industrial Development Office, City of Wichita

Table 13. GROWTH RATES FOR KANSAS CITY AQCR

Demographic Factor	Growth Rate % per year	Source
Mfg. employees	2.60	Metro. Bul. #3, p.17
Population	3.00	Metro. Bul. #3, p. 9
Generating capacity	8.00	Private communication with Mr. Terney, Kansas City Board of Public Utilities, Kansas City, Kansas, October 1971

POST-1970 EMISSION CONTROLS

General

Both Kansas and Missouri forbid open burning under their present regulations. Missouri does not anticipate the adoption of any other regulations (Post-1970) directly affecting Set II pollutants. Kansas has regulations specifically limiting CO, HC, and NO_x emissions pending. These are referred to as Post-1970 Controls. It is estimated that the new regulations would reduce emissions as follows:

Source	Reduction, %		
	CO	HC	NO_x
Indus. & Comm. fuel burn.	0	0	0
Power plants	0	0	5
Process losses	90	70	0
Solid Waste incin.	0	0	0
Gasoline handling	0	0	0
Solvents	0	0	0

A summary of the proposed regulations is attached (Appendix 1).

Regulation 28-19-23 controls HC emissions from fuel tanks greater than 40,000 gal. capacity. It is estimated that 75% are presently uncontrolled (Kansas Statewide Inventory, Sec. 3.3.7). Thus the regulation would reduce emissions by approximately 70%

(.90 X .75). The balance of the regulation controls vapor blowdown and ethylene waste gas streams. These are not significant sources in the two regions. It was therefore determined that an overall process emissions (including gasoline storage) reduction of 70% would be attributable to the regulation.

Regulation 28-19-24 controls CO emissions from foundries and refineries. Afterburners will reduce emissions by 90%. The only other major CO emitting process is carbon black production. Overall, a 90% reduction in process emissions is warranted since there are no carbon black plants in either region.

Regulation 28-19-25 limits emissions from nitric acid plants. There are no nitric acid plants in either region therefore process NO_x emissions are not reduced.

Regulation 28-19-31 limits NO_x emissions from indirect heating units. However the upper limit is as high as un-controlled emission rates under proper firing conditions and little impact is seen from the regulation. Impact is estimated to be 5% reduction.

ADJUSTMENT OF APPENDIX I CURVES
TO REFLECT LOCAL AUTOMOTIVE GROWTH RATE

General

Figures 1 through 3, Appendix I, 36 FR 15500, are based
on a national average traffic growth rate of 5% per year. The
growth rates for Wichita and Kansas City metropolitan areas are
3.1%[a] and 3.8%[b] respectively. The Appendix I curves can be
adjusted to reflect this difference in growth rate by multiplying
the plotted values by the ratios of the actual growth to the
assumed (5%) growth. Thus, using 1967 as the base year, the
plotted value for 1975 for Wichita should be multiplied by
the fraction $\dfrac{1 + (8 \times 0.031)}{1 + (8 \times 0.050)}$.

The recalculated emission rates for each region is as
follows:

Table 14. RECALCULATED VALUES FOR AUTOMOTIVE EMISSION RATES

AQCR	YEAR	ANNUAL GROWTH RATE %	POLLUTANT		
			HC	CO	NO_x
S. CENTRAL (WICHITA)	1970	3.1	0.85	0.92	1.09
	1975	3.1	0.49	0.63	0.96
	1977	3.1	0.35	0.44	0.72
KANSAS CITY	1970	3.8	0.88	0.95	1.12
	1975	3.8	0.51	0.65	1.01
	1977	3.8	0.37	0.46	0.76

These adjusted values are shown on Figures 1 through 3.

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a) Correspondence from E.P. Landman, State Highway Commission
    of Kansas, dated September 20, 1971.

b) Correspondence from R.P. Turner, U.S. Department of Transportation,
    dated October 8, 1971.

ADJUSTED NORMALIZED EMISSION RATES FOR S. CENTRAL AND KANSAS CITY AQCR's
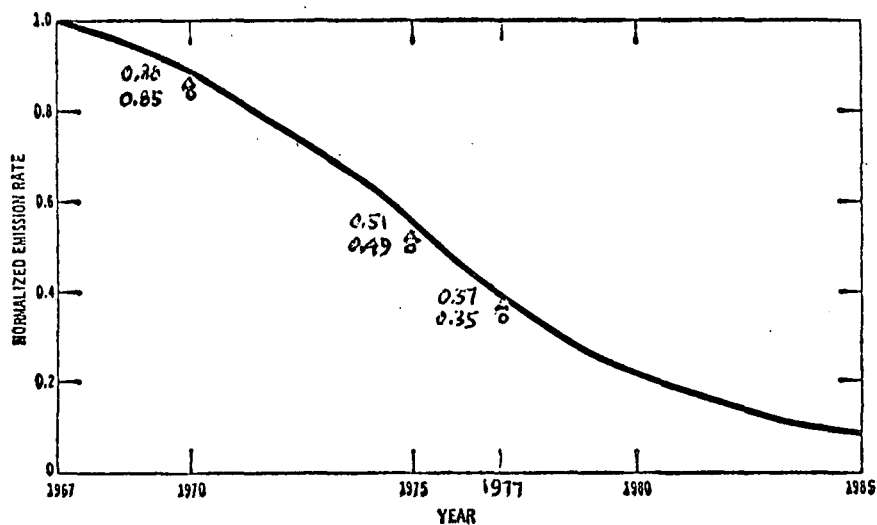

Figure 1. Hydrocarbon emission rates from urban vehicles in United States - projected from 1967 base of 1.
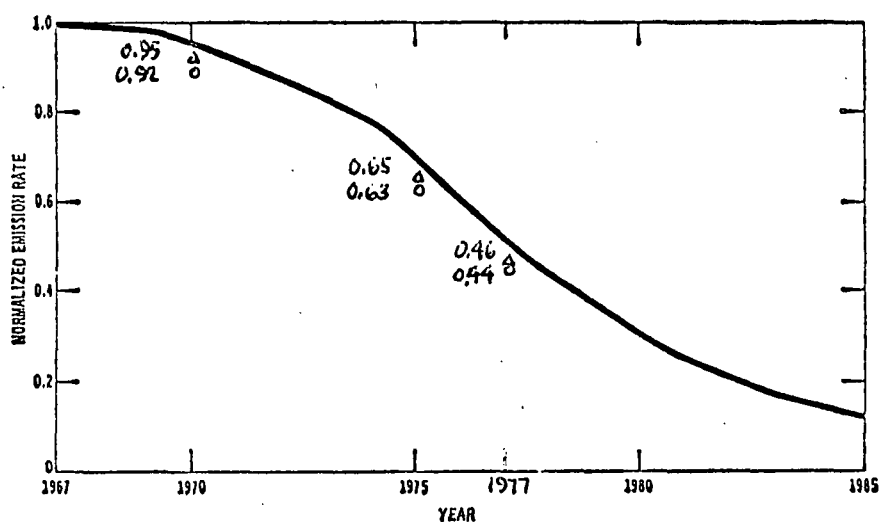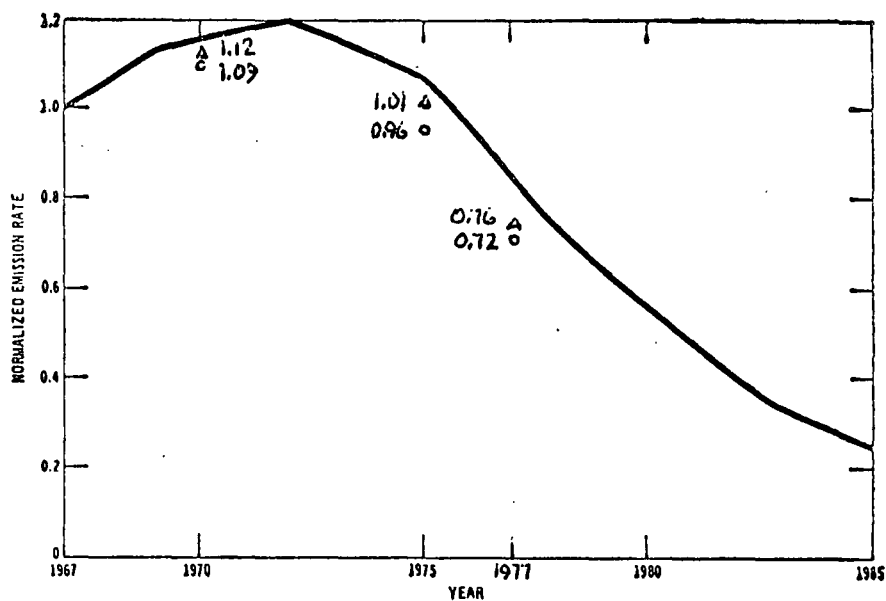

Figure 2. Carbon monoxide emission rates from urban vehicles in United States - projected from 1967 base of 1.

Δ - KANSAS CITY AQCR

O - S. CENTRAL AQCR

Figure 3. Nitrogen oxides emission rates from urban vehicles in United States - projected from 1967 base of 1.

APPENDIX 1

SUMMARY OF PROVISIONS OF PROPOSED AMENDMENTS TO KANSAS AIR POLLUTION CONTROL REGULATIONS (July 1971)

28-19-1 (Amendment): Intended to define intent of Ambient Air Quality Standards. New definition is consistent with intended application of such standards by the federal government.

28-19-2 (Amendment): Revises definition of Total Suspended Particulate and Sulfur Dioxide and defines additional pollutants.

28-19-3 (Amendment): Changes existing ambient air quality standard for sulfur dioxide and establishes new state standards for carbon monoxide, photo-chemical oxidants, hydrocarbons, and nitrogen dioxide. All proposed standards are the same as nationally applicable federal "secondary" standards which have been promulgated to protect the public welfare from any known or anticipated adverse effects associated with air pollution.

28-19-4 (Amendment): Makes all standards applicable throughout the state.

28-19-6 (Amendment): Revises policy statement regarding emission regulations to encourage application of best control procedures available at any time.

28-19-7 (Amendment): Redefines "alteration" of emission sources to include operational changes, as well as physical changes, to equipment which may substantially increase the amount of emissions.

28-19-8 (Amendment): Lowers level of SO_2 and/or SO_3 and indirect heating capacity that must be reported and expands list of pollutants which must be reported to include oxides of nitrogen, carbon monoxide, and hydrocarbons.

28-19-11 (Amendment): Provides for temporary excessive emissions which result from malfunctioning of processing equipment, as well as control equipment.

28-19-12 (Amendment): Requires that stack testing be conducted in accordance with federally approved procedures and provides that regular, fixed monitoring may be required for certain sources. This latter provision is required to comply with federal law.

28-19-15 (New): Exempts certain new stationary sources from state control which will be directly subject to federal control.

28-19-22 (New): Establishes limits on sulfur compound emissions from: (1) sulfuric acid plants, (2) non-ferrous smelters, and (3) combustion of process gases (other than for indirect heating, secondary product recovery and control of odors from low BTU streams).

28-19-23 (New): Establishes control requirements concerning sources of hydrocarbon emission including: (1) gasoline and petroleum distillate storage tanks, (2) ethylene production, or utilization, plants, and (3) storage and processing operations which emit more than 50 pounds of hydrocarbons per day.

28-19-24 (New): Establishes control requirements for carbon monoxide emissions from foundries and refineries.

28-19-25 (New): Establishes limits on emissions of oxides of nitrogen from nitric acid plants.

28-19-30 (Amendment): Requires that emissions from indirect heating equipment be tested in accordance with federally approved procedures.

28-19-31 (Amendment): Establishes limits on sulfur dioxide and nitrogen oxide emissions from indirect heating units. The sulfur dioxide restrictions become applicable to systems placed in operation after January 1, 1972, and the nitrogen oxide limits become applicable to units placed under purchase contract after January 1, 1972.

28-19-42 (Amendment): Requires that incinerators be tested in accordance with federally approved procedures.

28-19-55, 28-19-56, 28-19-57, 28-19-58 (New): Provide for an emergency episode plan, as required by federal law. Various "action" levels are established and the development of emergency pollution curtailment plans, by major pollution sources, is required.

SOURCE CATEGORY	Control Factor (a)	Growth %[b]		Emissions, 1000 TPY		
		1975	1977	1970[c]	1975	1977
Indus. and Comm. Fuel	100	113	118	1.3	1.5	1.5
Power Plants	100	140	156	5.3	7.4	8.3
Process Losses	10	113	118	8.7	0.9	0.9
Solid Waste Disposal	100	115	121	0.9	1.0	1.1
Other - Open Burning	0	0	0	14.4	0	0
Misc.	100	100	100	17.5	17.5	17.5

(a) Percent of emissions after enforcement of post-1970 regulations

(b) Percent of 1970 emissions

(c) Sum of Tables 4-17 & 4-20

TOTALS $\longrightarrow$ | 48.1 | 28.3 | 29.3 |

$\dfrac{197\text{N Total}}{1970 \text{ Total}} \longrightarrow$ | 0.587 | 0.607 |

GF_{75} $\quad$ GF_{77}

FROM APPENDIX I CURVE __2__ :

$E_{75} = 0.65$

$E_{77} = 0.46$

$E_{70} = 0.95$

FROM EMISS. INVENTORY:

$F_{70} = \dfrac{\text{Motor Veh. Emiss}}{\text{Total Emiss}}$

$= \dfrac{643,100}{691,200} = 0.930$

$\dfrac{E_{75}}{E_{70}} \quad (F_{70}) + (1-F_{70})(GF_{75}) = \dfrac{0.65}{0.95}(0.930) + (1-0.930)\,0.587$

$= 0.636 + 0.041 = 0.67$

$\dfrac{E_{77}}{E_{70}} \quad (F_{70}) + (1-F_{70})(GF_{77}) = \dfrac{0.46}{0.95}(0.930) + (1-0.930)\,0.607$

$= 0.450 + 0.042 = 0.49$

METHODOLOGY FOR CALCULATION OF EMISSIONS REQUIRED
TO MEET THE FEDERAL AIR QUALITY STANDARDS

Emission reductions required to meet the Federal Air Quality Standards were calculated using the proportional model (36 FR 15490) for NO_x and CO while the O_x standard is met based upon HC reductions as set forth in Appendix J (36 FR 15502). The values used for existing air quality were as follows:

Pollutant	Reading
NO_x	Annual arithmetic mean
CO	Second highest 8 hr. average
O_x	Second highest 1 hr. average

The rationale for using the second highest reading for CO and O_x is that the Air Quality Standards for these pollutants is based on maximum concentration not to be exceeded <u>more than once per year</u>. Thus the Air Quality Standard is based on the <u>second</u> <u>highest</u> reading and strategies must be calculated accordingly.

The required percentage reduction for NO_x and CO was first calculated by the equation:

$$\frac{A - C}{A - B} \times 100$$

where:

A = Existing air quality at the locating having the highest (NO_x) or second highest (CO and O_x) measured concentration in the Region.

B = Background concentration (assumed to be zero
    for all Set II pollutants)

C = National Standard

Oxidant strategies were based on the reduction of

hydrocarbons per Fig. 1, Appendix J (36 FR 15502)(Attached Figure

3-1).
Emissions required to achieve the Air Quality Standards

were then calculated by multiplying the existing emissions

times one minus the percentage reduction required.

Table 3-1 summarizes the reduction calculations.

TABLE 3-1. SUMMARY OF REDUCTION CALCULATIONS FOR
            SET II POLLUTANTS FOR S. CENTRAL KANSAS
            AND KANSAS CITY AQCR'S

	S. Cen. Kan. AQCR			Kansas City AQCR		
	NO_x	CO	O_x	NO_x	CO	O_x
Existing air quality	99	5.1	190	57	16.6	168
National standard	100	10	160	100	10	160
Percent reduction to meet AQS	–	–	16[b]	–	39.8	3[b]
Existing emission, 1000 TPY	75.3	280.4	71.3[c]	306.4	689.2	186.4
Emission required to meet AQS, 1000 TPY	a	a	59.9	a	414	181

(a) Existing emissions are less than the required amount

(b) See Figure 3-1
(c) Hydrocarbon emissions
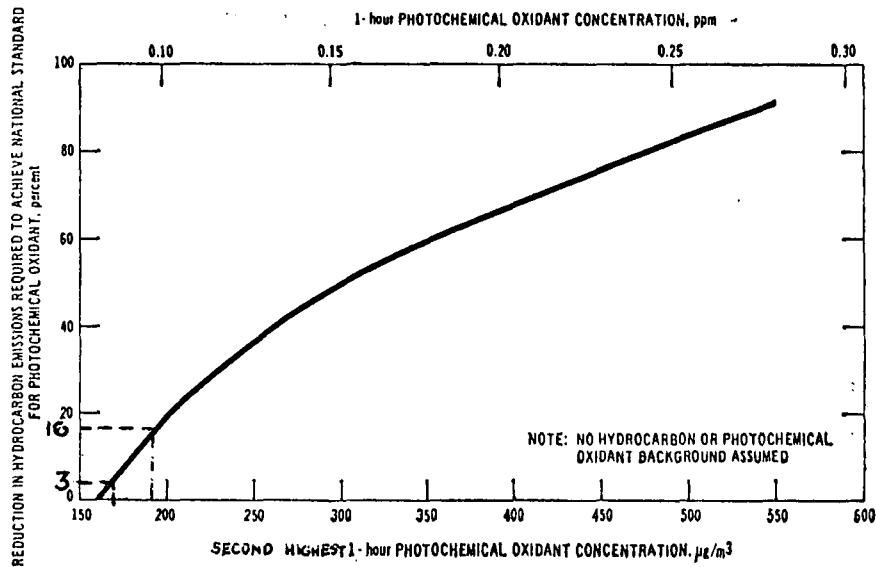
Figure 1. Required hydrocarbon emission control as a function of photochemical oxidant concentration. (Reference: Air Quality Criteria for Nitrogen Oxides, AP-84, Environmental Protection Agency, Washington, D.C., January 1971.)

Figure 3-1 - Appendix J Method for Determining
Hydrocarbon Emission Reductions

APPENDIX 4

Control Strategy Calculations

for

Set II Pollutants

for

South Central Kansas AQCR

and

Kansas City IAQCR

Strategies 1 and 2

TABLE 4-1
RESULTS OF FED. MOT. VEH. CONTROL
PROGRAM FOR HYDROCARBONS
S. CENTRAL KAN. (WICHITA) AQCR
WITHOUT POST-1970 CONTROLS

SOURCE CATEGORY	Control Factor (a)	Growth %[b]		Emissions, 1000 TPY		
		1975	1977	1970	1975	1977
Indus. and Comm. Fuel	100	103	104	2.0	2.1	2.1
Power Plants	100	130	142	1.4	1.8	2.0
Process Losses	100	103	104	5.3	5.4	5.5
Solid Waste Disposal (Incin.	100	106	108	0.6	0.6	0.7
Other - Open Burning	0	0	0	4.2	0	0
Gasoline Handling	100	103	104	3.1	3.2	3.2
Solvents	100	103	104	4.6	4.7	4.8
Misc.	100	100	100	4.7	4.7	4.7
TOTALS $\longrightarrow$				25.9	22.5	23.0
$\dfrac{197N\ Total}{1970\ Total} \longrightarrow$					0.868	0.855
					GF_{75}	GF_{77}

(a) Percent of emissions
after enforcement of
post-1970 regulations

(b) Percent of 1970 emissions

FROM APPENDIX I CURVE __1__ :

$E_{75} = 0.49$

$E_{77} = 0.35$

$E_{70} = 0.85$

FROM EMISS. INVENTORY:

$$F_{70} = \frac{Motor\ Veh.\ Emiss}{Total\ Emiss}$$

$$= \frac{45,400}{71,300} = 0.64$$

$$\frac{E_{75}}{E_{70}}\ (F_{70})\ +\ (1-F_{70})(GF_{75})\ =\ \frac{0.49}{0.85}\ (0.64)\ +\ (1-0.64)\ 0.868$$

$$=\ 0.369\ +\ 0.312\ =\ 0.68$$

$$\frac{E_{77}}{E_{70}}\ (F_{70})\ +\ (1-F_{70})(GF_{77})\ =\ \frac{0.35}{0.85}\ (0.64)\ +\ (1-0.64)\ 0.855$$

$$=\ 0.264\ +\ 0.308\ =\ 0.57$$

TABLE 4-2

RESULTS OF FED. MOT. VEH. CONTROL
PROGRAM FOR CARBON MONOXIDE
S. CENTRAL KAN. (WICHITA) AQCR
WITHOUT POST-1970 CONTROLS

SOURCE CATEGORY	Control Factor (a)	Growth %[b]		Emissions, 1000 TPY		
		1975	1977	1970	1975	1977
Indus. and Comm. Fuel	100	103	104	0.5	0.5	0.5
Power Plants	100	130	142	0	0	0
Process Losses	100	103	104	1.1	1.1	1.1
Solid Waste Disposal (Incin.)	100	106	108	2.1	2.2	2.3
Other - Open Burning	0	0	0	11.9	0	0
Agricultural Burn.	50	106	108	1.5	0.8	0.8
Misc.	100	100	100	13.8	13.8	13.8

(a) Percent of emissions
    after enforcement of
    post-1970 regulations

(b) Percent of 1970 emissions

TOTALS $\longrightarrow$	30.9	18.4	18.5
$\dfrac{197N \text{ Total}}{1970 \text{ Total}} \longrightarrow$		0.596	0.598
		GF_{75}	GF_{77}

FROM APPENDIX I CURVE __2__ :

$E_{75} = 0.63$

$E_{77} = 0.44$

$E_{70} = 0.92$

FROM EMISS. INVENTORY:

$$F_{70} = \frac{\text{Motor Veh. Emiss}}{\text{Total Emiss}}$$

$$= \frac{249,500}{280,400} = 0.89$$

$$\frac{E_{75}}{E_{70}} \; (F_{70}) + (1-F_{70})(GF_{75}) = \frac{0.63}{0.92}(0.89) + (1-0.89)\,0.596$$

$$= 0.608 + 0.066 = 0.67$$

$$\frac{E_{77}}{E_{70}} \; (F_{70}) + (1-F_{70})(GF_{77}) = \frac{0.44}{0.92}(0.89) + (1-0.89)\,0.598$$

$$= 0.425 + 0.066 = 0.49$$

TABLE 4-3
RESULTS OF FED. MOT. VEH. CONTROL
PROGRAM FOR NITORGEN OXIDES
S. CENTRAL KAN. (WICHITA) AQCR
WITHOUT POST-1970 CONTROLS

SOURCE CATEGORY	Control Factor (a)	Growth %[b]		Emissions, 1000 TPY		
		1975	1977	1970	1975	1977
Indus. and Comm. Fuel	100	103	104	10.0	10.3	10.4
Power Plants	100	130	142	14.0	18.2	19.9
Process Losses	100	103	104	9.1	9.4	9.5
Solid Waste Disposal(Incin.)	100	106	108	0.6	0.6	0.7
Other - Open Burning	0	0	0	0.9	0	0
Misc.	100	100	100	1.9	1.9	1.9

TOTALS $\longrightarrow$ 36.5   40.4   42.4

$\dfrac{197N \text{ Total}}{1970 \text{ Total}} \longrightarrow$ 1.11   1.16

         GF_{75} GF_{77}

(a) Percent of emissions after enforcement of post-1970 regulations

(b) Percent of 1970 emissions

FROM APPENDIX I CURVE __3__ :

$E_{75} = 0.96$

$E_{77} = 0.72$

$E_{70} = 1.09$

FROM EMISS. INVENTORY:

$$F_{70} = \frac{\text{Motor Veh. Emiss}}{\text{Total Emiss}}$$

$$= \frac{38,800}{75,300} = 0.52$$

$$\frac{E_{75}}{E_{70}} (F_{70}) + (1-F_{70})(GF_{75}) = \frac{0.96}{1.09} (0.52) + (1-0.52) \, 1.11$$

$$= 0.456 + 0.532 = 0.99$$

$$\frac{E_{77}}{E_{70}} (F_{70}) + (1-F_{70})(GF_{77}) = \frac{0.72}{1.09} (0.52) + (1-0.52) \, 1.16$$

$$= 0.342 + 0.556 = 0.90$$

SOURCE CATEGORY	Control Factor (a)	Growth %[b]		Emissions, 1000 TPY		
		1975	1977	1970	1975	1977
Indus. and Comm. Fuel	100	103	104	2.0	2.1	2.1
Power Plants	100	130	142	1.4	1.8	2.0
Process Losses	30	103	104	5.3	1.6	1.7
Solid Waste Disposal(Incin.)	100	106	108	0.6	0.6	0.7
Other - Open Burning	0	0	0	4.2	0	0
Gasoline Handling	100	103	104	3.1	3.2	3.2
Solvents	100	103	104	4.6	4.7	4.8
Misc.	100	100	100	4.7	4.7	4.7
TOTALS $\longrightarrow$				25.9	18.7	19.2

(a) Percent of emissions
after enforcement of
post-1970 regulations

(b) Percent of 1970 emissions

$\dfrac{197N \text{ Total}}{1970 \text{ Total}} \longrightarrow$ 0.722   0.740

                         GF_{75} GF_{77}

FROM APPENDIX I CURVE __1__ :

$E_{75} = 0.49$

$E_{77} = 0.35$

$E_{70} = 0.85$

FROM EMISS. INVENTORY:

$F_{70} = \dfrac{\text{Motor Veh. Emiss}}{\text{Total Emiss}}$

$= \dfrac{45,400}{71,300} = 0.64$

$\dfrac{E_{75}}{E_{70}} \quad (F_{70}) + (1-F_{70})(GF_{75}) = \dfrac{0.49}{0.85} \ (0.64) + (1-0.64)\ 0.722$

$= 0.369 + 0.260 = 0.60$

$\dfrac{E_{77}}{E_{70}} \quad (F_{70}) + (1-F_{70})(GF_{77}) = \dfrac{0.35}{0.85} \ (0.64) + (1-0.64)\ 0.740$

$= 0.264 + 0.266 = 0.53$

TABLE 4-5
RESULTS OF FED. MOT. VEH. CONTROL
PROGRAM FOR CARBON MONOXIDE
S. CENTRAL KAN. (WICHITA) AQCR
WITH POST-1970 (PROPOSED) CONTROLS

SOURCE CATEGORY	Control Factor (a)	Growth %[b]		Emissions, 1000 TPY		
		1975	1977	1970	1975	1977
Indus. and Comm. Fuel	100	103	104	0.5	0.5	0.5
Power Plants	100	130	142	0	0	0
Process Losses	10	103	104	1.1	0.1	0.1
Solid Waste Disposal(Incin.)	100	106	108	2.1	2.2	2.3
Other - Open Burning	0	0	0	11.9	0	0
Agricultural Burn.	50	106	108	1.5	0.8	0.8
Misc.	100	100	100	13.8	13.8	13.8

(a) Percent of emissions after enforcement of post-1970 regulations

(b) Percent of 1970 emissions

TOTALS $\longrightarrow$ | 30.9 | 17.4 | 17.5 |

$\dfrac{197N \text{ Total}}{1970 \text{ Total}} \longrightarrow$ | 0.562 | 0.566 |

GF_{75} GF_{77}

FROM APPENDIX I CURVE ___2___ :

$E_{75} = 0.63$

$E_{77} = 0.44$

$E_{70} = 0.92$

FROM EMISS. INVENTORY:

$F_{70} = \dfrac{\text{Motor Veh. Emiss}}{\text{Total Emiss}}$

$= \dfrac{249,500}{280,400} = 0.89$

$\dfrac{E_{75}}{E_{70}} \quad (F_{70}) + (1-F_{70})(GF_{75}) = \dfrac{0.63}{0.92}(0.89) + (1-0.89)\,0.562$

$= 0.608 + 0.062 = 0.67$

$\dfrac{E_{77}}{E_{70}} \quad (F_{70}) + (1-F_{70})(GF_{77}) = \dfrac{0.44}{0.92}(0.89) + (1-0.89)\,0.566$

$= 0.425 + 0.062 = 0.49$

WITH POST-1970 (PROPOSED) CONTROLS

SOURCE CATEGORY	Control Factor (a)	Growth % b		Emissions, 1000 TPY		
		1975	1977	1970	1975	1977
Indus. and Comm. Fuel	100	103	104	10.0	10.3	10.4
Power Plants	95	130	142	14.0	17.3	18.9
Process Losses	100	103	104	9.1	9.4	9.5
Solid Waste Disposal(Incin.)	100	106	108	0.6	0.6	0.7
Other - Open Burning	0	0	0	0.9	0	0
Misc.	100	100	100	1.9	1.9	1.9

(a) Percent of emissions after enforcement of post-1970 regulations

(b) Percent of 1970 emissions

TOTALS $\longrightarrow$ 36.5 39.5 41.4

$\dfrac{197N\ Total}{1970\ Total} \longrightarrow$ 1.08   1.13

GF_{75} GF_{77}

FROM APPENDIX I CURVE __3__ :

$E_{75} = 0.96$

$E_{77} = 0.72$

$E_{70} = 1.09$

FROM EMISS. INVENTORY:

$F_{70} = \dfrac{Motor\ Veh.\ Emiss}{Total\ Emiss}$

$= \dfrac{38,800}{75,300} = 0.52$

$\dfrac{E_{75}}{E_{70}} (F_{70}) + (1-F_{70})(GF_{75}) = \dfrac{0.96}{1.09} (0.52) + (1-0.52)\ 1.08$

$= 0.456 + 0.519 = 0.97$

$\dfrac{E_{77}}{E_{70}} (F_{70}) + (1-F_{70})(GF_{77}) = \dfrac{0.72}{1.09} (0.52) + (1-0.52)\ 1.13$

$= 0.342 + 0.544 = 0.89$

SOURCE CATEGORY	Control Factor (a)	Growth % (b)		Emissions,(c) 1000 TPY		
		1975	1977	1970	1975	1977
Indus. and Comm. Fuel	100	113	118	11.4	12.9	13.5
Power Plants	100	140	156	3.0	4.2	4.7
Process Losses	100	113	118	30.2	34.1	35.6
Solid Waste Disposal	100	115	121	.2	.2	.2
Other - Open Burning	0	0	0	5.7	0	0
Gasoline Handling	100	113	118	8.6	9.7	10.1
Solvents	100	113	118	5.5	6.2	6.5
Misc.	100	100	100	8.7	8.7	8.7

(a) Percent of emissions after enforcement of post-1970 regulations

(b) Percent of 1970 emissions

(c) Sum of Tables 4-13 & 4-16

TOTALS $\longrightarrow$ 73.3   76.0   79.3

$\dfrac{197N\ Total}{1970\ Total} \longrightarrow$ 1.04   1.08

GF_{75} GF_{77}

FROM APPENDIX I CURVE __1__ :

$E_{75} = 0.51$

$E_{77} = 0.37$

$E_{70} = 0.88$

FROM EMISS. INVENTORY:

$$F_{70} = \frac{Motor\ Veh.\ Emiss}{Total\ Emiss}$$

$$= \frac{112,900}{186,200} = 0.606$$

$$\frac{E_{75}}{E_{70}}\ (F_{70}) + (1-F_{70})(GF_{75}) = \frac{0.51}{0.88}\ (0.606) + (1-0.606)\ 1.04$$

$$= 0.350 + 0.409 = 0.76$$

$$\frac{E_{77}}{E_{70}}\ (F_{70}) + (1-F_{70})(GF_{77}) = \frac{0.37}{0.88}\ (0.606) + (1-0.606)\ 1.08$$

$$= 0.254 + 0.426 = 0.68$$

TABLE 4-8
RESULTS OF FED. MOT. VEH. CONTROL
PROGRAM FOR CARBON MONOXIDES
KANSAS CITY AQCR (KAN. & MO.)
WITHOUT POST-1970 CONTROLS

SOURCE CATEGORY	Control Factor (a)	Growth %[b]		Emissions[c] 1000 TPY		
		1975	1977	1970	1975	1977
Indus. and Comm. Fuel	100	113	118	1.3	1.5	1.5
Power Plants	100	140	156	5.3	7.4	8.3
Process Losses	100	113	118	8.7	9.9	10.2
Solid Waste Disposal	100	115	121	0.9	1.0	1.1
Other - Open Burning	0	0	0	14.4	0	0
Misc.	100	100	100	17.5	17.5	17.5

(a) Percent of emissions after enforcement of post-1970 regulations

(b) Percent of 1970 emissions

(c) Sum of Tables 4-14 & 4-17

TOTALS ⟶ | 48.1 | 37.3 | 38.6 |

$\dfrac{197\text{N Total}}{1970\ \text{Total}}$ ⟶ | 0.775 | 0.794 |

GF_{75} GF_{77}

FROM APPENDIX I CURVE __2__ :

$E_{75} = 0.65$

$E_{77} = 0.46$

$E_{70} = 0.95$

FROM EMISS. INVENTORY:

$$F_{70} = \frac{\text{Motor Veh. Emiss}}{\text{Total Emiss}}$$

$$= \frac{643,100}{691,200} = 0.930$$

$$\frac{E_{75}}{E_{70}} \ (F_{70}) + (1-F_{70})(GF_{75}) = \frac{0.65}{0.95} (0.930) + (1-0.930)\ 0.775$$

$$= 0.636 + 0.054 = 0.69$$

$$\frac{E_{77}}{E_{70}} \ (F_{70}) + (1-F_{70})(GF_{77}) = \frac{0.46}{0.95} (0.930) + (1-0.930)\ 0.794$$

$$= 0.450 + 0.055 = 0.50$$

TABLE 4-9
RESULTS OF FED. MOT. VEH. CONTROL
PROGRAM FOR NITROGEN OXIDES
KANSAS CITY AQCR (KAN. & MO.)
WITHOUT POST-1970 CONTROLS

SOURCE CATEGORY	Control Factor (a)	Growth %[b]		Emissions,[c] 1000 TPY		
		1975	1977	1970	1975	1977
Indus. and Comm. Fuel	100	113	118	128.3	145.0	151.4
Power Plants	100	140	156	81.7	114.2	127.6
Process Losses	100	113	118	2.6	3.0	3.1
Solid Waste Disposal	100	115	121	0.5	0.5	0.6
Other - Open Burning	0	0	0	1.0	0	0
Misc.	100	100	100	8.5	8.5	8.5

(a) Percent of emissions after enforcement of post-1970 regulations

(b) Percent of 1970 emissions

(c) Sum of Tables 4-15 & 4-18

TOTALS $\longrightarrow$ 222.6   271.2   291.2

$\dfrac{197N \text{ Total}}{1970 \text{ Total}} \longrightarrow$ 1.22   1.31

GF_{75} GF_{77}

FROM APPENDIX I CURVE __3__ :

$E_{75} = 1.01$

$E_{77} = 0.76$

$E_{70} = 1.12$

FROM EMISS. INVENTORY:

$$F_{70} = \frac{\text{Motor Veh. Emiss}}{\text{Total Emiss}}$$

$$= \frac{83,700}{306,300} = 0.273$$

$$\frac{E_{75}}{E_{70}} \ (F_{70}) + (1-F_{70})(GF_{75}) = \frac{1.01}{1.12} \ (0.273) + (1-0.273) \ 1.22$$

$$= 0.246 + 0.887 = 1.13$$

$$\frac{E_{77}}{E_{70}} \ (F_{70}) + (1-F_{70})(GF_{77}) = \frac{0.76}{1.12} \ (0.273) + (1-0.273) \ 1.31$$

$$= 0.185 + 0.952 = 1.14$$

SOURCE CATEGORY	Control Factor (a)	Growth %[b]		Emissions,[c] 1000 TPY		
		1975	1977	1970	1975	1977
Indus. and Comm. Fuel				11.4	12.9	13.5
Power Plants				3.0	4.2	4.7
Process Losses				30.2	28.8	30.1
Solid Waste Disposal				.2	.2	.2
Other - Open Burning				5.7	0	0
Gasoline Handling				8.6	9.7	10.1
Solvents				5.5	6.2	6.5
Misc.				8.7	8.7	8.7

(a) Percent of emissions after enforcement of post-1970 regulations

TOTALS $\longrightarrow$ | 73.3 | 70.7 | 73.8 |

(b) Percent of 1970 emissions

$\dfrac{\text{197N Total}}{\text{1970 Total}} \longrightarrow$ | 0.964 | 1.01 |

(c) Sum of Tables 4-16 & 4-19

GF_{75} GF_{77}

FROM APPENDIX I CURVE __1__ :

$E_{75} = 0.51$

$E_{77} = 0.37$

$E_{70} = 0.88$

FROM EMISS. INVENTORY:

$F_{70} = \dfrac{\text{Motor Veh. Emiss}}{\text{Total Emiss}}$

$= \dfrac{112,900}{186,200} = 0.606$

$$\dfrac{E_{75}}{E_{70}} \ (F_{70}) + (1-F_{70})(GF_{75}) = \dfrac{0.51}{0.88}(0.606) + (1-0.606)\,0.964$$

$$= 0.350 + 0.380 = 0.73$$

$$\dfrac{E_{77}}{E_{70}} \ (F_{70}) + (1-F_{70})(GF_{77}) = \dfrac{0.37}{0.88}(0.606) + (1-0.606)\,1.01$$

$$= 0.254 + 0.398 + 0.65$$

SOURCE CATEGORY	Control Factor (a)	Growth %b		Emissions,c 1000 TPY		
		1975	1977	1970	1975	1977
Indus. and Comm. Fuel				1.3	1.5	1.5
Power Plants				5.3	7.4	8.3
Process Losses				8.7	8.6	8.9
Solid Waste Disposal				0.9	1.0	1.1
Other - Open Burning				14.4	0	0
Misc.				17.5	17.5	17.5

TOTALS ⟶ 48.1 36.0 37.2

$\dfrac{\text{197N Total}}{\text{1970 Total}}$ ⟶ 0.748 0.773

GF_{75} GF_{77}

(a) Percent of emissions after enforcement of post-1970 regulations

(b) Percent of 1970 emissions

(c) Sum of Tables 4-17 & 4-20

FROM APPENDIX I CURVE __2__ :

$E_{75} = 0.65$

$E_{77} = 0.46$

$E_{70} = 0.95$

FROM EMISS. INVENTORY:

$$F_{70} = \frac{\text{Motor Veh. Emiss}}{\text{Total Emiss}}$$

$$= \frac{643,100}{691,200} = 0.930$$

$$\frac{E_{75}}{E_{70}} \; (F_{70}) + (1-F_{70})(GF_{75}) = \frac{0.65}{0.95}(0.930) + (1-0.930) \; 0.748$$

$$= 0.636 + 0.052 = 0.69$$

$$\frac{E_{77}}{E_{70}} \; (F_{70}) + (1-F_{70})(GF_{77}) = \frac{0.46}{0.95}(0.930) + (1-0.930) \; 0.773$$

$$= 0.450 + 0.054 = 0.50$$

SOURCE CATEGORY	Control Factor (a)	Growth %[b]		Emissions,[c] 1000 TPY		
		1975	1977	1970	1975	1977
Indus. and Comm. Fuel				128.3	145.0	151.4
Power Plants				81.7	113.6	126.9
Process Losses				2.6	3.0	3.1
Solid Waste Disposal				0.5	0.5	0.6
Other – Open Burning				1.0	0	0
Misc.				8.5	8.5	8.5
TOTALS →				222.6	270.6	290.5
197N Total / 1970 Total →					1.22 GF_{75}	1.30 GF_{77}

(a) Percent of emissions after enforcement of post-1970 regulations

(b) Percent of 1970 emissions

(c) Sum of Table 4-18 & 4-21

FROM APPENDIX I CURVE __3__ :

$E_{75} = 1.01$

$E_{77} = 0.76$

$E_{70} = 1.12$

FROM EMISS. INVENTORY:

$$F_{70} = \frac{\text{Motor Veh. Emiss}}{\text{Total Emiss}}$$

$$= \frac{83,700}{306,300} = 0.273$$

$$\frac{E_{75}}{E_{70}} (F_{70}) + (1-F_{70})(GF_{75}) = \frac{1.01}{1.12}(0.273) + (1-0.273)\,1.22$$

$$= 0.246 + 0.887 = 1.13$$

$$\frac{E_{77}}{E_{70}} (F_{70}) + (1-F_{70})(GF_{77}) = \frac{0.76}{1.12}(0.273) + (1-0.273)\,1.30$$

$$= 0.185 + 0.945 = 1.13$$

TABLE 4-13
RESULTS OF FED. MOT. VEH. CONTROL
PROGRAM FOR HYDROCARBONS
KANSAS CITY AQCR
KANSAS PORTION
WITHOUT POST-1970 CONTROLS

SOURCE CATEGORY	Control Factor (a)	Growth %[b]		Emissions, 1000 TPY		
		1975	1977	1970	1975	1977
Indus. and Comm. Fuel	100	113	118	0.6	0.7	0.7
Power Plants	100	140	156	0.6	0.8	0.9
Process Losses	100	113	118	6.6	7.5	7.8
Solid Waste Disposal	100	115	121	0.2	0.2	0.2
Other - Open Burning	0	0	0	1.9	0	0
Gasoling Handling	100	113	118	3.0	3.4	3.5
Solvents	100	113	118	4.4	5.0	5.2
Misc.	100	100	100	4.7	4.7	4.7
TOTALS ⟶				22.0	22.3	23.0

(a) Percent of emissions after enforcement of post-1970 regulations

(b) Percent of 1970 emissions

$$\frac{197N\ Total}{1970\ Total} \longrightarrow \quad 1.01 \quad 1.04$$
$$\qquad\qquad\qquad\qquad GF_{75} \quad GF_{77}$$

FROM APPENDIX I CURVE __1__ :

$E_{75} = 0.51$

$E_{77} = 0.37$

$E_{70} = 0.88$

FROM EMISS. INVENTORY:

$$F_{70} = \frac{Motor\ Veh.\ Emiss}{Total\ Emiss}$$

$$= \frac{33,000}{55,000} = 0.600$$

$$\frac{E_{75}}{E_{70}} \ (F_{70}) + (1-F_{70})(GF_{75}) = \frac{0.51}{0.88}(0.600) + (1-0.600)\ 1.01$$

$$= 0.348 + 0.404 = 0.75$$

$$\frac{E_{77}}{E_{70}} \ (F_{70}) + (1-F_{70})(GF_{77}) = \frac{0.37}{0.88}(0.600) + (1-0.600)\ 1.04$$

$$= 0.252 + 0.416 = 0.67$$

RESULTS OF FED. MOT. VEH. CONTROL PROGRAM FOR CARBON MONOXIDE KANSAS CITY AQCR KANSAS PORTION WITHOUT POST-1970 CONTROLS

SOURCE CATEGORY	Control Factor (a)	Growth % (b)		Emissions, 1000 TPY		
		1975	1977	1970	1975	1977
Indus. and Comm. Fuel	100	113	118	0.8	0.9	0.9
Power Plants	100	140	156	0.1	0.1	0.2
Process Losses	100	113	118	1.3	1.5	1.5
Solid Waste Disposal	100	115	121	0.9	1.0	1.1
Other - Open Burning	0	0	0	3.4	0	0
Misc.	100	100	100	12.9	12.9	12.9

(a) Percent of emissions after enforcement of post-1970 regulations

(b) Percent of 1970 emissions

TOTALS $\longrightarrow$ 19.4 | 16.4 | 16.6

$\dfrac{197N\ Total}{1970\ Total} \longrightarrow$ 0.845 | 0.855

GF_{75} GF_{77}

FROM APPENDIX I CURVE __2__ :

$E_{75} = 0.65$

$E_{77} = 0.46$

$E_{70} = 0.95$

FROM EMISS. INVENTORY:

$$F_{70} = \frac{Motor\ Veh.\ Emiss}{Total\ Emiss}$$

$$= \frac{184,200}{203,600} = 0.905$$

$$\frac{E_{75}}{E_{70}} (F_{70}) + (1-F_{70})(GF_{75}) = \frac{0.65}{0.95}(0.905) + (1-0.905)\,0.845$$

$$= 0.618 + 0.080 = 0.70$$

$$\frac{E_{77}}{E_{70}} (F_{70}) + (1-F_{70})(GF_{77}) = \frac{0.46}{0.95}(0.905) + (1-0.905)\,0.855$$

$$= 0.437 + 0.081 = 0.52$$

TABLE 4-15
RESULTS OF FED. MOT. VEH. CONTROL
PROGRAM FOR NITROGEN OXIDES
KANSAS CITY AQCR
KANSAS PORTION
WITHOUT POST-1970 CONTROLS

SOURCE CATEGORY	Control Factor (a)	Growth %[b] 1975	Growth %[b] 1977	Emissions, 1000 TPY 1970	Emissions, 1000 TPY 1975	Emissions, 1000 TPY 1977
Indus. and Comm. Fuel	100	113	118	3.1	3.5	3.7
Power Plants	100	140	156	8.7	12.2	13.6
Process Losses	100	113	118	1.2	1.4	1.4
Solid Waste Disposal	100	115	121	0.3	0.3	0.4
Other - Open Burning	0	0	0	0.2	0	0
Misc.	100	100	100	5.2	5.2	5.2

TOTALS $\longrightarrow$ 18.7 | 22.6 | 24.3

$\dfrac{\text{197N Total}}{\text{1970 Total}} \longrightarrow$ 1.21 | 1.30

GF_{75} GF_{77}

(a) Percent of emissions after enforcement of post-1970 regulations

(b) Percent of 1970 emissions

FROM APPENDIX I CURVE __3__ :

$E_{75} = 1.01$

$E_{77} = 0.76$

$E_{70} = 1.12$

FROM EMISS. INVENTORY:

$F_{70} = \dfrac{\text{Motor Veh. Emiss}}{\text{Total Emiss}}$

$= \dfrac{25,800}{44,500} = 0.579$

$\dfrac{E_{75}}{E_{70}} (F_{70}) + (1-F_{70})(GF_{75}) = \dfrac{1.01}{1.12} (0.579) + (1-0.579) \, 1.21$

$= 0.521 + 0.510 = 1.03$

$\dfrac{E_{77}}{E_{70}} (F_{70}) + (1-F_{70})(GF_{77}) = \dfrac{0.76}{1.12} (0.579) + (1-0.579) \, 1.30$

$= 0.392 + 0.548 = 0.94$

TABLE 4-16
RESULTS OF FED. MOT. VEH. CONTROL
PROGRAM FOR HYDROCARBONS
KANSAS CITY AQCR
MISSOURI PORTION
WITHOUT POST-1970 CONTROLS

SOURCE CATEGORY	Control Factor (a)	Growth % [b]		Emissions, 1000 TPY		
		1975	1977	1970	1975	1977
Indus. and Comm. Fuel	100	113	118	10.8	12.2	12.8
Power Plants	100	140	156	2.4	3.4	3.8
Process Losses	100	113	118	23.6	26.6	27.8
Solid Waste Disposal	100	115	121	0	0	0
Other - Open Burning	0	0	0	3.8	0	0
Misc.	100	100	100	4.0	4.0	4.0
Solvents	100	113	118	1.1	1.2	1.3
Gasoline Handling	100	113	118	5.6	6.3	6.6

(a) Percent of emissions after enforcement of post-1970 regulations

(b) Percent of 1970 emissions

TOTALS ⟶   51.3   53.7   56.3

$\frac{197N\ Total}{1970\ Total}$ ⟶   1.05   1.08

          GF_{75} GF_{77}

FROM APPENDIX I CURVE __1__ :

$E_{75} = 0.51$

$E_{77} = 0.37$

$E_{70} = 0.88$

FROM EMISS. INVENTORY:

$$F_{70} = \frac{Motor\ Veh.\ Emiss}{Total\ Emiss}$$

$$= \frac{79,000}{131,200} = 0.609$$

$$\frac{E_{75}}{E_{70}} (F_{70}) + (1-F_{70})(GF_{75}) = \frac{0.51}{0.88}(0.609) + (1-0.609)\ 1.05$$

$$= 0.352 + 0.412 = 0.76$$

$$\frac{E_{77}}{E_{70}} (F_{70}) + (1-F_{70})(GF_{77}) = \frac{0.37}{0.88}(0.609) + (1-0.609)\ 1.08$$

$$= 0.256 + 0.423 = 0.68$$

TABLE 4-17
RESULTS OF FED. MOT. VEH. CONTROL
PROGRAM FOR CARBON MONOXIDES
KANSAS CITY AQCR
MISSOURI PORTION
WITHOUT POST-1970 CONTROLS

SOURCE CATEGORY	Control Factor (a)	Growth % [b]		Emissions, 1000 TPY		
		1975	1977	1970	1975	1977
Indus. and Comm. Fuel	100	113	118	0.5	0.6	0.6
Power Plants	100	140	156	5.2	7.3	8.1
Process Losses	100	113	118	7.4	8.4	8.7
Solid Waste Disposal(Incin.)	100	115	121	0	0	0
Other - Open Burning	0	0	0	11.0	0	0
Misc.	100	100	100	4.6	4.6	4.6

(a) Percent of emissions
after enforcement of
post-1970 regulations

(b) Percent of 1970 emissions

TOTALS →

	1970	1975	1977
TOTALS	28.7	20.9	22.0
$\frac{197N \text{ Total}}{1970 \text{ Total}}$ →		0.728	0.767
		GF_{75}	GF_{77}

FROM APPENDIX I CURVE __2__ :

$E_{75} = 0.65$

$E_{77} = 0.46$

$E_{70} = 0.95$

FROM EMISS. INVENTORY:

$$F_{70} = \frac{\text{Motor Veh. Emiss}}{\text{Total Emiss}}$$

$$= \frac{458,900}{487,600} = 0.941$$

$$\frac{E_{75}}{E_{70}} \quad (F_{70}) + (1-F_{70})(GF_{75}) = \frac{0.65}{0.95}(0.941) + (1-0.941)\,0.728$$

$$= 0.645 + 0.057 = 0.70$$

$$\frac{E_{77}}{E_{70}} \quad (F_{70}) + (1-F_{70})(GF_{77}) = \frac{0.46}{0.95}(0.941) + (1-0.941)\,0.767$$

$$= 0.454 + 0.060 = 0.51$$

TABLE 4-18
RESULTS OF FED. MOT. VEH. CONTROL PROGRAM FOR NITROGEN OXIDES
KANSAS CITY AQCR
MISSOURI PORTION
WITHOUT POST-1970 CONTROLS

SOURCE CATEGORY	Control Factor (a)	Growth % [b]		Emissions, 1000 TPY		
		1975	1977	1970	1975	1977
Indus. and Comm. Fuel	100	113	118	125.2	141.5	147.7
Power Plants	100	140	156	73.0	102.0	114.0
Process Losses	100	113	118	1.4	1.6	1.7
Solid Waste Disposal	100	115	121	0.2	0.2	0.2
Other - Open Burning	0	0	0	0.8	0	0
Mics.	100	100	100	3.3	3.3	3.3

(a) Percent of emissions after enforcement of post-1970 regulations

(b) Percent of 1970 emissions

TOTALS $\longrightarrow$ 203.9   248.6   266.9

$\dfrac{197N \text{ Total}}{1970 \text{ Total}} \longrightarrow$ 1.22   1.31

GF_{75} GF_{77}

FROM APPENDIX I CURVE __3__ :

$E_{75} = 1.01$

$E_{77} = 0.76$

$E_{70} = 1.12$

FROM EMISS. INVENTORY:

$$F_{70} = \frac{Motor\ Veh.\ Emiss}{Total\ Emiss}$$

$$= \frac{57,900}{261,800} = 0.221$$

$$\frac{E_{75}}{E_{70}} \ (F_{70}) + (1-F_{70})(GF_{75}) = \frac{1.01}{1.12}(0.221) + (1-0.211)\ 1.22$$

$$= 0.199 + 0.950 = 1.15$$

$$\frac{E_{77}}{E_{70}} \ (F_{70}) + (1-F_{70})(GF_{77}) = \frac{0.70}{1.12}(0.221) + (1-0.211)\ 1.31$$

$$= 0.138 + 1.02 = 1.16$$

TABLE 4-19
RESULTS OF FED. MOT. VEH. CONTROL
PROGRAM FOR HYDROCARBONS
KANSAS CITY AQCR
KANSAS PORTION
WITH POST-1970 CONTROLS

SOURCE CATEGORY	Control Factor (a)	Growth % [b]		Emissions, 1000 TPY		
		1975	1977	1970	1975	1977
Indus. and Comm. Fuel	100	113	118	0.6	0.7	0.7
Power Plants	100	140	156	0.6	0.8	0.9
Process Losses	30	113	118	6.6	2.2	2.3
Solid Waste Disposal(Incin.)	100	115	121	0.2	0.2	0.2
Other - Open Burning	0	0	0	1.9	0	0
Gasoline Handling	100	113	118	3.0	3.4	3.5
Solvents	100	113	118	4.4	5.0	5.2
Misc.	100	100	110	4.7	4.7	4.7

(a) Percent of emissions after enforcement of post-1970 regulations

(b) Percent of 1970 emissions

TOTALS $\longrightarrow$ 22.0 | 17.0 | 17.5

$\dfrac{197N\ Total}{1970\ Total} \longrightarrow$ 0.773 | 0.795

                       GF_{75} GF_{77}

FROM APPENDIX I CURVE $\underline{\ 1\ }$:

E_{75} = 0.51

E_{77} = 0.37

E_{70} = 0.88

FROM EMISS. INVENTORY:

$$F_{70} = \frac{Motor\ Veh.\ Emiss}{Total\ Emiss}$$

$$= \frac{33,000}{55,000} = 0.600$$

$$\frac{E_{75}}{E_{70}}\ (F_{70})\ +\ (1-F_{70})(GF_{75})\ = \frac{0.51}{0.88}\ (0.600)\ +\ (1-0.600)\ 0.773$$

$$= 0.348\ +\ 0.310\ =\ 0.66$$

$$\frac{E_{77}}{E_{70}}\ (F_{70})\ +\ (1-F_{70})(GF_{77})\ = \frac{0.37}{0.88}\ (0.600)\ +\ (1-0.600)\ 0.795$$

$$= 0.252\ +\ 0.318\ =\ 0.57$$

TABLE 4-20
RESULTS OF FED. MOT. VEH. CONTROL
PROGRAM FOR CARBON MONOXIDE
KANSAS CITY AQCR
KANSAS PORTION
WITH POST-1970 CONTROLS

SOURCE CATEGORY	Control Factor (a)	Growth %[b]		Emissions, 1000 TPY		
		1975	1977	1970	1975	1977
Indus. and Comm. Fuel	100	113	118	0.8	0.9	0.9
Power Plants	100	140	156	0.1	0.1	0.2
Process Losses	10	113	118	1.3	0.2	0.2
Solid Waste Disposal	100	115	121	0.9	1.0	1.1
Other - Open Burning	0	0	0	3.4	0	0
Misc.	100	100	100	12.9	12.9	12.9

(a) Percent of emissions after enforcement of post-1970 regulations

(b) Percent of 1970 emissions

TOTALS $\longrightarrow$ 19.4   15.1   15.3

$\dfrac{\text{197N Total}}{\text{1970 Total}} \longrightarrow$ 0.778   0.788

            GF_{75} GF_{77}

FROM APPENDIX I CURVE __2__ :

$E_{75} = 0.65$

$E_{77} = 0.46$

$E_{70} = 0.95$

FROM EMISS. INVENTORY:

$$F_{70} = \frac{\text{Motor Veh. Emiss}}{\text{Total Emiss}}$$

$$= \frac{184,200}{203,600} = 0.905$$

$$\frac{E_{75}}{E_{70}} (F_{70}) + (1-F_{70})(GF_{75}) = \frac{0.65}{0.95} (0.905) + (1-0.905)\,0.778$$

$$= 0.618 + 0.074 = 0.69$$

$$\frac{E_{77}}{E_{70}} (F_{70}) + (1-F_{70})(GF_{77}) = \frac{0.46}{0.95} (0.905) + (1-0.905)\,0.788$$

$$= 0.437 + 0.075 = 0.51$$

TABLE 4-21
RESULTS OF FED. MOT. VEH. CONTROL
PROGRAM FOR NITROGEN OXIDES
KANSAS CITY AQCR
KANSAS PORTION
WITH POST-1970 CONTROLS

SOURCE CATEGORY	Control Factor (a)	Growth %		Emissions, 1000 TPY		
		1975	1977	1970	1975	1977
Indus. and Comm. Fuel	100	113	118	3.1	3.5	3.7
Power Plants	95	140	156	8.7	11.6	12.9
Process Losses	100	113	118	1.2	1.4	1.4
Solid Waste Disposal	100	115	121	0.3	0.3	0.4
Other - Open Burning	0	0	0	0.2	0	0
Misc.	100	100	100	5.2	5.2	5.2

(a) Percent of emissions after enforcement of post-1970 regulations

(b) Percent of 1970 emissions

TOTALS $\longrightarrow$ | 18.7 | 22.0 | 23.6 |

$\dfrac{197N\ Total}{1970\ Total} \longrightarrow$ | 1.18 | 1.26 |

GF_{75} GF_{77}

FROM APPENDIX I CURVE __3__ :

$E_{75} = 1.01$

$E_{77} = 0.76$

$E_{70} = 1.12$

FROM EMISS. INVENTORY:

$$F_{70} = \frac{Motor\ Veh.\ Emiss}{Total\ Emiss}$$

$$= \frac{25,800}{44,500} = 0.578$$

$$\frac{E_{75}}{E_{70}} \ (F_{70}) \ + \ (1-F_{70})(GF_{75}) \ = \frac{1.01}{1.12} \ (0.578) \ + \ (1-0.578)\ 1.18$$

$$= 0.521 + 0.498 = 1.02$$

$$\frac{E_{77}}{E_{70}} \ (F_{70}) \ + \ (1-F_{70})(GF_{77}) \ = \frac{0.76}{1.12} \ (0.578) \ + \ (1-0.578)\ 1.26$$

$$= 0.392 + 0.532 = 0.92$$