March 1975

IMPLEMENTATION PLAN REVIEW

FOR

NORTH CAROLINA

APPENDICES

U. S. ENVIRONMENTAL PROTECTION AGENCY

APPENDIX A

State Implementation Plan Background

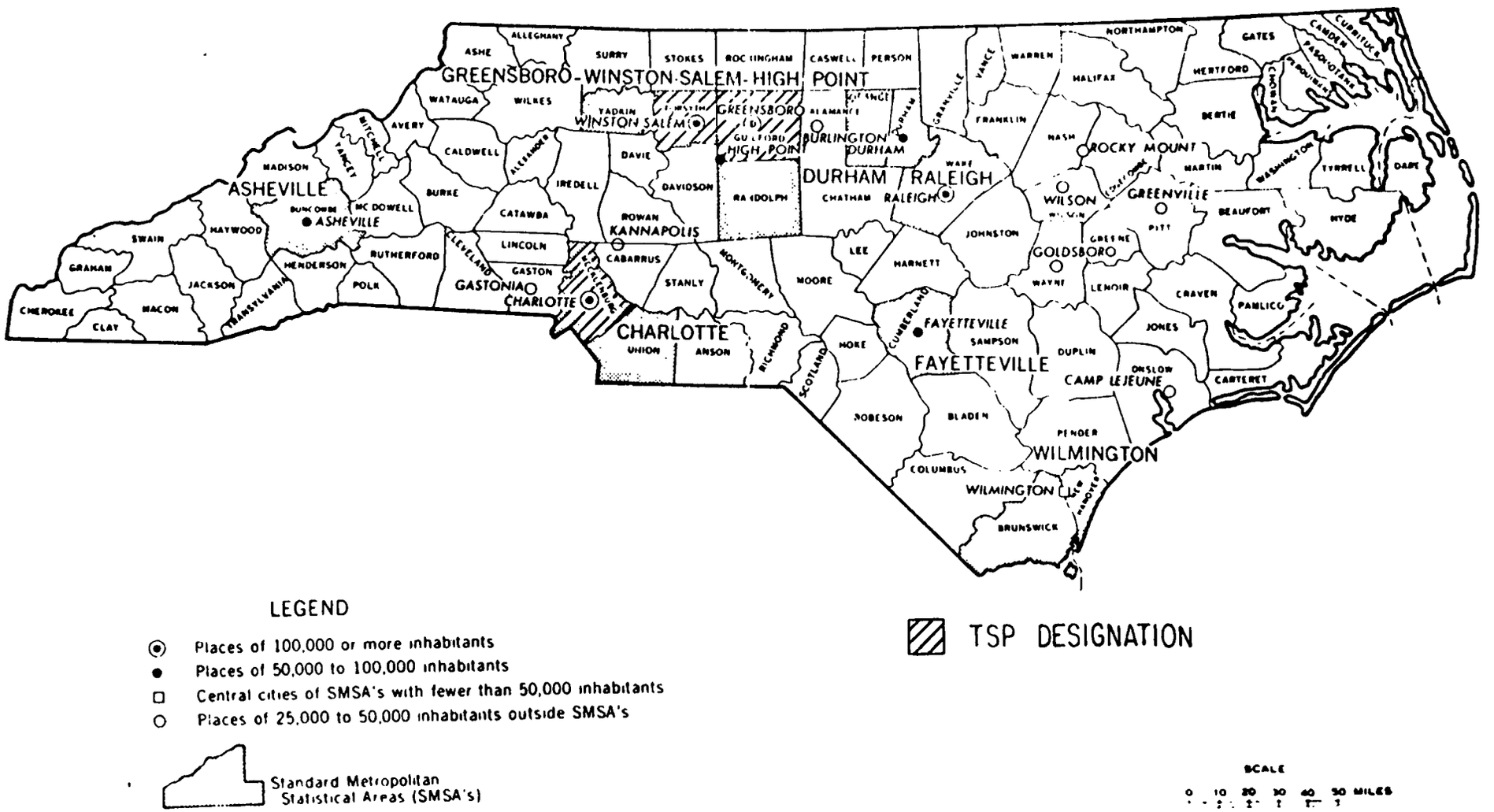

Figure A-1. Proposed North Carolina Air Quality Maintenance Areas (AQMAs)

Table A-1. North Carolina Air Pollution Control Areas

Air Quality Control Region	Federal Number	Demographic Information: Population 1970 (Millions)	Area (Square Miles)	Population Per Square Mile	Priority Classification: Particulates	SO_x	NO_x	Proposed AQMA Designations[a]: TSP Counties	SO_x Counties
Northern Piedmont	136	.98	5,440	181	I	III	III	(2) Guilford, Forsyth	(0)
Eastern Mountain	165	.53	5,836	91	I	III	III	(0)	(0)
Eastern Piedmont	166	.92	8,116	114	I	III	III	(0)	(0)
Metropolitan Charlotte (South Carolina)	167	1.06	5,962	178	I	II	III	(1) Mecklenburg	(0)
Northern Coastal Plain	168	.28	6,193	45	I	III	III	(0)	(0)
Sandhills	169	.58	6,942	84	II	III	III	(0)	(0)
Southern Coastal Plain	170	.58	7,701	76	II	III	III	(0)	(0)
Western Mountain	171	.34	4,899	69	I	III	III	(0)	(0)

[a]As of January 21, 1975.

Table A-2. North Carolina Ambient Air Quality Standards

All concentrations in $\mu gm/m^3$

		Total Suspended Particulate		Sulfur Oxides			Nitrogen Dioxide	
		Annual	24-Hour	Annual	24-Hour	3-Hour	Annual	24-Hour
Federal	Primary	75(G)	260[a]	80(A)	365[a]	---	100(A)	---
	Secondary	60(G)	150[a]	---	---	1300[a]	100(A)	---
State		60(G)	150[a]	60(A)[b]	260[a,b]	1300[a]	100(A)	250[a]

[a] Not to be exceeded more than once per year.

[b] Was adopted based on original EPA policy which was rescinded July, 1973.

(A) Arithmetic mean
(G) Geometric mean

Table A-3. North Carolina AQCR Air Quality Status, TSP[a]

AQCR No.	No. Stations Reporting		TSP Concentration ($\mu gm/m^3$)			Number of Stations Exceeding Ambient Air Quality Standards				% Reduction Required to Meet Standards	Controlling Standard
			Highest Reading		2nd Highest Reading	Primary		Secondary			
	24-Hr	Annual	Annual	24-Hr	24-Hr	Annual	24-Hr[c]	Annual	24-Hr[c]		
136	29	1	84	335	258	1	0	1	8	+ 47	24-Hr
165	27	0	–	527	330	–	1	–	5	+ 60	24-Hr
166	18	1	82	315	303	1	1	1	6	+ 56	24-Hr
167[b]	47	6	63	646	645	0	1	1	8	+ 80	24-Hr
168	12	0	–	321	229	–	0	–	1	+ 40	24-Hr
169	9	0	–	264	250	–	0	–	1	+ 45	24-Hr
170	14	0	–	754	395	–	1	–	3	+ 67	24-Hr
171	24	0	–	884	738	–	4	–	9	+ 83	24-Hr

[a]1973 air quality data in National Air Data Bank as of June 7, 1974

[b]Interstate.

[c]Violations based on 2nd highest reading at any station.

[d]Formula:

$$\text{Maximum of } \left[\left(\frac{\text{2nd Highest 24-Hr - 24-Hr Secondary Standard}}{\text{2nd Highest 24-Hr - Background}} \right) \times 100, \left(\frac{\text{Annual - Annual Secondary Standard}}{\text{Annual - Background}} \right) \times 100 \right]$$

North Carolina particulate background concentration: 30 $\mu gm/m^3$

Note that this is a first approximation. EPA no longer encourages the use of rollback calculations to demonstrate NAAQS attainment. However, in the absence of dispersion modeling calculations it is the only measure available and it is used here.

Table A-4. North Carolina AQCR Air Quality Status, SO_2[a]

AQCR No.	No. Stations Reporting			SO_2 Concentration ($\mu gm/m^3$)			Number of Stations Exceeding Ambient Air Quality Standards			% Reduction Required to Meet Standards[d]	Controlling Standard
				Highest Reading		2nd Highest Reading	Primary		Secondary		
	Annual	24-Hr	Cont.	Annual	24-Hr	24-Hr	Annual	24-Hr[c]	3-Hr[c]		
136	1	26	0	17	82	59	0	0	—	- 371	Annual
165	0	20	0	—	47	40	—	0	—	- 813	24-Hr
166	1	18	0	17	110	81	0	0	—	- 351	24-Hr
167[b]	3	35	2	13	323	121	0	0	—	- 202	24-Hr
168	1	13	0	7	14	10	0	0	—	- 1,042	Annual
169	0	8	0	—	124	53	—	0	—	- 589	24-Hr
170	0	13	0	—	65	64	—	0	—	- 470	24-Hr
171	0	14	0	—	35	19	—	0	—	- 1,821	24-Hr

[a]1973 air quality data in National Aerometric Data Bank as of June 7, 1974.

[b]Interstate.

[c]Violations based on 2nd highest reading at any station.

[d]Formula:

$$\text{Maximum of } \left[\left(\frac{\text{2nd Highest 24-Hr - 24-Hr Standard}}{\text{2nd Highest 24-Hr}} \right) \times 100, \quad \left(\frac{\text{Annual - Annual Standard}}{\text{Annual}} \right) \times 100 \right]$$

Note that this is a first approximation. EPA no longer encourages the use of rollback calculations to demonstrate NAAQS attainment. However, in the absence of dispersion modeling calculations it is the only measure available and it is used here.

Table A-5. North Carolina Fuel Combustion Source Summary

AQCR No.	Power Plants[a]	Other Fuel Combustion Point Sources[b]	Area Sources[c]	Total Emissions (10^3 tons/yr)[d] TSP	Total Emissions (10^3 tons/yr)[d] SO_2	% Emissions from North Carolina Fuel Combustion Sources TSP	% Emissions from North Carolina Fuel Combustion Sources SO_2
136	2	14	11	49	31	31	94
165	2	4	15	31	88	61	99
166	3	1	16	147	118	40	97
167[e]	3	1	8	120	144	68	85
168	0	2	15	36	31	28	48
169	1	14	11	37	12	19	92
170	2	6	13	94	67	24	82
171	1	5	11	27	47	67	94
Total	14	47	100	541	538	43	89

[a] North Carolina plants

[b] North Carolina plants contributing 90% of the particulate and SO_2 emissions or 1,000 or more tons per year.

[c] North Carolina counties

[d] AQCR total

[e] Interstate

Table A-6. North Carolina Emissions Summary, TSP[a]

AQCR	Total (10^3 tons/yr)	%	Electricity Generation (10^3 tons/yr)	%	Industrial/Commercial/ Institutional Point Source (10^3 tons/yr)	%	Area Source (10^3 tons/yr)	%
136	49	9	1	2	2	4	12	24
165	31	6	8	26	4	11	7	22
166	147	27	49	34	3	2	7	5
167 North Carolina	108	20	68	63	4	4	9	8
Other	12	2	0	0	3	25	2	21
Total	120	22	68	57	7	6	11	10
168	36	7	<1	<1	8	22	2	5
169	37	7	2	5	1	4	4	10
170	94	17	14	15	6	6	3	3
171	27	5	2	6	13	49	3	11
Total	541	100	144	27	44	8	49	9

[a]Emission data from Reference 6.

Table A-7. North Carolina Emissions Summary, SO_2[a]

AQCR	Total (10^3 tons/yr)	%	Electricity Generation (10^3 tons/yr)	%	Industrial/Commercial/ Institutional Point Source (10^3 tons/yr)	%	Area Source (10^3 tons/yr)	%
136	31	6	16	52	5	16	8	24
165	88	16	78	89	4	4	5	5
166	118	22	90	76	19	16	5	5
167 North Carolina	128	24	113	88	4	3	6	5
Other	16	3	0	0	11	67	3	19
Total	144	27	113	79	15	11	9	6
168	31	6	<1	<1	14	44	1	4
169	12	2	4	34	4	32	3	21
170	67	12	30	45	23	34	2	4
171	47	9	13	27	29	63	2	5
Total	538	100	345	64	113	21	35	7

[a]Emission data from Reference 6.

Table A-8. North Carolina AQCR Required Emission Reduction[a]

AQCR	Estimated Particulate Emission Reduction Required		Estimated SO_2 Emission Reduction Required	
	%	10^3 tons/year	%	10^3 tons/year
136	+ 47	+ 23	- 371[c]	- 115
165	+ 60	+ 19	- 813[c]	- 715
166	+ 56	+ 82	- 351[c]	- 414
167[b]	+ 80	+ 96	- 202	- 291
168	+ 40	+ 14	- 1,042[c]	- 323
169	+ 45	+ 17	- 589[c]	- 71
170	+ 67	+ 63	- 470[c]	- 315
171	+ 83	+ 22	- 1,821[c]	- 856

[a]Based on a proportional change of emissions to air quality. Note that this is a first approximation. EPA no longer encourages the use of rollback calculations to demonstrate NAAQS attainment. However, in the absence of dispersion modeling results, it is the only measure available and it is used here.

[b]Interstate.

[c]Exceptionally large negative numbers indicate current air quality is very good. In this range, the proportional calculations do not give a good picture of allowable emission increases. They are included here only as general indicators.

Table A-9. North Carolina Fuel Combustion Emission Regulations

	Existing	New[a]
Visible[b]	No emission shall be darker than Ringelmann #2 or equivalent spacity for more than 5 min. in any one hour or for more than 20 min. in any 24-hour period. On July 1, 1976, the standard for new sources shall apply.	No emission shall be darker than Ringelmann #1 or equivalent opacity for more than 5 min. in any one hour or for more than 20 min. in any 24-hour period.
Particulate Matter[c]	Heat Input[d] (10^6 Btu/hr) / Maximum Allowable Emission of Particulate Matter (lb-hr/10^6 Btu) Up to and including 10 — 0.60 100 — 0.33 1,000 — 0.18 ≥ 10,000 — 0.10 Between the values listed see Figure A-1.	Same as existing units.
SO_2	2.3 lb $SO_2/10^6$ Btu input per hour[e] Existing sources must meet the new source standard by July 1, 1980 unless a source demonstrates that ambient air quality standards in its vicinity will not be contravened.	1.6 lb $SO_2/10^6$ Btu input per hour

[a] Constructed after July 1, 1975.

[b] Exceptions exist during startups using approved procedures or where uncombined water vapor is the only reason for failure to comply.

[c] Applies to fuels such as coal, coke, lignite and fuel oil, but not wood or refuse. Separate emission limits apply for wood and refuse.

[d] Total heat input of all fuel burning units in a plant is used to determine maximum allowable emission.

[e] Lower limit could apply if violations of ambient air quality standards due to a specific source were demonstrated.

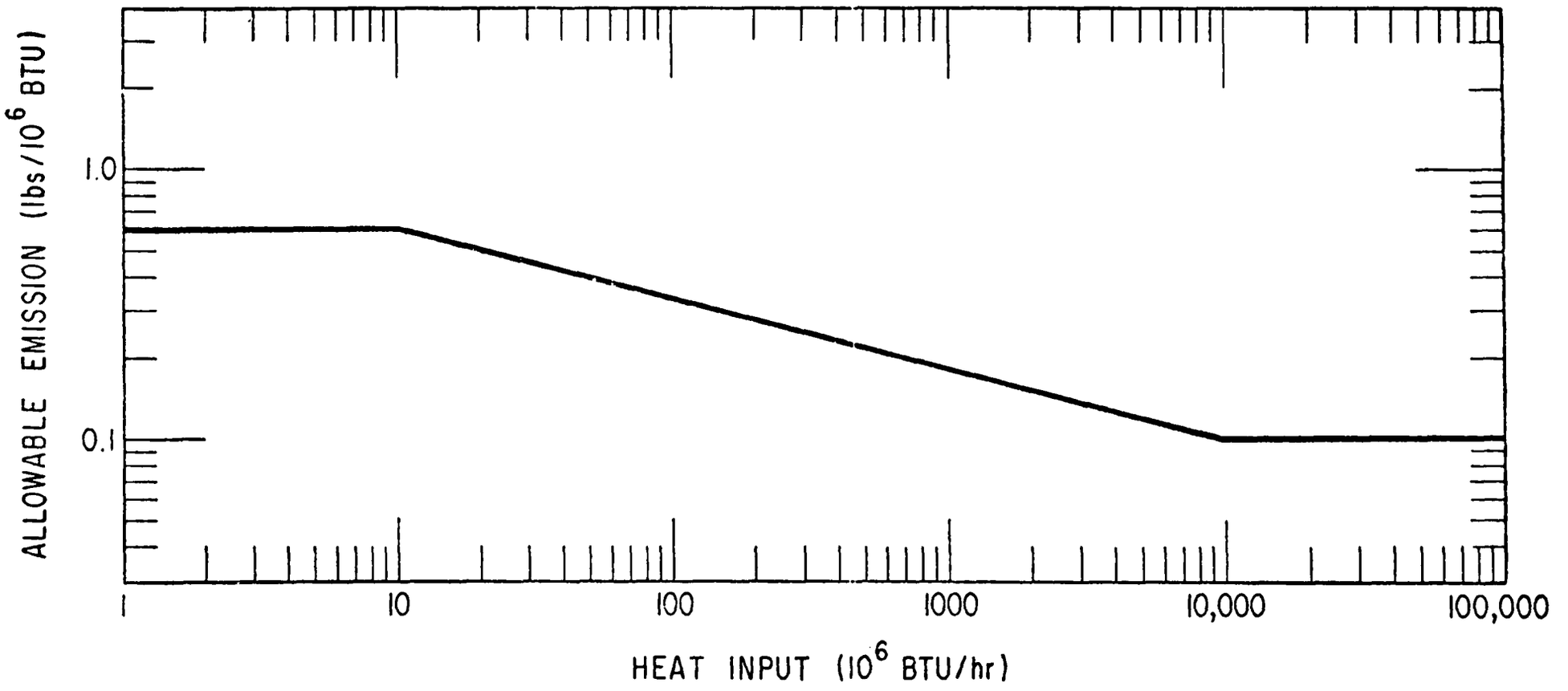

Figure A-2. Allowable Particulate Emissions from Fuel Combustion Sources in North Carolina

APPENDIX B

Regional Air Quality Assessment

Table B-1. North Carolina AQCR Candidacy Assessment for Particulate Regulation Relaxation

Air Quality Control Region	Federal Number	Stations with Particulate Air Quality Violations[a]	Expected Attainment Date	Number of Counties with Proposed AQMA Designations	Total Particulate Emissions (10^3 tons/yr)	% Emissions from North Carolina Fuel Combustion	Estimated Emission Reduction Required for NAAQS (10^3 tons/yr)	Particulate Priority
Northern Piedmont	136	8	7/75	2	49	31	+ 23	I
Eastern Mountain	165	5[b]	7/75	0	31	61	+ 19	I
Eastern Piedmont	166	6	7/75	0	147	40	+ 82	I
Metropolitan Charlotte[c]	167	9	7/75	1	120	68	+ 96	I
Northern Coastal Plain	168	1[b]	7/75	0	36	28	+ 14	I
Sandhills	169	1[b]	7/75	0	37	19	+ 17	II
Southern Coastal Plain	170	3[b]	7/75	0	94	24	+ 63	II
Western Mountain	171	9[b]	7/75	0	27	67	+ 22	I

[a]Total number of stations given on Table A-3.

[b]No annual data.

[c]Interstate.

Table B-2. North Carolina AQCR Candidacy Assessment for SO_2 Regulation Relaxation

Air Quality Control Region	Federal Number	Stations with SO_2 Air Quality Violations[a]	Expected Attainment Date	Number of Counties with Proposed AQMA Designations	Total SO_2 Emissions (10^3 tons/yr)	% Emissions from North Carolina Fuel Combustion	Estimated Emission Reduction Required for NAAQS (10^3 tons/yr)	SO_2 Priority
Northern Piedmont	136	0	c	0	31	94	- 115	III
Eastern Mountain	165	0[b]	c	0	88	99	- 715	III
Eastern Piedmont	166	0	c	0	118	97	- 414	III
Metropolitan Charlotte[d]	167	0	c	0	144	85	- 291	II
Northern Coastal Plain	168	0	c	0	31	48	- 323	III
Sandhills	169	0[b]	c	0	12	92	- 71	III
Southern Coastal Plain	170	0[b]	c	0	67	82	- 315	III
Western Mountain	171	0[b]	c	0	47	94	- 856	III

[a]Total number of stations given on Table A-4.

[b]No annual data.

[c]Presently meeting standards.

[d]Interstate.

APPENDIX C

Power Plant Assessment

Table C-1. North Carolina Power Plant Assessment

AQCR		1975 Capacity (Mw)	Estimated 1975 Fuel Use		% S Under SIP Regulations[b]	% S Allowed by Model[c]
			Fuel	Quantity[a]		
136	Dan River	166	Coal	868	<1	
	Belews Creek 1 and 2[d]	2160	Coal	4,257	1-2	
165	Cliffside	781	Coal	1,498	1-2	
	Marshall	2000	Coal	5,106	<1	
			Oil	5,062	<1	
166	Cape Fear	421	Coal	816	1-2	
			Oil	293	<1	
	Roxboro[e]	1788	Coal	4,249	1-2	
			Oil	918	<1	
	Chapel Hill[f]	12.5	Coal	40	1-2	
			Gas	449		
167[g]	Allen	1155	Coal	3,268	1-2	
	Buck	440	Coal	1,187	<1	-
	Riverbend	631	Coal	1,392	1-2	-
168	No Power Plants					
169	W. H. Weatherspoon	166	Coal	204	1-2	
			Oil	339	<1	
			Gas	4,295		
170	H. F. Lee	402	Coal	855	1-2	-
			Oil	473	<1	-
			Gas	1,095	-	
	L. V. Sutton	672	Coal	357	1-2	
			Oil	1,530	1-2	
			Gas	3,977		
171	Ashville	414	Coal	854	1-2	
			Oil	507	<1	

[a] Coal quantity in 10^3 tons/yr; oil quantity in 10^3 gal/yr; gas quantity in 10^6 ft^3/yr. Estimates based on 1971 fuel use patterns plus planned additions.

[b] The maximum allowable % S is assumed to be the 1971 % S unless the regulations require a lower % S. Oil % S is assumed to remain at 1971 levels.

[c] No modeling results were available for power plants in North Carolina.

[d] New plants in 1974 and 1975

[e] New unit in 1973.

[f] Includes some fuel used for steam heating and/or process steam.

[g] Interstate.

Table C-2. North Carolina Power Plant Evaluation Summary

AQCR	Fuel	1975 Fuel Required by SIP Regulations[a] < 1%	1-2%	2-3%	> 3%	1975 Fuel Required by Modified Regulations < 1%	1-2%	2-3%	> 3%
136	coal	868	4257			No modeling results available.			
165	coal	5106	1498			No modeling results available.			
	oil	5062							
166	coal		5105			No modeling results available.			
	oil	1211							
	gas	449							
167[b]	coal	1187	4660			No modeling results available.			
168	No plants								
169	coal		204			No modeling results available.			
	oil	339							
	gas	4295							
170	coal		1212			No modeling results available.			
	oil	473	1530						
	gas	5072							
171	coal		854			No modeling results available.			
	oil	507							
North Carolina Total									
	coal	7161	17790			No modeling results available for North Carolina power plants.			
	oil	7592	1530						
	gas	9816							

[a]Fuel requirements based on 1971 fuel use patterns at 1975 consumption rates plus any new units. Maximum % S is 1971 % S unless regulations require a lower % S. Oil % S is assumed to remain at 1971 levels. Coal in 10^3 tons/yr; oil in 10^3 gal/yr; gas in 10^6 ft^3/yr.

[b]Interstate.

APPENDIX D

Industrial, Commercial, Institutional Point Source Assessment

Table D-1. North Carolina Industrial/Commercial/Institutional Source Assessment

AQCR	Plant[a]	Fuel	Estimated Fuel Consumption[b]	SIP Regulations % S[c]
136	Cone Mills-Granite Finish Box	Coal	4	>3
		Oil	1,500	2-3
		Gas	491	-
	Burl Craft	Oil	600	2-3
	Mayfair Textile Coal	Oil	1,565	>3
		Gas	440	
	La Fry Roofing Company	Oil	1,200	2-3
	Burlington Industries, Inc. - Denton	Oil	775	2-3
	Burlington Industries, Inc.	Oil	1,392	>3
		Gas	387	
	Joseph Schlitz Company	Oil	1,565	>3
		Gas	220	-
	Cone Mills-White Oak Plant	Coal	26	>3
		Gas	1,055	-
	North Carolina A & T State University	Coal	8.2	>3
		Oil	1,719	1-2
	Randolph Mills	Coal	6	1-2
	Lucks	Oil	600	2-3
	Renfro Hosiery Mills	Oil	1,050	2-3
	Chatam Manufacturing Company	Coal	34	1-2
		Oil	189	<1
	Burnsville Mill	Oil	466	2-3
165	Old Fort Finishing	Coal	30	1-2
		Oil	50	<1
	American Thread Company	Oil	1,020	2-3
	Marion Manufacturing	Coal	3.5	1-2
	Appalachian State University	Coal	10.5	1-2

Table D-1. North Carolina Industrial/Commercial/Institutional Source Assessment (Contd.)

AQCR	Plant[a]	Fuel	Estimated Fuel Consumption[b]	SIP Regulations % S[c]
166	Ablemark Paper Company	Coal Oil	4.5 18,832	>3 1-2
167[d]	Kerr Bleach	Coal	24	1-2
168	Texas Gulf Sulphur Company	Oil	9,190	2-3
	Weyerhauser Company	Oil	59,600	2-3
169	Harris Mining Company	Coal	7.0	1-2
	DuPont	Oil	1,440	2-3
	Alamac Knit	Oil	1,300	2-3
	Burlington Industries, Inc. Fayetteville	Oil	1,620	2-3
	Rohm-Haas Company	D-Oil R-Oil	600 4,500	<1 2-3
	Texfi Lively Knits	Oil Gas	680 1	2-3 -
	Burlington Industries, Inc. - Erwin Plant	Oil	5,340	2-3
	Texfi Counter Knit	Oil	420	2-3
	J. P. Stevens	Coal	8.0	1-2
	Textured Fabrics, Inc.	Oil	330	2-3
	Texfi-Lumberton	Oil Gas	360 67	>3
	Beaunit Corporation	Oil	1,400	2-3
	Johns-Manville Products Corporation	Oil Gas	400 1	2-3
	Spring Mills	Coal	24	1-2
170	Georgia-Pacific Corporation	Oil	2,570	2-3
	Federal Paperboard	Oil Gas	36,200 1,302	2-3
	Weyerhauser Company	Oil	22,700	2-3

Table D-1. North Carolina Industrial/Commercial/Institutional Source Assessment (Contd.)

AQCR	Plant[a]	Fuel	Estimated Fuel Consumption[b]	SIP Regulations % S[c]
170 (Contd.)	Caswell Center	Coal	21	1-2
	Diamond Shamrock	Oil	10,600	2-3
	Hercules, Inc.	Oil	30,650	2-3
		Gas	702	
171	American Enka Company[e]	D-Oil	765	<1
		R-Oil	21,350	2-3
		Gas	600	-
	American Enka Company[e]	Coal	201	1-2
		D-Oil	805	<1
		R-Oil	21,350	2-3
		Gas	600	
	Champion Papers	Coal	332	1-2
		Oil	644	2-3
	The Mead Corporation	Coal	76	1-2
		Oil	450	<1
	The Olin Corporation	Coal	152	1-2
		Gas	902	

[a]North Carolina plants contributing 90% of the AQCR's SO_2 or particulates or emitting more than 1,000 tons/yr.

[b]Coal in 10^3 tons/yr; oil in 10^3 gal/yr; gas in 10^6 ft^3/yr.

[c]For dual coal-oil fired plants, the % S in oil was assumed to remain at its present level. For plants firing both distillate and residual oils, but no coal, the % S in the distillate oil was assumed to remain constant.

[d]Interstate.

[e]One of two American Enka plants in AQCR 171.

Table D-2. North Carolina Industrial/Commercial/Institutional Source Evaluation Summary

AQCR	Fuel[a]	Fuel Required by Existing Regulations[a] < 1%	1-2%	2-3%	> 3%
136	coal		40		38
	oil	189	1,719	6,191	4,522
	gas	2,593			
165	coal		44		
	oil	50		1,020	
166	coal				4
	oil		18,832		
167[b]	coal		24		
168	oil			68,790	
169	coal		39		
	oil	600		17,430	360
	gas	69			
170	coal		21		
	oil			102,720	
	gas	2,004			
171	coal		761		
	oil	2,020		43,344	
	gas	2,102			
North Carolina Total	coal		929		42
	oil	2,859	20,551	239,495	4,882
	gas	6,768			

[a]Includes fuel use for sources listed on Table D-1 only.
Coal in 10^3 tons/yr; oil in 10^3 gal/yr; gas in 10^3 ft^3/yr.

[b]Interstate.

APPENDIX E

Area Source Assessment

Table E-1. North Carolina Area Source Fuel Use

AQCR	Coal (10^3 tons/yr)	Residual Oil (10^3 gals/yr)	Distillate Oil (10^3 gals/yr)	Natural Gas (10^6 ft^3/yr)
136	83	NA	119,240	28,990
165	58	3,720	97,580	14,050
166	73	NA	95,860	20,760
167[a]	82	4,250	138,210	36,620
168	16	2,620	46,250	4,320
169	35	NA	61,030	11,080
170	38	3,700	87,420	10,910
171	34	3,140	66,350	6,490
Total	419	17,430	711,940	133,220

[a]Interstate - Fuel use figures are for entire AQCR.

APPENDIX F

Fuels Assessment

Table F-1. North Carolina Clean Fuels Analysis Summary

AQCR	Fuel	Existing Regulations Clean Fuel Requirements[a] < 1% S	1 - 2% S	2 - 3% S	3% S	Minimum Clean Fuels Savings Through Regulation Modification[b] < 1% S	1 - 2% S	2 - 3% S	3% S
136	coal	868	4,297		38	No modeling results available.			
	oil	189	1,719	6,191	4,522				
165	coal	5,106	1,542			No modeling results available.			
	oil	5,112		1,020					
166	coal		5,105		4	No modeling results available.			
	oil	1,211	18,832						
167[c]	coal	1,187	4,684			No modeling results available.			
168	coal		204			No power plants.			
	oil	339		68,790					
169	coal		1,251			No modeling results available.			
	oil	1,073	1,530	17,430	360				
170	coal		875			No modeling results available.			
	oil	507		102,720					
171	coal		761			No modeling results available.			
	oil	2,020		43,344					
North Carolina Total	coal	7,161	18,719		42	[d]			
	oil	10,451	22,081	239,495	4,882				

[a]For power plants and industrial/commercial/institutional point sources. Includes fuel use for power plants (Table C-1) and industrial/commercial/institutional point sources (Table D-1) only. Coal in 10^3 tons/yr; oil in 10^3 gals/yr.

[b]Based on modeling results for power plants only.

[c]Interstate

[d]No modeling results were available for North Carolina power plants - Thus, no estimates of minimum clean fuels savings could be made.

REFERENCES

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16. ABSTRACT

Section IV of the Energy Supply and Environmental Coorination Act of 1974, (ESECA) requires EPA to review each State Implementation Plan (SIP) to determine if revisions can be made to control regulations for stationary fuel combustion sources without interfering with the attainment and maintenance of the national ambient air quality standards. This doument contains the technical appendices used in EPA's review.

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