

Appendix F: RACT and RACM Modeling and Tables

RACT modeling

To determine the feasibility of additional NO_x and SO₂ reductions on statewide monitors, a sensitivity test was performed which reduced ALL sources of NO, NO₂, and SO₂ statewide by 50%. The base year 2005 with the BaseM emissions inventory was used. Utility software provided by LADCO allowed the combined emission inventory (point sources plus area sources) to be reduced by 50% across the state of Michigan. The unaltered 2005 based year was run using the CAMx photochemical grid model. Then the model was rerun using the emissions files containing the Michigan reduced emissions. The results were compared in a relative fashion to determine what effect such a draconian cut would make to sensitive monitors. For the Dearborn monitor, the relative reduction factor yielded from the 50% cuts was 0.973. If this factor is applied to the current 2009 predicted concentration of 15.7 ug/m³, the revised impact would be 15.3 ug/m³, a relatively small reduction. As statewide cuts of 50% are beyond reasonable reductions, lesser cuts would result in even lower reductions in impacts. This conclusion supports the theory that regional cuts in NO_x and SO₂ will be required to provide significant reductions of PM_{2.5} at Michigan monitors. Additional cuts in Michigan only emissions will have negligible effects on Michigan monitors.

Tables 1 and 2 show the reductions from the modeling of a statewide RACM and 7county non-attainment area RACM as described above. Table 3 through 7 show emissions from EGUs, point source non-EGUs, stationary area sources, and mobile on-road and off-road sources. These tables are for informational purposes only.

Table 1. SO2 and NOx RACM model run for the State of Michigan.

	03-05		03-05	Overall
	DV (actual)	RRF	w/50% RACT	Reduction
New_Haven	13.1	0.964	12.6	-0.47
Luna_Pier	14.2	0.972	13.8	-0.40
Oak_Park	14.3	0.974	13.9	-0.37
Port_Huron	13.8	0.964	13.3	-0.50
Ann_Arbor	12.3	0.971	11.9	-0.36
Ypsilanti	14.4	0.971	14.0	-0.42
Allen_Park	15.1	0.973	14.7	-0.41
West_Fort	16.4	0.973	16.0	-0.44
Linwood	15.2	0.973	14.8	-0.41
East_7Mile	14.8	0.974	14.4	-0.38
Livonia	13.9	0.971	13.5	-0.40
Dearborn	18.2	0.973	17.7	-0.49
Wyandotte	15.5	0.973	15.1	-0.42

Table 2. SO2 and NOx RACT model run for Michigan's seven county non-attainment area.

	03-05 DV (actual)	New 03-05 w / 50% RACT	Overall Reductions
New_Haven	13.1	12.9	-0.20
Luna_Pier	14.2	14.1	-0.13
Oak_Park	14.3	14.2	-0.13
Port_Huron	13.8	13.6	-0.21
Ann_Arbor	12.3	12.2	-0.10
Ypsilanti	14.4	14.3	-0.12
Allen_Park	15.1	15.0	-0.15
West_Fort	16.4	16.2	-0.16
Linwood	15.2	15.1	-0.15
East_7Mile	14.8	14.7	-0.13
Livonia	13.9	13.8	-0.11
Dearborn	18.2	18.0	-0.18
Wyandotte	15.5	15.3	-0.15

Table 3. EGU point source emissions for 2002, >90 tpy emissions for Southeast Michigan.

SRN	Facility Name	City	NOX (tpy)	PM25- PRI (tpy)	SO2 (tpy)
B2816	DETROIT EDISON/MONROE POWER	MONROE	40905.39	35.72	91920.12
B2796	ST. CLAIR / BELLE RIVER POWER PLANT	SAINT CLAIR	23479.34	1.82	70882.86
B2811	DETROIT EDISON TRENTON CHANNEL	TRENTON	5961.03	7.53	30170.81
B2810	DETROIT EDISON RIVER ROUGE	RIVER ROUGE	5143.43	4.15	16194.30
B2846	J.R. WHITING CO	ERIE	3785.19	547.26	13037.26
B6145	DETROIT EDISON GREENWOOD ENERGY CENTER	AVOCA	913.17	28.65	2840.01
B2132	WYANDOTTE DEPT MUNI POWER	WYANDOTTE	553.89	1.07	1344.07
B2814	DETROIT THERMAL LLC - BEACON	DETROIT	301.04		0.95
B2185	DETROIT PUBLIC LIGHTING	DETROIT	208.21		2.11

Table 4. Non-EGU point source emissions for 2002, >90 tpy emissions for Southeast Michigan.

SRN	Facility Name	City	NOX (tpy)	PM25-PRI (tpy)	SO2 (tpy)
A7809	NATIONAL STEEL CORP	ECORSE	3785.48	0.00	4746.19
B1743	HOLCIM (US) INC.	DUNDEE	1455.07	16.81	7128.90
A9831	MARATHON ASHLAND PETROLEUM	DETROIT	1323.24	0.02	874.10
A8640	ROUGE STEEL CO	DEARBORN	1306.91	45.90	252.35
M4148	GREATER DETROIT RESOURCE RECOVERY	DETROIT	837.19		148.13
B1877	GUARDIAN INDUSTRIES	CARLETON	651.29	124.29	208.12
B6420	E.B. EDDY PAPER INC.	PORT HURON	608.88	5.54	826.38
B3520	CARMEUSE/DETROIT LIME	DETROIT	555.98	0.00	29.14
M4199	GENERAL MOTORS HAMTRAMCK	DETROIT	547.27	1.47	560.60
B6478	BELLE RIVER COMPRESSOR STATION	SAINT CLAIR	542.15	6.24	0.09
N5572	HOWELL COMPRESSOR STATION	HOWELL	512.48	0.00	0.03
N6631	DEARBORN INDUSTRIAL GENERATION	DEARBORN	484.47		870.31
B4032	GENERAL MOTORS PONTIAC SITE OPERATIONS	PONTIAC	332.52	0.01	15.40
B2169	CARMEUSE/ RIVER ROUGE	RIVER ROUGE	326.51	8.00	110.59
M0675	UNIVERSITY OF MI	ANN ARBOR	309.09	0.00	1.40
B2103	DETROIT WASTEWATER TREATMENT PLANT	DETROIT	275.83	0.25	51.56
B4281	CENTRAL WAYNE ENERGY RECOVERY	DEARBORN HTS	249.93		4.50
N1436	DAIMLERCHRYSLER TECHNOLOGY CENTER	AUBURN HILLS	239.08		8.29
A6240	CARGILL SALT	SAINT CLAIR	219.13	48.92	714.78
A8638	DETROIT DIESEL CORP	DETROIT	213.50		44.62
B6481	CAPAC COMPRESSOR STATION	CAPAC	188.52		0.04
M4782	EQ-SITE #2-MDWTP	BELLEVILLE	168.40		0.90
B4049	GM TECHNICAL CENTER	WARREN	156.17	0.00	3.32
B6637	ST. CLAIR COMPRESSOR STATION	IRA TWP	152.35		0.03
B7227	GENERAL MOTORS CORPORATION - ORION ASSEMBLY1997000	LAKE ORION	145.06	0.24	287.06
A8650	FORD MOTOR CO/ WAYNE COMPLEX	WAYNE	141.86		9.63
M4764	FORD MOTOR CO-ELM ST BOILERHOUSE	DEARBORN	135.18	0.00	0.43
A7051	IPMC AQUISITION LLC	DETROIT	128.08	0.00	0.40
N3920	FREEDOM COMPRESSOR STATION	MANCHESTER	122.74		0.03

SRN	Facility Name	City	NOX (tpy)	PM25- PRI (tpy)	SO2 (tpy)
B7061	NORTH STAR STEEL CO	MONROE	119.57		14.13
N2688	ONYX-ARBOR HILLS LANDFILL	NORTHVILLE	106.82	3.21	8.00
H5877	EASTERN MI UNIVERSITY	YPSILANTI	105.43	0.00	0.27
A3567	VISTEON CORPORATION STERLING PLANT	STERLING HTS	104.70		0.36
B2329	PARKEDALE PHARMACEUTICALS, INC.	ROCHESTER	98.69	0.00	0.12
B2052	G.M. POWERTRAIN GROUP	YPSILANTI	96.81	0.00	1.34
M4510	CITY SAND & LANDFILL INC	SUMPTER TWP	92.14		2.79
B2173	ATOFINA CHEMICALS INC	RIVERVIEW	90.34		0.30
M4734	FORD MOTOR CO AUTOTRANS NEW PROD.	LIVONIA	89.15	7.37	6.85
N5986	CARLETON FARMS LANDFILL	NEW BOSTON	84.83	0.00	4.91

Table 5. Stationary area source emissions for 2002 for Southeast Michigan.

SCC	Emission Process Description	Nox (tpy)	PM25-PRI (tpy)	SO2 (tpy)
2102002000	Stationary Source Fuel Combustion - Industrial Coal	2397.05	1035.53	12145.07
2660000000	Leaking Underground Storage Tanks & Remedial Action Activites	480.00		528.00
2104004000	Stationary Source Fuel Combustion - Residential Distillate Oil	111.67	13.21	264.29
2103005000	Stationary Source Fuel Combustion - Commercial/Institutional Residual Oil	43.70	2.68	154.20
2103004000	Stationary Source Fuel Combustion - Commercial/Institutional Distillate Oil	44.01	4.69	118.74
2104006000	Stationary Source Fuel Combustion - Residential Natural Gas	9526.25	770.21	60.81
2102004000	Stationary Source Fuel Combustion - Industrial Distillate Oil	18.76	1.45	50.61
2103006000	Stationary Source Fuel Combustion - Commercial/Institutional Natural Gas	4055.86	308.25	24.34
2104011000	Stationary Source Fuel Combustion - Residential Kerosene	8.49	1.04	20.06
2104001000	Stationary Source Fuel Combustion - Residential Coal	0.99	1.78	19.26
2103011005	Stationary Source Fuel Combustion - Commercial Kerosene	6.01	0.71	13.73
2102006000	Stationary Source Fuel Combustion - Industrial Natural Gas	1541.66	117.17	9.25
2104008010	Residential Woodburning: Woodstoves	43.82	478.86	6.26
2102011000	Stationary Source Fuel Combustion - Industrial Kerosene	2.32	0.27	5.29
2199007000	Stationary Source Fuel Combustion - Liquefied Petroleum Gas (LPG)	277.22	14.50	2.13
2810030000	Structure fires	7.35		
2104008001	Residential Woodburning: Fireplaces		111.55	
2102005000	Stationary Source Fuel Combustion - Industrial Residual Oil	0.00	0.00	0.00
2103002000	Stationary Source Fuel Combustion - Commercial/Institutional Coal	0.00	0.00	0.00

Table 6. On-road mobile source emissions for 2002 for Southeast Michigan.

SCC	SCC L1Desc	SCC L2Desc	SCC L3Desc	Nox (tpy)	PM25- PRI (tpy)	SO2 (tpy)
223007411	Mobile Sources	Highway Vehicles - Diesel	Heavy Duty Diesel Vehicles (HDDV) Class 8A & 8B	68963.83	1291.91	1048.15
220100111	Mobile Sources	Highway Vehicles - Gasoline	Light Duty Gasoline Vehicles (LDGV)	29917.60	400.61	1934.99
220102011	Mobile Sources	Highway Vehicles - Gasoline	Light Duty Gasoline Trucks 1 & 2 (M6) = LDGT1 (M5)	27403.00	393.13	2203.47
220107011	Mobile Sources	Highway Vehicles - Gasoline	Heavy Duty Gasoline Vehicles 2B thru 8B & Buses (HDGV)	11496.60	156.49	408.21
223007311	Mobile Sources	Highway Vehicles - Diesel	Heavy Duty Diesel Vehicles (HDDV) Class 6 & 7	10391.07	274.14	243.84
223007111	Mobile Sources	Highway Vehicles - Diesel	Heavy Duty Diesel Vehicles (HDDV) Class 2B	2653.60	88.89	94.94
223007511	Mobile Sources	Highway Vehicles - Diesel	Heavy Duty Diesel Buses (School & Transit)	2411.34	117.15	58.74
223007211	Mobile Sources	Highway Vehicles - Diesel	Heavy Duty Diesel Vehicles (HDDV) Class 3, 4, & 5	2278.40	54.02	77.71
220108011	Mobile Sources	Highway Vehicles - Gasoline	Motorcycles (MC)	632.20	10.37	18.04
223000111	Mobile Sources	Highway Vehicles - Diesel	Light Duty Diesel Vehicles (LDDV)	134.00	40.15	14.75
223006011	Mobile Sources	Highway Vehicles - Diesel	Light Duty Diesel Trucks 1 thru 4 (M6) (LDDT)	100.50	26.11	18.54

Table 7. Off-road mobile source emissions for 2002 for Southeast Michigan.

SCC	SCC L1Desc	SCC L2Desc	SCC L3Desc	NOX (tpy)	PM25-PRI (tpy)	SO2 (tpy)
22700020	Mobile Sources	Off-highway Vehicle Diesel	Construction and Mining Equipment	13044.77	1000.12	1717.40
22800021	Mobile Sources	Marine Vessels, Commercial	Diesel	7709.92	298.34	349.37
22670030	Mobile Sources	LPG	Industrial Equipment	6195.69	28.93	6.73
22820200	Mobile Sources	Pleasure Craft	Diesel	2968.18	73.68	165.44
22700030	Mobile Sources	Off-highway Vehicle Diesel	Industrial Equipment	2808.21	250.73	396.30
22800031	Mobile Sources	Marine Vessels, Commercial	Residual	2067.10	86.98	1165.29
22650040	Mobile Sources	Off-highway Vehicle Gasoline, 4-Stroke	Lawn and Garden Equipment	1597.19	48.81	82.52
22750200	Mobile Sources	Aircraft	Commercial Aircraft	1569.71	0.00	190.87
22700060	Mobile Sources	Off-highway Vehicle Diesel	Commercial Equipment	1282.97	159.55	155.58
22700050	Mobile Sources	Off-highway Vehicle Diesel	Agricultural Equipment	1085.48	126.81	118.52
22700040	Mobile Sources	Off-highway Vehicle Diesel	Lawn and Garden Equipment	574.06	61.72	68.15
22680030	Mobile Sources	CNG	Industrial Equipment	454.35	2.13	0.42
22650020	Mobile Sources	Off-highway Vehicle Gasoline, 4-Stroke	Construction and Mining Equipment	360.68	5.43	10.91
22650030	Mobile Sources	Off-highway Vehicle Gasoline, 4-Stroke	Industrial Equipment	349.10	3.32	7.11
22700080	Mobile Sources	Off-highway Vehicle Diesel	Airport Ground Support Equipment	272.25	20.42	32.72
22670060	Mobile Sources	LPG	Commercial Equipment	241.19	1.12	0.26
22680060	Mobile Sources	CNG	Commercial Equipment	156.78	0.78	0.14
22670020	Mobile Sources	LPG	Construction and Mining Equipment	137.78	0.65	0.15
22650010	Mobile Sources	Off-highway Vehicle Gasoline, 4-Stroke	Recreational Equipment	115.06	6.66	8.08
22600040	Mobile Sources	Off-highway Vehicle Gasoline, 2-Stroke	Lawn and Garden Equipment	47.29	339.82	7.72
22650060	Mobile Sources	Off-highway Vehicle Gasoline, 4-Stroke	Commercial Equipment	0.00	0.00	656.23
22670040	Mobile Sources	LPG	Lawn and Garden Equipment	42.29	0.20	0.05
22820100	Mobile Sources	Pleasure Craft	Gasoline 4-Stroke	22.61	0.22	0.73
22750500	Mobile Sources	Aircraft	General Aviation	13.05	0.00	1.14
22600020	Mobile Sources	Off-highway Vehicle Gasoline, 2-Stroke	Construction and Mining Equipment	10.81	50.43	0.96

22650050	Mobile Sources	Off-highway Vehicle Gasoline, 4-Stroke	Agricultural Equipment	10.56	0.14	0.35
22600010	Mobile Sources	Off-highway Vehicle Gasoline, 2-Stroke	Recreational Equipment	10.26	75.57	2.28
22820050	Mobile Sources	Pleasure Craft	Gasoline 2-Stroke	10.24	22.02	1.02
22700010	Mobile Sources	Off-highway Vehicle Diesel	Recreational Equipment	10.00	2.05	1.15
22750010	Mobile Sources	Aircraft	Military Aircraft	9.76	0.00	0.00
SCC	SCC L1Desc	SCC L2Desc	SCC L3Desc	NOX (tpy)	PM25-PRI (tpy)	SO2 (tpy)
22670080	Mobile Sources	LPG	Airport Ground Support Equipment	7.09	0.03	0.01
22650080	Mobile Sources	Off-highway Vehicle Gasoline, 4-Stroke	Airport Ground Support Equipment	5.93	0.06	0.12
22680050	Mobile Sources	CNG	Agricultural Equipment	2.25	0.01	0.00
22600060	Mobile Sources	Off-highway Vehicle Gasoline, 2-Stroke	Commercial Equipment	1.86	18.98	0.45
22850040	Mobile Sources	Railroad Equipment	Gasoline, 4-Stroke	1.06	0.03	0.05
22670010	Mobile Sources	LPG	Recreational Equipment	0.93	0.00	0.00
22680020	Mobile Sources	CNG	Construction and Mining Equipment	0.16	0.00	0.00
22850060	Mobile Sources	Railroad Equipment	LPG	0.13	0.00	0.00
22670050	Mobile Sources	LPG	Agricultural Equipment	0.10	0.00	0.00
22600030	Mobile Sources	Off-highway Vehicle Gasoline, 2-Stroke	Industrial Equipment	0.03	0.34	0.01
22600050	Mobile Sources	Off-highway Vehicle Gasoline, 2-Stroke	Agricultural Equipment	0.01	0.09	0.00
22600070	Mobile Sources	Off-highway Vehicle Gasoline, 2-Stroke	Logging Equipment	0.00	0.00	0.00
22650070	Mobile Sources	Off-highway Vehicle Gasoline, 4-Stroke	Logging Equipment	0.00	0.00	0.00
22650100	Mobile Sources	Off-highway Vehicle Gasoline, 4-Stroke	Industrial Equipment	0.00	0.00	0.00
22680100	Mobile Sources	CNG	Industrial Equipment	0.00	0.00	0.00
22700070	Mobile Sources	Off-highway Vehicle Diesel	Logging Equipment	0.00	0.00	0.00
22700090	Mobile Sources	Off-highway Vehicle Diesel	Underground Mining Equipment	0.00	0.00	0.00
22700100	Mobile Sources	Off-highway Vehicle Diesel	Industrial Equipment	0.00	0.00	0.00