Appendix F: Ohio Toxic Emissions Inventory

BACKGROUND

The State of Ohio developed a point and area source air toxic emission inventory for the Great Lakes Air Toxic Emission Inventory Project for calendar year 1999. The inventory is an improvement to the 1998 inventory by including additional pollutants and area source inventories. Future inventories will continue to build on existing inventories and receive additional enhancements in order to produce a better estimate of the State's toxic profile. In most cases, Ohio followed the Air Toxic Emissions Inventory Protocol for the Great Lakes Commission in developing its contribution to the regional inventory. Collection of activity data presented a major challenge to Ohio and in some cases assumptions were made to produce realistic estimates. The point and area source calculations were performed outside of RAPIDS and the emission estimates were then imported in RAPIDS.

CALCULATION METHODS

Point Sources

Ohio decided to follow a similar approach to the one used for the 1998 inventory year and utilized the Toxic Release Inventory (TRI) data to fulfil the point source inventory requirement. This data is considered of high confidence and it has been quality assured. There are 1600 TRI facilities in the state and around 1200 facilities have air releases. The TRI pollutant names were converted to the RAPIDS materials codes and the TRI records were inserted in RAPIDS.

Area sources

A large number of area source inventories were included in the 1999 inventory that were not in the 1998 inventory. A description of the calculation methods, assumptions and data sources for area source inventories is described below.

Architectural Coating

From the U.S. Dept of Agriculture chemical application rates and acres treated for corn, soybeans, wheat, oat field crops were obtained. Pesticide apportionment was accomplished by multiplying the state pesticide usage by the ratio of county to the state harvested acres. Emissions were calculated by using emission factors published in: Air and Waste Management Association. M. Trevor Scholtz, Carol F. Slama, Eva C. Voldner. Pesticide Emission Factor from Agricultural Soils. June 13-18, 1993.

Architectural Coating

County population, VOC emission factors for both water and solvent based paints, and the annual paint usage factors were employed to estimate the VOC emissions at the county level. The approach is consistent with the recommended methodology.

Asphalt Paving

County vehicle miles traveled were provided from the Ohio Department of Transportation and the state's highway spending figures for asphalt paving were employed to calculate the VOC emissions.

Autobody Refinishing

County employment and the EIIP recommended factor of 3519 lbs VOC/employee were used to estimate VOC emissions. Toxic emissions were speciated using profile 1194.

Consumer and commercial Solvents

County population and the 7.84 lbs VOC/person emission factor were employed to estimate VOC emissions. Toxic emissions were calculated using EIIP recommended factors.

Dry Cleaning

The two major types of dry cleaning operations are coin operated with SIC code 7215 and SIC 7216. County employment and the EIIP recommended toxic emission factors of 52 lbs perc/employee for SIC 7215 and 1200 lbs of perc/employee for SIC 7211 were used in the percloroethylene estimate.

Gasoline Marketing

The amount of gasoline sales in Ohio for year 1998 was provided from the National Energy Information. Use of gasoline sales was apportioned to county by VMT (Vehicles Miles Traveled). In the emission calculation of Stage I operations, Ohio assumed that 95% of the loadings are submerged and 5% are splashed in the underground tank. In the emission calculation of Stage II operations, 16 counties are subjected to a stage II vapor control system. For spillage and tank breathing, Ohio used EIIP calculation methodology. Rapids speciation profile 1190 was used in the estimation of Toxic pollutants.

Graphic Arts

County population and the 70.1 lbs VOC/person emission factor provided by Wisconsin DNR were employed to estimate VOC emissions. Toxic emissions were calculated using EIIP recommended factors and RAPID profiles 1191 and 1086.

Hospital Sterilizers

Hospital beds per county data were collected and they were multiplied to ethylene oxide emission factors to estimate emissions by county.

Human Cremation

The total number of cremated bodies in counties with crematories were multiplied with toxic emission factors to produce a county estimate of emission.

Industrial Surface Coatings

Employment data was used for available SIC codes were obtained from the "1999 County Business Patterns " publication and county population data for selected SIC codes from the State's population projection center. The per employee EIIP emission factors or the per capita emission factors were used to estimate VOC emissions and the regional protocol speciation profiles were applied to estimate toxic emissions.

Lamp Breakage

The NTI national lamp breakage was apportioned to the state and county level using the population surrogate.

Lamp Recycling

Surveyed the three major lamp recycling facilities and obtained number of recycled lamps. The NTI factor for mercury was applied to the number of recycled lamps to calculate the county mercury release.

Landfills

Activity data were provided by the Ohio EPA's Division of Solid Waste. Assumptions had to be made to complete missing information on waste received per year and years landfills are in operation. Assumptions and toxic emission factors are consistent with the EIIP guidance Volume III: Chapter 14.

Publicly Owned Treatment Works

Activity data were provided by the Division of Surface Water. RAPIDS protocol was used to estimate waste flow and toxic pollutants.

Residential Fuel Combustion

This source category covers only the residential air emissions from the combustion of coal, natural gas, distillate fuel oil, liquified petroleum gas, natural gas and wood. The county fuel usage was multiplied with the toxic emission factors for commercial units since there is a limited number of factors for residential units.

Solvent Cleaning

Ohio opted to utilize the per capita methodology and toxic speciation profile number 1195 in RAPIDS which is consistent with the regional protocol.

Structure Fires

Residential and commercial structure fires at the county level were multiplies with FIRE toxic emission factors to produce a county estimate

Traffic Marking

County highway miles of road was assumed one traffic marking application per year and the calculated paint usage was multiplied with toxic emission factors to produce a county estimate of toxic pollutants.

RESULTS

Ohio's Great Lakes Toxic Inventory for inventory year 1999 accounted for al 188 air toxic pollutants. The methodologies for each one of the categories were dependent on the availability of activity data. We continue to strive for better methodologies, better emission factors and more accurate activity data so as to ensure the accuracy of the information. Each future inventory should be an improvement over the previous inventories and also account for more sources and pollutants.

INFORMATION

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Table F-1 – Ohio - Statewide Emissions (lb/yr)

Pollutant	Point Sources	Area Sources	Total
ACETALDEHYDE	259834	43.39	259877.39
ACETAMIDE	21	1.32	22.32
ACETONITRILE	12134		12134
ACETOPHENONE	1864	97.49	1961.49
ACETYLAMIN,2	2		2
ACROLEIN	250	107487.12	107737.12
ACRYLAMIDE	3700		3700
ACRYLIC ACID	3140	0.01	3140.01
ACRYLONITRIL	108525	31452.45	139977.45
ALLYL ALCOHO	6794		6794
ALLYL CHLORI	25		25
ALUMINUM	78942		78942
AMMONIA	13775352		13775352
ANILINE	24581		24581
ANTHRACENE	2968	8711.65	11679.65
ANTIMONY	1147	611943.58	613090.58
ANTIMONY CMP	12065		12065
ARSENIC	94	283.16	377.16
ARSENIC CMP	23671		23671
ASBESTOS	1371		1371
ATRAZINE	27	3785998	3786025
BARIUM	3148		3148
BARIUM CMP	60902		60902
BENZENE	631854	4114700.82	4746554.82
BENZIDINE	2		2
BENZOTRICHLO	2		2
BENZYL CHLOR	1634		1634
BERYLLIU CMP	450		450
BERYLLIUM	721	167.86	888.86
BIPHENYL	9220		9220
BIS(2-CLETH)	4		4
BISPHENOL A	22413		22413
BROMOFORM	2		2
BROMOMETH	184		184
BUT ACRYLATE	36657		36657
BUT ALC,N	1537526		1537526
BUT ALC,S	92380		92380
BUTADIENE,13	43459		43459
BUTYRALDEHYD	1200		1200
CADMIUM	17	552.74	569.74
CADMIUM CMP	1827		1827
CAPTAN	3705		3705
CARBARYL	940		940
CARBON DISUL	242978	4144.81	247122.81
CARBON TETRA	10674	24319.05	34993.05
CARBONYL SUL	5603830	2756.39	5606586.39
CELLOSOLVE	58	23509.26	23567.26
CFC-11	328		328
CFC-113	642		642
CFC-114	436000		436000
CFC-12	3241		3241
CFC-13	337		337
CHLOR DIOXID	22002		22002
CHLORDANE	2		2
CHLORINE	48435	10786497.6	10834932.6
CHLOROBENZ	77059		77059
CHLOROETHANE	285072	105108.74	390180.74
CHLOROFORM	41906	138120.86	180026.86
CHROMIUM	31406	1075.5	32481.5
CHROMIUM CMP	88584		88584
CLBENZILATE	2		2
CLMETH METH	65		65
COBALT	1527	830.22	2357.22
COBALT CMP	4588		4588
COPPER	54355	556.89	54911.89
COPPER CMP	20244		20244

Pollutant	Point Sources	Area Sources	Total
CREOSOTE	61945		61945
CRESOL MX IS	53734		53734
CRESOL,M	108		108
CRESOL,O	704		704
CRESOL,P	140		140
CROTONALDEHY	11		11
CUMENE	95678	11447.55	107125.55
CYANIDE CMP	16016		16016
CYCHEXANE	634861		634861
CYCHEXANOL	3		3
D,2,4	3779		3779
DIAMINOTOLUE	1405		1405
DIAZINON	25955		25955
DIBENZOFURAN	4440	83.67	4523.67
DIBROMOET,12	1496		1496
DIBUTYL PHTH	22	481279.51	481301.51
DICHLORVOS	3		3
DICLBENZ,14	1579		1579
DICLBENZEN,M	7		7
DICLBENZEN,O	6		6
DICLBENZENES	13		13
DICLETH,11-	92		92
DICLPROPE,13	7	1808406.73	1808413.73
DIETHANOLAMI	22692		22692
DIEYLHEX PHT	10331		10331
DIMETH HY,11	8		8
DIMETH PHTHA	1216		1216
DIMETH SULFA	96		96
DIMETHBNZ,33	2		2
DIMETHFORMAM	11680	110996.09	122676.09
DIMETHOXY,32	2		2
DIMETHYLAMIN	1615		1615
DIMETHYLANIL	3905		3905
DINITRTOL,24	2		2
DINITRTOL,26	3		3
DIOXANE	7265	1221.76	8486.76
DIPHENHYD,12	2		2
EPICLHYDRIN	439		439
ETH ACRYLATE	8949		8949
ETHYL CARBAM	79		79
ETHYLBENZENE	561250	1729125.46	2290375.46
ETHYLENE	545090		545090
ETHYLENE GLY	68540	3601504.12	3670044.12
ETHYLENE OXI	515	241921.28	242436.28
FORMALDEHYDE	781345	68632.29	849977.29
FORMIC ACID	7532		7532
GLY ETHE GRP	3868296		3868296
H2SO4	16115714		16115714
HALON-1301	16255		16255
HCFC-141B	113122		113122
HCFC-142B	1360739		1360739
HCFC-22	242334		242334
HCL	68043934	371098.5	68415032.5
HEPTACHLOR	2		2
HEXACL-1,3-C	8		8
HEXANE	2416683	5554795.1	7971478.1
HEXCHLORETH	776		776
HEXCL-13-BUT	262		262
HEXCLBENZENE	2		2
HF	6678984		6678984
HYDRAZINE	81		81
HYDROGEN CYA	36036	864838.05	900874.05
HYDROQUINONE	906		906
ISO-PROP ALC	4991		4991
LEAD	19411	437.41	19848.41
LEAD CMP	77390		77390
LINDANE ISO	2		2
MALEIC ANHYD	455		455
MANGANES CMP	582658		582658

Pollutant	Point Sources	Area Sources	Total
MANGANESE	39620	663.31	40283.31
MERCURY	1653	213.75	1866.75
METEN BIS,44	2		2
METH ACRYLAT	41321		41321
METH CELLOSO	61		61
METH ETH KET	2799035	17995524.04	20794559.04
METH IODIDE	153		153
METH ISOBUT	790247	9622566.04	10412813.04
METH METHACR	67824	6259	74083
METH TERT BU	9303		9303
METHANOL	3699756	7211021.78	10910777.78
METHENE BROM	15		15
METHYLENE CL	1603568	6904154.3	8507722.3
NAPHTHALENE	184567	430116.1	614683.1
NDIMETH CARB	4		4
NICKEL	17391	11806.06	29197.06
NICKEL CMP	23234		23234
NITRATES	7774		7774
NITRIC ACID	225266		225266
NITROBENZ	28		28
NITROPHENL,4	168		168
NITROPROPA,2	82	22.01	104.01
PCP	2		2
PENTCLNITBEN	7		7
PERC	615030	11170632.34	11785662.34
PHENANTHRENE	3925	48675.76	52600.76
PHENOL	935036	1.12	935037.12
PHENYLENED,P	1		1
PHOSGENE	14	0.45	14.45
PHTHALIC ANH	4353		4353
PROPENE	380121		380121
PROPOXUR	11		11
PRPLENE OXID	3638	14468	18106
PYRIDINE	8741		8741
QUINOLINE	2744		2744
QUINONE	19		19
SELENIUM CMP	60889		60889
SILVER	523		523
STYRENE	2127478	74764.66	2202242.66
TCE,111	23990	34098303.9	34122293.9
TERT-BUT ALC	6290		6290
TETCLET,1122	7	17447.29	17454.29
THALLIUM	1020		1020
THIOUREA	208		208
TITAN TETCL	262		262
TOLUENE	2783946	58846174.76	61630120.76
TOLUENE2,6DI	10		10
TOLUENE24DII	1878		1878
TOLUIDINE,O-	42		42
TOXAPHENE	15		15
TRICHLORETHY	867105	28415274.21	29282379.21
TRICLBNZ,124	8996		8996
TRICLETH,112	28		28
TRICLPHN,245	3		3
TRICLPHN,246	3		3
TRIETHAMINE	128804	9482.83	138286.83
TRIFLURALIN	3110		3110
TRIMETHBE124	332712		332712
VANADIUM	1000		1000
VINLIDENE CL	6615		6615
VINYL ACETAT	37045	0.41	37045.41
VINYL CHLOR	714	436458.37	437172.37
XYLENE,M	35818	524452.63	560270.63
XYLENE,O	207	405185.39	405392.39
XYLENE,P	219	359981.85	360200.85
XYLENES ISO	4140498	113668267.9	117808765.9
ZINC CMP	367682		367682
ZINC10	125240		125240