September 15, 2019

SPECIFICATION SHEET: OTHPT

Description: Canadian and Mexican point source emissions, for simulating 2016 and future year air quality

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1. EXECUTIVE SUMMARY

Canadian and Mexican point source emissions are processed in the othpt sector using inventories provided by Environment and Climate Change Canada (ECCC) for year 2015, and a projection of Mexico emissions from 2008 to 2016. This sector includes all point source emissions in Canada and Mexico, except for ag land breaking PM emissions in Canada (othptdust sector). Temporal profiles are provided by ECCC. Base year inventories were processed with the Sparse Matrix Operating Kernel Emissions (SMOKE) modeling system version 4.6. SMOKE creates emissions in a format that can be input into air quality models. National and province/state-level emission summaries for key pollutants are provided.

2. INTRODUCTION

This document details the approach and data sources to be used for developing 2016 emissions for the Canadian and Mexican point source (othpt, or other point) sector. This sector includes all point source emissions in Canada and Mexico, except for ag land breaking PM emissions in Canada, which require afdust-style reductions and are in the othpt sector.

Canadian emissions for this sector are provided by ECCC for the year 2015 and are used directly (i.e. without projecting) for 2016 modeling. In Canada, the othpt sector includes the following inventories:

- Agricultural emissions from livestock (NH3 and VOC) and fertilizer (NH3), which are now represented as point sources rather than area sources in Canada
- Aircraft emissions, including landing and take-off (LTO)
- Upstream oil and gas (UOG)
- Other point source emissions (EGUs and various nonEGU point sources)
- CMV C3 emissions, extracted from the area source marine inventory and converted to point format

In Mexico, the othpt sector includes a point source inventory for year 2016, and a CMV port inventory for year 2014.

The othpt sector includes 732 SCCs. To help manage the size of this document, a full table of SCCs is not included here.

3. INVENTORY DEVELOPMENT METHODS

Canada

ECCC provided the Canadian point source emissions inventory for 2015 in a format that is close to, but not exactly, FF10. Some columns that are unused by SMOKE contained metadata that needed to be reformatted or moved prior to importing the data into EPA's Emissions Modeling Framework (EMF), due to restrictions on variables types imposed by the FF10 format (e.g. character values in numeric fields). Also, accented characters needed to be removed from facility names to facilitate importing the data into EMF. Finally, point source IDs such as the unit_id and rel_point_id were added to the inventory where necessary, since these IDs are required by SMOKE.

Emissions for year 2015 were used directly for year 2016 modeling in beta platform. The ag and aircraft inventories are monthly, and the other Canada inventories in othpt are annual. The Canada point inventories are census-division-level.

Detailed documentation of the ECCC emissions inventories for 2015 is provided in the following document: *A18031_2015_Canadian_CAC_EmissionsInventoryPackage_version1.docx*
The othpt sector includes eight Canadian point inventories that were provided directly by ECCC: three ag inventories (animal_NH3, animal_VOC, fertilizer_NH3); point_airport_LTO; Upstream Oil and Gas (UOG); and three inventories covering other point sources according to pollutant (CB6 species, total VOC, and all pollutants except VOC).

The othpt sector also includes a point inventory representing Canadian CMV C3 emissions. ECCC provided all CMV emissions as an area source inventory. To support application of plume rise to Canadian C3 emissions, the area source C3 emissions were converted to point format, using shapefiles provided by ECCC for marine sources to allocate the sources to specific coordinates, and moved to the othpt sector. Underway and port emissions were plotted using separate shapefiles. To prevent a double count with this sector, the cmv_c3 sector does not include any emissions in Canadian federal waters, on-shore or off-shore.

In Canada, different pollutants were sometimes assigned to different point source IDs even though they originate from the same source. Whenever PM10 and PM2.5 emissions from the same source were assigned to different point source IDs, SMOKE treats the PM10 and PM2.5 emissions as coming from separate sources, causing an error in the PMC calculation within SMOKE. To fix this error, we changed the process IDs for many PM2.5 records so that they matched the process IDs for PM10. Occasionally we had to change the unit IDs for the same reason.

Information regarding the pre-speciated VOC point source inventory in Canada is provided in Section 4, Chemical Speciation.

Mexico

The othpt sector includes two Mexico inventories. One of the inventories is a general point source inventory. This inventory is based on projections of a 2008 inventory. The inventory was originally projected to years 2014 and 2018 by ERG. For 2016 beta platform, emissions values from those two years were averaged (interpolated) to 2016.

The second Mexico point source inventory is a CMV inventory, which includes emissions from a few ports in Mexico, but not including any underway emissions. This inventory is only available

for the year 2014, so no projections or interpolations to 2016 were performed; instead, year 2014 emissions were used directly. Because this inventory includes no underway emissions, it does not double-count CMV emissions in Mexico federal waters from the cmv_c3 sector.

4. ANCILLARY DATA

Spatial Allocation

Spatial allocation of othpt emissions to the national 36km and 12km domains used for air quality modeling is accomplished using latitude and longitude coordinates from the inventories.

Temporal Allocation

Othpt sector inventories are temporalized to hourly using month-of-year, day-of-week, and hour-of-day temporal profiles. The Canadian ag and aircraft inventories are monthly and do not have month-of-year temporalization applied. ECCC provided temporal profiles and an SCC cross-reference. The Canadian temporal profiles used in beta platform differ from those provided by ECCC in the following ways:

- ECCC provided temporal profiles and cross-references in a format used by older versions of SMOKE (3.5 and earlier). We converted their profiles and cross-reference to the format used by SMOKE 4.6.
- ECCC's cross-reference included an overall default profile (SCC=000000000) to be used when specific SCCs were not included in the cross-reference. As a standard practice, we do not include an overall default profile in our temporal cross-reference, so we removed that assignment and filled in missing SCCs, with profiles assigned to those for similar SCCs as needed.

Mexico sources use the same temporal profiles as Canada.

Reports summarizing total emissions according to the monthly, day-of-week, and hour-of-day temporal profile assignments are included in the emissions modeling workgroup reports package at the state and county level.

Chemical Speciation

One of the Canadian point source inventories includes pre-speciated VOC emissions for the CB6 mechanism. However, this inventory did not include all species needed for the CB6 mechaism for CMAQ; specifically, CH4, SOAALK, NAPH, and XYLMN were missing. For the NAPH species, naphthalene emissions from a supplemental HAP inventory provided by ECCC were used. Then, XYL was converted to XYLMN by subtracting NAPH. Finally, CH4 and SOAALK were speciated from total VOC (also provided by ECCC) using traditional speciation profiles by SCC.

In addition to the pre-speciated VOC inventory, ECCC also provided a total inventory VOC (VOC_INV) inventory for the same point sources. These VOC_INV emissions are passed through SMOKE with species name VOC_INV only and are not speciated. Including VOC_INV in the model-ready emissions helps with generation of post-SMOKE reports or plots of total VOC emissions.

There are also other sources in Canada, such as oil and gas, for which we do not have pre-speciated VOC emissions and for which we apply VOC speciation within SMOKE.

Otherwise, the othpt sector includes speciation of PM2.5 and VOC emissions using the same profiles and SCC cross-references as in the US. Other than the pre-speciated VOC emissions in Canada, there is no HAP integration in this sector.

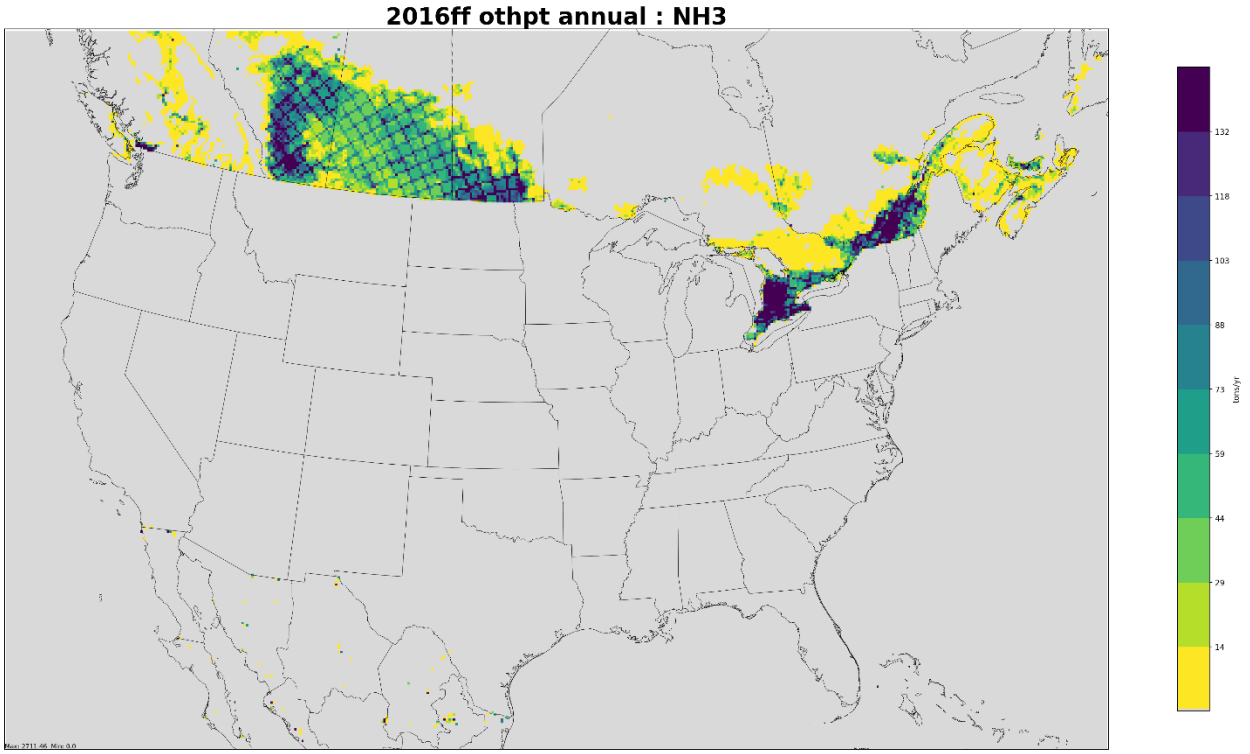
Reports summarizing total PM2.5 and VOC emissions according to speciation profile are included in the emissions modeling workgroup reports package at the state and county level.

5. EMISSIONS PROJECTION METHODS

Canada point agriculture

After the 2015 emissions inventories were modeled for the 2016ff case, but before the future year inventories were prepared, a peculiar spatial allocation was discovered in the NH3 emissions, in which diagonal lines in a “waffle pattern” have more pronounced emissions. This waffle pattern was due to the ECCC point agricultural inventories being allocated on a different resolution grid, 10km in this case, than we use in our emissions modeling platforms. When 10km resolution points are plotted on a 12km resolution grid, the resulting spatial allocation is uneven. This “waffle pattern” is illustrated in Figure 1.

Figure 1. 2016ff 12US1 othpt annual NH_3 emissions with "waffle pattern"



After modeling the 2016ff emissions case, new versions of the 2015 Canada point ag inventories were developed with an improved spatial allocation. Spatial apportionment factors were calculated using the area of overlap between the 10 km Canada Lambert grid and a 4 km resolution grid with the same boundaries and grid projection as the 36US3 modeling domain. The 2015 Canada point ag emissions were placed into the 10 km grid cells based on the inventory latitude and longitude and aggregated by province and location. The spatial factors were then applied to allocate the emissions to the 4 km grid cells. Centroid latitude and longitudes for each respective emitting 4 km grid cell were used to fill the location information of the resulting point Flat File. The 4 km resolution inventories were then aggregated to 12 km resolution in order to reduce the size of the inventory.

The improved 2015 inventories were then projected to future years 2023 and 2028. Future year inventories from ECCC were not available in time for inclusion in beta platform. Instead, ECCC provided data from which future year projections of these inventories could be derived. This data, provided by ECCC in a file called "Projected_CAN2015_2023_2028.xlsx", includes emissions data for 2015, 2023, and 2028 by pollutant, province, ECCC sub-class code, and other source categories. This data was used to calculate 2015-to-2023 and 2015-to-2028 projection factors, which were then applied to the improved 2015 point ag inventories to create projections of Canadian ag emissions for 2023 and 2028.

Projection factors were applied by province, sub-class code, and pollutant. The ECCC projection workbook included additional source information which provides more detail than do the sub-class codes, but that more detailed information could not be easily mapped to the inventory, and the level of detail offered by the sub-class codes was considered sufficient for projection purposes. For the ag inventories, the sub-class codes are similar in detail to SCCs: fertilizer has a single sub-class code, and animal emissions categories (broilers, dairy, horses, sheep, etc) each have a separate sub-class code.

Canada point airport and C3 emissions

As with the ag inventories, future year airport emission inventories from ECCC were not available in time for inclusion in beta platform. Instead, future year projections of airport emissions were derived using the same data and approach that was used to project not only ag, but also transportation-related emissions in the othar and onroad_can sectors. Projection factors were calculated for each future year by province, pollutant, and ECCC sub-class code. Sub-class codes for airport emissions are similar in detail to SCCs, with separate codes for piston and turbine emissions from military aircraft, commercial aircraft, and general aviation. Future year projections of the 2015 point C3 inventory described in Section 3 were also developed using this method.

Other Canada point sources

Future year projections for stationary point sources (excluding ag) were provided by ECCC for 2023 and 2028. ECCC provided emissions inventories for upstream oil and gas sources (UOG) and for all other stationary point sources, including electric power generation. These inventories were generally used as-is, with the following exceptions.

The 2015 non-UOG stationary point source inventories included monthly emissions as well as annual emissions. In the future year projected inventories provided by ECCC, monthly emissions were included not included for EPG (electric power generation) sources, but were for the rest of the non-UOG sources. For consistency with the base year, monthly emissions were added to the EPG sources in the inventory, using facility-specific monthly temporal profiles derived from the 2015 inventory. For new facilities that were not in 2015, monthly emissions were left blank in the inventory, and monthly temporalization is applied SMOKE using profiles assigned by SCC.

For 2015, ECCC provided a pre-speciated point source inventory including species for the CB6 mechanism. For the future years, ECCC did not provide a pre-speciated inventory, but advised that speciation for the future years is unchanged from the base year. Because the baseline VOC emissions are different in the future year projections, it was necessary to develop a pre-

speciated CB6 inventory for the future years which is consistent with the 2015 inventory but is based on future year projections of VOC. For this, speciation profiles for each facility-SCC in 2015 were calculated using the 2015 CB6 inventory, and these profiles were applied to future year VOC to create a CB6 future year inventory. Speciation profiles were also developed by SCC from 2015, for application to future year facility-SCC combinations which could not be matched to 2015. The future year inventories also include SCCs which were not in the 2015 inventory all; for those sources, we apply standard speciation profiles in SMOKE. To prevent double counting of VOC speciated within SMOKE with pre-speciated VOC, the point source inventory has VOC emissions represented as VOC_INV for sources that are in the pre-speciated CB6 inventory, and as VOC for sources that are not pre-speciated. Only the VOC and not the VOC_INV is speciated within SMOKE.

Changes to point source IDs in the stationary source inventory were necessary for the PMC calculation, which is based on inventory PM_{10} and $PM_{2.5}$. This SMOKE calculation requires that PM_{10} and $PM_{2.5}$ emissions are assigned to the same point source IDs, but that was not always the case with respect to the rel_point_id and process_id fields for each unit. This was also an issue with the 2015 inventory, but the procedure that was used to fix 2015 did not help resolve this issue in the future year inventories, and so a more robust fix was implemented for 2023 and 2028. All rel_point_id and process_id values in the 2023 and 2028 Canada stationary point inventories were redefined, such that all records with the same FIPS code, latitude, longitude, and stack parameters (implying emissions from the same stack) were assigned the same rel_point_id and process_id for all pollutants. This fixed all instances in which PM_{10} and $PM_{2.5}$ from the same source were assigned different point source IDs, but there are still sources in the future year inventories in which PM_{10} emissions are less than the $PM_{2.5}$ emissions from the same source.

Mexico

The othpt sector includes two Mexico inventories. One of the inventories is a general point source inventory. This inventory is based on projections of a 2008 inventory. The inventory was originally projected to years 2018, 2025, and 2030 by ERG. For the beta platform future year projections, emissions values from 2018 and 2025 were interpolated to 2023, and values from 2025 and 2030 were interpolated to 2028. These inventories are unchanged from the 2011 platform.

The second Mexico point source inventory is a CMV inventory, which includes emissions from a few ports in Mexico, but not including any underway emissions. This inventory is only available for the year 2014, so no projections or interpolations to 2023 or 2028 were performed; instead, year 2014 emissions were used directly. Because this inventory includes no underway

emissions, it does not double-count CMV emissions in Mexico federal waters from the cmv_c3 sector.

6. EMISSIONS PROCESSING REQUIREMENTS

Othpt emissions are processed for air quality modeling using the Sparse Matrix Operator Kernel Emissions (SMOKE[1]) modeling system. As with all point source sectors, this is typically handled with two separate scripts, or "jobs": one which processes time-independent, or "onetime", programs (Smkinven, Spcmat, Grdmat, Smkreport, Elevpoint), and one which processes time-dependent programs (Temporal, Smkmerge). Since some of the point source inventories are monthly, the onetime step is run once for every month.

The othpt sector is processed through SMOKE using a PELVCONFIG file that classifies all emissions as "elevated". This means all of the othpt sector emissions are output to an inline point source file for input to CMAQ and are subject to plume rise, even though some of these sources will end up being low-level sources based on plume rise calculations. A 2-D gridded emissions file for othpt is not generated, nor are any othpt sector emissions merged into the model-ready 2-D gridded emissions.

7. EMISSIONS SUMMARIES

National and state totals by pollutant for the beta platform cases are provided here, and some example plots. Additional onroad mobile plots and maps are available online through the LADCO website[2] and the Intermountain West Data Warehouse[3].

The case descriptions are as follows:

2011en, 2023en, 2028el = Final 2011, 2023, and 2028 cases from the 2011v6.3 platform

2014fd = 2014NEIv2 and 2014 NATA

2016fe = 2016 alpha platform (grown from 2014NEIv2)

2016ff = 2016 beta platform

Table 1. Comparison of Canada national total annual CAPS othpt emissions (tons/yr)

Pollutant	2011en	2014fd	2016fe	2016ff	2023en	2023ff	2028el	2028ff
CO	1,405,817	1,405,817	1,479,048	1,338,471	1,697,818	1,342,178	1,322,367	1,383,364
NH3	19,240	19,240	20,712	522,334	25,401	633,311	20,978	719,767
NOX	833,998	833,998	799,283	1,049,857	811,424	853,130	938,876	749,113

[1] http://www.smoke-model.org/index.cfm
[2] https://www.ladco.org/technical/modeling-results/2016-inventory-collaborative/
[3] http://views.cira.colostate.edu/iwdw/eibrowser2016

Pollutant	2011en	2014fd	2016fe	2016ff	2023en	2023ff	2028el	2028ff
PM10	133,709	133,709	112,210	156,809	121,884	105,395	163,330	112,044
PM2.5	57,660	57,660	56,881	61,707	64,236	59,392	67,998	63,387
SO2	1,235,619	1,235,619	1,107,046	1,126,873	903,591	988,481	1,233,069	977,572
VOC	963,504	963,504	979,770	989,611	1,026,119	861,810	513,761	939,348

Table 2. Comparison of Mexico national total annual CAPS othpt emissions (tons/yr)

Pollutant	2011en	2014fd	2016fe	2016ff	2023en	2023ff	2028el	2028ff
CO	683,482	801,953	870,711	870,711	928,414	1,057,572	1,005,161	1,134,320
NH3	32,773	33,978	36,587	36,587	45,251	45,251	51,916	51,916
NOX	651,521	1,041,307	1,041,004	1,041,004	775,506	1,120,199	868,360	1,213,053
PM10	241,496	277,304	285,497	285,497	304,874	332,342	348,528	375,996
PM2.5	168,144	200,851	205,461	205,461	210,851	236,324	240,645	266,118
SO2	2,276,770	2,341,533	2,286,086	2,286,086	2,105,867	2,287,648	2,181,839	2,363,621
VOC	303,905	332,800	356,270	356,270	427,730	443,396	496,080	511,746

Table 3. Comparison of province total annual NOx othpt emissions (tons/yr)

Province	2011en	2014fd	2016fe	2016ff	2023en	2023ff	2028el	2028ff
Alberta	489,584	489,584	447,382	510,293	421,837	401,967	575,981	299,990
British Columbia	86,375	86,375	102,308	157,831	140,438	114,811	89,526	112,407
Manitoba	3,590	3,590	3,755	4,327	4,250	3,826	3,822	3,906
NW Territories	9,497	9,497	10,882	12,639	15,040	7,485	9,107	8,101
New Brunswick	15,790	15,790	16,127	15,638	17,138	15,038	16,804	15,463
Newfoundland	15,449	15,449	14,747	43,653	17,288	29,909	23,646	31,020
Nova Scotia	23,948	23,948	22,255	52,741	17,174	39,300	25,181	40,641
Nunavut	3,154	3,154	815	9,739	1,110	16,535	5,588	18,245
Ontario	76,441	76,441	72,529	86,561	77,106	83,779	72,773	84,863
Prince Edward Island	269	269	261	619	234	376	321	373
Quebec	39,911	39,911	41,623	88,267	42,254	77,215	50,554	82,122
Saskatchewan	69,971	69,971	66,578	67,385	57,526	62,792	65,439	51,877
Yukon	18	18	20	163	27	96	135	106

Table 4. Comparison of state total annual NOx othpt emissions (tons/yr)

State	2011en	2014fd	2016fe	2016ff	2023en	2023ff	2028el	2028ff
Aguascalientes	987	1,046	1,115	1,115	1,407	1,407	1,657	1,657
Baja Calif	14,498	51,617	57,007	57,007	32,455	68,596	36,145	72,286
Baja Calif Sur	8,899	30,995	26,952	26,952	2,582	23,187	2,740	23,345
Campeche	35,616	107,621	109,753	109,753	41,077	115,087	43,559	117,570
Chiapas	5,503	5,736	6,107	6,107	7,500	7,570	8,690	8,761
Chihuahua	11,989	11,839	12,807	12,807	13,663	13,663	15,396	15,396
Coahuila	217,689	260,400	233,909	233,909	218,533	218,533	239,177	239,177
Colima	15,921	39,088	40,154	40,154	7,294	37,224	6,261	36,191

State	2011en	2014fd	2016fe	2016ff	2023en	2023ff	2028el	2028ff
Distrito Federal	2,582	2,727	2,964	2,964	3,853	3,853	4,536	4,536
Durango	6,988	6,653	7,231	7,231	7,371	7,371	8,167	8,167
Guanajuato	9,566	8,940	9,767	9,767	12,567	12,567	14,143	14,143
Guerrero	14,706	18,006	16,289	16,289	14,270	15,216	15,052	15,997
Hidalgo	35,641	36,580	38,735	38,735	50,270	50,270	57,900	57,900
Jalisco	7,403	7,841	8,366	8,366	10,547	10,547	12,415	12,415
Mexico	17,656	18,613	23,400	23,400	35,567	35,567	42,073	42,073
Michoacan	4,966	18,673	19,026	19,026	6,938	20,422	8,150	21,634
Morelos	4,249	4,504	4,806	4,806	6,064	6,064	7,142	7,142
Nayarit	375	399	426	426	538	538	631	631
Nuevo Leon	41,887	45,445	48,758	48,758	57,573	57,573	67,018	67,018
Oaxaca	10,928	33,165	34,158	34,158	13,944	36,090	14,946	37,092
Puebla	7,360	7,740	8,397	8,397	11,104	11,104	13,054	13,054
Queretaro	9,793	11,964	12,953	12,953	22,762	22,762	28,917	28,917
Quintana Roo	616	16,310	16,163	16,163	388	16,028	432	16,072
San Luis Potosi	22,263	22,661	25,636	25,636	33,743	33,743	37,848	37,848
Sinaloa	10,982	23,914	20,023	20,023	2,049	16,009	2,450	16,410
Sonora	14,581	24,938	25,361	25,361	18,526	28,992	20,768	31,233
Tabasco	23,255	38,740	40,317	40,317	29,986	45,517	33,749	49,280
Tamaulipas	34,020	67,274	69,921	69,921	42,968	75,605	48,354	80,990
Tlaxcala	962	1,019	1,140	1,140	1,531	1,531	1,806	1,806
Veracruz	48,607	98,705	101,302	101,302	56,892	108,695	61,418	113,221
Yucatan	11,020	18,142	18,049	18,049	11,529	18,855	13,747	21,073
Zacatecas	11	12	12	12	15	15	18	18

Table 5. Comparison of province total annual SO2 othpt emissions (tons/yr)

Province	2011en	2014fd	2016fe	2016ff	2023en	2023ff	2028el	2028ff
Alberta	341,784	341,784	286,947	271,989	266,675	225,666	397,763	199,576
British Columbia	71,232	71,232	84,143	62,802	121,567	59,670	72,876	60,402
Manitoba	175,367	175,367	134,557	169,249	12,128	243,113	150,628	261,212
NW Territories	713	713	673	988	553	826	228	908
New Brunswick	21,768	21,768	21,746	23,221	21,681	20,282	25,405	20,650
Newfoundland	23,320	23,320	19,278	21,528	18,105	14,068	29,199	14,059
Nova Scotia	81,235	81,235	72,089	69,648	44,652	42,173	77,531	42,339
Nunavut	12	12	13	2,484	17	2,798	128	3,044
Ontario	286,280	286,280	249,695	273,618	171,985	139,982	224,069	143,831
Prince Edward Island	253	253	225	165	141	88	859	88
Quebec	119,561	119,561	130,632	120,629	160,187	139,700	137,299	146,114
Saskatchewan	114,092	114,092	107,043	110,516	85,895	100,074	117,038	85,303
Yukon	3	3	3	38	4	40	47	45

Table 6. Comparison of state total annual SO2 othpt emissions (tons/yr)

State	2011en	2014fd	2016fe	2016ff	2023en	2023ff	2028el	2028ff
Aguascalientes	2,126	2,254	2,405	2,405	3,034	3,034	3,573	3,573
Baja Calif	6,544	25,584	26,051	26,051	9,312	27,968	10,939	29,594
Baja Calif Sur	23,287	32,009	22,362	22,362	1,258	11,924	1,478	12,143
Campeche	597,041	602,321	640,701	640,701	680,281	722,312	710,130	752,160
Chiapas	64,007	67,876	72,430	72,430	91,338	91,376	107,575	107,613
Chihuahua	26,614	16,536	19,391	19,391	10,357	10,357	6,101	6,101
Coahuila	259,191	307,877	279,080	279,080	266,372	266,372	293,265	293,265
Colima	120,897	73,727	81,724	81,724	32,885	48,325	17,649	33,088
Distrito Federal	815	862	919	919	1,166	1,166	1,372	1,372
Durango	23,453	16,985	19,303	19,303	14,845	14,845	13,374	13,374
Guanajuato	45,221	37,023	40,646	40,646	41,309	41,309	40,820	40,820
Guerrero	136,218	158,113	141,750	141,750	130,119	130,626	135,900	136,407
Hidalgo	235,959	233,150	196,831	196,831	184,420	184,420	194,849	194,849
Jalisco	28,016	29,691	31,684	31,684	39,974	39,974	47,078	47,078
Mexico	7,594	7,736	8,403	8,403	10,985	10,985	12,801	12,801
Michoacan	15,236	22,308	23,385	23,385	20,150	27,105	23,491	30,447
Morelos	11,889	12,600	13,446	13,446	16,968	16,968	19,985	19,985
Nayarit	335	355	379	379	478	478	563	563
Nuevo Leon	37,296	35,410	40,357	40,357	48,160	48,160	51,357	51,357
Oaxaca	120,767	130,599	142,578	142,578	146,499	157,923	149,424	160,848
Puebla	5,322	5,621	6,004	6,004	7,675	7,675	9,029	9,029
Queretaro	5,211	5,525	5,896	5,896	7,447	7,447	8,773	8,773
Quintana Roo	688	8,853	8,589	8,589	178	8,274	169	8,265
San Luis Potosi	77,709	60,398	70,544	70,544	69,928	69,928	66,068	66,068
Sinaloa	106,500	103,052	63,463	63,463	14,453	21,654	17,401	24,602
Sonora	75,235	73,211	45,469	45,469	10,868	16,285	13,062	18,480
Tabasco	16,234	24,919	26,039	26,039	22,532	30,544	26,279	34,291
Tamaulipas	48,001	57,551	63,957	63,957	49,954	66,790	49,670	66,506
Tlaxcala	1,706	1,807	1,929	1,929	2,436	2,436	2,869	2,869
Veracruz	159,311	168,060	171,215	171,215	154,777	181,501	134,612	161,335
Yucatan	18,345	19,517	19,154	19,154	15,704	19,484	12,181	15,961
Zacatecas	3	3	3	3	4	4	5	5