Review of 2017 Emissions Inventory Data for the Austin-Round Rock-Georgetown Metropolitan Statistical Area

Prepared by the Capital Area Council of Governments

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1 Executive Summary

Every three years, the U.S. Environmental Protection Agency (EPA) prepares a comprehensive inventory of emissions for every county in the country known as the "National Emissions Inventory" (NEI). 2017 is one such NEI year, and EPA is in the process of finalizing the data for an anticipated April 30, 2020, release date. The NEI is a collaborative effort that requires extensive input from states, and serves as a foundation for a wide range of air quality planning efforts. The NEI includes data for both annual and ozone (O_3) season day (OSD) emissions of "criteria" pollutants regulated through National Ambient Air Quality Standards (NAAQS) and their precursors, as well as Hazardous Air Pollutants (HAPs) regulated under Section 112 of the Clean Air Act. This report is focused on reviewing data and documentation on criteria pollutant and precursor emissions estimates and activity estimates currently available from the Texas Commission on Environmental Quality (TCEQ) for 2017 that either will be used for the 2017 NEI or may serve as a useful point of comparison for the NEI for the Austin-Round Rock-Georgetown Metropolitan Statistical Area (MSA). The Austin-Round Rock-Georgetown MSA includes Bastrop, Caldwell, Hays, Travis, and Williamson Counties. Pollutants reviewed include:

- Carbon Monoxide (CO);
- Ammonia (NH_3);
- Nitrogen Oxides (NO_X);
- Lead (Pb);
- Particulate Matter 10 micrometers or less in diameter (PM_{10});
- Particulate Matter 2.5 micrometers or less in diameter ($PM_{2.5}$);
- Sulfur Dioxide (S_{O2}); and
- Volatile Organic Compounds (VOC).

The following tables summarize the total annual emissions by source type and county.

Table 1-1. Criteria Pollutant Summary by Source Type (tpy)

Source	CO	NH_3	NO_X	Pb	PM_{10}	$PM_{2.5}$	SO_2	VOC
Point	5,729.48	29.74	4,797.60	0.02	980.50	554.50	1,918.41	744.22
Area	8,105.74	7,992.81	4,378.35	0.02	138,334.20	16,487.06	190.97	28,372.96
Non-Road	34,132.57	9.89	5,176.58	0.77	419.56	398.10	93.04	2,804.16
On-Road	77,708.62	497.88	12,500.53	0.00	1,062.22	415.89	110.13	6,277.43
TOTAL	**125,676.40**	**8,530.31**	**26,853.06**	**0.81**	**140,796.48**	**17,855.56**	**2,312.56**	**38,198.77**

Table 1-2. Criteria Pollutant Summary by County

County	CO	NH_3	NO_X	Pb	PM_{10}	$PM_{2.5}$	SO_2	VOC
Bastrop	7,511.05	1,058.25	2,236.02	0.08	23,345.41	2,744.59	307.49	1,941.47
Caldwell	5,119.78	1,267.83	1,838.31	0.22	8,724.79	1,081.12	354.75	5,322.23
Hays	17,441.82	894.92	4,683.54	0.01	26,345.13	3,270.98	1,194.26	3,525.07
Travis	70,418.34	2,325.41	13,048.97	0.18	44,627.98	5,927.28	387.86	19,762.52
Williamson	25,185.41	2,983.91	5,046.22	0.33	37,753.17	4,831.59	68.20	7,647.47
TOTAL	**125,676.40**	**8,530.31**	**26,853.06**	**0.81**	**140,796.48**	**17,855.56**	**2,312.56**	**38,198.77**

Due to the importance of NO_X emissions in contributing to ground-level O_3 formation in the region relative to VOC, (NO_X accounts for about 99% of the region's impact on ambient O_3 based on prior modeling analyses conducted by CAPCOG), this report also includes analysis of OSD NO_X data and related activity data. The table below shows a summary of OSD NO_X emissions by source and county.

Table 1-3. OSD NO_X Emissions by Source Type (tpd)

Source	Bastrop	Caldwell	Hays	Travis	Williamson	TOTAL
Point	3.27	0.80	6.77	4.72	0.15	**15.71**
Area	0.46	1.89	0.80	6.47	1.99	**11.61**
Non-Road	1.55	1.19	1.38	8.29	4.60	**17.01**
On-Road	2.26	1.31	4.52	18.07	7.80	**33.96**
TOTAL	**7.55**	**5.19**	**13.48**	**37.54**	**14.55**	**78.30**

Key objectives of this report include:

- Explaining the basis for data that will be included in the 2017 NEI for the MSA;
- Improving understanding of the relative importance of different source types; and
- Identifying any potential limitations of the data for specific source categories.

Some important caveats for this report:

- The way EPA classifies sources for the NEI is somewhat different than the way TCEQ classifies sources, particularly for locomotives, airports, and oil and gas drill rigs. CAPCOG follows the TCEQ classification system for this report and notes the differences where applicable.
- Not all sources available to CAPCOG included estimates for all pollutants. For example, Pb data is only available for point sources, and the airport emissions estimates did not include NH_3.
- EPA will use activity data submitted by the states with its MOVES2014b model in order to generate on-road and non-road emissions data, but due to differences in modeling approaches between EPA and TCEQ, the actual emissions estimates generated by each agency will differ.
- TCEQ is not submitting any updates for the locomotive or oil and gas drill rig source categories (both of which are included under the "Non-Road" source category in TCEQ's classification scheme), and EPA has not yet released data for either of these source types, so the data presented in this report for these two categories is the existing "Trends" emissions data developed in 2015 with a 2017 analysis year.
- The "Area Source" data presented here does not include some sources EPA is preparing, but should be complete for all major sources of NO_X at least.

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2 Introduction

As described by the EPA, the NEI, "is a comprehensive and detailed estimate of air emissions of criteria pollutants, criteria precursors, and hazardous air pollutants (HAPs) from all significant emissions sources." The NEI is released every three years and is used for a variety of applications, including:

- Regulatory impact analyses (RIAs);
- NAAQS and regional haze implementation;
- NAAQS and regional haze reviews;
- Monitoring rules and reports;
- National Air Toxics Assessments (NATA); and
- Trends analyses.

The last completed NEI was for 2014, and the next one currently being prepared will be for 2017, with EPA planning a full release by April 30, 2020.[1] EPA release point source data publicly in August 2019. [2]

This report is designed to:

- Understand and summarize emissions and activity data that will be included in the 2017 NEI for Bastrop, Caldwell, Hays, Travis, and Williamson Counties;
- Compare these data to other relevant emissions and activity estimates;
- Identify potentially important caveats for the use of 2017 NEI data for various air quality planning purposes; and
- Identify opportunities for improving these data in the future.

2.1 Pollutants

Pollutants covered by the NEI include:

- "Criteria" pollutants subject to NAAQS and their precursors; and
    - Primary pollutants regulated by NAAQS include CO, NO_X, Pb, $PM_{2.5}$, and PM_{10}
    - Precursors for O_3 include NO_X and VOC.
    - Precursors for $PM_{2.5}$ and PM_{10} include direct $PM_{2.5}$, direct $PM_{2.5}$, SO_2, NH_3, VOC, and NO_X.[3]
- HAPs (187 different toxic air pollutants regulated under Section 112 of the Clean Air Act).

[1] EPA. 2017 NEI Plan: Final Addendum. 4/10/2019. Available at: https://www.epa.gov/sites/production/files/2019-04/documents/2017nei_plan_addendum_final_apr2019_0.pdf.

[2] EPA. 2017 National Emissions Inventory, August 2019 Point Release Technical Support Document (DRAFT). Office of Air Quality Planning and Standards, Air Quality Assessment Division, Emissions Inventory and Analysis Group. August 2019.

[3] EPA. Emissions Inventory Guidance for Implementation of Ozone and Particulate Matter National Ambient Air Quality Standards (NAAQS) and Regional Haze Regulations. Office of Air Quality Planning and Standards, Air Quality Assessment Division. Research Triangle Park, NC. EPA-454/B-17-002. May 2017. Available online at: https://www.epa.gov/sites/production/files/2017-07/documents/ei_guidance_may_2017_final_rev.pdf.

This report examines only the criteria air pollutants and their precursors, with a special focus on NO_X emissions due to their importance to regional O_3 formation.

2.2 Source Classification

Emissions sources in the NEI are classified as follows:

- Point sources: larger sources located at a fixed, stationary location that report emissions to the state
- Nonpoint/Area sources: smaller stationary sources that do not report emissions to the state
- On-Road sources: emissions from mobile sources registered to operate on public roads
- Non-Road sources: emissions from mobile sources not registered to operate on public roads ("mobile" includes equipment that moves at least once a year)
- Event sources: wildfires and prescribed burns.
- Biogenic emissions: emissions from soil or vegetation

This report covers point, nonpoint/area, on-road, and non-road sources.

There are several notable differences in EPA's classification of certain mobile sources and TCEQ's typical classification:

Table 2-1. Differences in EPA/TCEQ Classification of Selected "Offroad" Sources

Source Category Name	EPA Classification	TCEQ Classification
Aircraft/Airports	Point	Non-road/"Off-road"
Commercial Marine Vessels	Nonpoint	Non-road/"Off-road"
Locomotives	Point for railyards, nonpoint for all others	Non-road/"Off-road"
Oil and Gas Drill Rigs	Nonpoint oil and gas production and exploration	Non-road/"Off-road"

EPA's 2017 emissions inventory guidance document for implementation of the O_3 NAAQS, PM NAAQS, and Regional Haze regulations actually lists aircraft, aircraft ground support equipment, locomotives, and commercial marine vehicles as "nonroad" equipment, similar to how TCEQ classifies these sources. For this report, CAPCOG will include these sources as "nonroad." It is CAPCOG's understanding that EPA treats mobile oil and gas "drill rigs" as part of the "nonpoint" oil and gas production emissions.

2.3 Process

EPA plans its initial public release of the NEI by April 30, 2020. EPA will be releasing draft and final data in its Emissions Information System (EIS) ahead of then, but CAPCOG does not have access to EIS. Only point source data has already been made available for public review on EPA's website.

- 7/1/2019: Target date for 2017v1 point source NEI release in EIS
- 8/XX/2019: Point source EI public release
- 9/15/2019: Target date for 2017v1 on-road, non-road, and event NEI release in EIS

- 2/28/2020: Target date for 2017v1 nonpoint release in EIS
- 3/31/2020: 2017v1 NEI Public Release

3 Point Sources

Each year, the TCEQ requires a number of large facilities that have actual emissions above certain thresholds to report their emissions data to the agency. The TCEQ also has separate reporting thresholds for NO_X and VOC that apply to the MSA and other counties considered "near-nonattainment" for O_3.[4] EPA's Air Emissions Reporting Rule (AERR) has 2017 reporting thresholds for point sources applicable to the Austin-Round Rock-Georgetown MSA that differ somewhat from TCEQ's reporting threshold, primarily because EPA's threshold is based on potential to emit (PTE) rather than actual emissions.[5] These thresholds in tons per year (tpy) are indicated below.

Table 3-1. Point Source Reporting Thresholds Applicable to MSA for 2017 (tpy)

Pollutant	EPA	TCEQ
CO	≥1,000 (PTE)	≥100
NH_3	≥100 (PTE)	≥100
NO_X	≥100 (PTE)	≥25 (actual)
Pb	≥0.5 (actual)	≥0.5 (actual)
$PM_{2.5}$	≥100 (PTE)	≥100
PM_{10}	≥100 (PTE)	≥100
SO_2	≥100 (PTE)	≥100
VOC	≥100 (PTE)	≥10 (actual)

Table 3-2. 2017 Annual Point Source Emissions by County (tpy)

County	CO	NH_3	NO_X	Pb	PM_{10}	$PM_{2.5}$	SO_2	VOC
Bastrop	516.17	10.78	768.89	0.02	257.47	119.27	292.32	60.81
Caldwell	119.62	0.00	309.41	0.00	18.46	18.46	337.73	61.51
Hays	4,024.44	3.25	2,331.39	0.00	415.90	233.87	1,164.39	259.53
Travis	951.68	15.71	1,335.11	0.00	250.25	163.76	119.20	335.23
Williamson	117.56	0.00	52.81	0.00	38.42	19.14	4.78	27.14
TOTAL	**5,729.48**	**29.74**	**4,797.60**	**0.02**	**980.50**	**554.50**	**1,918.41**	**744.22**

[4] TCEQ. "2017 Emissions Inventory Guidelines." Air Quality Division. January 2018. RG-360/17. Available online at: https://www.tceq.texas.gov/assets/public/comm_exec/pubs/rg/rg360/rg360-17/rg-360.pdf

[5] 40 CFR Part 70, except for lead

3.1 2017 Point Source Emissions Data Reported to TCEQ

CAPCOG reviewed TCEQ's statewide point source emissions summary for 2017[6] in order to identify facilities that submitted an emissions inventory to TCEQ for that year. A total of 28 different facilities reported to TCEQ for Bastrop, Caldwell, Hays, Travis, and Williamson Counties. The following table identifies each facility and its annual 2017 criteria pollutant totals.

Table 3-3. Annual Point Source Emissions Totals Reported to TCEQ, 2017 (tpy)

County	CO	NO_X	Pb	PM_{10}	$PM_{2.5}$	SO_2	VOC
Bastrop	516.17	768.89	0.0156	257.47	119.27	292.32	60.81
Caldwell	119.62	309.41	0.0000	18.46	18.46	337.73	61.51
Hays	4,024.44	2,331.39	0.0042	415.90	233.87	1,164.39	259.53
Travis	951.68	1,335.11	0.0011	250.25	163.76	119.20	335.23
Williamson	117.56	52.81	0.0000	38.42	19.14	4.78	27.14
TOTAL	**5,729.48**	**4,797.60**	**0.0209**	**980.50**	**554.50**	**1,918.41**	**744.22**

CAPCOG also reviewed EPA's point source spreadsheet released in August 2019. A total of 51 facilities are listed for Bastrop, Caldwell, Hays, Travis, and Williamson Counties, 24 of which overlap with TCEQ's list. 18 of EPA's point sources are airports, which TCEQ and CAPCOG classify under "non-road." This leaves four facilities on TCEQ's list but not EPA's, and nine on EPA's list but not TCEQ's.

Table 3-4. Differences in TCEQ and EPA Point Source Facility List

Facility	County	TCEQ List	EPA List
Flint Hills Resources Mustang Ridge Terminal	Caldwell	☒	☐
Elgin Rubber Company	Caldwell	☐	☒
Sunset Farms Landfill	Travis	☒	☐
Texas Disposal System Landfill	Travis	☒	☐
Pure Castings Co.	Travis	☐	☒
Abbott Labs Lvs Mfg. Plant	Travis	☐	☒
Motorola Oak Hill Facility	Travis	☐	☒
Flextronics America LLC	Travis	☐	☒
BAE Systems	Travis	☐	☒
Oldcastle Apg. Trexas Inc. (DBA Custom-Crete)	Travis	☐	☒
Hanson Pipe & Products Inc. Austin	Travis	☐	☒
Round Rock-Abbott Labs	Williamson	☐	☒
Williamson County Landfill	Williamson	☒	☐

Collectively, the facilities on EPA's list that were not on TCEQ's list emitted a total of 1.95 pounds of lead (0.0010 tons), but reported no criteria air pollution. The facilities on TCEQ's list totaled 121.97 tons of CO, 82.98 tons of VOC, 37.08 tons of PM_{10}, 29.95 tons of NO_X in 2017, 17.8 tons of $PM_{2.5}$, 7.23 tons of SO_2, and 0 tons of NH_3 or Pb.

[6] 2013thru2017statesum.xlsx, available at: https://www.tceq.texas.gov/airquality/point-source-ei/psei.html. Last accessed 7/18/2019.

Table 3-5. TCEQ Point Source Emissions Reported for 2017 (tpy)

RN	SITE	COUNTY	CO	NH3	NO_X	Pb	PM_{10}	$PM_{2.5}$	SO_2	VOC
RN102038486	SIM GIDEON POWER PLANT	BASTROP	11.57	0.0000	311.34	0.0010	13.678	13.6028	1.15	11.53
RN100212034	ELGIN FACILITY	BASTROP	98.09	0.0000	28.97	0.0000	49.710	41.9718	165.87	7.54
RN100225846	ELGIN PLANT	BASTROP	46.25	0.0000	25.24	0.0146	129.902	0.0575	114.83	0.95
RN100723915	LOST PINES 1 POWER PLANT	BASTROP	111.93	10.7817	163.92	0.0000	35.928	35.3862	4.42	5.06
RN101056851	BASTROP ENERGY CENTER	BASTROP	248.32	0.0000	239.41	0.0000	28.256	28.2562	6.05	35.73
RN100212018	LULING GAS PLANT	CALDWELL	19.54	0.0000	33.35	0.0000	0.374	0.3743	337.47	6.92
RN100220177	PRAIRIE LEA COMPRESSOR STATION	CALDWELL	99.03	0.0000	275.64	0.0000	18.085	18.0850	0.26	35.98
RN105366934	MUSTANG RIDGE TERMINAL	CALDWELL	1.05	0.0000	0.42	0.0000	0.000	0.0000	0.00	18.61
RN102597846	TEXAS LEHIGH CEMENT	HAYS	3,579.60	2.0582	2,200.30	0.0042	326.105	144.0696	1,157.98	183.23
RN100211689	HAYS ENERGY FACILITY	HAYS	444.84	1.1900	131.08	0.0000	89.796	89.7964	6.41	76.30
RN100219872	DECKER CREEK POWER PLANT	TRAVIS	127.22	0.0053	332.10	0.0011	5.845	5.8434	4.34	22.31

RN	SITE	COUNTY	CO	NH3	NO_X	Pb	PM_{10}	$PM_{2.5}$	SO_2	VOC
RN100214337	MCNEIL PLANT & QUARRY	TRAVIS	58.99	0.0000	379.49	0.0000	65.913	31.8833	0.73	2.78
RN105074561	AUSTIN HOT MIX	TRAVIS	23.09	0.0000	4.56	0.0000	4.247	0.5094	0.60	11.63
RN100843747	ED BLUESTEIN SITE	TRAVIS	8.75	0.0416	13.35	0.0000	24.754	0.6643	0.43	28.39
RN102533510	HAL C WEAVER POWER PLANT	TRAVIS	70.06	3.0823	274.75	0.0000	15.395	15.3893	1.21	10.93
RN100723741	SPANSION AUSTIN FACILITY	TRAVIS	11.86	0.1912	8.06	0.0000	3.466	1.1747	0.62	6.94
RN102752763	INTEGRATED CIRCUIT MFG OAK HILL FAB	TRAVIS	7.58	0.0961	9.42	0.0000	31.815	28.7118	0.03	11.36
RN100542752	BFI SUNSET FARMS LANDFILL	TRAVIS	91.98	0.0000	27.59	0.0000	7.660	7.6600	60.10	7.30
RN100218692	3M AUSTIN CENTER	TRAVIS	0.69	0.0000	31.14	0.0000	3.113	2.9187	0.14	3.23
RN101059673	AUSTIN TERMINAL	TRAVIS	7.29	0.0000	2.92	0.0000	0.006	0.0005	0.00	51.60
RN100215938	AUSTIN COMMUNITY LANDFILL	TRAVIS	271.47	0.0000	39.36	0.0000	56.650	40.5300	44.00	10.47
RN101992246	SUNSET FARMS ENERGY	TRAVIS	0.00	0.0000	0.00	0.0000	0.000	0.0000	0.00	0.00

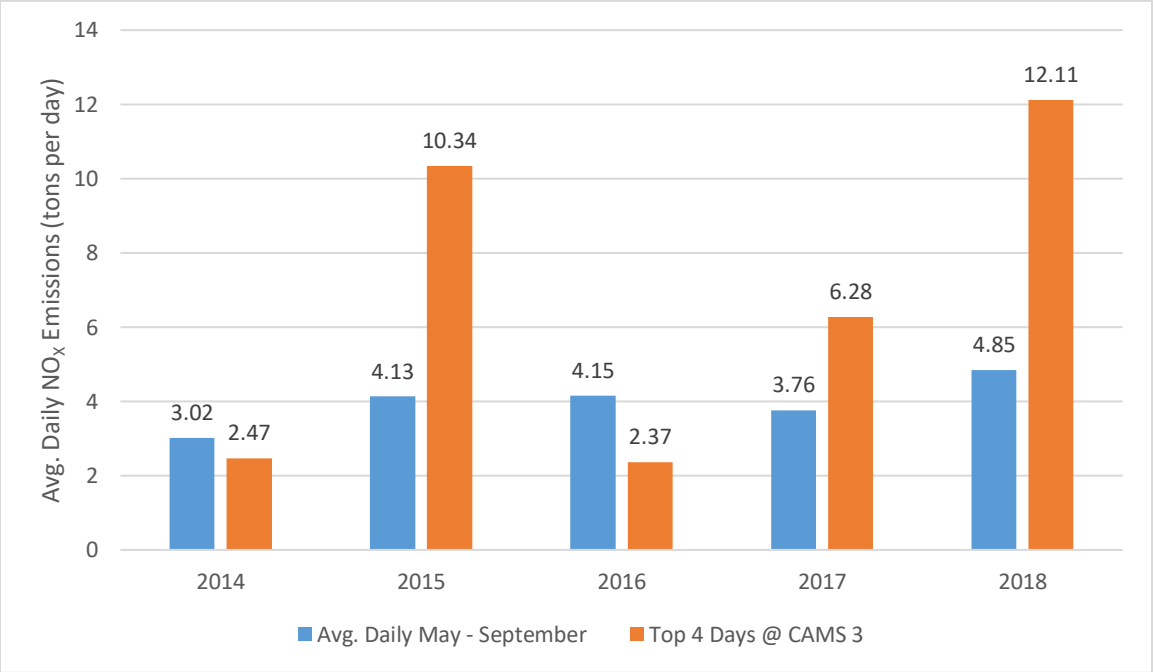
RN	SITE	COUNTY	CO	NH3	NO_X	Pb	PM_{10}	$PM_{2.5}$	SO_2	VOC
RN100518026	AUSTIN FABRICATION FACILITY	TRAVIS	135.45	6.5534	136.25	0.0000	2.957	2.9557	0.60	101.20
RN100215052	SAND HILL ENERGY CENTER	TRAVIS	117.86	5.7353	65.09	0.0000	22.851	19.9479	3.41	8.55
RN102016698	TEXAS DISPOSAL SYSTEMS LANDFILL	TRAVIS	19.41	0.0000	11.04	0.0000	5.575	5.5750	2.98	58.54
RN100225754	WILLIAMSON COUNTY LANDFILL HUTTO	WILLIAMSON	101.51	0.0000	18.49	0.0000	31.505	12.2250	4.25	5.83
RN100725712	COUPLAND PUMP STATION	WILLIAMSON	14.32	0.0000	32.26	0.0000	1.021	1.0207	0.53	9.13
RN100728179	DURCON LABORATORY TOPS	WILLIAMSON	1.73	0.0000	2.06	0.0000	5.890	5.8900	0.01	12.18
TOTAL	**n/a**	**n/a**	**5,729.48**	**29.7351**	**4,797.60**	**0.0209**	**980.50**	**554.50**	**1,918.41**	**744.22**

CAPCOG compared the NO_X data in TCEQ's annual summary for 2017 to EPA's data. There were some very minor differences likely attributable to rounding. The deviations ranges from -0.0037 tpy to +0.0048 tpy. The emissions summary in the Executive Summary includes totals for TCEQ's report.

3.2 Caveats about Regional Power Plant Data

One important caveat about regional electrical generating unit (EGU) data in the 2017 NEI is that while the data in the NEI is certainly accurate, assuming that these data are representative of emissions data in 2016 or 2018 would be a mistake. It would also be a mistake to assume that the OSD data for these power plants discussed later on in this report is representative of actual emissions on the four worst O_3 days of the year, which are key for O_3 NAAQS compliance. A recent analysis of 2018 ambient air quality data conducted by CAPCOG included an analysis of the differences in the NO_X emissions at area power plants for an average day between May 1 and September 30 and on the four worst days O_3 days at the region's key regulatory monitoring station. The comparison for the last five years is shown below.

Figure 3-1. O_3 Season Daily EGU Point Source NO_X Emissions Averages May – September and Top 4 Days at CAMS 3 2014-2018



These data suggest an upward trend in OSD NO_X emissions over this time frame, and that the closure of several large coal plants on the Texas Grid in late 2017/early 2018 likely resulted in increased load on some of the region's older, plants with higher NO_X emission rates (Sim Gideon and Decker). The high variability year to year and large differences between average NO_X emissions on a generic OSD and the NO_X emissions on the key four days also suggest that it's important to over-rely on 2017 NEI data for analyzing power plant NO_X emissions within the region.

Another caveat is that both TCEQ and EPA directly use EPA's hourly NO_X emissions data reported by facilities under federal rules for its photochemical modeling efforts rather than the 2017 NEI data. While there is excellent agreement between these estimates and the data submitted to TCEQ in most instances, there are major differences for the Decker Creek Power Plant turbine units. Due to lack of

stack testing data that meets EPA requirements or continuous emissions monitoring systems (CEMS) for these units, the hourly data used for these photochemical modeling projects uses a "worst case scenario" emissions rate that results in much higher modeled NO_X emissions from the Decker facility when the turbines are used than is actually occurring and as would be expected from the data in the NEI. Therefore, it's important to take care when interpreting photochemical modeling results that do not use any kind of adjustment for the emission rates for these units to ensure they were consistent with the data in the NEI.

4 Area Sources

"Area sources," which EPA refers to as "nonpoint" sources, include a diffuse collection of emission sources. Estimates for area sources are developed by both TCEQ and EPA, although TCEQ handles the most important sources, particularly for significant sources of NO_X emissions. TCEQ's submission to EPA covers 268 different emissions sources (based on distinct source classification codes). This represents only about 38% of the 703 active nonpoint SCCs listed in EPA's source classification code (SCC) database (not including the 18 SCCs that overlap with the "nonroad" source category in TCEQ's classification system). However, TCEQ's data likely constitutes the vast majority of the area source emissions for most categories, particularly for NO_X. The following table summarizes the data TCEQ submitted to EPA.[7]

Table 4-1. 2017 TCEQ Area Source Emissions by County (tpy)

County	CO	NH_3	NO_X	Pb	PM_{10}	$PM_{2.5}$	SO_2	VOC
Bastrop	1,189.30	1,019.47	177.06	0.00	23,002.75	2,570.44	9.24	1,394.74
Caldwell	1,217.81	1,252.42	686.53	0.00	8,651.52	1,023.44	12.77	4,908.44
Hays	1,777.66	831.28	294.00	0.00	25,785.67	2,956.67	16.95	2,271.24
Travis	2,655.12	2,021.76	2,421.57	0.01	43,526.34	5,327.37	117.04	14,096.73
Williamson	1,265.84	2,867.88	799.19	0.00	37,367.93	4,609.15	34.97	5,701.81
TOTAL	**8,105.74**	**7,992.81**	**4,378.35**	**0.02**	**138,334.20**	**16,487.06**	**190.97**	**28,372.96**

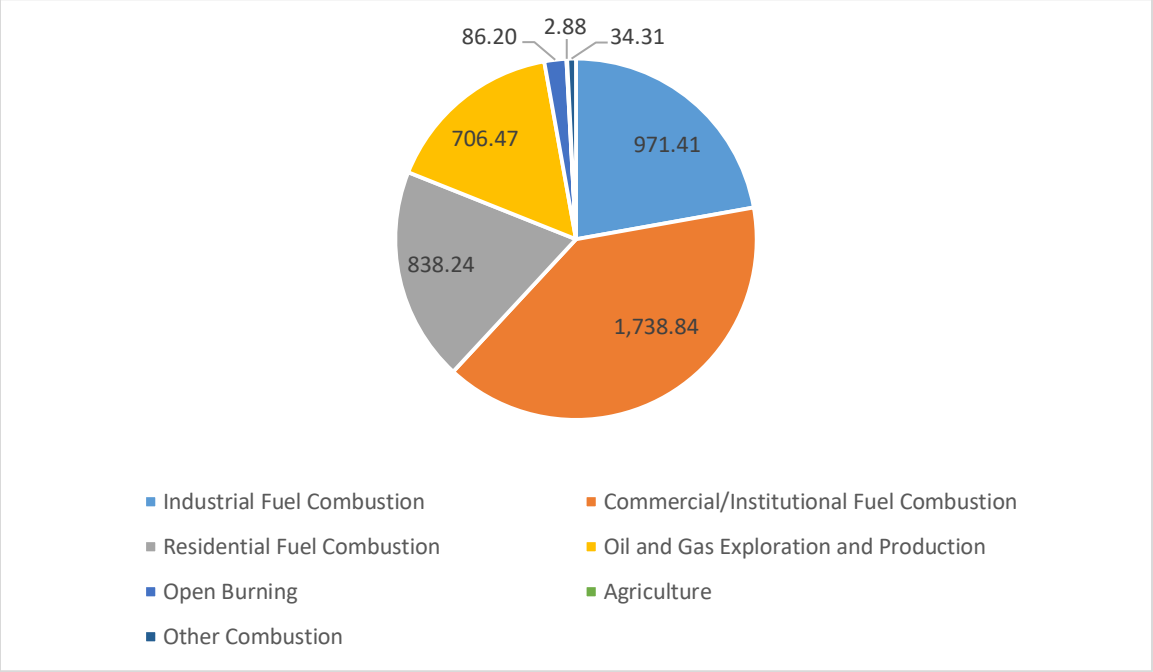
EPA's 2017 NEI plan describes the nonpoint development process as involving several different categories of nonpoint emissions:

- Category 1: sources that do not require point source reconciliation and where existing methodology is expected to have minimal changes and thus, extensive additional resource investment is less important than other sources.
- Category 2: Sources that do not require point source inventory reconciliation, but where the existing methodology needs updates, and thus, more extensive collaboration with states, local governments, and tribes on methodology and tools are needed than Category 1 tools
- Category 3: Sources that require point inventory reconciliation. These sources are last in the schedule because proper subtraction must taint until the 2017 point data are available (this is particularly important for industrial and commercial/institutional combustion).

[7] E-mail from Matthew Southard, TCEQ, to Andrew Hoekzema, CAPCOG, July 26, 2019.

The following chart summarizes the relative contribution of different categories of annual area source NO_X emissions.

Figure 4-1. 2017 NO_X Emissions by Source Category (tpy)



5 Non-Road Sources

Non-road sources includes four different sources: sources modeled in MOVES2014b, airports, locomotives, and commercial marine vessels (not present in the Austin-Round Rock-Georgetown MSA). Drill rigs are included in the non-road source category. The following table summarizes the total non-road NO_X emissions by source type.

Table 5-1. 2017 Annual Non-Road Source Emissions by Source Type (tpy)

Source Type	CO	NH_3	NO_X	Pb	PM_{10}	$PM_{2.5}$	SO_2	VOC
MOVES2014b	31,504.04	9.27	3,556.46	0.00	368.20	351.39	5.60	2,528.76
Airport	2,431.93	0.00	747.94	0.77	28.13	24.17	86.74	234.34
Rail	196.60	0.62	872.18	0.00	23.23	22.54	0.70	41.06
TOTAL	**34,132.57**	**9.89**	**5,176.58**	**0.77**	**419.56**	**398.10**	**93.04**	**2,804.16**

Total non-road emissions by county are shown below.

Table 5-2. 2017 Annual Non-Road Source Emissions by County (tpy)

County	CO	NH_3	NO_X	Pb	PM_{10}	$PM_{2.5}$	SO_2	VOC
Bastrop	1,168.87	0.80	459.35	0.06	32.09	30.93	0.54	82.43
Caldwell	1,205.78	0.56	356.74	0.22	28.18	26.14	1.40	150.69
Hays	2,411.35	0.81	424.74	0.00	34.39	32.77	0.56	264.10
Travis	22,741.33	4.31	2,616.89	0.17	207.93	197.69	87.40	1,783.79
Williamson	6,605.24	3.41	1,318.86	0.32	116.97	110.56	3.15	523.15

County	CO	NH_3	NO_X	Pb	PM_{10}	$PM_{2.5}$	SO_2	VOC
TOTAL	**34,132.57**	**9.89**	**5,176.58**	**0.77**	**419.56**	**398.10**	**93.04**	**2,804.16**

5.1 Nonroad Sources Modeled in MOVES2014

EPA's MOVES2014b mobile source emissions model is EPA's approved model for estimating emissions from a number of non-road mobile sources. This includes:

- Agricultural equipment;
- Commercial equipment;
- Construction and mining equipment;
- Industrial equipment;
- Lawn and garden equipment;
- Logging equipment;
- Pleasure craft;
- Railroad equipment (other than locomotives); and
- Recreational equipment.

The state's submission to EPA for these categories the 2017 NEI consists of a series of county databases (CDBs) that are inputs into the MOVES2014b model. MOVES2014b has a number of important changes to for non-road emissions modeling, including new emission rates for 2011+ model year Tier 4 engines and new growth patterns. ERG also developed a specially adapted model for Texas called "TexN2," which facilitates the use of Texas-specific nonroad equipment population, activity, fuels, and related data, and accounts for Texas-specific emissions adjustments such as Texas Low-Emissions Diesel (TxLED).[8]

Table 5-3. 2017 MOVES2014b Non-Road Emissions by County (tpy)

County	CO	NH_3	NO_X	Pb	PM_{10}	$PM_{2.5}$	SO_2	VOC
Bastrop	1,078.75	0.68	292.72	0.00	27.59	26.58	0.36	73.85
Caldwell	924.31	0.42	171.57	0.00	18.15	17.37	0.23	134.19
Hays	2,365.32	0.68	260.44	0.00	29.83	28.38	0.41	256.58
Travis	20,985.68	4.21	1,720.41	0.00	189.74	180.42	2.86	1,562.74
Williamson	6,149.98	3.27	1,111.32	0.00	102.89	98.63	1.74	501.41
TOTAL	**31,504.04**	**9.27**	**3,556.46**	**0.00**	**368.20**	**351.39**	**5.60**	**2,528.76**

The following table summarizes the emissions by equipment type.

[8] ERG. *Development of Texas Statewide 2017 AERR Inventory for Nonroad Category Mobile Sources Final Report*. Prepared for TCEQ. October 26, 2018. ERG No. 0345.00.017. https://www.tceq.texas.gov/assets/public/implementation/air/am/contracts/reports/ei/5821881185013-20181026-erg-texas_statewide_emissions_inventory_nonroad_model_mobile_sources.pdf

Table 5-4. 2017 MOVES2014b Non-Road Emissions by Equipment Type (tpy)

Equipment Type	CO	NH_3	NO_X	PM_{10}	$PM_{2.5}$	SO_2	VOC
Recreational Equipment	3,491.46	0.27	39.33	22.38	20.62	0.24	713.87
Const. & Mining Equip.	2,991.10	4.59	1,651.50	145.29	140.12	2.15	261.99
Industrial Equipment	974.58	0.59	412.51	22.13	21.68	0.62	42.46
L&G Equipment	12,293.75	0.78	150.46	70.44	64.96	0.72	908.66
Agricultural Equipment	812.94	2.07	911.35	74.33	72.10	1.03	78.57
Commercial Equipment	10,274.11	0.87	346.66	30.93	29.42	0.75	374.25
Recreational Marine	662.44	0.08	39.73	2.06	1.90	0.08	148.13
Railway Maintenance	3.67	0.01	4.91	0.62	0.61	0.00	0.84
TOTAL	**31,504.04**	**9.27**	**3,556.46**	**368.20**	**351.39**	**5.60**	**2,528.76**

Similar to the differences in modeling approaches for on-road sources, the CDBs used in TexN2 will produce different emissions estimates than they will produce in the normal version of MOVES2014b. Equipment population updates were based on population databases from 1996, 1998, 1999, and 2000 – 2014, with annual population growth indices based on specialized equipment activity projections, Census population projections, economic projections, and fuel consumption data. As EPA describes, "Because the model assigns constant hours-per-year activity rates to each piece of nonroad equipment, changes in emissions-generating activity levels are instead approximated by estimated changes in nonroad engine populations."[9]

One potential targeted update could be the agricultural equipment populations from the Census of Agriculture, which includes tractor counts and counts of other equipment modeled in MOVES2014b. The last one conducted actually was for 2017, so there is an opportunity to update the equipment populations to directly reflect that data.

5.2 Airports

Airport emissions were prepared by ERG for TCEQ using the Federal Aviation Administration (FAA) Aviation Environmental Design Tool (AEDT).[10] The following table summarizes emissions totals.

Table 5-5. 2017 Airport Non-Road Emissions by County (tpy)

County	CO	NH_3	NO_X	Pb[11]	PM_{10}	$PM_{2.5}$	SO_2	VOC
Bastrop	53.62	0.00	0.17	0.06	0.08	0.07	0.06	0.69
Caldwell	237.21	0.00	7.39	0.22	5.21	4.09	1.01	8.45
Hays	5.18	0.00	0.03	0.00	0.10	0.07	0.01	0.07
Travis	1,722.74	0.00	732.76	0.17	13.91	13.13	84.42	213.00
Williamson	413.18	0.00	7.59	0.32	8.81	6.82	1.25	12.12

[9] EPA. *Nonroad Engine Population Growth Estimates in MOVES2014b*. EPA-420-R-18-010. July 2018. https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100UXJK.pdf

[10] ERG. *2017 Texas Statewide Aircraft Emissions Inventory*. ERG No. 0345.00.002. Prepared for TCEQ. January 4, 2019. https://www.tceq.texas.gov/assets/public/implementation/air/am/contracts/reports/ei/582188250819-20190104-erg-2017_statewide_airport_emissions_inventory.pdf

[11] Note that for Pb, CAPCOG used county totals from EPA's August 2019 point source emissions inventory release. For all other pollutants, CAPCOG used data provided by ERG by Roger Chang to Andrew Hoekzema (CAPCOG) on July 26, 2019.

County	CO	NH_3	NO_X	Pb^{11}	PM_{10}	$PM_{2.5}$	SO_2	VOC
TOTAL	**2,431.93**	**0.00**	**747.94**	**0.77**	**28.13**	**24.17**	**86.74**	**234.34**

EPA includes commercial aircraft, air taxis, general aviation, and military aircraft in their airport emissions inventories, which are point sources in the 2017 NEI. The airport emissions inventories also include auxiliary power units (APUs) and ground support equipment (GSE).

Applicable SCCs are identified below:

- Commercial aviation: 227502000
- Air taxis:
    - Piston-driven: 2275060011
    - Turbine-driven: 2275060012
- General aviation:
    - Piston-driven: 2275050011
    - Turbine-driven: 2275050012
- Military: 2275001000
- Auxiliary Power Units: 2275070000
- Ground Support Equipment:
    - Compressed natural gas (CNG-fueled): 2268008005
    - Diesel-fueled: 2270008005
    - Gasoline-fueled: 2265008005
    - Liquefied Petroleum Gas (LPG) – fueled: 2267008005

ABIA identified a 5% reduction in APU emissions attributable to electric-powered gates that allow aircraft to connect to the gate and not use APUs. It did not identify any GSE emission reduction %, although there are electric GSE in service at ABIA. CAPCOG contacted ABIA staff to investigate this issue further.

5.3 Locomotives

The “rail” sector includes all locomotives in the NEI. All locomotives are considered a non-road category in TCEQ’s classification scheme, but for the 2017 NEI, freight and passenger locomotives are included in the “nonpoint” source category, while yard locomotives are included in the point category.

Table 5-6. Locomotive SCCs

SCC	Sector	Description
2285002006	Nonpoint	Railroad Equipment; Diesel; Line Haul Locomotives: Class I Operations
2285002007	Nonpoint	Railroad Equipment; Diesel; Line Haul Locomotives: Class II/III Operations
2285002008	Nonpoint	Railroad Equipment; Diesel; Line Haul Locomotives: Passenger Trains
2285002008	Nonpoint	Railroad Equipment; Diesel; Line Haul Locomotives: Commuter Lines

SCC	Sector	Description
2285002008	Point	Railroad Equipment; Diesel; Yard Locomotives

TCEQ submitted 2017 emissions data from a 2015 "trends" inventory prepared by ERG for the 2014 NEI. The following table summarizes the emissions totals for each county.[12]

Table 5-7. 2017 Locomotive Non-Road Emissions by County (tpy)

County	CO	NH_3	NO_X	Pb	PM_{10}	$PM_{2.5}$	SO_2	VOC
Bastrop	36.50	0.12	166.46	0.00	4.42	4.28	0.13	7.89
Caldwell	44.26	0.14	177.78	0.00	4.82	4.68	0.16	8.05
Hays	40.85	0.13	164.26	0.00	4.45	4.32	0.14	7.45
Travis	32.91	0.10	163.72	0.00	4.27	4.15	0.12	8.05
Williamson	42.08	0.13	199.95	0.00	5.27	5.11	0.15	9.62
TOTAL	**196.60**	**0.62**	**872.18**	**0.00**	**23.23**	**22.54**	**0.70**	**41.06**

EPA's 2017 NEI locomotive data are based on data prepared by the Illinois EPA and LADCO.[13] Emissions data are not yet available for this project. However, LACDO's approach appears similar to the approach ERG took for the 2015 inventory. Possible advantages of using the LADCO approach would be the newer data and more highly refined age distribution data, but ERG's estimates include Texas-specific age distribution data (which would in turn account for the impact of TERP grants), and TxLED.

6 On-Road Sources

The AERR requires Texas to submit MOVES model county databases (CDBs) for on-road sources rather than emissions, although Texas is allowed to (and does) also submit emissions data. As EPA explains in its 2017 NEI plan, "Collection of inputs, rather than emissions, is required to provide EPA the ability to run varying model scenarios and future projections from the same input basis."[14] The following table summarizes the annual on-road emissions estimated by TCEQ as reported in the documentation for the development of these data.[15]

Table 6-1. 2017 Annual On-Road Source Emissions by County (tpy)

County	CO	NH_3	NO_X	Pb	PM_{10}	$PM_{2.5}$	SO_2	VOC
Bastrop	4,636.72	27.20	830.72	n/a	53.10	23.94	5.39	403.50

[12] ERG. *2014 Texas Statewide Locomotive Emissions Inventory and 2008 through 2040 Trend Inventories.* August 26, 2015. ERG No. 0345.00.003.005. https://www.tceq.texas.gov/assets/public/implementation/air/am/contracts/reports/ei/582155153802FY15-20150826-erg-locomotive_2014aerr_inventory_trends_2008to2040.pdf

[13] Harrell, Matthew (Illinois EPA); and Mark Janssen (Lake Michigan Air Directors Consortium). Nonpoint and Point locomotive (rail) emissions for the 2017 National Emissions Inventory (NEI). August 19, 2019. Available online at: ftp://newftp.epa.gov/air/nei/2017/doc/supporting_data/point/2017Rail_main_21aug2019.pdf

[14] EPA. 2017 NEI Final Plan: Revised July 18, 2018. https://www.epa.gov/sites/production/files/2018-07/documents/2017_nei_plan_final_revised_jul2018.pdf

[15] Texas A&M Transportation Institute (TTI). Development of 2017 On-Road Mobile Source Annual, Summer Work Weekday and Winter Work Weekday Emissions Inventories for All Specified Areas: Austin Area Technical Report. Prepared for the TCEQ by the TTI Transportation Modeling Program. August 2019. TTI Study No. 609691-0001. Available at: ftp://amdaftp.tceq.texas.gov/pub/EI/onroad/aerr/2017/for_EPA/

County	CO	NH_3	NO_X	Pb	PM_{10}	$PM_{2.5}$	SO_2	VOC
Caldwell	2,576.56	14.85	485.63	n/a	26.62	13.08	2.85	201.59
Hays	9,228.37	59.58	1,633.42	n/a	109.17	47.67	12.36	730.19
Travis	44,070.20	283.63	6,675.40	n/a	643.47	238.45	64.23	3,546.78
Williamson	17,196.77	112.62	2,875.36	n/a	229.86	92.75	25.30	1,395.37
TOTAL	**77,708.62**	**497.88**	**12,500.53**	**n/a**	**1,062.22**	**415.89**	**110.13**	**6,277.43**

Texas A&M's Transportation Institute (TTI) developed link/travel demand model-based on-road emissions inventories for the six-county Capital Area Metropolitan Planning Organization (CAMPO) region, which – in addition to the five counties in the Austin-Round Rock-Georgetown MSA, also includes Burnet County. TTI's modeling approach involved developing county-level emissions rates that were then applied to hourly, link-level and off-network activity data in order to generate emissions estimates. For diesel on-road vehicles, TTI also reduced NO_X emissions for the five counties in the MSA and other parts of eastern Texas based on modeled 4.8 – 6.2% NO_X reductions from the use of Texas Low-Emission Diesel (TxLED).

- Fuel properties are averaged with another 95 counties in East Texas that also have state-level regulations requiring TxLED and Reid Vapor Pressure limited to 7.8 pounds per square inch. This is particularly notable due to the large differences in average gasoline sulfur levels from samples collected in the Austin-Round Rock-Georgetown MSA relative to the other 90 counties it is grouped with.
- The impacts of the I/M program will be based only on default compliance assumptions rather than actual programmatic data, and will be isolated to only passenger cars, passenger trucks, and light commercial trucks rather than all gasoline-powered vehicles other than motorcycles.
- TxLED NO_X reductions are not likely to be in the 2017 NEI.
- The age distribution inputs used by TTI were based directly on July 2014 data rather than a projection of the age distribution using the July 2014 data (which is the latest available).

6.1 Comparison to Trends Inventory Data

In 2015, TTI produced on-road "trends" emissions inventories for 1990, and every year from 1999-2050 for every county in the state.[16] CAPCOG has heavily relied on these trends inventories in recent years for planning purposes, including in the development of the recent 2019-2023 regional air quality plan. The following table provides a comparison of some of the key data in each inventory.

Table 6-2. Comparison of 2017 Data from Trends On-Road Inventory to 2017 AERR Data

Parameter	Trends Inventory (2017 Analysis Year)	2017 AERR	% Difference from Trends Inventory
Annual VMT	18,683,849,700	19,644,803,815	+5.14%

[16] TTI. *Development and Production of Annual and Summer Weekday, On-Road Mobile Source, Trend Emission Inventories for All 254 Texas Counties for 1990 and for Each Year from 1999 through 2050 Technical Report*. Prepared by TTI's Transportation Modeling Program for TCEQ. TTI Study No. 605111-0001. August 2015. Available at: ftp://amdaftp.tceq.texas.gov/pub/EI/onroad/mvs14_trends/

Parameter	Trends Inventory (2017 Analysis Year)	2017 AERR	% Difference from Trends Inventory
Annual Starts	2,654,279,177	3,046,912,001	+14.79%
Gasoline Sulfur (ppm)	10	21.28	+112.80%
NO_X (tpy)	11,452.14	12,500.53	+9.15%

Other key differences included the following:

- The use of "virtual links" and highway performance monitoring system (HPMS) data for the "trends" inventory, while using actual links and TDM data for the 2017 AERR
- Larger geographic aggregation data for the "trends" inventory
- The use of MOVES2014 (October 2014 release) for the "trends" inventory and MOVES2014a for the 2017 AERR estimate.

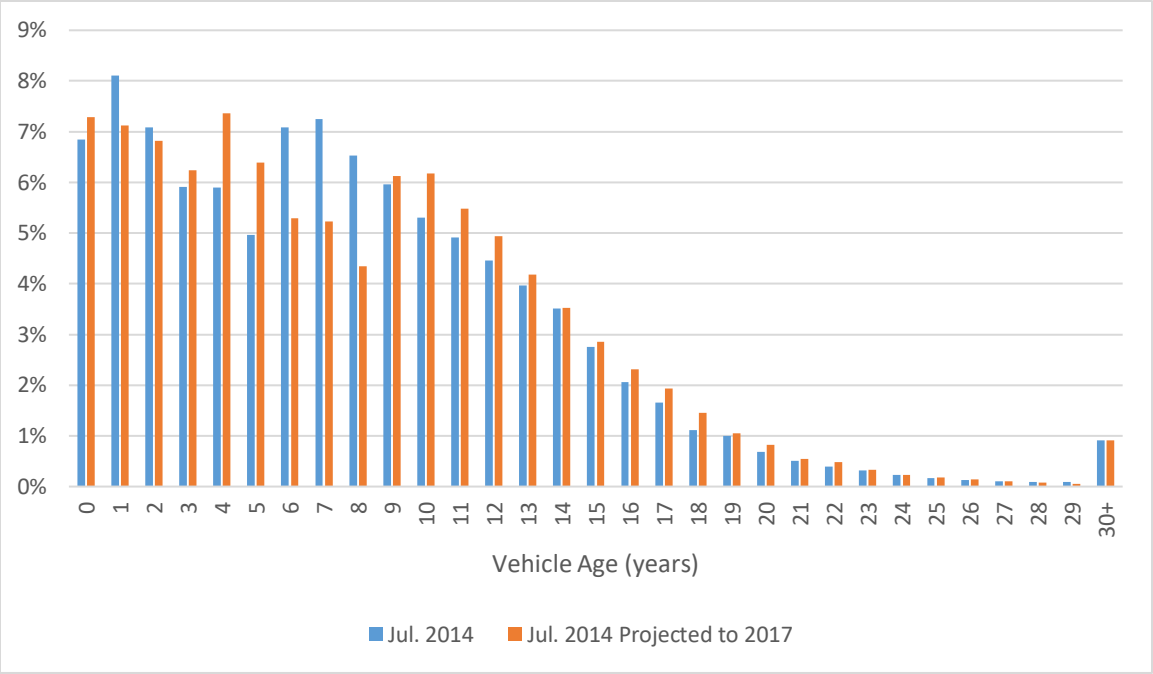
6.2 Areas for Further Refinement

6.2.1 Age Distribution

One area that could be improved upon would be the vehicle age distribution. Unfortunately, 2017 age distribution data is not currently available for emissions modeling from registration records, so July 2014 age distribution remains the most recent data available. Directly using these age distributions obscures the impact of the economic recession on vehicle sales from 2009-2011, however, leading to an over-estimation of vehicles 6-8 years old due to the impact of the economic recession on new vehicle purchases from 2009-2011, and a corresponding under-estimation of vehicles in the 3-5 year range, since the age distribution would have shifted by three years from 2014 to 2017. The figure below illustrates this issue, using the Travis County age distribution listed in the Appendix of TTI's report and EPA's MOVES age projection tool.[17]

[17] Available online here: https://www.epa.gov/sites/production/files/2016-06/age-distribution-projection-tool-moves2014.xlsm.

Figure 6-1. Comparison of July 1, 2014, Passenger Car Age Distribution to Distribution Projected to 2017

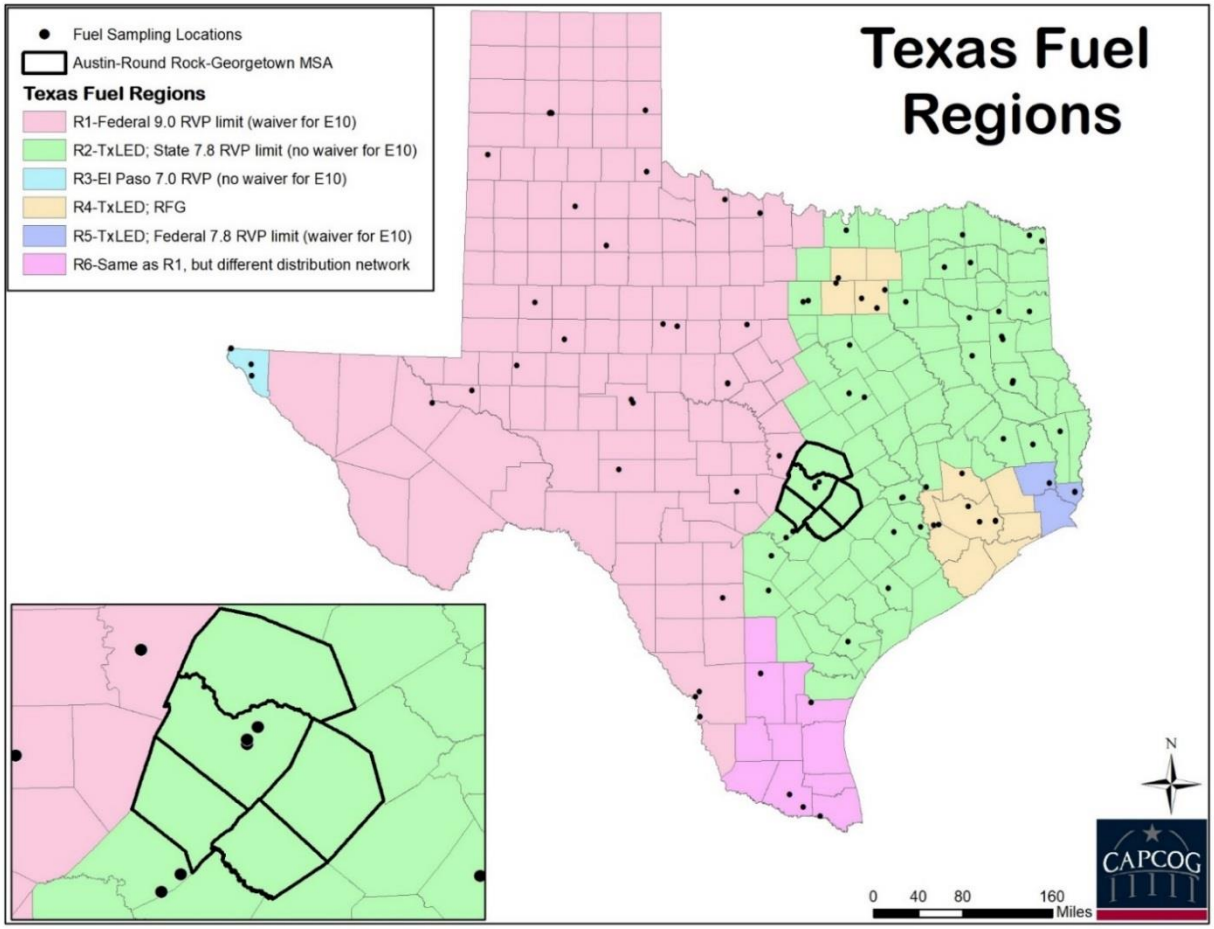


One of the other issues that arises regarding the age distribution data is that the effects of TERP grants on heavy-duty vehicle age distributions in 2017 would not be expected to be the same as they were in 2014 *or* what a straightforward age projection from 2014.

6.2.2 Gasoline Fuel Properties

TCEQ's documentation included a summary of the fuel property data used for the AERR submission. The same "fuel region" grouping that TCEQ used for other recent projects appears to have been used for this project. This grouped the five counties in the Austin-Round Rock-Georgetown MSA into a larger "fuel region" (fuel region 2, identified in the databases as fuelregionid 17801000000), which include another 91 counties in the Eastern part of the state where Reid Vapor Pressure (RVP) is limited to no more than 7.8 pounds per square inch (psi) by state law outside of the 12 counties in the Dallas-Fort Worth and Houston areas where reformulated gasoline (RFG) is required. A map of the six different "fuel regions," along with the 2017 sampling locations, is shown below.

Figure 6-2. TCEQ Texas Fuel Regions with 2017 Fuel Sampling Locations



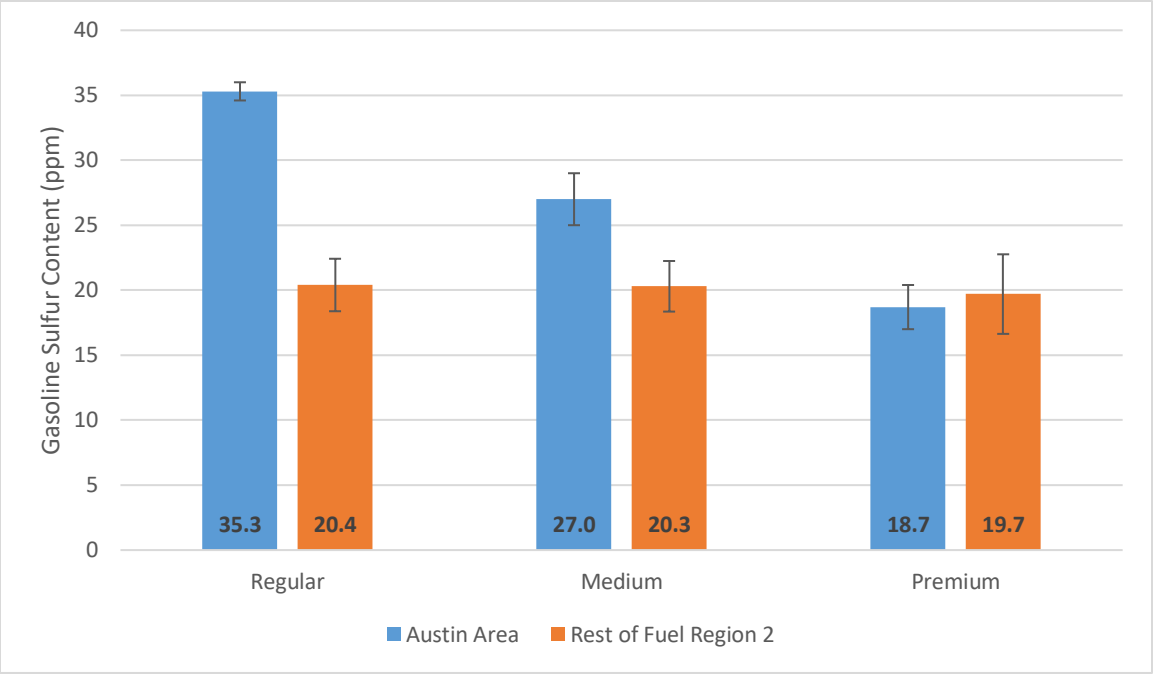
For fuel region 2, the gasoline sulfur level TCEQ used for the AERR submission was **21.28 parts per million (ppm)**.[18] Based on ERG's methodology, this involves weighting the samples based on the statewide market share for regular, medium, and premium-grade gasoline as reported to the Energy Information Administration (EIA) (86.12%, 6.42%, and 7.48%, respectively).[19]

However, the gasoline sulfur levels at the sampling locations in the Austin-Round Rock-Georgetown MSA in 2017 showed much higher sulfur levels, as shown in the table below.

[18] Note: CAPCOG calculated a slightly different 21.41 ppm average for fuel region 2 based on the available fuel sampling data.

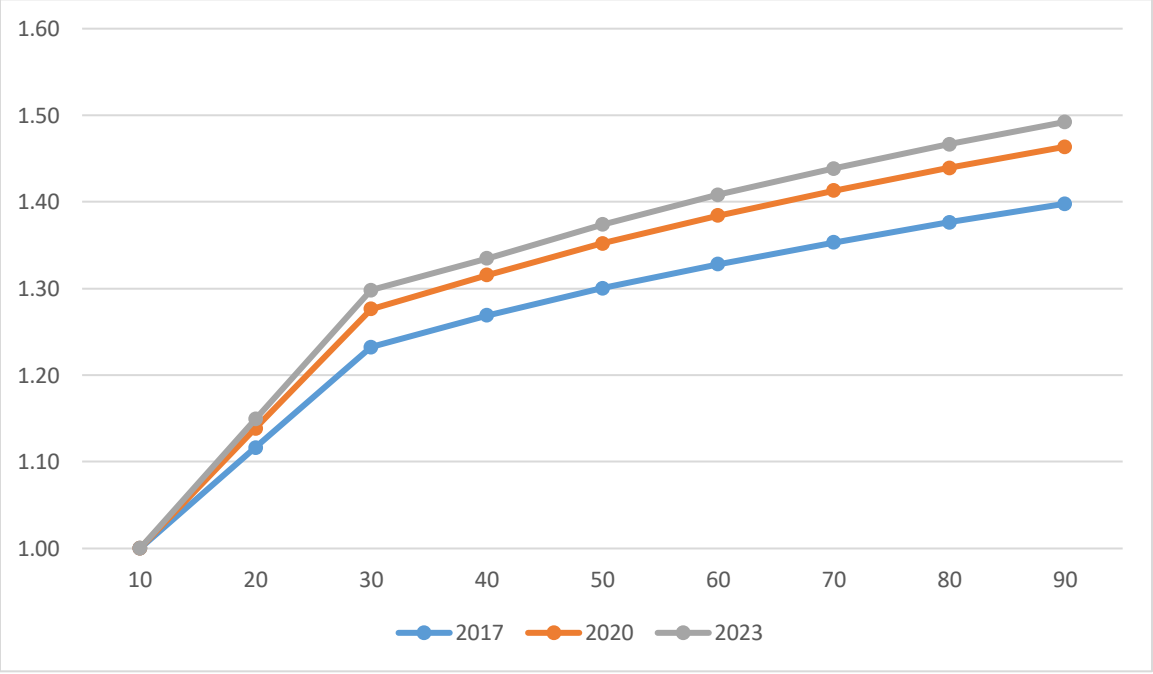
[19] EIA. "Refiner Motor Gasoline Sales Volumes." Area: Texas; Sales Type: Sales to End Users, Total; Period-Unit: Annual - Thousand Gallons Per Day. Version Release date: 8/1/2019; accessed 8/6/2019. https://www.eia.gov/dnav/pet/PET_CONS_REFMG_D_STX_VTR_MGALPD_A.htm

Figure 6-3. Comparison of Austin-Area Gasoline Sulfur Levels and 95% Confidence Intervals Compared to the Rest of Fuel Region 2



If the Austin-area sampling is aggregated separately, the resulting weighted average for the region would be **33.56 ppm**, 12.28 ppm and 37% higher than the 21.28 ppm level that is assigned to the county for the 2017 AERR.

Figure 6-4. Travis County Gasoline Vehicle NO_X Emissions in 2017, 2020, and 2023 by Sulfur Level Compared to 10 ppm



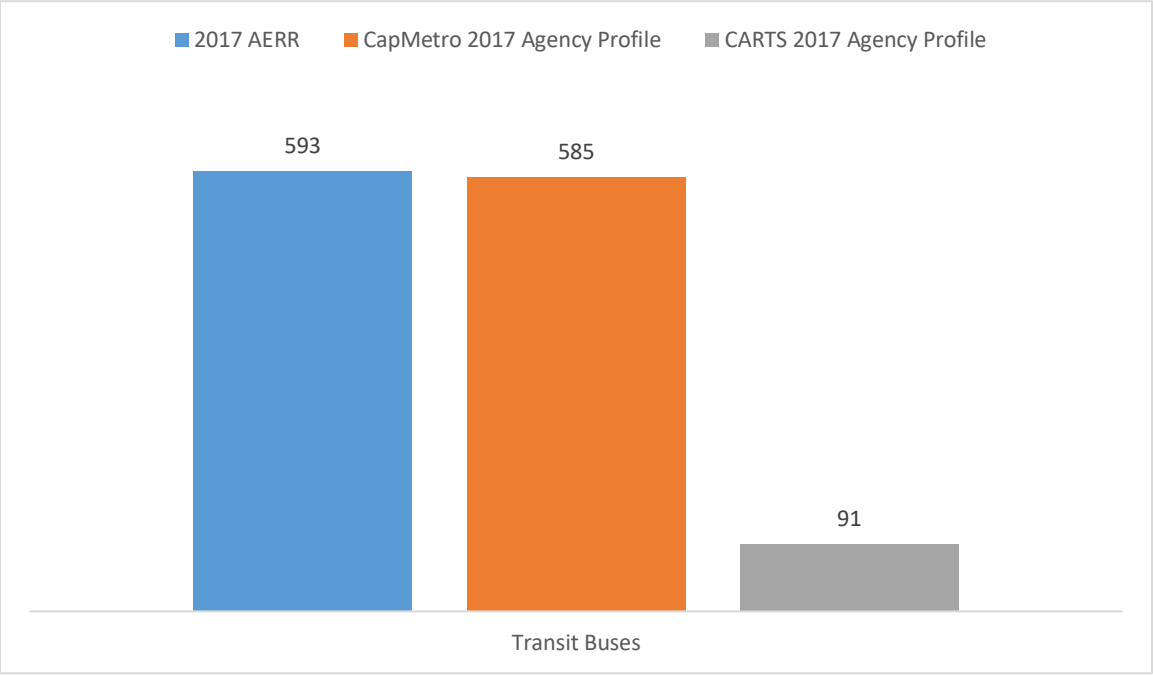
Based on this analysis, the use of Austin area-specific 33.56 ppm sulfur level would result in gasoline vehicle emissions that were approximately 10% higher than the results from using the region 2 sulfur level of 21.28 ppm in the current AERR submission.

6.2.3 Transit Buses

While not a huge source of NO_X emissions within the region, transit buses remain one aspect of the on-road inventory categorized by high degrees of uncertainty due to the use of many different default assumptions regarding the fraction of vehicles within certain weight classes that are transit buses and the age distribution of transit buses.

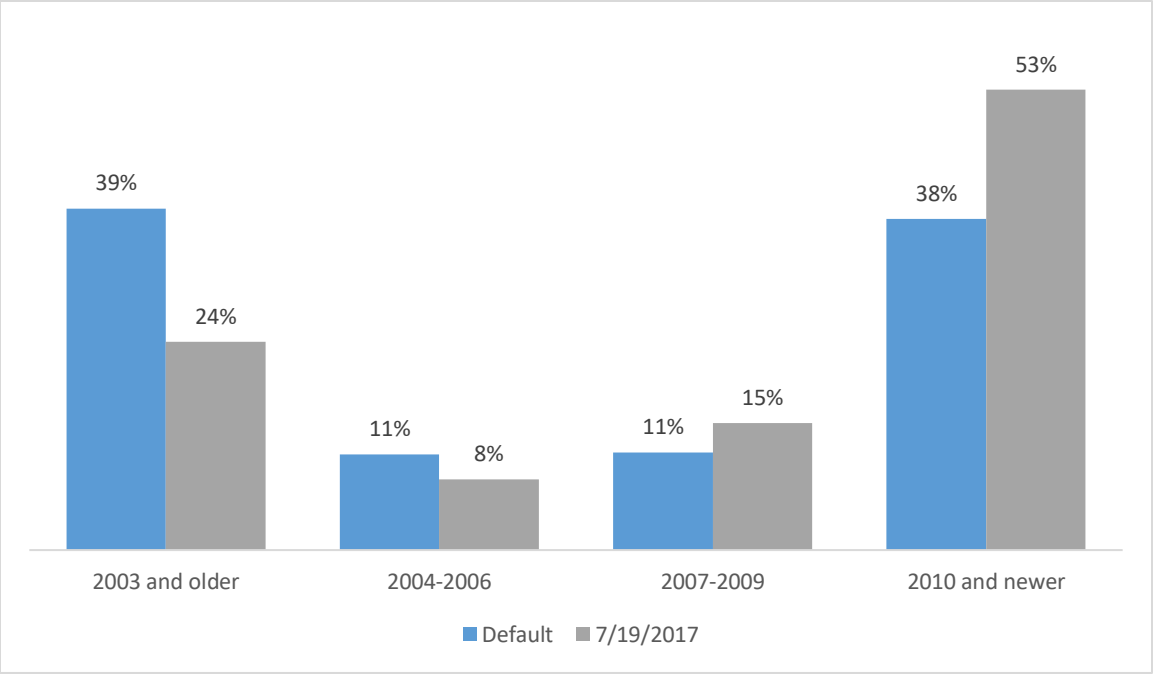
TTI's estimate for transit bus counts are generally consistent with data in the CapMetro and Capital Area Rural Transit System (CARTS) 2017 agency profiles from the National Transit Database.

Figure 6-5: 2017 Transit Bus Counts



CAPCOG obtained a spreadsheet from CapMetro listing all of the active transit buses in service as of various dates dating back to September 2016. CAPCOG analyzed data from 2017 compared to MOVES defaults, which TCEQ used for this source use type. This comparison is shown below.

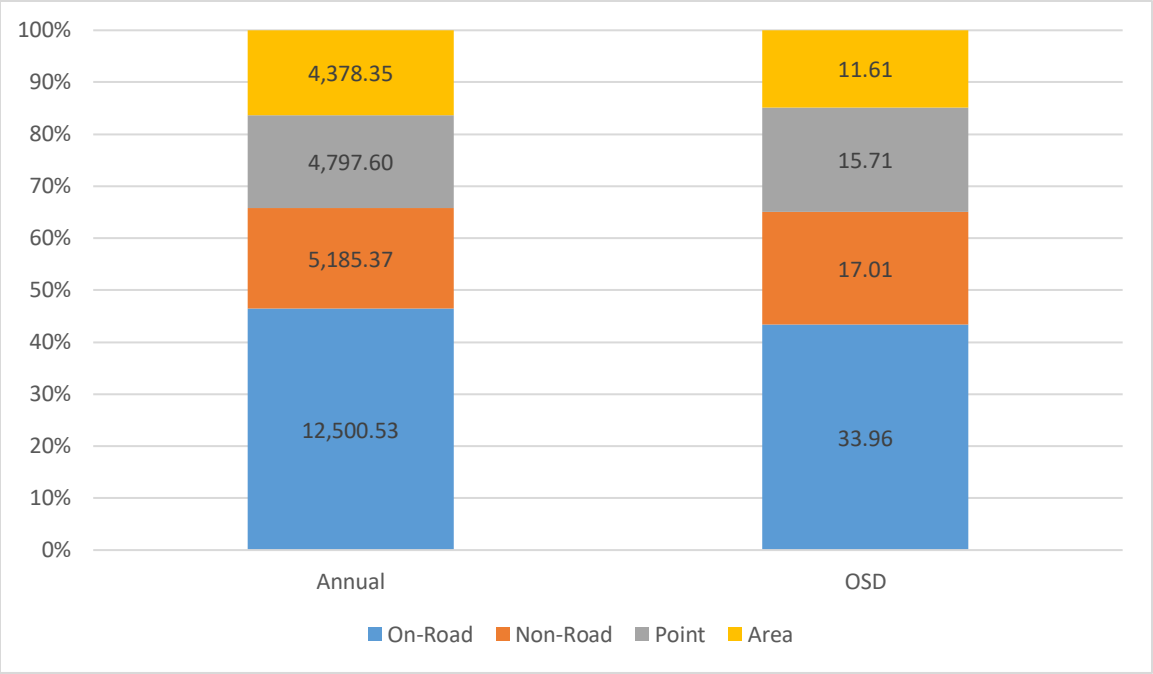
Figure 6-6. Comparison of Default 2017 Age Distribution for Transit Buses to CapMetro Age Distribution 7/19/2017



7 Ozone Season Day NO_X Emissions

Since OSD NOX emissions are the most relevant for O3 planning, understanding the extent to which different sources contribute to NO_X emissions on an annual basis versus on OSDs can be helpful. As the figure below shows, however, mobile sources made up about 65% of NO_X for both annual and OSD weekday estimates, while stationary sources made up the remaining 35%.

Figure 7-1. Comparison of 2017 Annual and OSD Weekday NO_X Emissions by Source Type



The table below shows a summary of OSD NO_X emissions by source and county.

Table 7-1. OSD NO_X Emissions by Source Type (tpd)

Source	Bastrop	Caldwell	Hays	Travis	Williamson	TOTAL
Point	3.27	0.80	6.77	4.72	0.15	**15.71**
Area	0.46	1.89	0.80	6.47	1.99	**11.61**
Non-Road	1.55	1.19	1.38	8.29	4.60	**17.01**
On-Road	2.26	1.31	4.52	18.07	7.80	**33.96**
TOTAL	**7.55**	**5.19**	**13.48**	**37.54**	**14.55**	**78.30**

8 Summary

This report provides details on the 2017 annual and OSD emissions of CO, NH_3, NO_X, Pb, PM_{10}, $PM_{2.5}$, SO_2, and VOC for Bastrop, Caldwell, Hays, Travis, and Williamson Counties and associated activity data.

- On-road sources continue to constitute the largest source of CO and NO_X;
    - In terms of VMT, starts, and gasoline sulfur levels, 2017 AERR data all tended to lead to higher NO_X emissions
    - Actual NO_X emissions would tend to be higher due to even higher sulfur levels within the Austin area relative to other areas and lower historical I/M compliance rates than is reflected in the CDBs used for TTI's estimates

    - Age distribution data assumptions could also be based on projections rather than direct 2014 data in order to more accurately reflect the dip in new vehicle purchases from 2009-2011 due to the economic recession

- Non-road sources make up the 2nd largest sources of NO_X emissions and largest source of Pb emissions;
    - Updated input data for the MOVES2014b sources (such as the 2017 Census of Agriculture) could improve estimates for these categories;
    - Improved estimates of ground support equipment (GSE) at ABIA could be developed to improve airport emissions inventories;
    - Locomotive emissions data provided by TCEQ are based on similar methods as what EPA is using for the 2017 inventories;
- Point sources make up the 3rd largest source of NO_X emissions, but the largest source of SO_2;
    - Point sources made up a larger share of the region's total NO_X emissions during O_3 season, and an even larger share on the top four O_3 days;
    - There have been significant year-to-year variations in EGU NO_X emissions from 2014-2018, with trends upwards over this time frame; and
- Area sources make up the 4th largest source of NO_f emissions, but the largest source of emissions of NH_3, PM_{10}, PM_{10}, and VOC.

Recommendations for future analysis include:

- Continued regional fuel sampling;
- Comparison of final 2017 NEI data to data submitted by TCEQ;
- Work with TCEQ to develop targeted updates to selected high-priority data for the 2nd release of the NEI after initial public release on April 30, 2020.