

Non-diesel Project Example Emissions Calculation

Non-diesel projects have a lot of leeway in the source of their emissions estimate. If the vendor you are working with can provide an emissions estimate, it is fine to use that.

For gasoline vehicles, if vendor emission estimates are not available, you can simply multiply the annual miles driven (or projected miles) by an emission factor for each of the three pollutants on the CMAQ spreadsheet. These pollutants are VOC (volatile organic compounds), NO_x (Nitrogen Oxides) and CO (Carbon Monoxide). For CO₂ (Carbon dioxide- greenhouse gases), a source of these emissions for cars is <http://www.fueleconomy.gov/>

In this example, the proposal is requesting a Global Electric Motorcar (GEM). This vehicle will replace a 1997 Ford (2WD) pick-up truck that is gasoline powered. Typically, the pick-up truck was used throughout the applicant's large campus of buildings and to go back and forth to the nearby town for supplies. It is run about 7000 miles per year.

By the end of this example, you will have the following:

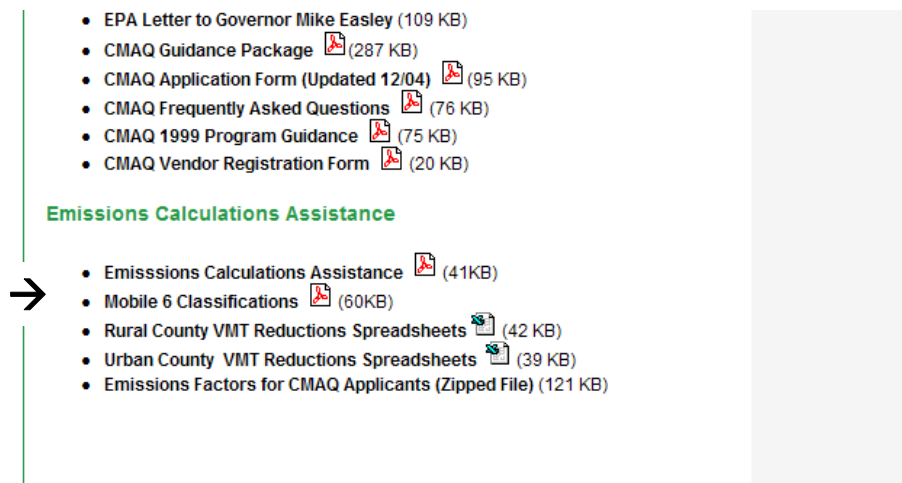
Total NO_x, VOC, CO, and CO₂ reduced and cost effectiveness.

For vehicle emissions in North Carolina:

<http://www.ncdot.org/doh/preconstruct/tpb/services/air.html>

Scroll down to the very bottom of the page where it says “**Emissions Calculations Assistance**”. We will use the various spreadsheets provided below that.

Look at “**Mobile 6 Classifications**” table first to decide what column to use in the “**Urban county VMT Reduction Spreadsheets**” or “**Rural County VMT Reduction Spreadsheets**”. The arrow on the screen shot below shows which one to click on.



The screenshot shows a list of links on a website. A green arrow points to the link 'Emissions Calculations Assistance' (41KB). The list includes:

- EPA Letter to Governor Mike Easley (109 KB)
- CMAQ Guidance Package (287 KB)
- CMAQ Application Form (Updated 12/04) (95 KB)
- CMAQ Frequently Asked Questions (76 KB)
- CMAQ 1999 Program Guidance (75 KB)
- CMAQ Vendor Registration Form (20 KB)

Emissions Calculations Assistance

- Emissions Calculations Assistance (41KB)
- Mobile 6 Classifications (60KB)
- Rural County VMT Reductions Spreadsheets (42 KB)
- Urban County VMT Reductions Spreadsheets (39 KB)
- Emissions Factors for CMAQ Applicants (Zipped File) (121 KB)

Once you click on the link, it returns the following table:

Appendix B
MOBILE6 Input Data Format Reference Tables

Table 3: Complete MOBILE6 Vehicle Classifications

No	Abbreviation	Description
1	LDGV	Light-Duty Gasoline Vehicles (Passenger Cars)
2	LDGT1	Light-Duty Gasoline Trucks 1 (0-6,000 lbs. GVWR, 0-3750 lbs. LVW)
3	LDGT2	Light-Duty Gasoline Trucks 2 (0-6,000 lbs. GVWR, 3751-5750 lbs. LVW)
4	LDGT3	Light-Duty Gasoline Trucks 3 (6,001-8,500 lbs. GVWR, 0-5750 lbs. ALVW)
5	LDGT4	Light-Duty Gasoline Trucks 4 (6,001-8,500 lbs. GVWR, 5751 lbs. and greater ALVW)
6	HDBGV2B	Class 2b Heavy-Duty Gasoline Vehicles (8501-10,000 lbs. GVWR)
7	HDBGV3	Class 3 Heavy-Duty Gasoline Vehicles (10,001-14,000 lbs. GVWR)
8	HDBGV4	Class 4 Heavy-Duty Gasoline Vehicles (14,001-16,000 lbs. GVWR)
9	HDBGV5	Class 5 Heavy-Duty Gasoline Vehicles (16,001-19,500 lbs. GVWR)
10	HDBGV6	Class 6 Heavy-Duty Gasoline Vehicles (19,501-26,000 lbs. GVWR)
11	HDBGV7	Class 7 Heavy-Duty Gasoline Vehicles (26,001-33,000 lbs. GVWR)
12	HDBGV8A	Class 8a Heavy-Duty Gasoline Vehicles (33,001-60,000 lbs. GVWR)
13	HDBGV8B	Class 8b Heavy-Duty Gasoline Vehicles (>60,000 lbs. GVWR)
14	LDDV	Light-Duty Diesel Vehicles (Passenger Cars)
15	LDDT12	Light-Duty Diesel Trucks 1 and 2 (0-6,000 lbs. GVWR)
16	HDDV2B	Class 2b Heavy-Duty Diesel Vehicles (8501-10,000 lbs. GVWR)
17	HDDV3	Class 3 Heavy-Duty Diesel Vehicles (10,001-14,000 lbs. GVWR)
18	HDDV4	Class 4 Heavy-Duty Diesel Vehicles (14,001-16,000 lbs. GVWR)
19	HDDV5	Class 5 Heavy-Duty Diesel Vehicles (16,001-19,500 lbs. GVWR)
20	HDDV6	Class 6 Heavy-Duty Diesel Vehicles (19,501-26,000 lbs. GVWR)
21	HDDV7	Class 7 Heavy-Duty Diesel Vehicles (26,001-33,000 lbs. GVWR)
22	HDDV8A	Class 8a Heavy-Duty Diesel Vehicles (33,001-60,000 lbs. GVWR)
23	HDDV8B	Class 8b Heavy-Duty Diesel Vehicles (>60,000 lbs. GVWR)
24	MC	Motorcycles (Gasoline)

The truck described would be a LDGT1 or LDGT2

***** We decide it is a LDGT1 = Light-Duty Gasoline Trucks 1

So we look at the “LDGT1” column in the “**Urban County VMT Reductions Spreadsheets**”

- EPA Letter to Governor Mike Easley (109 KB)
- CMAQ Guidance Package (287 KB)
- CMAQ Application Form (Updated 12/04) (95 KB)
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If your project has several vehicles, you may use the combined VMT and use the “**ALL VEH**” column. First decide how much of the pick-up truck vehicle miles traveled (VMT) is rural or urban

*****We decided that it was urban. Those spreadsheets look like this:

Urban NO_x (Some columns are omitted)

Description	Pol Name	LDGV	LDGT1	LDGT2	LDGT3	LDGT4	HDGV2B	HDGV3	HDGV4	HDGV5	HDGV6	HDGV7	HDGV8A	ALL VEH	Avg Spd
Rural interstate	NOX	0.369	0.442	0.629	0.670	0.934	2.192	2.270	2.674	2.564	2.511	2.845	3.241	2.457	65
Rural principle arterial	NOX	0.362	0.433	0.617	0.658	0.919	2.123	2.198	2.590	2.483	2.432	2.755	3.139	1.312	60
Rural minor arterial	NOX	0.348	0.413	0.592	0.632	0.890	1.972	2.042	2.406	2.307	2.259	2.559	2.916	0.942	49
Rural major collector	NOX	0.343	0.406	0.583	0.623	0.880	1.916	1.984	2.337	2.241	2.194	2.486	2.832	0.813	45
Rural minor collector	NOX	0.342	0.405	0.581	0.621	0.877	1.903	1.971	2.321	2.226	2.180	2.470	2.814	0.805	44
Rural local	NOX	0.342	0.405	0.581	0.621	0.877	1.903	1.971	2.321	2.226	2.180	2.470	2.814	0.793	44
Urban interstate	NOX	0.364	0.435	0.620	0.660	0.922	2.138	2.214	2.608	2.501	2.449	2.774	3.160	1.554	61
Urban freeway	NOX	0.367	0.438	0.624	0.665	0.928	2.166	2.243	2.642	2.533	2.481	2.811	3.202	1.210	63
Urban principle arterial	NOX	0.339	0.401	0.577	0.616	0.873	1.876	1.943	2.289	2.195	2.149	2.435	2.774	0.772	42
Urban minor arterial	NOX	0.339	0.401	0.577	0.616	0.873	1.876	1.943	2.289	2.195	2.149	2.435	2.774	0.700	42
Urban collector	NOX	0.335	0.394	0.568	0.607	0.863	1.807	1.872	2.205	2.114	2.070	2.346	2.672	0.652	37
Urban local	NOX	0.335	0.395	0.569	0.609	0.865	1.821	1.886	2.221	2.130	2.086	2.364	2.692	0.725	38

Urban CO (Some columns are omitted)

Description	Pol Name	LDGV	LDGT1	LDGT2	LDGT3	LDGT4	HDGV2B	HDGV3	HDGV4	HDGV5	HDGV6	HDGV7	HDGV8A	ALL VEH	Avg Spd
Rural interstate	CO	11.445	15.035	16.032	14.810	15.125	10.522	11.494	14.430	13.591	13.212	14.986	16.613	10.909	65
Rural principle arterial	CO	11.111	14.623	15.592	14.361	14.671	8.636	9.434	11.844	11.155	10.844	12.300	13.636	11.868	60
Rural minor arterial	CO	10.381	13.723	14.630	13.381	13.677	6.822	7.451	9.355	8.811	8.565	9.715	10.770	11.293	49
Rural major collector	CO	10.108	13.386	14.270	13.015	13.306	6.643	7.256	9.109	8.580	8.341	9.460	10.488	11.245	45
Rural minor collector	CO	10.047	13.311	14.190	12.933	13.223	6.670	7.286	9.147	8.615	8.375	9.499	10.531	11.190	44
Rural local	CO	10.047	13.311	14.190	12.933	13.223	6.670	7.286	9.147	8.615	8.375	9.499	10.531	11.226	44
Urban interstate	CO	11.182	14.711	15.686	14.456	14.767	9.038	9.873	12.395	11.674	11.349	12.872	14.270	11.615	61
Urban freeway	CO	11.318	14.878	15.864	14.639	14.952	9.804	10.709	13.445	12.663	12.310	13.963	15.479	12.484	63
Urban principle arterial	CO	9.916	13.150	14.018	12.758	13.046	6.729	7.350	9.228	8.691	8.449	9.583	10.624	11.110	42
Urban minor arterial	CO	9.916	13.150	14.018	12.758	13.046	6.729	7.350	9.228	8.691	8.449	9.583	10.624	11.313	42
Urban collector	CO	9.583	12.739	13.580	12.311	12.593	7.104	7.760	9.743	9.176	8.920	10.118	11.217	11.043	37
Urban local	CO	9.650	12.822	13.667	12.400	12.684	6.995	7.641	9.593	9.035	8.784	9.963	11.045	10.929	38

Urban VOC (Some columns are omitted)

Description	PoI Name	LDGV	LDGT1	LDGT2	LDGT3	LDGT4	HDGV2B	HDGV3	HDGV4	HDGV5	HDGV6	HDGV7	HDGV8A	ALL
Rural interstate	VOC	0.397	0.624	0.655	0.587	0.623	0.507	0.706	1.199	0.955	0.920	1.012	1.186	0.4
Rural principle arterial	VOC	0.402	0.631	0.662	0.594	0.630	0.510	0.707	1.202	0.957	0.922	1.014	1.188	0.5
Rural minor arterial	VOC	0.418	0.653	0.683	0.614	0.651	0.537	0.732	1.243	0.986	0.950	1.044	1.225	0.5
Rural major collector	VOC	0.426	0.662	0.693	0.623	0.660	0.555	0.748	1.269	1.005	0.969	1.065	1.250	0.5
Rural minor collector	VOC	0.428	0.664	0.695	0.625	0.662	0.560	0.754	1.276	1.011	0.975	1.071	1.257	0.5
Rural local	VOC	0.428	0.664	0.695	0.625	0.662	0.560	0.754	1.276	1.011	0.975	1.071	1.257	0.5
Urban interstate	VOC	0.401	0.629	0.660	0.592	0.628	0.509	0.707	1.202	0.957	0.922	1.014	1.188	0.5
Urban freeway	VOC	0.399	0.627	0.657	0.589	0.625	0.508	0.706	1.200	0.956	0.921	1.013	1.187	0.5
Urban principle arterial	VOC	0.433	0.669	0.700	0.629	0.667	0.572	0.765	1.292	1.024	0.987	1.085	1.273	0.5
Urban minor arterial	VOC	0.433	0.669	0.700	0.629	0.667	0.572	0.765	1.292	1.024	0.987	1.085	1.273	0.5
Urban collector	VOC	0.446	0.682	0.713	0.642	0.680	0.607	0.799	1.343	1.063	1.025	1.127	1.323	0.5
Urban local	VOC	0.443	0.680	0.710	0.639	0.677	0.599	0.791	1.331	1.054	1.016	1.118	1.311	0.5

*****We decide that we drive 100% urban minor arterial
 So we multiply our VMT=7000 miles/year x the emission factor for that road type for each pollutant is as follows:

Chose the correct Emission Factor for each pollutant

Pollutant	NO _x (g/mile)	VOC (g/mile)	CO (g/mile)
Emission Factor (urban minor arterial for LDGT1)	.401	.669	13.150

Multiply each emission factor by the number of miles per day

Pollutant	NO _x (g/year)	VOC (g/year)	CO (g/year)
Emission Reductions (g/year)	.401 x 7000 = 2,807	.669 x 7000 = 4,683	13.150 x 7000 = 92,050

Convert from gram/year to tons per year (I typed it into Goggle)

Pollutant	NO _x (tons/year)	VOC (tons/year)	CO (tons/year)
Convert to tons/yr	3 x 10 ⁻³	5 x 10 ⁻³	0.1

You must use another source to determine CO₂ emissions. <http://www.fueleconomy.gov/> provides them for many makes and models of cars and light duty trucks without doing any calculations! See the screen shot below for the Ford pick up:

The screenshot shows the 'Best and Worst MPG' section of the fueleconomy.gov website. It lists several Ford F150 Pickup 2WD models with the following data:

Model	City MPG	Hwy MPG	Estimated Annual Fuel Cost	Carbon Footprint (tons/yr of CO ₂)	Score
Ford F150 Pickup 2WD 6 cyl, 4.2 L, Automatic 4-spd, (FFS), Regular	15	20	\$2346	10.8	NA
Ford F150 Pickup 2WD 6 cyl, 4.2 L, Manual 5-spd, (FFS), Regular	15	20	\$2346	10.8	NA
Ford F150 Pickup 2WD 8 cyl, 4.6 L, Automatic 4-spd, (FFS), Regular	14	20	\$2494	11.4	NA
Ford F150 Pickup 2WD 8 cyl, 4.6 L, Manual 5-spd, (FFS), Regular	14	20	\$2494	11.4	NA

So the Ford F150 Pick-up 2wd emits 10.8 tons per year of CO₂

Pollutant	NOx (tons/year)	VOC (tons/year)	CO (tons/year)	CO2 (tons/year)	Total
Total emissions	3×10^{-3}	5×10^{-3}	.1	10.8	10.9

You assume the emissions for the GEM that will replace the pick up truck is 0 tons/year. So:

10.9 tons/year – 0 = 10.9 tons /year reduced. If we assume the GEM will be in use for at least 3 years (battery packs typically need to be replaced every 2-3 years.) the total emissions reduction would be 32.7 tons (10.9 tons/year*3 years).

Cost Effectiveness for the Project

If the GEM costs \$8,000 and you request the full amount from DAQ:

Cost Effectiveness of the Project = \$ DAQ requested / total tons of pollution reduced

\$8,000/32.7 tons = \$244 /tons reduced pollution