



Mecklenburg County 2014 Fleet Inventory

Prepared by Mecklenburg County Air Quality

May 2015

(Revised July 2015)

Mecklenburg County Air Quality (MCAQ) conducts an inventory of County owned on-road vehicles and non-road equipment to determine the amount of nitrogen oxide (NO_x) emissions, a precursor to ground-level ozone, that originate from the fleet. This report highlights NO_x emission results for calendar year 2014. The table below is a summary of County fleet NO_x emissions from 2009 through 2014, showing the reduction in NO_x emissions across the fleet.

On-Road Fleet	2009	2010	2011	2012	2013	2014
NO _x Emissions (tons)	6.8	5.3	6.6	5.7	4.7	3.8
Miles driven (millions)	10.2	9.9	10.7	9.7	9.9	9.3
Vehicle Population	1091	1165	1050	1127	1198	1150
Non-Road Fleet	2009	2010	2011	2012	2013	2014
NO _x Emissions (tons)	49.2	45.3	42.5	32.3	26.5	23.5
Hours of Operations	104,395	51,690	38,522	49,885	40,596	39,302
Vehicle Population	120	120	128	124	125	121
Combined Fleet	2009	2010	2011	2012	2013	2014
NO _x Emissions (tons)	56.1	50.6	49.1	38.0	31.2	27.3
% NO_x Reduction from 2009 Baseline		10%	12%	32%	44%	51%

Fleet information and annual usage data is provided by individual County divisions and Asset and Facilities Management (AFM). The quality of the inventory is reliant upon the accuracy of the equipment data provided to MCAQ by the County divisions who operate the equipment. Emissions are calculated by multiplying the vehicle specific emission factor (EF) by the number of vehicle miles traveled (VMT) for on-road vehicles, or operation hours and brake-horsepower for non-road equipment, during the calendar year.

Analysis of 2014 County fleet emissions produced the following findings.

On-Road Fleet:

- In 2014, ozone-forming NO_x emissions by Mecklenburg County's on-road fleet decreased by 19% compared to 2013, down to 3.8 tons. This decrease in on-road emissions can be attributed to three main factors;
 - A 4% decrease in the amount of vehicles driven during calendar year 2014 as compared to 2013.
 - Those vehicles that were driven traveled 6% less total miles for 2014 as compared to 2013, and;
 - The attrition of older, dirtier operating vehicles combined with the procurement of new, cleaner operating vehicles; 19% of on-road vehicles are 2014 or 2015 models.

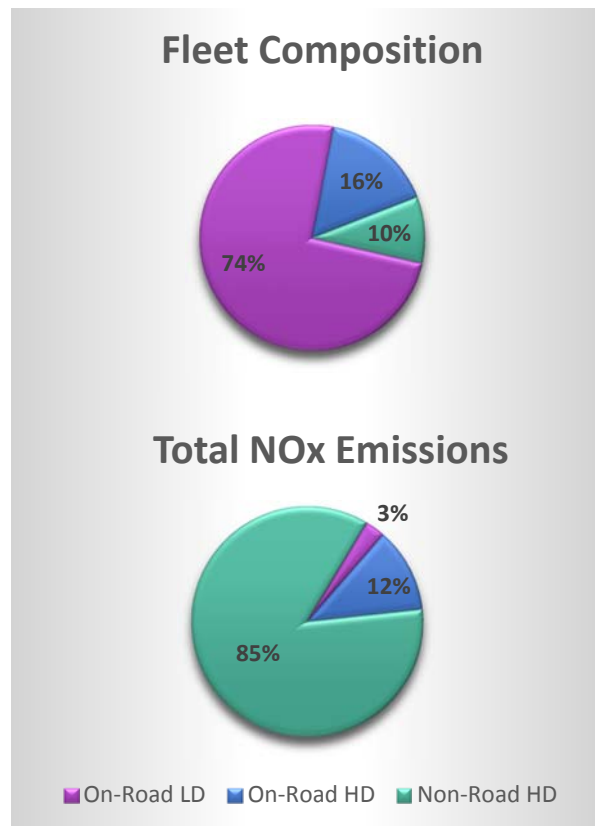
- On-road fleet vehicles are averaging less NO_x emissions for each mile driven. NO_x emissions per mile driven decreased to 0.37 grams/mile in 2014 compared to 0.61 grams/mile in 2009.
- 90% of the on-road NO_x emissions were generated from heavy-duty (HD) vehicles, which comprise only 19% of the County on-road fleet. Light-duty (LD) vehicles make up the majority of the on-road fleet but emit far less NO_x.

Non-Road Fleet:

- The overall NO_x emissions from County owned non-road fleet in 2014 decreased to 23.5 tons. This 11% decrease in non-road emissions can be attributed to three main factors:
 - A 3% decrease in the amount of equipment operated in 2014 compared to 2013.
 - The equipment operated in 2014 had a 3% reduction in overall usage hours.
 - Efforts by all divisions to retire older, lower tier engines and purchase newer higher tier engines, when needed.
- Of the top 20 NO_x producing equipment in 2014, all have a tier 2 engine or cleaner. Seven of the top twenty NO_x producers are tier 4 certified, meaning they are the cleanest engines currently available. See Appendix C.
- While most of the County's non-road NO_x emissions come from equipment operated by the Solid Waste Division, their equipment has the lowest emission rate per bhp-hr and they continue to reduce their overall NO_x emissions year after year.

Combined Fleet:

- In 2014, fleet NO_x emissions were 51% less than emissions from the baseline year 2009. Emissions from both the on-road and non-road fleets have decreased by approximately half, showcasing the efforts made by County Departments to reduce their emissions from each fleet sector.
- The non-road fleet emitted a larger portion of NO_x emissions compared to on-road, while having a smaller population of equipment. This is due to the HD diesel engines used in non-road equipment polluting at a higher rate than on-road vehicel engines.
- Nearly 92% of fleet NO_x emissions came from one County Department, Land Use and Environmental Sevices Agency (LUESA), which includes Solid Waste, Water and Land Resources, Air Quality,



Geospatial Information Services and Code Enforcement. These divisions require daily field work and often times heavy duty vehicles and equipment to conduct their core job duties. LUESA therefore, has the largest number of vehicles and non-road equipment with the highest VMT and operating hours of all County Departments.

Discussion:

The County should continue to consider the following factors when evaluating fleet vehicles and equipment to pursue NOx emission reductions.

- Evaluate the replacement schedule and usage of heavy duty vehicles and non-road equipment, which contribute a disproportionate amount of NOx emissions in the County's inventory.
- Right-size vehicles and equipment so employees are using the most efficient model to perform the required job.
- Retire older vehicles and equipment, and replace them (if necessary) with newer, cleaner vehicles.
- Optimize trip/service areas to reduce travel distance between required service calls.
- Allocate the cleanest vehicles to the drivers who travel the most miles each year.

While there are still opportunities to reduce fleet emissions, significant, rapid emission reductions will become less feasible to achieve in the future.

- The County currently has a fairly clean fleet: 36% of the on-road fleet is less than 5 years old and 29% of the non-road fleet is at least a tier 3. Given the smaller emission footprint of the County fleet, there is less opportunity for emission reductions on the same scale as past reductions, given currently available technology.
- Significant financial resources will have to be used to upgrade higher-emission nonroad equipment, but since much of this equipment is already relatively clean, these upgrades will result in less significant emission reductions. In other words, NOx emission reductions will become more expensive per ton reduced than they have been previously.
- Although new federal standards going into effect in 2017 will reduce emissions from on-road vehicles, the new standards will not impact non-road equipment, which is the County's largest source of NOx.

The attached appendices show the top 20 highest NOx emitting vehicles and equipment for each fleet sector. MCAQ will assist individual County Department and Divisions with identifying strategies to reduce emissions from these vehicles.

Appendix A: Top 20 Light-Duty On-Road Vehicles

EQUIP #	Full Description	YEAR	VEHICLE MAKE	MODEL	FUEL TYPE	Class	VMT for 2014	NOx EF (g/mi)	NOx Emissions (tons)
4196	Business and Financial Management	2006	Chevrolet	C-1500	Gasoline	LD	18826	0.60	0.0125
4193	Park and Recreation -East	2006	Chevrolet	C-1500	Gasoline	LD	14600	0.60	0.0097
4121	LUESA - Code Enforcement	2006	Chevrolet	Colorado	Gasoline	LD	27626	0.30	0.0091
3974	Park and Recreation	2004	Chevrolet	C-1500	Gasoline	LD	13802	0.60	0.0091
3683	Park and Recreation - Park Repair	2001	Chevrolet	K-1500	Gasoline	LD	8432	0.98	0.0091
3972	Park and Recreation	2004	Chevrolet	C-1500	Gasoline	LD	10973	0.60	0.0073
3968	Park and Recreation	2004	Chevrolet	C-1500	Gasoline	LD	10541	0.60	0.0070
3587	LUESA - Code Enforcement	2000	Chevrolet	C-1500	Gasoline	LD	6351	0.98	0.0069
3962	LUESA - Code Enforcement	2004	Chevrolet	C-1500	Gasoline	LD	10372	0.60	0.0069
3824	Sheriff - WRRRC	2002	Ford	Crown Victoria	Gasoline	LD	19433	0.30	0.0064
3601	LUESA - Air Quality - Lab	2000	Chevrolet	G-1500	Gasoline	LD	3805	1.53	0.0064
4130	LUESA - Code Enforcement	2006	Chevrolet	Colorado	Gasoline	LD	18941	0.30	0.0063
4126	LUESA - Code Enforcement	2006	Chevrolet	Colorado	Gasoline	LD	18640	0.30	0.0062
4132	LUESA - Code Enforcement	2006	Chevrolet	Colorado	Gasoline	LD	17640	0.30	0.0058
4100	LUESA - Code Enforcement	2005	Chevrolet	Trail Blazer	Gasoline	LD	26300	0.20	0.0058
3684	Park and Recreation - NR/CONS	2001	Chevrolet	K-1500	Gasoline	LD	5366	0.98	0.0058
4421	Park and Recreation - Admin.	2007	Ford	E-150	Gasoline	LD	5715	0.90	0.0057
4191	Park and Recreation - North	2006	Chevrolet	C-1500	Gasoline	LD	8307	0.60	0.0055
4386	Park and Recreation	2007	Ford	F-150	Gasoline	LD	23677	0.20	0.0052
4035	Sheriff - WRRRC	2004	Chevrolet	Tahoe	Gasoline	LD	7490	0.60	0.0050

Appendix B: Top 20 Heavy-Duty On-road Vehicles

Equip #	Department - Description	Year	Vehicle Make	Model	Fuel Type	Class	VMT for 2014	NOx EF (g/mi)	NOx Emissions (tons)
825	LUESA - Solid Waste - Recycling	2001	Freight.	D13	Diesel	HD	21,075	11.21	0.260
826	LUESA - Solid Waste - Recycling	2003	Volvo	VED12	Diesel	HD	31,267	7.27	0.251
828	LUESA - Solid Waste - Recycling	2005	Mack	CV713	Diesel	HD	25,268	8.48	0.236
833	LUESA - Solid Waste - Recycling	2009	Volvo	D13	Diesel	HD	41,178	3.33	0.151
9816	LUESA - Storm Water Operations	1986	Freightliner	Tandem Dump	Diesel	HD	6,528	15.96	0.115
827	LUESA - Solid Waste - Compost	2005	Freight.	M2112	Diesel	HD	10,711	7.32	0.086
829	LUESA - Solid Waste - Recycling	2007	Volvo	VED12	Diesel	HD	27,459	2.64	0.080
824	LUESA - Solid Waste - Recycling	2000	Freightliner	FL80	Diesel	HD	6,062	11.51	0.077
9817	LUESA - Storm Water Operations	1986	Freightliner	Tandem Dump	Diesel	HD	3,847	15.96	0.068
3990	DSS - Services for Adults	2004	Ford	E-450	Gasoline	HD	17,856	3.18	0.063
4113	LUESA - Water & Land Resources	1996	GMC	Top Kick Dump	Diesel	HD	4,172	12.42	0.057
4027	PARK & RECREATION - Park Repair	2005	Ford	F-450	Diesel	HD	13,100	3.50	0.051
4016	PARK & RECREATION - Park Repair	2005	Freightliner	M2106	Diesel	HD	5,813	7.32	0.047
4031	PARK & RECREATION - Central III	2005	Chevrolet	C-3500 C/C	Diesel	HD	13,734	3.00	0.045
890	LUESA - Storm Water Operations	1989	Ford	F-800 Dump	Diesel	HD	2,730	14.10	0.042
830	LUESA - Solid Waste - Compost	2007	GMC	TC8C042	Diesel	HD	19,157	1.93	0.041
914	LUESA - Solid Waste - Compost	2009	GMC	TC7C042	Diesel	HD	10,618	3.28	0.038
4153	PARK & RECREATION - East	2006	Chevrolet	C-3500 C/C	Diesel	HD	11,958	2.88	0.038
4616	LUESA - Storm Water Operations	2009	Sterling	Tandem Dump	Diesel	HD	9,445	3.09	0.032
4029	PARK & RECREATION - Turf/Irrigation	2005	Chevrolet	C-3500 C/C	Diesel	HD	9,651	3.00	0.032

Appendix C: Top 20 Heavy-Duty Non-Road Equipment

Department	Equipment Description/ID	Model Year	Emission Tier	Engine Hp	Fuel Type	Hours Operated	NOx EF (g/bhp-hr)	NOx Emissions (tons)
Solid Waste	SWZ937 Diamond Z 1460b-45	2011	4	1000	Diesel	1053	2.6	3.02
Solid Waste	SWZ938 Diamond Z 1460B-46	2011	4	1000	Diesel	845	2.6	2.42
Solid Waste	Compactor Cat 826G	2004	2	380	Diesel	1225	4.56	2.34
Solid Waste	SWL 227 Loader Volvo L70F	2011	3	169	Diesel	1918	2.85	1.02
Solid Waste	SWL 218 Loader John Deere 544J	2007	3	149	Diesel	1732	2.85	0.81
Solid Waste	SWL 224 Volvo L70F	2011	3	150	Diesel	1686	2.85	0.79
Solid Waste	Compactor Cat 826H	2012	4	425	Diesel	1085	1.49	0.76
Solid Waste	SWL 221 Wheel Loader John Deere 544J	2008	3	149	Diesel	1513	2.85	0.71
Solid Waste	Excavator Komatsu 300-7	2007	3	184	Diesel	1212	2.85	0.70
Solid Waste	Dozer Cat D6TWH	2011	4	227	Diesel	1822	1.49	0.68
Solid Waste	Off-road Truck Volvo A30 F	2012	4	315	Diesel	1214	1.49	0.63
Solid Waste	SWZ934 Screener McCloskey 621RE	2006	2	170	Diesel	714	4.65	0.62
Solid Waste	SWZ932 Screener Power Screen 1600	2005	2	170	Diesel	707	4.65	0.62
Solid Waste	SWL 223 Volvo L70F	2011	3	150	Diesel	1239	2.85	0.58
Solid Waste	Dozer Cat D7R	2004	2	258	Diesel	437	4.65	0.58
Solid Waste	SWL 222 Wheel Loader John Deere 544J	2008	3	149	Diesel	1201	2.85	0.56
Solid Waste	SWL226 Loader John Deere 644K	2013	4	180	Diesel	1888	1.49	0.56
Solid Waste	SWL220 Loader John Deere 444J	2008	3	149	Diesel	1178	2.85	0.55
Solid Waste	SWT 504 Cat 320 D	2011	3	147	Diesel	1065	2.85	0.49
Solid Waste	Dozer Cat D6TLGP	2011	4	227	Diesel	1296	1.49	0.48