Appendix H: Estimation of Vehicle Starts for CO Analysis

A component of the emissions rates for each functional class is an estimate of the start-based emissions. This rate is based on an assumed number of starts per vehicle and is added to running emissions to produce a single rate to apply to vehicle miles traveled. Mobile 6 defaults are 7.28 starts for passenger cars and 8.06 starts for light duty trucks.

Mobile6 Defaults Vehicle type	# of starts
1 (LDGV)	7.28
2 (LDGT1)	8.06
3 (LDGT2)	8.06
4 (LDGT3)	8.06
5 (LDGT4)	8.06
6 (HDGV2B)	6.88
14 (LDDV)	7.28
15 (LDDT12)	8.06
24 (MC)	1.35
28 (LDDT34)	8.06

However, the use of default rates isn't the best practice for heavily urbanized area with an updated Travel Demand model. Area specific rates could be calculated by dividing the total number of trips from the travel demand model by the total number of registered vehicles. Therefore, the following process was used to derive more appropriate vehicle starts assumptions for the Metrolina Region:

- Step One: DMV Vehicle Registration data were obtained for calendar years 1990-2007. Projections to 2015 and other horizon years were done using the 1990-2007 data.
- Step Two: Total Trips by year for each county are broken down by Base, Commercial vehicles and IX-XI (Internal /External and External/Internal). External-Internal or Internal –External travel is defined as having one trip end external to the modeled area. Therefore, only half of these trips need to be included as having a start in the modeled area. Truck numbers were subtracted from the total number of trips. Furthermore, during the mode choice step these PERSON trips are split into AUTO trips and TRANSIT trips. Since there is not a specific "nest" in the mode choice model for motorcycle trips, these trips are treated as AUTO trips. The travel survey data is generally not robust enough to draw any conclusions about the proportion of the auto trips that are actually motorcycle trips. Therefore, it was decided that the cleanest approach is to leave MC trips in the total trips and number of MC in the number of Registered vehicles. The Sum includes all Auto (not transit) trips including LDV, LDT, MC and all other trips except the Commercial vehicles and Internal-external trips.
- Step Three- Results from Step Two were divided by Step One to calculate Trips/Vehicle values.

STARTS BY COUNTY/YEAR/VEHICLE CLASS USING DMV DATA

MECKLENBURG COUNTY

Class	2002	2010	2015	2025	2035
1	6.48	6.57	6.58	6.53	6.42

2	6.48	6.57	6.58	6.53	6.42
3	6.48	6.57	6.58	6.53	6.42
4	6.48	6.57	6.58	6.53	6.42
5	6.48	6.57	6.58	6.53	6.42
6	6.88	6.88	6.88	6.88	6.88
14	6.48	6.57	6.58	6.53	6.42
15	6.48	6.57	6.58	6.53	6.42
24	1.35	1.35	1.35	1.35	1.35
28	6.48	6.57	6.58	6.53	6.42

GASTON COUNTY

Class	2002	2010	2015	2025	2035
1	5.46	5.59	5.95	6.58	6.98
2	5.46	5.59	5.95	6.58	6.98
3	5.46	5.59	5.95	6.58	6.98
4	5.46	5.59	5.95	6.58	6.98
5	5.46	5.59	5.95	6.58	6.98
6	6.88	6.88	6.88	6.88	6.88
14	5.46	5.59	5.95	6.58	6.98
15	5.46	5.59	5.95	6.58	6.98
24	1.35	1.35	1.35	1.35	1.35
28	5.46	5.59	5.95	6.58	6.98

5-COUNTY (LESS IREDELL)

Class	2002	2010	2015	2025	2035
1	4.81	4.9	5.15	5.42	5.62
2	4.81	4.9	5.15	5.42	5.62
3	4.81	4.9	5.15	5.42	5.62
4	4.81	4.9	5.15	5.42	5.62
5	4.81	4.9	5.15	5.42	5.62
6	6.88	6.88	6.88	6.88	6.88
14	4.81	4.9	5.15	5.42	5.62
15	4.81	4.9	5.15	5.42	5.62
24	1.35	1.35	1.35	1.35	1.35
28	4.81	4.9	5.15	5.42	5.62

Additional information on Internal-External & External-Internal Trips Analysis:

- External Station Analysis considers through trips, external-internal (XI) and internal-external (IX) trips.
- The IX-XI trip production data utilized for REA (Regional Emission Analysis) contains no through-trip data. Only internal-external and external-internal trip productions are in the data.

- In general, trip productions and attractions must balance according to established modeling procedure. For example, every trip has exactly one production trip end and one attraction trip end; total area production and attraction trip ends for each purpose must be equal. This is true for IX-XI trips as well, i.e. for every internal-external trip there is an external-internal trip. Therefore, since ½ of the IX-XI trips originate internally, this is the quantity utilized for REA.

A similar methodology was applied in previous Metrolina and Triangle Region conformity analyses; following is an email from US EPA staff indicating the appropriateness of the methodology employed:

Re: Number of starts per day for Mecklenburg County
Date: Mon, 28 Feb 2005 11:50:35 –0500
From: Brzezinski.David@epamail.epa.gov
To: Behshad Norowzi <bnorowzi@dot.state.nc.us>
CC: Aspy.Dale@epamail.epa.gov

I have looked over your methodology and agree that it shows a lower overall starts per day (trips) than any the MOBILE6 default values. This is true even though your figure includes some starts that are assumed to occur outside Mecklenburg County. It would be reasonable to use your calculated values in place of the MOBILE6 defaults for all of the vehicle classes (gasoline and diesel), except for motorcycles, which already has a very low rate.

David Brzezinski, EPA OTAQ ASD, 734-214-4235