

Memorandum

April 20, 2010

To: MOVES Task Force

From: Eulalie Lucas 

Department of Transportation Planning

Subject: Results of MOVES2010 Model Sensitivity Tests: Use of Local Input Data for 2005, County Level vs. Custom Domain.

I. Introduction

Since the last meeting of the Task Force, final recommendations for local inputs were developed and applied to 2005 conditions. Table 1 shows the inputs where a combination of local and default values were used in executing the model, as in the case of the District of Columbia and Fairfax County. For counties in Maryland local data for all inputs with the exception of average speed distributions were applied in all runs. Details regarding the development of Meteorological Data are available in Sunil Kumar's presentation dated 3/16/2010 and for travel related inputs in Daivamani Sivasailam's memo dated 4/13/2010. Details associated with the development of fuel programs and IM programs may be obtained from Mohammed Khan, Maryland Department of the Environment.

Staff prepared 2005 ozone day and annual emission estimates for Maryland counties at two levels: County Level and Custom Domain. These results are listed in the attached tables and graphs. In addition to these results staff also prepared emissions for Fairfax County and the District of Columbia. Local data for some of the inputs were not available for jurisdiction in Virginia and for the District of Columbia; Table 1 shows where these instances occurred. Results for Fairfax County and the District of Columbia are included because new inputs have been added to the analysis: meteorological data and month, day and hourly factors associated with vehicle miles of travel (VMT). As mentioned in previous reports to this committee, default values are based on National trends applied at the jurisdiction level. MOBILE emissions are

based on the most current approved travel data at jurisdiction level generated by MWCOG Travel Demand Model Version 2.2/ for the 2009 CLRP (October, 2009).

Table 1

Input Item	FFX and DC Inputs		MD Inputs
	Default	Local	Local
Vehicle Age Distribution		X	X
Vehicle Population		X	X
Annual VMT by Jurisdiction and adj. factors		X	X
Annual. VMT Distributed by Vehicle. Type		X	X
Vehicle Type VMT Percentages by Facility Type		X	X
I/M Programs	X		X
Fuel Supply	X		X
Fuel Formulation	X		X
Average Speed Distribution	X		Def
Meteorological Data		X	X

II. Results

Table 2, with accompanying graphs 2A, 2B and 2C, shows emissions for ozone day VOC and NOx for selected jurisdictions and Table 3 with graphs shows annual emissions for Montgomery County. Local_1 reflect results presented on 3/16/2010 and Local_2 reflect results using revised inputs described in Siva's memo dated 4/13/2010.

Staff applied the County Data Manager tool to estimate emissions at the county level and the Custom Domain tool for the Maryland Domain emissions estimates. The Custom Domain will allow the user to model a multicounty area as a single county. MOVES database has no default values for any of the County Data Manager tabs, so the user must have all the necessary information. Average Speed Distributions were extracted from the MOVES database and imported as local data for this exercise.

Table 4 shows the computer run times using the Custom Domain approach described in the above paragraph. The main purpose for exploring these two approaches was to identify time savings associated with each approach.

Table 5 with graphs illustrates 2005 ozone day emission estimates for the two approaches and Table 6 with graphs compares the two approaches for 2005 annual CO2, NOx and PM 2.5 emissions, for Maryland jurisdictions.

III. Next Steps

DTP/DEP staff will continue to update input parameters as data become available. Emissions associated with 2030 conditions as well as emission rates associated with ozone day and annual runs will be presented at the next meeting.

Attachments

Table 2-A. 2005 District of Columbia Ozone Day VOC and NOx Emissions

	Mobile6		MOVES_Default		MOVES_Local_1		MOVES_Local_2	
	VOC	NOx	VOC	NOx	VOC	NOx	VOC	NOx
Start	2.2156	1.1670	3.196552	3.546664	2.463634	2.745434	2.479361	2.754493
Running	5.0379	15.1030	4.141346	25.91664	3.932606	25.0081	3.675276	20.16494
Start & Running	7.2535	16.2700	7.3379	29.4633	6.3962	27.7535	6.1546	22.9194
Vehicle Related	1.0900	0.0000	4.119234	0.0000	3.433254	0.448101	3.172395	0.044213
Bus, Transit, and Auto	0.1644	1.6449	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	8.5079	17.9149	11.4571	29.4633	9.8295	28.2016	9.3270	22.9636

Table 2-B. 2005 Fairfax County Ozone Day VOC and NOx Emissions

	Mobile6		MOVES_Default		MOVES_Local_1		MOVES_Local_2	
	VOC	NOx	VOC	NOx	VOC	NOx	VOC	NOx
Start	4.3793	2.3223	9.841817	11.05646	7.600262	8.33571	7.615109	8.348927
Running	10.3411	42.6183	12.4238	78.87182	8.067451	55.77891	8.41248	50.19582
Start & Running	14.7204	44.9405	22.2656	89.9283	15.6677	64.1146	16.0276	58.5447
Vehicle Related	2.6348	0.0000	12.31919	2.718791	7.276822	0.933416	7.012112	0.091862
Bus, Transit, and Auto	0.3532	2.0440	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	17.7084	46.9845	34.5848	92.6471	22.9445	65.0480	23.0397	58.6366

*MOVES_Local_1: Def values for IM,Fuel Supply and Formulation, Average Speed Distribution

*MOVES_Local_2: Def values for IM,Fuel Supply and Formulation, Average Speed Distribution, and local data for MET. Data and Annual VMT fractions

Table 2-C. 2005 Montgomery County Ozone Day VOC and NOx Emissions

	Mobile6		MOVES_Default		MOVES_Local_1		MOVES_Local_2	
	VOC	NOx	VOC	NOx	VOC	NOx	VOC	NOx
Start	3.8015	2.0324	6.807264	6.719485	6.9689	6.199248	7.081989	6.791165
Running	8.8443	33.6277	7.941241	53.2063	6.841734	44.59158	6.759428	39.34423
Start & Running	12.6458	35.6601	14.7485	59.9258	13.8106	50.7908	13.8414	46.1354
Vehicle Related	2.2796	0.0000	8.350632	0.909911	6.825645	0.929983	5.898962	0.063036
Bus, Transit, and Auto	0.3024	2.5402	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	15.2277	38.2003	23.0991	60.8357	20.6363	51.7208	19.7404	46.1984

*MOVES_Local_1: Def values for IM,Fuel Supply and Formulation, Average Speed Distribution

*MOVES_Local_2: All local inputs except average speed distributions

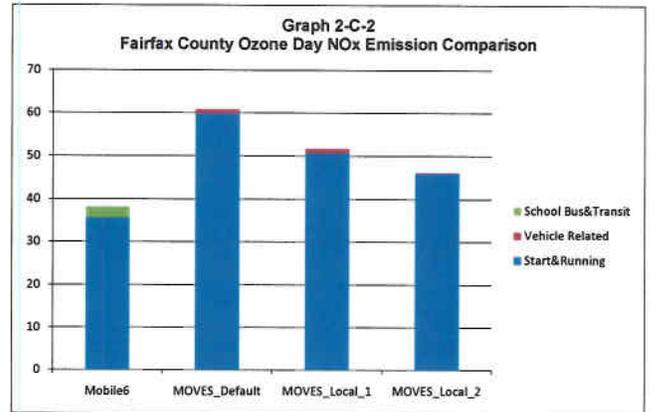
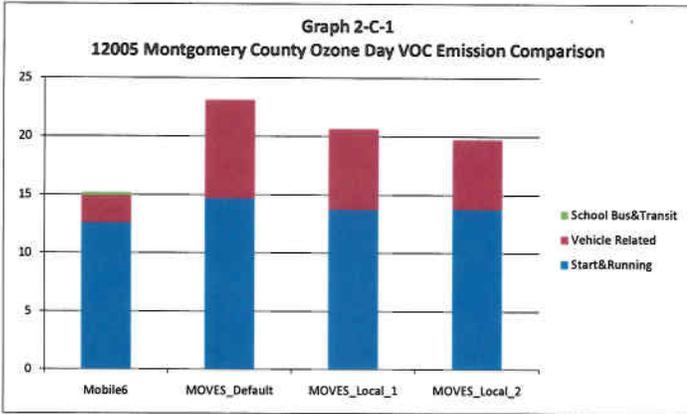
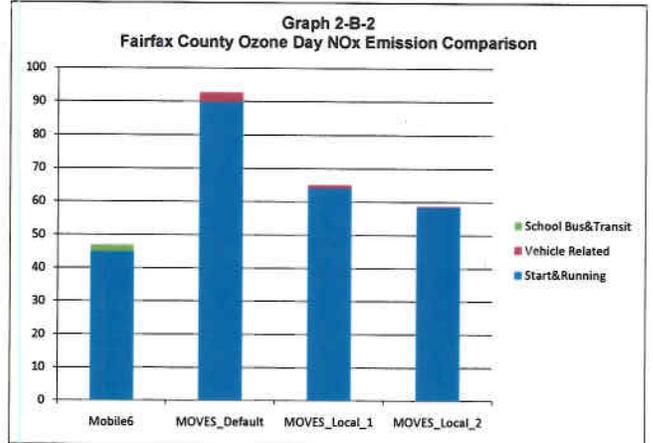
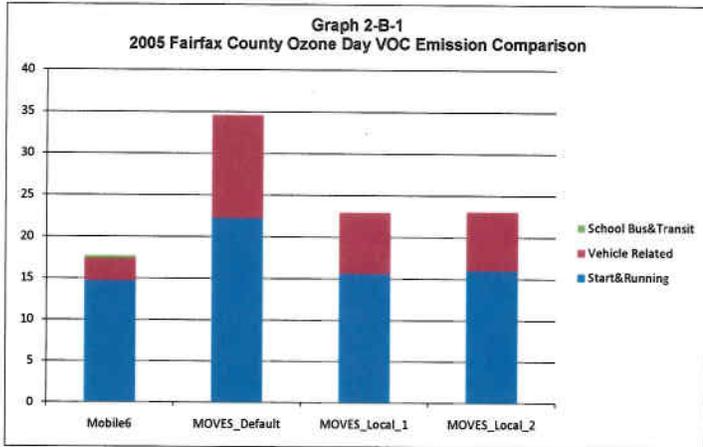
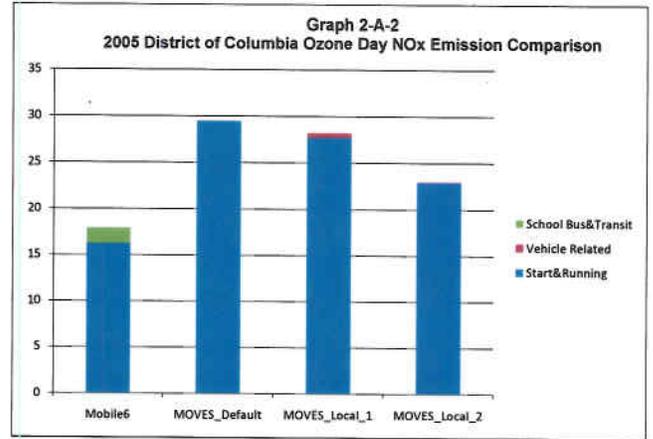
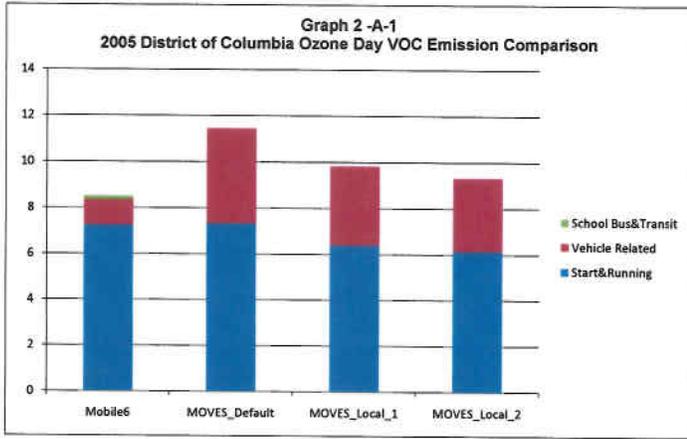


Table 3
2005 Montgomery County CO₂, NO_x, PM_{2.5} Emissions (Annual)

Montgomery	Mobile6			MOVES2010_Def			MOVES2010_Local1			MOVES2010_Local2		
	CO ₂	NO _x	PM _{2.5}	CO ₂	NO _x	PM _{2.5}	CO ₂	NO _x	PM _{2.5}	CO ₂	NO _x	PM _{2.5}
Total	4,517,969	14,879	265	4,620,947	19,837	686	4,840,257	17,369	598	4,440,568	15,907	439

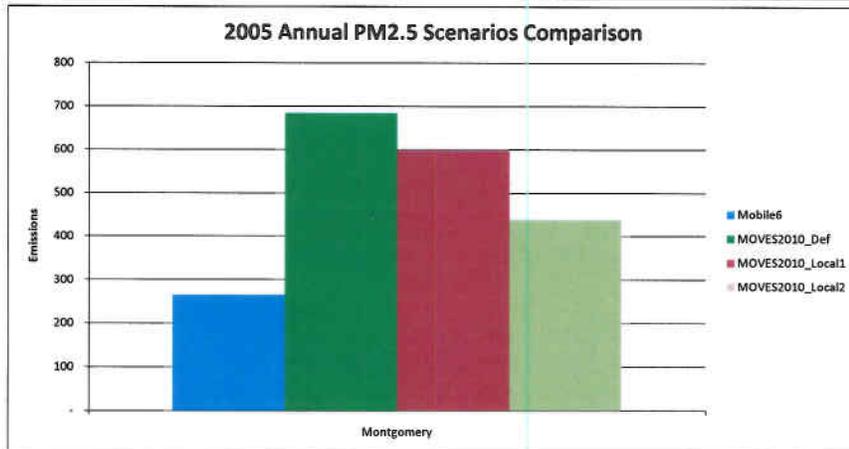
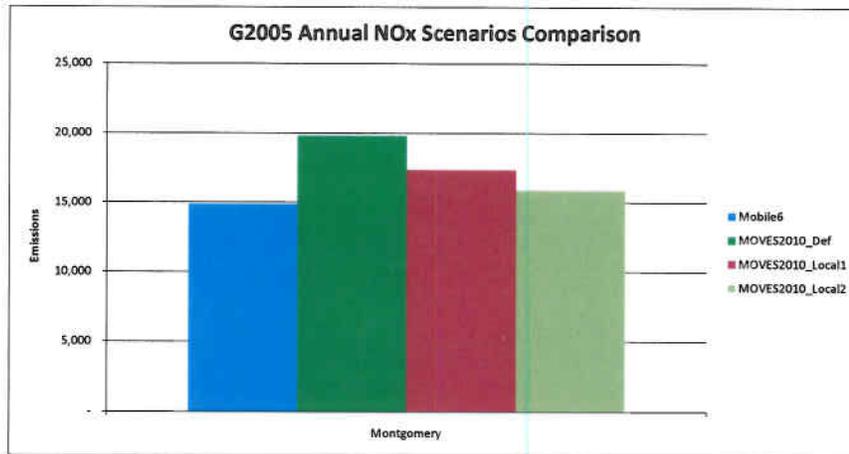
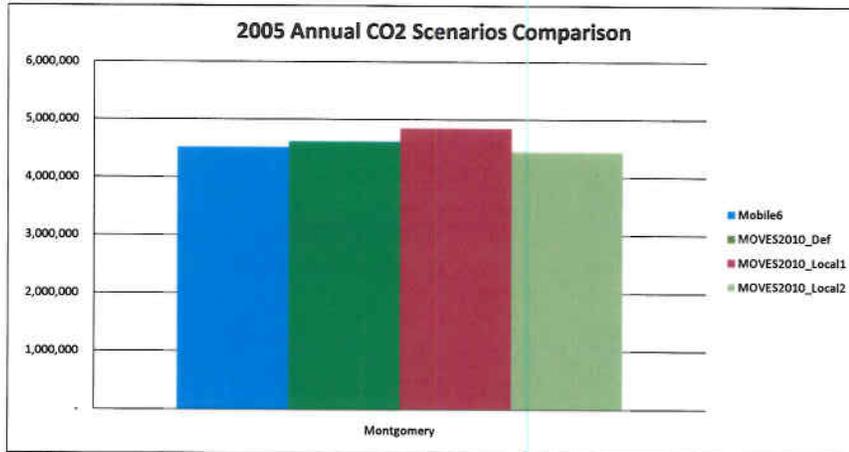


Table 4

Comparison of Approximate Computer Run Times

Approach	Ozone Day	Total Time	Annual	Total Time
County Level (County Data Manager)	19 min. per county	1.6 Hrs. for Maryland counties(5)	7.6 Hrs. per county	13.1 Hrs. for MD counties (5)
Custom Domain	19. min. per domain	19 min. per domain	2.6 Hrs. per MD county	2.6 Hrs. MD domain

Table 5
2005 Maryland Ozone Season VOC and NOx Emissions

	MOVES 2010 Local	
	VOC	NOx
MTG	19.740	46.198
PG	21.542	54.390
FRED	7.772	23.747
CLVT	2.308	5.225
CHLS	3.569	7.705
Summary of 5 Jurisdictions	54.932	137.265
Maryland Custum Domain	54.668	135.189
Diff	-0.264	-2.076
Diff%	-0.005	-0.015

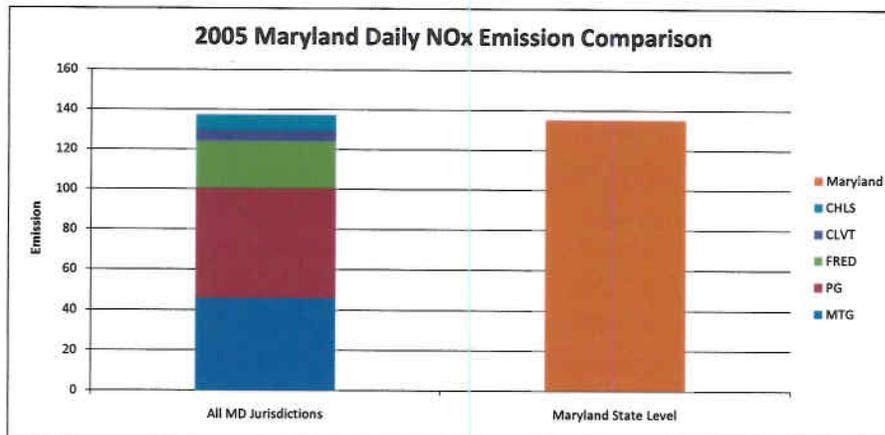
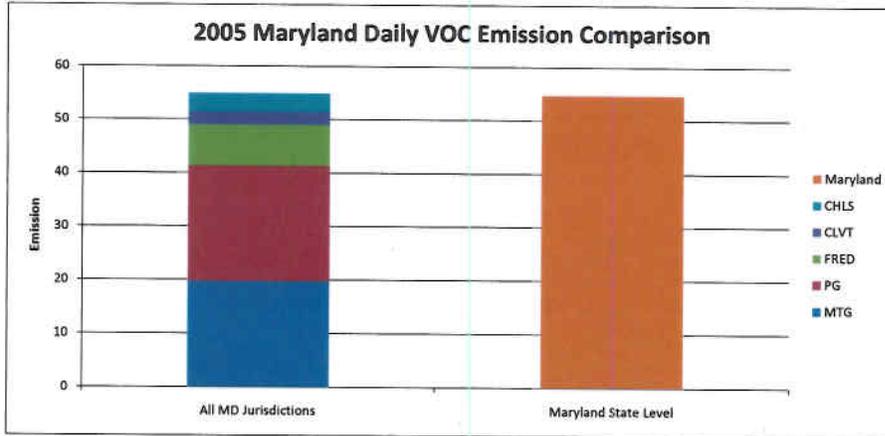


Table 6
2005 Maryland Annual CO₂, NO_x and PM_{2.5} Emissions

	MOVES 2010 Local		
	CO ₂	NO _x	PM _{2.5}
MTG	4440568.214	15906.760	439.290
PG	4603233.891	18676.659	546.917
FRED	1983859.617	7697.171	256.390
CLVT	375428.231	1554.391	41.876
CHLS	632714.072	2674.685	75.772
Summary of 5 Jurisdictions	12035804.025	46509.666	1360.246
Maryland Custom Domain	12031737.681	46682.315	1350.449
Diff	-4066.34	172.65	-9.80
Diff%	-0.03%	0.37%	-0.72%

