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CARBON MONOXIDE SCREEN FOR SIGNALIZED INTERSECTIONS COSIM, VERSION 3.0: TECHNICAL DOCUMENTATION

Prepared By

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A report of the findings of

ICT-R27-7
Update the Illinois Carbon Monoxide Screen for Intersection Modeling

Illinois Center for Transportation
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16. Abstract

The Illinois Department of Transportation (IDOT) currently uses the computer screening model Illinois CO Screen for Intersection Modeling (COSIM) to estimate worst-case CO concentrations for proposed roadway projects affecting signalized intersections. The original model was developed as part of the Illinois Transportation Research Center (ITRC) research project IIIA-H1, FY 97, completed in October 1999. Modeled results from Version 1.0 and 1.1 of COSIM are based on the U.S. Environmental Protection Agency's (USEPA) mobile source emission model, MOBILE5b, and roadway dispersion model, CAL3QHC v 2.0 (Larson, 1999). The second version of COSIM was released in 2003. Version 2.0 incorporated new emission factor (EF) tables developed using USEPA's updated version of the MOBILE model called MOBILE6. In addition to updating the emission factors used in COSIM, pre-screen criteria for determining when COSIM needs to be used for a roadway project were developed and incorporated into COSIM as a Pre-Screen feature (Larson, 2003). In 2007, regulatory changes in the Illinois vehicle Inspection and Maintenance (I&M) program prompted the Illinois Environmental Protection Agency (IEPA) to recommend that IDOT update COSIM with new EF tables using the MOBILE6.2 model. Based on this recommendation, IDOT and the Illinois Center for Transportation (ICT) provided funding to update the COSIM model. As part of the update, IDOT also requested that the methodology used in creating the original Pre-Screen criteria be reevaluated and possibly revised based on the findings of the evaluation. This report provides technical documentation on the updates and revisions made to Version 3.0 of COSIM finalized in June 2008.

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EXECUTIVE SUMMARY

The Illinois Department of Transportation (IDOT) currently uses the computer screening model Illinois CO Screen for Intersection Modeling (COSIM) to estimate worst-case CO concentrations for proposed roadway projects affecting signalized intersections. The original model was developed as part of the Illinois Transportation Research Center (ITRC) research project IIIA-H1, FY 97, completed in October 1999. Modeled results from Version 1.0 and 1.1 of COSIM are based on the U.S. Environmental Protection Agency's (USEPA) mobile source emission model, MOBILE5b, and roadway dispersion model, CAL3QHC v 2.0 (Larson, 1999). The second version of COSIM was released in 2003. Version 2.0 incorporated new emission factor (EF) tables developed using USEPA's updated version of the MOBILE model called MOBILE6. In addition to updating the emission factors used in COSIM, pre-screen criteria for determining when COSIM needs to be used for a roadway project were developed and incorporated into COSIM as a Pre-Screen feature (Larson, 2003). In 2007, regulatory changes in the Illinois vehicle Inspection and Maintenance (I&M) program prompted the Illinois Environmental Protection Agency (IEPA) to recommend that IDOT update COSIM with new EF tables using the MOBILE6.2 model. Based on this recommendation, IDOT and the Illinois Center for Transportation (ICT) provided funding to update the COSIM model. As part of the update, IDOT also requested that the methodology used in creating the original Pre-Screen criteria be reevaluated and possibly revised based on the findings of the evaluation. This report provides technical documentation on the updates and revisions made to Version 3.0 of COSIM finalized in June 2008.

CHAPTER 1: UPDATING ILLINOIS COSIM EMISSION FACTORS

Illinois COSIM (Carbon Monoxide Screen for Intersection Modeling), Version 2.0 is a Windows-based screening model that is currently being used by the Illinois Department of Transportation (IDOT) staff to estimate worst-case carbon monoxide (CO) concentrations that could result from proposed roadway projects with signalized intersections. If the results from COSIM are within the National Ambient Air Quality Standards (NAAQS) for CO, no further CO modeling is required for the intersection. If the results from COSIM indicate that the project may cause a NAAQS violation, a detailed analysis is required to more accurately evaluate potential CO levels.

Modeled results from COSIM are based on the U.S. Environmental Protection Agency's (USEPA) mobile source emission model, MOBILE, and roadway dispersion model, CAL3QHC v 2.0. The first version of COSIM released in 1999 used emission factors from MOBILE5b. In January 2002, the USEPA released an updated version of the MOBILE model called MOBILE6. Significant changes to the model included updated basic emission rates, more realistic driving patterns, improved correction factors, changes in fleet composition, and impacts of new regulations promulgated since MOBILE5b (USEPA, 2003). The second version of COSIM was released in 2003 and incorporated new emission factor (EF) tables derived from MOBILE6.

Recent regulatory changes in the vehicle Inspection and Maintenance (I&M) program in Illinois have prompted IDOT to update the EF tables in COSIM. Specifically, EF tables in COSIM Version 2.0 were developed using the I&M240 program. In February 2007, the I&M240 program was replaced with the On-board Diagnostics-only (OBD) program. Since the new OBD I&M program will result in different CO EFs, Illinois Environmental Protection Agency (IEPA) recommended IDOT update COSIM with new EF tables using the MOBILE6.2 model. This chapter details the updates made to the Illinois specific EFs used in the new Version 3.0 of the COSIM model.

1.1 EMISSION FACTOR UPDATES

Emission factors in COSIM Version 2.0 were based on the results of six different MOBILE6 input files (Larson, 2003). The files were developed to capture six different default vehicle fleet characteristics defined by IEPA. The six areas are defined as follows:

1. Vehicles in counties north of the 40^{o} North latitude line that are in attainment for ozone without vehicle inspection and maintenance (I/M) programs.
2. Vehicles in counties north of the 40^{o} North latitude line that are in non-attainment for ozone with vehicle I/M programs.
3. Vehicles in counties north of the 40^{o} North latitude line that are in non-attainment for ozone without vehicle I/M programs.
4. Vehicles in counties south of the 40^{o} North latitude line that are in attainment for ozone without vehicle I/M programs.
5. Vehicles in counties south of the 40^{o} North latitude line that are in non-attainment for ozone with vehicle I/M programs.
6. Vehicles in counties south of the 40^{o} North latitude line that are in non-attainment for ozone without vehicle I/M programs.

For COSIM Version 3.0, six new MOBILE6.2 input files were created based on these same 6 criteria. Additional vehicle registration distribution and I/M data files were

provided by staff from IEPA. Copies of each MOBILE6.2 input file and the supporting files necessary to calculate the EFs with MOBILE6.2 are included in Appendix A.

The values in the six lookup tables of emission factors in the COSIM Version 2.0 computer code were replaced with the results from running the new MOBILE6.2 input files. The new lookup tables are provided in Figures 1-1 through 1-6. Note that the new emission factors for the six regions are lower than the previously used emission factors. The updated version of COSIM accesses and uses the appropriate emission factors using the same methodology as previous versions of COSIM as described below.

When a user selects a county in COSIM, a number is assigned to the selected county. Based on the county number, at least one region index is assigned to the current project. The region index references one of the six emission factor tables arranged by model year versus average speed. The year ranges from 0 to 11, covering the years 2008 to 2019. Emission factors for years after 2019 are assumed equal to the 2019 EFs.

The speed ranges from 0 to 11, covering speeds from 0 mph (idle) to 55 mph, in increments of 5 mph. EFs for speeds between the 5 mph intervals are obtained by linear interpolation. The feasibility of linear interpolation was tested in the first phase of the project and determined to be acceptable (Larson, 1999).

In counties where I/M and non I/M regions adjoin, the same methodology is used as in the original COSIM of taking emission factors from both the I/M and non I/M regions, weighting them accordingly, and adding them together to determine an average emission factor for the county (Larson, 1999).

After the idle and free-flow emission factors are determined, COSIM inserts them into the CAL3QHC input file and runs CAL3QHC to determine the worst-case CO concentrations.

MOBILE6.2 - Region Index 0 - North Attainment Region

The MOBILE6.2 input file used for this run was: N_ATT.in

The MOBILE6.2 output file was: N_ATT.OUT

Emission factors include exhaust running and start emissions.

		Idle (2.5 mph)	Idle (2.5 mph)	5 mph	10 mph	15 mph	20 mph	25 mph	30 mph	35 mph	40 mph	45 mph	50 mph	55 mph
Year	Index	**in g/mi**	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
2008	**0**	50.535	126.338	33.443	24.921	22.144	20.700	19.903	19.511	19.514	20.035	20.583	21.157	21.757
2009	**1**	47.609	119.023	31.547	23.565	20.974	19.633	18.893	18.534	18.543	19.046	19.571	20.118	20.687
2010	**2**	44.916	112.290	29.850	22.329	19.872	18.602	17.899	17.561	17.567	18.047	18.549	19.070	19.612
2011	**3**	42.507	106.268	28.437	21.351	19.006	17.796	17.123	16.803	16.807	17.269	17.751	18.251	18.770
2012	**4**	40.131	100.328	27.001	20.352	18.136	16.992	16.355	16.055	16.059	16.502	16.965	17.444	17.942
2013	**5**	38.351	95.878	25.852	19.516	17.402	16.313	15.704	15.420	15.424	15.851	16.297	16.759	17.238
2014	**6**	36.836	92.090	24.881	18.808	16.778	15.731	15.144	14.873	14.875	15.289	15.719	16.165	16.628
2015	**7**	35.685	89.213	24.151	18.281	16.313	15.299	14.728	14.467	14.467	14.869	15.288	15.722	16.172
2016	**8**	34.598	86.495	23.451	17.767	15.857	14.873	14.317	14.064	14.063	14.454	14.862	15.284	15.723
2017	**9**	33.760	84.400	22.918	17.381	15.518	14.557	14.014	13.768	13.765	14.148	14.547	14.961	15.391
2018	**10**	33.008	82.520	22.417	17.002	15.178	14.237	13.705	13.464	13.462	13.838	14.230	14.637	15.059
2019	**11**	32.394	80.985	22.007	16.692	14.899	13.975	13.451	13.215	13.212	13.583	13.969	14.370	14.787

** Emission Factors in g/mi except for Idle Speed. Idle speed EFs in g/hr.*

Figure 1-1. EFs in Region Index 0: *Counties north of the 40^{o} North latitude line that are in attainment for ozone without vehicle inspection and maintenance (I/M) programs.*

MOBILE6.2 - Region Index 1 - North Non-Attainment Region With I/M Program														
The MOBILE6.2 input file used for this run was: N_NAT_IM.in														
The MOBILE6.2 output file was: N_NAT_IM.OUT														
Emission factors include exhaust running and start emissions.														
		Idle (2.5 mph)	Idle (2.5 mph)	5 mph	10 mph	15 mph	20 mph	25 mph	30 mph	35 mph	40 mph	45 mph	50 mph	55 mph
Year	Index	**in g/mi**	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
2008	**0**	37.083	92.708	25.305	19.294	17.282	16.224	15.633	15.358	15.369	15.771	16.201	16.655	17.136
2009	**1**	33.976	84.940	23.281	17.858	16.058	15.115	14.589	14.350	14.367	14.747	15.150	15.573	16.018
2010	**2**	31.458	78.645	21.693	16.719	15.061	14.192	13.705	13.488	13.502	13.860	14.238	14.635	15.051
2011	**3**	29.267	73.168	20.342	15.769	14.232	13.428	12.974	12.776	12.789	13.128	13.485	13.859	14.252
2012	**4**	27.422	68.555	19.186	14.949	13.518	12.770	12.345	12.164	12.176	12.498	12.837	13.193	13.566
2013	**5**	25.992	64.980	18.264	14.282	12.938	12.235	11.834	11.667	11.678	11.987	12.313	12.654	13.011
2014	**6**	24.853	62.133	17.530	13.749	12.468	11.799	11.416	11.259	11.269	11.567	11.881	12.209	12.553
2015	**7**	24.013	60.033	16.992	13.356	12.122	11.477	11.106	10.955	10.964	11.253	11.558	11.877	12.211
2016	**8**	23.335	58.338	16.553	13.035	11.837	11.211	10.850	10.705	10.713	10.995	11.292	11.604	11.930
2017	**9**	22.841	57.103	16.233	12.799	11.629	11.017	10.664	10.523	10.530	10.807	11.099	11.405	11.725
2018	**10**	22.441	56.103	15.966	12.598	11.449	10.849	10.502	10.363	10.371	10.644	10.932	11.234	11.550
2019	**11**	22.126	55.315	15.753	12.436	11.303	10.712	10.369	10.234	10.241	10.511	10.796	11.095	11.407
	** Emission Factors in g/mi except for Idle Speed. Idle speed EFs in g/hr.*													

Figure 1-2. EFs in Region Index 1: *Counties north of the 40^{o} North latitude line that are in non-attainment for ozone with vehicle I/M programs.*

MOBILE6.2 - Region Index 2 - North Non-Attainment Region														
The MOBILE6.2 input file used for this run was: N_NAT.in														
The MOBILE6.2 output file was: N_NAT.out														
Emission factors include exhaust running and start emissions.														
		Idle (2.5 mph)	Idle (2.5 mph)	5 mph	10 mph	15 mph	20 mph	25 mph	30 mph	35 mph	40 mph	45 mph	50 mph	55 mph
Year	Index	**in g/mi**	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
2008	**0**	43.747	109.368	29.189	21.779	19.297	18.003	17.282	16.931	16.927	17.387	17.874	18.387	18.926
2009	**1**	40.957	102.393	27.351	20.461	18.169	16.979	16.316	15.998	15.999	16.439	16.903	17.387	17.893
2010	**2**	38.644	96.610	25.883	19.401	17.235	16.112	15.485	15.186	15.184	15.603	16.044	16.504	16.984
2011	**3**	36.585	91.463	24.610	18.501	16.448	15.385	14.788	14.507	14.504	14.905	15.326	15.765	16.223
2012	**4**	34.788	86.970	23.484	17.701	15.752	14.742	14.174	13.909	13.905	14.290	14.694	15.115	15.553
2013	**5**	33.294	83.235	22.524	17.011	15.152	14.190	13.648	13.397	13.393	13.765	14.155	14.560	14.983
2014	**6**	32.057	80.143	21.734	16.442	14.653	13.729	13.206	12.967	12.961	13.322	13.699	14.092	14.501
2015	**7**	31.109	77.773	21.133	16.009	14.275	13.378	12.869	12.638	12.632	12.983	13.351	13.734	14.132
2016	**8**	30.331	75.828	20.638	15.652	13.961	13.088	12.591	12.366	12.360	12.703	13.063	13.437	13.827
2017	**9**	29.735	74.338	20.258	15.380	13.723	12.868	12.380	12.161	12.154	12.492	12.846	13.214	13.597
2018	**10**	29.243	73.108	19.939	15.145	13.517	12.676	12.196	11.981	11.974	12.308	12.657	13.020	13.399
2019	**11**	28.840	72.100	19.674	14.950	13.345	12.516	12.042	11.831	11.824	12.154	12.500	12.859	13.233
	** Emission Factors in g/mi except for Idle Speed. Idle speed EFs in g/hr.*													

Figure 1-3. EFs in Region Index 2: *Counties north of the 40^{o} North latitude line that are in non-attainment for ozone without vehicle I/M programs.*

MOBILE6.2 - Region Index 3 - South Attainment Region														
The MOBILE6.2 input file used for this run was: S_ATT.in														
The MOBILE6.2 output file was: S_ATT.out														
Emission factors include exhaust running and start emissions.														
		Idle (2.5 mph)	Idle (2.5 mph)	5 mph	10 mph	15 mph	20 mph	25 mph	30 mph	35 mph	40 mph	45 mph	50 mph	55 mph
Year	Index	**in g/mi**	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
2008	**0**	45.274	113.185	29.867	22.150	19.620	18.303	17.573	17.213	17.210	17.675	18.167	18.683	19.224
2009	**1**	42.653	106.633	28.167	20.938	18.579	17.356	16.679	16.349	16.352	16.801	17.273	17.765	18.278
2010	**2**	40.262	100.655	26.661	19.844	17.606	16.447	15.803	15.493	15.494	15.924	16.374	16.844	17.333
2011	**3**	38.099	95.248	25.395	18.970	16.835	15.730	15.115	14.821	14.821	15.234	15.667	16.118	16.587
2012	**4**	35.968	89.920	24.106	18.076	16.057	15.014	14.431	14.155	14.156	14.553	14.968	15.401	15.851
2013	**5**	34.382	85.955	23.082	17.333	15.407	14.413	13.856	13.595	13.595	13.979	14.380	14.797	15.230
2014	**6**	33.035	82.588	22.219	16.706	14.855	13.899	13.363	13.114	13.112	13.483	13.871	14.274	14.693
2015	**7**	32.007	80.018	21.569	16.237	14.443	13.517	12.995	12.755	12.752	13.113	13.490	13.882	14.290
2016	**8**	31.047	77.618	20.951	15.784	14.042	13.142	12.634	12.402	12.398	12.749	13.117	13.499	13.896
2017	**9**	30.301	75.753	20.477	15.442	13.742	12.864	12.367	12.140	12.136	12.480	12.840	13.214	13.603
2018	**10**	29.635	74.088	20.034	15.108	13.442	12.583	12.095	11.874	11.869	12.208	12.561	12.929	13.312
2019	**11**	29.092	72.730	19.672	14.836	13.198	12.353	11.874	11.657	11.651	11.985	12.334	12.697	13.075
	** Emission Factors in g/mi except for Idle Speed. Idle speed EFs in g/hr.*													

Figure 1-4. EFs in Region Index 3: *Counties south of the 40^{o} North latitude line that are in attainment for ozone without vehicle inspection and maintenance (I/M) programs.*

MOBILE6.2 - Region Index 4 - South Non-Attainment Region (Metro-East) With I/M Program														
The MOBILE6.2 input file used for this run was: S_NAT_IM.in														
The MOBILE6.2 output file was: S_NAT_IM.out														
Emission factors include exhaust running and start emissions.														
		Idle (2.5 mph)	Idle (2.5 mph)	5 mph	10 mph	15 mph	20 mph	25 mph	30 mph	35 mph	40 mph	45 mph	50 mph	55 mph
Year	Index	**in g/mi**	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
2008	**0**	37.405	93.513	25.226	19.067	17.033	15.962	15.365	15.080	15.085	15.475	15.892	16.335	16.802
2009	**1**	34.417	86.043	23.297	17.705	15.872	14.911	14.376	14.127	14.139	14.511	14.905	15.320	15.756
2010	**2**	31.859	79.648	21.693	16.555	14.860	13.972	13.476	13.249	13.260	13.610	13.982	14.373	14.783
2011	**3**	29.582	73.955	20.338	15.619	14.042	13.216	12.753	12.544	12.555	12.889	13.241	13.612	14.001
2012	**4**	27.462	68.655	19.040	14.714	13.256	12.494	12.064	11.875	11.886	12.203	12.538	12.889	13.257
2013	**5**	25.934	64.835	18.053	13.999	12.633	11.919	11.514	11.340	11.351	11.655	11.976	12.312	12.664
2014	**6**	24.675	61.688	17.243	13.411	12.116	11.439	11.054	10.891	10.900	11.193	11.501	11.824	12.162
2015	**7**	23.748	59.370	16.652	12.983	11.739	11.090	10.718	10.563	10.571	10.854	11.153	11.466	11.794
2016	**8**	22.925	57.313	16.118	12.589	11.389	10.762	10.403	10.254	10.261	10.536	10.826	11.130	11.448
2017	**9**	22.328	55.820	15.732	12.306	11.139	10.529	10.179	10.035	10.041	10.310	10.594	10.891	11.203
2018	**10**	21.807	54.518	15.380	12.037	10.897	10.301	9.958	9.818	9.824	10.088	10.367	10.659	10.965
2019	**11**	21.393	53.483	15.099	11.821	10.702	10.118	9.780	9.643	9.649	9.909	10.184	10.472	10.774
	** Emission Factors in g/mi except for Idle Speed. Idle speed EFs in g/hr.*													

Figure 1-5. EFs in Region Index 4: *Counties south of the 40^{o} North latitude line that are in non-attainment for ozone with vehicle I/M programs.*

MOBILE6.2 - Region Index 5 - South Non-Attainment Region (Metro-East)														
The MOBILE6.2 input file used for this run was: S_NAT.in														
The MOBILE6.2 output file was: S_NAT.out														
Emission factors include exhaust running and start emissions.														
		Idle (2.5 mph)	Idle (2.5 mph)	5 mph	10 mph	15 mph	20 mph	25 mph	30 mph	35 mph	40 mph	45 mph	50 mph	55 mph
Year	Index	**in g/mi**	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
2008	**0**	43.492	108.730	28.779	21.344	18.880	17.594	16.879	16.524	16.514	16.957	17.427	17.922	18.443
2009	**1**	40.883	102.208	27.071	20.124	17.834	16.645	15.984	15.661	15.658	16.085	16.535	17.006	17.499
2010	**2**	38.598	96.495	25.629	19.078	16.908	15.782	15.154	14.850	14.846	15.254	15.684	16.133	16.603
2011	**3**	36.534	91.335	24.399	18.224	16.156	15.085	14.486	14.199	14.194	14.587	15.000	15.431	15.881
2012	**4**	34.571	86.428	23.196	17.381	15.423	14.410	13.841	13.572	13.567	13.944	14.341	14.754	15.186
2013	**5**	33.068	82.670	22.224	16.677	14.809	13.843	13.300	13.045	13.040	13.405	13.788	14.186	14.602
2014	**6**	31.806	79.515	21.414	16.090	14.293	13.364	12.840	12.597	12.591	12.944	13.315	13.701	14.103
2015	**7**	30.852	77.130	20.808	15.653	13.910	13.009	12.500	12.264	12.257	12.602	12.963	13.339	13.731
2016	**8**	29.970	74.925	20.240	15.238	13.544	12.668	12.172	11.944	11.936	12.272	12.624	12.991	13.373
2017	**9**	29.299	73.248	19.812	14.929	13.273	12.417	11.931	11.709	11.700	12.030	12.375	12.735	13.111
2018	**10**	28.702	71.755	19.416	14.633	13.009	12.170	11.693	11.475	11.467	11.791	12.131	12.486	12.855
2019	**11**	28.210	70.525	19.090	14.389	12.791	11.966	11.496	11.283	11.274	11.594	11.930	12.280	12.644
	** Emission Factors in g/mi except for Idle Speed. Idle speed EFs in g/hr.*													

Figure 1-6. EFs in Region Index 5: *Counties south of the 40^{o} North latitude line that are in non-attainment for ozone without vehicle I/M programs.*

CHAPTER 2: ILLINOIS COSIM VERSION 3.0

Several changes have been made to COSIM Version 2.0 in developing Version 3.0. Aside from updating the MOBILE6 emission factor lookup tables, as discussed in Chapter 1 of this report, revisions to the Pre-Screen feature were the most significant changes made to the COSIM Version 3.0 program. This chapter documents the other revisions made to the COSIM model.

2.1 REVISING THE PRE-SCREEN FEATURE

The Pre-Screen feature in COSIM Version 2.0 was developed to allow the user to determine if a full COSIM run was needed by only entering 3 variables. The criteria used in the Pre-Screen were developed using a base case scenario in COSIM that would produce worst-case CO concentrations (Larson, 2003). At the request of IDOT, a task was added to the project scope to reevaluate the methodology used in creating the Pre-Screen criteria.

After five years of using the Pre-Screen feature, IDOT noticed a trend that larger four-way intersections designed to handle higher traffic volumes, typically failed the Pre-Screen criteria even though a full COSIM model run would produce CO concentrations well below the NAAQS. This can be attributed to two conservative concepts that went into developing the original Pre-Screen criteria. The first is an upper bound placed on traffic volume. This was done to avoid oversaturated traffic conditions. Since the intersection type used in developing the criteria was a medium sized intersection, the total traffic volume on any leg of the intersection was capped at approximately 1,800 vph. Traffic volumes over 1,800 vph produced oversaturated conditions in the CAL3QHC model runs, and therefore 1,800 vph was considered the upper bound of the pre-screen. Subsequently, larger intersections designed to handle higher traffic volumes typically failed the Pre-Screen criteria because peak hourly volumes were above the upper bound.

The second reason the larger four-way intersections typically failed the Pre-Screen yet yielded COSIM results well below the NAAQS is that the criteria was developed including all traffic volume travelling on the busiest leg of an intersection. For the base case intersection (i.e., a 3x3 one way intersection), the total traffic volume on a leg is equal to the approach volume on the leg. For a four-way or T-type intersection, that is not the case. Often times, only half the total traffic volume traveling on the busiest leg of the intersection is attributed to approach volume. Since the approach volume is used in the queuing algorithms, and idling vehicles produce higher emissions than free flowing traffic movements, emissions on four-way and T-type intersections are less when total traffic volume is considered.

To help account for these two factors while still maintaining a conservative approach for the Pre-Screen, new Pre-Screen criteria were developed removing the upper bound on “total traffic volume” and basing the new Pre-Screen traffic volumes on “approach volume” rather than total volume. This still allows for a worse case scenario as approach traffic volumes are associated with slower speeds and idling vehicles which produce higher CO emission rates. Holding all other input variables the same as previous work (Larson, 2003), except for model year which was now 2008, choosing the worst-case intersection to use for the base case was re-evaluated. The type of intersection that corresponded to the failing model run with the least traffic volume per leg was deemed the worst-case intersection and used as the base case. In the original analysis, the worst-case intersection was the 3x3 one-way intersection. In this study, the

14 intersection types were re-evaluated using approach traffic volumes rather than total traffic volumes, and it was determined that the 6x6 T-type intersection was worse than the 3x3 one-way intersection. That is, using the same input variables, concentrations were slightly higher on the 6x6 T-type intersection at the same receptor distances. New Pre-screen criteria were developed using the same methodology as in the COSIM Version 2.0 model with the exception of traffic volume. Approach volumes on all legs of the intersection were set equal. As done previously, the approach volumes were then distributed to the various traffic movements on the leg. Designated and non-designated turning volumes were assigned 15% and 10% of the total approach volume respectively. The remaining approach volume was assigned to thru traffic. Due to the lane configuration of the T-Type intersection, approach volume on leg B of the intersection had to be handled differently since all traffic must either turn right or left because there are no thru lanes. For the model runs, half the approach volume on leg B was designated as left turn, the other half as right turn.

A series of model runs was performed by increasing the approach traffic volumes on each leg by 300 vph. For each approach volume, CO concentrations were estimated in each quadrant surrounding the intersection in 100 by 100 foot grids with receptors spaced 10 feet apart. The highest modeled 8-hour average concentration (including a 3.0 ppm background concentration) at each receptor distance was recorded until the modeled concentration exceeded 8.5 ppm. Due to the nonsymmetrical geometry and oversaturated traffic conditions, the highest modeled concentrations did not always occur equi-distance from the roadway nor in the same quadrant. The approach volume that would yield a concentration of 8.5 ppm, or "critical approach volume," was determined using linear interpolation between the volumes above and below 8.5 ppm for a given receptor distance. (NAAQS for an 8-hour CO average concentration is 9 ppm. The lower 8.5 ppm cut-off was used to ensure that the pre-screen criteria were conservative.) This was repeated at each receptor location. The interpolated "critical approach volumes" were divided by 0.08 to obtain "critical ADT values." The critical ADT values at each receptor location were then plotted against receptor distance. A line was drawn beneath the data points from each modeled region to represent the pre-screen criterion for the region. Points lying below the line meet the pre-screen criterion and do not require additional CO modeling. Points lying above the line fail the pre-screen criterion and require a COSIM analysis to better estimate conditions at the intersection.

Results from each of the four regions are provided in Figure 2-1. Figure 2-2 provides a comparison of the pre-screen criteria used in Version 2.0 and Version 3.0. Figure 2-2 shows that the new pre-screen criteria used in COSIM Version 3.0 are significantly higher for all four regions. Although it should be noted, the Version 2.0 criteria are based on total traffic volume traveling on the leg, whereas Version 3.0 criteria are based on approach volume traveling on the leg. If the Version 3.0 criteria included all traffic volume traveling on the leg, the curves would be even higher.

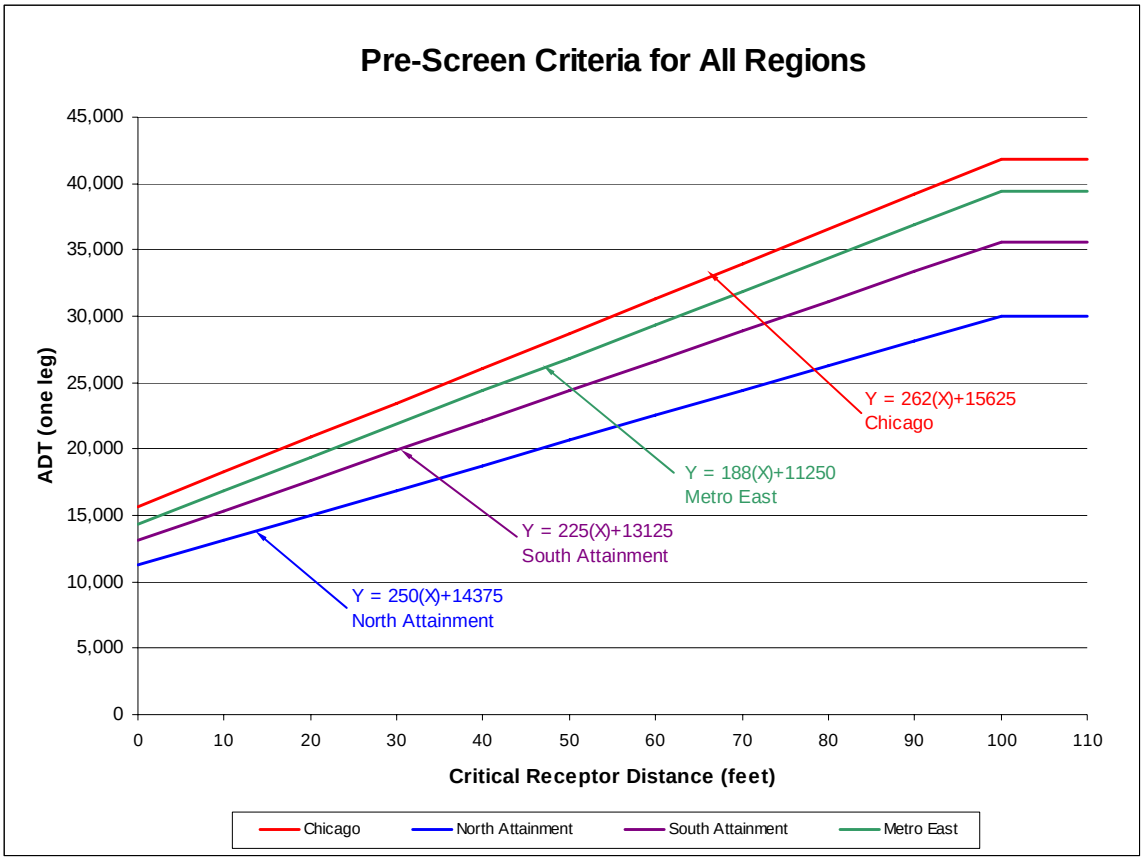

Figure 2-1. New Pre-Screen criteria for COSIM Version 3.0.

2.2 OTHER REVISIONS IN VERSION 3.0

Other minor changes were made to the COSIM program to create Version 3.0. Some of the additions and revisions are apparent to the user, that is, a user could run Versions 2.0 and 3.0 and see many of the visible differences. Other changes made do not affect the appearance of the program, but rather the program's operating algorithms.

2.2.1 Visible Revisions

The following is a list and brief discussion of revisions made to Version 2.0 that are visible to someone using Version 3.0.

- The Welcome to Illinois COSIM title screen and About COSIM dialog box - The version number and release date have been updated to Version 3.0 – June 2008. Copyright information has been updated to 1999-2008.
- Welcome to Illinois COSIM dialog box – The IDOT logo has been updated.
- COSIM logo in the main view has been updated to Version 3.0.
- Program Title Bar - the program title bar has been updated to display the name of the open COSIM project file followed by COSIM 3.0.
- Help File Updates – numerous minor changes were made to the help sections based on comments received from the project committee.

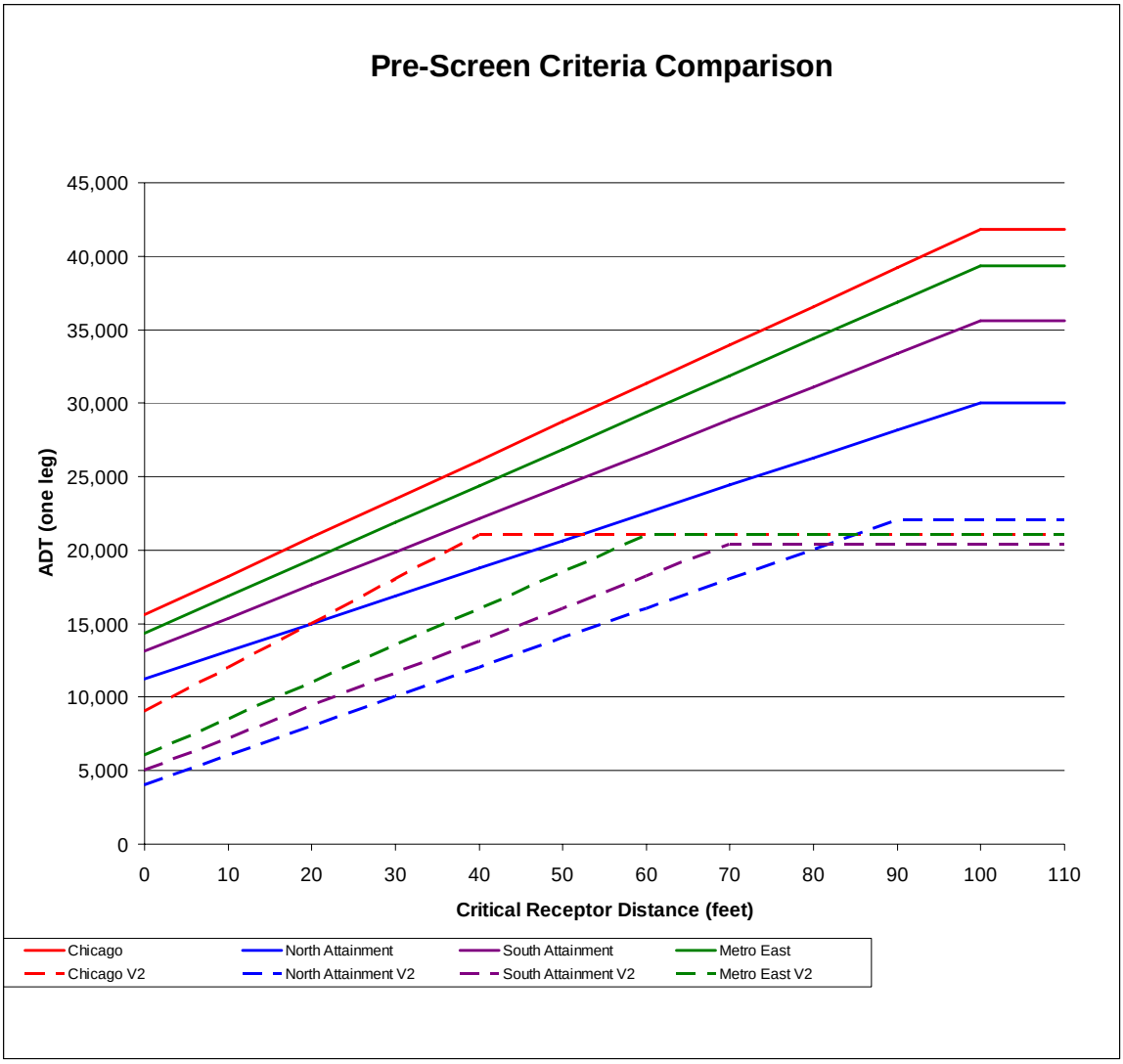

Figure 2-2. New Pre-screen criteria comparison: Version 2.0 – dashed lines. Version 3.0 – solid lines.

- Year of Analysis, on page 1 of the General Inputs screens, has been updated to include model years 2008 through 2050. Spin buttons and error messages associated with entering a valid model year have also been updated.
- Intersection Location – the dropdown counties listed under the Districts on page 2 of the General Inputs screens have been updated to reflect IDOT's most recent District/County designations. Specifically, District 2 lost Bureau and Dekalb. District 3 gained Bureau and Dekalb and lost Marshall, Putnam, Woodford, and McLean. District 4 gained Marshall, Putnam, and Woodford. District 5 gained McLean and lost Clark, Coles, Cumberland, Macon, Moultrie, and Shelby. District 7 gained Clark, Coles, Cumberland, Macon, Moultrie, and Shelby and lost Marion, Hamilton, Jefferson, and White. District 8 gained Marion. District 9 gained Hamilton, Jefferson, and White. The district map of Illinois graphic has been revised to reflect the new district boundaries.

- Default Approach Volumes, on page 2 of the Intersection Inputs screens, have been changed from 2 vph to 3 vph. This was done to fix a bug discovered while updating the program. In COSIM 2.0, if a 6x6 T-type intersection is selected and run with the approach volume on D-C Thru of 2 vph, CAL3QHC errors out and does not produce an output file. Changing this minimum volume from 2 vph to 3 vph eliminates this potential error.
- CAL3QHC executable was updated with EPA's latest version Dated 04244 (web reference http://www.epa.gov/scram001/dispersion_prefrec.htm).
- When the CALC button is pressed, the program opens a CAL3QHC input file from the COSIM program folder, replaces input variables with those entered using the COSIM input dialog boxes and creates a new CAL3QHC input file that is saved in the COSIM program folder. If there is any problem reading the input file or creating the new input file, an error message box is displayed. These error message boxes have been updated to reflect a problem experienced by users with restricted user rights under the Windows XP operating system to read "Cannot open CAL3QHC input file. Please make sure you have full user rights to the COSIM program folder before continuing." or "Cannot create CAL3QHC input file. Please make sure you have full user rights to the COSIM program folder before continuing." Note: If the user does not have unrestricted read/write access to the COSIM program folder, COSIM can't properly complete the CO calculations using CAL3QHC.
- Final Report Heading - has been updated to COSIM 3.0.
- Pre-Screen volume input - documentation on Pre-Screen dialog box was revised to reflect the changes made to the volume input. COSIM 2.0 required the total volume on the busiest leg of the intersection. This included traffic traveling in both directions on the leg. COSIM 3.0 only requires the user to enter the approach volume on the busiest leg of the intersection. Dialog box now reads "Highest design year traffic APPROACH volume on busiest leg of intersection: Approach volume entered should be the highest value on any leg of the intersection. Enter as average daily traffic volume (ADT) or peak hourly traffic volume in vehicles per hour (vph) for the design year."
- Pre-Screen Report Heading - has been updated to COSIM 3.0. "Highest Traffic Volume" header has been changed to "Highest Approach Volume."
- Pre-Screen Report Documentation – for a project that passes the Pre-Screen, the first paragraph of the report has been revised to read "Intersection PASSES Pre-Screen. COSIM analysis not required. Highest approach volume for the design year on any leg of the intersection is below the Pre-Screen Cuttoff ADT for the closest receptor distance." The last paragraph of the report has been revised to read "A Pre-Screen carbon monoxide analysis was completed for the proposed project. The results from this proposed roadway improvement indicated that a COSIM air quality analysis is not required, as the results for the worst-case receptor are below the 8-hour average National Ambient Air Quality Standard for CO of 9.0 ppm which is necessary to protect the public health and welfare." For a project that fails the Pre-Screen, the last paragraph of the report has been revised to read "Highest approach volume for the design year on any leg of the intersection is above the Pre-Screen Cutoff ADT for the chosen receptor distance."

2.2.2 Non-visible Revisions

In addition to revising the emission factor lookup table with MOBILE6.2 emission factors as discussed in Chapter 1, much of the code was revised. The majority of code revisions were to account for IDOT's District/County restructuring. Although the changes

affect the operation of the COSIM Version 3.0 program, they are not visibly apparent to the user.

2.3 COSIM VERSION 1 AND 2 COMPATIBILITY

COSIM Version 3.0 has the ability to open project files saved using Version 1.0 (this includes Versions 1.0 or 1.1) or Version 2.0. If a Version 1.0 or 2.0 file is opened, all the saved input variables will appear but the user will have to run through the entire series of input screens before CO concentrations can be calculated. If the previously saved model year was 1999 through 2007, a new valid model year (2008 through 2050) will have to be entered. If a Version 1.0 or 2.0 file is opened and calculations were made before the file was saved, the final report in Version 1.0 or 2.0 formats (with the exception of the year being shown as 2 digits) will be displayed in the main view. The user is able to print the old report; however, to rerun the calculations, the user will have to step through all of the input screens. The variables saved to the old file will appear in the input boxes as the user steps through the screens. When the calculate button is selected, CO concentrations will be recalculated using the latest MOBILE6.2 emission factors. Once the calculate button is pressed, the previously saved CO concentrations that were calculated using the emission factors in Version 1.0 or 2.0 will be lost. COSIM Version 3.0 is not able to recalculate CO concentrations determined in Versions 1.0 or 2.0.

CHAPTER 3: CONCLUSIONS

IDOT, IEPA, and FHWA reviewed this report and the revised COSIM Version 3.0 program. Their comments have been addressed and are reflected in the final release of this report and Version 3.0 of the COSIM model. The COSIM User's Manual has been updated to reflect changes made to the model and is now titled "Illinois COSIM Version 3.0 Carbon Monoxide Screen for Intersection Modeling Air Quality Manual." Electronic PDF versions of this report and the revised Air Quality Manual were provided to IDOT along with CDs containing the COSIM 3.0 installation program. An electronic copy of the C++ source code was also provided to IDOT. Contact the IDOT Bureau of Design and Environment Air Quality Specialist at (217) 785-4181 for additional information on Illinois COSIM.

REFERENCES

Larson, S.M., et al, Carbon Monoxide Analysis for Highway Projects, University of Illinois, Department of Civil and Environmental Engineering, Oct. (1999).

Larson, S.M. and S. Peters, Carbon Monoxide Analysis for Highway Projects: Phase II, University of Illinois, Department of Civil and Environmental Engineering, May (2003).

U.S. Environmental Protection Agency, User's Guide to MOBILE6.1 and MOBILE6.2 (Mobile Source Emissions Factor Model), U.S. EPA, Ann Arbor, Michigan, EPA420-R-03-010, August (2003).

APPENDIX A: ADDITIONAL MOBILE6.2 FILES

Note that to conserve space, the Scenario Section in each of the input files presented in this appendix only includes a scenario for an average speed of 2.5 mph for calendar year 2007. The actual MOBILE6.2 input files used for determining emission factors contained additional Scenario Records for average speeds of 2.5 and 5 to 55 mph in 5 mph increments for calendar years 2007 - 2020 inclusive.

A.1 ATTAINMENT AREAS TO THE NORTH OF 40^{O} N LATITUDE

```
* COSIM 3.0 Input File
* Input file for Illinois Attainment areas to the North of 40 deg N. Latitude

* The following is a description of the scenario modeled by this input file:

* Pollutant Modeled: CO only.
* Type of emissions: Exhaust Running and Start.
* Reformulated Gasoline Program: NONE.
* Oxygenated Fuels - Ether Blend Market Share: 0.000
*                  - Alcohol Blend Market Share: 0.900
*                  - Oxygen Content of Ether Blend: 0.000
*                  - Oxygen Content of Alcohol Blend: 0.350
*                  - RVP Waiver: psi waiver
* Minimum Temperature: 13 oF
* Maximum Temperature: 29 oF
* Fuel RVP: 13
* User Supplied Registration Data: DNSTRD03.d provided by Sam Long of IEPA.
* I/M Program: NONE.
* Calendar Years: 2007 - 2020
* Calendar Month: January
* Altitude: Low
* Type of Roadway: Arterial only.
* Speeds: 2.5 to 55 mph
* All other variables use MOBILE6 Defaults!!!!!

********* HEADER SECTION ************

MOBILE6 INPUT FILE :

POLLUTANTS         : CO

REPORT FILE        : N_ATT.out

* this command produces output for all scenarios in each run.
DATABASE OUTPUT    :

* this command will display column names in the output table.
WITH FIELDNAMES    :

* this command will limit the type of emissions included in the output.  1 = do not include, 2 = include.
* emission types in order are Exhaust Running, Exhaust Start, Evaporative Hot Soak, Evaporative Diurnal
* Evaporative Resting Loss, Evaporative Running Loss, Evaporative Crankcase, and Evaporative Refueling.
* The only emission types that pertain to CO are Exhaust Running, Exhaust Start.
* the following line limits emissions to Exhaust Running and Start.
DATABASE EMISSIONS : 2211 1111

* this command will limit output to daily time periods only, and will aggregate output.
AGGREGATED OUTPUT  :

* this command will write results table to a file called "N_ATT.TB1"
EMISSIONS TABLE    : N_ATT.TB1

RUN DATA

********* RUN SECTION - For North Attainment Area ************

* this command will display separate start, running, and total exhaust EFs in the descriptive output file.
EXPAND EXHAUST     :

* five inputs for Ether Blend Market Share, Alcohol Blend Market Share, Oxygen Content of Ether Blend,
* Oxygen Content of Alcohol Blend, and RVP Waiver Switch (2 = 1 psi waiver)
OXYGENATED FUELS   : .000 .900 .000 .035 2

MIN/MAX TEMPERATURE: 13. 29.

FUEL RVP           : 13.

* Call to Vehicle Distribution File (DNSTRD03.d Provided by Sam Long of IEPA)
```

```
REG DIST           : DNSTRD03.d

********* SCENARIO SECTIONS ************

********* Idle Speed Scenarios *********

SCENARIO RECORD    : Scenario Title - North Attainment at Idle Speed for 2007
CALENDAR YEAR      : 2007
EVALUATION MONTH   : 1
ALTITUDE           : 1
AVERAGE SPEED      : 2.5 Arterial

END OF RUN         :
```

A.2 ATTAINMENT AREAS TO THE SOUTH OF 40^{O} N LATITUDE

```
* COSIM 3.0 Input File
* Input file for Illinois Attainment areas to the South of 40 deg N. Latitude

* The following is a description of the scenario modeled by this input file:

* Pollutant Modeled: CO only.
* Type of Roadway: Arterial only.
* Type of emissions: Exhaust Running and Start.
* Reformulated Gasoline Program: NONE.
* Oxygenated Fuels - Ether Blend Market Share: 0.000
*                   - Alcohol Blend Market Share: 0.900
*                   - Oxygen Content of Ether Blend: 0.000
*                   - Oxygen Content of Alcohol Blend: 0.350
*                   - RVP Waiver: psi waiver
* Minimum Temperature: 21 oF
* Maximum Temperature: 38 oF
* Fuel RVP: 13
* User Supplied Registration Data: DNSTRD03.d provided by Sam Long of IEPA.
* I/M Program: NONE.
* Calendar Years: 2007 - 2020
* Calendar Month: January
* Altitude: Low
* Speeds: 2.5 to 55 mph
* All other variables use MOBILE6 Defaults!!!!!


********* HEADER SECTION ************

MOBILE6 INPUT FILE :

POLLUTANTS         : CO

REPORT FILE        : S_ATT.out

* this command produces output for all scenarios in each run.
DATABASE OUTPUT    :

* this command will display column names in the output table.
WITH FIELDNAMES    :

* this command will limit the type of emissions included in the output.  1 = do not include, 2 = include.
* emission types in order are Exhaust Running, Exhaust Start, Evaporative Hot Soak, Evaporative Diurnal
* Evaporative Resting Loss, Evaporative Running Loss, Evaporative Crankcase, and Evaporative Refueling.
* The only emission types that pertain to CO are Exhaust Running, Exhaust Start.
* the following line limits emissions to Exhaust Running and Start.
DATABASE EMISSIONS : 2211 1111

* this command will limit output to daily time periods only, and will aggregate output.
AGGREGATED OUTPUT  :

* this command will write results table to a file called "S_ATT.TB1"
EMISSIONS TABLE    : S_ATT.TB1

RUN DATA

********* RUN SECTION - For South Attainment Area ************

* this command will display separate start, running, and total exhaust EFs in the descriptive output file.
EXPAND EXHAUST     :

* five inputs for Ether Blend Market Share, Alcohol Blend Market Share, Oxygen Content of Ether Blend,
* Oxygen Content of Alcohol Blend, and RVP Waiver Switch (2 = 1 psi waiver)
OXYGENATED FUELS   : .000 .900 .000 .035 2

MIN/MAX TEMPERATURE: 21. 38.

FUEL RVP           : 13.

* Call to Vehicle Distribution File (DNSTRD03.d Provided by Sam Long of IEPA)
REG DIST           : DNSTRD03.d
```

```
********* SCENARIO SECTIONS ************

********* Idle Speed Scenarios *********

SCENARIO RECORD    : Scenario Title - South Attainment at Idle Speed for 2007
CALENDAR YEAR      : 2007
EVALUATION MONTH   : 1
ALTITUDE           : 1
AVERAGE SPEED      : 2.5 Arterial

END OF RUN         :
```

A.3 NON-ATTAINMENT AREAS IN THE CHICAGO REGION WITH I/M PROGRAMS

```
* COSIM 3.0 Input File
* Input file for Illinois Non-Attainment areas to the North of 40 deg N. Latitude
* In the Chicago Area with I/M Program

* The following is a description of the scenario modeled by this input file:

* Pollutant Modeled: CO only.
* Type of Roadway: Arterial only.
* Type of emissions: Exhaust Running and Start.
* Reformulated Gasoline Program: North Region of the Country
* Oxygenated Fuels: NONE.
* Minimum Temperature: 13 oF
* Maximum Temperature: 29 oF
* Fuel RVP: 14.
* User Supplied Registration Data: CHIRD03.d Provided by Sam Long of IEPA
* I/M Program: IM07ON.D provided by Sam Long of IEPA
* Calendar Years: 2007 - 2020
* Calendar Month: January
* Altitude: Low
* Speeds: 2.5 to 55 mph
* All other variables use MOBILE6 Defaults!!!!!


********* HEADER SECTION ************

MOBILE6 INPUT FILE :

POLLUTANTS         : CO

REPORT FILE        : N_NAT_IM.out

* this command produces output for all scenarios in each run.
DATABASE OUTPUT    :

* this command will display column names in the output table.
WITH FIELDNAMES    :

* this command will limit the type of emissions included in the output.  1 = do not include, 2 = include.
* emission types in order are Exhaust Running, Exhaust Start, Evaporative Hot Soak, Evaporative Diurnal
* Evaporative Resting Loss, Evaporative Running Loss, Evaporative Crankcase, and Evaporative Refueling.
* The only emission types that pertain to CO are Exhaust Running, Exhaust Start.
* the following line limits emissions to Exhaust Running and Start.
DATABASE EMISSIONS : 2211 1111

* this command will limit output to daily time periods only, and will aggregate output.
AGGREGATED OUTPUT  :

* this command will write results table to a file called "N_NAT_IM.TB1"
EMISSIONS TABLE    : N_NAT_IM.TB1

RUN DATA

********* RUN SECTION - For North Non-Attainment Area with I/M Program ************

* this command will display separate start, running, and total exhaust EFs in the descriptive output file.
EXPAND EXHAUST     :

* this indicates a RFG program in the Chicago area using the "North Region" of the country
FUEL PROGRAM       : 2 N

MIN/MAX TEMPERATURE: 13. 29.

* fuel RVP is most likely overriden with the FUEL PROGRAM specifying RFG program.
FUEL RVP           : 14.

* Call to Vehicle Distribution File (CHIRD03.d Provided by Sam Long of IEPA)
REG DIST           : CHIRD03.d

***** I/M Program Parameters *****

* Call to external data file with I/M parameters
* ILLINOIS ENHANCED I/M DESCRIPTION (IM07ON.D provided by Sam Long of IEPA)
```

```
I/M DESC FILE      : IM07ON.D

********* SCENARIO SECTIONS ************


********* Idle Speed Scenarios *********

SCENARIO RECORD    : Scenario Title - North Non-Attainment at Idle Speed for 2007
CALENDAR YEAR      : 2007
EVALUATION MONTH   : 1
ALTITUDE           : 1
AVERAGE SPEED      : 2.5 Arterial


END OF RUN         :
```

A.4 NON-ATTAINMENT AREAS IN THE CHICAGO REGION WITHOUT I/M PROGRAMS

```
* COSIM 3.0 Input File
* Input file for Illinois Non-Attainment areas to the North of 40 deg N. Latitude
* In the Chicago Area without an I/M Program

* The following is a description of the scenario modeled by this input file:

* Pollutant Modeled: CO only.
* Type of Roadway: Arterial only.
* Type of emissions: Exhaust Running and Start.
* Reformulated Gasoline Program: North Region of the Country
* Oxygenated Fuels: NONE.
* Minimum Temperature: 13 oF
* Maximum Temperature: 29 oF
* Fuel RVP: 14.
* User Supplied Registration Data: CHIRD03.d Provided by Sam Long of IEPA
* I/M Program: NONE.
* Calendar Years: 2007 - 2020
* Calendar Month: January
* Altitude: Low
* Speeds: 2.5 to 55 mph
* All other variables use MOBILE6 Defaults!!!!!


********* HEADER SECTION ************

MOBILE6 INPUT FILE :

POLLUTANTS         : CO

REPORT FILE        : N_NAT.out

* this command produces output for all scenarios in each run.
DATABASE OUTPUT    :

* this command will display column names in the output table.
WITH FIELDNAMES    :

* this command will limit the type of emissions included in the output.  1 = do not include, 2 = include.
* emission types in order are Exhaust Running, Exhaust Start, Evaporative Hot Soak, Evaporative Diurnal
* Evaporative Resting Loss, Evaporative Running Loss, Evaporative Crankcase, and Evaporative Refueling.
* The only emission types that pertain to CO are Exhaust Running, Exhaust Start.
* the following line limits emissions to Exhaust Running and Start.
DATABASE EMISSIONS : 2211 1111

* this command will limit output to daily time periods only, and will aggregate output.
AGGREGATED OUTPUT  :

* this command will write results table to a file called "N_NAT.TB1"
EMISSIONS TABLE    : N_NAT.TB1

RUN DATA

********* RUN SECTION - For North Non-Attainment Area without an I/M Program ************

* this command will display separate start, running, and total exhaust EFs in the descriptive output file.
EXPAND EXHAUST     :

* this indicates a RFG program in the Chicago area
FUEL PROGRAM       : 2 N

MIN/MAX TEMPERATURE: 13. 29.

* fuel RVP is most likely overriden with the FUEL PROGRAM specifying RFG program.
FUEL RVP           : 14.

* Call to Vehicle Distribution File
```

```
REG DIST           : CHIRD03.d

********* SCENARIO SECTIONS ************

********* Idle Speed Scenarios *********

SCENARIO RECORD    : Scenario Title - North Non-Attainment at Idle Speed for 2007
CALENDAR YEAR      : 2007
EVALUATION MONTH   : 1
ALTITUDE           : 1
AVERAGE SPEED      : 2.5 Arterial


END OF RUN         :
```

A.5 NON-ATTAINMENT AREAS IN THE METRO-EAST REGION WITH I/M PROGRAMS

```
* COSIM 3.0 Input File
* Input file for Illinois Non-Attainment areas to the South of 40 deg N. Latitude
* In the Metro-East Area with I/M Program

* The following is a description of the scenario modeled by this input file:

* Pollutant Modeled: CO only.
* Type of Roadway: Arterial only.
* Type of emissions: Exhaust Running and Start.
* Reformulated Gasoline Program: South Region of the Country
* Oxygenated Fuels - NONE
* Minimum Temperature: 21 oF
* Maximum Temperature: 38 oF
* Fuel RVP: 14.
* User Supplied Registration Data: MERD03.d provided by Sam Long of IEPA
* I/M Program: IM07ON.D provided by Sam Long of IEPA
* Calendar Years: 2007 - 2020
* Calendar Month: January
* Altitude: Low
* Speeds: 2.5 to 55 mph
* All other variables use MOBILE6 Defaults!!!!!


********* HEADER SECTION ************

MOBILE6 INPUT FILE :

POLLUTANTS         : CO

REPORT FILE        : S_NAT_IM.out

* this command produces output for all scenarios in each run.
DATABASE OUTPUT    :

* this command will display column names in the output table.
WITH FIELDNAMES    :

* this command will limit the type of emissions included in the output.  1 = do not include, 2 = include.
* emission types in order are Exhaust Running, Exhaust Start, Evaporative Hot Soak, Evaporative Diurnal
* Evaporative Resting Loss, Evaporative Running Loss, Evaporative Crankcase, and Evaporative Refueling.
* The only emission types that pertain to CO are Exhaust Running, Exhaust Start.
* the following line limits emissions to Exhaust Running and Start.
DATABASE EMISSIONS : 2211 1111

* this command will limit output to daily time periods only, and will aggregate output.
AGGREGATED OUTPUT  :

* this command will write results table to a file called "S_NAT_IM.TB1"
EMISSIONS TABLE    : S_NAT_IM.TB1

RUN DATA

********* RUN SECTION - For South Non-Attainment Area with I/M Program ************

* this command will display separate start, running, and total exhaust EFs in the descriptive output file.
EXPAND EXHAUST     :

* this indicates a RFG program in the Metro-East area using the "South Region" of the country
FUEL PROGRAM       : 2 S

MIN/MAX TEMPERATURE: 21. 38.

FUEL RVP           : 14.

* Call to Vehicle Distribution File for Metro-East
REG DIST           : MERD03.d

* Call to external data file with I/M parameters
```

```
* ILLINOIS ENHANCED I/M DESCRIPTION (IM07ON.D provided by Sam Long of IEPA)
I/M DESC FILE      : IM07ON.D

********* SCENARIO SECTIONS ************

********* Idle Speed Scenarios *********

SCENARIO RECORD    : Scenario Title - South Non-Attainment at Idle Speed for 2007
CALENDAR YEAR      : 2007
EVALUATION MONTH   : 1
ALTITUDE           : 1
AVERAGE SPEED      : 2.5 Arterial


END OF RUN         :
```

A.6 NON-ATTAINMENT AREAS IN THE METRO-EAST REGION WITHOUT I/M PROGRAMS

```
* COSIM 3.0 Input File
* Input file for Illinois Non-Attainment areas to the South of 40 deg N. Latitude
* In the Metro-East Area without I/M Program

* The following is a description of the scenario modeled by this input file:

* Pollutant Modeled: CO only.
* Type of Roadway: Arterial only.
* Type of emissions: Exhaust Running and Start.
* Reformulated Gasoline Program: South Region of the Country
* Oxygenated Fuels - None
* Minimum Temperature: 21 oF
* Maximum Temperature: 38 oF
* Fuel RVP: 14.
* User Supplied Registration Data: MERD03.d provided by Sam Long of IEPA
* I/M Program: NONE.
* Calendar Years: 2007 - 2020
* Calendar Month: January
* Altitude: Low
* Speeds: 2.5 to 55 mph
* All other variables use MOBILE6 Defaults!!!!!


********* HEADER SECTION ************

MOBILE6 INPUT FILE :

POLLUTANTS         : CO

REPORT FILE        : S_NAT.out

* this command produces output for all scenarios in each run.
DATABASE OUTPUT    :

* this command will display column names in the output table.
WITH FIELDNAMES    :

* this command will limit the type of emissions included in the output.  1 = do not include, 2 = include.
* emission types in order are Exhaust Running, Exhaust Start, Evaporative Hot Soak, Evaporative Diurnal
* Evaporative Resting Loss, Evaporative Running Loss, Evaporative Crankcase, and Evaporative Refueling.
* The only emission types that pertain to CO are Exhaust Running, Exhaust Start.
* the following line limits emissions to Exhaust Running and Start.
DATABASE EMISSIONS : 2211 1111

* this command will limit output to daily time periods only, and will aggregate output.
AGGREGATED OUTPUT  :

* this command will write results table to a file called "S_NAT.TB1"
EMISSIONS TABLE    : S_NAT.TB1

RUN DATA

********* RUN SECTION - For South Non-Attainment Area without I/M Program ************

* this command will display separate start, running, and total exhaust EFs in the descriptive output file.
EXPAND EXHAUST     :

* this indicates a RFG program in the Metro-East area using the "South Region" of the country
FUEL PROGRAM       : 2 S

MIN/MAX TEMPERATURE: 21. 38.

FUEL RVP           : 14.

* Call to Vehicle Distribution File for Metro-East
REG DIST           : MERD03.d
```

```
********* SCENARIO SECTIONS ************

********* Idle Speed Scenarios *********

SCENARIO RECORD    : Scenario Title - South Non-Attainment at Idle Speed for 2007
CALENDAR YEAR      : 2007
EVALUATION MONTH   : 1
ALTITUDE           : 1
AVERAGE SPEED      : 2.5 Arterial


END OF RUN         :
```

A.7 VEHICLE REGISTRATION DATA FOR DOWNSTATE COUNTIES – DNSTRD03.D

```
REG DIST
*
* This file DNSTRD03.D is derived from REGDATA.D, the default MOBILE6 RD file.
*  This file was created 19.v.06 by SSL.  The values shown for LDVs and LDTs
*  are from 2003 ISOS registration data, as given in RD03ERG.xls.  In the
*  this version, LD[G]V and LD[G]T1234 values for All Downstate Counties were
*  used from RD03ERG.xls.
*
* This file contains Registration Distribution fractions for the 16 vehicle
*  classes by age for July of any calendar year for the whole Downstate area,
*  based on 2003/4 gasoline-vehicle age distribution data supplied to SL by
*  ISOS, just as the CHRD01.D file came from I/M test data supplied by Jim
*  Matheny of DVIM.  (See C:\SSLFILES\INVEN\RDAGE01.XLS.)  Age distribution
*  fractions have been rounded to 4 decimal places, and some of the RDs for
*  late years (typically in the last line--entries 21-25) have at times been
*   modified by +/- 0.0001 or so as necessary to make the RDs add up to 1.0000.
*
* The user is referred to REGDATA.D and to M6 Users Guide Section 2.8.7.1
*  p. 63 ff) for more detailed information about the nature of RD files.  See
*  also Section 5.3.2 (p. 169 ff)  for information on converting M5b RDs to M6
*  RDs.  See also \SOURCE\BD20.FOR for default RDs.
*
* This file is representative of all Downstate counties.  Downstate North and
*  Downstate South RDs are very similar:  See RD03ERG.xls, Chart 2.

* In this file, the first number in each distribution is an integer that
*  indicates which of the 16 M6 vehicle classes are represented by the RD in
*  question.  That number is followed by 25 age fractions arranged in two rows
*  of 10 values followed by a row with the last 5 values.  (This is similar to
*  the format used in M5b for RDs.)
*
* RDs for all vehicle classes are given in this file.  This is for completeness
*  even though only those vehicle classes whose RDs were changed from the
*  REGDATA defaults need to be included in this file.  Those that were not
*  changed, are so noted.
*
* It is assumed that the RDs for diesel vehicles are the same as the RDs for
*  the corresponding gasoline vehicles; in particular,  LDDV and LDDT RDs are
*  assumed the same as LDGV and LDGT RDs.  Since the (default) HDV RDs are
*  based  more on diesel vehicles to start with, and HDGVs are many fewer than
*  HDDVs, especially in the higher weight classes, we feel the HDV RDs
*  represent both HDGV and HDDV reasonably well.
*
* I have assumed Default RDs for the various HDV classes.  Good area-specific
*  HDV age distribution data are lacking--RD03ERG covered only LDVs--and
*  besides, much Chicago-area HDV VMT is from vehicles registered outside the
*  Chicago area.   The best choice, then, was to go with the HDV defaults; and
*  similarly with MCs.
*
*  ---SL
*   Checked and revised to reflect correct LDGV/LDGT1 RDs by SL 7.ix.06.
*
*
* M6 LDV = M5 LDV (Light-duty Vehicles--passenger cars--from
*  RD03ERG.XLS for Downstate
 1 0.0454 0.0605 0.0644 0.0690 0.0751 0.0719 0.0628 0.0646 0.0584 0.0659
   0.0542 0.0514 0.0452 0.0407 0.0341 0.0310 0.0243 0.0174 0.0139 0.0111
   0.0086 0.0049 0.0030 0.0025 0.0197
* The following, commented out, are the default (REGDATA) values for LDV.
* 0.0530 0.0706 0.0706 0.0705 0.0703 0.0698 0.0689 0.0676 0.0655 0.0627
* 0.0588 0.0539 0.0458 0.0363 0.0288 0.0228 0.0181 0.0144 0.0114 0.0090
* 0.0072 0.0057 0.0045 0.0036 0.0102
*
* M6 LDT1 = M5 LDT1 from RD03ERG.xls for Downstate
 2 0.0373 0.0497 0.0529 0.0364 0.0315 0.0275 0.0363 0.0302 0.0552 0.0553
   0.0738 0.0551 0.0470 0.0653 0.0496 0.0586 0.0486 0.0487 0.0397 0.0284
   0.0188 0.0119 0.0108 0.0081 0.0233
* The following, commented out, are the Default (REGDATA) values for LDT12
* 2 0.0581 0.0774 0.0769 0.0760 0.0745 0.0723 0.0693 0.0656 0.0610 0.0557
*   0.0498 0.0436 0.0372 0.0309 0.0249 0.0195 0.0147 0.0107 0.0085 0.0081
*   0.0078 0.0075 0.0072 0.0069 0.0359
*
```

```
* M6 LDT2 = LDT2 from RD03ERG.xls for Downstate
 3 0.0579 0.0772 0.0822 0.0859 0.0983 0.0881 0.0931 0.0846 0.0497 0.0504
   0.0447 0.0406 0.0325 0.0244 0.0194 0.0166 0.0191 0.0056 0.0055 0.0044
   0.0050 0.0037 0.0018 0.0014 0.0079
* The following, commented out, are the default (REGDATA) values for LDT12
* 3 0.0581 0.0774 0.0769 0.0760 0.0745 0.0723 0.0693 0.0656 0.0610 0.0557
*   0.0498 0.0436 0.0372 0.0309 0.0249 0.0195 0.0147 0.0107 0.0085 0.0081
*   0.0078 0.0075 0.0072 0.0069 0.0359
*
* M6 LDT3 = LDT3 from RD03ERG.xls for Downstate
 4 0.0499 0.0665 0.0709 0.0702 0.0731 0.0839 0.0579 0.0579 0.0547 0.0649
   0.0596 0.0422 0.0343 0.0212 0.0238 0.0258 0.0209 0.0154 0.0146 0.0122
   0.0104 0.0074 0.0047 0.0028 0.0548
* The following, commented out, are the default (REGDATA) values for LDT34
* 4 0.0594 0.0738 0.0688 0.0640 0.0597 0.0556 0.0518 0.0482 0.0449 0.0419
*   0.0390 0.0363 0.0338 0.0315 0.0294 0.0274 0.0255 0.0237 0.0221 0.0206
*   0.0192 0.0179 0.0167 0.0156 0.0732
*
* M6 LDT4 = LDT2 from RD03ERG.xls for Downstate
 5 0.0596 0.0795 0.0847 0.1007 0.0845 0.0957 0.0697 0.0676 0.0550 0.0544
   0.0495 0.0177 0.0189 0.0108 0.0144 0.0054 0.0074 0.0053 0.0088 0.0084
   0.0052 0.0030 0.0018 0.0011 0.0909
* The following, commented out, are the default (REGDATA) values for LDT34
* 5 0.0594 0.0738 0.0688 0.0640 0.0597 0.0556 0.0518 0.0482 0.0449 0.0419
*   0.0390 0.0363 0.0338 0.0315 0.0294 0.0274 0.0255 0.0237 0.0221 0.0206
*   0.0192 0.0179 0.0167 0.0156 0.0732


*
* HDV2B (Heavy-duty vehicles 2B--M6 Default RDs)
 6 0.0503 0.0916 0.0833 0.0758 0.0690 0.0627 0.0571 0.0519 0.0472 0.0430
   0.0391 0.0356 0.0324 0.0294 0.0268 0.0244 0.0222 0.0202 0.0184 0.0167
   0.0152 0.0138 0.0126 0.0114 0.0499
* HDV3 (Heavy-duty vehicles3, same RD as HDV2B, M6 Default RDs)
 7 0.0503 0.0916 0.0833 0.0758 0.0690 0.0627 0.0571 0.0519 0.0472 0.0430
   0.0391 0.0356 0.0324 0.0294 0.0268 0.0244 0.0222 0.0202 0.0184 0.0167
   0.0152 0.0138 0.0126 0.0114 0.0499
* HDV4 (Heavy-duty vehicles 4, M6 default RDs)
 8 0.0388 0.0726 0.0679 0.0635 0.0594 0.0556 0.0520 0.0486 0.0455 0.0425
   0.0398 0.0372 0.0348 0.0326 0.0304 0.0285 0.0266 0.0249 0.0233 0.0218
   0.0204 0.0191 0.0178 0.0167 0.0797
* HDV5 (Heavy-duty vehicles 5, same RD as HDV4, M6 Default)
 9 0.0388 0.0726 0.0679 0.0635 0.0594 0.0556 0.0520 0.0486 0.0455 0.0425
   0.0398 0.0372 0.0348 0.0326 0.0304 0.0285 0.0266 0.0249 0.0233 0.0218
   0.0204 0.0191 0.0178 0.0167 0.0797
* HDV6 (Heavy-duty vehicless 6, same RD as HDV4, M6 Default)
10 0.0388 0.0726 0.0679 0.0635 0.0594 0.0556 0.0520 0.0486 0.0455 0.0425
   0.0398 0.0372 0.0348 0.0326 0.0304 0.0285 0.0266 0.0249 0.0233 0.0218
   0.0204 0.0191 0.0178 0.0167 0.0797
* HDV7 (Heavy-duty vehicles 7, same RD as HDV4, M6 Default)
11 0.0388 0.0726 0.0679 0.0635 0.0594 0.0556 0.0520 0.0486 0.0455 0.0425
   0.0398 0.0372 0.0348 0.0326 0.0304 0.0285 0.0266 0.0249 0.0233 0.0218
   0.0204 0.0191 0.0178 0.0167 0.0797
* HDV8A (Heavy-duty vehicles 8A same RD as HDV4, M6 Default)
12 0.0388 0.0726 0.0679 0.0635 0.0594 0.0556 0.0520 0.0486 0.0455 0.0425
   0.0398 0.0372 0.0348 0.0326 0.0304 0.0285 0.0266 0.0249 0.0233 0.0218
   0.0204 0.0191 0.0178 0.0167 0.0797
* HDV8B (Heavy-duty vehicles 8B,same RD as HDV4, M6 Default)
13 0.0388 0.0726 0.0679 0.0635 0.0594 0.0556 0.0520 0.0486 0.0455 0.0425
   0.0398 0.0372 0.0348 0.0326 0.0304 0.0285 0.0266 0.0249 0.0233 0.0218
   0.0204 0.0191 0.0178 0.0167 0.0797
* HDBS (HDV School buses; this M6 RD default is assumed)
14 0.0393 0.0734 0.0686 0.0641 0.0599 0.0559 0.0522 0.0488 0.0456 0.0426
   0.0398 0.0372 0.0347 0.0324 0.0303 0.0283 0.0264 0.0247 0.0231 0.0216
   0.0201 0.0188 0.0176 0.0165 0.0781
* HDBT (HDV Transit buses; this M6 RD default is assumed)
15 0.0307 0.0614 0.0614 0.0614 0.0614 0.0614 0.0614 0.0614 0.0614 0.0613
   0.0611 0.0607 0.0595 0.0568 0.0511 0.0406 0.0254 0.0121 0.0099 0.0081
   0.0066 0.0054 0.0044 0.0037 0.0114
* Motorcycles (this M6 default RD is the same as M5a/b's default RD)
16 0.1440 0.1680 0.1350 0.1090 0.0880 0.0700 0.0560 0.0450 0.0360 0.0290
   0.0230 0.0970 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000
   0.0000 0.0000 0.0000 0.0000 0.0000
*
*
```

A.8 VEHICLE REGISTRATION DATA FOR CHICAGO AREA – CHIRD03.D

```
REG DIST
*
* This file CHIRD03.D is derived from REGDATA.D, the default MOBILE6 RD file.
*  This file was created 22.ij.06 by SSL and revised on 10.iv.06.  The values
*  shown for LDVs and LDTs are from 2003 ISOS registration data, as given in
*  RD03ERG.xls.  In the 22.ij. version, only LDGV RDs were changed from the
*  2002 values, but in the 10.iv. version, the RDs for the four LDT types were
*  changed to those given in RD03ERG.xls for the Chicago area.
*
```

```
* This file contains Registration Distribution fractions for the 16 vehicle
*  classes by age for July of any calendar year for the Chicago NAA, based on
*  2003/41 gasoline-vehicle age distribution data supplied to SL by ISOS, just
*  as the CHRD01.D file came from I/M test data supplied by Jim Matheny of DVIM.
*  (See C:\SSLFILES\INVEN\RDAGE01.XLS.)  Age distribution fractions have been
*  rounded to 4 decimal places, and some of the RDs from  for late years
*  (typically in the last line--entries 21-25) have at times been modified by
*  +/- 0.0001 or so as necessary to make the RDs add up to 1.0000.
*
* The user is referred to REGDATA.D and to M6 Users Guide Section 2.8.7.1
*  p. 63 ff) for more detailed information about the nature of RD files.  See
*  also Section 5.3.2 (p. 169 ff)  for information on converting M5b RDs to M6
*  RDs.  See also \SOURCE\BD20.FOR for default RDs.
*
* In this file, the first number in each distribution is an integer that
*  indicates which of the 16 M6 vehicle classes are represented by the RD in
*  question.  That number is followed by 25 age fractions arranged in two rows
*  of 10 values followed by a row with the last 5 values.  (This is similar to
*  the format used in M5b for RDs.)
*
* RDs for all vehicle classes are given in this file.  This is for completeness,
*  even though only those vehicle classes whose RDs were changed from the
*  REGDATA defaults need to be included in this file.  Those that were not
*  changed, are so noted.
*
* It is assumed that the RDs for diesel vehicles are the same as the RDs for
*  the corresponding gasoline vehicles; in particular,  LDDV and LDDT RDs are
*  assumed the same as LDGV and LDGT RDs.  Since the (default) HDV RDs are
*  based  more on diesel vehicles to start with, and HDGVs are many fewer than
*  HDDVs, especially in the higher weight classes, we feel the HDV RDs
*  represent both HDGV and HDDV reasonably well.
*
* I have assumed Default RDs for the various HDV classes.  Good area-specific
*  HDV age distribution data are lacking--RD03ERG covered only LDVs--and
*  besides, much Chicago-area HDV VMT is from vehicles registered outside the
*  Chicago area.   The best choice, then, was to go with the HDV defaults; and
*  similarly with MCs.
*
*  ---SL
*
*
* M6 LDV = M5 LDV (Light-duty Vehicles--passenger cars--from
*  RD03ERG.XLS for Chicago
 1 0.0603 0.0804 0.0805 0.0818 0.0845 0.0773 0.0673 0.0670 0.0574 0.0620
   0.0493 0.0449 0.0388 0.0331 0.0280 0.0233 0.0169 0.0122 0.0089 0.0067
   0.0045 0.0025 0.0014 0.0009 0.0101
* The following, commented out, are the CHIRD01 values.
*1  0.0548 0.0870 0.0798 0.0735 0.0751 0.0668 0.0775 0.0655 0.0609 0.0565
*   0.0530 0.0505 0.0472 0.0399 0.0295 0.0241 0.0174 0.0114 0.0062 0.0033
*   0.0023 0.0024 0.0030 0.0021 0.0103
*
* M6 LDT1 = M5 LDT1 from RD03ERG.xls for Chicago
 2 0.0796 0.1061 0.1062 0.0532 0.0365 0.0331 0.0358 0.0331 0.0546 0.0569
   0.0676 0.0520 0.0396 0.0516 0.0443 0.0444 0.0300 0.0282 0.0188 0.0103
   0.0052 0.0026 0.0021 0.0016 0.0066
* The following, commented out, are the CHIRD01 values
* 2 0.0746 0.1128 0.1041 0.1055 0.0886 0.0737 0.0719 0.0694 0.0572 0.0451
*   0.0437 0.0329 0.0333 0.0289 0.0202 0.0140 0.0092 0.0053 0.0024 0.0015
*   0.0011 0.0006 0.0008 0.0006 0.0026
*
* M6 LDT2 = LDT2 from RD03ERG.xls for Chicago
 3 0.0767 0.1023 0.1024 0.1053 0.1024 0.0893 0.0920 0.0766 0.0563 0.0517
   0.0434 0.0348 0.0237 0.0157 0.0082 0.0061 0.0061 0.0015 0.0014 0.0010
   0.0009 0.0005 0.0003 0.0002 0.0012
* The following, commented out, are the CHIRD01 values
* 3 0.0746 0.1128 0.1041 0.1055 0.0886 0.0737 0.0719 0.0694 0.0572 0.0451
*   0.0437 0.0329 0.0333 0.0289 0.0202 0.0140 0.0092 0.0053 0.0024 0.0015
*   0.0011 0.0006 0.0008 0.0006 0.0026
*
* M6 LDT3 = LDT3 from RD03ERG.xls for Chicago
 4 0.0674 0.0899 0.0900 0.0830 0.0867 0.1041 0.0614 0.0594 0.0433 0.0571
   0.0479 0.0391 0.0303 0.0218 0.0232 0.0236 0.0185 0.0130 0.0092 0.0066
   0.0049 0.0031 0.0017 0.0005 0.0143
* The following, commented out, are the CHIRD01 values
* 4 0.0629 0.1095 0.1300 0.0889 0.0835 0.0624 0.0725 0.0611 0.0455 0.0388
*   0.0300 0.0348 0.0387 0.0313 0.0236 0.0225 0.0161 0.0123 0.0076 0.0034
*   0.0017 0.0032 0.0074 0.0049 0.0074
*
* M6 LDT4 = LDT2 from RD03ERG.xls for Chicago
 5 0.0695 0.0926 0.0927 0.1167 0.1127 0.1290 0.0953 0.0753 0.0561 0.0505
   0.0405 0.0135 0.0137 0.0049 0.0065 0.0041 0.0035 0.0024 0.0042 0.0029
   0.0017 0.0010 0.0003 0.0002 0.0102
* The following, commented out, are the CHIRD01 values
* 5 0.0629 0.1095 0.1300 0.0889 0.0835 0.0624 0.0725 0.0611 0.0455 0.0388
*   0.0300 0.0348 0.0387 0.0313 0.0236 0.0225 0.0161 0.0123 0.0076 0.0034
*   0.0017 0.0032 0.0074 0.0049 0.0074
```

```
*
* HDV2B (Heavy-duty vehicles 2B--M6 Default RDs)
 6 0.0503 0.0916 0.0833 0.0758 0.0690 0.0627 0.0571 0.0519 0.0472 0.0430
   0.0391 0.0356 0.0324 0.0294 0.0268 0.0244 0.0222 0.0202 0.0184 0.0167
   0.0152 0.0138 0.0126 0.0114 0.0499
* HDV3 (Heavy-duty vehicles3, same RD as HDV2B, M6 Default RDs)
 7 0.0503 0.0916 0.0833 0.0758 0.0690 0.0627 0.0571 0.0519 0.0472 0.0430
   0.0391 0.0356 0.0324 0.0294 0.0268 0.0244 0.0222 0.0202 0.0184 0.0167
   0.0152 0.0138 0.0126 0.0114 0.0499
* HDV4 (Heavy-duty vehicles 4, M6 default RDs)
 8 0.0388 0.0726 0.0679 0.0635 0.0594 0.0556 0.0520 0.0486 0.0455 0.0425
   0.0398 0.0372 0.0348 0.0326 0.0304 0.0285 0.0266 0.0249 0.0233 0.0218
   0.0204 0.0191 0.0178 0.0167 0.0797
* HDV5 (Heavy-duty vehicles 5, same RD as HDV4, M6 Default)
 9 0.0388 0.0726 0.0679 0.0635 0.0594 0.0556 0.0520 0.0486 0.0455 0.0425
   0.0398 0.0372 0.0348 0.0326 0.0304 0.0285 0.0266 0.0249 0.0233 0.0218
   0.0204 0.0191 0.0178 0.0167 0.0797
* HDV6 (Heavy-duty vehicless 6, same RD as HDV4, M6 Default)
10 0.0388 0.0726 0.0679 0.0635 0.0594 0.0556 0.0520 0.0486 0.0455 0.0425
   0.0398 0.0372 0.0348 0.0326 0.0304 0.0285 0.0266 0.0249 0.0233 0.0218
   0.0204 0.0191 0.0178 0.0167 0.0797
* HDV7 (Heavy-duty vehicles 7, same RD as HDV4, M6 Default)
11 0.0388 0.0726 0.0679 0.0635 0.0594 0.0556 0.0520 0.0486 0.0455 0.0425
   0.0398 0.0372 0.0348 0.0326 0.0304 0.0285 0.0266 0.0249 0.0233 0.0218
   0.0204 0.0191 0.0178 0.0167 0.0797
* HDV8A (Heavy-duty vehicles 8A same RD as HDV4, M6 Default)
12 0.0388 0.0726 0.0679 0.0635 0.0594 0.0556 0.0520 0.0486 0.0455 0.0425
   0.0398 0.0372 0.0348 0.0326 0.0304 0.0285 0.0266 0.0249 0.0233 0.0218
   0.0204 0.0191 0.0178 0.0167 0.0797
* HDV8B (Heavy-duty vehicles 8B,same RD as HDV4, M6 Default)
13 0.0388 0.0726 0.0679 0.0635 0.0594 0.0556 0.0520 0.0486 0.0455 0.0425
   0.0398 0.0372 0.0348 0.0326 0.0304 0.0285 0.0266 0.0249 0.0233 0.0218
   0.0204 0.0191 0.0178 0.0167 0.0797
* HDBS (HDV School buses; this M6 RD default is assumed)
14 0.0393 0.0734 0.0686 0.0641 0.0599 0.0559 0.0522 0.0488 0.0456 0.0426
   0.0398 0.0372 0.0347 0.0324 0.0303 0.0283 0.0264 0.0247 0.0231 0.0216
   0.0201 0.0188 0.0176 0.0165 0.0781
* HDBT (HDV Transit buses; this M6 RD default is assumed)
15 0.0307 0.0614 0.0614 0.0614 0.0614 0.0614 0.0614 0.0614 0.0614 0.0613
   0.0611 0.0607 0.0595 0.0568 0.0511 0.0406 0.0254 0.0121 0.0099 0.0081
   0.0066 0.0054 0.0044 0.0037 0.0114
* Motorcycles (this M6 default RD is the same as M5a/b's default RD)
16 0.1440 0.1680 0.1350 0.1090 0.0880 0.0700 0.0560 0.0450 0.0360 0.0290
   0.0230 0.0970 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000
   0.0000 0.0000 0.0000 0.0000 0.0000
*
*
```

A.9 VEHICLE REGISTRATION DATA FOR METRO-EAST AREA – MERD03.D

```
REG DIST
*
* This file MERD03.D is derived from CHIRD01.D, MERD01, and REGDATA.D, the
*  default MOBILE6 RD file.  This file was created 11.iv.06 by SSL.
*
* It contains Registration Distribution fractions for the 16 vehicle classes
*  by age for July of any calendar year for the Metro-East NAA, based on 2003/4
*  gasoline-vehicle age distribution data supplied to SL by ERG, which took
*  registration data statewide from ISOS and turned it into the LDV/LDT RDs
*  shown below.
*
* The user is referred to REGDATA.D and to M6 Users Guide Section 2.8.7.1 (p.
*  63 ff) for more detailed information about the nature of RD files.  See
*  also Section 5.3.2 (p. 169 ff)  for information on converting M5b RDs to M6
*  RDs.  See also \SOURCE\BD20.FOR, the default RD built into M6.
*
* In this file, the first number in each distribution is an integer that
*  indicates which of the 16 M6 vehicle classes are represented by the RD in
*  question. (1=LDV, 2=LDT1, etc)  That number is followed by 25 age fractions
*  arranged in two rows of 10 values and a third row with the last 5 values.
*  The last value on the third line is the fraction of vehicles 25 years old
*  or older.  In this file, the first few values  1 0.045 0.075 ... means that
*  4.5% of LDVs were 1 year old or less, 7.5% were 1-2 years old, etc. This is
*  similar to the format of RDs in M5b.)
*
* RDs for all vehicle classes are given in this file.  This is for completeness
*  even though only those vehicle classes whose RDs were changed from the
*  REGDATA defaults need to be included in this file.  Those that were not
*  changed, are so noted.
*
* See SL's file RDAGE01.XLS for original '01 Age Distribution data from VIM,
*  and also \AREASPEC\M5RD01.txt, which is a MOBILE5b-type RD for the Chicago
*  & Metro-East area for '01 derived from RDAGE01.
*
* It is assumed that the RDs for diesel vehicles are the same as the RDs for
*  the corresponding gasoline vehicles; in particular,  LDDV and LDDT RDs are
*  assumed the same as LDGV and LDGT RDs.  Since the (default) HDV RDs are
```

```
*  based  more on diesel vehicles to start with, and HDGVs are many fewer than
*  HDDVs, especially in the higher weight classes, we feel the HDV RDs
*  represent both HDGV and HDDV reasonably well.  I discussed (31.v.02) this
*  decision with Dave Brzezinski of OTAQ, and he agrees it is reasonable
*  and proper.
*
* I have assumed Default RDs for the various HDV classes.  Good area-specific
*  HDV age distribution data are lacking--RD03ERG covered only LDVs--and
*  besides, much Metro-East-area HDV VMT is from vehicles registered outside the
*  Metro-East area.   The best choice, then, was to go with the HDV defaults; and
*  similarly with MCs.
*
*
*  ---SL

* M6 LDV = M5 LDV (Light-duty Vehicles--passenger cars--from
*  RD03ERG.XLS for the 3-county Metro-East area
 1 0.0512 0.0682 0.0755 0.0782 0.0807 0.0727 0.0606 0.0624 0.0565 0.0633
   0.0511 0.0481 0.0412 0.0368 0.0310 0.0270 0.0211 0.0161 0.0136 0.0105
   0.0073 0.0042 0.0025 0.0025 0.0177
*
* M6 LDT1 = M5 LDT1 from RD03ERG.xls for Metro-East
 2 0.0476 0.0634 0.0702 0.0437 0.0320 0.0305 0.0389 0.0315 0.0581 0.0561
   0.0725 0.0564 0.0442 0.0595 0.0428 0.0500 0.0417 0.0425 0.0349 0.0249
   0.0141 0.0099 0.0085 0.0070 0.0191
*
* M6 LDT2 = LDT2 from RD03ERG.xls for Metro-East
 3 0.0655 0.0874 0.0967 0.1007 0.1001 0.0889 0.0899 0.0773 0.0439 0.0440
   0.0394 0.0364 0.0315 0.0226 0.0164 0.0147 0.0153 0.0048 0.0050 0.0041
   0.0040 0.0026 0.0016 0.0010 0.0062
*
* M6 LDT3 = LDT3 from RD03ERG.xls for Metro-East
 4 0.0646 0.0861 0.0953 0.0831 0.0758 0.0821 0.0511 0.0479 0.0489 0.0632
   0.0546 0.0369 0.0325 0.0192 0.0225 0.0219 0.0181 0.0143 0.0133 0.0112
   0.0076 0.0055 0.0035 0.0021 0.0387
*
* M6 LDT4 = LDT2 from RD03ERG.xls for Metro-East
 5 0.0641 0.0855 0.0945 0.1084 0.0976 0.0986 0.0786 0.0701 0.0597 0.0527
   0.0416 0.0137 0.0205 0.0067 0.0114 0.0053 0.0049 0.0062 0.0082 0.0102
   0.0046 0.0032 0.0018 0.0003 0.0516

* Here follow, commented out, the original 3-place RDs from MERD01.D, for
*  reference.  They have been commented out so as not to interfere.
* M6 LDV = M5 LDGV (Light-duty Vehicles--passenger cars--from
*  RDAGE01.XLS and M5RD01.TXT for Metro-East
* 1 0.045 0.075 0.081 0.083 0.081 0.070 0.075 0.065 0.058 0.053
*   0.051 0.042 0.043 0.038 0.029 0.026 0.023 0.014 0.010 0.006
*   0.004 0.003 0.005 0.004 0.016
* M6 LDT1 = (M5) LDGT1 as in RDAge01 for Metro-East
* 2 0.053 0.081 0.096 0.076 0.071 0.069 0.074 0.064 0.059 0.047
*   0.045 0.045 0.047 0.041 0.027 0.026 0.020 0.013 0.011 0.008
*   0.005 0.002 0.005 0.002 0.013
* M6 LDT2 = (M5) LDGT1 as in RDAge01
* 3 0.053 0.081 0.096 0.076 0.071 0.069 0.074 0.064 0.059 0.047
*   0.045 0.045 0.047 0.041 0.027 0.026 0.020 0.013 0.011 0.008
*   0.005 0.002 0.005 0.002 0.013
* M6 LDT3 = (M5) LDGT2 as in RDAge01
* 4 0.046 0.086 0.065 0.055 0.062 0.075 0.064 0.078 0.059 0.049
*   0.045 0.047 0.038 0.042 0.027 0.030 0.016 0.017 0.011 0.010
*   0.004 0.006 0.021 0.021 0.026
* M6 LDT4 = (M5) LDGT2 as in RDAge01
* 5 0.046 0.086 0.065 0.055 0.062 0.075 0.064 0.078 0.059 0.049
*   0.045 0.047 0.038 0.042 0.027 0.030 0.016 0.017 0.011 0.010
*   0.004 0.006 0.021 0.021 0.026

* HDV2B (Heavy-duty vehicles 2B--M6 Default RDs)
 6 0.0503 0.0916 0.0833 0.0758 0.0690 0.0627 0.0571 0.0519 0.0472 0.0430
   0.0391 0.0356 0.0324 0.0294 0.0268 0.0244 0.0222 0.0202 0.0184 0.0167
   0.0152 0.0138 0.0126 0.0114 0.0499
* HDV3 (Heavy-duty vehicles3, same RD as HDV2B, as in M6 Default RDs)
 7 0.0503 0.0916 0.0833 0.0758 0.0690 0.0627 0.0571 0.0519 0.0472 0.0430
   0.0391 0.0356 0.0324 0.0294 0.0268 0.0244 0.0222 0.0202 0.0184 0.0167
   0.0152 0.0138 0.0126 0.0114 0.0499
* HDV4 (Heavy-duty vehicles 4, M6 default RDs)
 8 0.0388 0.0726 0.0679 0.0635 0.0594 0.0556 0.0520 0.0486 0.0455 0.0425
   0.0398 0.0372 0.0348 0.0326 0.0304 0.0285 0.0266 0.0249 0.0233 0.0218
   0.0204 0.0191 0.0178 0.0167 0.0797
* HDV5 (Heavy-duty vehicles 5, same RD as HDV4, as in M6 Default)
 9 0.0388 0.0726 0.0679 0.0635 0.0594 0.0556 0.0520 0.0486 0.0455 0.0425
   0.0398 0.0372 0.0348 0.0326 0.0304 0.0285 0.0266 0.0249 0.0233 0.0218
   0.0204 0.0191 0.0178 0.0167 0.0797
* HDV6 (Heavy-duty vehicless 6, same RD as HDV4, as in M6 Default)
10 0.0388 0.0726 0.0679 0.0635 0.0594 0.0556 0.0520 0.0486 0.0455 0.0425
   0.0398 0.0372 0.0348 0.0326 0.0304 0.0285 0.0266 0.0249 0.0233 0.0218
   0.0204 0.0191 0.0178 0.0167 0.0797
* HDV7 (Heavy-duty vehicles 7, same RD as HDV4, as in M6 Default)
11 0.0388 0.0726 0.0679 0.0635 0.0594 0.0556 0.0520 0.0486 0.0455 0.0425
   0.0398 0.0372 0.0348 0.0326 0.0304 0.0285 0.0266 0.0249 0.0233 0.0218
```

```
   0.0204 0.0191 0.0178 0.0167 0.0797
* HDV8A (Heavy-duty vehicles 8A same RD as HDV4, as in M6 Default)
12 0.0388 0.0726 0.0679 0.0635 0.0594 0.0556 0.0520 0.0486 0.0455 0.0425
   0.0398 0.0372 0.0348 0.0326 0.0304 0.0285 0.0266 0.0249 0.0233 0.0218
   0.0204 0.0191 0.0178 0.0167 0.0797
* HDV8B (Heavy-duty vehicles 8B,same RD as HDV4, as in M6 Default)
13 0.0388 0.0726 0.0679 0.0635 0.0594 0.0556 0.0520 0.0486 0.0455 0.0425
   0.0398 0.0372 0.0348 0.0326 0.0304 0.0285 0.0266 0.0249 0.0233 0.0218
   0.0204 0.0191 0.0178 0.0167 0.0797
* HDBS (HDV School buses; this M6 RD default is assumed)
14 0.0393 0.0734 0.0686 0.0641 0.0599 0.0559 0.0522 0.0488 0.0456 0.0426
   0.0398 0.0372 0.0347 0.0324 0.0303 0.0283 0.0264 0.0247 0.0231 0.0216
   0.0201 0.0188 0.0176 0.0165 0.0781
* HDBT (HDV Transit buses; this M6 RD default is assumed)
15 0.0307 0.0614 0.0614 0.0614 0.0614 0.0614 0.0614 0.0614 0.0614 0.0613
   0.0611 0.0607 0.0595 0.0568 0.0511 0.0406 0.0254 0.0121 0.0099 0.0081
   0.0066 0.0054 0.0044 0.0037 0.0114
* Motorcycles (this M6 default RD is the same as M5a/b's default RD)
16 0.1440 0.1680 0.1350 0.1090 0.0880 0.0700 0.0560 0.0450 0.0360 0.0290
   0.0230 0.0970 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000
   0.0000 0.0000 0.0000 0.0000 0.0000
```

A.10 INSPECTION/MAINTENANCE PROGRAMS FILE – IM07ON.D

```
* ILLINOIS ENHANCED I/M DESCRIPTION

*  Filename: IMO7ON.D

* EXTERNAL INPUT FILE FOR ILLINOIS' OBD-ONLY I/M PROGRAM FROM 2007 ON.
* OBD-ONLY APPLIES TO LIGHT-DUTY VEHICLES ONLY; HDVs still get an
*  Idle Test & Gas Cap Check
* All program start years set to 1986 per USEPA guidance in
*  "Frequently Asked Questions on MOBILE6".

* This represents the NEW I/M program in which only 1996 & newer
*  vehicles are tested with an OBD test; and OBD applies only to LDVs.
*  This program will come into effect in February 2007.

*-------------------------------------------------
*  Program description for post MY'96 LDV OBD I/M
*=================================================

* FIRST I/M program--"Evap" OBD for MY 1996+ LDVs
*-------------------------------------------------
I/M PROGRAM        : 1 1986 2050 2 T/O EVAP OBD
I/M MODEL YEARS    : 1 1996 2050
I/M VEHICLES       : 1 22222 11111111 1
I/M STRINGENCY     : 1 20.0
I/M COMPLIANCE     : 1 95.0
I/M WAIVER RATES   : 1 0.5 2.2     '01 data
I/M EXEMPTION AGE  : 1 25
I/M GRACE PERIOD   : 1 4

* Second I/M program--"Exhaust" OBD for MY 1996+ LDVs
*-------------------------------------------------
I/M PROGRAM        : 2 1986 2050 2 T/O OBD I/M
I/M MODEL YEARS    : 2 1996 2050
I/M VEHICLES       : 2 22222 11111111 1
I/M STRINGENCY     : 2 20.0
I/M COMPLIANCE     : 2 95.0
I/M WAIVER RATES   : 2 0.5 2.2     '01 data
I/M EXEMPTION AGE  : 2 25
I/M GRACE PERIOD   : 2 4
*


*-------------------------------------------------
*  Program description for post MY'96 HDV Idle & GC I/M
*=================================================

* Third I/M program--HDV IDLE for MY 1996+ HDVs
*-------------------------------------------------
I/M PROGRAM        : 3 1986 2050 2 T/O IDLE
I/M MODEL YEARS    : 3 1996 2050
I/M VEHICLES       : 3 11111 22222222 2
I/M STRINGENCY     : 3 20.0
I/M COMPLIANCE     : 3 95.0
I/M WAIVER RATES   : 3 1.2 1.5     '01 data
I/M EXEMPTION AGE  : 3 25
I/M GRACE PERIOD   : 3 4

* Fourth I/M program--Gas Cap Check for MY 1996+ HDVs
*-------------------------------------------------
I/M PROGRAM        : 4 1986 2050 2 T/O GC
I/M MODEL YEARS    : 4 1996 2050
I/M VEHICLES       : 4 11111 22222222 2
I/M COMPLIANCE     : 4 95.0
```

```
I/M WAIVER RATES   : 4 1.2 1.5     '01 data
I/M EXEMPTION AGE  : 4 25
I/M GRACE PERIOD   : 4 4

* NOTES


* This is a standard Illinois I/M input, describing
*  the I/M program with OBD as it is supposed to exist
*  after January 2007.  It is the file to be used for
*  regular M6 I/M runs for 2007 and future years.
*
* This file was originally SB397.D, by Jim Matheny of
*  IEPA/BOA/VIM, supplied to SL by JM 24.viij.05 and
*  verified by SL.  JM's original SB397.D has been
*  slightly revised by the addition of comments such
*  as this one.  The actual inputs have not been
*  changed, except to move and renumber "Exhaust OBD",
*  Program 6 in JM's original SB397 to Program 2, and
*  renumber JM's Programs 4 and 5 in the original SB397
*  to Programs 3 and 4.  This was done to put the two
*  LDV OBD programs (exhaust and evaporative) together,
*  and the two HDV programs together too.  The order of
*  the programs in the I/M file is not significant and
*  has no effect in M6, but the programs must be numbered
*  sequentially.
* JM verified that this file as shown is correctly
*  describes the I/M program planned (summer 2005) for
*  introduction in January '07.
* ---------------
* COMPARISON WITH ILLOBDIM.D:
* The first three programs in ILLOBDIM.D, covering the idle
*  test for MY'68-'81 LDVs, IM240 for '81-'95 LDVs, and gas
*  cap check for MY'68-'95 LDVs have been eliminated from
*  IM07ON; and the two HDV programs now refer only to MY'96
*  and later.
```


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