CONCEPT

On-Road Motor Vehicle (MV) Model

Change Log – March 16th, 2006

Current Version – 0.6

Previous Version – 0.5

There are 3 significant changes in the CONCEPT MV model in this release – the addition of trip ends as a separate category of activity for calculating hotsoak emissions, specification of the temporal profiles for trip starts and trip ends in the run control file, and inclusion of a number of QA checks and reports to the model. The changes are described below – specific changes to CONCEPT MV inputs are described in the fourth section of this document. The last section describes miscellaneous changes.

Trip Ends and Hotsoak Emissions

CONCEPT MV calculates hot soak emissions as the product of a vehicle activity value and the hotsoak emission factor generated by the MOBILE6 model. The emission factor is expressed in grams per hour with an accompanying MOBILE6 assumed value for trip ends per hour. CONCEPT MV divides the emission factor by the MOBILE6 assumed number of trip ends per hour to generate an emission factor in grams per trip end. The prior version of CONCEPT MV then multiplied that emission factor by the input number of trip starts per hour to estimate the total hotsoak emissions.

CONCEPT MV can now calculate hot soak emissions using a user-specified number of trip ends. The model accepts trip ends in the RPO Data Exchange Protocol Mobile Attribute (MA) format – the same format that is used for trip starts. The attribute type for trip ends is "ENDS". In addition, the user can specify a different spatial surrogate code (SSC) for allocating trip ends to the model grid than that specified for trip starts.

If trip ends are not available for a network, but trip starts are input, CONCEPT MV will generate pseudo-ends records by spatially allocating trip starts using the SSC specified for trip ends. These pseudo-ends records are in addition to the spatially allocated trip starts records (allocated using the trip starts SSC). By specifying different SSCs for trip starts and trip ends, the user can generate a more accurately distributed set of hotsoak emissions for networks where separate estimates of trip starts and trip ends are not available.

Temporal Profiles for Trips

CONCEPT MV previously had hard-coded the temporal profiles for trip starts. Two profiles were used – one for weekdays and one for weekends. The default temporal profiles for trip starts from the MOBILE6 model were hard-coded in CONCEPT MV. With this release, the user may now specify the 24-hourly values for each of 4 trips temporal profiles – weekday trip starts, weekend

trip starts, weekday trip ends, and weekend trip ends. These values (if provided) are given in the run control file as a set of 24 comma-separated values for hours 1 through 24 of each run day. If no values are provided in the run control file, CONCEPT MV uses the default profiles from MOBILE6.

QA Checks and Reports

Prior to running the MV model (after importing all of the data and generating the link-grid cross-reference), CONCEPT MV now executes a number of "pre-flight" QA checks. If an error is reported by any of these checks, the MV run will terminate (after the input checks are complete, so you will see all of the errors that were found in the inputs). Some of the input checks only issue a warning or an informational message – these do not terminate the run. The checks include:

1. The time zone specified in the run control file is valid.

2. The emission modes and pollutant codes are valid.

3. All inputs for VMT, trip starts, and trip ends have a network name assigned.

4. Link VMT, HPMS VMT, trip starts, and trip ends, if provided, include the episode date(s).

5. Total volume temporal profiles and vehicle mix profiles overlap the episode date(s).

6. All VMT, trip starts, and trip ends are provided as daily totals, not period totals.

7. For each network, speeds are either calculated by CONCEPT MV or are provided directly (no mixed speed data within a network).

8. If CONCEPT MV is to calculate speed, input includes freeflow speed, volume, and capacity.

9. If CONCEPT MV is to calculate speed, all speed adjustment curve ids are defined in the RPO Mobile MC file.

10. HPMS VMT data, if provided, does not specify vehicle types (HPMS VMT is entered as total across all vehicle types), and is specified for the FHWA roadway classes (plus ramps, if desired – refer to the CONCEPT users manual for a list of valid roadway type codes).

11. Link VMT data, if provided, uses valid FHWA roadway type codes (plus ramps).

12. The link-grid cross reference table contains at least one entry for each link provided in the RPO Mobile ML file (if not, this condition generates a warning, not an error).

13. Minimum speed bin value is zero (if not, this condition generates a warning, not an error).

14. The maximum speed bin upper value is greater than or equal to the maximum actual speed or freeflow speed provided.

15. The minimum and maximum values covered by the temperature bins are, respectively, less than or equal to and greater than or equal to the minimum and maximum temperatures in the meteorological data. Note that this check is not limited to the episode days – the code checks the entire met data set.

16. Vehicle mix profiles are provided for all 8 MOBILE5 vehicle classes, and all of the FHWA roadway types (ramps are optional).

17. The area types specified in the vehicle mix profiles are correct for the given roadway type codes.

18. The total volume temporal profiles do not specify vehicle types, but do specify all of the FHWA roadway types (ramps are optional).

19. The area types specified in the temporal profiles are correct for the given roadway type codes.

20. The MOBILE5 vehicle type cross reference file (m5_vehicle_type_xref) contains all of the TDM vehicle type codes provided in the RPO Mobile MA input data.

21. Each of the MOBILE5 vehicle classes is assigned to no more than one TDM vehicle type in the MOBILE5 vehicle type cross reference file.

22. Speciation profiles exist for all valid combinations of the specified pollutants and emission modes (if not, a warning is generated, not an error).

The model also prints an informational message describing the extents (minimum and maximum grid coordinates) of the VMT (link and HPMS), trip starts, and trip ends data. Users should check this output to ensure that the different networks have been projected onto the model grid correctly.

Upon completion of these checks, the CONCEPT MV model performs a review of the MOBILE6 representative county input file (repcounty.xml) that checks the following:

1. The specified representative county file exists.

2. Each representative county includes a FUEL RVP command, unless the county includes a reformulated gasoline fuel program (FUEL PROGRAM = 2).

3. Any external files referenced in the representative county data exist in the directory indicated for the mobile6 data files. Commands that are checked for external files are:

   MPG ESTIMATES

   REG DIST

   MILE ACCUM RATE

   NGV FRACTION

   NGV EF

   STARTS PER DAY

   START DIST

SOAK DISTRIBUTION

HOT SOAK ACTIVITY

DIURN SOAK ACTIVITY

WE DA TRI LEN DI

WE EN TRI LEN DI

I/M CUTPOINTS

I/M DESC FILE

T2 EXH PHASE-IN

T2 EVAP PHASE-IN

T2 CERT

94+ LDG IMP

Note that the external files associated with the PARTICULATE EF command are not checked since CONCEPT automatically copies the MOBILE6 default files to the required location.

4. The representative county data does not include any "prohibited" MOBILE6 commands. Commands that may not be specified in the user input are:

MOBILE6 INPUT FILE

MOBILE6 BATCH FILE

RUN DATA

SCENARIO RECORD

END OF RUN

POLLUTANTS

PARTICULATES

PARTICULATE EF

PARTICLE SIZE

EXPRESS HC AS

AIR TOXICS

ADDITIONAL HAPS

REPORT FILE

DATABASE OUTPUT

WITH FIELDNAMES

DATABASE OPTIONS

DATABASE EMISSIONS

DATABASE FACILITIES

DATABASE VEHICLES

DATABASE AGES

DATABASE HOURS

DATABASE YEARS

DAILY OUTPUT

AGGREGATED OUTPUT

EMISSIONS TABLE

CALENDAR YEAR

EVALUATION MONTH

MIN/MAX TEMPERATURE

HOURLY TEMPERATURES

ABSOLUTE HUMIDITY

RELATIVE HUMIDITY

BAROMETRIC PRES

VMT FRACTIONS

VMT BY FACILITY

VMT BY HOUR

SPEED VMT

AVERAGE SPEED

DATABASE GROUPS

In addition to the "pre-flight" checks, CONCEPT MV also outputs QA summary reports at the conclusion of each step to make it easier to check the execution. The QA reports can be individually enabled or disabled in the run control file. Also, the user can specify whether the reports should be streamed to the standard output along with the other runtime messages, or should be written to individual files in the directory specified for model output. There is a utility script in the src/mv/output directory that can be used to run the QA reports after the CONCEPT MV model has been run. Run the script (run_summaries.sh) with no parameters to see the proper syntax.

At this time, the emission factors summary report is very time-consuming. We continue to look for ways to speed up the report, but users may want to run the CONCEPT MV model with this report disabled, then run the report at a later time.

Changes to CONCEPT MV Input Formats - Run Control File

Note – please refer to the example file located in the concept directory (run_control.example) for details on all available run control commands.

ENDS_SSC

Spatial surrogate code to use for trip ends. If the code specified is not found, the population surrogate will be used and a warning message printed to the standard output. Default – 100. Example:

ENDS_SSC = 99999

MV_Summaries_Dest

set to either LOG or DIR. LOG will cause CONCEPT MV to write the requested QA summaries to the standard output. DIR will cause CONCEPT MV to write each summary to an individual text file in the output directory specified in the concept run_mv_model command. Default – LOG. Example:

MV_Summaries_Dest = DIR

MV__Summary***

Set to Yes or No to enable or disable a specific QA summary report. The valid commands are:

MV_HPMS_Summary

MV_Temporal_Summary

MV_Speed_Summary

MV_Spatial_Summary

MV_Vehicle_Summary

MV_M6_Runs_Summary

MV_M6_EF_Summary

MV_Raw_Summary

MV_Final_Summary

Default – No. Example:

MV_M6_EF_Summary = No

STARTSProfile_Weekday
STARTSProfile_Weekend
ENDSProfile_Weekday
ENDSProfile_Weekend

Sets the 24 hourly weekday or weekend profile values for trip starts or trip ends. Default – MOBILE6 profile values. Example:

STARTSProfile_Weekday = 0.01, 0.03, 0.04, 0.05, 0.05, 0.04, 0.04, 0.04, 0.05, 0.06, ...

Other Changes

The main concept script was modified to rearrange the help text into logical groups. Also, code was added to the script to attempt to find the appropriate postgis installation directory – if the script can not find the location, the user may set the location in an environment variable named POSTGIS_DIR. If the postgis files can not be found, the script will exit with an error. The script also checks that the psql command is in the user's path.

There is a new directory at $CONCEPT_HOME/src/mv/util that contains 2 useful scripts for initializing and running the MV model. The directory also contains example files containing the list of input file names for globals, rpo, met data, and mv data. A similar directory exists at

$CONCEPT_HOME/src/nonroad/util with scripts and an example filenames file for the NONROAD model.

Several changes were made to the concept script, the database creation scripts, and the importers to fix problems with running the NONROAD portion of CONCEPT. A test case has been set up for v0.6 and is posted as nr_test_v0.6.tgz.