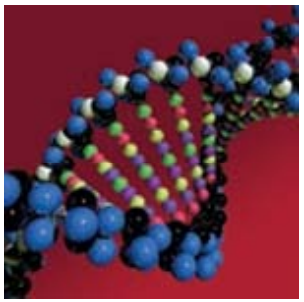
Use of MOVES2010 in Link Level On-Road Vehicle Emissions Modeling Using CONCEPT-MV


Presented by Chris Lindhjem

Allison DenBleyker, Michele Jimenez, John Haasbeek, Alison K. Pollack, ENVIRON International Corporation

Zheng Li, Clark County

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ENVIRON

Overview

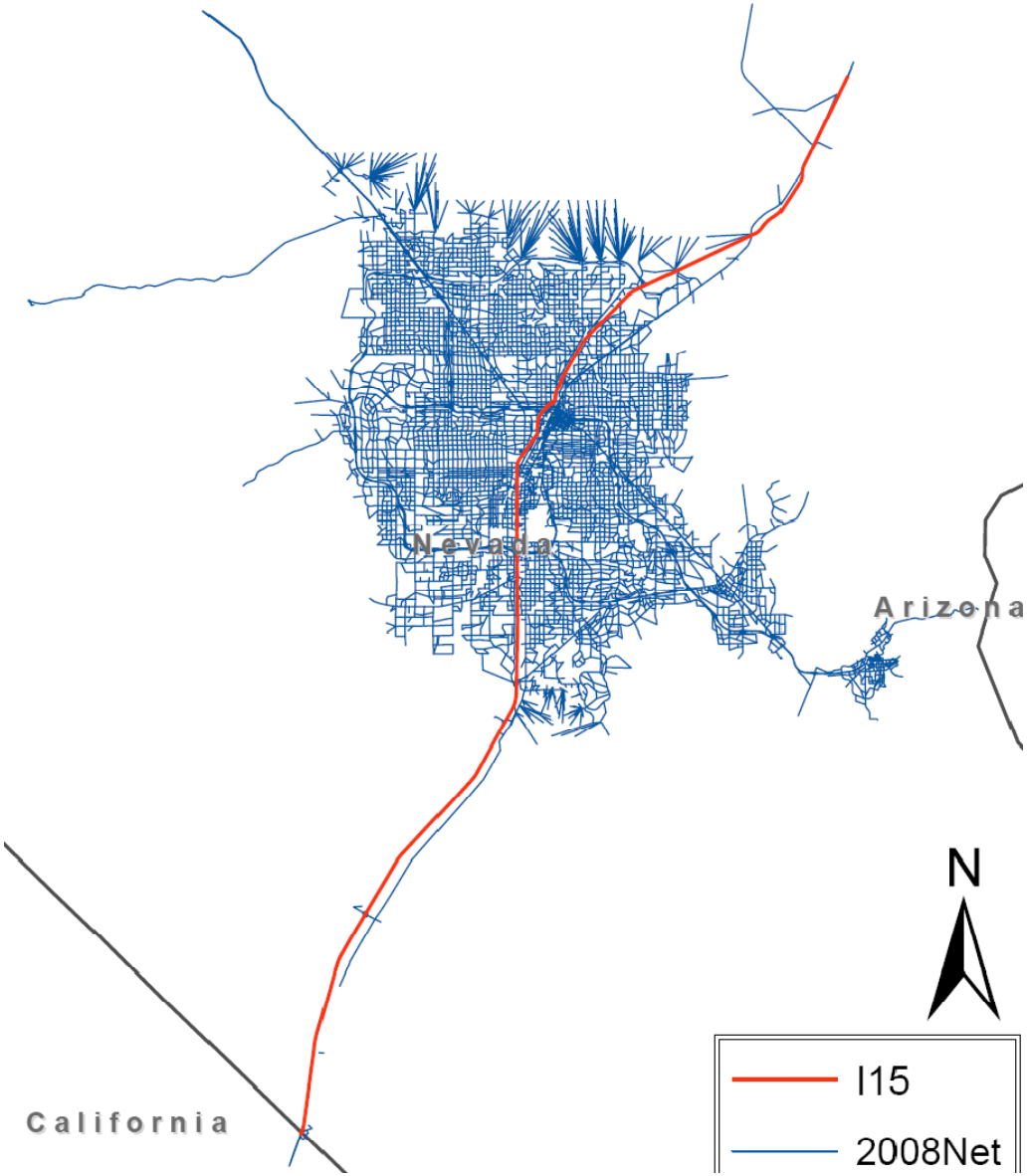
- Use and function of CONCEPT
- Incorporating MOVES2010
  - New model structure
  - Use of MOVES2010 Lookup Tables
  - Describe new model estimates
  - Implications of revised emissions with MOVES2010
- Sample regional results with detailed emission process and vehicle type
- Next steps using MOVES2010a

Link-Level Emissions: CONCEPT MV Model

- Uses output from transportation demand models (TDM) for vehicle volumes
- Generates gridded, hourly link-level emissions by vehicle class
- Uses MOVES vehicle classes (source types) and road types (facilities)
- Detailed temporal resolution of traffic volume, speeds, and VMT mix (truck mix!)
- Uses gridded meteorological data for temperature and humidity
- Uses MOVES2010a emission factors

Basic Input
(Link Activity Data)

- Link volumes
- Link speeds
  - Calculated from link volume and capacity (Standard Algorithms)
  - External file (optional)
- Vehicle population
  - Area VMT for heavy-duty trucks and vehicle registration (early EPA guidance) for light-duty cars and trucks

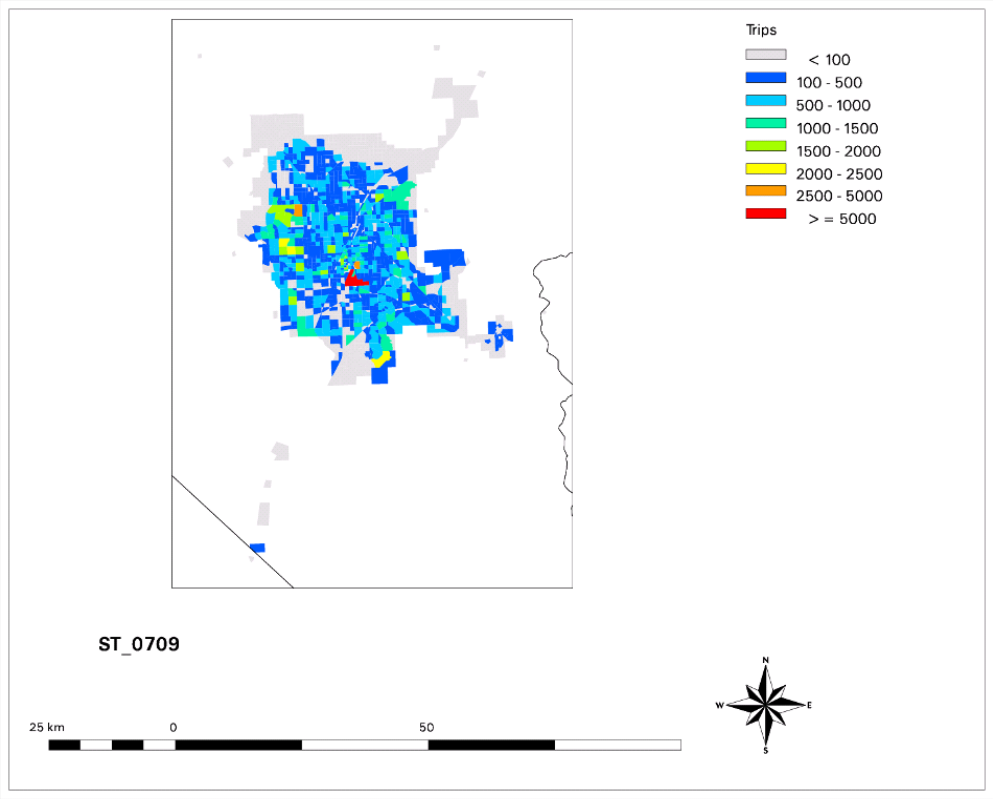


Other Traffic Data

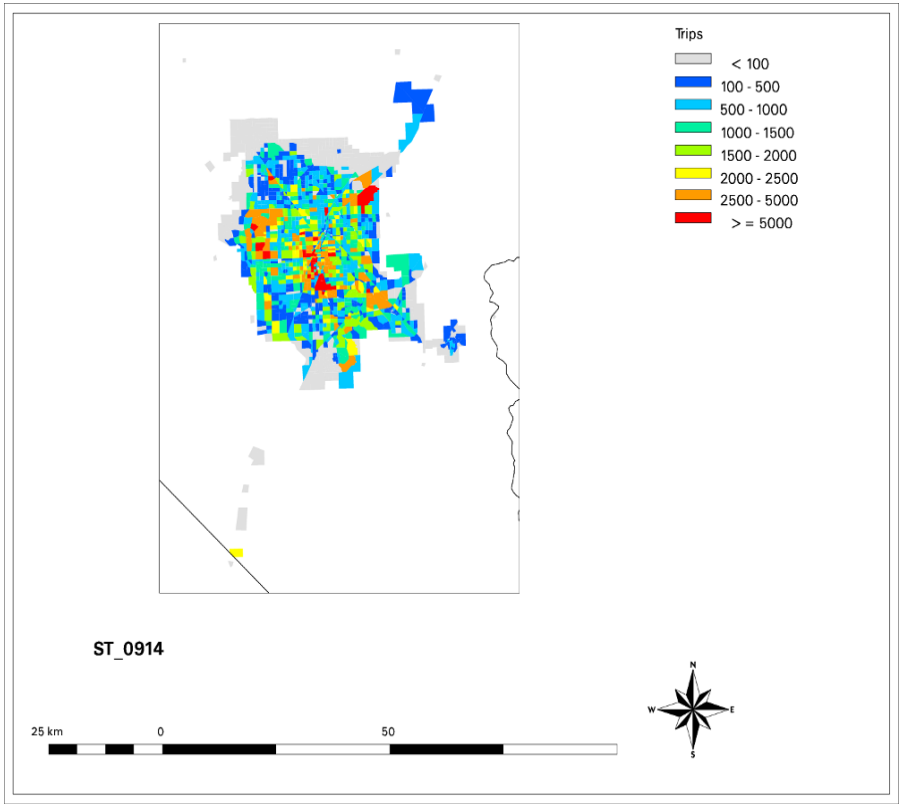
- Vehicle (source) types
  - Determined from vehicle classification data
  - By road type (limited access and other, ramps)
  - Temporal (time of day and day of week)
- Trips Start and Destination
  - Derived from survey data
  - By time of day
  - By Traffic Analysis Zones (TAZ), subregional areas

Traffic Analysis Zones

Clark Co. Early Trip Starts



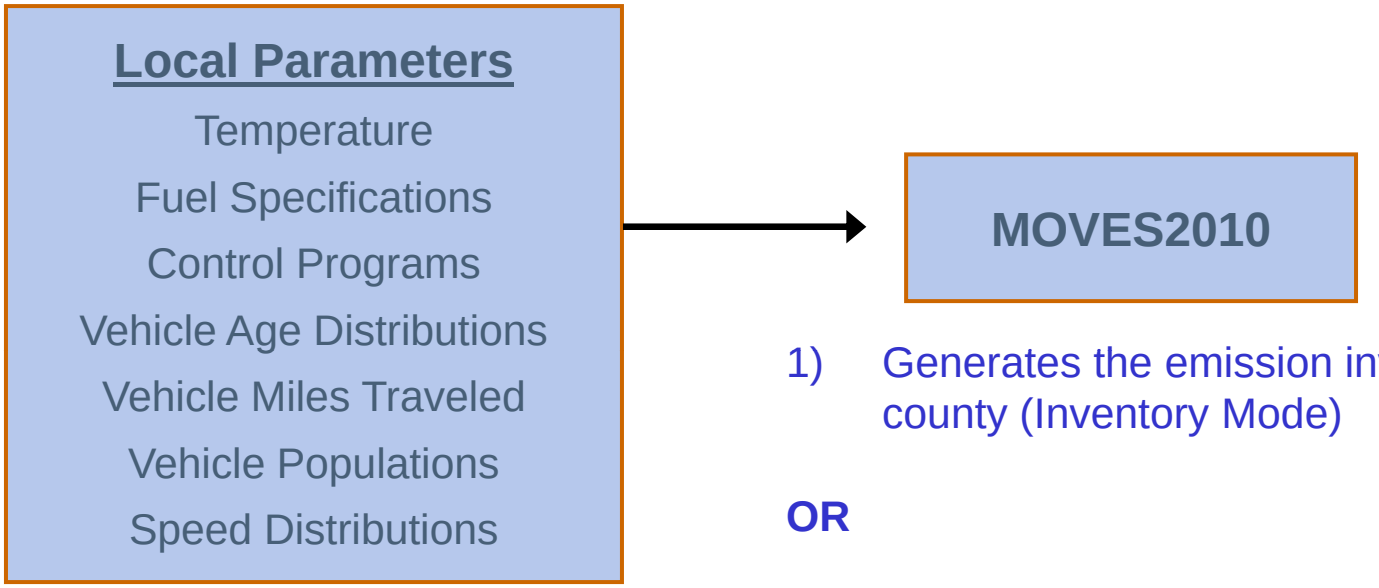
Clark Co. Mid-Day Trip Starts



Advanced Features (Queueing)

- Traffic volumes exceeding capacity
  - Cap above which the volume is queued
  - Queued determined
    - Queue length equals number of cars and length
    - Car length variable includes gap between cars
    - Queue length subtracted from link length to estimate flowing length
  - Speed averaged between queued and flowing
    - Geometric average (averaged by time) speed
    - May be possible to break link into queued and flowing (average speed does not produce average emissions)

Estimating Emissions with MOVES



1) Generates the emission inventories by county (Inventory Mode)

OR

2) Lookup tables of emission factors
   a. Running processes (g/mile)
   b. Start, idle, and parked (g/vehicle-hour)
   c. Evaporative (g/vehicle-hour)

MOVES requires vehicle populations in addition to vehicle miles traveled

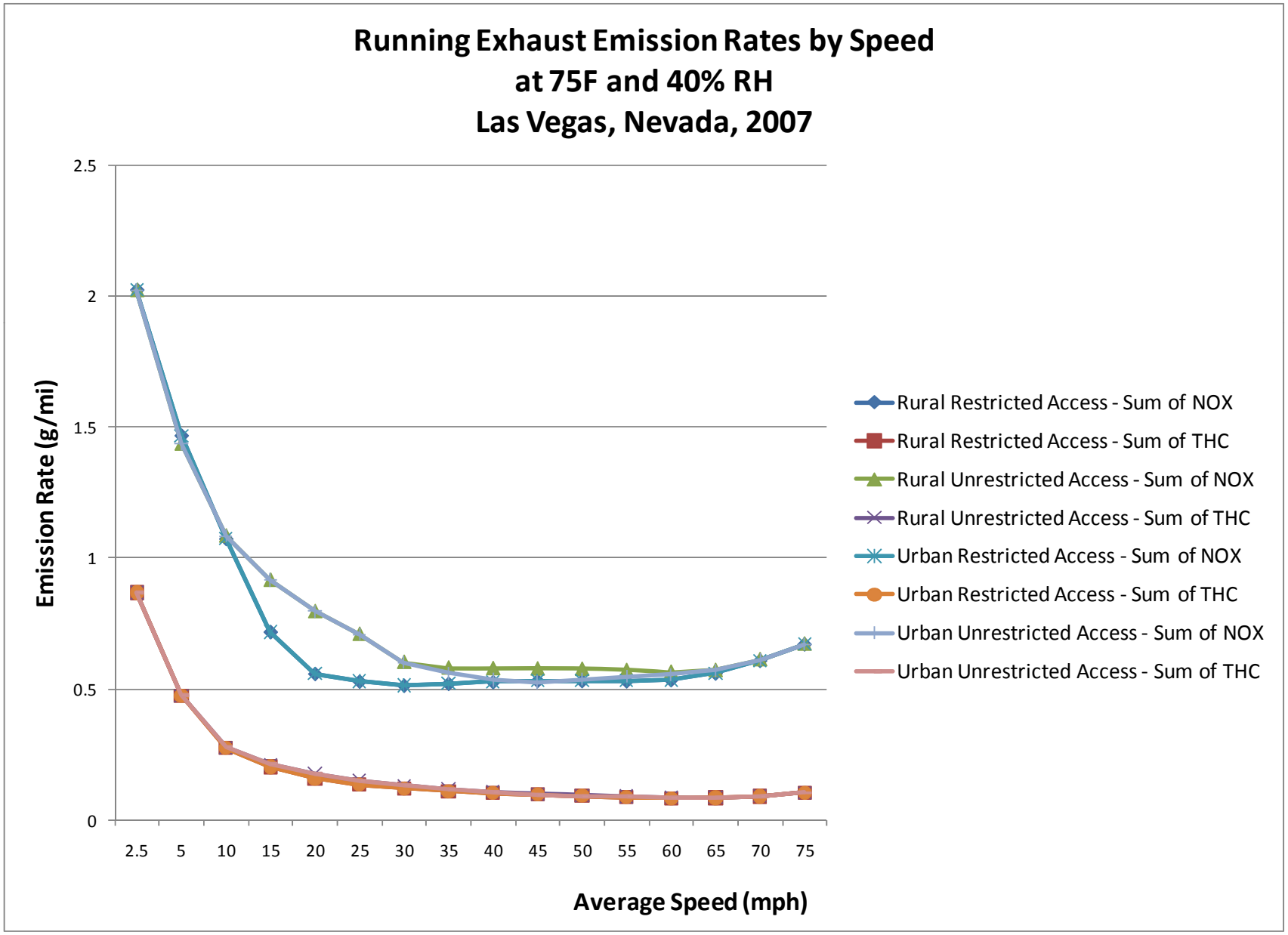
MOVES2010 and Link-Level Emissions

Process Name	Rateperdistance (g/mile)	Ratepervehicle (g/vehicle/hour)	Rateperprofile (g/vehicle/hour)
Running Exhaust	X	-	-
Crankcase Running Exhaust	X	-	-
Brakewear	X	-	-
Tirewear	X	-	-
Evaporative Fuel Vapor Venting	X	-	X
Evaporative Permeation	X	X	-
Evaporative Fuel Leaks	X	X	-
Start Exhaust	-	X	-
Crankcase Start Exhaust	-	X	-
Extended Idle Exhaust	-	X	-
Crankcase Extended Idle Exhaust	-	X	-
Refueling Displacement Vapor Loss	-	-	-
Refueling Spillage Loss	-	-	-

MOVES2010 and Link-Level Emissions

- Rateperdistance (g/mile)
  - VMT (Hourly speeds)
    - Measure of congestion (Vehicle volumes, capacity, and free flow speeds)
    - Alternative files (fixed by transportation models)
  - Vehicle type (Hourly by road type)
  - Three dimensional emission factor lookup tables (temperature, humidity, and speed)
- Rateperprofile (g/vehicle/hour)
  - Number of vehicles for evaporative emissions vapor venting
  - Affected by daily temperature profile (previous hour temperatures)
    - Parked vehicles
    - Includes former MOBILE6 ‘diurnal’ and ‘hot soak’ emissions processes
  - Spatially allocated to trip ends by TAZ

Speed Matters (Light-Duty)



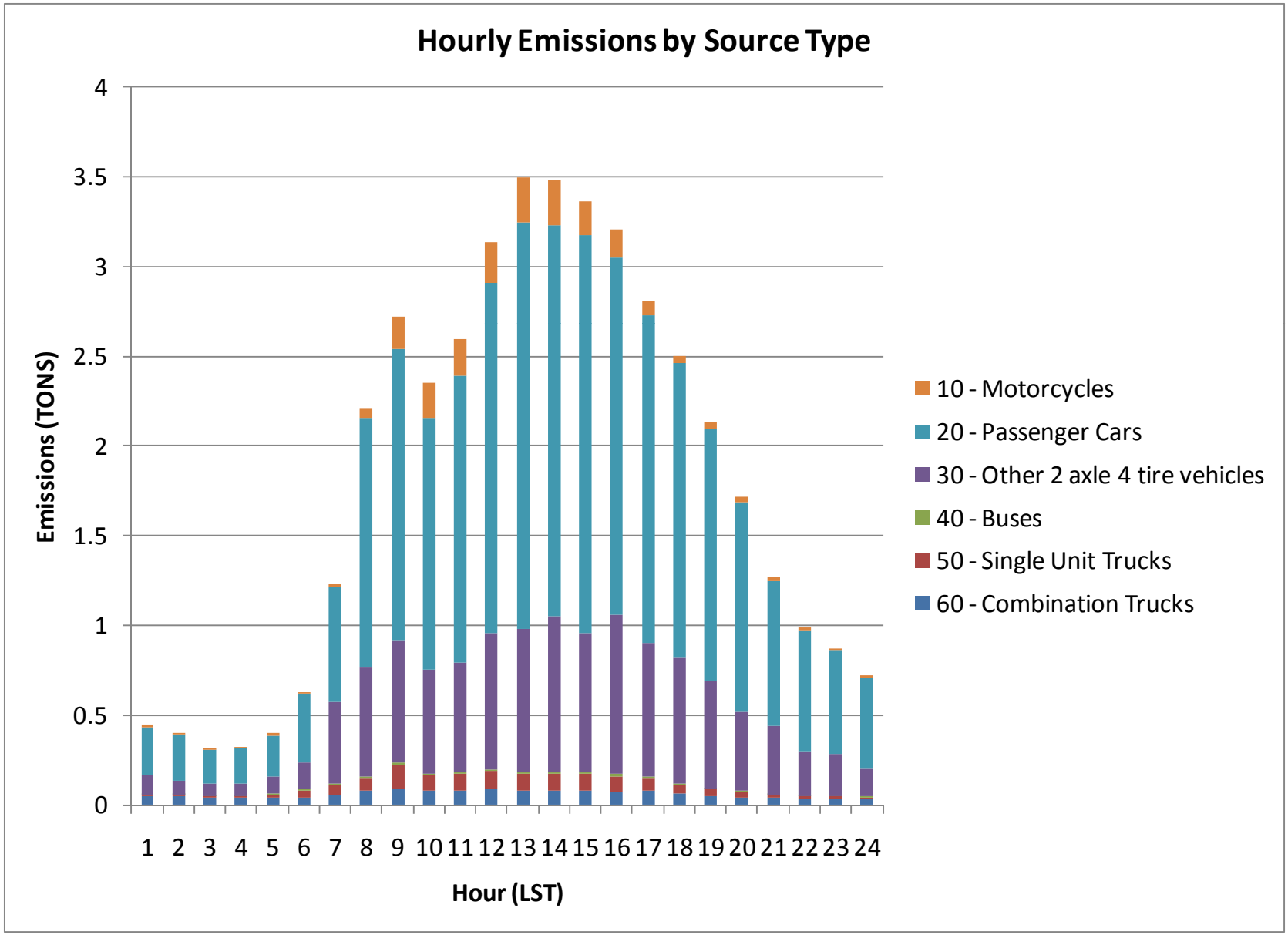
MOVES2010 and Link-Level Emissions

- Ratepervehicle (g/vehicle/hour)
  - Parked vehicle emissions
  - Vehicle population, vehicle type, and temperature (humidity incorporated as an off-model calculation)
  - Start exhaust (temperature and humidity)
    - Hourly emission rates affected by temperature
    - Spatially allocated to trip starts by TAZ
  - Extended idle
    - Hourly emission rates affected by temperature and humidity
    - Spatially allocated to truck stops or other locations
  - Permeation and leaks
    - Affected by temperature
    - Spatially allocated to trip ends from TAZ

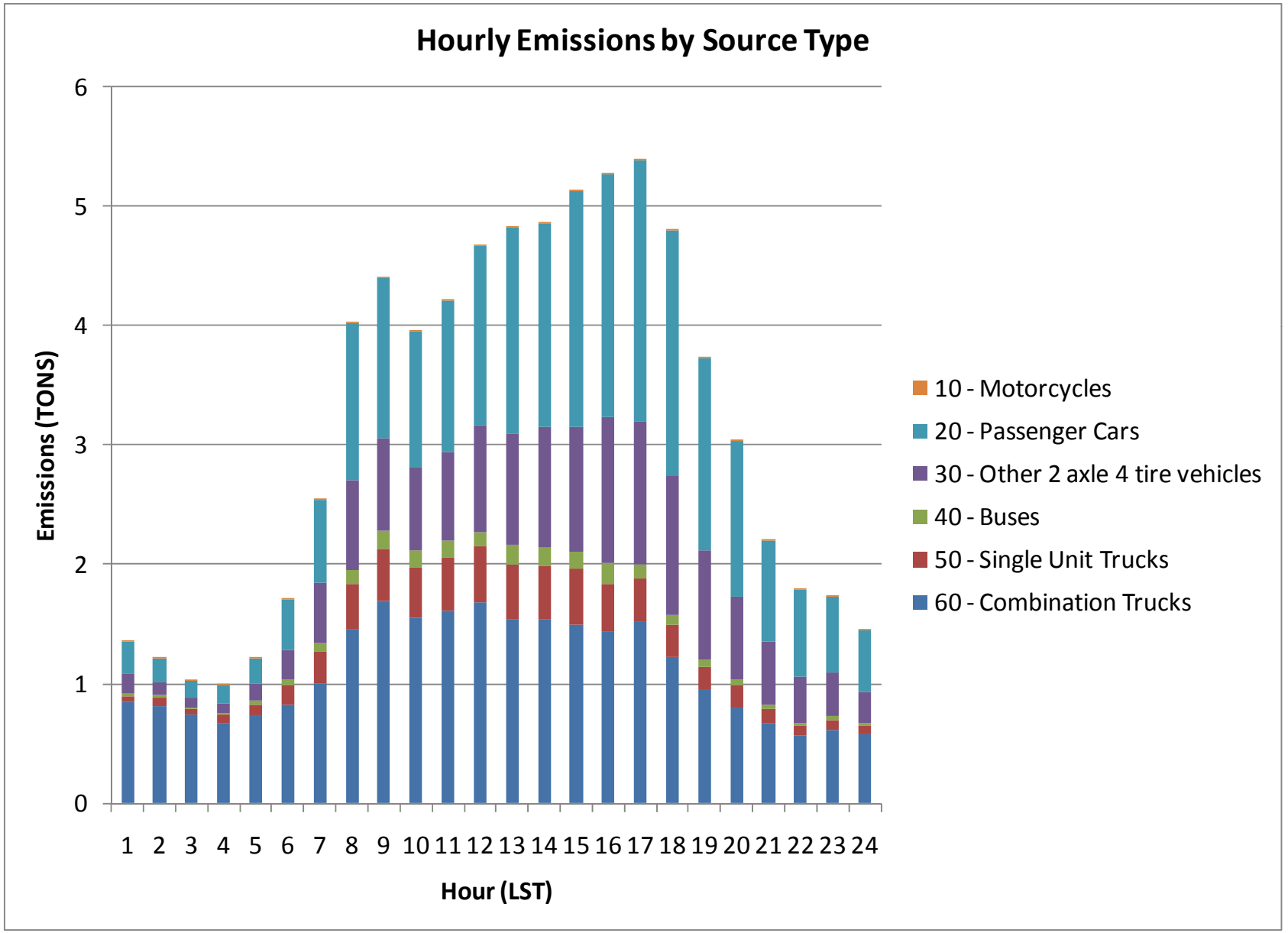
Clark County Trial Run

- Complete but approximate traffic volumes, vehicle population, and trips
- Weekday sample for 2007
- Full CONCEPT and MOVE2010 run with all vehicles and processes

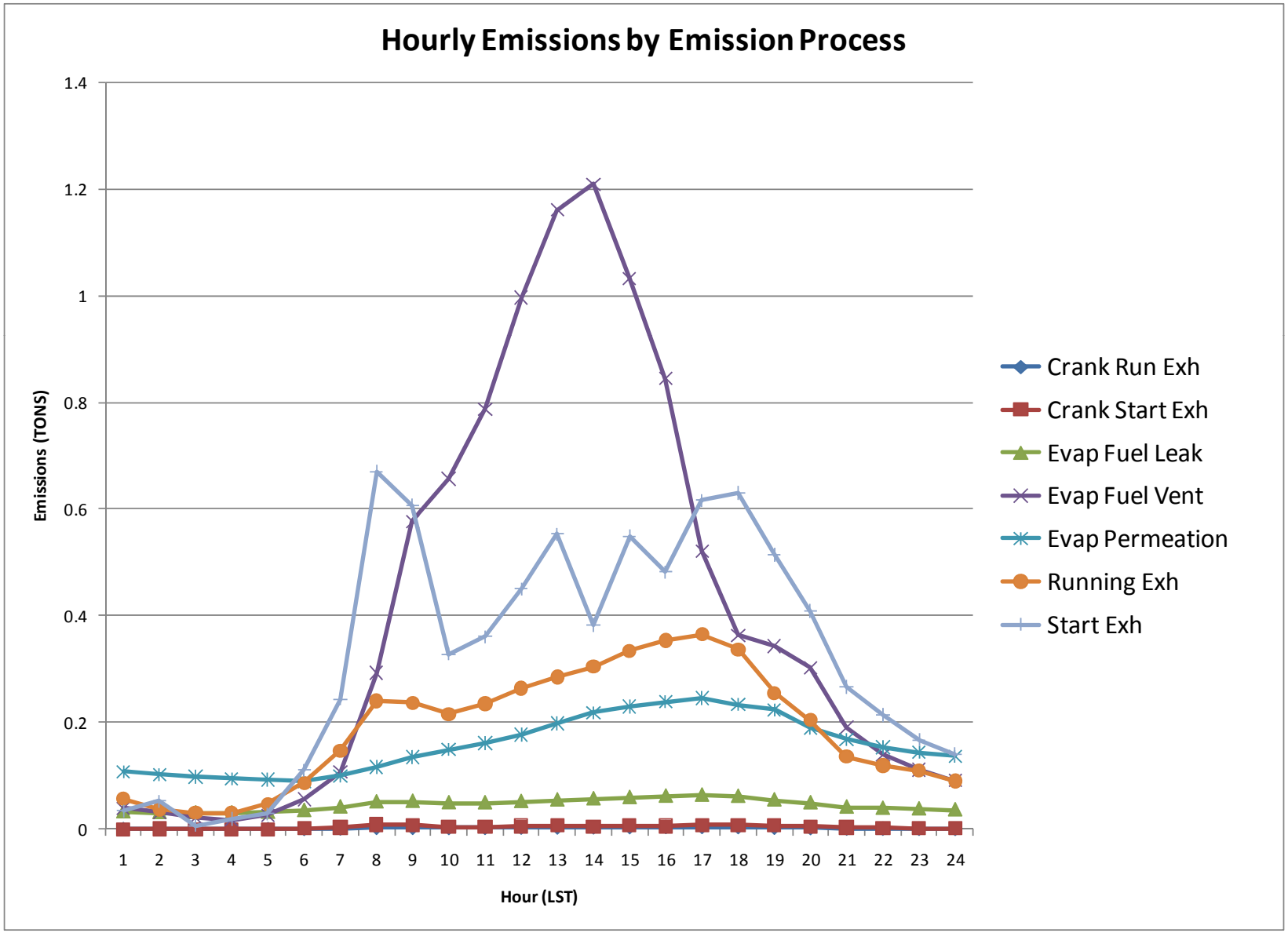
Clark Co. TOG Emissions



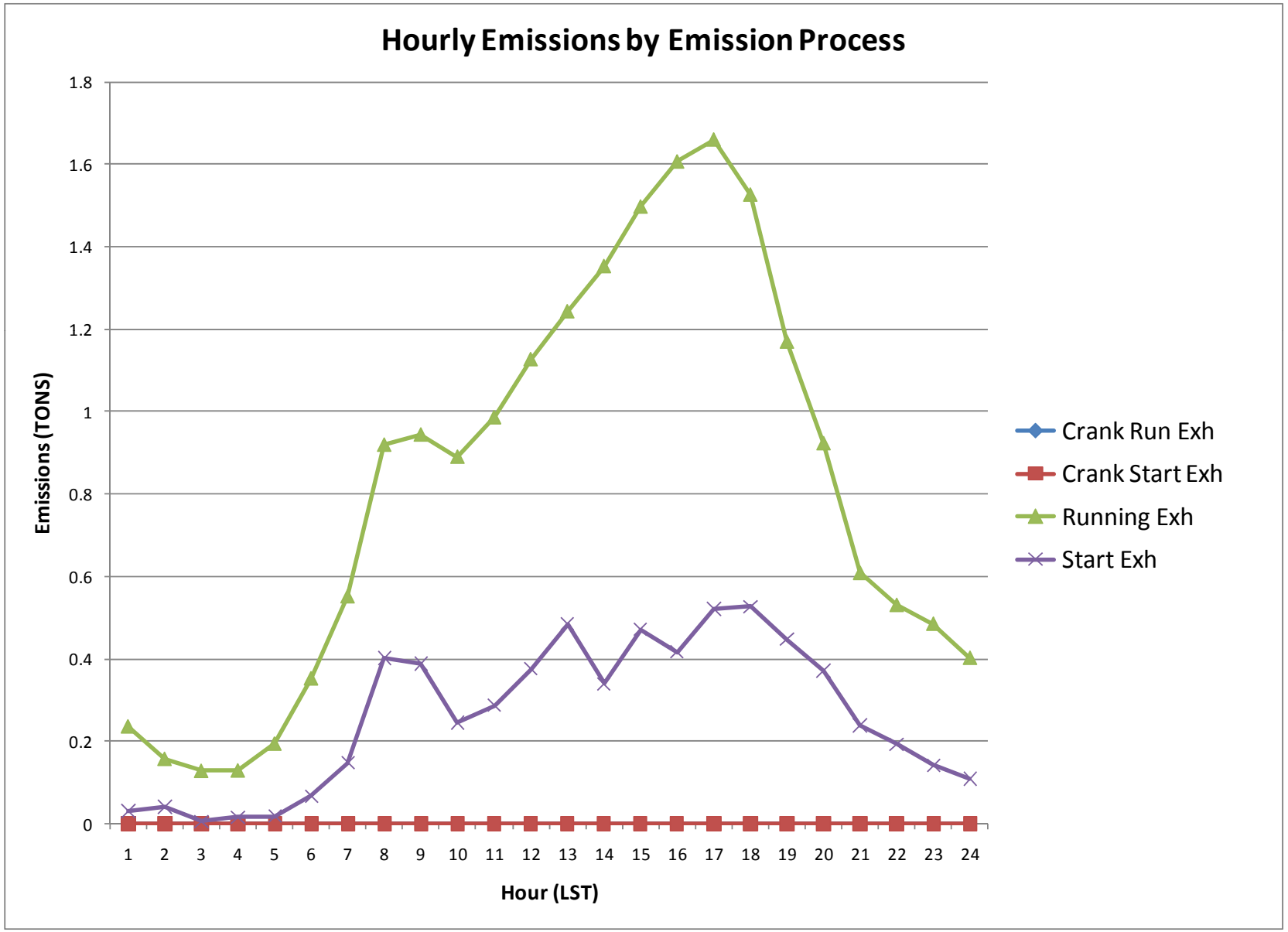
Clark Co. NO Emissions



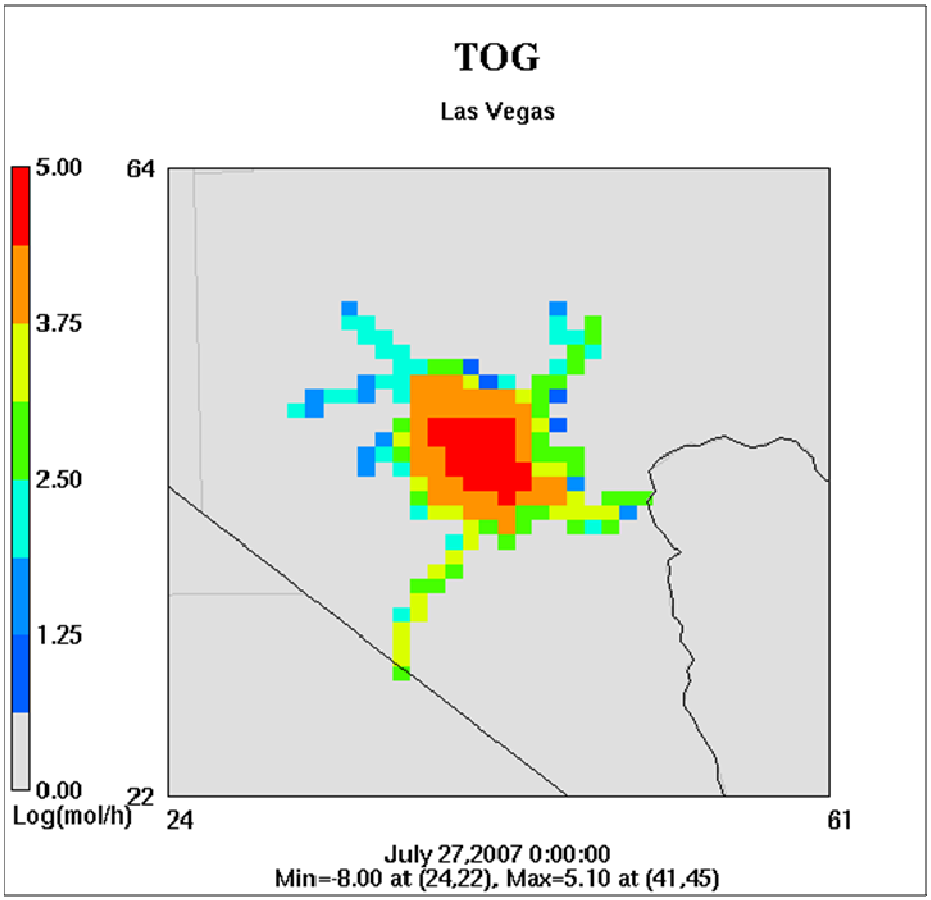
MOVES2010 Process (TOG)

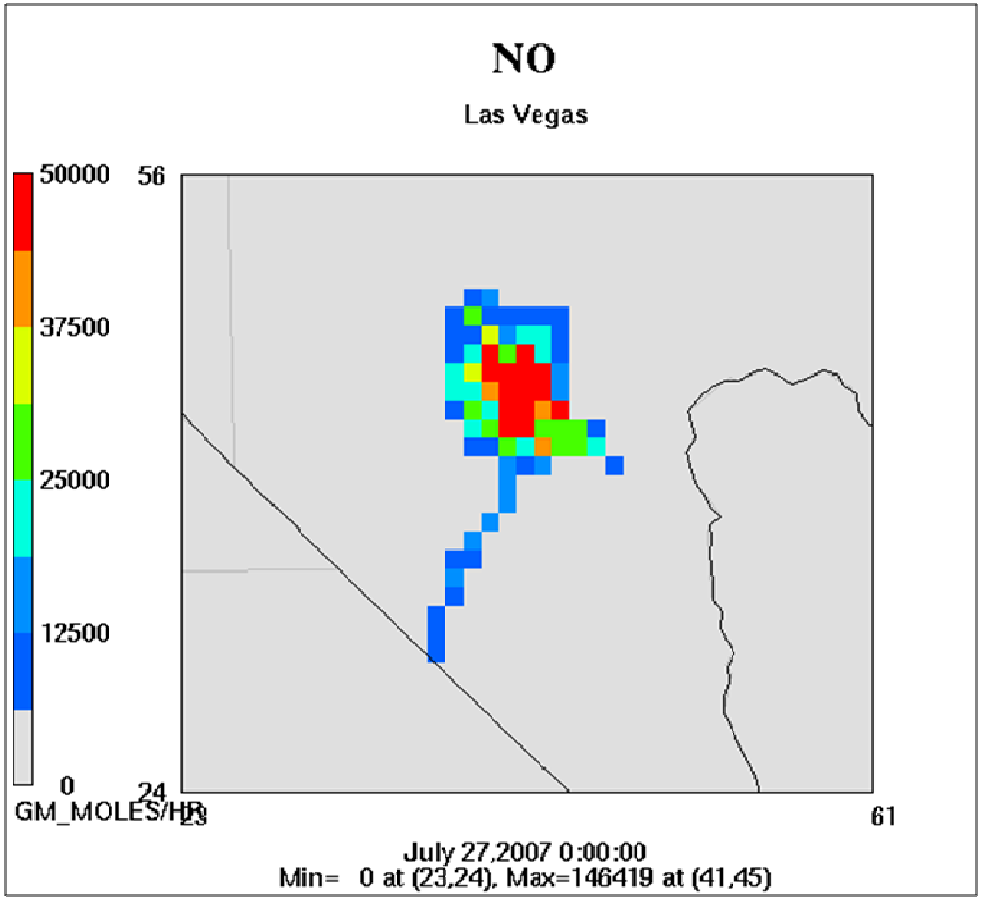


MOVES2010 Process (NO)



MOVES Gridded Emissions





Full MOVES2010 CONCEPT Implementation

- Work in progress: Full MOVES2010a CONCEPT Implementation
  - Implemented MOVES into CONCEPT MV link-based emissions for Las Vegas using start and running exhaust, and evaporative emissions MOVES2010**a** lookup tables
  - Cooperative program to fully implement MOVES2010**a** for any other area in U.S.
    - Ramps
    - Meteorological preprocessor (multiple counties)
    - PM estimates incorporation

Discussion/questions