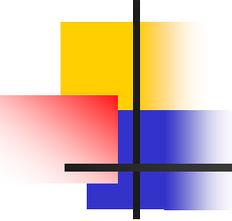


# Improvements to the Spatial and Temporal Representativeness of Modeling Emission Estimates

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Presented by:  
Lyle R. Chinkin  
Stephen B. Reid  
Sonoma Technology, Inc.  
Petaluma, CA

Presented to:  
The CCOS Technical Committee  
Sacramento, CA  
July 6, 2006



# Presentation Outline

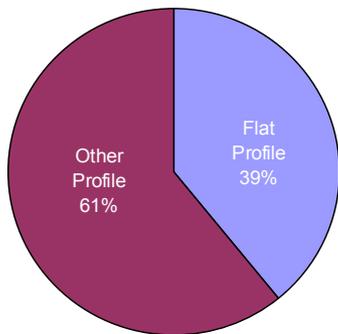
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- Project Overview
  - Key Questions
  - Key Benefits
  - Objectives
- Statement of Work
  - Task 1 – Kickoff Meeting
  - Task 2 – Temporal Assessment
  - Task 3 – Spatial Assessment
  - Task 4 – Documentation & Consultation
- Potential Phase 2 Analyses

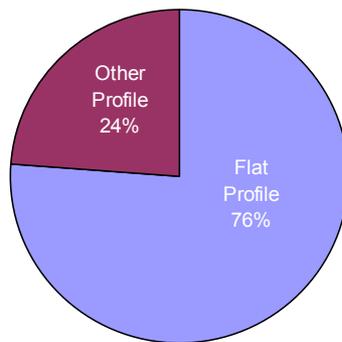
# Key Questions (1 of 4)

1. How well are area, off-road mobile, and point source emissions characterized temporally?
  - Discrepancies in temporal profile assignments by region
  - All weekdays assigned same relative activity
  - Default (flat) profiles frequently used

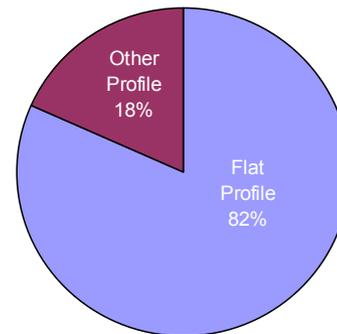
Area & Off-road NOx



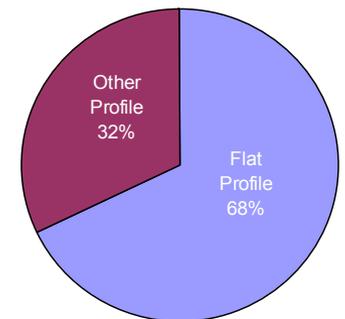
Area & Off-road TOG

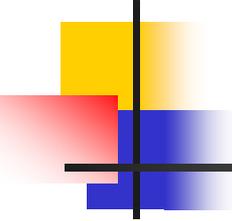


Point Source NOx



Point Source TOG



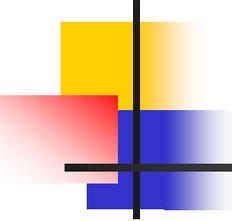


# Key Questions (2 of 4)

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## 2. How well are on-road mobile source emissions characterized temporally?

- Modeled activity data do not account for explicit day-of-week variations
- Weekend emissions are adjusted from weekday estimates
- Temporal variations in heavy-duty truck emissions may not be well represented by DTIM (especially seasonal activity patterns)



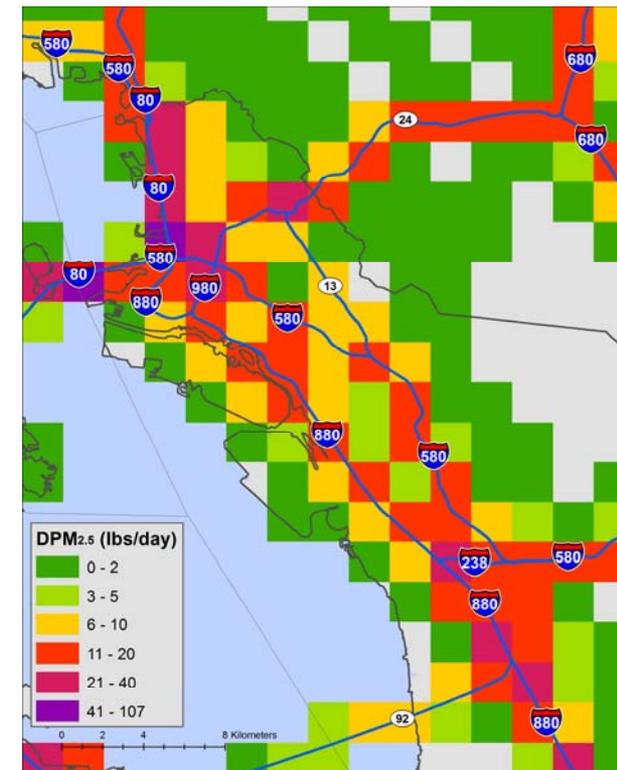
# Key Questions (3 of 4)

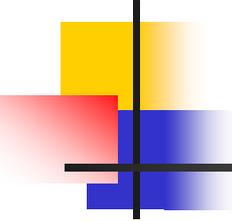
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3. How well are area, off-road mobile, and point source emissions characterized spatially?
  - Vintage of current spatial surrogates
  - Regional differences in the availability of spatial surrogate data
  - Future-year changes in spatial surrogate footprints (urbanization, agricultural land losses, etc.)

# Key Questions (4 of 4)

4. How well are on-road mobile source emissions characterized spatially?
  - The spatial allocation of heavy-duty truck activities is represented as a fraction of light-duty vehicles
  - Future-year emission estimates are spatially distributed according to base-year transportation networks

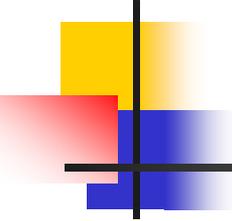




# Key Benefits of Phase 1

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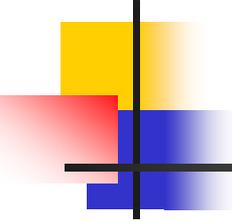
- Identify strengths of and areas of improvement for the spatial and temporal characterization of modeling emission estimates
- Rank the potential impact of identified improvements to the emission inventories



# Key Benefits of Phase 2

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- Improve photochemical modeling results by more accurately characterizing temporal and spatial variations in ozone precursor emissions
- Increase confidence in the accuracy of spatial and temporal variations in the modeling emission estimates



# Project Objectives

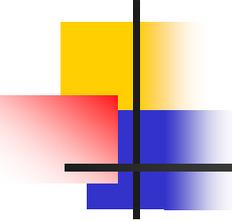
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## Phase 1

- To **assess** the spatial and temporal characteristics of the current base-year and future-year anthropogenic modeling emissions inputs and identify potential improvements

## Phase 2 (if approved)

- To develop specific methods and data sets to **implement** improvements to the spatial and temporal representativeness of base-year and future-year emissions estimates



# Statement of Work – Phase 1

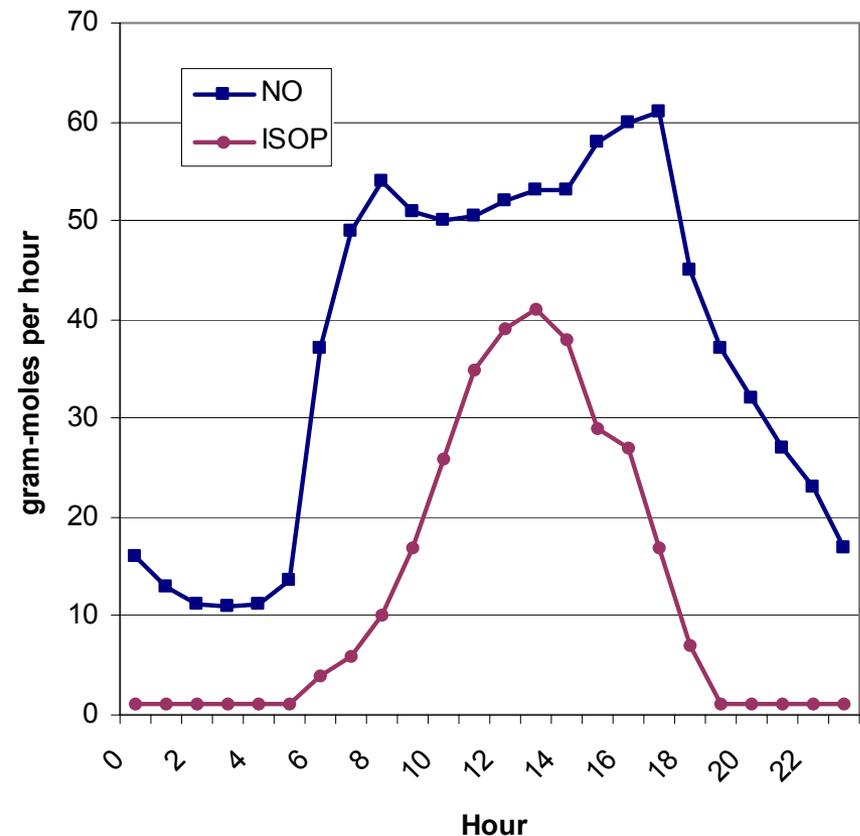
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- Task 1 – Kickoff meeting, selection of future years to be reviewed
- Task 2 – Assess the accuracy of temporal variations in the CCOS emission inventories
- Task 3 – Assess the accuracy of spatial variations in the CCOS emission inventories
- Task 4 – Document Phase 1 findings, develop a Phase 2 work plan

# Task 2 – Temporal Assessment (1 of 5)

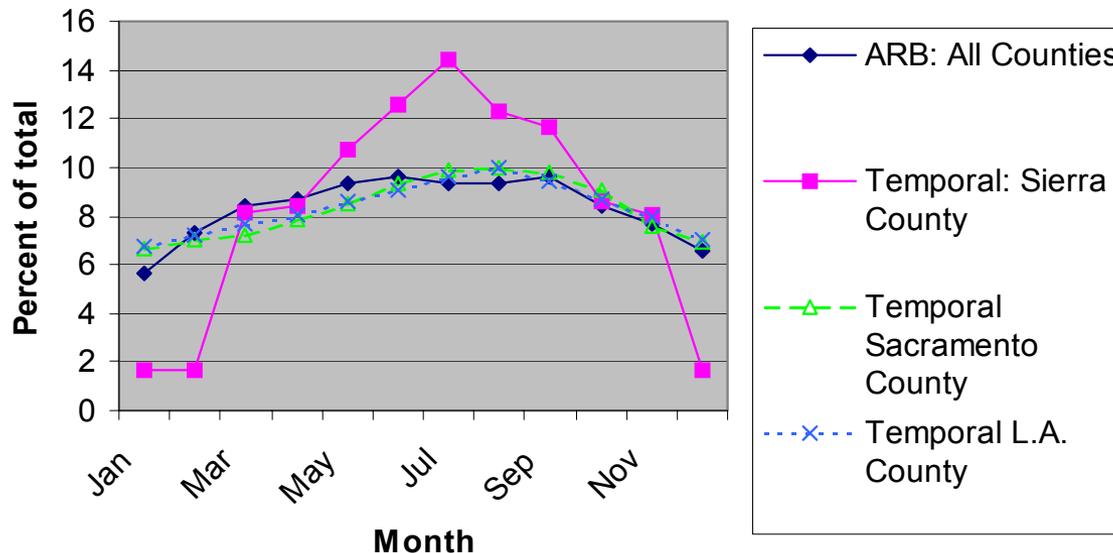
- Plot temporal variations by pollutant, source category, and region

CCOS model-ready emissions  
for September 13, 2000  
(average gram-moles/hour)



# Task 2 – Temporal Assessment (2 of 5)

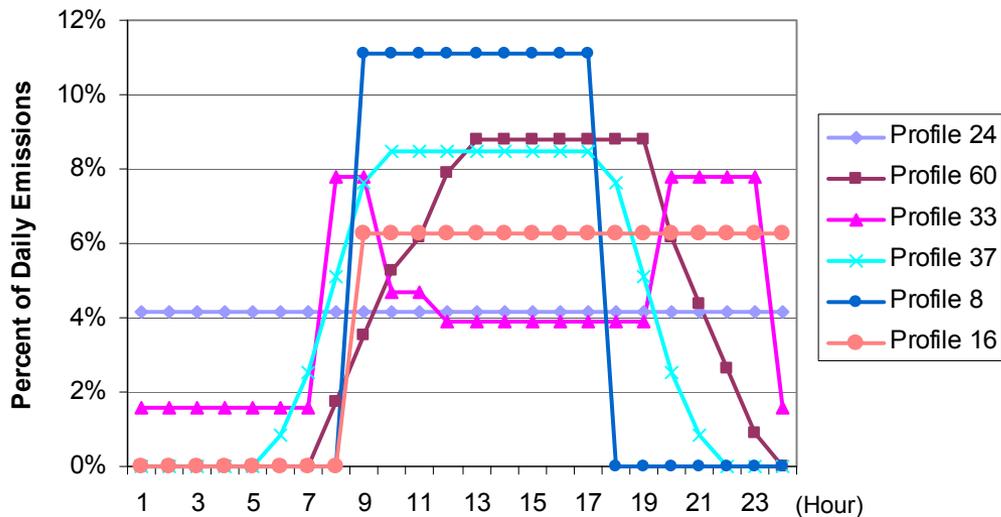
- Review temporal profile assignments by source category and region



Monthly profiles for lawn and garden equipment

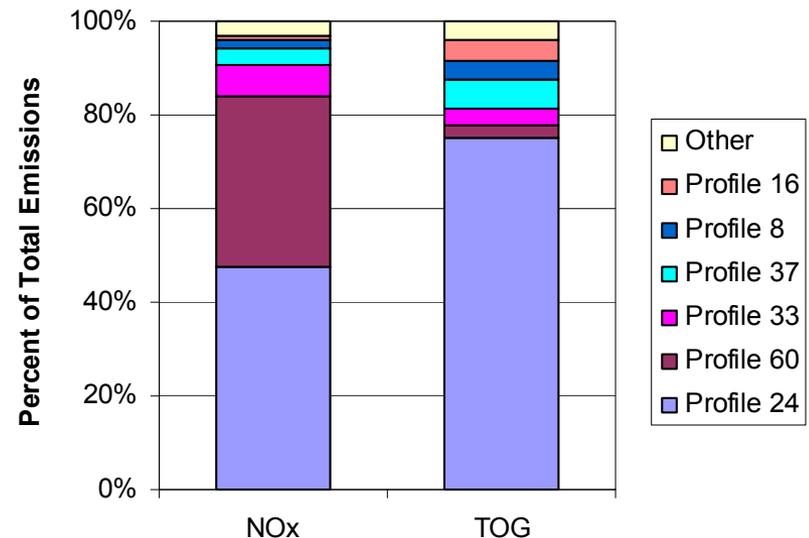
# Task 2 – Temporal Assessment (3 of 5)

- Prioritize key sources and associated temporal profiles by emissions/reactivity



- Profile 8 – Printing facilities
- Profile 16 – Architectural Coatings
- Profile 24 – Natural Gas Distribution, Trains
- Profile 33 – Residential Wood Combustion
- Profile 37 – Degreasing
- Profile 60 – Construction Equipment

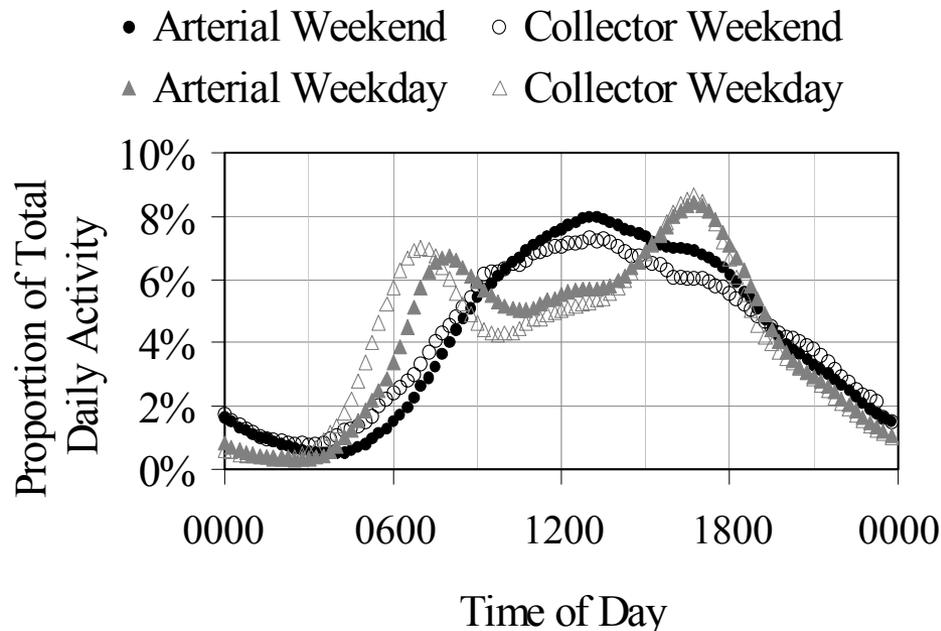
Area, off-road, and point source emissions by diurnal profile\*



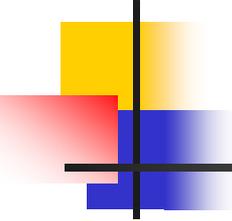
\*The total number of diurnal profiles was ~40

# Task 2 – Temporal Assessment (4 of 5)

- Evaluate on-road temporal distributions produced by EMFAC/DTIM modeling



Average diurnal traffic patterns on surface streets in the South Coast Air Basin



## Task 2 – Temporal Assessment (5 of 5)

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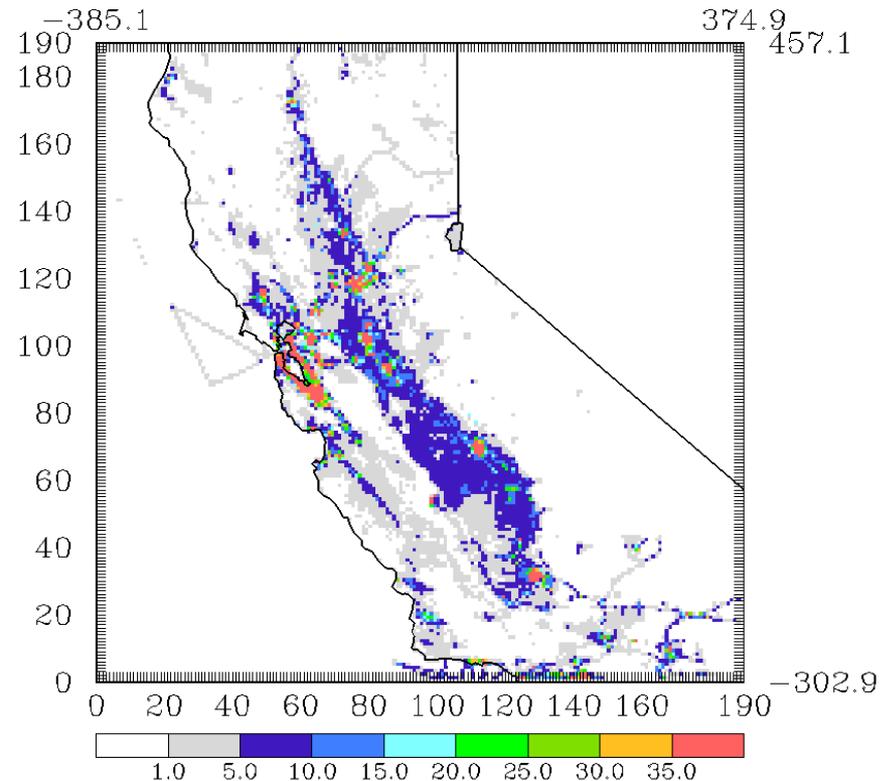
- Examine existing data sources and the findings of relevant studies, including
  - Traffic volume counts (weigh-in-motion data, pneumatic loop counters, etc.)
  - Statewide truck survey (California Dept. of Transportation, 2001)
  - Goods movement information (Metropolitan Transportation Commission regional study for the Bay Area)
  - Activity data collection efforts for area and off-road mobile sources (California Air Resources Board-sponsored weekday-weekend study, etc.)
  - Continuous emissions monitoring data for large point sources

# Task 3 – Spatial Assessment (1 of 5)

- Plot spatial variations by pollutant, source category, month, etc.

CCOS area source  
NO<sub>x</sub> emissions

July 31, 2000 – 12:00 PM

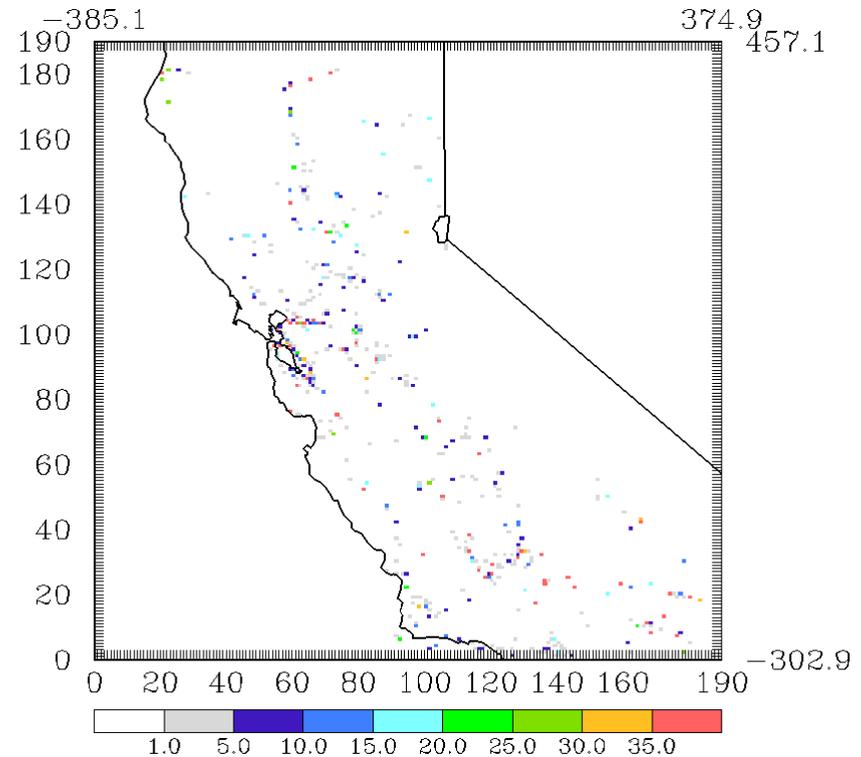


# Task 3 – Spatial Assessment (2 of 5)

- Geocode addresses of major point sources to verify location coordinates

CCOS point source  
NO<sub>x</sub> emissions

July 31, 2000 – 12:00 PM

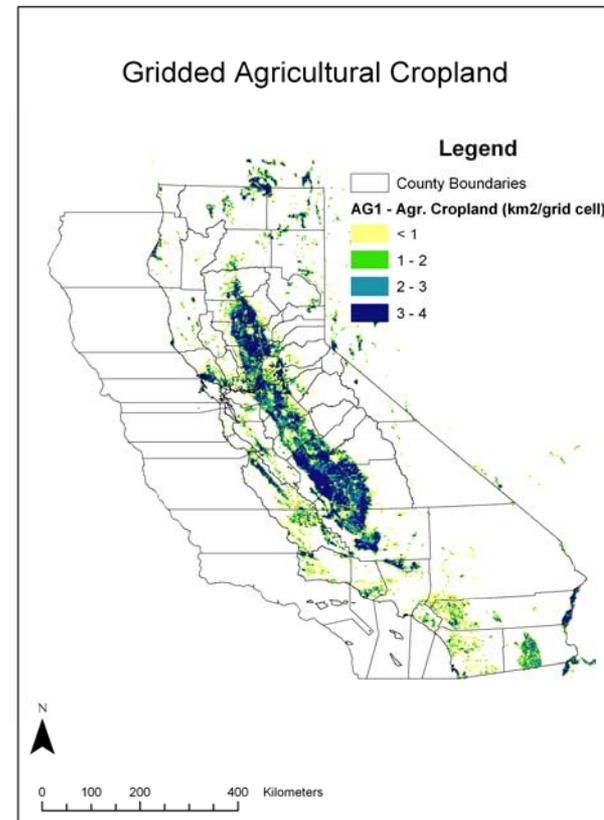


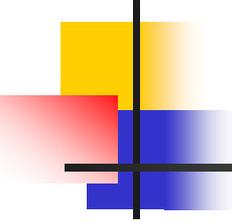
# Task 3 – Spatial Assessment (3 of 5)

- Review spatial surrogate assignments by source category and the vintage of spatial surrogate data sets

Current CCOS spatial surrogate data for agricultural croplands

(from 1995 Dept. of Water Resources land use data)





## Task 3 – Spatial Assessment (4 of 5)

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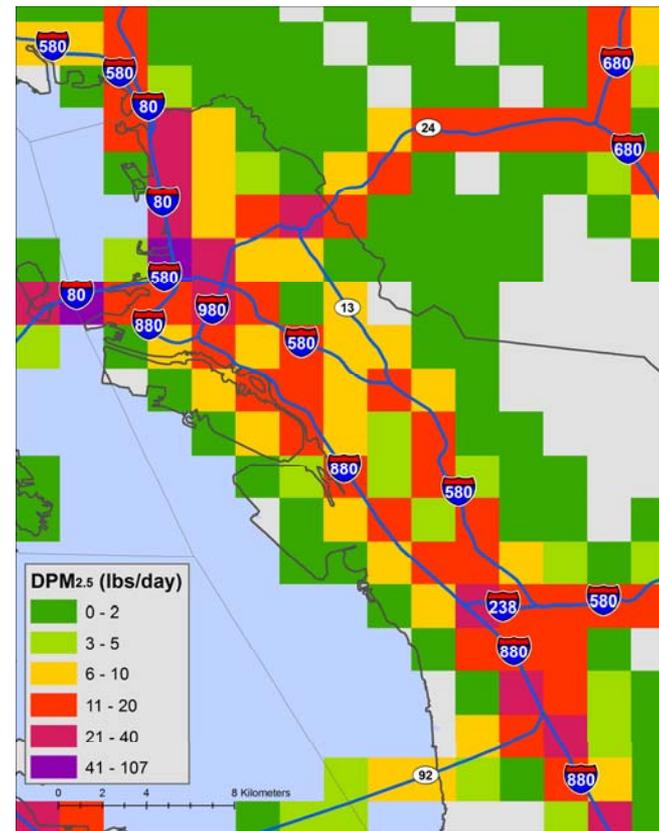
- Prioritize key sources and associated surrogates by emissions/reactivity
  - 65 spatial surrogates derived from various land use, land cover, demographic, and socio-economic data sets
    - 1990 Census data
    - 1993 U.S. Geological Survey land use data
    - 1997 Electronic Yellow Pages
    - 1998 National Atlas (mine locations)
    - 2000 Bureau of Transportation Statistics port and shipping lane locations

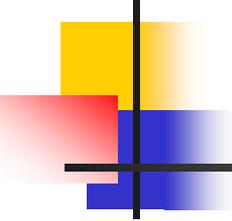
# Task 3 – Spatial Assessment (5 of 5)

- Evaluate on-road spatial distributions produced by EMFAC/DTIM modeling

## BAAQMD Air Toxics Inventory:

District staff determined that DTIM erroneously assigned on-road mobile source emissions from heavy-duty trucks to a section of Interstate 580 where heavy-duty traffic is prohibited.

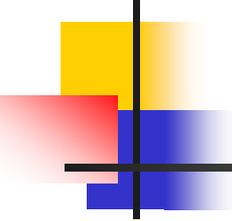




## Task 4 – Documentation & Consultation

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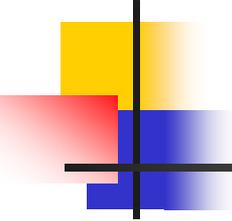
- Work with the CCOS Technical Committee (TC) to determine next steps
  - Prepare a draft report on Phase 1 findings and, if appropriate, a draft Phase 2 work plan
  - Attend a one-day meeting with the CCOS TC to discuss Phase 1 findings and proposed Phase 2 analyses (basic vs. enhanced options in proposal)
  - Prepare a final Phase 1 report and, if appropriate, a final Phase 2 work plan



# Potential Phase 2 Tasks (1 of 2)

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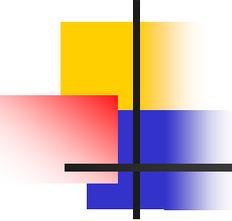
- Task 5 – Improve point source characterizations
- Task 6 – Improve area source characterizations
- Task 7 – Improve the characterization of seasonal trucking activities
- Task 8 – Improve the characterization of on-road mobile sources during the summer



## Potential Phase 2 Tasks (2 of 2)

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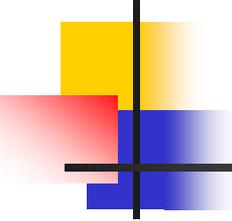
- Task 9 – Improve the characterization of trucking activity related to goods movement
- Task 10 – Evaluate options for DTIM replacement
- Task 11 – Provide data, software, and documentation
- Task 12 – Prepare a final report and journal paper



# Project Schedule

Task	Deliverables	Due Date
All	Progress reports and invoices	Monthly
1	Project kickoff meeting	July 6, 2006
2	Draft technical memorandum	September 15, 2006
2	Final technical memorandum	October 9, 2006 <sup>a</sup>
3	Draft technical memorandum	September 15, 2006
3	Final technical memorandum	October 9, 2006 <sup>a</sup>
4	Draft Phase 1 report and draft Phase 2 work plan	October 16, 2006
4	Task 4 workshop	November 15, 2006
4	Final Phase 1 report and final Phase 2 work plan	December 28, 2006 <sup>a</sup>
5-10	Completion of approved Phase 2 analyses	August 15, 2007
11-12	Draft final report, draft manuscript, software, data files, and documentation	October 15, 2007
12	Task 12 meeting	November 15, 2007
12	Final report and manuscript	December 17, 2007

<sup>a</sup>Actual date depends on receipt of comments from the CCOS TC.



# Discussion

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Questions or comments?