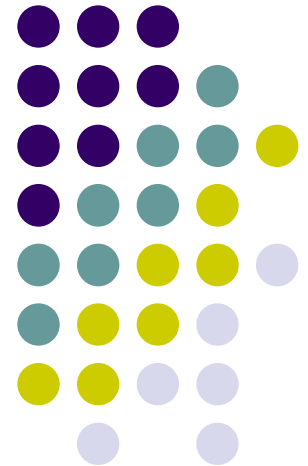
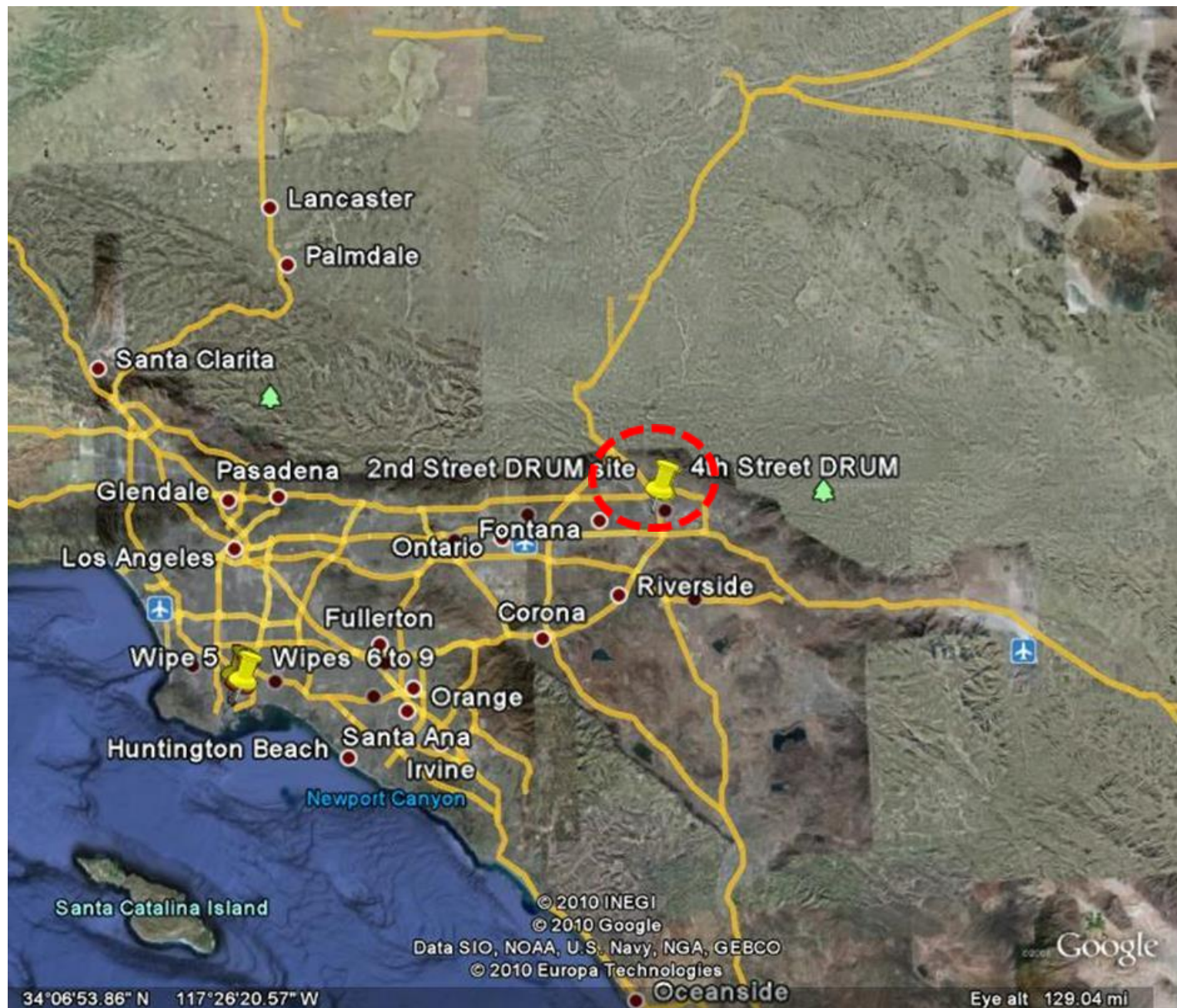


# Mitigation at BNSF Intermodal Facility, San Bernardino and Mira Loma

A presentation for Vegetation for Mitigation  
June 2, 2015

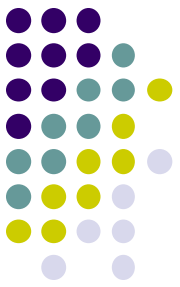
Tom Cahill, David Barnes and the UCD DELTA  
Group,  
Kristen Boberg and Peter Wood, the CA Department  
of Toxic Substances Control







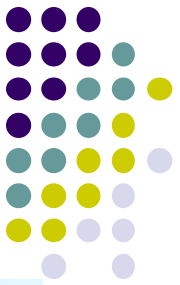
# The BNSF San Bernardino intermodal facility – rail to truck





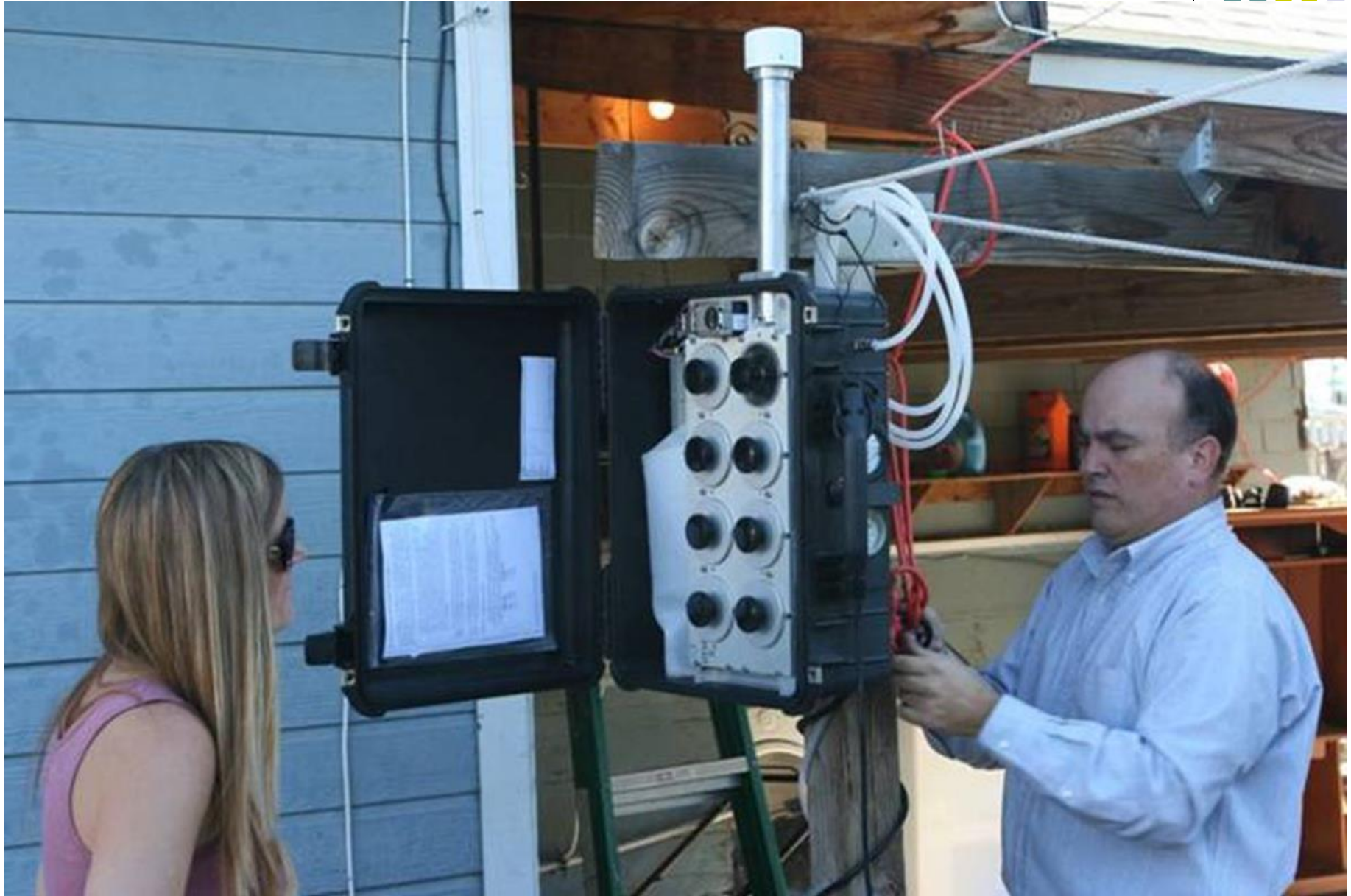


# The Vernon Street sampling site with a California pepper tree.

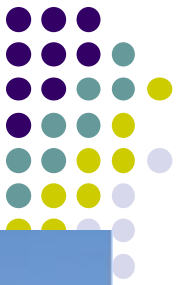




## Davis and Kristen – outside DRUM



# 4<sup>th</sup> Street mitigation corridor



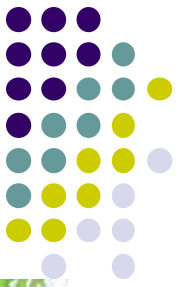


# California pepper tree



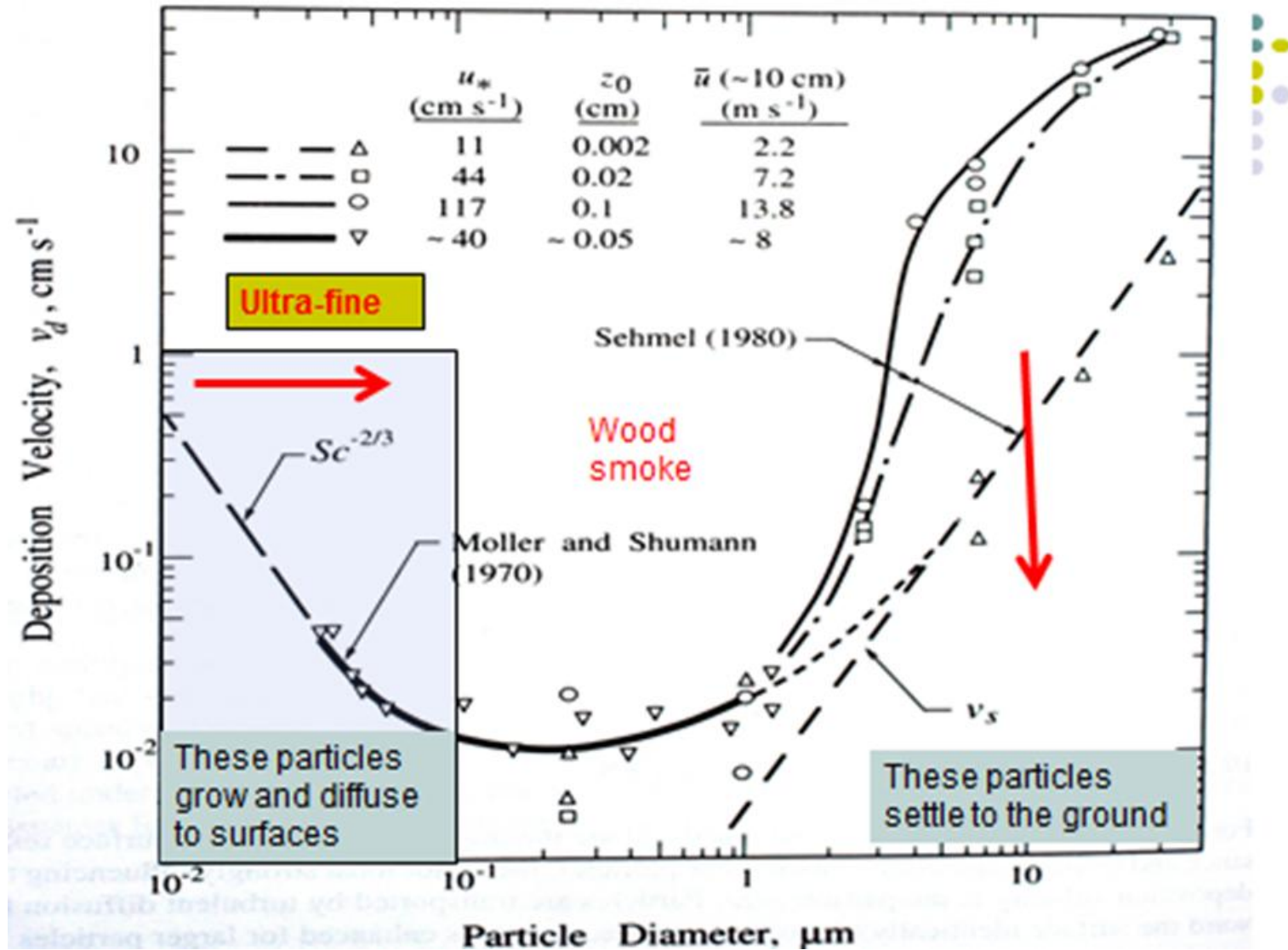


# One of our favorites – the California (ne'e Peruvian) Pepper Tree

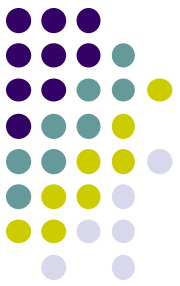




# Removal of aerosols







**Funded mitigation – 2 miles of California peppers, plus understory, by tearing up two lanes of the old Hwy 66 (4<sup>th</sup> Street). Our sampling and mitigation sites** 



# 4<sup>th</sup> Street mitigation corridor



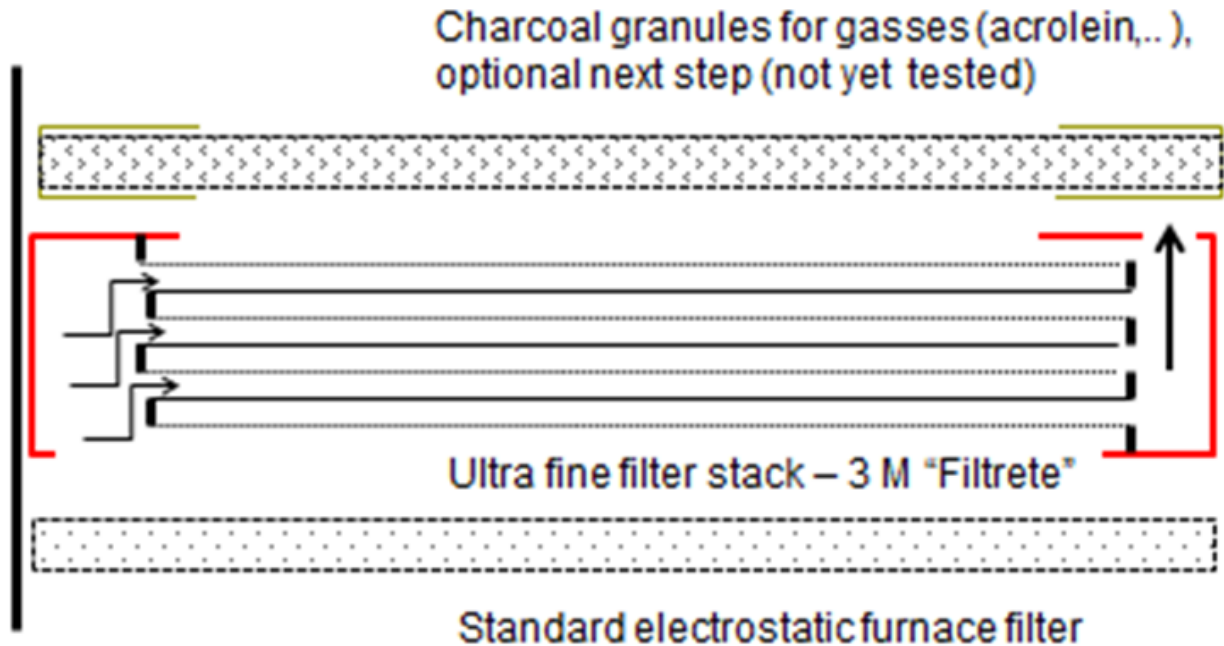


# Indoor mitigation: Checking the “Green Air” enhanced filtration system



# The “Green Air” system

And for the retrofits....4 filters in parallel

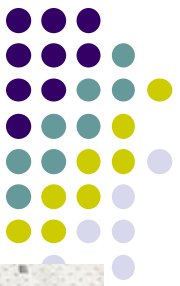


UC Davis DELTA Group  
“Green Air” system;  
estimated cost \$300, from  
any hardware store





# Mira Loma project – now a settlement has been reached with the Dept. of Justice.







# Combining the Watt Avenue results and the literature on health impacts ..



## My personal priorities:

### – **Source reduction**

- Remove metals from brake pads (↓ ultra fine aerosols)
- Remove zinc thio-phosphate from motor oils
- Ban metallic smoke reducing additives in diesel fuel

### – **Impact reduction**

- Don't build any more elevated freeways
  - Mitigate those you already have (barrier vegetation?).
- Minimize choke points that trigger braking
- Avoid residences downwind of elevated freeways
  - Especially at points where braking commonly occurs
- Plant and maintain heavy canopy vegetation
- Enhanced filtration in at-risk residences, schools, etc.

# My personal evaluations of the problems:



- Problem #1      What do we need to mitigate?
  - Ultra fine metals (cardio-vascular) and very fine to ultra fine diesel ( heavy PAHs like BaP), (and more to follow).
- Problem # 2      Despite greatly reduced roadway emissions, health impacts continue to be observed.
  - “Wear” aerosols are medically important and have not declined.
- Problem #3      The health effects seen near roadways extend much farther out than models and data predict.
  - Raised freeways and sound walls project aerosols far downwind
- Problem #4      The growing importance of metallic “wear” aerosols that lack data and are hard to model versus vegetation.
  - Measurements can be made mimicking ultra fine “wear” aerosol emissions in ambient conditions



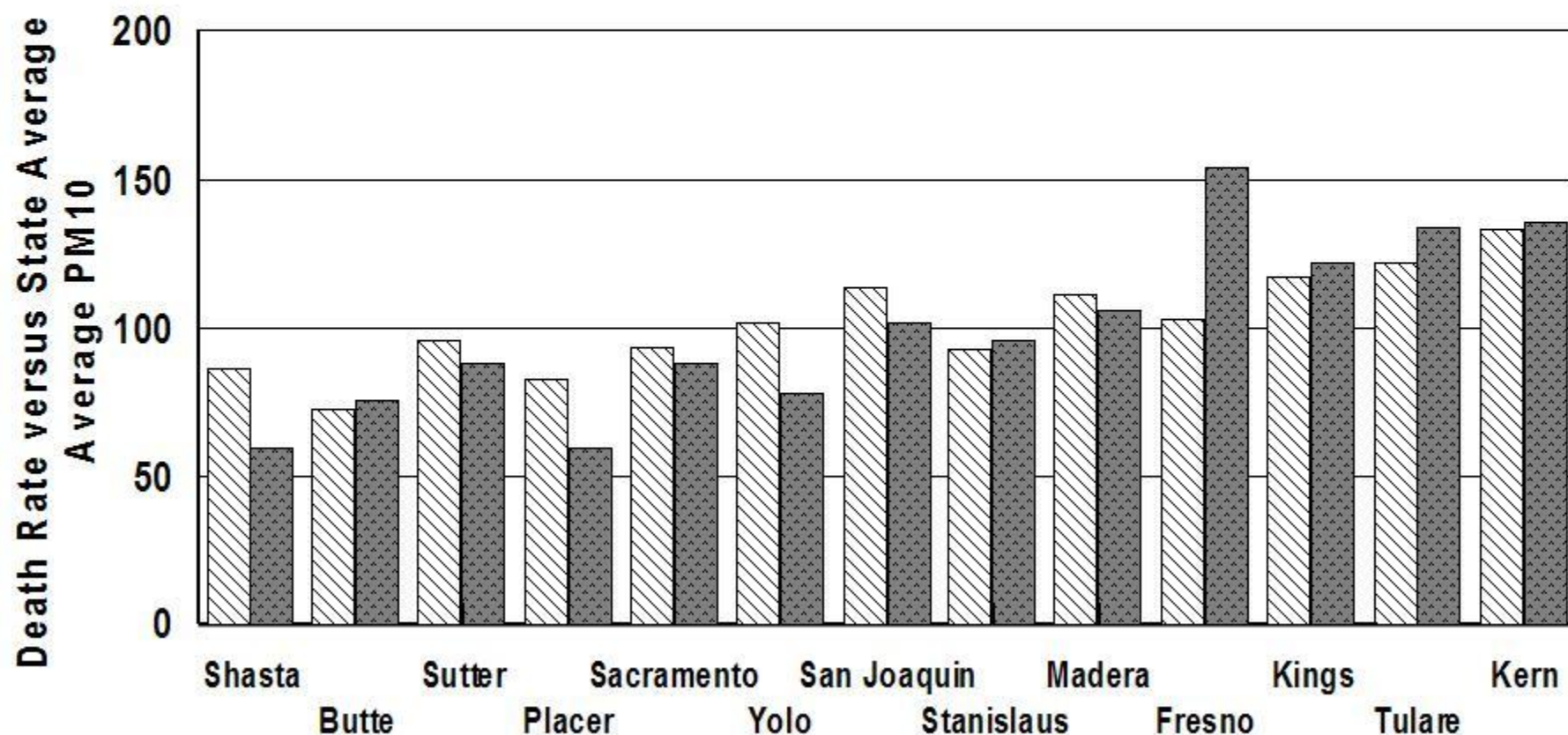
# Results of the HETF BCSET Central Valley Report (1997)



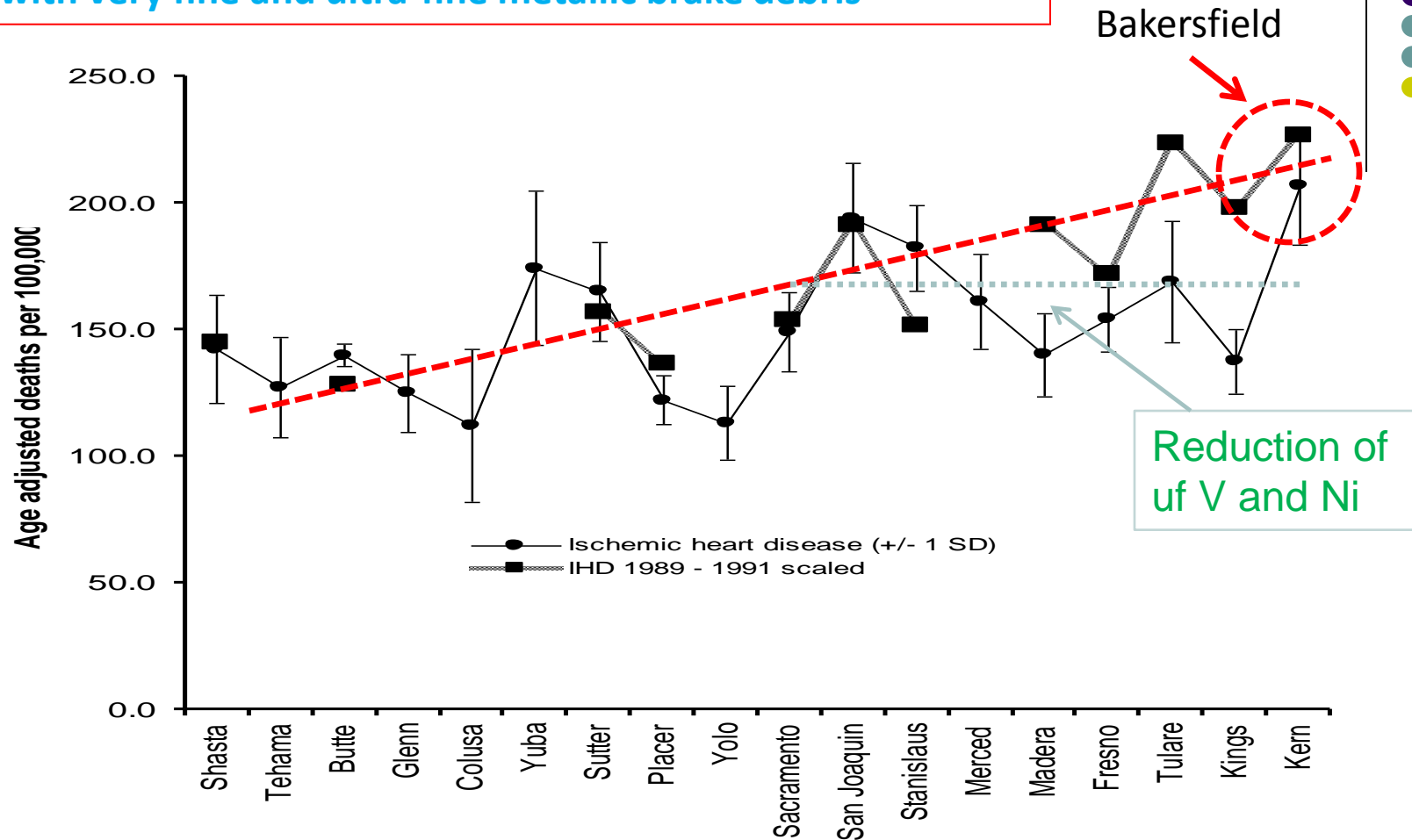
## Mortality and Air Pollution in the California Central Valley

Correlation  $r^2 = 0.56$

Ischemic Heart Disease Annual average PM10 mass



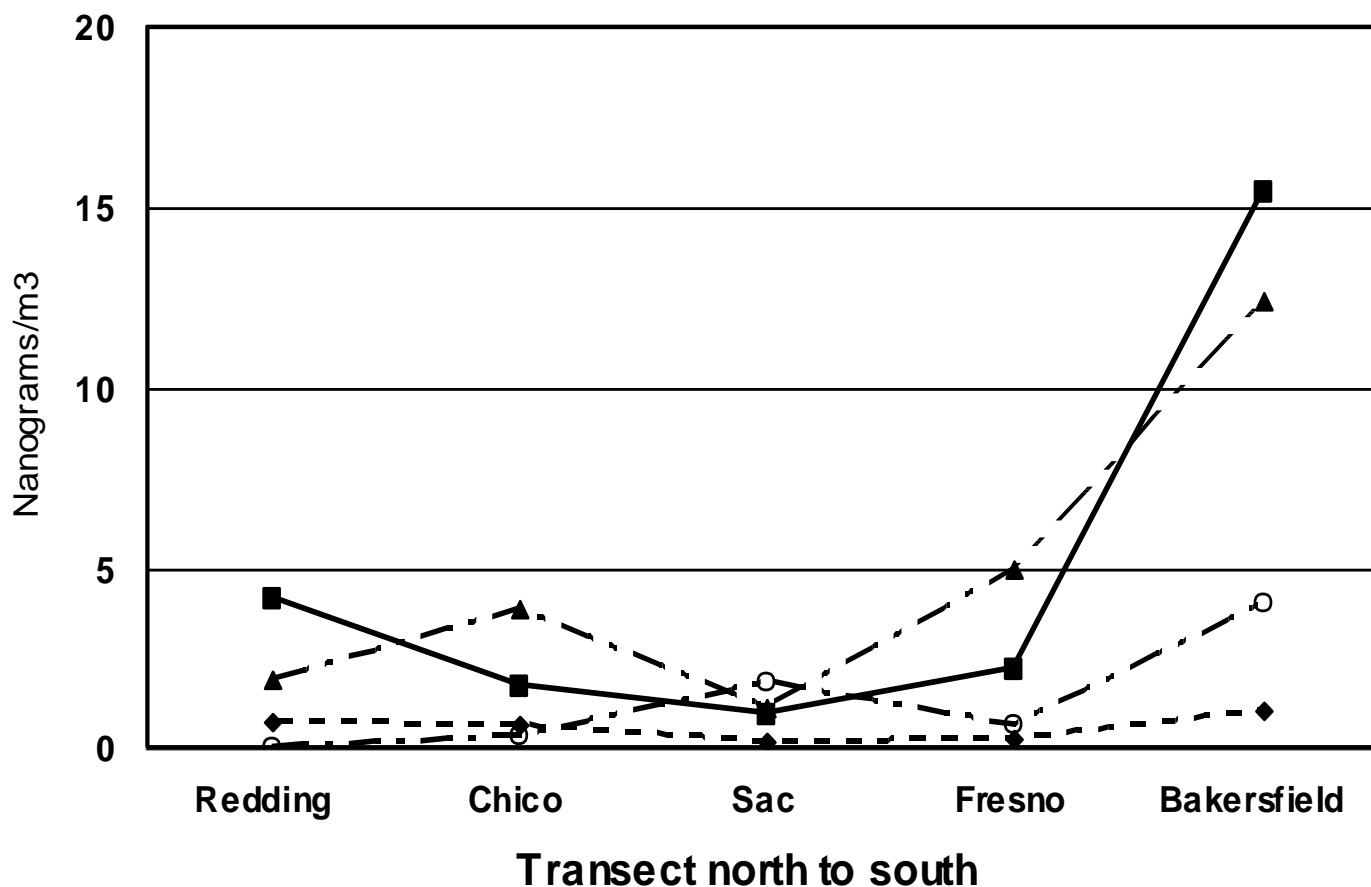
EPA/AS&T papers on Ischemic Heart Disease associated with very fine and ultra-fine metallic brake debris



Ischemic heart disease (IHD) in the California Central valley, 1989 -1991 versus 2003 – 2007, associated with vf and uf metals from brakes and V and Ni from petroleum. Removal of the V and Ni reduced IHD. (Cahill et al 2011b)



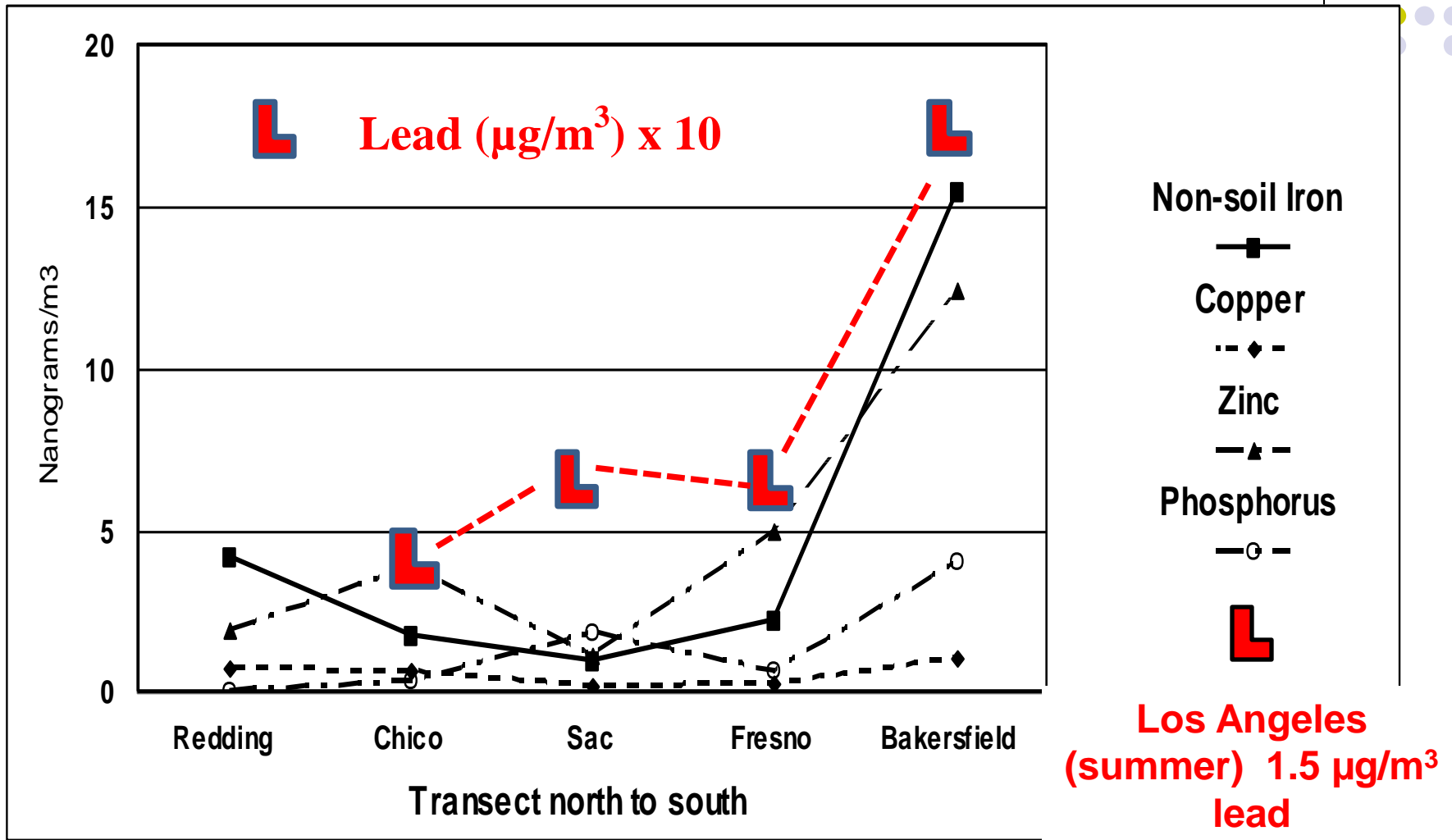
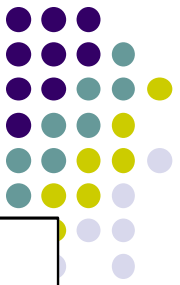
**Problem #3:** HETF study (1997) found enhanced heart attack death rates in Bakersfield. In 2009, we found that the same ultra fine metallic aerosols from braking seen downwind of Watt Avenue are elevated in Bakersfield.



Iron and zinc  $\cong$  at Watt Avenue in winter

The heart disease death rate in Bakersfield is enhanced by 60%

# Adding lead from 1973





In the winter, air flows from Bakersfield north,  
so no Bay Area impact



But in winter Bakersfield  
is downwind of high  
mountain passes with  
two major freeways