

San Joaquin Valley Draft 2008 PM2.5 Plan

Attainment Demonstration

Workshop

February 25 and 26, 2008

California Environmental Protection Agency



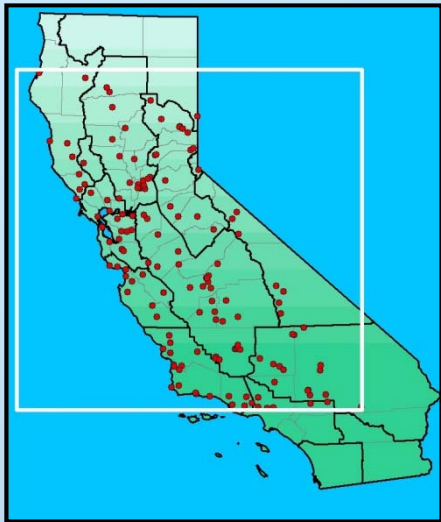
Air Resources Board

U.S. EPA Requires Weight of Evidence Approach

- Attainment demonstration characterizes the emission reductions needed for attainment
- Multiple tools used:
 - Air quality and emissions trends
 - Source apportionment and other modeling (rollback)
 - Grid-based photochemical modeling

CRPAQS Provides Scientific Basis

- Extensive field monitoring at the surface and aloft



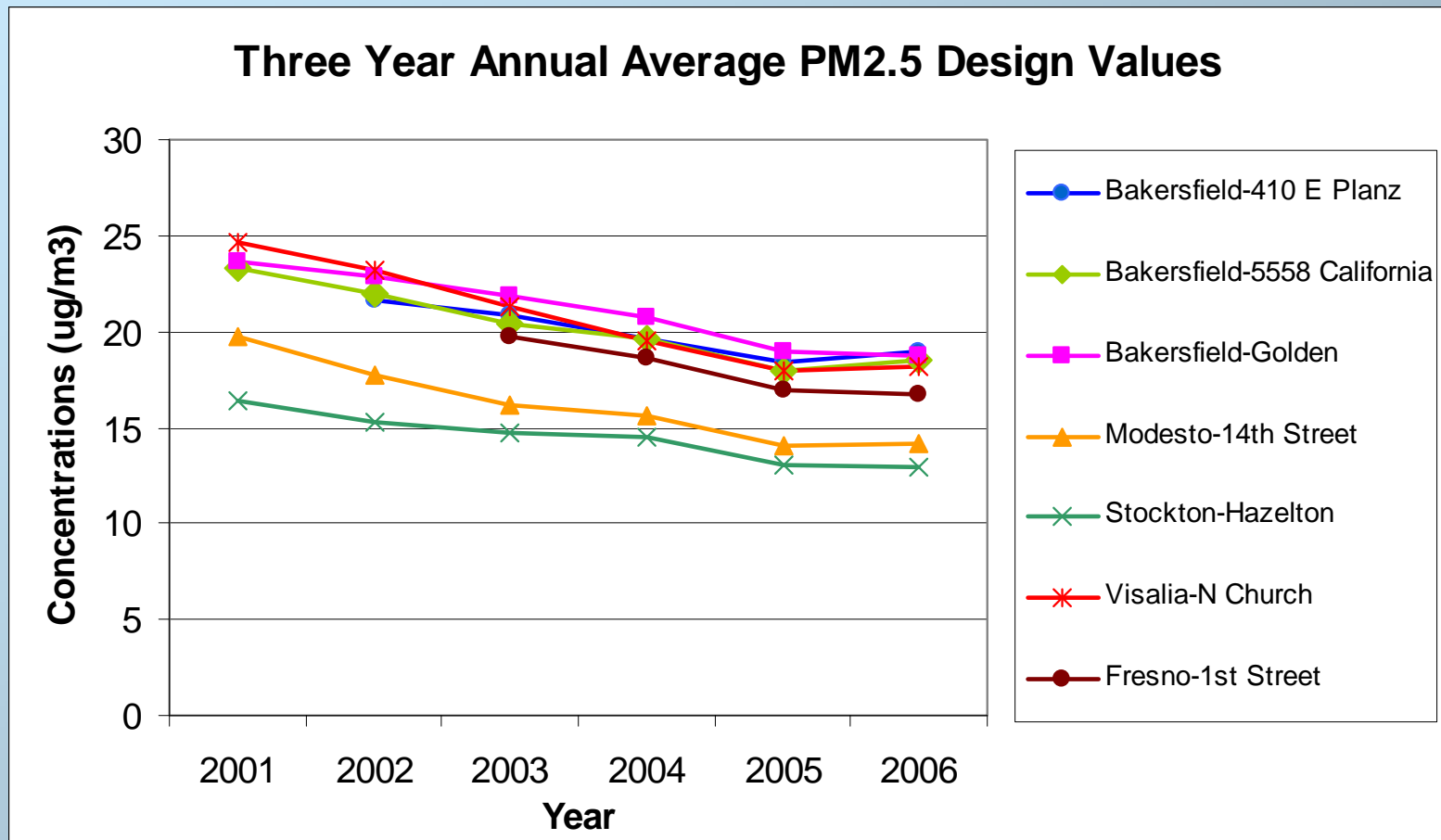
- hundreds of monitoring sites
- millions of data records
- numerous teams of experts



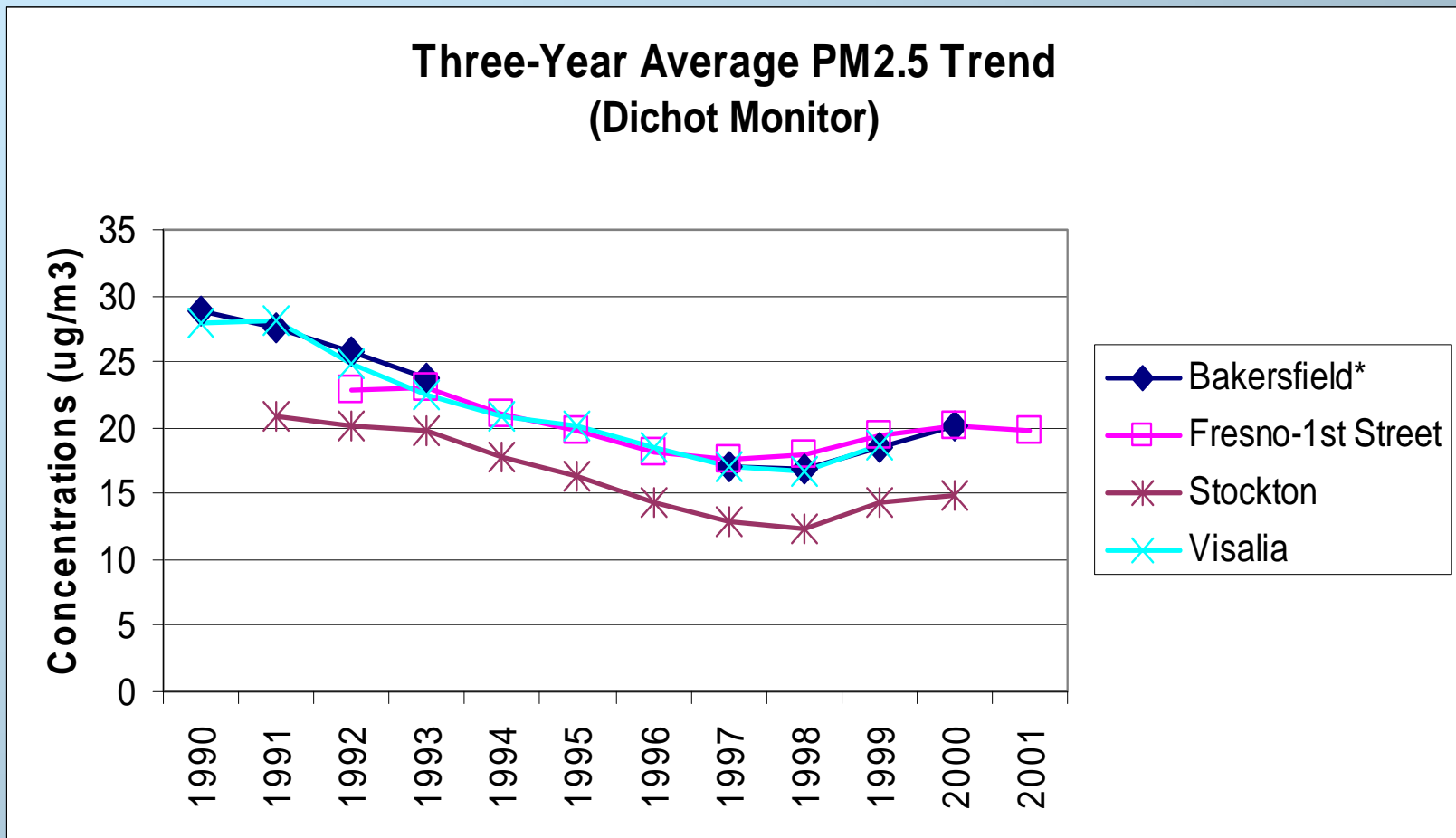
- Improved emission inventory
- State-of-the-science air quality modeling
- World class data base

Air Quality Trends

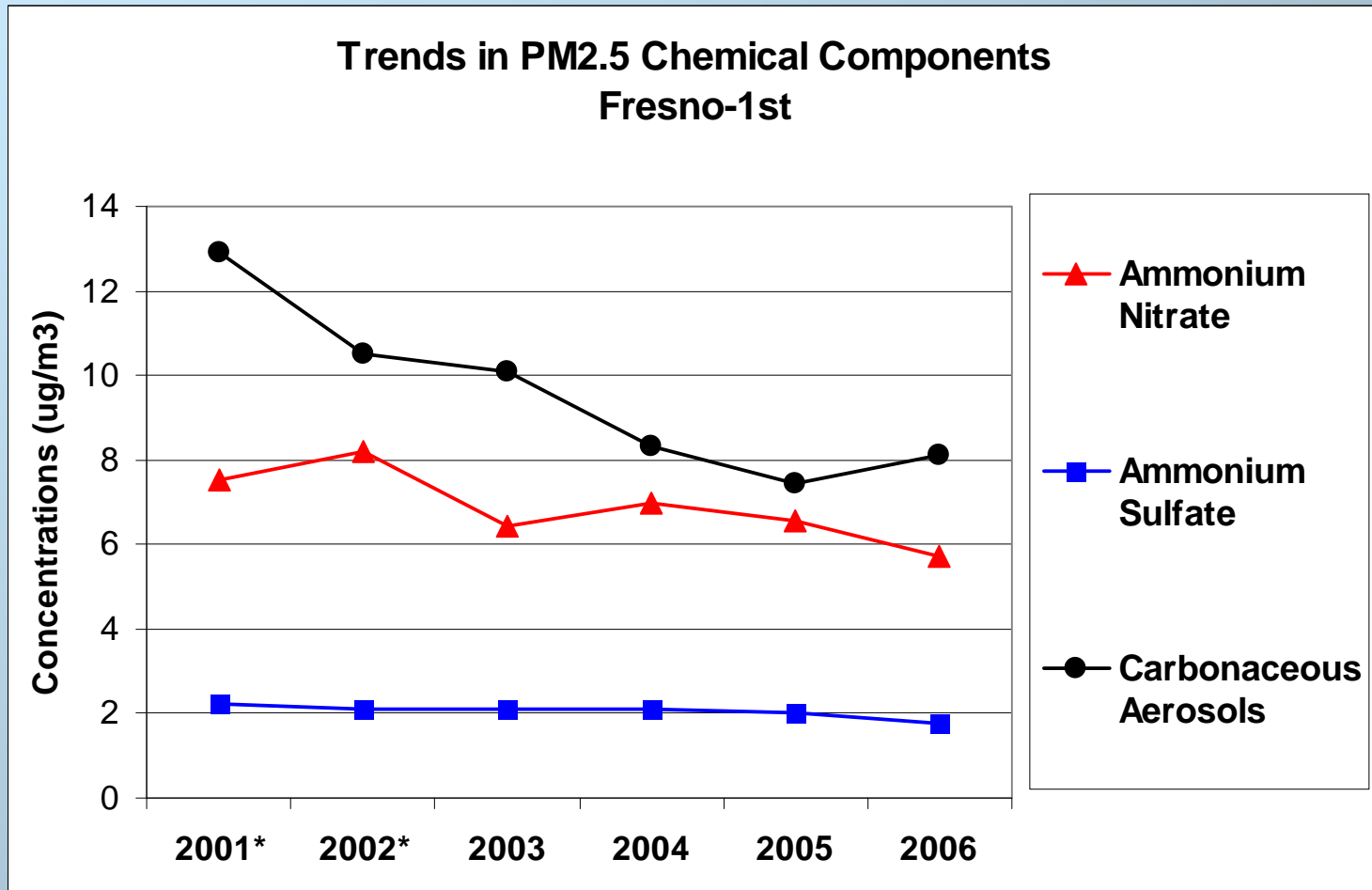
Downward Trend in Recent Annual PM2.5 Concentrations



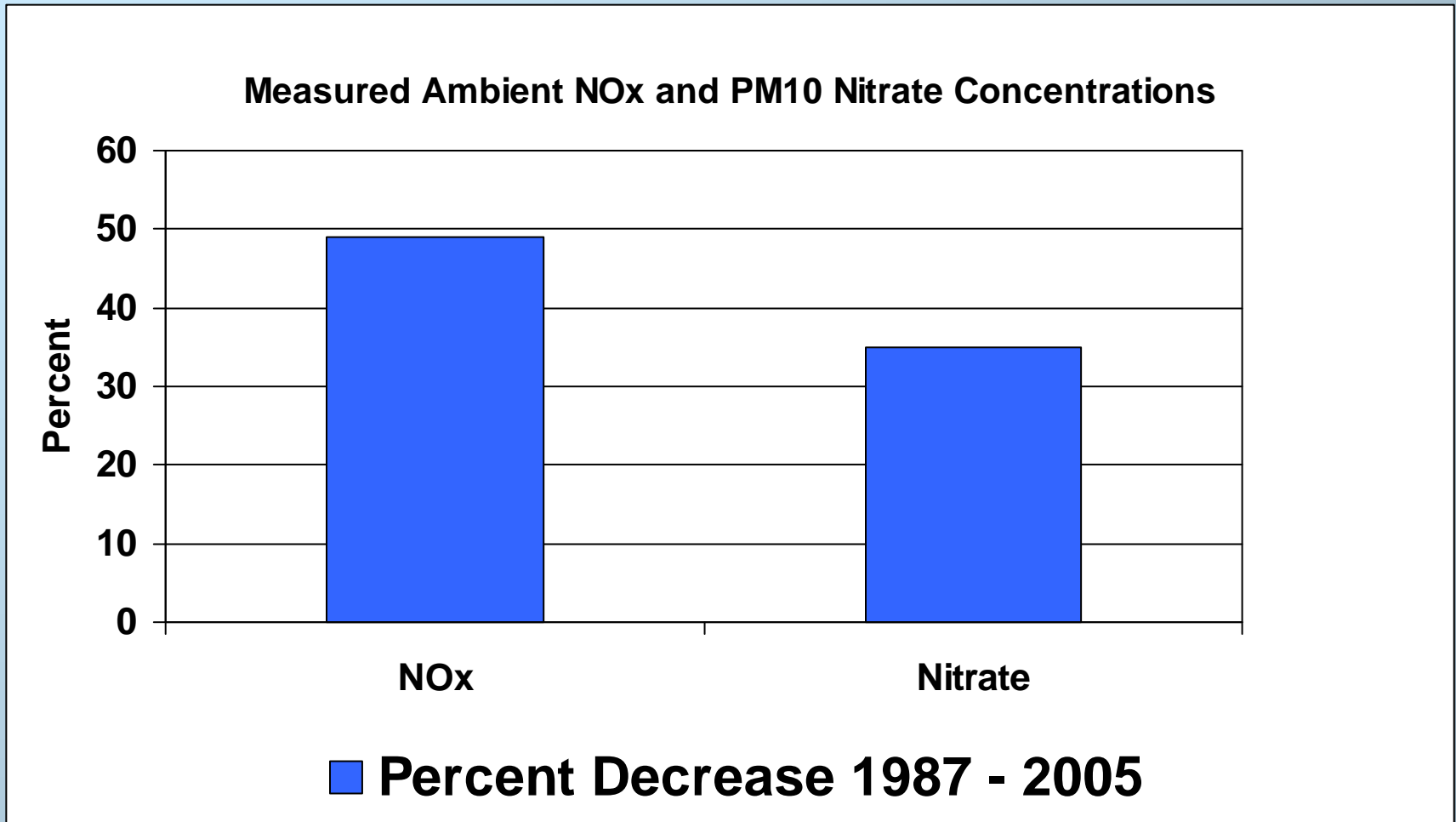
Downward Trend in Long-Term PM2.5 Concentrations



Downward Trends in Key Chemical Components



Long-term Correlations in Reductions of NOx and Nitrate

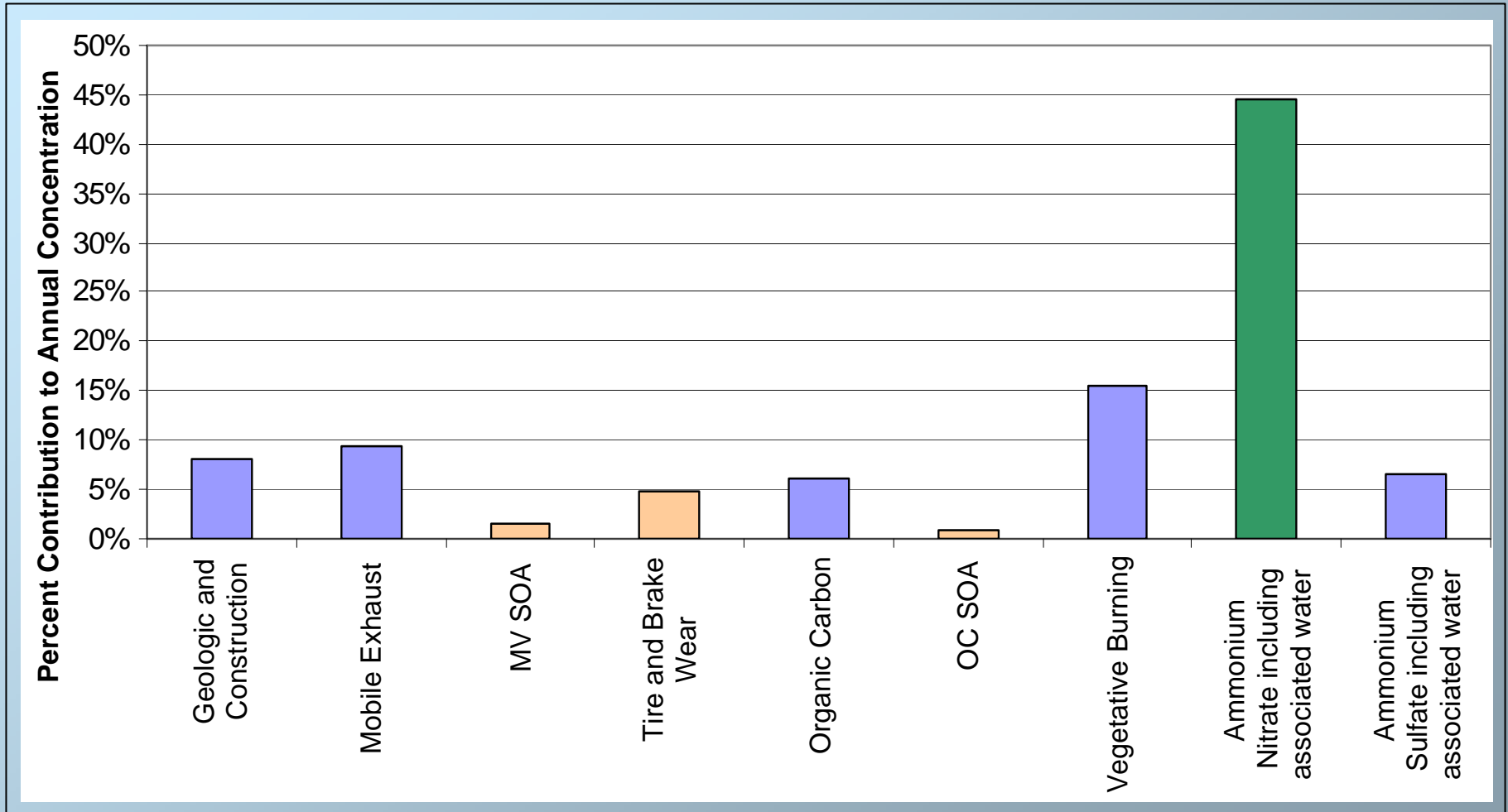


Source Apportionment and Other Modeling

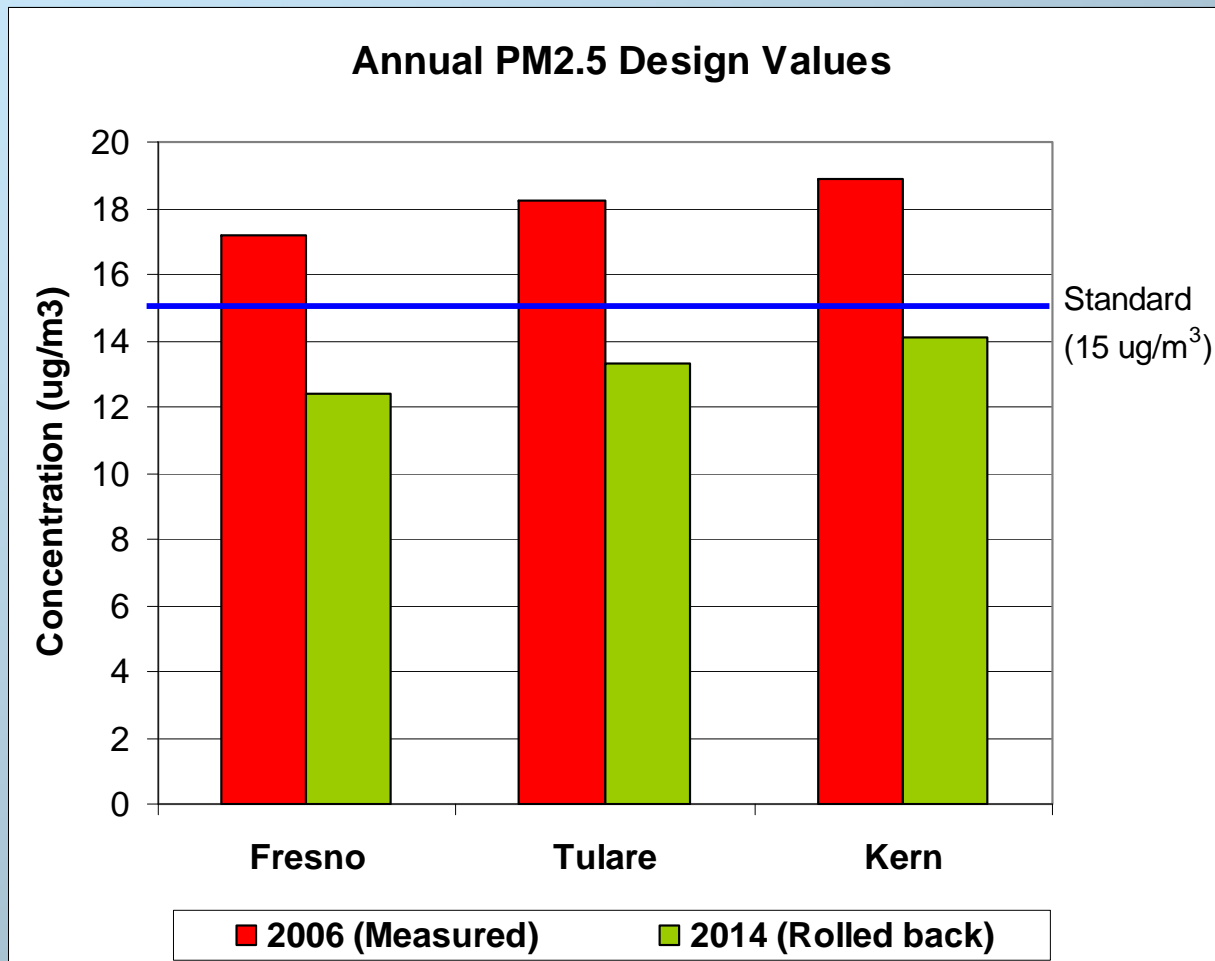
Rollback Approach

- Integrates
 - Source apportionment data and
 - Emissions trends with control strategy
- Projects future air quality values (design values)

Average Source Contribution



Attaining the Annual Standard in 2014 Rollback Approach



Grid-Based Photochemical Modeling

Grid-Based Photochemical Modeling

- Simulates chemistry and meteorology to predict PM2.5 concentrations
- Conducted according to U.S. EPA guidelines
- Our modeling team participates in national committees on model development and applications
- Run on multiple computer clusters

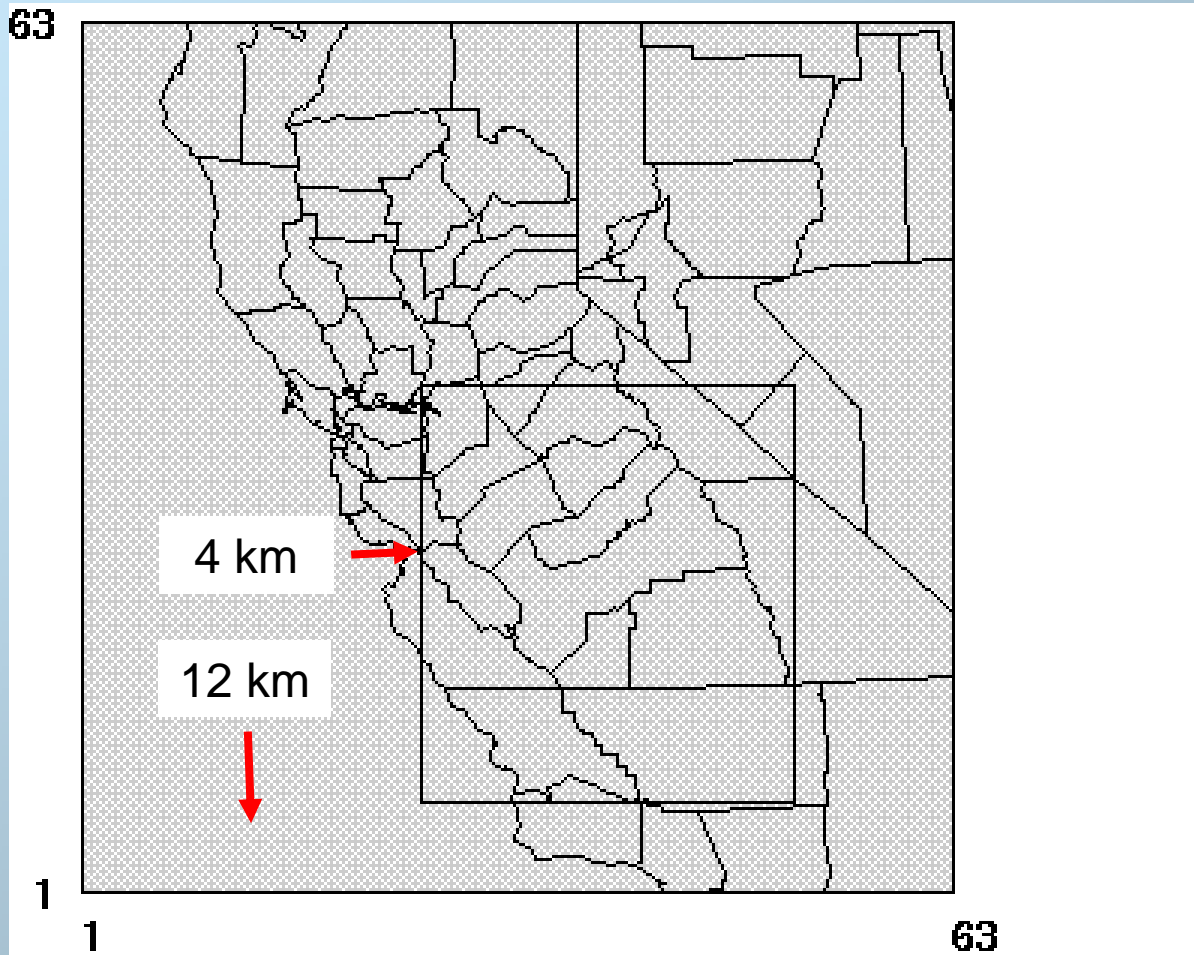
Emission Inventory Improvements

- Agricultural Burning
 - Reflected burn permit data
 - Accounted for changes due to adopted rule
- Residential Wood Combustion
 - Distributed emissions spatially using residential wood heating data
 - Considered limit on fireplaces due to adopted rule
- Cooking
 - Based on survey data
- Manufacturing and Industrial Fuel Combustion
 - Reflected reductions due to adopted rules
 - Updated fuel use for industrial sources
- Updated dust categories to reflect lower contribution to PM_{2.5}

Air Quality Modeling

- Models Used:
 - **Air Quality – CMAQ** (U.S. EPA Community Multi-Scale Air Quality Model)
 - **Meteorology – MM5** (Pennsylvania State University / National Center for Atmospheric Research Mesoscale Model)
- Periods Modeled:
 - One full year of daily modeling
 - 2000 used to establish model performance
 - 2005 and 2014 used to evaluate attainment (with 2000 meteorology)
- CMAQ and MM5 models are widely used and thoroughly peer-reviewed
- Model performance consistent with previous PM_{2.5} applications in California

Air Quality Modeling Domains

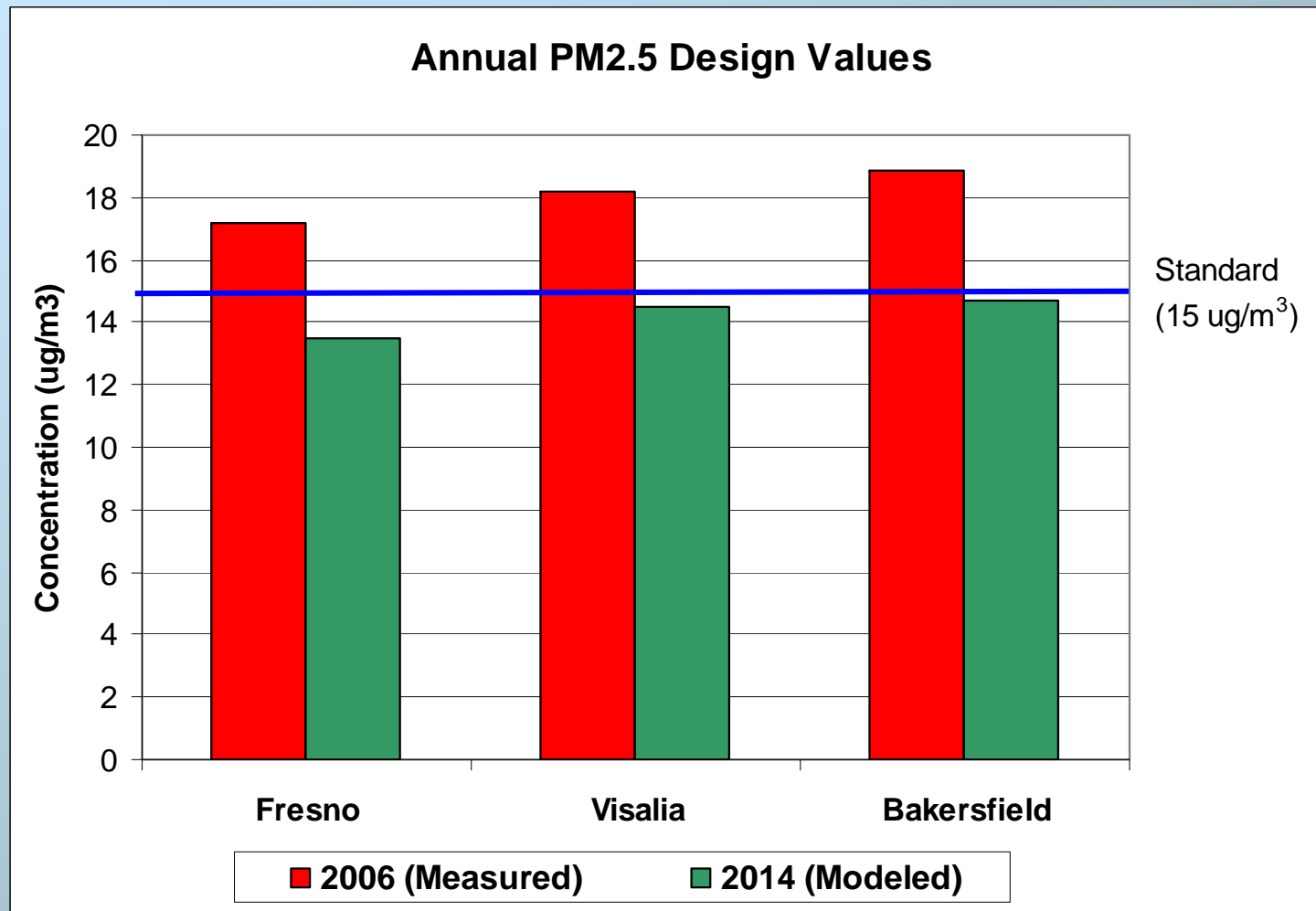


Computational Needs

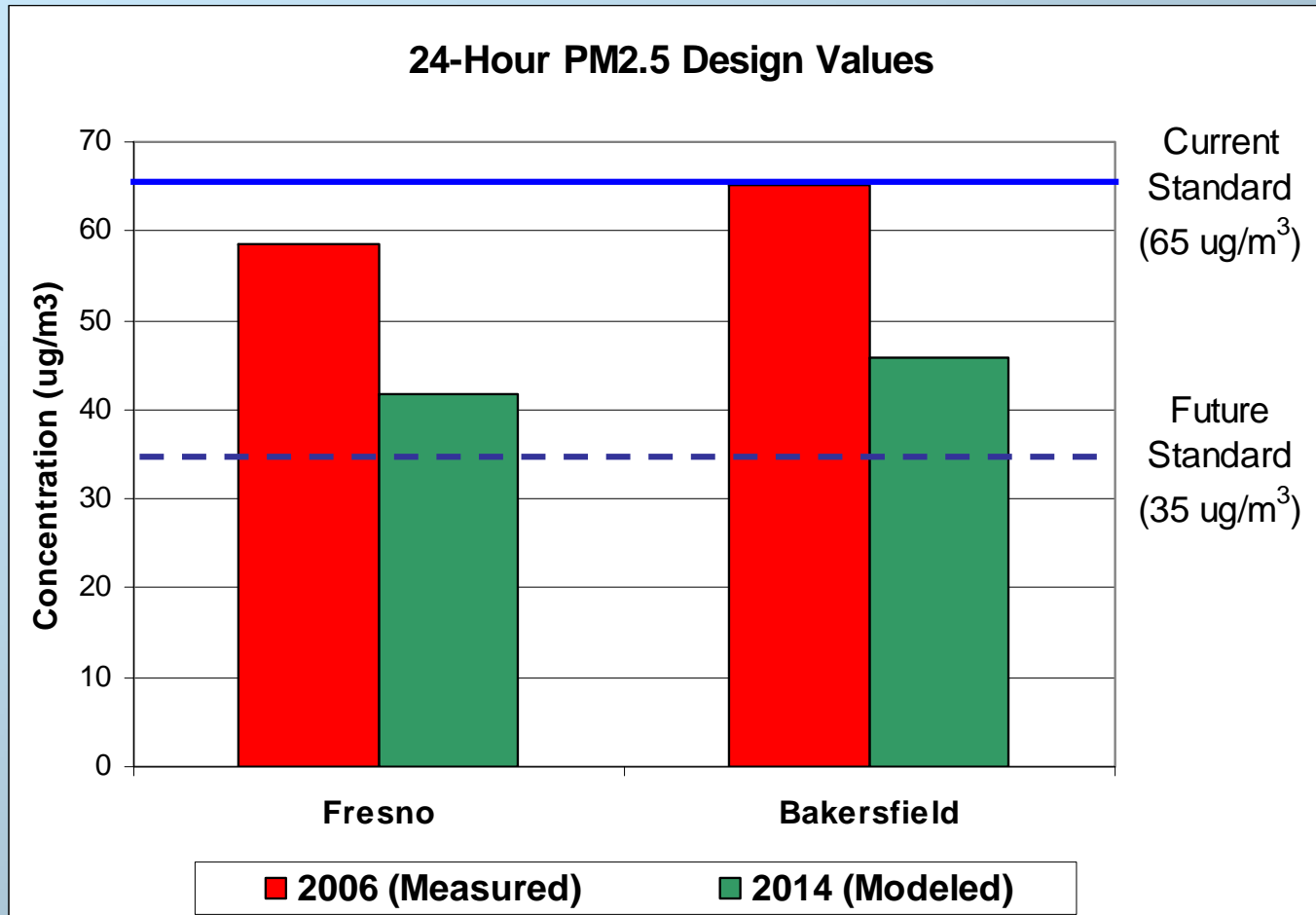
- Both MM5 and CMAQ models require very significant computer resources and were run on a dedicated network of 100 computer processors (built and maintained by ARB staff)
- MM5 Model:
 - 36 and 12 km² domains – 98 days runtime
 - 4 km² domain – 42 days runtime
- CMAQ Model:
 - 12 km² domain – 2 days runtime
 - 4 km² domain – 4 days runtime
- Disk space for a single 4 km² CMAQ model run - ~300 GB

Attaining the Annual Standard in 2014

Grid-Based Modeling



Attaining the 24-Hour Standard in 2014 Grid-Based Modeling



Weight of Evidence Analyses Help Define Control Approach

- Monitoring data show main components of PM_{2.5} are:
 - ammonium nitrate and
 - directly emitted PM_{2.5} (from combustion sources)
- Modeling indicates control strategy focus:
 - NO_x controls are most effective in reducing ammonium nitrate
 - All contributors to PM_{2.5} need to be reduced, but on a relative basis reductions in
 - Direct PM_{2.5} are more effective than NO_x

Conclusions

The Weight of Evidence shows:

- Both short-term and long-term downward trends in PM2.5 levels have occurred
- Directly emitted PM2.5 and NOx are key to control strategy
- Valley attains annual PM2.5 standard in 2014
- Valley continues to attain the 24-hour PM2.5 standard
- Valley is making significant progress towards upcoming 24-hour PM2.5 standard