



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IX

75 Hawthorne Street

San Francisco, CA 94105-3901

DEC 08 2009

Joel Craig
Air Monitoring Manager
San Luis Obispo Air Pollution Control District
3433 Roberto Court
San Luis Obispo, CA 93401

Dear Mr. Craig:

Thank you for the opportunity to provide comments on the "South County Phase 2 Particulate Study." Overall, I found this to be a comprehensive study that was conducted using robust and reliable measurement techniques. My assessment is that the analyses in this study were sound and the findings are well-supported by the data. I have enclosed the original report with minor editorial comments written in the margins.

Sincerely,

A handwritten signature in cursive script, appearing to read "Meredith Kurpius".

Meredith Kurpius, Ph.D.
Air Quality Analysis Office

MEREDITH R. KURPIUS (BAUER)

Environmental Protection Agency
75 Hawthorne Street, AIR-7
San Francisco, CA 94105
(415) 947-4534
Kurpius.meredith@epa.gov

Education

2001	Ph.D.	Ecosystem Science	University of California at Berkeley
1995	B.S.	Natural Resources	Cornell University (with Honors)

Honors and Awards

National EPA Award, National Science Foundation Graduate Fellowship, Berkeley Instructional Award, Berkeley Fellowship, Sigma Xi Award, Cornell National Scholar, Golden Key National Honor Society

Professional Interests: To apply creative scientific thinking in ways that simultaneously benefit the environment, business, and society.

Relevant Work Experience

2006-present Environmental Scientist

US EPA Region 9, Air Division, Office of Air Quality Analysis

Coordinated air monitoring activities in Region 9 with expertise in climate change and air toxics.

- Worked closely with state, local, and tribal agencies on air monitoring issues
- Served as R9's Regional Science Coordinator for ORD's Global Climate Change Research Program
- Initiated Air Division workgroup to address climate change issues within Air Division such as biodiesel
- Organized conference to address the impacts of climate change on air quality in the Pacific Southwest
 - Collaborative effort with ORD that brought together leading climate change scientists with EPA, state, local, and tribal air quality regulators
 - Conference highlighted in 2008 Region 9 Annual Progress Report
 - Meeting organized as a green conference; collaborated with Region 9 EMS team to develop a policy on green conferences as part of this effort
- Identified regulatory barriers preventing air monitoring stations from converting to alternative energy sources and worked with Region 9 regulatory agencies and Headquarters to remove them
- Worked with state, local, and tribal agencies along with industry to measure and reduce air toxics
- Conducted a nationally-recognized program evaluation to improve air toxics monitoring and mitigation efforts in Region 9
- Member of Region 9 Risk Team

2004-2006 Environmental Scientist

US EPA, Office of Inspector General, Program Evaluations

Evaluated EPA programs to promote economy and efficiency with a focus on OSWER programs.

- Issues evaluated include: RCRA programs, rulemaking, and state authorization of EPA programs
- Received training in RCRA, briefings, auditing, interviewing, writing, and teamwork

2002-2004 Post-doctoral Scientist

Oregon State University, OR

Investigated uptake of carbon by forests.

- Primary finding that old growth ponderosa pine forests sequester more carbon dioxide than young- or intermediate-growth ponderosa pine forests
- Worked collaboratively with team of scientists

1996–2001 Graduate Student Researcher
University of California at Berkeley, CA

Studied transport and fate of pollutants in forests in the Sierra Nevada Mountains.

- Primary finding that significant amounts of ozone and other air pollutants are transported and deposited to remote areas of the Sierra Nevada Mountains
- Wrote and collaborated on numerous peer-reviewed scientific publications

Spring 1997, 1998, 1999 Teaching Assistant for Atmospheric Chemistry
University of California at Berkeley, CA

Designed and led weekly discussion and problem-solving sessions for an introductory atmospheric chemistry course for upper-division undergraduate students.

1995–1996 Climate Change Analyst
US EPA, Climate Change Division, Washington, DC

Provided technical expertise in climate change policy development.

- Managed production of Inventory of U.S. Greenhouse Gas Emissions Inventory, 1990-1994
- Conducted extensive data analysis examining role of U.S. in global climate change and effects of potential mitigation strategies.

1993–1995 Cornell Environmental Science Undergraduate Research
Cornell University, Ithaca, NY

Designed and executed a research project studying the breakdown of CFCs by microorganisms in peat.

1993–1995 Research Assistant
Cornell University, Ithaca, NY

Assisted in field- and lab-work in a long-term project studying methane and carbon dioxide fluxes in wetland and forest systems in upstate New York.

First-authored Publications

- Kurpius, M.R., J. Irvine, P.A. Schwarz, B.E. Law, and M.H. Unsworth, Annual carbon exchange along a ponderosa pine chronosequence, *Journal of Geophysical Research - Atmospheres*, in review.
- Kurpius, M.R. and A.H. Goldstein, Gas-phase chemistry dominates O₃ loss to a forest, implying a source of aerosols and hydroxyl radicals to the atmosphere, *Geophysical Research Letters*, **30(7)**, 1371-1374, 2003.
- Kurpius, M.R., J.A. Panek, N. Nikolov and A.H. Goldstein, Partitioning of water flux and environmental controls on transpiration in a Sierra Nevada ponderosa pine plantation, *Agricultural and Forest Meteorology*, **117**, 173-192, 2003.
- Kurpius, M.R., M. McKay, A.H. Goldstein, Annual ozone deposition to a Sierra Nevada ponderosa pine plantation, *Atmospheric Environment*, **36**, 4503-4515, 2002.
- Bauer (Kurpius), M.R., A.H. Goldstein, J.A. Panek, N.E. Hultman, Ozone deposition to a ponderosa pine plantation in the Sierra Nevada Mountains (CA): a comparison of two different climatic years, *Journal of Geophysical Research*, **105**, 22,123-22,136, 2000.
- Bauer (Kurpius), M.R. and J.B. Yavitt, Processes and mechanisms controlling consumption of CFC-11 and CFC-12 by peat from a conifer-swamp and black spruce-tamarack bog in New York State, *Chemosphere*, **32**, 759-768, 1996.

References

Joel Scheraga, EPA/ORD National Program Director for Global Climate Change
Scheraga.joel@epa.gov, (202)564-3385

Steve Hanna, EPA/OIG Assignment Manager for Waste
Hanna.steve@epa.gov, (415)947-4527

CAL POLY

California Polytechnic State University
San Luis Obispo, CA 93407

Earth & Soil Sciences Department
(805) 756-2261 • (805) 756-5412
www.earthsoils.calpoly.edu

March 2, 2010

Joel Craig
San Luis Obispo County Air Pollution Control District

Dear Joel:

This letter confirms my review of the second draft of the Nipomo Mesa (South County) Phase2 particulate matter study, and conveys my support of its methods, results, and conclusions. The addition of the element data, especially, strengthens the case made by the study, of the origin of the particulate matter being the vehicle area of the Oceano dunes, and subsequently being conveyed to the Nipomo Mesa by prevailing winds.

Sincerely,

Lynn E. Moody
Head, Earth & Soil Sciences Department
Cal Poly

Lynn E. Moody
Earth & Soil Sciences Department, Cal Poly
(805) 756-2807, lmood@calpoly.edu

EDUCATION

University of Cincinnati	Geology	B.S., 1974
California Polytechnic State University	Soil Science	M.S., 1989
University of California, Riverside	Soil Science	Ph.D., 1993

APPOINTMENTS

Professor and Chair/ Head, Earth & Soil Sciences Department, Cal Poly, San Luis Obispo, CA. 2008-present.
Associate Professor, Earth & Soil Sciences Department, Cal Poly, San Luis Obispo, CA. 2003- 2008.
Assistant Professor, Soil Science Department, Cal Poly, San Luis Obispo, CA. 1999 -2003.
Lecturer, Soil Science Department, Cal Poly, San Luis Obispo, CA. 1995 - 1999.
Project Leader, USDA, Natural Resources Conservation Service, Soil Survey, Lancaster, CA. 1994 - 1995.
Soil Scientist/ Ecologist, USDA, Natural Resources Conservation Service Urban Soils Team, Lancaster, CA. 1993 - 1994.
Visiting Assistant Professor, Department of Soil & Environmental Sciences, University of California, Riverside, CA. 1993.

PUBLICATIONS

Lynn, Warren, J.E. Thomas, and **L.E. Moody**. 2008. Petrographic Microscope Techniques for Identifying Soil Minerals in Grain Mounts. Chapter 6 in *Methods of Soil Analysis*, American Society of Agronomy-Soil Science Society of America, Madison, WI.
Corresponding author. peer reviewed

Moody, L.E. 2006. Leaching and Illuviation, p. 1022-1025 in *Encyclopedia of Soil Science* (2nd edition), Volume 2, Ratten Lal editor, Taylor & Francis Group, New York. *peer reviewed*

Lynn E. Moody, 2004, Watershed study results offer strategies for reducing erosion and sedimentation associated with cattle grazing. Research Report, California State University Agricultural Research Initiative, California Agricultural Technology Institute, CSU Fresno.

Sections in "Nature of the Survey Area," Soil Survey of San Luis Obispo County, California, Carrizo Plain Area by Eric N. Vinson and Ken Oster. 2003, USDA, NRCS: **Moody, Lynn E.** and Karen Wiley. History and Development; **Moody, Lynn E.** and Eric N. Vinson. Physiography, Relief, and Drainage; **Moody, Lynn E.** Geology; **Moody, Lynn E.** and Karen Wiley. Plant Communities.

Moody, L.E.; 2001. Leaching and Illuviation; entry for *Encyclopedia of Soil Science*; Marcel Dekker. *Invited paper*

Moody, L.E. (Editor). 1999. Field Guide to the Morro Bay Watershed. Morro Bay National Monitoring Program, Central Coast Regional Water Quality Control Board and California Polytechnic State University.

Moody, L.E. (Editor). 1999. Field Guide to Montaña de Oro State Park; Veldt Grass Management Program. Morro Bay National Monitoring Program, Central Coast Regional Water Quality Control Board and California Polytechnic State University.

Moody, L. E., and R. C. Graham; Silica-cemented terrace edges, Central California Coast; *Soil Science Society of America Journal*; volume 61; pages 1723-1729; 1997. *peer reviewed*

Moody, L. E., and R. C. Graham; Geomorphic and pedogenic evolution in coastal sediments, central California; *Geoderma*; volume 67; pages 181-201; 1995. *peer reviewed*

Moody, L. E., and R. C. Graham; Pedogenic processes in thick sand deposits on a marine terrace; In: D. L. Cremeens, R. B. Brown, and J. H. Huddleston (Editors), *Whole Regolith Pedology*. Soil Science Society of America Special Publication 34, Madison, WI.; 1994. *peer reviewed*

PRESENTATIONS (past 12 years only)

- J.L. Ghezzi, **L. Moody**, A.F. Garcia, W. Preston, and B. Hallock. 2009. A study of parent materials and weathering sequences in several profiles and the relationship of clay dispersivity and clay mineralogy to water quality. ASA meetings, Pittsburgh, PA.
- **Moody, Lynn E.** and Craig Stubler. 2008. Integration of Long-Term Watershed Monitoring into a Soil Physics Course. ASA meetings, Houston, TX.
- **Moody, L.E.** 2007. Geomorphic and Pedogenic Development on Marine Terraces, Montana de Oro State Park. Field presentation to Southern California Geological Society and Central Coast Geological Society.
- J.L. Beckett, **L.E. Moody**, M.A. Whiteford, and M.E. Pedersen. 2006. Learn by Doing Pedagogy in Agriculture through Enterprise Projects. Poster presentation at "A Leadership Summit to Effect Change in Teaching and Learning, The National Academy of Sciences Board on Agriculture and Natural Resources and Board on Life Sciences, Washington, D.C.
- **Moody, L.E.**, C.P. Stubler, A.V. Young, B.D. Dietterick, J.C. Daly, R.K. Smidt, and K. McNeill. 2002. Water Quality and Range Improvements Following Best Management Practices Implementation. ASA meetings, Indianapolis, Indiana.
- Williamson, T.N., and **L.E. Moody**. 2002. Co-existence of Veldt Grass (*Ehrharta calycina*) and Native Plants along Coastal California. ASA meetings, Indianapolis, Indiana.
- **Moody, L.E.** 2001. Soil and Landscape Relationships of Petrocalcic Soils, California. ASA meetings, Charlotte, North Carolina.
- **Moody, L.E.** and R.C. Graham. 2000. Sand and Clay Mineralogy in Marine Terrace Soils and Deep Regolith, California Coast. ASA meetings, Minneapolis, Minnesota.

- **Moody, L.E.** 2000. Relating Soil Mineralogy to Pedological Factors and Processes. **Invited talk**, ASA meetings, Minneapolis, Minnesota.
- **Moody, L.E.**, T.K. Levesque, C.L. Hall, and E.R. Meyerholz. 1999. Dispersion and Related Properties of Several Coast Ranges Soils, California. ASA meetings, Salt Lake City, Utah.
- Dietterick, Brian C. and **Lynn Moody**. 1999. BMP Effectiveness following Six Years of Water Quality Monitoring on Chumash and Walters Creeks. Seventh Annual Nonpoint Source Monitoring Workshop, September, 1999, Morro Bay, California.
- **Moody, L. E.**, and R. C. Graham. April 30, 1998. Pedogenic and Geomorphic Evolution in Coastal Sediments, Central California. Physics Department Colloquium, Cal Poly, San Luis Obispo, CA.

STUDENT ADVISING

Senior Project Advisees, Year, and Title of Senior Project Report

- Edward R. Meyerholz, 1996, Mineral transformations and weathering of soils from the Morro Bay Watershed.
- Cheryl L. Hall, 1997, The effect of soil and site characteristics on dispersive behavior, Dairy Creek Watershed, California.
- Mike J. Fallon, 1997, Trail degradation on mountain bike and hiking trails in Montaña de Oro State Park.
- Heidi C. Quiggle, 1997, The hydraulic conductivity of the barrier layer at Lake San Antonio, North Shore Landfill, Monterey Co.
- Keith A. Ybaben, 1997, Soil investigation & foundation recommendations for Cal Poly Mech. Eng. thrust vector test tank project.
- Wendi S. Lelke, 1997, Seasonal distribution of pH and salinity in surface waters of Morro Bay Estuary.
- Joseph O'Neill, 1998, Effects of domestic greywater irrigation on Cropley Clay physical and chemical properties.
- Amber Seward, 1998, The effect of C/N ratios of organic amendments on the activity of earthworms.
- Tish K. Levesque, 1998, Influence of selected soil properties on dispersive behavior of soils from the Chumash Creek Watershed.
- Timothy A. Nicely, 1998, The influence of soil characteristics on hydraulic conductivity of a rotational slide, San Luis Obispo Co.
- Jason C. Smith, 1998, Bedload sediment evaluation for the Walters and Chumash Creeks paired sub-watershed study, 1997-98.
- Jennifer M. Putterer, 1998, A comparative study of the relationship between plant productivity, aspect, and soil-water availability.
- Jascha K. Janowicz, 1999, Influence of soil properties on a rotational slump in the Walters Creek Watershed, San Luis Obispo Co.
- Marne Settera, 2000, Implementation of the Revised Universal Soil Loss Equation in the Walters and Chumash Watersheds.
- Seth D. Burgess, 2001, Effects of lichen colonization on mineral weathering.
- David McAlister, 2001, Denitrification of natural water with the addition of cellulose, activated carbon, sucrose, and maltose.
- Allyson V. Young, 2001, The relationship of some soil properties to the distribution of *Arctostaphylos morroensis*.
- Kimberly Zangmeister, 2002, Investigation of catenary relationships on a hillslope in San Luis Obispo, California.
- Alaina Frazier, 2003, Relationships of pH, color, and degree of decomposition in Alaskan Histosols.
- Christina Anne Garcia, 2003, Introducing soil science to children for a better tomorrow.
- Rebecca S. Claassen, 2005, Greener Cleaners: A business plan. (co-advisor with Dr. William Preston)
- Ashlee Dere, 2005, Evidence for ancient shorelines in Montaña de Oro State Park, San Luis Obispo, California.
- Justine Simkins, 2005, Marine terraces at Swanton Pacific Ranch, Santa Cruz County, California.
- Matthew G. diCicco, 2006, Generalized stratigraphy of the seawater intrusion area in the Pajaro Valley, California.
- Darren Wollrich, 2006, Creation of a Cal Poly Soils GIS database.
- Lisa E. Eckert, 2007, Effects of fire on soils of Kelvin Canyon, California.
- Richelle Leggett, 2007, **Effects of salt and different pH solutions on the solubility of calcite.**
- Tracy Curry, 2007, Weathering of siliceous shale at Montaña de Oro State Park.
- Jennifer Carr, 2008, "Earth Science...so what do you do with that?" Careers in Earth Science.
- Daniel Kim, 2009, Acquisition of GIS and Earth Systems modeling equipment for the Cal Poly Earth & Soil Sciences Department.
- Therese Angie Quintana-Jones, 2009, Searching for root, soil, & mycorrhizal relations of *Ehrharta calycina*, perennial veldt grass.
- Renee M. Nall, 2009, **Organic carbon content in surface and subsurface soil on a toposequence on the Peterson Ranch in Poly Canyon.**

Graduate Thesis committee chair: Jessique Ghezzi, degree expected Winter 2010.

Academic Advisor to undergraduate Soil Science and Earth Science students, 1995 to present.

Soils Club Advisor, 1999-2000 Academic Year.

Faculty Advisor, Multicultural Agricultural Program (MAP) Center, 1998 to 2008.

Soil Judging Coach, 1999 to 2008.

Awards for Teaching

- Distinguished Educator, 2001-2002, presented by the California Faculty Association, Cal Poly, San Luis Obispo.
- Outstanding Teaching Assistant, Department of Soil & Environmental Science, University of California, Riverside, 1993.

Significant Recent Academic-Related Experience

Cankdeska Cikana College Summer Study Program, June 2008. With Dr. Kate Martin, Ethnic Studies Department, College of Liberal Studies. Focused on cooperation of students, faculty, and mentors to design, landscape, and plant a native garden in North Dakota and learn about the grass plains environment from an interdisciplinary perspective.

Learn by Doing Lab, Spring 2009 and planned for Spring 2010. In cooperation with CESaME, mentored six graduate and

undergraduate students in presenting Earth Science lab activities for middle school students, visiting Cal Poly with teachers.



**Santa Barbara County
Air Pollution Control District**

February 19, 2010

Mr. Larry Allen
Air Pollution Control Officer
San Luis Obispo Air Pollution Control District
3433 Roberto Court
San Luis Obispo CA 93401

Regarding: South County Phase 2 Particulate Study

Dear Mr. Allen:

I am writing you in response your request to provide one final peer review of the South County Phase 2 Particulate Study. As we are a neighboring Air Pollution Control District, we appreciate the opportunity to have been involved in both Phase 1 and Phase 2 of this important study effort. My staff and I have worked closely with your staff in the design, implementation, and data analysis aspects of the Phase 2 Study and believe that it was conducted using proper scientific methods and data analysis techniques.

We concur with all (please see finding #3 request below) of the major findings, summary and conclusions of the Phase 2 study and most importantly that the predominant source of the PM concentrations measured on the Nipomo Mesa is crustal materials transported from the open sand sheets in the dune area of the coast. We also agree that the open sand sheets disturbed by OHV activities emit significantly greater amounts of PM than the undisturbed sand sheets under the same wind conditions. We do, however, have concerns with finding #3 and whether the coke piles are a "significant" source of PM on the Nipomo Mesa. This concern is not from a volumetric standpoint as it is very clear that crustal materials are the predominant source of PM on the Mesa. Our concern regarding the "significance" of the coke piles is from a toxics perspective and we request that additional elemental analysis be provided to quantify Nickel and Vanadium (as a tracer for the coke piles) in the coarse PM fractions for both the Mesa 2 site and the Dunes Center control site.

I also want to send you my highest commendation of Joel Craig for his superior work ethic and dedication to both the Phase 1 and Phase 2 studies. Joel is a credit to our air quality profession and it has been my pleasure to work with him.

If you have any questions, please contact me at 805-961-8857.

Sincerely,



Tom Murphy
Manager, Technology and Environmental Assessment

cc: Joel Craig, SLOAPCD
Joe Petrini, SBCAPCD
Joel Cordes, SBCAPCD
Terry Dressler, SBCAPCD

Tom Murphy

Technology & Environmental Assessment Division Manager

Santa Barbara County Air Pollution Control District

260 San Antonio Road Suite A, Santa Barbara CA 93110

805-961-8857

MurphyT@sbcapcd.org

Education

- | | |
|---|------|
| M.A in Geography/Climatology
<i>California State University, Northridge</i> | 1989 |
| B.A. in Geography
<i>University of California, Santa Barbara</i> | 1982 |

Experience

- | | |
|---|------------------|
| Technology & Environmental Assessment Division Manager
Santa Barbara County Air Pollution Control District <ul style="list-style-type: none">• Management and policy direction for the Division, which is one of two technical divisions at the District, and encompasses Planning, Rules, Air Monitoring, Innovative Technologies/Funding Programs, Public Outreach, and California Environmental Quality Act (CEQA) Review.• Leading negotiations on technical issues and policies with federal, state, and local agencies, and with industry representatives.• Managing EPA Grant and state funding allotments, coordinating Division activities to meet federal and state requirements.• Performing technical studies, e.g. <i>Assessment of Transport from Santa Barbara County to the South Coast Air Basin</i> (2005); peer reviewing scientific studies, including San Luis Obispo Air Pollution Control District <i>Nipomo Mesa Particulate Study</i> (2007, Phase I), and <i>South County Particulate Study</i> (2010, Phase II). | 2004-
present |
| Planning and Technology Supervisor (1998-2004)
Air Quality Scientist (1992-1998)
Air Quality Engineer (1987-1992)
Santa Barbara County Air Pollution Control District <ul style="list-style-type: none">• Managing development and implementation of Clean Air Plans, oversight of Innovative Technologies Group funding programs.• Photochemical, dense gas modeling, risk management and prevention plans, criteria pollutant modeling, air quality impact analyses. | 1987-2004 |
| Atmospheric Scientist, Regulatory Assessment Group
Aerovironment, Inc. <ul style="list-style-type: none">• Permit modeling, air quality impact assessments, ozone and weather data analysis for Sierra Nevada Transport Study; analysis for Ormond Plume Characterization Study for Southern California Edison. | 1985-1987 |
| Analyst for Southern California Edison, consultant for Pacific Gas & Electric <ul style="list-style-type: none">• Modeling, analysis of air quality and meteorological data, studies of severe winds. | 1984-1985 |
-

Air Quality Plans — Santa Barbara County Air Pollution Control District

Air Quality Attainment Plan (1991), *Rate of Progress Plan* (1993), *Clean Air Plans*: 1994, 1998, 2001, 2004, 2007.

Publications and Presentations

Tom Murphy (2009): *Air Pollution in the Santa Barbara Channel*. Shore to Sea Lecture Series, Santa Barbara Maritime Museum and Channel Islands National Marine Sanctuary, August 11 & 12, 2009.

Tom Murphy (2009): *Regulating Marine Vessels*. Channel Islands National Marine Sanctuary Advisory Council, July 17, 2009.

Tom Murphy (2006): *Marine Shipping Emissions*. Maritime Working Group Meeting at the Port of Long Beach, September 12, 2006.

Tom Murphy (2005): *The Need to Reduce Marine Shipping Emissions: A Santa Barbara County Case Study*. Ventura County Air Pollution Control District, November 2005.

Tom Murphy (2005): *The Need to Reduce Marine Shipping Emissions: A Santa Barbara County Case Study*. Air & Waste Management Association Local Chapter, September 21, 2005.

Tom Murphy (2004): *The Need to Reduce Marine Shipping Emissions: A Santa Barbara County Case Study*. West Coast Region Conference on Marine Port Air Quality Impacts, Seattle, WA, April 21-22, 2004.

Tom Murphy, Ray McCaffrey, Kathy Patton, and Douglas W. Allard (2003): *The Need to Reduce Marine Shipping Emissions: A Santa Barbara Case Study*. 96th Annual Air and Waste Management Association Conference.

Douglas W. Allard, Kathy Patton and Tom Murphy (1998): *The Role of Innovative Technologies in Air Pollution Control Strategies*. Air and Waste Management Association Magazine for Environmental Managers, December 1998.

Khanh T. Tran and Tom Murphy (1993): *Wind Field and Photochemical Modeling in the Santa Barbara Channel*. 86th Annual Air and Waste Management Association Meeting

Tom Murphy and J. Ivor John (1991): *Spatial, Temporal, and Meteorological Characteristics of Ozone Violations in Santa Barbara County*. 7th Joint Conference on Applications of Air Pollution Meteorology, a Joint Air and Waste Management Association and American Meteorological Society Conference.

Dr. Arnold Court and Tom Murphy (1984): *White Mountain Weather -- Highest in the United States*. 3rd International Conference on Mountain Meteorology, a Joint Air Pollution Control Association and American Meteorological Society Conference.

Memberships & Affiliations

- Member, Air & Waste Management Association
 - Member, California Air Pollution Control Officers Association (CAPCOA) Climate Protection Committee, and Planning Managers Committee
-

Granite Rock Company
A National Baldrige Award Winner

Michael A Taylor Ph.D.

Professor Emeritus, Civil and Environmental Engineering
University of California, Davis

Manager of Materials Research

7275 Bayview Way

Sacramento CA 95831-3217

Tel. and fax: 916 392 1630

Email mat.dct@comcast.net or mtaylor@graniterock.com

12 Feb. 2010

To Whom it May Concern:

I have read both the drafts (in late 2009) and the final versions (February 2010) of the reports prepared for the San Luis Obispo County Air Pollution Control District, and entitled

South County Phase 2 Particulate Study.

In my opinion the conclusions drawn are supported by the data and the analyses of the data.

Sincerely,



Michael Taylor

RESUME

Michael A. Taylor
Professor Emeritus
Civil and Environmental Engineering
University of California, Davis

Manager of Materials Research
Granite Rock Company
Watsonville Ca 95077

12 Feb 2010

CHRONOLOGICAL SUMMARY

1960 Bachelors degree in England 1960; worked for 1 year as structural engineer.
1961-63 Attended Cornell University for MS. Research Assistant in testing laboratory. Returned to England for a further year in consulting.
1964 Moved to Barbados, West Indies as chief engineer for a design/construction company. Two years supervising design and construction of many buildings and a bridge.
1966 moved to Berkeley to pursue Ph.D. Teaching Assistant for 2 years.
1969 completed degree and accepted position at U.C. Davis.
1969-1993. Taught classes and conducted research in Civil Engineering, Structural Engineering and Engineering Materials.
1993 took early retirement from university (though I still teach occasionally as a "recall" professor).
1995-present employed by Granite Rock Company in Watsonville CA first as director of Research and Technical Services (1995-2000) then as Manager of Materials Research.
1961-present Have operated a one-man consulting company (sometimes intermittently).

CURRENT TITLES

Professor Emeritus Civil and Environmental Engineering University of California at Davis
Manager of Materials Research Granite Rock Company Watsonville CA 95077

EDUCATION

1960: B.Sc (Hons.) Civil Engineering. University of Manchester U.K.
1963: M.S. Structural Engineering. Cornell University
1969: Ph.D. Structural Engineering and Structural Mechanics (SESM). University of California, Berkeley.

ACADEMIC CAREER

1969-present University of California Davis
1961-63 Teaching and Research Assistant Cornell University
1963-4 Lecturer at Salford University U.K. (structures and mathematics)
1998-9 Visiting lecturer (mechanics of materials) University of the Pacific

MELVIN D. ZELDIN
Environmental Consultant
33 White Dove Court
Sparks, NV 89436

February 15, 2010

Mr. Larry Allen, APCO
San Luis Obispo County APCD
3433 Roberto Ct.
San Luis Obispo, CA 93401

RE: Second Review of the "South County Phase 2 Particulate Study"

Dear Mr. Allen:

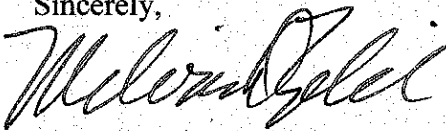
I have received the latest draft version of the subject report. I believe the report is enhanced with the changes and revisions made, especially with respect to additional figures and analyses.

As I stated previously, the conclusions of the report are sound. The consistency of the many different approaches taken in analyzing and interpreting the data makes a compelling case in showing that the off-road vehicle activity at the Oceano Dunes State Vehicle Recreation Area impacts particulate air quality in the region.

Your staff is to be complimented for the study design, analytical work, and report preparation. This is a well-constructed, carefully designed, and thoughtfully analyzed field study. I have reviewed many other reports which do not meet the quality and caliber of this one.

Should you have any questions, please feel free to contact me at 775-530-9548. A short biographical write-up is attached.

Sincerely,



Melvin D. Zeldin
Environmental Consultant

Atch.

RECEIVED

FEB 18 2010

AIR POLLUTION CONTROL DIST
SAN LUIS OBISPO COUNTY

MELVIN D. ZELDIN
Environmental Consultant
33 White Dove Court
Sparks, NV 89436

December 29, 2009

Mr. Larry Allen, APCO
San Luis Obispo County APCD
3433 Roberto Ct.
San Luis Obispo, CA 93401

RE: Review and Comment on "South County Phase 2 Particulate Study"

Dear Mr. Allen:

As you have requested, I have reviewed the subject report (Study), and I am providing comments. This letter is divided into the three sections: (1) a brief overview of the study; (2) general comments; and (3) specific comments.

1. Brief Overview of the Study

The San Luis Obispo County Air Pollution Control District (APCD) conducted a particulate study from March 2008 to March 2009 in the Nipomo Mesa region to assess, primarily, the effects of the off-road vehicle (OHV) activity at the Oceano Dunes State Vehicle Recreation Area (SVRA) upon particulate air quality in the region. An earlier study in 2004 documented exceedances of the California health-based ambient air quality standard for thoracic particulates (PM10) and suggested that the OHV activity in the SVRA may be the main source of PM10 leading to the exceedances.

In conducting the Phase 2 study, the APCD partnered with other groups noted for their expertise in these types of studies. Specifically, Great Basin Unified APCD assisted with sand movement measurements based on their many years of experience with the Owens (dry) Lake – the most significant source of crustal PM10 in the nation; the Delta Group provided sampling using their drum samplers, which allows for size-resolved samples as well as chemical speciation of those samples; and the California Air Resources Board provided laboratory analysis of certain samples. The APCD collected filter-based PM10 samples, continuous PM10 measurements, and critical meteorological data.

From the analyses of the data, a number of key findings were determined, the most significant of which is that episodes (i.e., exceedances of the State ambient air quality standard for PM10) measured in the Nipomo Mesa on high wind days are associated with emissions from disturbed and denuded soils in the SVRA.

2. General Comments

First, having been involved with many air quality field studies (e.g., Coachella Valley PM10; South Coast's MATES-II; South Coast's TEP-2000 Speciated Particulate Study; and the Roseville Railyard Study), I know that the project design is critical to the success of any field monitoring study. A monitoring project needs to be designed in ways that provide the data necessary to address the project objectives, as well as providing robust data sets to deal with ancillary issues that almost always occur. It is my opinion that the design of the Study was well conceived and scientifically sound. Naturally, if one had an unlimited budget, an almost infinite number of additional measurements can be made, but given limited resources for virtually every field study, the APCD's resources were used very effectively.

Second, it is very difficult in these types of studies to "prove" a source is responsible for observed ambient particulate levels. Data, if analyzed correctly, tell a story of what is happening, and for the conclusions to have merit, the analyses need to consistently point to the same conclusions. Consistency among many different analytical approaches leads to a "weight-of-evidence" result that provides a very strong basis that the results are indeed representative of the actual phenomena occurring. It is my opinion that the analyses performed, the approaches taken, and the data depicted are very consistent with the hypothesis that the SVRA, as related to the OHV activity occurring in that area, is the primary source of emissions related to episode days. The following summarizes the consistency of results:

- 1) Elevated PM10 levels are associated with stronger winds from the west-northwest direction at both the CDF, Mesa2, and Oso sites. (Figs. 3-14, 3-23, 3-29)
- 2) Plots indicate different threshold friction velocities for disturbed soils in the SVRA as compared to the vegetated area near the Oso site, with higher thresholds related to the Oso site. (Fig. 3-43, Table 4-2) This is consistent with disturbed soils more readily prone to wind entrainment than undisturbed, naturally crusted soils.
- 3) Elevated levels are directionally sensitive; that is, elevated PM10 levels at higher wind speeds occur only when the winds blow from the SVRA area to the CDF and Mesa2 sites. (Figs 3-14, 3-23, 3-42)
- 4) Sensit measurements show significant sand movement under higher wind conditions, and these measurements show much higher movement within the SVRA than the measurements in the dunes to the south of the SVRA. (Figs. 4-2, 4-3)
- 5) Cox Sandcatcher monitors show the greatest amount of sand movement in the SVRA, with no such detection in the dune areas south of the SVRA.
- 6) There is no indication of any substantial background levels of PM10 coming off the ocean when the west-northwest winds occur. (Fig. 3-5)
- 7) The sites downwind of the SVRA (CDF and Mesa2) have higher average PM10 levels than monitors both north and south of the SVRA. (Figs. 3-45, 3-47)
- 8) Analysis of vehicle data in the SVRA show higher PM10 under the highest vehicle activity days as compared to the lowest vehicle activity days. (Table 3-3)

If the SVRA is the primary source area for the exceedances observed in the Nipomo Mesa, all of the findings are consistent with that result. There are no contradictory results. Hence the overwhelming weight-of-evidence strongly supports the SVRA as the main source area for elevated PM10 levels in the Nipomo Mesa.

There are two mechanisms for PM10 emissions in the SVRA: (1) windblown entrainment of disturbed soils; and (2) mechanical action of the OHVs causing particles to become airborne. It appears from the data that windblown action is by far the primary cause. The APCD estimates that 10-15% of the soil component of the PM10 may be due to the mechanical action of the vehicles, but that estimate is not readily derived from the data. There may be other techniques that may provide a statistical estimate of that component.

Third, there are some analyses related to some of the ancillary findings that I do have comments about; however, these do not affect the primary finding. I also have some suggestions for additional analyses, if possible, that may provide more insight into the phenomena occurring. These are detailed in Part 3, below.

3. Specific Comments

The following specific comments are provided. (As there are no page numbers in the report, references will be made by notating section-page. That is, for example, the fourth page of Section 2 would be referenced as "page 2-4.")

- 1) It would be helpful to add an Executive Summary that includes the key findings up front.
- 2) Page 3-2, second paragraph: Statement is made that the Figure 3.3 wind rose shows "...the wind direction is from the west and generally occurs in the afternoon." The wind rose does not indicate any time of day, and so the statement that the strongest winds occur in the afternoon needs to be supported by another chart, perhaps one that shows average wind speed by time of day.
- 3) In some figures, such as Figure 3-7, the legend is too small to read. Legends need to be re-done with larger font to make readable.
- 4) Figure 3-7 suggests that dense fog events are the cause of artifact high PM10 episodes. While no meteorological observations are available to confirm the fog, the strip chart indicates that fog occurred early in the morning, then burned off by 0800 as the wind increased. At about 1800 hours, the winds became light and variable, and dense fog returned. The PM10, varying at high levels throughout the evening, probably more reflect the density of the fog. These events reflect artifact salt particles on the sampler filter media as the moisture is evaporated. Sea salt particles, per se, are likely not suspended in the air at the time, but rather dissolved in the fog droplets. Some of the salt particle episodes delineated in Figure 3.9 at the Pier Avenue site may well represent similar events, as the levels of chloride ion analyzed from the 24-hour samples appear otherwise excessive as ambient particles, even in a coastal zone. For example, samples collected at San Nicolas Island, about 60 miles off the southern California coast, and

influenced overwhelmingly by marine conditions, showed only a few micrograms per cubic meter of sea salt as determined as part of the TEP-2000 speciated particulate study conducted by the South Coast AQMD.

5) Figure 3-15 is not explained or referred to in the text.

6) Page 3-13: The analysis of the Hillview PM10 measurements includes a comparison with the Mesa2 site, as shown in the scatterplot in Figure 3-18. The explanation in the text suggests that local source influences near the Hillview site account for higher readings at Hillview than Mesa2 on lower concentration days; whereas on higher concentration days, Mesa2 has higher values. What is unclear, however, is why only Mesa2 was given for a comparison, rather than the CDF site, which appears closer in proximity to Hillview than the Mesa2 site. What also is unexplained is a reason why Mesa2 would be higher than Hillview under higher wind conditions since Hillview is located more immediately downwind of the SVRA (2.8 miles) than the Mesa2 site (3.1 miles).

7) Page 3-28: Figure 3.35 is incorrectly labeled as Figure 3.37.

8) Figures 3.37 and 3.38: These combined strip charts for episode and non-episode days at Mesa2 are visually descriptive. It would be helpful to also include strip charts for the CDF, Oso, and Grover Beach sites for the same days so one can see what happens on these days at other sites.

9) Figure 3.42 shows the sensitivity of wind direction, under higher wind speeds, to elevated PM10 levels: as the wind changes from north to a more west-northwesterly direction, PM10 levels jump due to being downwind of the SVRA. As a companion test, it would seem that the Oso site would be downwind of the SVRA when winds are from about 340 degrees. Are there any days at the Oso site with winds greater than 20 mph with a wind direction of about 340 degrees \pm 20 degrees (under which the Oso site would be the downwind receptor)? If so, are any elevated PM10 levels noted at Oso? (From Figure 3.29, it appears there are no such cases, unfortunately.)

10) There are two figures labeled 3.48 – one on page 3-40 and the other on page 3-42.

11) The discussion in Section 3.2.4 looks at contributing factors other than wind, and suggests that temperature has an additional effect. Because wind is a direct factor (e.g., wind causes entrainment of dust), but temperature is a possible indirect factor (e.g., it of itself does not cause emissions, but may enhance the effects caused by the wind), care needs to be taken that the relationship is a valid one. An indirect variable could be related to another factor which correlates to both of the plotted variables; hence the result as shown. For example, it might also be that the warmer temperatures are events that occur closer to the warmer months of the year, which also have longer daylight hours, and more hours for recreational activity. I'm not suggesting that the described temperature relationship is incorrect (rather, it is plausible); however, care must be exercised in these types of secondary statistical relationships. Also, it is not clear why

Mesa2 was selected for this analysis. CDF, being closer to the source, would have been preferred. Also, having the same analysis done for CDF would add to the value of the results, if indeed, the results are consistent for both sites. In fact, it would be helpful to add Oso into this analysis, especially since the temperature there is probably more indicative of the dunes area than the Mesa2 temperature.

12) Section 3.2.5 discusses the SVRA vehicle attendance on a daily basis, which is an implied relationship to vehicle activity within the SVRA. Table 3.3 compares measurements with vehicle attendance. Since vehicle activity would be a direct source of PM10 emission through mechanical action, relationships here would suggest that this is a source of such emissions in addition to wind entrainment. The comparison of averages is suggestive, but a more formal student's t-test (a standard statistical procedure) would at least provide some statistical confidence levels in the differences of the average PM10 concentrations. Further, it would be insightful to take the stratification process by wind speed bins (as shown in Figures 3.48 to 3.51) and rather than temperature, use vehicle attendance. The wind data from the CDF site would be preferable to use as it is closer to the SVRA. Since the Table 3.3 analysis does not account for wind speeds, using the wind stratification approach may yield a relationship that is indicative of this direct source of emissions.

13) In California, ammonium nitrate is a major component of urbanized particulates. I did not notice any analysis reported for nitrate or ammonium ion. The ammonia sources are typically of biological origin. For at least one site, perhaps the Pier Avenue site, analysis for ammonium ion should have been done and indicated in addition to the chloride ion. Although this study focuses on crustal materials in a marine influenced region, some anthropogenic non-crustal particles are being generated. It would have added some value to specify those levels. Even if very low, that information would be beneficial.

14) Figure 5.12 (Delta Group results): the results seem somewhat anomalous. In soil-dominated episodes, it doesn't make sense why concentrations in the 1.15 – 2.5 micrometers range would be nearing 40 micrograms per cubic meter, which is more than the 2.5-5.0 and 5.0-10.0 size fractions. In fact, concentrations increase as the size fraction decreases. These reported results appear inconsistent with all the soil sample size fractionation analyses and inconsistent with known aerosol characteristics of PM10. There is no explanation given for this result. In an earlier analysis, some suggestion was made as to fallout over distance of the larger particles, but this is not apparent in Figure 5.12, nor are these results consistent with other studies looking at size-resolved ambient particles. If the primary source of these particles were, for example, combustion-related emissions, these results would make more sense. Given crustal source dominance in this case, I would suspect some sort of error in the analytical portion of the Delta Group work.

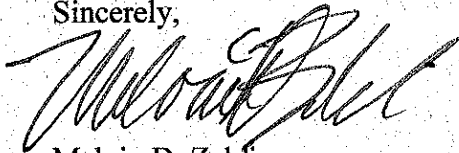
15) Some additional visual depiction of sample episode days would be helpful by taking the base map as shown in Figure 2.3 and constructing spatial isopleths of concentrations (perhaps maximum 24-hour concentrations) as measured at each site. Interpolation techniques can be used, but it appears there is sufficient density of sites to construct

meaningful pictures of spatial concentrations. I would suggest taking several episode days and one non-episode day, selecting candidate days based on having the greatest number of samplers in operation at the time. These spatial plots can be very illuminating.

I hope these comments are helpful. As a brief background as to my experience in this type of work, I had a primary role in the development of several key air monitoring field studies, as indicated in the first paragraph of Section 2. Also, I served for 13 years on the California Air Resources Board's Research Screening Committee, having reviewed and commented on over 100 final research reports. I am attaching a copy of a resolution given to me by the ARB which speaks for itself.

Should you have any questions, please feel free to contact me at 775-530-9548.

Sincerely,

A handwritten signature in black ink, appearing to read 'Melvin D. Zeldin', written in a cursive style.

Melvin D. Zeldin
Environmental Consultant

Atch.

Melvin D. Zeldin
Environmental Consultant

Melvin D. Zeldin is a nationally recognized expert in the field of air program management, air quality data analysis, and air monitoring, and, since 2006 has served as the Executive Director of CAPCOA – the California Air Pollution Control Officers Association – a non-profit organization of air pollution control officers from all 35 local and regional air districts in California. In that capacity, Mr. Zeldin is responsible for the overall operations of the organization. From 2002 to 2006, he served as technical consultant to the Association.

Over the course of his 38-year career, Mr. Zeldin has been involved with many aspects of air quality management, science, policy-making, including developing air quality management plans and rules and regulations; managing air monitoring programs; conducting air quality research programs; providing air quality data analysis and assessment; and serving in a variety of advisory roles. He helped design the Roseville Railyard Air Monitoring Program for the Placer County APCD; and served as an air quality technical advisor to the Tahoe Regional Planning Agency.

In 2001, Mr. Zeldin retired from the South Coast Air Quality Management District (AQMD), where he was Assistant Deputy Executive Officer for Science and Technology Advancement. In his tenure with the AQMD, he was: (1) responsible for the overall operation of the air monitoring, laboratory, and source testing functions; (2) project manager with overall responsibility for the development of their Air Quality Management Plan; (3) project manager for the MATES-II hallmark air toxics study in the South Coast Air Basin; (4) project manager with overall responsibility for the Coachella Valley PM10 studies; and (5) project manager for the TEP-2000 speciated particulate air monitoring study for the South Coast Air Basin.

In addition, Mr. Zeldin has contributed on a national level, serving as the facilitator for the National Monitoring Strategy Committee; participating in the development of the national Natural Events Policy; serving as a consultant to the EPA's Clean Air Science Advisory Committee's (CASAC) Subcommittee on Fine Particulates; serving as co-chair of the National Association of Clean Air Agencies' Monitoring Committee; and participating in the EPA FACA process for the development of the ozone and fine particulate ambient air quality standards. On a statewide level, Mr. Zeldin was a 13-year member of the California Air Resources Board's Research Screening Committee, which oversees the agency's extramural research program.

Mr. Zeldin has a degree in meteorology from U.C.L.A. In 2002, the Air and Waste Management Association recognized his achievements and presented him with the S. Smith Griswold Award for outstanding contributions to the prevention of air pollution by a government agency staff member.

State of California
AIR RESOURCES BOARD

Resolution 01-26

July 26, 2001

WHEREAS, after thirteen years of distinguished service as a member of the California Air Resources Board Research Screening Committee, Mr. Melvin Zeldin is leaving state service;

WHEREAS, he was first appointed to the Research Screening Committee in 1988 by the California Air Resources Board;

WHEREAS, he has served the Committee, the Board, and the State of California faithfully;

WHEREAS, he has always exhibited the epitome of fairness in reviewing scientific issues coming before the Committee;

WHEREAS, he was extremely dedicated in the time spent and study given to each and every matter brought before the Committee;

WHEREAS, he has always been at the forefront in acquiring the high quality information needed to address important air quality issues through pertinent research;

WHEREAS, he has been instrumental in the success of the speciated particulate matter monitoring programs and comprehensive data analysis in southern California;

WHEREAS, his insights and involvement in planning and conducting various field studies in southern California have been invaluable as demonstrated in his foresight and commitment to collecting the necessary air quality data for documenting health effects and the impacts of our air pollution control programs, specifically during the Children's Health Study; and

WHEREAS, his accomplishments include directing the Multiple Air Toxics Exposure Study as well as working closely with the Coachella Valley to bring it into attainment of the federal PM10 standard.

NOW, THEREFORE, BE IT RESOLVED that the Air Resources Board thanks Mr. Zeldin for his many years of dedicated service to the Air Resources Board and the people of California.

Executed at San Francisco, California, this 26th Day of July 2001.


Dr. Alan C. Lloyd, Chairman

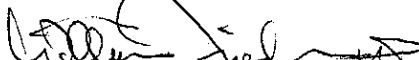

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Arnold Schwarzenegger
Governor

February 18, 2010

Mr. Larry Allen
Air Pollution Control Officer
San Luis Obispo County Air Pollution
Control District
3433 Roberto Court
San Luis Obispo, California 93401

Dear Mr. Allen:

We appreciate the opportunity to provide comments on the San Luis Obispo County Air Pollution Control District's "South County Phase 2 Particulate Study". Air Resources Board technical staff has reviewed the report and agree with the methodology used in the analysis and that it supports the technical findings presented in the report.

If you have any questions please contact me at (916) 322-7137 or via email at kmaglian@arb.ca.gov.

Sincerely,

Karen Magliano, Chief
Air Quality Data Branch
Planning and Technical Support Division

*The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption.
For a list of simple ways you can reduce demand and cut your energy costs, see our website: <http://www.arb.ca.gov>.*

California Environmental Protection Agency

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