

## Meeting Minutes

WRAP Dust Emissions Joint Forum  
July 27-28, 2004 @ Reno, Nevada

### Attendees:

Mike Edwards, Co-chair	Idaho DEQ	Wilfred J. Nabahe	Lone Pine Paiute-Shoshone
Duane Ono, Co-chair	Great Basin APCD	Wayne Leipold	Phelps-Dodge Miami
Richard Countess	Countess Environmental	Gail Cooke	NM ED/ AQB
Rob Farber	Southern California Edison	Barbara Trost	AK/ DEC
Jean-Paul Huys	Nevada BAQP	Bruce Friedl	AZ DEQ
Lee Alter	WGA	Bob Palzer	Sierra Club
Mel Zeldin	Consultant	Tom Moore	WGA/ WRAP
Lee Gribovicz	Wyoming DEQ	Cathy Messerschmitt	NTEC-TCC
Jin Xu	DRI	Ken Hamilton	Wyoming FB
Alissa Dickerson	DRI	Chat Cowherd	Midwest Research Institute
Susan Hardy	MAG (Utah)	Tamoke Smiley	Walker River Paiute Tribe
Cathy Arthur	MAG (Arizona)	Roxanne Ellingson	Walker River Paiute Tribe
Bob Gruenig	NTEC	Patrick Gaffney	CA Air Resources Board
Toni Richards	Bishop Paiute Tribe	Jim Paulus	Great Basin APCD
Juliette Jeanne	Reno-Sparks Indian Colony	David Groeneveld	HydroBio
Kermit Snow	Ft. Belknap Tribes, MT	Hampden Kuhns	DRI
Gerard Mansell	ENVIRON		

### Meeting Summary

The WRAP Dust Emissions Joint Forum (DEJF) convened at the Atlantis Hotel in Reno, Nevada at 9:00 AM July 27<sup>th</sup> and met through 3:00 PM of July 28, 2004. A sign-up sheet was taken of attendees. The purpose of this meeting was to hear technical presentations on new dust tracking and analysis methodology such as satellite imagery, to receive information on the current state of some dust research and technology, to hear reports from contractors on the status of projects that the DEJF is currently undertaking, and to discuss the direction that the DEJF will take in 2005.

The five tasks that are currently being worked on by the DEJF are:

- ✓ Establish a Common Definition of Dust, with a Natural/Anthropogenic Split
- ✓ Develop a Handbook and Website Resource for Compiling Contemporary Knowledge of Fugitive Dust
- ✓ Improve Estimates of the Fine Fraction (PM<sub>2.5</sub>) of Dust Emission Factors
- ✓ Examine the 20% Worst Visibility Days for Frequency and Magnitude of Dust Impacts and Their Probable Sources at WRAP Class I Areas
- ✓ Refine the WRAP's Windblown Dust Model & Produce a 2002 Emission Inventory

An initial draft of the 2005 DEJF Workplan & Budget had been proposed in June and reviewed by the WRAP Planning Team at their July 20-21<sup>st</sup> Meeting. In addition to completing the above planned projects, the DEJF had requested funding to maintain the Fugitive Dust Handbook, hold a Workshop on Fugitive Dust Control Technology, and prepare a Sample Dust Implementation Plan for Regional Haze SIP's. The Planning Team had suggested that this last project, the RH Dust Implementation Template,

was a worthy idea, but with a tighter 2005 WRAP Budget, the team had suggested that this project could be deferred until 2006, when control strategies are going to be developed for the §308 and §309 SIP's. Members of the DEJF were concerned with this potential delay, and determined to petition the Planning Team to restore some reasonable amount of funding such that this project could move forward in 2005. It was felt that other projects, such as the Definition of Dust, might not require the full financing anticipated in the current budget. And the Forum concluded that the Planning Team's sympathetic response, along some financial juggling, the RH Dust Implementation Template could probably move forward in the coming year.

Other presentations included a description of the intensive Windblown Dust Monitoring & Modeling that is taking place at Owens Lake, and a report on Satellite Imagery being used for quantifying compliance with Windblown Dust Controls required by the Air Pollution Agencies (vegetation cover or land flooding) at this California location.

And another presentation on Satellite Imagery was given; this one on "spectral analysis" of erodible land being used in Clark County, Nevada to improve the Fugitive Dust emission inventory around Las Vegas.

Then participants heard a presentation on the California Air Pollution Control Officers Association (CAPCOA) perspective on recent California particulate legislation (SB 700 "Agriculture and Air Quality" & SB 656 "Reduce Public Exposure to Particulate Emissions") that now has a greater effect on agricultural operations in the state.

And a representative of the Desert Research Institute gave a presentation on Fugitive Dust Research going forward at DRI involving:

- Portable Wind Tunnel Testing
- Unpaved Road Dust Emission Factors
- TRAKER Measurements @ Lake Tahoe
- Near Field Deposition

The full Agenda and all presentations given at this meeting are posted on the WRAP Website, under the Dust Emission Joint Forum "Prior Meetings & Calls" page.

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### Meeting Details

#### **★ Overview of DEJF Goals & Program Timeframes ★**

Lee Alter began the meeting with an overview of the history of the WRAP & how the DEJF fits into that organization. He noted that the 1997 establishment of WRAP traces its origins to the Grand Canyon Visibility Transport Commission (GCVTC), an organization established by the EPA in 1990 to address visibility impairment by regional haze problems in the Four Corners area of the southwestern United States. In addition to regional haze the WRAP can address any other common air quality issues raised by WRAP members. The WRAP is composed of the states of the Dakotas, Colorado & New Mexico and those west of this line (see presentation map), along with all of the Indian Tribes located within this

western half of the country. The WRAP effort is funded by EPA Grant money, historically about \$4MM per year, but lowered for the 2004 Grant (2005 spending) to just over \$3MM.

He described some of the types of visibility analyses that are being undertaken by the WRAP, showing the types of pollutants and sources of emissions that affect visibility in the west (details in presentation). And he presented a slide showing the schedule of the tasks necessary to allow the states/tribes to develop regional haze SIP's/TIP's by the statutory timeframes contained in the EPA's Regional Haze Rule (states' deadline is the end of 2007).

He noted that the DEJF projects currently being undertaken include:

- the definition of dust (natural vs. anthropogenic)
- electronic fugitive dust handbook describing emissions & controls
- analysis of dust impacts in ambient monitoring
- completion of a windblown dust inventory
- analysis of the size distribution of dust

For 2005, the DEJF plans include:

- maintain and update the fugitive dust handbook
- enhanced ambient data analysis
- sponsor & conduct a dust control measures workshop
- sample dust control demonstration plan for SIP's

There ensued a discussion about dust controls, and there was some contention that controls of fugitive dust may be cheaper per ton than controls in other emission sectors, such as stationary point sources. But it was also pointed out that the entities responsible for fugitive dust sources (federal land managers, states, tribes & local agencies) may not have funding for such controls, while commercial enterprises responsible for other source sectors may be able to adjust the prices to cover the cost of controls from those commercial activities. It was noted that such economic adjustments do affect some ventures more than others, forcing change to societal practices and habits.

### **★ Update on Fugitive Dust Handbook & Website ★**

Richard Countess is the consultant with the contract for preparing the electronic Fugitive Dust handbook, and this date he gave an update of the project status. He began by describing the team members from Countess Environmental & Midwest Research Institute (MRI).

The project tasks include:

- 1 Develop the Project Workplan
- 2 Compile Fugitive Dust Information
- 3 Summarize Fugitive Dust Control Method Options
- 4 Draft Fugitive Dust Handbook
- 5 Create Fugitive Dust Website

He noted that the Handbook Project Workplan was submitted to the Forum and finalized this Spring. Regarding Fugitive Dust Information, he noted that they have considerable information on emissions and on control techniques. He listed the Fugitive Dust Source Categories, and he noted that fugitive dust from agricultural harvesting, and windblown dust from unpaved roads were not included. There was discussion as to why Ag harvesting emissions weren't included and it was felt that EPA had generally excluded agriculture in their AP-42 compilations on dust. Richard explained that he was looking for feedback from members on whether this category should be picked up in the project. He explained that the sources of information include EPA's AP-42 document, the California ARB and MRI's work on construction & demolition.

Regarding Control Options, Richard found that there is a large uncertainty in cost effectiveness estimates (\$/ton PM reduced), thus they are progressing along a path to develop a step by step methodology for calculating cost effectiveness using individual and localized input data parameters.

Regarding the Draft Handbook, the contractor has submitted a Draft Chapter, and a Proposed Table of Contents to the Forum Sub-Committee. These documents have been circulated within the DEJF membership, and comment is being accepted. He noted that the full Draft is due September 10<sup>th</sup>, with the Handbook finalized by November 5<sup>th</sup> this year.

Regarding the Website, Countess Environmental has met with the WRAP webmaster, and they are discussing the advantages of using "frames" on the project. The Website design map is due August 16<sup>th</sup>, but they plan on delaying the final Website design until all the data content is finalized.

He noted that the Project Subcommittee was meeting at the end of this day, to discuss the project progress, and to receive feedback on the draft documents regarding emission factors and control options.

### **★ Windblown Dust Modeling & Inventory Status ★**

Gerry Mansell of ENVIRON gave a presentation of the work that was done in Phase I of the project, and the plan and status for Phase II. Regarding Phase I, ENVIRON followed the "MacDougall Method" categorizing vacant land soil types, and applying wind tunnel generated emission factors based on hourly wind velocity and other meteorological data. Phase I was completed at the end of 2003, with a March 12, 2004 dated final report accepted by the Forum.

But there was considerable criticism of how accurately this Phase I wind tunnel based methodology portrayed the actual 2002 emissions, and it was decided to look at options for improving this data under Phase II of the project. Gerry then went into detailed explanation of how they are proceeding and what technical adjustments they are incorporating into the revised model. ENVIRON looked at three recent papers describing alternate approaches to calculating windblown dust (Draxler, Zender & Shao). These alternate models basically look at land use and then estimate a variable wind threshold for initial dust generation based on surface roughness length, and whether the soil was disturbed. Previously the methodology had used a fixed wind threshold at 20 MPH, which tended to ignore some emissions which can occur at lower wind speeds. ENVIRON also had previously used a fixed assumption of the "lag time" between a precipitation event and the resumption of dust emissions. But the revised methodology has variable timing for resumption of dust generation, again based on land use categories. And some adjustments for dust reservoir capacity are incorporated based on land use. There are also adjustments

based on soil characteristics agricultural, soil disturbance and other parameters in the new model. And there will be a model performance evaluation conducted by comparing predicted dust emissions with measured IMPROVE dust extinction.

Phase II will develop the preferred WRAP dust methodology for hourly resolved dust emissions, and a 2002 gridded PM inventory will be completed for the WRAP regional modeling domain. The inventory will be at 12 KM grid spacing, but will have used 36 KM data for meteorological parameters. ENVIRON is planning of completing the draft 2002 inventory by the end of July, and the Final '02 inventory is target for August 20<sup>th</sup>. The initial model performance evaluation report will be prepared in August, and the refined model performance evaluation report is planned for October 31<sup>st</sup> this year.

### **★ Update on the 20% Worst Days Analysis for Dust Contribution ★**

Jin Xu of DRI gave a presentation on the status of the analysis of ambient data for the dust contribution. He noted that DRI was categorizing visibility incidents based on the scale as transcontinental, regional or local events. They've identified aerosol signatures of transcontinental dust and identified days/sites that have been influenced by Asian/African dust based on these signatures, along with other techniques such as satellite images or back-trajectory modeling.

And he then gave a detailed presentation on technique and limitations of analyses based on dust emission/wind correlations (see presentation). DRI is looking to identify relationships between high wind days and high fugitive dust across the IMPROVE network in the WRAP region. Questions to answer include:

- Can we extract wind speed thresholds for high wind events in the IMPROVE data set?
- What wind metric is appropriate to flush out these events?
- How can this help to distinguish high dust events that are local, regional, or large scale?

### **★ Windblown Dust Monitoring & Modeling @ Owens Lake ★**

Duane Ono gave a presentation on some of the monitoring and modeling that the Great Basin Air Pollution Control District of California has conducted on Owens Lake. Owens Lake emits about 80,000 TPY of PM<sub>10</sub>, and because of this significant emission source, the work in this area represents the "Cadillac" of dust studies in the country. Although he didn't feel that this monitoring could be used to categorize the entire WRAP region at this high level of detail, he suggested that other jurisdictions could gain valuable insight from the work done at Owens Lake, and that the method could be applied in other areas in a less complex manner.

He noted that the dust emission (PM<sub>10</sub>: g/cm<sup>2</sup>/hr) identification method that they use boils down to a constant multiplied by the sand flux at 15 centimeters height. They have 135 sand flux monitors (called Cox Sand Catchers), one on each square kilometer of the dry lake bed. They also have six PM<sub>10</sub> TEOM monitors and 13 ten meter met towers. With this dense array of monitoring equipment, the Great Basin APCD has been able to specifically target highly defined areas for emission control activities, thus minimizing the necessary expenditure to attain ambient standards in the area. Duane said that some agencies may want to try monitoring wind blown dust areas with Cox Sand Catchers as a cheap way (\$30 each) to identify which areas are eroding.

## ★ CAPCOA's Perspective on Recent California PM Legislation ★

Mel Zeldin gave a presentation on the California Air Pollution Control Officers Association (CAPCOA) perspective on California PM legislation affecting agriculture. California formerly exempted agriculture from Air Pollution permit requirements, but last year the state passed two bills to revoke this exemption and escape federal sanctions. The bills were SB 700 "Agriculture and Air Quality" & SB 656 "Reduce Public Exposure to Particulate Emissions".

SB 700 has the following features:

- Defines "agricultural source" in state law;
- Removes Ag restriction for air permits;
- Establishes specific permitting requirements and exemptions for Ag sources;
- Requires Ag emission control requirements in PM<sub>10</sub> non-attainment areas;
- Requires permits and mitigation for "large" confined animal facilities; and
- Requires CAPCOA to establish a clearinghouse on information relevant to agriculture emissions control

An Ag source is one used for production of crops, raising of fowl or animals that has a Combined Animal Facility (CAF), has internal combustion engines, or is subject to Title V permitting requirements. A "large" CAF is yet to be defined, but must be defined by July '05.

The purpose of SB 656 is to make progress toward the attainment of both federal and state particulate matter (both PM<sub>10</sub> & PM<sub>2.5</sub>) ambient air quality standards. Under the law, CARB must develop and adopt a list of measures for reducing PM by January '05. Then CARB and the California APCD's must adopt implementation schedules for controls by July '05. CARB must report back to the Legislature in 2009 about the actions taken, and the law "sunsets" in 2011 unless specifically renewed.

The control lists must be based on the "most readily available, feasible, cost-effective measures" in place as of January 1, 2004. They must consider measures applicable to both *directly emitted* and *precursor emissions*.

## ★ Satellite Imagery to Improve Fugitive Dust Emissions ★

Chat Cowherd of MRI gave a presentation on "spectral analysis" of erodible land in Clark County around Las Vegas. The project will use satellite imagery to inventory erodible lands according to categories such as:

- Native desert (natural state)
- Disturbed vacant land (loss of surface protection)
- Stabilized vacant land (restoration of surface protection)
- Private unpaved roads (dirt or gravel)

These lands can be broken down into Wind Erodibility Groups (WEG's) broken down from the Soil Texture Triangle as:

- 1 – Silty Sand & Clay (WEG's 4 & 5)
- 2 – Sandy Silt (WEG's 2 & 3)
- 3 – Loam (WEG 4L)
- 4 – Sand (WEG 1)
- 5 – Silt (WEG's 6 & 7)

MRI intends to begin the project with a pilot study to develop and verify predictive algorithms, and they will balance imagery resolution against emission intensity variation to maximize cost-effectiveness (see presentation for detail).

### **★ Satellite Imagery for Quantifying Compliance with Windblown Dust Controls ★**

David Groeneveld of HydroBio Remote Sensing gave another presentation on using satellite imagery, this time with data used for measuring compliance with windblown dust controls in the Owens Lake area. Los Angeles has requirements to control dust at Owens Lake with a minimum of either 50% vegetation cover or 75% land flooding. This project involves using the differences in satellite images to determine compliance with these surface moisture and vegetation cover requirements (see presentation for details).

David made the point that the tools for satellite remote sensing have improved dramatically in the past few years, with more powerful computers and much improved software. Therefore he concluded that remote sensing has the potential for highly improved analysis of dust generation and effectiveness of control programs.

### **★ Fugitive Dust Research at DRI ★**

Hampden Kuhns gave a presentation on the various fugitive dust research projects going forward at DRI. These include:

- Portable Wind Tunnel Testing
- Unpaved Road Dust Emission Factors
- TRAKER Measurements @ Lake Tahoe
- Near Field Deposition

#### **✦ Portable Wind Tunnel Testing ✦**

Hampden described the Wind Tunnel equipment that DRI developed and is using to study wind erosion, and some of the results from their studies. The use a "PI Swirl" device to generate varying  $PM_{10}$  concentrations (see presentation for details).

#### **✦ Unpaved Road Dust Emission Factors ✦**

At Ft. Bliss in El Paso, Texas, DRI is conducting testing of unpaved road dust generation, using instrumented towers adjacent to the roads (see presentation for details). They have reached the following conclusions:

- Emission factors are dependent on vehicle speed and weight

- Emission potentials of unpaved road soils were relatively constant in Ft. Bliss TX based on TRAKER.
- Need to determine how emission potential varies in other regions.
- Time since last rainfall is correlated with unpaved road emission factors

#### ❖ TRAKER Measurements @ Lake Tahoe ❖

Testing Re-entrained Aerosol Kinetic Emissions from Roads (TRAKER) involves particulate sampling equipment mounted on a Chevy Van to measure road dust emissions. Particle sensor equipment mounted on the van includes a 5830 TSI DustTrak and a 1.108 Grimm Particle Size Analyzer, along with a Magellan GPS locator. The van is driven at varying speeds and over varying road conditions to determine "real-time" unpaved road dust emissions from these changing vehicular operations (see presentation for details). They have reached the following conclusions:

- Road Dust EF's drop by 70-80% from Spring to Summer
- Cities roads are dirtier than high speed rural highways
- Something is different between CA and NV roads that create less dust

#### ❖ Transportable Fraction of Dust ❖

The basic problem is that the emission inventory of dust sources appears to be too high compared with what particulate is actually measured in the air. Two possible explanations of the discrepancy are 1) that our inventory is inaccurate, or 2) we are not accounting for removal of dust near the source.

To investigate the problem, one can use Modeling, which is inexpensive and allows easy simulation of countless environments. The disadvantage is that it is difficult to know if results are accurate. The alternative is to use Measurement, which provides results based on a "Real" data. The disadvantage here is that its expensive and labor intensive.

DRI has undertaken measurement studies to investigate near field deposition for WESTAR, and produced a report available on that organization's website. And they have compared the results against some of the modeled results (see presentation for details). They feel that the next round of research should target additional field studies, model improvement and incorporate more consideration of vegetation and landscape.

#### ★ PM<sub>2.5</sub> Fine Fraction of Fugitive Dust ★

Chat Cowherd noted that he is in the process of developing the proposal for MRI, and is looking to deliver that proposal in August. The costs are expected to be significantly higher than originally estimated, now in the range of \$125K.

In general the estimated PM<sub>2.5</sub> fraction has gone down from the past numbers, but the current 15-25% range is still considered high. Chat mentioned that experts now were suggesting that the fine fraction should be closer to a range of 6-10% for various dust sources.

There was concern over the timing of this project, and it was pointed out that any information generated on this question should be transmitted to the RMC early on 2005 to assure that the dispersion modeling

reflected the most current information. Dr. Cowherd was encouraged to get the proposal completed as soon as possible. There was discussion about where the samples should be taken, and it was concluded that the scientific diversity of necessary soils should be matched with those members of the forum that are willing to take a sample. The proposal will include a detailed protocol on how to take a sample.

### ★ "Natural" vs Anthropogenic Definition of Dust ★

The definition of dust is coming out that anything that is "mechanically entrained will be anthropogenic. For windblown dust, there has to be some fraction that anthropogenic is "over & above" what would occur anyway.

There was discussion about what funding is necessary to bring the draft definition to finalization. And Lee Gribovicz pointed out that not only does the definition have to be finalized, but then we have to implement this definition with the emission inventories to *quantify* the natural/anthropogenic split. There was \$70K dedicated to this project in the previous budget, but there was some sense that this task won't take that much funding. Lee G. was concerned that if we can't really eliminate funding to get the work done, as it is a high priority for the §308 and §309 SIP's. A call was set for August 13<sup>th</sup> (11 PM Mountain) to further discuss this project.

### ★ DEJF Goals & Program Timeframes as related to 2005 Budget & Workplan ★

Lee G. explained that at the beginning of the Planning Team Meeting, initial Forum/Workgroup budget requests exceeded available funding by over a million dollars. All workplan proposals were looked at closely, and Mike Edwards explained that one project that didn't make it through the Planning Team meeting was the \$125K for a sample RH Implementation plan for dust. The Planning Team had suggested that this project could be deferred until 2006, when control strategies are going to be developed for the §308 and §309 SIP's.

Lee Alter suggested that this project could be used to integrate all the dust elements, and there was general agreement that this was desirable goal. It was pointed out that in the WRAP, the Forum is recognized as the center of expertise. It was suggested that if the DEJF Membership felt strongly that they needed some additional funding, they could make that request to the Planning Team, and some reasonable amount might be restored (probably not the full \$125K, though).

### ★ Action Items ★

Action Items identified include:

- Richard Countess will set out the handbook project actions
- Lee Alter will send out the definition of dust
- the DEJF Co-Chairs will send out the MRI fine fraction proposal
- New Mexico is looking at in-kind help on the SIP implementation dust control analysis
- the DEJF Co-Chairs will send out a revised 2005 workplan and the Forum will review this update on an August 13<sup>th</sup> call.
- the DEJF Co-Chairs will submit the final 2005 workplan to the Planning Team by August 20<sup>th</sup>

### ★ Next Meeting ★

It was suggested that sometime in November would be a good time to schedule the next meeting. The Co-Chairs will take comment on the exact date and a location in a subsequent E-Mail to the DEJF membership.

*Minutes Courtesy of Lee Gribovicz, Wyoming DEQ*