

O&G Workgroup February 16, 2010 Call Notes
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Call Summary

We held our eleventh call with interested O&G Stakeholders on Tuesday February 16th. There continues to be good interest in the activities of the O&G Workgroup, with about 11 announced participants representing the O&G Industry, and another 14 signed on from State Air Agencies, Federal Land Managers, EPA and Environmental Interest Groups.

The main topic of this call was a presentation on the history and air quality issues surrounding O&G Development in the Barnett Shale in North Central Texas. We also talked about the status of the O&G Workgroup in the “new” WRAP, with a revised Charter, expanded mission to other Regional Air Pollution issues beyond Regional Haze, and new structure to the membership and the Board.

And we went over the status of the Phase III O&G Emission Inventory Effort where funding for completion of the last four basins in Wyoming, North Dakota and Montana has become an issue. The WRAP and IPAMS will bring this issue before the New WRAP Board and with their support, intend to make appeal to Industry representatives which may not yet have contributed to the effort and to Federal Agencies which are interested in this comprehensive O&G inventory and may have some resources to help complete the effort.

Finally we talked about the status of the Workgroup’s O&G Mobile Source evaluation, an issue which was brought up by Workgroup members in response to the focus of previous inventories of only point and area sources in the O&G fields. There is significant delivery truck and personal vehicle traffic associated with most O&G operations, as well as use of heavy duty construction equipment in the fields such as bulldozers, graders and cranes. To get an example of the contribution of these O&G Mobile emissions to the overall impact of the industry, the Region 8 States and the EPA have directed the use of \$100K in EPA “Energy Overtarget Funding” towards a contract for a pilot project in the Piceance Basin of western Colorado.

At the end of the call, we discussed the likely availability of the next Phase III inventories, and noted that the exact completion dates for the Wind River and Powder River Basins in Wyoming were uncertain. But to make sure that participants get regular information on the issues surrounding this industry, we planned for another call in two months. The date selected for the **next Conference Call of this O&G Workgroup** is **Tuesday, April 13, 2009 at 10 AM Mountain Time**. Participants will call in to the WRAP Conference number at 1-866-206-0240, using Access Code 323375. The agenda for this next call will be developed and mailed to you later.

The Call Agenda and the Barnett Shale Presentation were posted on the WRAP website prior to this call, and they may be found on the WRAP Calendar link at:

<http://www.wrapair.org/cal/calendar.php?op=view&id=1766>

Call Details

“New WRAP”

Tom Moore began the call by talking about the “New WRAP”, the revised WRAP website and the status of O&G Workgroup under that new direction. He noted that there was a general sense that the existing WRAP organization and its mission needed to be reviewed and updated to meet stakeholder needs. So consequently an effort was undertaken in 2009 to determine what the State and Tribal Air Management agencies and FLM’s really wanted to see from us in the future. Out of this review was crafted a new Charter which the existing WRAP Board approved with over 2/3 majority vote effective December 16, 2009.

Previously the WRAP Board was composed of the Governor of each State in the WRAP region (or designee), an equal number of Tribal leaders, and the U.S. Secretary of the Interior and U.S. Secretary of Agriculture (or designees) as voting members. The Administrator of the U.S. Environmental Protection Agency (or designee) was a non voting Board member. This tended to be a rather top heavy and somewhat cumbersome Board. Now the WRAP “MEMBERSHIP” will be composed of all the states and tribes in the WRAP Region who were members of the old WRAP (except Nevada which has yet to formally join the WRAP), but in place of all members being on the Board, each constituency will elect five Board Members from their group to represent them. Thus there will be five State and five Tribal Board members, along with a single representative each from five Federal Agencies involved in WRAP Region air quality issues (US Forest Service, Park Service, Fish & Wildlife, Bureau of Land Management and the EPA). And because there are a number of Local Air Quality Agencies in WRAP states who are affected by regional air issues and have expertise to contribute to the effort, this new Board will seat two representatives of these local agencies. And obtaining membership for other tribes, state (Nevada) or local agencies which weren’t part of the original WRAP has been made relatively easy with only a letter (E-Mail) of intention required which identifies the organization’s member designee.

Other traditional WRAP stakeholders (public Environmental Organizations and Industrial Trade Groups) will still be welcomed to provide input to the WRAP planning and direction. Meetings of the WRAP membership will be open to the public and there will be opportunity for stakeholder review and comment on WRAP products. Stakeholder expertise will be solicited in appropriate WRAP technical work groups.

Tom also noted that the old WRAP website is now about 10 years old and is falling more out of date with passing time. This old will be archived such that historical users will still be able to access all WRAP technical information from their existing web links. But it will no longer be updated, and a new WRAP website will be established for current WRAP users, from which one can access all the old information. But the new WRAP website will be split into two parts. It will have a Public sector for general stakeholder information, as well as a Members Only sector where members will log in to conduct private WRAP business. This new website is expected to be unveiled and active within the next few weeks.

Regarding the O&G Workgroup, Tom noted that this Workgroup has been very active and involved with WRAP issues, thus it is expected to remain one of the priorities of the new WRAP Board. The first meeting of the new Board will be held at the end of March, and they will establish a Technical Steering Committee which will give WRAP Staff (Tom and me) direction on areas of focus for the coming year. Because of the prominence of Oil & Gas issues nationally and more particularly in the WRAP region, we confidently expect to continue providing long term support to the O&G Workgroup.

Phase III O&G Emission Inventory Status:

As most on this call were aware, the quantification of air pollutant emissions from O&G exploration and production field activities was pretty incomplete and spotty several years ago. The WRAP took steps to remedy this data hole with the compilation of the Phase I and Phase II O&G Emission Inventories in 2005-2007. But there were still significant deficiencies after these first two efforts and with cutback funding of RPO's, the WRAP had no funds to pursue necessary corrections. But the Independent Petroleum Association of the Mountain States (IPAMS) stepped up to fund the Phase III update to the Rocky Mountain region O&G EI's through its Oil & Gas industry membership.

This effort has produced highly complete and more up to date set of basin wide emission inventories for a new 2006 Baseline, and for a 2012 (2010 in the Denver-Julesburg Basin) mid-term projections. The Scope of this work is major O&G basins along the Rocky Mountains from Montana and North Dakota, down through Wyoming, across Colorado and Utah, and into New Mexico. To date Phase III Inventories have been completed for the Denver-Julesburg, Piceance, Uinta, North and South San Juan basins in Colorado, eastern Utah and along the Colorado/New Mexico border region.

But the cost of this effort has been substantial (running in the hundreds of thousand dollars) and Kathleen Sgamma of IPAMS explained that around the end of last year, she was forced to put a temporary hold on the completion of further basins planned in the Phase III Scope because IPAMS was running short of funds. She explained that she has since negotiated sufficient funding to complete the Wind River Basin of central Wyoming. But although data has been collected from other basins, she currently does not have funds to complete the inventories for Wyoming's Green River (southwest) and Powder River (northeast) Basins. Nor does she have funds to complete the Williston Basin of western North Dakota, or the Great Plains Basin of eastern Montana.

I explained that the response to Phase III has been overwhelmingly positive, thus we cannot let the project lie unfinished. The WRAP has worked with IPAMS to draft an appeal to potential funding sources, citing the benefits of the Phase III inventory effort. This appeal will be reviewed by the new WRAP Board and Air Directors for approval to distribute to O&G Workgroup members. We are hoping to reach O&G Industry representatives and possibly Federal Land Manager agencies which are benefitting from the preparation of the Phase III O&G emission inventories, but have not yet contributed to the cost of compiling the data and completing the basin reports.

O&G Mobile Source Emissions Analysis:

I then explained that during review of the Phase III Emission Inventory, members of the O&G Workgroup noted that the existing WRAP O&G Emission Inventory efforts focused only on Point & Area sources of air pollution associated with O&G Field Operations, but that the emission quantification efforts had failed to include the emissions from On and Nonroad Mobile sources that are also associated with these O&G production fields. They noted that considerable traffic was generated by O&G operations including voluminous equipment and supply deliveries from tanker trucks, delivery vans, tractor-trailer units. And the workforce operates a large fleet of vehicles for employee access and oil/gas well service purposes. In addition, there are numerous pieces of heavy equipment used in the construction and maintenance of well pads, pipelines and roads such as bulldozers, graders, scrapers, shovels and cranes.

As we were beginning to understand the profile associated with Point & Area emissions in the O&G fields, questions began arising as to whether the On and Nonroad Mobile emissions were significant in the overall emission picture, and whether we might have already captured some of these emissions in the County Level Mobile Source Emission Inventories we had already compiled for the States. A groundswell of interest in this Mobile Source O&G emissions topic was raised by some members of the O&G Workgroup, and they began lobbying for a separate effort to quantify these O&G Mobile Source emissions.

As noted before, under reduced RPO funding the WRAP was unable to come up with resources to initiate a study of O&G Mobile Source emissions. And so we began exploring with the various states most impacted by O&G operations in the Rocky Mountain region whether they might consider contributing to such a study effort. After exploring a variety of funding options, the WRAP Air Directors hit upon a pool of money held by Region 8 EPA for Energy Overtarget Funding. The Air Directors initiated discussions with EPA Manager Carl Daly for the use of these Energy Overtarget Funds, and eventually obtained agreement that EPA would dedicate \$100,000 towards this O&G Mobile Source emission evaluation effort.

Earlier work by Environ International consulting firm gave them invaluable experience in two areas critical to this project; first in developing WRAP region Mobile Source Emission Inventories, and second in developing the Phase I, II and III O&G Point/Area Source Emission Inventories for the WRAP region. Thus Environ was targeted early in the discussion as the firm most qualified to undertake the evaluation of Mobile Source emissions from O&G Exploration & Development field operations.

As EPA had existing contracts with the University of North Carolina, and as Environ was already established as a qualified sub-contractor for UNC, EPA concluded that the simplest and most direct way of channeling the Energy Overtarget Funds to Environ for this project was to amend their existing contract with UNC to incorporate this O&G Mobile Source Study.

The Scope of Work for this project was discussed intensively among the State representatives from the O&G Workgroup heavily impacted by O&G Field Operations, and who expressed deep

interest in this O&G Mobile Source Study, those being from Colorado, Utah and Wyoming. Because of the funding limits available for this project it was quickly deduced that intense study of O&G fields in all three states was infeasible. Therefore the States came together to recommend that a single Pilot Project be completed, compiling a complete Mobile Source emissions inventory for the Piceance Basin in Western Colorado, the Piceance Pilot Project (P3).

This effort involves establishing specific emission factors and surrogates for O&G operations in the Piceance Basin, obtaining operations and activity data to apply these emission factors, and calculating the full and complete Mobile Source criteria emission inventory for the Piceance Basin. In addition, the contractor is to compare the resultant Piceance Basin Mobile inventory against the Point & Area emission totals for Piceance to evaluate what significance the Mobile Source total plays in the overall picture of emissions from O&G operations in the Piceance. Finally Environ is to develop some methodology for comparing the evaluation of the Piceance Basin, to other O&G development basins within the WRAP region.

The final Environ Workplan will be reviewed by a Subcommittee of the O&G Workgroup composed of Colorado, Utah & Wyoming representatives, EPA and affected industry.. Data is to be obtained by survey of O&G Production Operators and their Service Contractors operating in the Piceance Basin. To insure good participation by these Operators and Contractors, a Kick-Off meeting will be held to enable the P3 proponents to explain the benefits of participating. The contract calls for completion of the P3 Study before the end of 2010.

Barnett Shale Air Issues

The main presentation for today's call was given by Ramon Alvarez, a Senior Scientist with the Environmental Defense Fund (EDF), and consisted of an overview and review of air emission issues associated with the Barnett Shale O&G development going on in the Fort Worth area of North Central Texas. Dr. Alvarez has been involved with intensive review of O&G sources of emissions and their ambient impact in this Barnett Shale development, classified as "unconventional" O&G production.

I noted that my readings of activities in this O&G development were quite different from the types of development I was familiar in the remote parts of the Rocky Mountain west, as this development was occurring in a heavily populated and extensively developed urban setting. I noted that some towns were actually banning further O&G drilling within City Limits. About the closest parallel to Barnett Shale O&G operations in the WRAP region is in the Denver-Julesburg basin of northeastern Colorado, but even that pales by comparison to the population problems affected by the Barnett operations.

This date Dr. Alvarez went over the slides of his PowerPoint presentation for the call attendees, a presentation entitled "Lessons from Texas". As noted earlier the PDF this presentation is posted on the WRAP Calendar link listed above in the Call Summary..

The first point he made was that his interest was piqued by a presentation from Colorado O&G Manager Mark McMillan at the 2008 Portland Emission Inventory Conference showing the extensive development of Colorado O&G with large numbers of new drilling permits and

thousands of active wells. But research quickly showed that the Barnett Shale had grown geometrically beginning around the year 2000 to similar numbers of active wells in 2009. And production figures show Barnett Shale surpassing Denver-Julesburg & Piceance Basin combined production in 2006 (710 to 656 BCF), and rising in latest production estimates of almost 1.4 trillion cubic feet (TCF) in 2009.

Dr. Alvarez noted that O&G methane emissions amounted to about 23% of the total 2007 US methane emissions, or about 2% of the total carbon dioxide equivalent (CO_{2e}) emissions of Greenhouse Gasses in the country. He notes that this is not simply an environmental issue, but also an issue of efficiency and economics. There is lost product, lost producer revenues (\$46 million in the Barnett Shale) and lost government royalties/taxes (\$3.2 million lost severance taxes to Texas).

He noted that 46% of US gas production is now from “unconventional” sources including shale, tight sands and coal bed methane. He had maps showing the location of shale gas plays in the US and data which indicated that the Barnett was among the most active in the country.

He pointed out that this Barnett O&G activity was occurring right on top of the Dallas-Ft. Worth Texas Ozone Non-Attainment area. He pointed out that Ft. Worth had a population of about 700,000 people, and also about 1,000 O&G wells within its city limits. Ft. Worth is the county seat of Tarrant County with a total of 1.75 million residents, almost 2,000 people per square mile. He compared that to the Denver-Julesburg Basin population density (Weld County) of 62 people/mi² and the Piceance Basin population density (Garfield County) of only 19 people/mi².

Regarding Emissions Inventory, in 2009 Dr. Al Armenderiz (then with Southern Methodist University - now Region 6 EPA Regional Administrator) produced a first cut at a Barnett inventory, showing O&G VOC emissions in the same scale as all Dallas-Ft. Worth on road mobile emissions. The study has received criticism for some of its assumptions, but Dr. Alvarez asserted that it has subsequently been found to be relatively in line with the Texas Commission on Environmental Quality's (TCEQ) own emission estimates.

Regarding VOC sources, TCEQ funded two studies of hydrocarbon emissions from liquid hydrocarbon (condensate/oil) storage tanks; one by URS/HARC and another by ERG/Hy-Bon (the latter discussed on the last December 15th O&G Workgroup call). These studies indicate emissions of 26-304 pounds VOC per day from storage tanks, or over 3,000 TPY in Denton County (about 25% of the total O&G VOC emission inventory). Unfortunately, Dr. Alvarez noted that the effect of these emissions on Ozone Non-Attainment or on human health have not been investigated as yet.

Dr. Alvarez did report on some of the ambient monitoring efforts being undertaken in the Barnett Shale district. He noted that these monitoring efforts focused on benzene and carbon disulfide. TCEQ surveyed a total of 94 sites in the region, but only took VOC monitoring values at 64 of those sites (instantaneous canister samples and real-time gas chromatography). Because some of the samples were geographically very close together EDF estimates that the 64 sample sites just represented only about 32 unique areas.

Benzene levels at 22 of the 64 monitoring sites (11 of the 32 unique areas) came back above the TCEQ's long term health-based comparison value of 1.4 ppb. He noted that 7 of the 11 unique areas were in "close proximity" to residences.

Carbon disulfide levels at 8 of the 32 unique areas also had concentrations above TCEQ's long term health-based comparison value of 1.0 ppb, while 3 of these samples were also above the short term comparison value of 10.0 ppb.

Dr. Alvarez notes that the Barnett Shale operations are a possible harbinger of things to come. The 2 million acres of the Barnett, compare to other oil shale areas of 0.5 up to 5 million acres. And while 5,800 locations have been drilled in the Barnett, only several hundred locations have been drilled in some of these other shale areas. With 33.9 TCF of recoverable gas in the Barnett, there are areas of up to 200 TCF of reserves in these other areas. And the break even cost for drilling is about \$4-\$7/MM Btu, indicating that it would probably be economical do develop these other shale plays.

Environ, the contractor that has developed the WRAP O&G inventories, also did inventory compilation for the Haynesville Shale on the Texas/Louisiana border. Those scenarios predict 22-51,000 TPY of NO_x from that development in 2012 and 23-97,000 TPY of NO_x in 2020.

Thanks always for your interest and participation.Lee

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