

Monitoring Air Quality

The Jonah Interagency Office (Project Office) was created as part of the Jonah Infill Drilling Project Record of Decision (ROD). The overarching purpose of the Project Office is to provide the services necessary to execute plans, monitoring, and other activities necessary to assure the effectiveness of land management recommendations, reclamation actions, and mitigation in the vicinity of the Jonah Natural Gas Field in accordance with the ROD for the Jonah Infill Drilling Project. In addition, the Project Office will provide oversight of funds available for reclamation monitoring and mitigation (offsite and onsite).

As established by the Charter for this Office, the scope of work for the Wyoming Department of Environmental Quality/Air Quality Division is to ensure compliance with the Wyoming Air Quality rules and regulations; validate, coordinate and oversee research; and provide information to the respective agencies regarding impacts, monitoring data and mitigation success.

Other objectives and duties for the personnel staffing this office include implementation or support **of monitoring and environmental compliance and permitting**, focusing on, but not limited to, air, water, wildlife and reclamation monitoring of on-site and designated off-site mitigation acres related to Jonah Field development. In addition, office personnel will regularly report to the public and other agencies the conditions of the resources in the Jonah development area.

The following information is being provided to inform the public and other agencies on compliance activities being conducted by the Air Quality Division (AQD), ambient air monitoring information that is readily available from the AQD and how the air quality-related commitments included in the ROD are being fulfilled.

Compliance Activities Conducted in the Jonah Field

The AQD inspector located within the Project Office conducts at least twenty inspections of facilities per month. This level of inspection will continue to be performed in 2008. Facility inspections include evaluations of the integrity of the air emission control systems, including combustion units, reboiler overheads condensers, hydrocarbons liquids storage tanks, drip tanks, vent lines, connectors, fittings, valves, relief valves, hatches and other appurtenances used to eliminate, reduce, contain or collect vapors containing regulated air pollutants (volatile organic compounds [VOCs] and hazardous air pollutants [HAPs]).

Combustors are used to incinerate pollutant-containing vapor streams from condensate storage tanks and dehydration unit process vents. Incineration of the vapors breaks the VOC and HAP components into smaller molecules of unregulated substances— water and carbon dioxide. If a combustor is found to be inoperable, then the emissions control system has been compromised resulting in atmospheric releases of un-incinerated or “uncontrolled” VOC and HAP pollutants. VOC and HAP pollutants are also vented to the atmosphere when the piping and valves used to contain and direct vapor streams to the combustors are compromised. Therefore, these components of vapor control systems are closely examined during inspections.

In addition to the monthly facility inspections, inspections are also performed (two to four annually) on the major sources and compression facilities in the area. A major source is defined as a source which emits, or has the potential to emit, 100 tons per year of an air pollutant, or any source which emits, or has the potential to emit, 10 tons per year of an individual HAP (or 25 tons per year of any combination of hazardous air pollutants) which has been listed pursuant to section 112(b) of the Clean Air Act. A more precise definition can be found in Chapter 6, Section 3 of Wyoming Air Quality Standards and Regulations.

More information on DEQ's enforcement activities occurring in the Jonah field may be found at <http://deq.state.wy.us/out/Enforcementactionmainpage.htm>.

Ambient Monitoring Managed by the AQD Occurring in the Upper Green River Valley

Several ambient air quality monitoring stations managed by the AQD are located in the area within and surrounding the Jonah field. The location of each of these monitors can be viewed at the following link <http://www.wyvisnet.com/>.

These monitors measure the levels of criteria pollutants in the atmosphere as well as visibility in the nearby Bridger Class I Area. The monitoring networks existing in the area include:

State and Local Air Monitoring Stations (SLAMS) are used by the Wyoming Department of Environmental Quality – Air Quality Division (WDEQ-AQD) to monitor particulate matter throughout the State of Wyoming. A SLAMS PM_{2.5} monitor is located in Pinedale.

The SLAMS PM_{2.5} monitor allows WDEQ to monitor PM_{2.5} data and provide a timely assessment of and revise or implement modifications to Wyoming's air quality program, assuring continued PM_{2.5} compliance with ambient air quality standards. One natural event concerning an exceedence of the ambient air standard for PM_{2.5} occurred in Pinedale on August 15, 2007, due to wildfires in the area. The document that DEQ/AQD is providing EPA may be found at <http://deq.state.wy.us/aqd/Monitoring%20Data.asp>.

Special Purpose Monitors:

The **Daniel South** monitor is a special purpose monitor operated by WDEQ-AQD, which was sited to monitor upwind effects of the Jonah and Pinedale Anticline gas fields. Pollutants including nitrogen dioxide (NO₂), ozone (O₃), and particulate matter < 10 microns (PM₁₀) and Formaldehyde are monitored.

The **Boulder** special purpose monitor is the result of a voluntary cooperative effort between Shell Exploration & Production and WDEQ-AQD. The station is sited to monitor air quality concentrations downwind of the Pinedale Anticline Field. Pollutants monitored include NO₂, O₃, PM₁₀ and Ammonia.

The **Jonah** special purpose monitor is operated by WDEQ-AQD. The Jonah Station is sited to monitor downwind impacts from the Jonah Field. WDEQ-AQD currently monitors NO₂, O₃, and PM₁₀ at the Jonah monitoring station.

Information regarding NO₂, O₃, PM₁₀, formaldehyde and ammonia can be viewed at the WDEQ-AQD office in Cheyenne.

Near real-time ambient air quality data collected at the monitoring sites discussed above may be viewed on-line at www.wyvisnet.com. The **Wyoming Visibility Monitoring Network** features live images and current air quality conditions from monitoring locations throughout the state. Digital images from live sites are updated every 15 minutes. In addition, near real-time air quality data provide current meteorological, air quality and visibility information.

Clean Air Status and Trends Network (CASTNet) is the nation's primary source for data on dry acidic deposition and rural, ground-level ozone. Operating since 1987, CASTNet is used in conjunction with other national monitoring networks to provide information for evaluating the effectiveness of national emission control strategies. A CASTNet monitor, operated by the EPA is located in Pinedale. More information about this monitor can be found at: <http://www.epa.gov/castnet/sites/pnd165.html>.

The **Interagency Monitoring of Protected Visual Environments (IMPROVE)** program was initiated in 1985. This program implemented an extensive long term monitoring program to establish the current visibility conditions, track changes in visibility and determine causal mechanism for the visibility impairment in the National Parks and Wilderness Areas. An IMPROVE monitor that measures visibility impairing aerosols and light extinction is located within the Bridger Wilderness area. More information about the IMPROVE program can be found at: <http://vista.cira.colostate.edu/improve/>.

The Wyoming AQD is in the process of conducting a Network Assessment for the southwestern WY area. The objectives of this assessment are to develop a network that efficiently and effectively characterizes the air resource in Southwest Wyoming and to determine efficient and effective placement of gaseous, particulate, and meteorological monitoring stations in the current Southwest Wyoming network. This assessment will consider a) National Ambient Air Quality Standards (NAAQS) compliance, b) background concentrations and downwind impacts from industrial activities, c) transport from other areas and d) health impacts to populated areas.

Air quality-related commitments included in the Jonah ROD

Commitment 1. Tier II or equivalent diesel engine emission technologies will be required for all drill rigs at the earliest date possible.

The status of the drill rig engines being used by each operator in the Jonah Field include:

- 1) BP currently has two rigs operating in the Jonah Field – both rigs have Tier II diesel engines;
- 2) EnCana currently has ten rigs operating in the Jonah Field – eight rigs have natural gas engines, one rig has Tier III diesel engines, and one rig has Tier I diesel engines; and
- 3) Ultra does not currently operate any rigs in the Jonah Field.

A description of “tier” terminology may be found at <http://www.epa.gov/nonroad-diesel/regulations.htm#tier2>.

Commitment 2. *The BLM will work cooperatively with state and other federal agencies, and with industry, to track emissions in the Pinedale Field Office area.*

Actual emissions inventory tracking was conducted by the WDEQ (in conjunction with industry) for the Jonah Infill Drilling Project (JIDP) and have been completed for years 2004 and 2005. An actual 2006 emissions inventory request is anticipated for the JIDP.

Operators are required to provide the JIO with drill rig emissions reports within ten days of completion. Drill rig emissions data is available from March 2006 to present. WDEQ currently assesses these reports on a quarterly basis and provides the results to BLM. These data are available upon request by contacting the JIO.

Commitment 3. *Operators will demonstrate by January 31 each year that emissions reductions from the JIDPA will reduce the potential impact to visibility as follows:*

a. Demonstration Period: The operators began a 12-month demonstration period after the signing of the ROD. The results of the demonstration period were provided to the BLM and DEQ.

b. Implementation Period: The Operators have submitted and will continue to submit annual operating plans that report the emissions from all emitting units in order to demonstrate that the potential visibility impact from the proposed project will be less than the potential visibility impact levels of the 80% emission reduction scenario described in the FEIS and to demonstrate that any potential visibility impact decreases as soon as possible to no days with an impact greater than or equal to 1 deciview (dv). These plans are available upon request by contacting the JIO.

Commitment 4. *In cooperation with the JIO established under the ROD, BLM will review ozone data collected in the area. If in the future air monitoring were to show ozone exceedances attributable at least in part to sources in the Jonah field, BLM will consult with WDEQ, EPA, USFS, and NPS to determine whether adaptive management would be needed to mitigate impacts.*

Ozone (O₃) is a faint blue gas that is generally not emitted directly into the atmosphere but is formed in the atmosphere from complex photochemical reactions involving nitrogen dioxide (NO₂) and volatile reactive organic compounds (VOCs). Internal combustion engines are one source of nitrogen oxides (NO_x). Coal-fired power plants often have the highest NO_x emissions although any combustion source will produce NO_x. Sources of VOCs include automotive emissions, paint, varnish and some types of vegetation. In the gas field, sources of VOCs include wellhead and flow line blow down episodes, well completion and re-completions, dehydration units, pneumatic pumps and condensate storage tanks. The faint acrid smell common after thunderstorms is caused by ozone formation via lightning. O₃ is a strong oxidizing chemical that can adversely impact lungs and eyes, and damage plants.

Ozone is a respiratory irritant at concentrations in excess of the federal standards. EPA is currently in the process of revising the ozone standard as part of its statutory requirements under the Clean Air Act.

Volatile organic compounds (VOCs) are organic chemical compounds that have high enough vapor pressures under normal conditions to significantly vaporize and enter the atmosphere. A wide range of carbon-based molecules, such as aldehydes, ketones, and hydrocarbons are VOCs. Many VOCs are also considered Hazardous Air Pollutants that are regulated by AQD. VOCs naturally occur as well, resulting from normal aspiration and volatilization from pine trees, sage brush, and other flora.

The AQD developed an intensive meteorological and ambient air quality study to evaluate the formation of ozone during the winter months in the Pinedale area. Elevated levels of ozone are normally recorded in urban areas in the summer, making the elevated levels previously recorded in February of 2005 and 2006 in Pinedale very unusual and worthy of study. In 2005, AQD recorded 3 days with 8-hour ozone concentrations greater than 0.08 ppm. In 2006 AQD recorded 1 day with an 8-hour concentration greater than 0.08 ppm. Although the Wyoming and National Ambient Air Quality Standard for ozone is 0.08 ppm over an eight hour period, a monitor must exceed this level on at least one occasion each year over a three year period for there to be a NAAQS violation, which was not the case at any of the Pinedale are ozone monitors.

This study was conducted beginning in the latter half of February through early April 2007 in order to understand previous elevated ozone events and gather additional information. This will ultimately form the basis for the development of a strategy to manage ozone formation in the Upper Green River Basin.

In order to determine what meteorological scenarios might be contributing to elevated ozone, the Air Quality Division utilized a variety of specialized equipment located on the ground, as well as, installed in a small plane, in addition to the three existing monitoring stations in the upper Green River Valley (Boulder, Jonah and Daniel South). This equipment was used to measure wind speeds, particulate matter, temperatures, nitrogen oxides (NO_x), volatile organic compounds (VOCs), ozone levels, structure of the atmosphere, vertical ozone profile, and ground surface albedo (amount of light reflected). At interest is to determine if ozone is being formed under wintertime conditions, given strong surface inversions trapping air in the Valley, coupled with strong reflection (albedo) of the sun's rays supplying sufficient energy to drive the formation of ozone in cold temperatures.

Preliminary results from the 2007 study showed:

Conditions during the February and March 2007 study were quite different from those in 2005 and 2006. During the 2007 study, there were substantially stronger upper level winds (meaning morning surface inversions did not persist), warmer temperatures, and markedly less snow cover. Although significantly elevated ozone concentrations were not measured during the 2007 study, valuable data were collected that will allow scientists to further understand the ozone formation process in the Upper Green River Basin.

During the 2007 study, AQD found that snow cover can reflect up to 80% of the ultraviolet light coming into the atmosphere from the sun. Ultraviolet light is a key component needed to form ozone. AQD also recorded background concentrations of ozone that, while lower than the episodes in 2005 and 2006, are higher than expected for wintertime formation. In addition to information about meteorological conditions, VOC samples were collected. Prior to the study, there was no previous information about VOC concentrations in the area. Typical gas field VOCs were found (ethane, propane, n-butane, i-butane, i-pentane, and n-pentane) as well as formaldehyde. AQD will perform more sampling in 2008 to determine the importance of VOCs and formaldehyde to ozone formation in the Upper Green, as well as continuing to investigate other aspects of wintertime ozone formation.

Commitment 5. *BLM will continue to work cooperatively with WDEQ, EPA, USFS, and NPS to maintain and enhance concentration, atmospheric deposition, and visibility monitoring in the Pinedale Field Office Area. The BLM and cooperating agencies will contribute technical expertise and financial resources to maintaining and enhancing air quality monitoring. The Operators will fund and participate in a joint industry/state/federal monitoring agreement to maintain and enhance air quality monitoring.*

Please refer to ambient air monitoring discussed under Commitment 1 above.

BACT (Best Available Control Technology) - AQD revised the Oil and Gas BACT guidelines effective September 1, 2007. These guidelines are more restrictive with regards to pollutant concentrations in the Jonah Development Area. A copy of this guidance is found at: <http://deq.state.wy.us/aqd/Oil%20and%20Gas/GUIDANCE2001.pdf>

Visibility and Atmospheric Deposition - The BLM is responsible for ensuring that visibility-impairing pollutants [specifically SO₂, NO_x, PM₁₀ and PM_{2.5}], are reduced in accordance with the reasonable progress goals and time-frames established within the State of Wyoming's Regional Haze State Implementation Plan (SIP). The Status of Wyoming's SIP and information concerning regional haze may be found at: <http://deq.state.wy.us/aqd/regionalhaze.asp>.

Prevention of significant deterioration - A study titled "Southwest Wyoming NO₂ PSD Increment Consumption Analysis: Modeling Results for Tasks 3 and 4", May 21, 2007, may be found at http://deq.state.wy.us/aqd/downloads/Modeling%20Studies/WDEQ_PSD_REVFINAL_2.pdf.

Results of the Tasks 3 and 4 modeling showed that maximum NO₂ PSD increment consumption in Wyoming within the Bridger Fitzpatrick Wilderness Area (BFWA) Class I areas ranges from 0.24 to 0.25 µg/m³ depending on which year of meteorological data (2001, 2002, 2003) is used to drive the simulation. This amounts to approximately 10% of the maximum allowable Class I increment consumption (2.5 µg/m³) specified in the PSD regulations. Within the Class II area, the maximum increment consumption ranges from 12 to 16 µg/m³ depending on which meteorological data set is used and occurs within the JPDA itself. These values represent

between 48 and 64% of the maximum allowable amount ($25 \mu\text{g}/\text{m}^3$) specified for Class II areas in the PSD regulation. Examination of the contributions of different source groups to these increment consumption values show that oil & gas sources have been the single most significant contributors to increment consumption in the BFWA Class I areas and surrounding Class II area. This result is consistent with the growth in oil & gas emissions and the proximity of the JPDA (where most of the growth in Sublette County oil & gas emissions has occurred) to the BFWA.

	Increment Consumed ($\mu\text{g}/\text{m}^3$)	Maximum PSD Allowance ($\mu\text{g}/\text{m}^3$)
Class I	0.24 – 0.25	2.50
Class II	12.0 – 16.0	25.0