

Legislative Studies Update & Minimization Strategies for Dust, VOCs, and Noise

**Renu Chakrabarty, PE
WVDEP – Division of Air Quality**

WVDEP Office of Oil and Gas Industry Workshop

**Charleston, WV
October 30, 2013**

Legislative Studies Update

- Noise, Light, Dust and VOCs
- Air Quality

Minimization Strategies

- Dust
- VOCs
- Noise



Legislative Studies Update

Legislative Studies

Natural Gas Horizontal Well Control Act (§22-6A)

Passed December 14, 2011

§22-6A-23 Impoundment and Pit Safety Study

§22-6A-12(e) Noise, Light, Dust, VOCs Related to Well Location Restrictions Study

§22-6A-23 Air Quality Study

* Contract with WVU's WV Water Research Institute

§22-6A-23 Impoundment and Pit Safety Study

- * Submitted to Legislative March 7, 2013
- * OOG report, WVU structural and water sampling reports, OOG follow-up pit/impoundment inspections, OOG standard pit/impoundment inspection checklist available on internet
- * 15 pits and impoundments, inc. 3 centralized pits
 - * Relative rank scoring system; new centralized pits scored higher
- * Radiological exposure within acceptable limits

§22-6A-23 Impoundment and Pit Safety Study

continued...

- * No imminent harm; no leakage detected
- * Construction and operating/maintenance issues found at some sites
 - * Placement of woody debris in the fill, improper compaction, surface erosion, slope movements, inadequately secured liners, bulges in liners, seepages and wet zones in embankments, slops and cracks, standing water on berms, debris on liners
 - * Corrective action taken
 - * Standardized checklist
 - * Specific training developed; provided internally and externally

§22-6A-12 (e)) Noise, Light, Dust, VOCs Related to Well Location Restrictions Study

The secretary shall, by **December 31, 2012**, report to the Legislature on the noise, light, dust and volatile organic compounds generated by the drilling of horizontal wells as they relate to the well location restrictions regarding occupied dwelling structures pursuant to this section. Upon a finding, if any, by the secretary that the well location restrictions regarding occupied dwelling structures are inadequate or otherwise require alteration to address the items examined in the study required by this subsection, the secretary shall have the authority to propose for promulgation legislative rules establishing guidelines and procedures regarding reasonable levels of noise, light, dust and volatile organic compounds relating to drilling horizontal wells, including reasonable means of mitigating such factors, if necessary.

- * Field component July – Oct. 2012
- * May 28, 2013 report submitted to Legislature

§22-6A-23 Air Quality Study

The secretary shall, by **July 1, 2013**, report to the Legislature on the need, if any, for further regulation of air pollution occurring from well sites, including the possible health impacts, the need for air quality inspections during drilling, the need for inspections of compressors, pits and impoundments, and any other potential air quality impacts that could be generated from this type of drilling activity that could harm human health or the environment. If he or she finds that specialized permit conditions are necessary, the secretary shall promulgate legislative rules establishing these new requirements.

- * June 28, 2013 report submitted to Legislature
 - * Overview of WVDEP's regulation of horizontal drilling across OOG, DAQ, DWWM
 - * Summary of various well location restrictions
 - * Discussion of status and results of unconventional oil and gas air studies in narrative and expanded in compendium in appendix
 - * No additional rules needed due to existing agency-wide framework and existing authority
 - * Continue to use minimization strategies



Natural Gas Horizontal Well Control Act

§22-6A Horizontal Well Permit Application Page

Legislative Studies

[§22-6A-23 Impoundment and Pit Safety Study](#)

[§22-6A-12\(e\) Noise, Light, Dust, Volatile Organic Compounds Related to Well Location Restrictions Study](#)

[§22-6A-22 Air Quality Study](#)

Legislative Studies

The Natural Gas Horizontal Well Control Act of December 14, 2011 (W. Va. Code §22-6A), directs the West Virginia Department of Environmental Protection's Office of Oil and Gas to conduct studies of horizontal well drilling activities related to air quality as well as the safety of pits and impoundments.

§22-6A-23 Impoundment and Pit Safety Study

§22-6A-12(e) Noise, Light, Dust, Volatile Organic Compounds Related to Well Location Restrictions Study

§22-6A-22 Air Quality Study

Noise, Light, Dust, VOCs Scope

- * 7 pads – Brooke, Marion & Wetzel Counties
- * 3 companies
- * Monitors off-pad/ambient air
 - * 6-12 days per site
 - * ~250 – 1,250 feet from pad center
 - * July – October 2012

Noise, Light, Dust, VOCs Scope *continued...*

- * Pad construction, vertical drilling, horizontal drilling; hydraulic fracturing; flowback/completion
- * With respect to 625' well location restriction from well pad center to occupied dwelling structure

Ambient Air Monitoring

- * West Virginia University (WVU) – Wireless Air Monitor System (WAMS)

PM_{2.5} (Dust), HCs, Light, Ionizing Radiation and Noise at multiple locations at each site; battery/solar powered

Summa canisters – 72-hour, volatiles

- * Department of Energy (DOE) – National Energy Technology Laboratory

PM₁₀, PM_{2.5}, HCs, Light, O₃, SO₂, NO_x, OC/EC, NH₃, CO₂(and isotopes), CH₄(and isotopes) at a single location at each site; run a via electric power or diesel generator

Right of Entry Agreement with Landowners for DEP, WVU, DOE access

RIGHT OF ENTRY AGREEMENT

THIS RIGHT OF ENTRY AGREEMENT (“Agreement”), made and entered into as of this _____ day of July, 2012, by and between _____

[insert names of property owners] (“Landowner”), whose property is located at _____

[insert physical address] (“Real Property”) and the West Virginia Department of Environmental Protection (“WVDEP”), with a mailing address of 601 57th Street, Southeast, Charleston, West Virginia, 25304.

WITNESSETH:

WHEREAS, Landowner owns certain real property at the above listed address, which property is in the vicinity of a horizontal natural gas well operation; and

WHEREAS, W. Va. Code §§ 22-6A-12(e) and 22-6A-22 require WVDEP to conduct studies regarding the possible air quality effects of horizontal natural gas operations (“Studies”); and

WHEREAS, as part of these Studies, WVDEP is requesting permission for itself and its agents associated with the Studies to enter onto the Real Property for the purpose of and upon the terms and conditions set forth in this Agreement, and Landowner is willing to grant such permission to WVDEP;

NOW, THEREFORE, for and in consideration of the mutual covenants and agreements set forth in this Agreement, Landowner and WVDEP agree as follows:

1. Landowner grants to WVDEP and its agents associated with the Studies the right to use the Real Property for the purposes of and for the period set forth in this Agreement, all upon the terms and conditions set forth herein.

DOE trailer



DOE photo





WAMS



WAMS and Summa Canister



Results

- * Noise levels were below the EPA's recommended 24-hour level of 70 dB (lifetime average)
 - * Site-averaged one-hour noise values above EPA's indoor (45 dB) and outdoor (55 dB) guidelines regarding interference with the ability to hear and cause annoyance (if experienced over 40 years)
- * Light levels, measured as skyglow, were zero during night time
- * Radiation levels were near zero

Results *continued...*

- * PM_{2.5} dust levels at the 625 foot setback distance had *one-hour average* values above the *annual* NAAQS limit
 - * However, there is no one-hr PM_{2.5} NAAQS
 - * No averages were above the 24-hour PM_{2.5} or PM₁₀ NAAQS
- * Benzene – values higher on some devices but not others
 - * *Dust and benzene – likely associated with diesel engine exhaust and access road traffic*

Results *continued*...

- * No public health threat or emergency based on actual sampling results
- * Based on the potential for different well pad geometries, WVDEP recommended the Legislature reconsider the reference point (i.e. from center of the well pad) for the location restriction to occupied dwellings to reduce *potential* exposures.
- * One option to consider - Limit of Disturbance (LOD) to provide a more consistent and effective safeguard for residents in affected areas



Federal and State Air Rules

What Kind of Air Rules May Apply?

- * West Virginia State Air Quality Rules
- * National Emission Standards for Hazardous Air Pollutants (NESHAPs) – Maximum Achievable Control Technology (MACT) Standards
- * New Source Performance Standards (NSPS)

What Air Rules May Apply?

Rule	Sources	Pollutants	Requirement
45CSR2	Hot Oil Heater, Reboiler	PM	Visible emissions readings, particulate matter emission limits.
45CSR4	Facilitywide	VOC	Objectionable odors prohibited.
45CSR6	Flare	PM	Particulate matter emission limits. Temporary flares meeting specific requirements are exempt from this rule.
45CSR13	Criteria pollutants emitted above 6 lb/hr and 10 tpy. HAPs emitted above 2 lb/hr or 5 tpy.	NO _x , CO, VOC, SO ₂ , PM, HAPs	Required to obtain air quality permit.
40CFR60.18	Flare	VOC	98% destruction efficiency of VOC emissions.
40CFR60 Subparts K, Ka, Kb	Storage Tanks	VOC	Prescribed control devices on storage tanks to reduce VOC emissions
40CFR60 Subpart GG	Gas Turbines	NO _x , , SO ₂	Must meet the emission control limits fo NO _x and SO ₂ . Must conduct performance testing.
40CFR60 Subpart KKK	Natural Gas Processing Plants	VOC	Must conduct Leak Detection and Repair (LDAR) on all processing equipment to reduce VOC emissions.
40CFR60 Subpart LLL	Natural Gas Sweetening Plants	SO ₂	Must conduct appropriate testing and monitoring to show compliance with SO ₂ limit.
40CFR60 Subpart IIII	Diesel-fired Engines	VOC, NO _x , CO, PM	Emission limits that may require the use of air pollution control devices. Must conduct performance testing.
40CFR60 Subpart JJJJ	Natural Gas-fired Engines	VOC, NO _x , CO	Emission limits that may require the use of air pollution control devices. Must conduct performance testing.

Continued...

What Air Rules May Apply? *continued...*

Rule	Sources	Pollutants	Requirement
40CFR60 Subpart KKKK	Gas Turbines	NO _x , SO ₂	Must meet the emission control limits for NO _x and SO ₂ . Must conduct performance testing.
40CFR60 Subpart OOOO	Gas Wells, Compressors, Pneumatic Controllers, Storage Vessels, Sweetening Units	VOC, SO ₂	Must meet the emission limits for VOC and SO ₂ . Must conduct appropriate testing, monitoring, and recordkeeping.
40CFR63, Subpart H	Equipment Leaks	HAPs	Varies depending upon source category.
40CFR63, Subpart HH	Tanks, Equipment Leaks, Glycol Dehydration Units at Production Facilities	HAPs	Must control HAP emissions from tanks, equipment leaks, and glycol dehydration units. Must conduct appropriate testing, monitoring, and recordkeeping.
40CFR63, Subpart VV	Oil-Water Separators	HAPs	Varies depending upon source category. Must conduct appropriate testing, monitoring, and recordkeeping.
40CFR63, Subpart HHH	Glycol Dehydration Units at Transmission Facilities	HAPs	Must control HAP emissions from glycol dehydration units. Must conduct appropriate testing, monitoring, and recordkeeping.
40CFR63, Subpart YYYY	Gas Turbines	HAPs	Must control HAP emissions from gas turbines. Must conduct appropriate testing, monitoring, and recordkeeping.
40CFR63, Subpart ZZZZ	Reciprocating Internal Combustion Engines	HAPs	Emission limits may require the use of air pollution control devices. Must conduct appropriate testing, monitoring, and recordkeeping.
40CFR98, Subpart W	Facilitywide	Greenhouse Gases	Greenhouse gas reporting requirements for applicable sources.



Minimization Strategies

Why?

- * Citizen complaints
- * Other regulatory requirements
 - * OSHA, DOH road bonds, access road sediment and control, general duty to minimize air emissions
- * Community safety and relations
 - * Nuisance issues
 - * Community Taskforce
 - * Emergency services, Law enforcement, DOH companies, schools hospitals, citizens
 - * Marshall Co., Wetzel Co.
- * Protect the environment



Unique terrain in West Virginia

- * Ridgetops – hillsides
- * Remote - nearby residences
- * Channeled air flow (hollow)
- * Site-specific considerations

Activities Generating Noise, Dust and VOCs during well pad development

- ❖ Temporary, Non-continuous
(pad construction – flowback/completion)
- * Vehicle Traffic
 - * Congestion
- * Vehicle Engine Idling
 - * On-road and off-road
- * Diesel-fueled Compressor Engines – Power & Hydraulic Fracturing

Remote site, no nearby residence





Remote site near a residence



Pre-§22-6A Pad



Pre-§22-6A Pad



Pre-§22-6A Pad

Site with nearby resident



Pre-§22-6A Pad



Pre-§22-6A Pad

DOE photo



Remote relatively nearby resident



Channeled Air Flow Site with nearby residents



Pre-§22-6A Pad



Channeled Air Flow Site with nearby residents



Pre-§22-6A Pad



Diesel-fueled compressors



Hydraulic Fracturing



Diesel engines

- * Operate 20 - 30 years
- * Emit
 - * Particulate matter (dust, soot)
 - * Nitrogen oxides (ozone pre-cursor & acid rain)
 - * Volatile organic compounds, inc. air toxics
- * Cancer and non-cancer effects associated with long-term exposure
 - * Non-cancer respiratory and cardiovascular effects
 - * Several human epi studies link increased lung cancer with diesel PM (EPA, NATA 2005)

Noise

- * EPA guideline threshold of less than 70 decibels over 24-hour average, to prevent hearing loss over a lifetime
- * Acceptable short-term noises may be above the average with no effects
- * Sound may be perceived as a nuisance at levels below the EPA guideline
 - * Transient nature & sound frequency
 - * Nighttime noises during sleep cycles more disruptive

Equivalent Sound Levels in Decibels Normally Occurring Inside Various Places ⁽¹⁾

SPACE	L eq (+) - Decibels
Small Store (1-5 clerks)	60
Large Store (more than 5 clerks)	65
Small Office (1-2 desks)	58
Medium Office (3-10 desks)	63
Large Office (more than 10 desks)	67
Miscellaneous Business	63
Residences:	
Typical movement of people – no TV or radio	40-45
Speech at 10 feet, normal voice	55
TV listening at 10 feet, no other activity	55-60
Stereo music	50-70

(+) These measurement were taken over durations typical of the operation of these facilities.

⁽¹⁾ EPA, “Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety”, Table 2

Dust

- * Particulate Matter
 - * EPA National Ambient Air Quality Standards (NAAQS)
 - * PM_{10} , 24-hr
 - * $PM_{2.5}$ – 24-hr and annual
 - * Fine particles can get deep into the lungs
 - * Adsorbed compounds

Volatile Organic Compounds (VOCs)

- Long term vs. short term exposures
- Some constituents may have health effects
- Contributes to ozone formation
- Benzene, Toluene, Xylenes, Ethylbenzene (BTEX)
- Diesel exhaust
 - Cancer and non-cancer effects associated with long-term exposure

Some Minimization Strategies for Noise, Dust and VOCs

- * Many of these already used by WV companies
- * Better use of roadway wetting agents would reduce peak dust exposures
- * Lower travel speeds
- * Noise reduction
 - * Access road siting ~ traffic congestion
 - * Mufflers
 - * Sound barriers
 - * Reduced nighttime operations

Some Minimization Strategies for Noise, Dust and VOCs *continued...*

- * Orientation of engines, traffic with respect to residences
- * Vehicle engine idling
- * Maintenance & catalysts - hydraulic fracturing engines

Co-benefits across minimization strategies

- ❖ Example: Orienting engines on well pads away from residences will reduce VOC exposure as well as noise.
- ❖ Drill rigs converted to natural gas (LNG, field gas)
 - diesel fuel cost savings, reduced VOCs, PM and noise.

Diesel-Powered Motor Vehicle Idling Act (West Virginia Code §17C-13A)

- * Applies on both private and public property
- * Limits regulated entities to no more than 15 min idling per one-hour period
 - * number of exceptions including for public safety & manufacturing
- * Enforceable by a law enforcement officer defined by code
 - * such as local police, county sheriffs and state police; not DEP inspectors

Before – Access Road Oct
2009



After – Access Road
Gravel over broken
pavement



DEP-Approved Roadway Wetting Agents List



west virginia department of environmental protection

Division of Water and Waste Management
601 57th Street SE
Charleston, WV 25304
Phone: 304-926-0495
Fax: 304-926-0496

Earl Ray Tomblin, Governor
Randy C. Huffman, Cabinet Secretary
www.dep.wv.gov

To: Joe Hickman, Assistant Chief Inspector, DWWM

From: Yogesh Patel, Chief Engineer, DWWM

Date: July 23, 2013

Re: Approved Dust Suppressant List

Listed below are the dust suppressants approved by the Division of Water and Waste Management

1. Calcium Chloride
2. COHEREX*
3. DUST BOND*
4. Lignin
5. Magnesium Chloride
6. Pennz Suppress
7. Permizine* (Molasses and Water)
8. Pine Tar Dust Binder*
9. ULTRA BOND 2000
10. RDC-100*
11. RDC-600*, **
 - a. RDC-600-11
 - b. RDC-600-21
 - c. RDC-600-31
 - d. RDC-600-41
 - e. RDC-600-51
 - f. RDC-600M
12. Track Master Prep*
13. Ammonium Ligno Sulfonate
14. Water

*Registered Trademark

**Product has been modified from previously approved formula

<http://www.dep.wv.gov/WWE/Programs/gw/Documents/Approved%20Dust%20Supressants%20July%202013%202nd%20list.pdf>

Temporary Sound Barriers



Temporary Sound Barriers



LNG or Line Gas Drill Rigs

- * In use currently at Antero, EQT, and Noble sites in WV
- * Can save up to ~3,000 gal diesel fuel/day
 - * 100% gas (no diesel supplement)
 - * Approx. \$12,000/day

Line Gas – cleaned before sent to rig



LNG



Take Aways

- * Nuisance issues are not necessarily public health issues
- * Common sense can go a long way
- * Evolving regulatory framework and awareness by industry

Questions?

Renu Chakrabarty, PE
Air Toxics Coordinator
Division of Air Quality
WV Department of Environmental Protection
601 57th Street, SE
Charleston, WV 25304

Phone: (304) 926-0499, ext. 1246

E-mail: Renu.M.Chakrabarty@wv.gov