

# REDUCING NOISE IN GAS DRILLING AND PRODUCTION

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By David Kidd, MS, PE and David McMahon J.D.

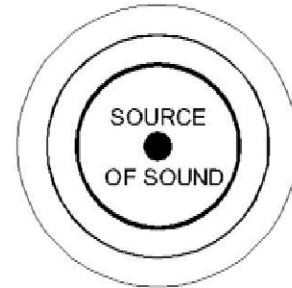
The main take-aways of this guide are:

- 1: Drilling and producing gas makes a lot of loud noise
- 2: Being around loud noises is more than just an irritation; it can be **very** bad for your health
- 3: Things can be done to reduce the amount of noise around gas drilling and production
- 4: You should include measures to control the noise in the agreement.

## Introduction to Noise

Sound is a form of energy. Think of throwing a rock in to a pool of water; it will make waves that move away from the rock. As the waves get farther from the rock, they get weaker.

Sound travels in waves that move through the air. As they get further from the source, they lose energy and become quieter.

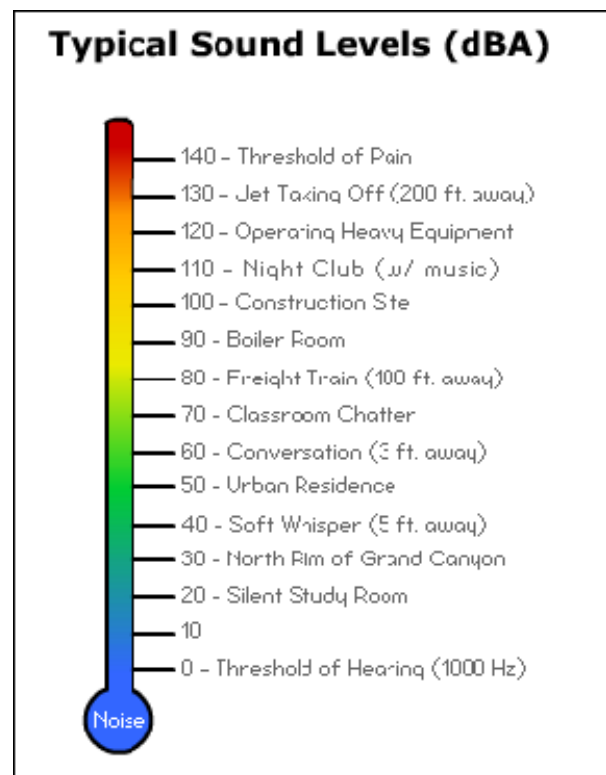


When looking at its effects on people, sound is measured in three ways: **loudness, pitch, and rhythm**. Duration is also important and you will be hearing these sounds for months and months and even years.

**Loudness** is measured in "**decibels**". The louder the sound, the higher the decibel reading. Decibels are measured on a "logarithmic" scale. 20 decibels is 10 more than 10 decibels; so 20 decibels is 10 times as strong as 10 decibels (not twice as strong as you might think). 30 decibels is 10 times stronger than 20 decibels, etc. etc.

The decibel readings of different sounds are shown:

*Image from OSHA.gov*



You can get a **sound level meter app** for your smart phone. Apple phones have the most consistent manufacturing quality, so their sound level meter apps are considered to be good and are used for some non-enforcement applications by OSHA.

You can also buy a sound meter online for \$10 and up. Keep in mind that a cheap meter may not be very accurate. Better quality sound meters and apps have software that will allow you to find the average decibels over a given time. You can certainly start with a smart phone app, but if you get in a dispute with a driller you may have to upgrade.

The **Pitch** of sound is caused by its **frequency**. High pitched sound (like squeaky car brakes) has a high frequency and low pitched sound (like a bass drum) has a low frequency. Both high pitched and low pitched sound can cause you problems. While you may not notice low rumbling sounds as much as high squeaky sounds, they can travel farther and still have bad effects on your body.

The **Rhythm** of sound like the beat of a drum; it can be even and steady or uneven. People like the constant random rhythm of a mountain stream splashing on rocks, but the rhythm of a dripping faucet or an irregular sound of a hammer can be irritating and therefore a problem. Even quiet sounds at an irritating rhythm can cause problems.

**Noise** is defined as sound that is irritating or loud.

**Acute** noise is loud and sudden, and lasts for a short time (like an alarm clock or a clap of thunder).

**Chronic** noise lasts for a long time (like living next to a busy highway or working in a noisy tavern) or a well site.

Being around noise can cause serious health problems. Noise causes stress in your body. The World Health Organization (WHO) has found the bad effects of noise shown below:

1: **Sleep Problems**

2: **Heart and blood pressure problems**

3: **Mood issues**

Being around noise has been related to other stress related problems also, including **headaches, ulcers, colitis**, etc.

The health problems above have the most effect on children, the elderly, and people who are in poor health already.

Imagine being around drilling and having sleep problems for months. Imagine your blood pressure increasing. Imagine being stressed, irritated, anxious, or depressed for the many months of drilling and fracking and even longer if truck noise etc. continues during years of natural gas production. It is worth it to take steps to prevent this from happening to you and your family.

## **Noise Regulations**

Unfortunately, at this time West Virginia does not have statewide noise regulations. In West Virginia, noise is governed by different local ordinances in the different cities and counties. These ordinances are generally not very specific and may not be strongly enforced. Many (if not most) municipalities and counties have not enacted any noise regulations at all. In that case, to reduce noise levels you are limited to bringing your own nuisance suits or enforcing an agreement you have created with the driller/operator in court as was suggested earlier in this article.

The World Health Organization (WHO) in Europe and federal Environmental Protection Agency (EPA) have **guidelines** for noise. These guidelines are general recommendations that cover decibel levels only, they do not cover pitch or rhythm or duration.

### **EPA Guidelines**

The EPA started to regulate noise in the 1970's; but later left it to the states and local governments. They did create some guidelines however; according to the EPA: being around an average of more than 70 decibels was considered to cause hearing loss. Exceeding an outdoor average limit of 55 decibels and an indoor average limit of 45 decibels was "identified as preventing activity, interference, and annoyance"

### **World Health Organization Guidelines**

Much more recently, the World Health Organization in Europe also has studied noise and made guidelines. These guidelines are the result of a thorough scientific review of specific noise studies.

In 2009 the WHO reached the conclusions below for **average nighttime noise**:

Less than 30 decibels: most people tolerate this level of noise without large problems

30 to 40 decibels: Some sleep effects start to happen, though this is tolerated by most healthy people

40 to 55 decibels: Serious health effects start to appear

Greater than 55 decibels: is considered to be dangerous to public health

In 2018, the **WHO in Europe made specific recommendations for four common sources of noise: roads, railroads, aircraft, and wind turbines**. To develop these guidelines, they did a thorough review of scientific articles for each source. The recommended average overall decibel levels ranged from 45 to 54 decibels (depending on the source) and the nighttime average decibel levels ranged from 40 to 45 decibels (again depending on the source).

**The averages of the maximum recommended WHO European levels above are 49 decibels during the day and 43 decibels during the night.**

The recommended values above could vary for the different sources because of the different pitches, rhythms, etc. of the noise. These other factors can affect how people may tolerate these different noises.

Keep in mind that the information above are recommendations and guidelines only. Noise affects different people in different ways. Some people may deal with noise well, others may have problems at low levels of noise.

The values shown above are **average** values only, which are a very simple way to analyze noise. You can imagine sleeping in a very quiet room that has an alarm clock go off every hour. Even though the average decibels in the room might be quite low, you still would not get a good night's sleep.

The guidelines above can be used by government agencies to develop **regulations**. Regulations are the specific rules that a driller/operator must follow. They are more detailed and legalistic than guidelines.

The state of Colorado has developed a set of noise regulations. They are relatively straightforward (about two pages long). At this time, on the internet the Colorado regulations are found at <https://cogcc.state.co.us/documents/reg/Rules/LATEST/800Series.pdf>

In summary, **for rural and residential areas the Colorado noise regulations limit daytime (7am to 7pm) noise to a maximum of 55 decibels and nighttime (7pm to 7am) noise to a maximum of 50 decibels.** These decibel values are found by averaging the readings over a minimum of 15 minutes. These regulations also cover occasional decibel increases, "periodic, impulsive or shrill noises", low frequency noise, and sound measurement methods. The decibel measurements are taken **outside** of buildings

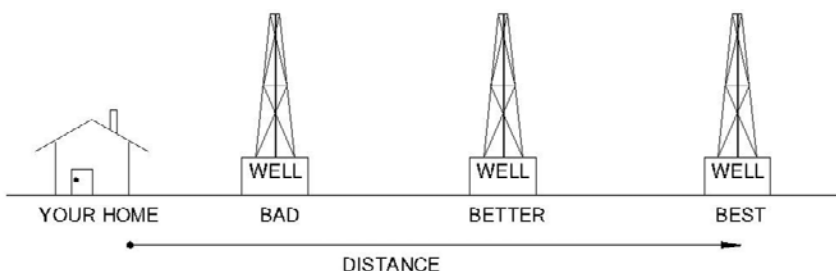
We feel that the Colorado decibel limits are too high when compared to the WHO research. The night time values seem especially high.

### Noise Control

The noise you hear near a well site can be controlled in three basic ways:

**1: The driller or producer can take measures to reduce the noise they make.** This can involve many specific technical methods. We will cover some of these later. **A driller should also make a conscious effort to make less noise and notify you if they are going to make loud noises.**

**2: You can put the well site and access road as far as possible from you and your house.** Sound decreases greatly as you move farther and farther from its source. A rough rule of thumb is that every time you double the distance, the sound decreases by six decibels.

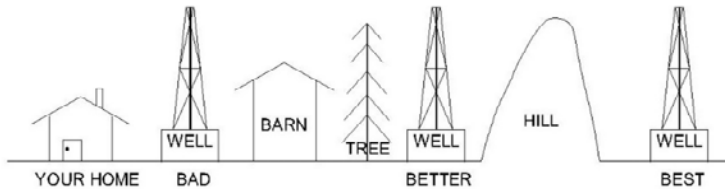


The regulations that exist for sound in different states and countries often suggest distances of at least 1000 feet between a home and the boundary of a drilling or production site. I include this distance as a rule of thumb only to give you some idea of normal "**setback**" distances. West Virginia currently only requires a separation of 625 feet between the **center** (not the boundary) of a drill pad and a home. This can mean that a well pad can be sited very close to your home.

West Virginia University did a study of Noise, Air Quality and Lighting in horizontal well drilling for the West Virginia Department of Environmental Protection. In this study they found that the 625 foot

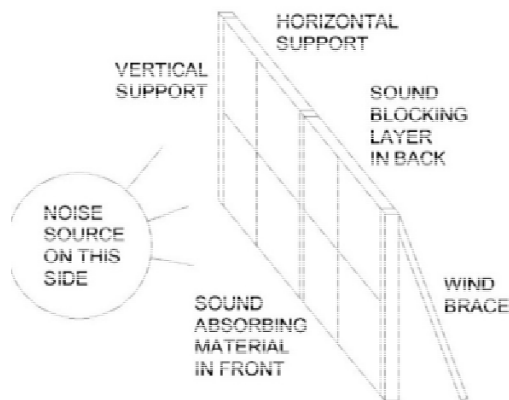
separation distance above was not enough to prevent dangerous noise levels, but the State Legislature has not changed this standard.

3. **Sound barriers can be used.** Having a hill or ridge between you and a driller would be a very good thing. Trees and buildings between you and a driller can help also. Keep in mind that when leaves fall from trees they don't block sound as well, so evergreen trees are best.



Having a driller/producer **keep their noisy equipment in a building** can be very helpful, a building with **sound absorbing insulation** is better. Sound walls and barriers are manufactured and can be placed around a site to absorb and block the sound. High quality sound barriers have a dense, sound blocking material with a sound absorbing material added. We do not believe that the sound protection needed can be achieved without a sound wall.

**Sound barriers are made in panels** and are placed together to make a wall around the source of sound. The closer they are to the source of sound the better. They can be 30 feet tall or more if needed. **Dirt berms** can be used to block sound also, though it is difficult to build them high enough to be fully effective. Sometimes sound barriers are added on top of berms.



Sound Barrier Panels

There are companies that work specifically on making sound absorbing products and designing gas well and production sites so they make less noise.

Noise reduction can be done around wells. In the Netherlands in Europe, drilling is done in cities around many peoples' homes. The drillers work very hard to reduce noise and report that they receive very few complaints from the nearby homes. Drillers and Producers in West Virginia can do the same. If they are drilling in your back yard, they should be sure that your home is still livable.

## Drilling and Production Steps and Noise Reduction Approaches

### **A: Road and Drill Pad Construction**

The first step in construction is to clear the site with Chainsaws, Bulldozers, and other equipment as required.

The topsoil is then scraped off with Bulldozers. Bulldozers and scrapers then cut the soil (and rocky layers beneath if required) down to the required depth. In extreme cases, the rocky layers can be blasted out with dynamite.

Construction Fabric (Geotextile) is sometimes then laid on the bottom of the excavation, and good quality gravel is put on top of it using Dump Trucks and Bulldozers.

The gravel is shaped with Graders and Backhoes, and then is compacted with vibrating roller Compactors.

Construction uses heavy equipment moving large amounts of earth. Construction makes a lot of noise.

The following things can be done to reduce and manage the noise.

- 1: **Only allow construction during certain hours.** This time should hopefully be the times when you aren't sleeping and aren't around much. i.e. Allow construction Monday – Friday 7:00am – 6:00 pm
- 2: Make sure that **all equipment is properly maintained, lubricated;** and has **mufflers installed.**
3. **Install sound barrier panels** around the site or at least between your residence or other use or building you want to protect (described in the **Noise Control** section above).

### **B: Drilling the well**

Renting a drill rig is very expensive, so **drilling is a 24/7 job.** Drill rigs are loud machines with tall “masts” on them. They drill down through the soil to the source of gas or oil. They use a connected series of pipes (the drill train) to connect to the drill bit at the end.

Wells are started by drilling straight down through the ground. The bit is rotated and cuts a hole (a “bore”) through the soil.

In shale wells, the bit is then turned to drill horizontally through the layer of shale underground.

Drilling mud (a mixture of clay, water, and additives) is pumped down through the drill train to the bottom of the bore hole and then travels up to the ground surface through the “annular” space between the drill piping and the bore hole.

Drilling mud is used to do different things in a well. It is used to power the drill bit in the horizontal well bore (and sometimes the vertical well bore). **Drilling mud is pumped at extremely high pressure by powerful and noisy pumps** and it is used to drive a mechanism that rotates the drill bit.

Drilling mud is also used to cool the drill bit and to carry the soil cuttings up to the ground surface. At the surface the drill mud is run through shale shakers to help remove the cuttings. The drilling mud is



sometimes kept in a lined pit on the pad and is sometimes recycled immediately back down the hole. Some of the cuttings also settle out and will be trucked off to landfills in noisy trucks.

Casing (a large pipe) is lowered in to the drill hole to separate the hole from the surrounding soil. A liquid cement grout is used on the outside of the casing to seal it in place. The WVSORO website has a slide show that shows how the vertical part of the well is drilled and cased and what can go wrong. <https://wvsoro.org/gas-well-drilled-ground-can-go-wrong/>.

**When drill rigs are running, they make a lot of loud noise;** including noise from engines, compressors, pumps, air moving systems, and flares; noise from trucks, forklifts and other moving equipment; and metal on metal squeals and clanging.

A study of a drilling rig can be done to find and reduce the major sources of loud noise.

Listed below are common things can be done to reduce and manage the noise.

### **Management Changes**

1: Take steps to **be sure the people on the drill rig know that reducing the noise is a priority.** They can then take steps to reduce the noise coming from the drilling rig (i.e. avoiding high drill string speeds, running equipment (such as shale shakers) only when needed, do loud things (i.e. unloading pipe, etc.) only during the day, taking care to reduce banging of pipes, etc.

2: **Maintain and lubricate all equipment properly.** Properly maintained and lubricated running equipment is less noisy.

3: **Encourage heavy trucks not to idle,** but to turn their motors off. There are some laws on idling trucks that could be enforced if a problem develops. **‘Jake’ brakes** that use engine compression and other means to slow trucks are very noisy and **should be prohibited.** **Have an offsite truck staging area away from homes,** and then call heavy trucks to the site when needed.

Etc.

### **Equipment Upgrades**

1: **Use an electric drill rig,** which uses electric motors that are powered either by power line electricity (which is best if available) or by an onsite diesel generator in a building. A generator building can be insulated to reduce the noise. Mechanical drill rigs are an older technology (but still common) that have individual diesel motors to power each piece of equipment. This can make it harder to control noise. Companies are very unlikely to buy or rent a special rig for you – all the more reason to have low decibel standards in the agreement and make them enforceable.

2: **Upgrade the drill rig equipment to modern lower noise alternatives.** In particular this includes pipe handling equipment, drill train braking equipment, compressors, pumps, cooling units, generators, and forklifts.

3: **Use low noise fans and install vibration isolation pads** on compressor and radiator fans and aim them upward.

4: **Install mufflers on all motors.** Use Hospital Grade Dissipative mufflers (which reduce the sound by roughly 40 decibels). This is certainly, assuming you already require a sound wall, the next easiest and effective step for a driller to take if the driller is producing more decibels that is in the agreement.

5: Install rubber mats on deck surfaces.



6: Enclose motors, generators, compressors, pumps, and cooling units in **sound insulated buildings and enclosures**.

7. **Install sound barrier panels** around the site (described in the **Noise Control** section above). This is a low cost thing that we believe you should insist on if there is not a ridge between the will site and your residence or other use or building you want protected.

### **C: Well Completion for Fracked wells**

**Well “completion,” the technical term for “fracking,” is also a 24/7 activity.** Once a horizontal well is drilled into the shale rock and the casing is installed, a perforating gun is moved in to place in the horizontal shale layer casing. Explosive charges are set off in the gun which punch holes in the casing and the surrounding shale. These small explosions happen a mile below the ground, and do not cause a lot of noise on the surface.



Fracking fluid (a mixture of water, sand, and additives) is pumped in to the holes in the shale to create cracks in the shale. The fluid pressure fractures the rock and the sand holds the cracks in the rock open. The gas can then flow through the cracks and in to the casing. Fracking fluid is mixed on site. This **fracking fluid is pumped in to the well at extremely high pressure. Enough pressure to fracture rocks 5000 feet underground and hold the fracture open while sand is forced in the fracture to hold it open. This process can create a lot of noise.**

Loud noises are caused by pumps and trucks. The methods for reducing the noise are similar to the methods for drilling rigs:

All equipment should be maintained properly. Modern lower noise equipment can be used. Trucks should reduce their idling, not use jake brakes, and can be staged in an isolated area if possible so they are only on site when needed.

### **D: Production of Oil and Gas**

A Workover Rig then comes to the site to clean up after the frack job and put in the production piping. The oil and gas move from the shale layer through the production piping to the wellhead.

A series of valves (called a Christmas Tree) is then put on the top of the production piping to control the flow of gas. The gas then travels to a separator which separates the water and certain liquid hydrocarbons from the gas. The production water is sent to a tank on site, and loud trucks move it out. The gas may go through a compressor, which pressurizes the gas and pushes it through the pipeline.





A pipeline will be built to the site, using many of the methods described in the **Road and Drill Pad Construction** section. The noise control methods would also be similar.

The pressurized gas is then pushed through the pipeline. After it leaves the well site or compressor this makes very little noise.

**Compressors are loud and should be put in sound insulated buildings.** They often have radiators and loud fans outside the buildings. These need the protections of even numbered fan blades and other protections noted above.

**The fans should be designed and installed to lower their noise levels.**

Trucks should be properly maintained, reduce their idling, not use “jake” brakes, and be staged in an isolated area if possible.

### **Noise Control Agreements**

**Noise control should absolutely be a part of any surface use agreement with a driller/operator.**

**Think about where the well and access road are located. Keep them as far from your home as you can.** Having a hill or a ridge between you and the well would be best. Trees and buildings between the well and you would be good also. And insist on a sound wall.

Because we cannot think of everything, the best approach to an agreement would be to have a “**performance standard**” that the driller/operator is required to meet. You probably can’t be an expert and tell the driller/operator what to do to reduce noise; and different driller/operators may prefer different methods. However, you can tell the driller/operator what standards for noise they should meet. The driller/operator should then have a plan certified by a registered professional engineer as part of the plans it has to give to the DEP regarding well site construction in order to meet the requirement set out to reduce the noise to the levels agreed to. You should be able to review the plan to see what noise control methods are being used.

The idea is that the **driller/operator can be the noise reduction expert or hire an expert to come up with a plan.** The noise control plan should be designed by a professional engineer, who will stamp the site blueprints and be responsible for the design. This engineer stamp is important. Your agreement should further provide that if the plan turns out not to meet the agreed upon standards, that additional noise suppression methods must be used.

Placing time limits on certain activities (i.e. construction, unloading pipe) would also be a good idea.

If you feel the noise is at an unacceptable level above what you agreed (and have a noise meter to confirm it); **you should have the right to complain and have a settled method to resolve the complaint.**

**The noise level around a well pad can have a very bad effect on your health and your life. It is worth the effort to have a well thought out noise reduction plan to protect yourself and your family.**