

# COAL BED METHANE BEST MANAGEMENT PRACTICES HANDBOOK

## **PROPOSED BMPS, ALTERNATIVE LANGUAGE AND ADDITIONAL INFORMATION FOR FUTURE CONSIDERATION** (4/12/04)

Included herein are additional proposed Best Management Practices (BMPs), alternative language for portions of the WGA Coal Bed Methane BMP Handbook, and other comments and additional ideas/sources of information on CBM BMPs. **This information was suggested too late in the process used to develop the Handbook and, therefore, too late to be fully considered by WGA's CBM Advisory Committee.** It is hoped that they will be reviewed and considered in the future.

### **INTRODUCTION AND OVERVIEW**

#### **Introduction**

##### **Proposed Alternative Language for the Introduction, Second Paragraph:**

*Current Language:* "With this guidance, the WGA sought funding to engage the CBM industry, all levels of government, and other stakeholders to build a Handbook of Best Management Practices (BMPs)."

*Proposed Language:* "With this guidance, the WGA sought funding to engage members of the CBM industry..."

#### **Purpose and Assumptions**

**Comment on Existing Handbook Language, Purpose and Assumptions, Second Paragraph:** Omit the following sentence "Other benefits and opportunities arising from CBM development such as job creation, tax revenue, royalty payments, and physical improvements for landowners (e.g., installation of cattle guards, fence replacement, on-going road maintenance, etc.) were also noted." because it sounds like CBM industry self promotion rather than a BMP.

##### **Proposed Alternative Language, Purpose and Assumptions, Third Paragraph, Second Sentence:**

*Existing Language:* "Development will produce jobs and revenues and contribute to meeting the Nation's energy needs, but should not compromise a healthy environment."

*Proposed Language:* "Development will produce reliable, affordable clean burning energy, jobs and revenues and contribute to meeting the Nation's energy needs, but should not compromise a healthy environment".

## **Best Management Practices: How Used, Definitions, Applications, and Suitability**

**Comment on Existing Handbook Language, BMP Definitions, First Sentence:** The word "proven" seems a bit strong.

### **I. PLANNING**

#### **Development Plans**

**Comment on Existing Handbook Language in Development Plans, Discussion Bullet Regarding Baseline Monitoring:** The Handbook discusses "Strategies for establishing a baseline and monitoring." The concept of "baseline monitoring" is a red herring. Some baseline monitoring programs are established by law (for example in other extractive industry regulations or certain environmental protection requirements) and mandate a minimum of one year's worth of monitoring data. Such a mandate may not exist in oil and gas law at the state or local government level. When it is required, many professionals cannot agree on what is adequate baseline monitoring. In the future, WGA might want to consider: a) substituting a term such as "scientific monitoring sufficient to understand pre-CBM activity conditions" for establishing a baseline or collecting baseline information, b) clarifying additional descriptions or criteria for baseline monitoring, or c) eliminating this part of the discussion entirely.

#### **Proposed Alternative Language in Development Plans, Discussion Bullet Regarding Maps:**

*Existing Language:* "The map can also include geographic features such as streams and other water bodies, and special ecosystems."

*Proposed Language:* "The map can also include geographic features such as streams and other water bodies, and special sensitive areas".

#### **Proposed Alternative Language In Development Plans Discussion Bullet Regarding Baseline Information:**

*Existing Language:* "Collection of baseline information on such things as surface uses and surface owner preferences, pre-development noise levels, air quality, surface and groundwater quality, and biological resources can assist in identifying critical data or information gaps."

*Proposed Language:* "Collection of baseline information on such things as surface uses and surface owner preferences, pre-development noise levels in sensitive areas, air quality, surface and groundwater quality where the groundwater is a used resource, and biological resources can assist in identifying critical data or information gaps."

**Comment on Existing Handbook Language in Development Plan Discussion:** Delete following sentence: "Oil and gas operators, government agencies, elected officials, affected surface and mineral owners, community representatives, and other concerned citizens working together to plan for anticipated field development can produce development plans that reflect environmental responsibility, respect for the land, efficient

energy resource development, and productive relationships among diverse interests while at the same time permitting extraction of CBM.”

### **Proposed Additions for the Planning Chapter**

**Proposed BPM: *Surface Use Standards*.** For each operational area, each gas well operator should develop and constantly improve its own BMPs.

Discussion: For each operational area gas well operators should strive to proactively implement good surface use practices adapted to the area and the requirements of its operations. For a comprehensive example of such practices see: Williams i) Standard Surface Use Plan, ii) Ten Point Plan for Drilling; and iii) Standard and Site Specific Mitigation Measures used in Garfield County, Colorado.

## **II. WATER**

### **Introduction**

#### **Proposed Alternative Language in the Water Introduction:**

*Existing Language:* “Because CBM production generally begins by withdrawing a high volume of water, this has raised significant issues, including the potential wasting of valued water resources; concerns about groundwater, specifically on the effects of lowering the water table, potential impacts on residential and agricultural wells, and possible contamination, and; produced water disposal or management, including downstream impacts on both water quantity and quality.”

*Proposed Language:* “Because CBM production generally begins by withdrawing a high volume of water, this has raised significant issues, including the potential wasting of valued water resources; concerns about groundwater, specifically on the effects on residential and agricultural wells, and; produced water disposal or management, including downstream impacts on both water quantity and quality.”

### **Water Management Planning**

#### **Proposed Alternative Language in the Water Management Planning Discussion, Point i):**

*Existing Language:* “likely quality of produced water”

*Proposed Language:* “estimated quality of produced water”

### **Produced Water Options:**

#### **Proposed Alternative Language for Produced Water Option, Factors for Consideration Bullets:**

*Existing Language:* “Long-term impacts to the environment”

*Proposed Language:* “Long-term effects to the environment”

## **Proposed Additions to the Water Chapter**

**Proposed BMP (somewhere in the Water Chapter or in the Infrastructure Chapter): *Storm water management practices.*** Control runoff and minimize sediment production from disturbed areas (roads, pads, pipelines, etc.) due to storm runoff.

**Proposed BMP: *Gas Companies Have Primary Responsibility for Solving Problems Caused by Produced Water From CBM Wells.***

Discussion: Without the production of water from CBM wells the water problems discussed below would not exist. The apparent profitability of CBM development is driving a boom in gas well drilling. It is the responsibility of the parties who are profiting from and pressing for this rapid development to promptly solve and pay for the problems caused by that rapid development. In keeping with Enlibra Principle Seven, (see Appendix B in the Handbook) gas companies should not increase their profits by reaping the benefits of CBM development while imposing its adverse consequences and the costs of solutions on other stakeholders.

**Proposed BMP: *Water Injection.*** If satisfactory solutions to surface water disposal and water quality issues cannot be implemented in a timely way in a field or portion thereof, water should be injected into appropriate geologic reservoirs.

Discussion: At present, stakeholders are searching for effective solutions to water issues caused by current levels of produced water discharge from CBM wells in Wyoming. At the same time rapid drilling continues. Variations in conditions, particularly water quality and soil types may well result in identification of different Best Practices for specific areas. However, it is clear that the prompt identification and implementation of actual best practice solutions to these water issues is a pressing priority.

**Proposed Additional Language:** The role of State Engineers and applicable state water law should be included in the discussion of water management. In many western states the State Engineer's Office is the agency responsible for determining "beneficial use", and that role should be understood in any discussion of beneficial use related to CBM produced water.

## **III. LANDOWNER RELATIONS**

### **Introduction**

**Proposed Alternative Language in the Landowner Relations Introduction:**

*Existing Language:* "Adoption of BMPs is often helpful in addressing interaction challenges related to a range of land owner issues, including: ....compensation for surface occupancy..."

*Proposed Language:* "Adoption of BMPs...compensation for damages..."

## **Communication and Notification:**

### **Proposed Alternative Language for the Communication and Notification Section:**

*Existing Language:* “This relationship should be based on both parties respecting and accommodating each other’s property rights and interests, with open and consistent communication.”

*Proposed Language:* “This relationship should be based on all parties respecting and accommodating each other’s property rights and interests, with open and consistent communication.”

### **Comment on Existing Handbook Language in the Communication and Notification**

**Section:** The comments on encouraging early and frequent communication between operator and surface owner are sound practices. Early and frequent communication as necessary will help alleviate problems on split estate when both parties act in good faith. Heading B. Plans, Agreements and Bonds – BMP 1, is a good example of what open and respectful communication between surface and mineral operators could accomplish. Also, the discussion of this BMP references a sample Surface Use Agreement available on the WGA website. A model SUA could actually be a BMP in and of itself, providing that the conditions in such an agreement do not violate regulatory permitting and other legal requirements. WGA should be cautious to avoid BMPs that mandate specific operator responsibilities on split estate given the extensive legal precedent that currently accrues to mineral owners and operators.

### **Comment on Existing Handbook Language in Communication and Notification**

**Section:** Delete the discussion of notification.

## **Plans Agreements and Bonds**

### **Comment on Existing Handbook Language in the Plans, Agreements and Bonds**

**Introduction:** Add property values and wildlife impacts to the sentence that reads: Adoption of BMPs is often helpful in addressing interaction challenges related to a range of land owner issues, including: location of wells...”

**Comment on the Footnote regarding Master Surface Use Agreements:** Delete the footnote and show a list of sites where to obtain such information.

### **Comments on Surface Use Agreements BMP:**

First Comment: Use the term “Surface Owner Agreement” instead of “Surface Use Agreement.”

Second Comment: Change the sentence that now reads: “This would include notice to the surface owner of record...” to “This would include a personal visit with the surface owner to discuss the preliminary plan. If the surface owner is not available for an initial face-to-face meeting, then the operator should send a notice to the surface owner of record ...”

Third Comment: Change the sentence in the discussion that now reads: “The SUA should address all relevant concerns, including such items as compensation for use of the surface, damage payments, and development plans that address facility and road locations, timing of operations, construction and reclamation requirements, water management, and access to the property.” to read “The SOA should address all relevant concerns, including such items as compensation for damages and development plans that address facility and road locations, timing of operations, construction and reclamation requirements, and water management.”

### **Comments on the Water Well Mitigation Agreement BMP:**

First Comment: Delete “when CBM development is occurring within the same aquifer” from the sentence that currently reads: “Operators should determine whether their operations could impair the capability of these water wells and take appropriate actions to mitigate such impacts when CBM development is occurring within the same aquifer”.

Second Comment: Change the sentence that now reads “A Water Well Mitigation Agreement should be offered to owners of wells and springs that could potentially be affected by CBM operations.” to “A Water Well Mitigation Agreement should be offered to appropriated owners of wells and springs...”

Third Comment: Add the following language to the Water Well Mitigation Agreement BMP: “The operator should promptly and voluntarily remedy any damage to water sources caused by its operations and any doubts should be resolved in favor of the landowner, at least where water is derived from or above the coal formation from which gas and water is being produced.”

### **Proposed Additions for the Landowner and Operator Relations Chapter**

**Proposed BMP: *Surface Owner Selection Of Reasonable Facility Locations:*** The surface owner is best able to select wellsites and facility locations together with road and pipeline routes which will minimize adverse impacts on existing and proposed surface uses, and to preserve the value of the surface, (Third Restatement of the Law of Property, Servitudes §4.8 (2000)). Landowners should be informed of the reasonable needs and alternatives available to the gas well operator so that a reasonable location may be selected within the drilling window for required operations. The fact that CBM fields are extensive and that any locations in the drilling window will generally result in similar production of gas allows surface use considerations to control the siting of wells, roads, pipelines, and other facilities.

**Proposed BMP: *Landowner Indemnification Provisions.*** SUAs Should Contain Landowner Indemnification Provisions.

**Discussion:** A typical indemnification provision might read: “The gas well operator hereby covenants and agrees to indemnify, defend and hold the Surface Owner harmless against any and all loss, damage, claims, injury, demands and suits which Surface Owner

may suffer as a result of or related to the gas well operator's operations on the Subject Property, excluding any portion of such loss, damage or claim caused by the negligence or willful misconduct of the Surface Owner." The indemnity provision simply assures the surface owner that the gas well operator will be responsible for loss and damage resulting from gas well operations.

**Proposed BMP:** SUAs should specifically identify the well, road, pipeline and other agreed upon facilities on a detailed attached plat. Buried pipelines should be well and permanently marked. Within sixty days after completion of construction, the operator should provide to the surface owner and record an "as built" survey so that successors, the parties themselves, and surveyors and planners can accurately locate the facilities and understand the extent of the agreed use.

Discussion: SUAs which generally reference the area to be used and permit multiple unspecified wells, road use or pipelines, or do not utilize the minimum reasonable footprint, constitute over reaching by the gas well operator and, as an unreasonable use, constitute a trespass. *Gerrity v. Magness, 946P.2d 913 (Colo. 1997)*.

## IV. INFRASTRUCTURE

### Introduction

**Comment on Existing Handbook Language:** In the Infrastructure Chapter Introduction delete the sentence that reads: "When properly managed, CBM development may also enhance the use and value of a landowner's property" because it seems like self promotion by the CBM industry.

### **Suggested as Additional Guiding Principles for Infrastructure Best Practice Operational Standards:**

- Within identified drilling windows and on leases, the landowner should select reasonable sites wells, roads and other facilities which accommodate existing and anticipated surface uses to the maximum extent possible.
- Tight control of contractors and agents to insure that best surface use practices are followed, agreements are complied with, and good surface owner relations are maintained.
- In general, well and facility footprints should be minimized to the maximum extent possible consistent with safe operating practices.
- In general, reclamation, including recontouring, topsoil replacement, and revegetation, should occur as early as possible with interim reclamation of disturbed areas not actually used for production operations being reclaimed upon completion of construction. See e.g. Colorado Oil and Gas Conservation Commission Rule 1003.

## **Roads and Transportation**

**Proposed BMP: *Arterial Roads*.** Existing ranch roads should generally be utilized as arterial roads to access two track well roads. Such roads should be adequately crowned, graveled, and drained by the operator to bear up under gas field traffic under adverse weather conditions, and the operator should maintain such roads in good and passable condition for the life of the field.

**Proposed BMP: *Limiting Road Use*.** Particularly on public lands in areas of sensitive wildlife habitat, birthing areas or winter range, etc., roads can be fenced and gated and closed to non-gas well personnel. Oil and gas traffic should be kept to a minimum and remote sensing and control systems utilized. Private lands are normally required to be gated and locked to preclude access to the general public. Reasonable landowner requests for gating and locking private lands should be complied with. Gas field traffic should stay on the roads at all times. On private lands, all road easements should be non-exclusive and limited to access to defined oil and gas facilities. The surface owner, rather than the gas company, has the right to grant access to the surface owner's property, including access roads.

### **Proposed Alternate Language for the Road Siting BMP in the Current Handbook.**

*Current Language:* Utilize and improve existing roads to gas field requirements to the maximum extent possible. Locate roads in areas that will optimize year-round, all-weather access, and minimize surface disturbance and environmental impacts. Road location should be selected in consultation with the surface owner, and should consider future development plans.

*Proposed Language:* Locate roads where landowners want them, where they will serve both gas field and surface owner needs, and in areas that will optimize year-round, all-weather access, and minimize surface disturbance and environmental impacts. Road location should be reasonably selected by the surface owner.

**Proposed Additional Language for the Service Industry Traffic BMP in the Current Handbook:** It is the operator's responsibility to ensure service company compliance with surface use agreements and permit requirements.

## **Pipelines and Power Lines (Gas, Water, and Power)**

### **Proposed Alternate Language for the Corridors BMP in the Current Handbook.**

*Current Language:* Use existing disturbance corridors whenever possible (ideally following access routes or existing pipeline routes).

*Proposed Language:* Use existing disturbance corridors and utility corridors to the maximum extent possible (ideally following utility easements, utility access corridors or existing pipeline routes). Rights-of-way should overlap with pipelines placed as close as possible to other utilities in the corridor. On relatively level ground, gathering lines can often be placed within ten feet of each other (in Houston, major pipelines are sometimes placed in corridors within one foot of each other).

*Proposed Discussion:* Gathering pipelines can have a significant unnecessary adverse impact on the usefulness and value of the surface. If gathering lines crisscross each other, they may define significant areas of non-use and divide the real property in small pieces which are unuseable for many valued purposes, such as residential or commercial development and siting of agricultural structures.

**Proposed Alternate Language for the Trenches BMP:**

*Current Language:* Locate all lines (i.e. gas and water disposal) in the same trenches (or immediately parallel to), and at the same time, if possible.

*Proposed Language:* Locate all lines (i.e. gas and water disposal) in the same corridors (or immediately parallel to), and at the same time, if possible.

**Proposed BMP: Location.** Outside of existing utility corridors, pipelines should be located along routes selected by the surface owner which reasonably accomplish the purpose of the gas well operator. Pipelines located in road rights-of-way or under roads or within ten feet of property boundaries will minimize adverse surface impacts. To the maximum extent possible, pipelines should be buried at least 48 inches deep to get below plow depth and reduce the risk of inadvertent excavation.

**Proposed BMP: Safety.** Pipeline markers should include one-call notices and contact numbers. Surface owners and others grading and excavating on the property should make use of the one-call system to locate pipelines prior to any excavation in the area of the pipeline. Steel pipelines should be properly fitted with cathodic protection to reduce the risk of corrosion and related gas leakage.

**Proposed BMP: Reclamation.** Pipeline should be double ditched with soil compaction and restoration of topsoil to the surface. Subsidence should be anticipated and mitigated using compaction and mounding of topsoil. If the ground settles over the trench, fill should be topsoil of like quality and free of noxious weeds. Foreign soil (from other properties) should be introduced onto the property only with prior written permission of the surface owner. The refilled trench should be contoured to conform to the terrain and revegetated utilizing a seed mixture agreed to by the surface owner and, as necessary, mulch and fertilizer. On agricultural lands, rocks of two inches or more in diameter should be “picked” by the operator at least three times over the ensuing two years to reduce the damage to agricultural equipment working over the excavated pipeline.

**Habitat and Species Protection**

**Proposed BMP: Survey areas for rare plants before building well pads.** At a minimum operators should review BLM and Forest Service sensitive species lists prior to siting infrastructure (e.g., well pads), and avoid locations where sensitive species are found. G1 and G3 plants represent the groups of most imperiled species as ranked by the NatureService and the Heritage Program network

## Wells

**Proposed BMP: *Footprint*.** The well footprint should be as small as possible. Use of a small well or facility footprint avoids trespass by unreasonable and unnecessary use.

### **Proposed alternative language to precede the bullets under Siting and Construction Considerations for Wells**

*Current Language:* Where feasible, site and construct wells with the following considerations:

*Proposed Language:* Within the applicable drilling window, the Landowner should be permitted to select a reasonable well location which accommodates surface use. To the extent possible, construct wells as follows:

### **Proposed Additional Consideration under Siting and Construction Considerations for Wells:**

- Choose and construct sites with reclamation in mind; i.e., if possible, avoid cutting trees and other long lived, slow growing vegetation, minimize cut and fill, and store topsoil and preserve it from erosion.
- Production facilities and equipment should be consolidated in as small an area as possible, a separate facilities location may be unnecessary or quite small for shallow CBM wells and is often 1,500 square feet or less for conventional wells. Production facilities should be bermed and fenced to preclude domestic and wild animals from entering the area. The wellhead is often fenced using a ten by ten pipe fence or, for Powder River CBM wells, may be winterized and enclosed in a steel container.
- Where no code exists, locate facilities and roads away from occupied dwellings. Add: (in addition to dwellings) agricultural and commercial buildings, schools, water sources, and other significant areas of surface use.
- Locate well sites no closer than one-half mile from homes and other domestic structures.
- Utilize closed-loop drilling systems to achieve pitless drilling and minimize truck traffic and water usage.

### **Proposed Alternative Language for the Reclamation BMP under Wells:**

*Current Language: **Reclamation**.* As soon as reasonably possible after drilling is completed, conduct interim reclamation to reduce the drill site to the minimum area required for production operations and to restore the disturbed areas to their pre-disturbance condition, or better, pursuant to landowner preference. Interim reclamation should include the following:

- Recontour disturbed areas to be compatible with existing grades, including for agricultural purposes.

- Depending on landowner preferences, replace topsoil to at least the depth and quality which existed prior to disturbance for final reclamation of the site upon abandonment of the well.
- Revegetate disturbed areas using a seed mixture to match native vegetation.
- Remove all chemicals, equipment, materials, and waste not necessary for sustaining production from the well pad.
- Use only certified and state inspected seed that is free of noxious weeds for reclamation.

*Proposed Language (Read in context of the proposed BMPs that follow below):* **Interim Reclamation.** As soon **as** reasonably possible after drilling is completed, conduct interim reclamation to reduce the drill site to the minimum area required for production operations and to restore the disturbed areas to their pre-disturbance condition, or better. Interim reclamation should include the following:

- Remove all chemicals, foreign substances, pit liners, contaminated soil and trash, together with all equipment which is not required to sustain production from the well.
- Fill and compact any pits.
- Recontour disturbed areas to be compatible with existing grades, including for agricultural and irrigation purposes.
- Replace topsoil on the reclaimed area to at least the depth and quality which existed prior to disturbance .
- Revegetate the reclaimed area using a weed free seed mixture selected by the surface owner to establish the desired crop or match native vegetation. Use only certified and state inspected seed that is free of noxious weeds for reclamation.
- Remove all chemicals, equipment, materials, and waste not necessary for sustaining production from the well pad.

**Proposed BMP: Final Reclamation:** Plug and abandon the well in accordance with regulatory requirements and good and safe operating practices. Promptly remove all equipment to below plow depth and promptly reclaim the entire well pad and any other disturbed areas in accordance with the BMP above.

**Proposed BMP: Equipment Removal.** Remove all equipment not necessary for well operations.

**Proposed BMP: *Centralized Well Sites.*** Centralized well sites, in certain circumstances, can reduce capital and operating costs and at the same time reduce adverse surface impacts, including the well site footprint, roads and pipelines. For example, the Colorado Oil and Gas Conservation Commission has determined that centralized well sites accomplish all of these savings with respect to drilling to the Williams Fork Formation in Mesa and Garfield Counties, Colorado. See COGCC website. However, centralized well sites should be expected to be impractical in shallow coalbeds until shallow, long reach directional drilling technology is proven. Some companies are working to develop the required techniques, which some expect to lower costs and improve production; but it will likely take some time.

### **Central Gas Gathering, Treatment, Compression, and Metering Facilities**

**Proposed BMP: *Water Gathering Systems.*** Where produced water is not discharged or injected at the wellsite, particularly for typically closely spaced CBM wells, water should be gathered using water gathering pipelines co-located with gas gathering lines. Such a water gathering system is often less expensive over the life of the field than water hauling by truck, and avoids the significant road damage and community disruption that results from constant heavy truck traffic often necessary to move large volumes of CBM water by truck.

**Proposed BMP: *Gas Gathering Systems.*** Low pressure gas gathering systems constructed utilizing centralized compression and treating facilities should be used. CBM normally requires low bottom hole pressures to dewater and to flow at an economical rate from the CBM well. Without such low pressure, little or no CBN gas from the coal formation can be recovered. Centralizing compressor facilities efficiently increase the gas pressure from gathering line inlet pressure (perhaps 50 psig) up to long distance transmission line pressure (often greater than 1000 psig). Centralized compression, as opposed to a compressor at every well, will normally save capital and operating costs, dramatically reduce adverse surface impacts (i.e., noise and unnecessary use of more land) and reduce system down time while achieving low bottom hold pressures at wells connected to the system. Centralized compressors can normally be quieted more cost effectively (on a per mmbtu basis) than small wellsite compressors.

**Proposed BMP: *Centralized Treatment and Processing.*** Centralized treatment (removal of impurities) and processing (removal and sale of natural gas liquids or helium) should be used. CBM often requires treating to remove CO<sub>2</sub>, nitrogen, or other impurities, and CBM infrequently may contain sufficient NGLs to warrant processing. With respect to generally low volume CBN wells, centralized facilities will normally save capital and operating costs, dramatically reduce adverse surface impacts, and reduce system downtime. Centralized treatment and processing facilities are often placed on property purchased by the facility operator and are normally subject to county and state regulatory and land use processes.

## **Pests and Noxious Weeds**

**Proposed Additional Language for the Integrated Pest Management BMP:** Each operator should have a pest and weed control procedure, and should be fully responsible for pest and weed control problems which result from or are aggregated by its operations. Control contractors should be supervised to ensure that control measures are effectively implemented, and at the optimum time.

**Proposed Additional Language for the Revegetation BMP:** Revegetation of disturbed areas not required for production should occur promptly following the completion of pipeline, road, well, and facility construction. This practice reduces erosion and establishes vegetation to hold topsoil. As compared to final reclamation, interim reclamation and revegetation provides a 30 to 50 year head start on plant growth, allows reestablishment of surface use, and normally ensures that a large portion of the reclamation will be completed by a responsible operator. (Toward the end of their productive life, gas wells may be transferred to “stripper” operators who may not adequately reclaim well and facilities sites.)

## **Visual Impacts**

**Proposed Additional Language for the Minimize Footprint BMP:** Consolidate equipment in a compact area which may often be effectively screened by placement on the cut side of the pad. Excessive or unnecessary use of the surface constitutes trespass.

## **Noise Abatement**

**Proposed Additional Measure to Help Abate Compressor and Pumpjack Equipment Noise:** Enclose compressors in sound insulated buildings with adequate ventilation to permit doors to be closed in the summer months.

**For Possible Inclusion in a Future Handbook Version as Additional Research Data Becomes Available:** Noise abatement measures may be applicable in areas where grouse are present (as well as in areas of human concern) because anecdotal information indicate that grouse avoid large areas around noise sources.

## **V. EMERGING TECHNOLOGIES**

The technologies and practices described in this section offer potential, but have not yet been tested sufficiently or utilized broadly and successfully enough to be characterized as best management practices. They may, however, become BMPs in the future.

**Microhole Drilling Technology:** Microhole drilling technology allows the drilling of wells using smaller diameter drill holes than are generally used for oil and gas wells. A hole diameter of 2-3/8 inch is characteristic. The technology involves coiled tubing, which spools from the drilling unit into the drill hole. The relatively small and light

drilling unit can be hauled with a light truck. Accordingly, microhole drilling offers the potential of decreased drilling costs as well as restricting disturbed environments to a smaller area during drilling. Collateral benefits include reduced impacts due to lighter equipment moving on access roads. Current investigations are focusing on drilling to relatively shallow formations (less than approximately 5,000 ft depth), however DOE considers deeper drilling to be achievable.