



ANTERO
RESOURCES

**Battlement Mesa Natural Gas Development Plan
Meeting #7 – Part 2**

**Environmental Program – Air Quality and Water
Resource Protection and Noise, Dust, Weed, Light,
and Visual Mitigation**

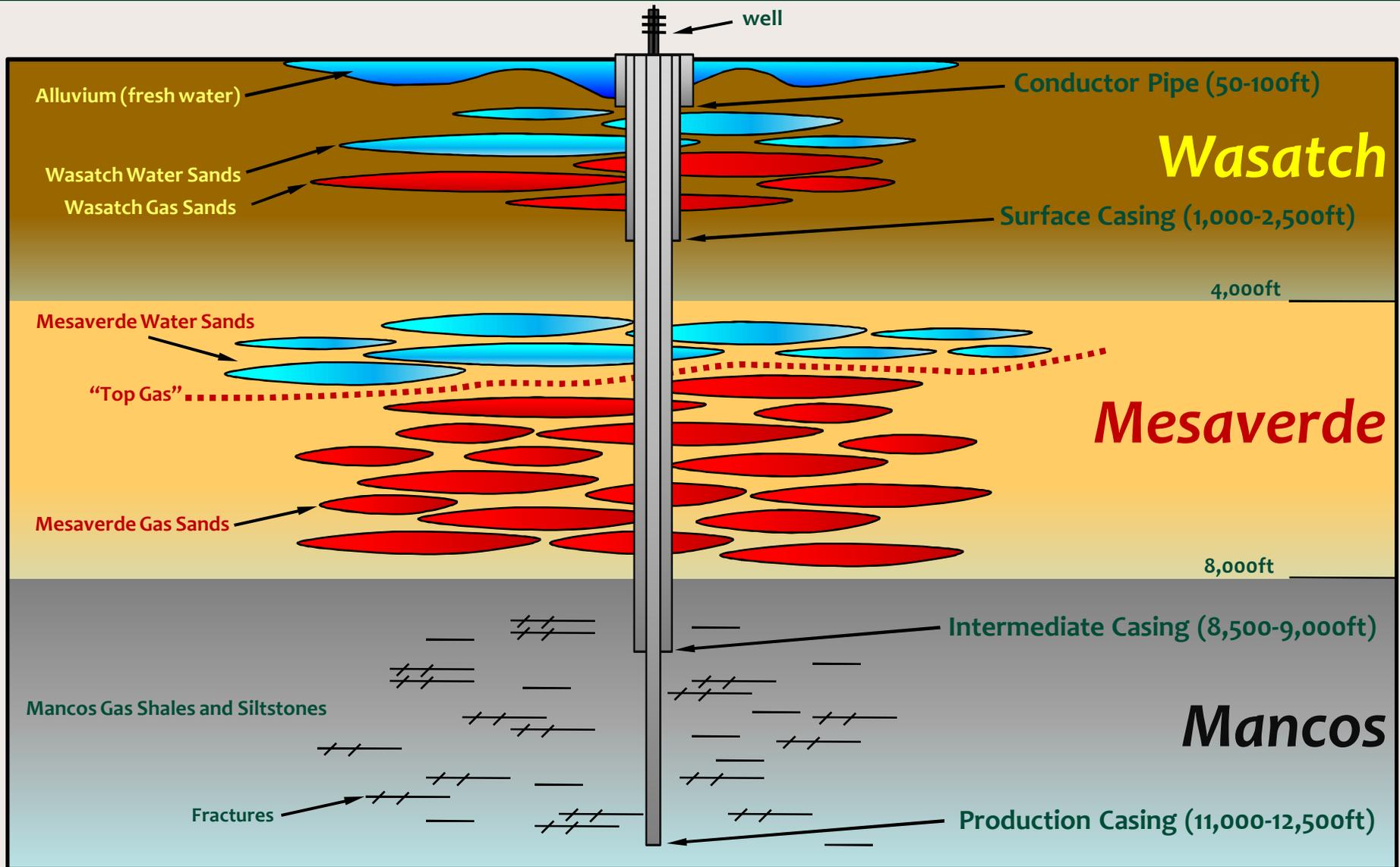
October 7, 2009



- **Protecting Water Resources**

- “Down-hole” drilling and completion practices protect near surface aquifers through the use of steel casing and cement (Meeting #6 on 9-16-09)
- Surface water resources are protected through Antero’s spill prevention and storm water and erosion control best management practices (these programs are regulated by County, State and Federal agencies)

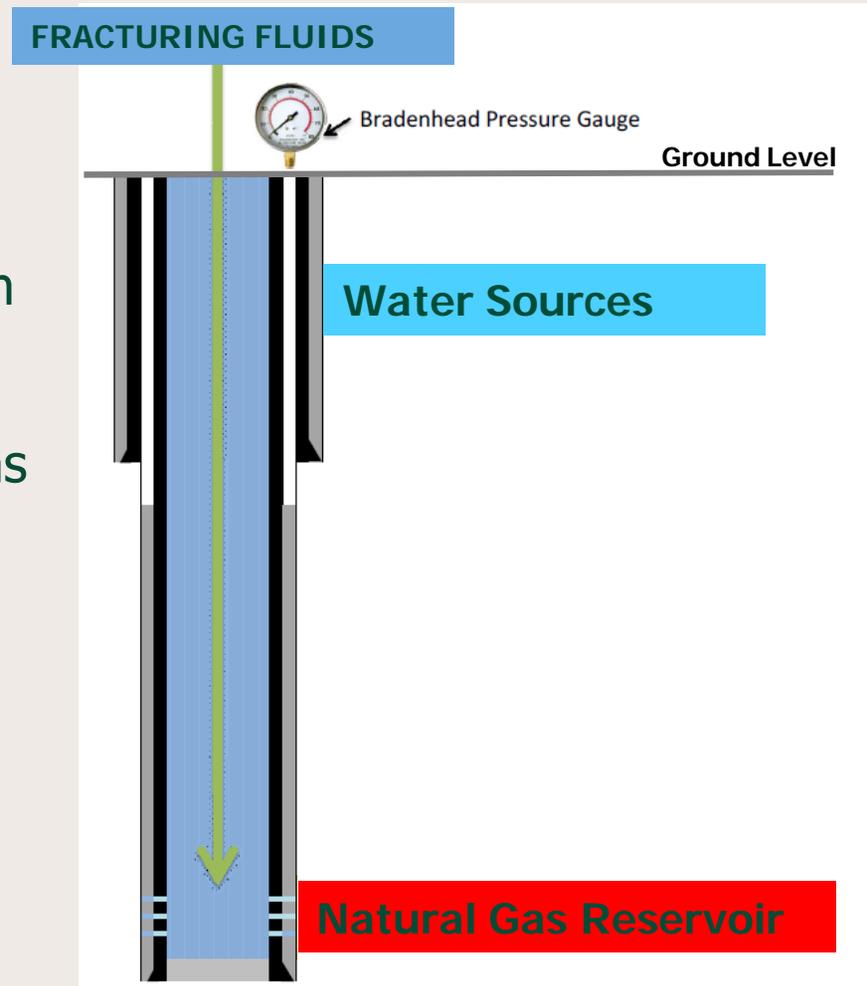
(Meeting #6 – Drilling and Completion and Water Management)
Isolating and Protecting Near Surface Water Sources



Wellbore Configuration to Protect Groundwater



- Conductor / Surface casing
 - Cemented to surface
 - State determines setting depth
- Production casing
 - Cemented per state regulations
 - Testing ensures integrity
 - Subject to high pressure
- COGCC Rule 341
 - Continuous monitoring of bradenhead pressure during fracing operations



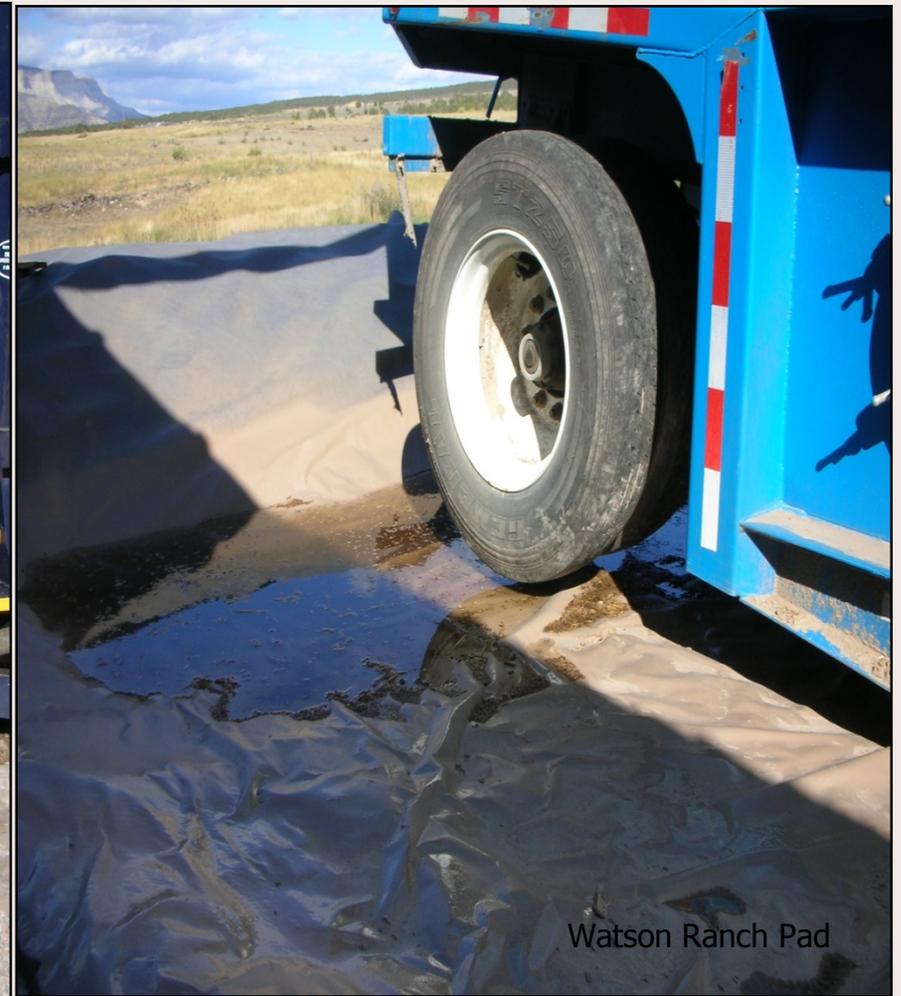
Surface Water Resource Protection – Spill Prevention



Liner under frac tanks to prevent ground water contamination



Watson Ranch Pad

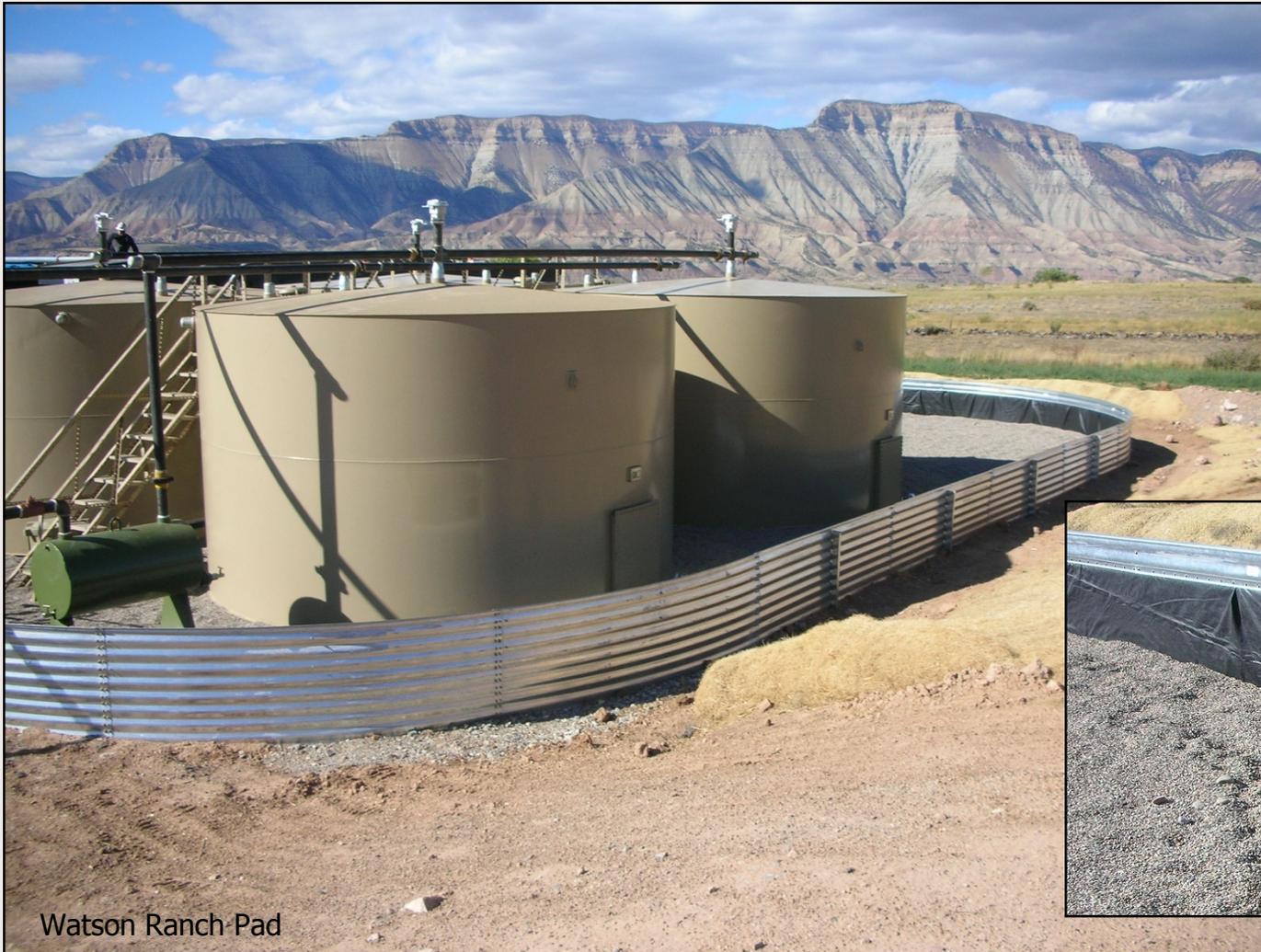


Watson Ranch Pad

Surface Water Resource Protection – Spill Prevention



Secondary Containment around storage tanks with lining



Watson Ranch Pad



Surface Water Resource Protection – Stormwater/Erosion Control



Perimeter berms with erosion blankets around pad for secondary containment and erosion control

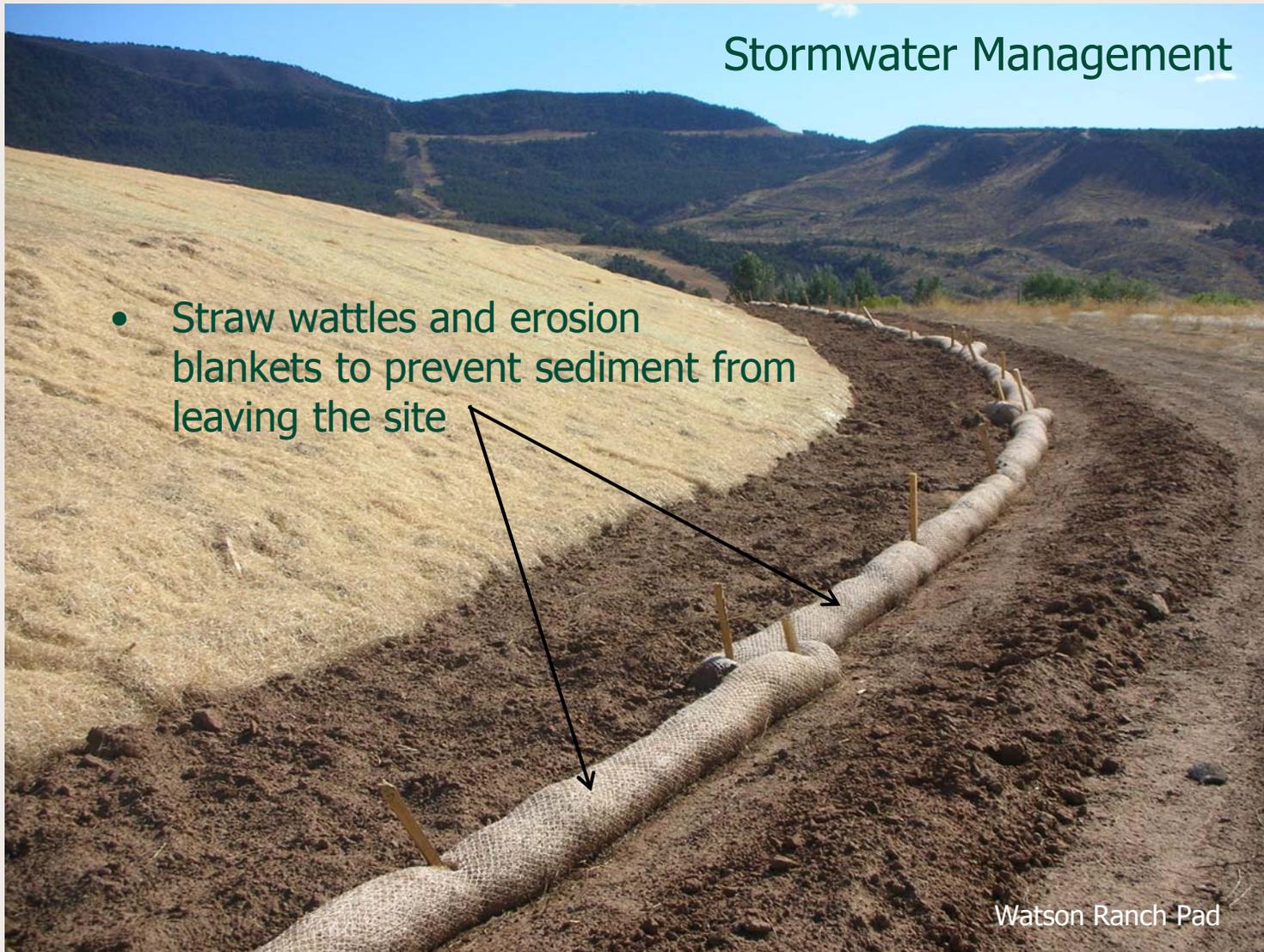
Top Soil stockpile (seeded)

Pad Perimeter Berm

Watson Ranch Pad

Stormwater Management

- Straw wattles and erosion blankets to prevent sediment from leaving the site



Surface Water Resource Protection



Antero Daily Stormwater Contractor Work Order - Battlement Mesa

Site ID: 045-00001 Inspection Date: 9/15/2009
 Area: Battlement Mesa Site Name: Watson Ranch Pad

SiteType: Drill Pad
 Location: Garfield County, Sec 17 T7S R95W
 LTE Inspector: Steve Sivigliano

Erosion Control	InUseY/ N	Req'dY/ N	Required Action or Maintenance	Assigned To	Status	Prerequisite Data or Actions	Estimated Date	Date Done
Rip Rap	No	Yes	INSTALL RIPRAP AT CULVERT INLET AND OUTLET, SEE MAP	Kip		call w/ Kip 10/5/2009	10/15/2009	
Sediment Control	InUseY/ N	Req'dY/ N	Required Action or Maintenance	Assigned To	Status	Prerequisite Data or Actions	Estimated Date	Date Done
Erosion Control Blanket	Yes	Yes	RE-INSTALL ECB'S AT NORTHEAST CORNER THAT WERE REMOVED DURING INSTALLATION OF METAL BERM	Kip		call w/ Kip 10/5/2009	10/15/2009	

Overall Comment: SITE HAS BEEN MOVED TO 30-DAY INSPECTION SCHEDULE AS CONSTRUCTION IS COMPLETE AND DRILLING ACTIVITIES ARE ONGOING. LANDOWNER HAS REQUESTED THAT NO ROCK BE PLACED IN IRRIGATION DITCH THAT RUNS THROUGH ACCESS ROAD VIA CULVERT, NO RIPRAP WILL BE INSTALLED.

Mitigation Strategies - Overview



- Noise
- Dust
- Light
- Weeds
- Visual

Mitigation Strategies - Noise



SUA

- **Antero/BMC Surface Use Agreement (SUA) addresses noise mitigation**
 - No centralized compression in PUD
 - Any wellhead compression housed, with high level of noise suppression equipment
 - High-grade mufflers on high noise output machinery
 - Consideration of electric power for drilling operations

6. Power/Telephone/Transformers. Only power lines, transformers and data transmission lines necessary for the operation of wells drilled on the Wellsite Location, or production equipment ancillary thereto, may be installed on the Wellsite Location or in the easement of any Access Road or Pipeline Easement. No power line, data transmission line or transformers will be permitted outside of Wellsite Location, Access Road or Pipeline Easement shown Exhibit B.
7. Hours of Operation. There will be no time of day restrictions with regard to drilling, completing, re-completing, workover, reservoir fracture stimulation operations. With respect to other routine ongoing maintenance, development and production operations, Operator agrees to limit such activities (except in the case of emergency) to between the hours of 7:00 AM to 8:00 PM.
8. Noise Abatement. Stationary engines and their exhausts shall be located and oriented to direct noise away from the homes closest to Wellsite Locations as set forth by COGCC Series 802.e rule. Equipment initially installed on Wellsite Locations shall be modern and well maintained. Operator will evaluate noise generation from equipment and require contractors to refit mufflers etc. in situations where the volume of sound produced may exceed applicable standards. Operator shall at all times maintain compliance with applicable Colorado Oil and Gas Conservation Commission ("COGCC") rules and regulations pertaining to noise reduction standards in Residential/ Agricultural/Rural areas and employ best management practices as set out in the COGCC Series 802 Noise Abatement Rule. Neither Operator nor its vendors shall be permitted to utilize engine braking on the Property.
9. Lighting Abatement. If a drilling rig is within 1,000 feet of an occupied dwelling, Operator and its subcontractors will align the drilling rig lighting equipment to minimize the proportion of the lights that are directed toward the dwelling and will install lighting shield devices on all of the more conspicuous lights. Lighting shall

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be directed inward and downward except as deemed necessary by Operator to illuminate other areas for safety reasons. Operator shall use appropriate technology to minimize light pollution emanating from the Property including, but not limited to, utilization of low density sodium vapor lighting.

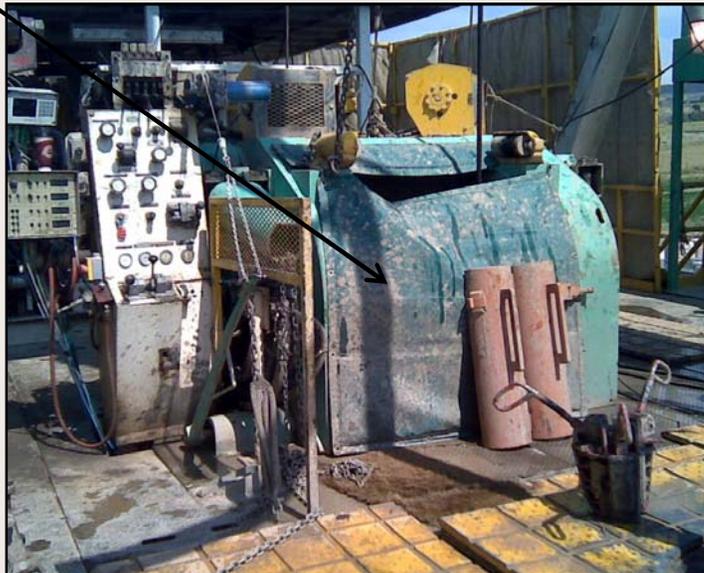
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Operator's operations shall be in compliance with the applicable Colorado

Slide 12

Mitigation Strategies - Noise

Sound
Blankets
(drill floor)



Watson Ranch Pad



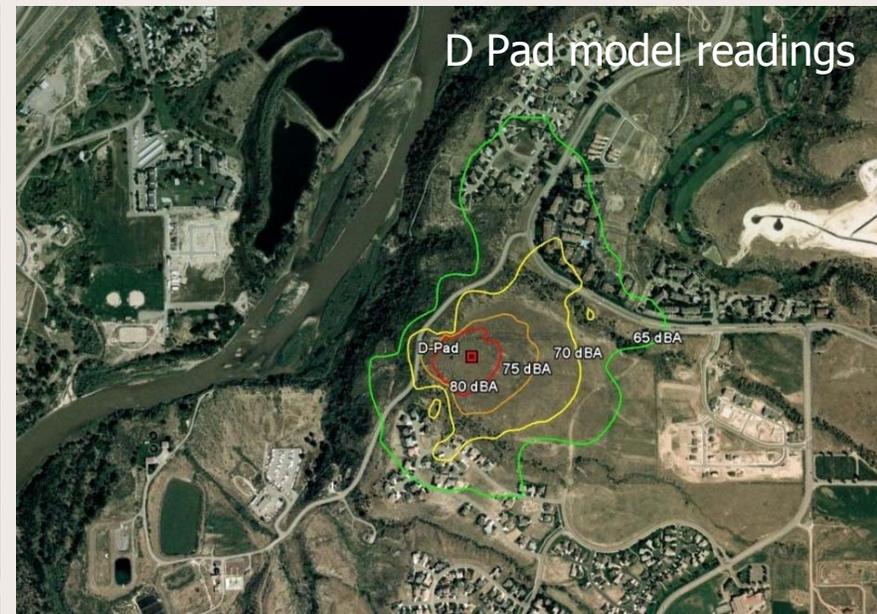
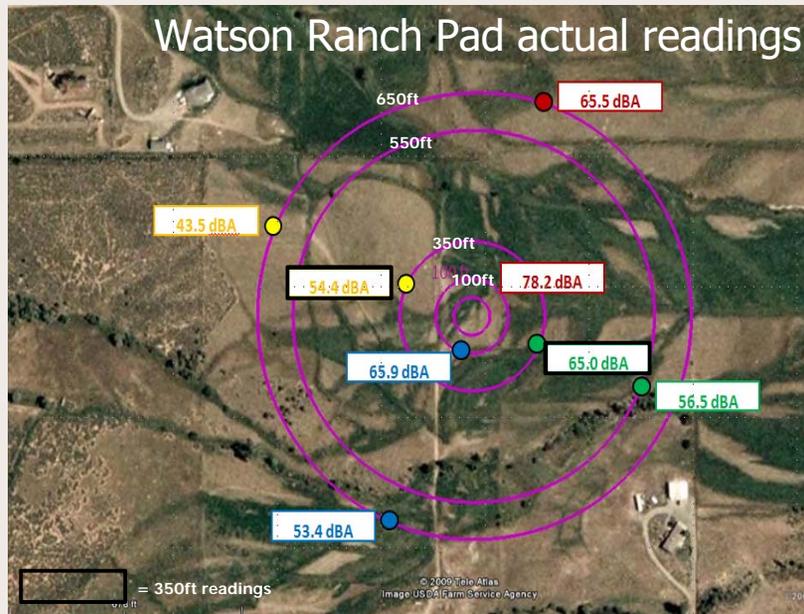
Hay Bales
(SE corner of pad)

Mitigation Strategies - Noise

- COGCC Regs for Drilling and Completing @ 350ft can't exceed 80dBA day, 75dBA night

- PUD regulations are 90 dB (1979 amended regulations) for industrial activity within PUD
- *Noise Solutions* (Denver) has been working on noise modeling for various pads
- Models thus far have shown that Antero will be in compliance with COGCC regulations for all pads
- *Don Behrens and Associates* did readings before and after mitigation (hay bales and blankets) on the Watson Ranch Pad
 - Data showed mitigation measures dropped noise levels 4 to 8 dBA depending on distance and direction
 - Extensive noise mitigation experience in Fort Worth Basin urban areas
 - Actual noise level measurements are well below COGCC regulations

**The modeling and actual readings can vary depending on the actual or input temperature, terrain, humidity, and wind direction



Mitigation Strategies - Dust



- **Antero/BMC Surface Use Agreement (SUA) addresses dust mitigation**
 - Soiltac and and/or liquid dust suppressants
 - Access roads and pads graveled
 - Road brushing and road washing
 - Long-term development provides for buried water lines to minimize truck traffic
 - Investigate joint industry effort to pave selected roads (e.g. CR 302 and 308)

SUA

reduction standards in Residential/ Agricultural/Rural areas and employ best management practices as set out in the COGCC Series 802 Noise Abatement Rule. Neither Operator nor its vendors shall be permitted to utilize engine braking on the Property.

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Operator's operations shall be in compliance with the applicable Colorado Department of Public Health and Environment Air Quality Control Commission Regulations, including, but not limited to, the Regulation No. 2 requirement that no oil or gas operation may cause or allow the emission of odorous air from any single source that is detectible after the odorous air has been diluted with seven or more volumes of odor-free air. These measurements shall be made outside the property line of the property from which the emission originates.

11. **Noxious Weed Management.** Operator shall maintain a noxious weed management plan consistent with the requirements of Garfield County, Colorado and the COGCC Series 1003.f. and 1004.e. rules on noxious weed management.
12. **Visual Impact Mitigation and Reclamation of Wellsite Locations.** Operator agrees to construct each Wellsite Location to mitigate visual impacts, including specific Wellsite Location requirements described in Exhibit C. As soon as reasonably feasible (and consistent with best practices and growing seasons), Operator shall commence interim and final reclamation operations as per COGCC Series 1003 and 1004 rules. The timing to begin such reclamation operations will be determined in good faith negotiations between Operator and Owner. The reclamation standards are set forth in the attached Exhibit D, Reclamation Plan.
13. **Environment and Safety.** Operator will comply with all applicable COGCC, Colorado Department of Public Health and Environment (CDPHE), Environmental Protection Agency (EPA) spill control, cleanup, and reporting requirements, the

Mitigation Strategies - Light



- **Antero/BMC Surface Use Agreement (SUA) addresses light mitigation**

- Pad-specific considerations
- Rig oriented to direct light away from nearby residents
- Low density sodium lighting
- Lights directed downward
- Rig shrouded on 3 sides
- Safety will govern in all cases

SUA

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7. **Hours of Operation.** There will be no time of day restrictions with regard to drilling, completing, re-completing, workover, reservoir fracture stimulation operations. With respect to other routine ongoing maintenance, development and production operations, Operator agrees to limit such activities (except in the case of emergency) to between the hours of 7:00 AM to 8:00 PM.
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Mitigation Strategies - Light



Mitigation Strategies - Weeds



- Antero/BMC Surface Use Agreement (SUA) requires the Operator to maintain a noxious weed management plan (page 9).

SUA

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a. Sanitary facilities will be on site at all times during drilling, testing and completion operations. Sewage will be placed in a portable chemical toilet. The toilet will be replaced periodically utilizing a licensed contractor. Toilet contents will be delivered to local wastewater treatment facilities in accordance with state and county regulations. Disposal will be in accordance with the State of Colorado and Garfield County rules and regulations regarding sewage treatment and disposal.

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f. **Weed control.** During drilling, production, and reclamation operations, all disturbed areas shall be kept as free of all undesirable plant species designated to be noxious weeds as practicable. Weed control measures shall be conducted in compliance with the Colorado Noxious Weed Act, C.R.S. §35-5.5-115 and the current rules pertaining to the administration and enforcement of the Colorado Noxious Weed Act. It is recommended that the operator consult with the local weed control agency or other weed control authority when weed infestation occurs. It is the responsibility of the operator to monitor affected and reclaimed lands for noxious weed infestations. If applicable, the Director may require a weed control plan.

COGCC 1000 Series Rules

c. **Final reclamation threshold for release of financial assurance.** Successful reclamation of the well site and access road will be considered completed when:

- (1) On crop land, reclamation has been performed as per Rules 1003 and 1004, and observation by the Director over two growing seasons has indicated no significant unrestored subsidence.
- (2) On non-crop land, reclamation has been performed as per Rules 1003 and 1004, and disturbed areas have been either built on, compacted, covered, paved, or otherwise stabilized in such a way as to minimize erosion to the extent practicable, or a uniform vegetative cover has been established that reflects pre-disturbance or reference area forbs, shrubs, and grasses with total percent plant cover of at least eighty percent (80%) of pre-disturbance or reference area levels, excluding noxious weeds, as determined by the Director through a visual appraisal. The Director shall consider the total cover of live perennial vegetation of adjacent or nearby undisturbed land, not including overstory or tree canopy cover, having similar soils, slope and aspect of the reclaimed area.
- (3) Disturbances resulting from flow line installations shall be deemed adequately reclaimed when the disturbed area is reasonably capable of supporting the pre-disturbance land use.
- (4) A Sundry Notice Form 4, has been submitted by the operator which describes the final reclamation procedures, any changes, if applicable, in the landowner's designated final land use, and any mitigation measures associated with final reclamation performed by the operator, and
- (5) A final reclamation inspection has been completed by the Director, there are no outstanding compliance issues relating to Commission rules, regulations, orders, permit conditions or the act, and the Director has notified the operator that final reclamation has been approved.

Mitigation Strategies - Weeds



- Antero/BMC Surface Use Agreement (SUA) includes a "Reclamation Plan" (Exhibit D), which includes specifics concerning noxious weeds (pages 41 and 42).

NOXIOUS WEED CONTROL PLAN

The location will be inspected three times per year by a qualified person. Based on this inspection, methods, materials, and timing of weed control measures will be specified. Weed control inspections and response measures will be documented. A table of the noxious weeds of concern to Garfield County is presented below.

Table 1: Garfield County Noxious Weed List

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Scientific Name/Common Name
<i>Cirsium arvense</i> Canada thistle
<i>Cichorium intybus</i> Chicory
<i>Arctium minus</i> Common burdock
<i>Linaria dolabrata</i> Dalmatian toadflax
<i>Centaurea diffusa</i> Diffuse knapweed
<i>Cardaria draba</i> Hoary cress
<i>Cynoglossum officinale</i> Houndstongue
<i>Aegilops cylindrica</i> Jointed goatgrass
<i>Euphorbia esula</i> Leafy spurge
<i>Carduus</i> spp. Musk thistle
<i>Crysanthemum leucanthemum</i> Oxeye daisy
<i>Carduus acanthoides</i> Plumeless thistle
<i>Lythrum salicaria</i> Purple loosestrife
<i>Centaurea repens</i> Russian knapweed
<i>Elaeagnus angustifolia</i> Russian olive
<i>Tamarix parviflora</i> , Salt Cedar
<i>Tamarix ramosissima</i> , Salt Cedar
<i>Onopordum acanthium</i> Scotch thistle
<i>Centaurea maculosa</i> Spotted knapweed
<i>Centaurea solstitialis</i> Yellow starthistle
<i>Linaria vulgaris</i> Yellow toadflax

Source: Garfield County - Noxious Weed List, 2007.

FINAL RECLAMATION

Successful final reclamation of the Property shall consist of compliance with the provisions of this Exhibit D and full compliance with the then-applicable provisions of COGCC Rule 1004.e or such comparable provision as is in effect at the time of such final reclamation.

Prior to final reclamation of Wellsites L and M, Operator and Owner agree to confer and determine between themselves what form the final reclamation of these Wellsites shall take. The agreement reached between these parties shall be reduced to writing and executed by both for submission to the COGCC. In the event no agreement can be reached, Operator shall reclaim these Wellsites as set forth above.

Mitigation Strategies - Weeds



Noxious Weed Management Program

- **Integrated Weed Management Approach** – Spraying with herbicides, Mowing (e.g. tumbleweed prior to seeding), Biocontrols (e.g. bindweed mice), Re-vegetation of disturbed areas
- **Treatment Spring** – treatment of biannual/annual weed species (scotch thistle, kochia, houndstongue, musk thistle)
- **Treatment Fall** – treatment of creeping perennials (Russian knapweed, Canada thistle)
- **Bare Ground** – treatment of pads excluding all vegetation growth for fire mitigation

Mitigation Strategies - Landscaping



- **Antero/BMC Surface Use Agreement (SUA) addresses pad landscaping**
 - DESIGNWORKSHOP landscaping design on 4 critical pads (C, D, L, M)
 - Berms and trees to shield pads and pad facilities from view
 - Pursue implementation prior to drilling where feasible
 - Antero responsible for maintaining landscaping
 - Noxious weed management plan will be integrated into the pad landscaping maintenance

SUA

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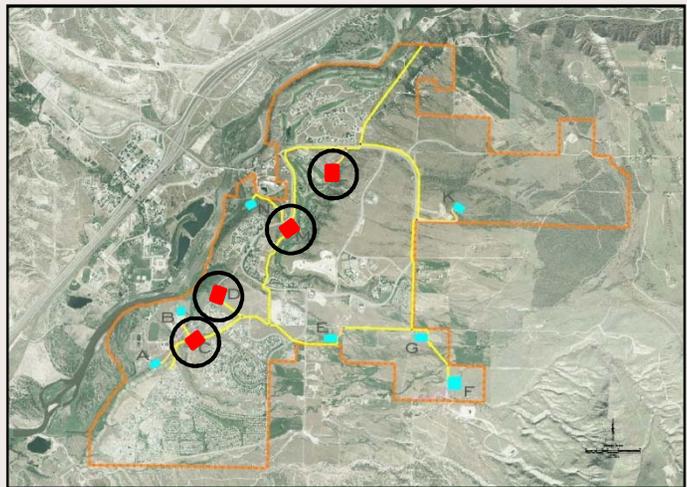
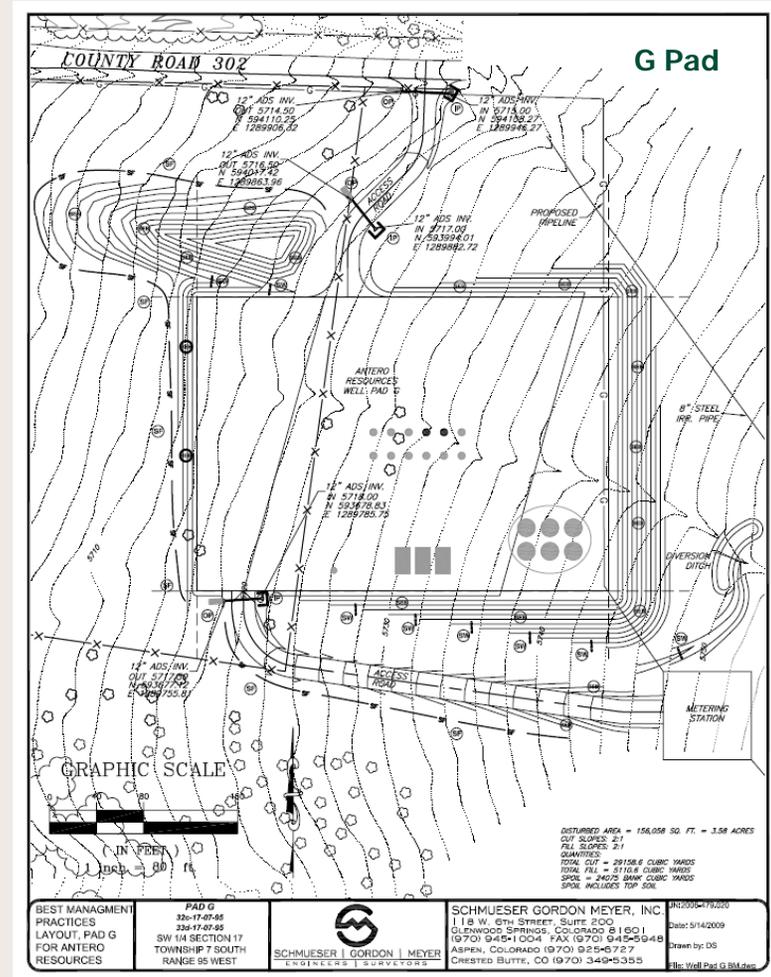
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9

b. All refuse, trash and other solid waste, (including cans, paper, cable, etc.) generated during drilling, testing and completion operations will be contained in enclosed receptacles, removed from the location promptly, and hauled to an authorized disposal site.

Mitigation Strategies - Landscaping



Question and Answer Session