

Chesapeake Energy Shale Operations Overview



Chesapeake Energy Overview



- **Founded in 1989**
- **Headquartered in Oklahoma City, OK**
 - ▶ Offices regionally located in Charleston, WV, Jane Lew, WV, Mt. Morris, PA, Canonsburg, PA, Harrisburg, PA, and Towanda, PA
- **Exclusive U.S. onshore focus**
- **One of the nation's largest natural gas producers**
 - ▶ 1Q'11 natural gas production of ~2.7 bcf/d, total production of ~3.1 bcfe/d
- **Nation's most active explorer 1993-2010**
- **Nation's most active horizontal driller 1993-2010**
 - ▶ #1 in the world in horizontal shale drilling over the past 10 years; >4,100 wells
- **Exceptional drilling success rate – 99%**

Chesapeake Energy Overview



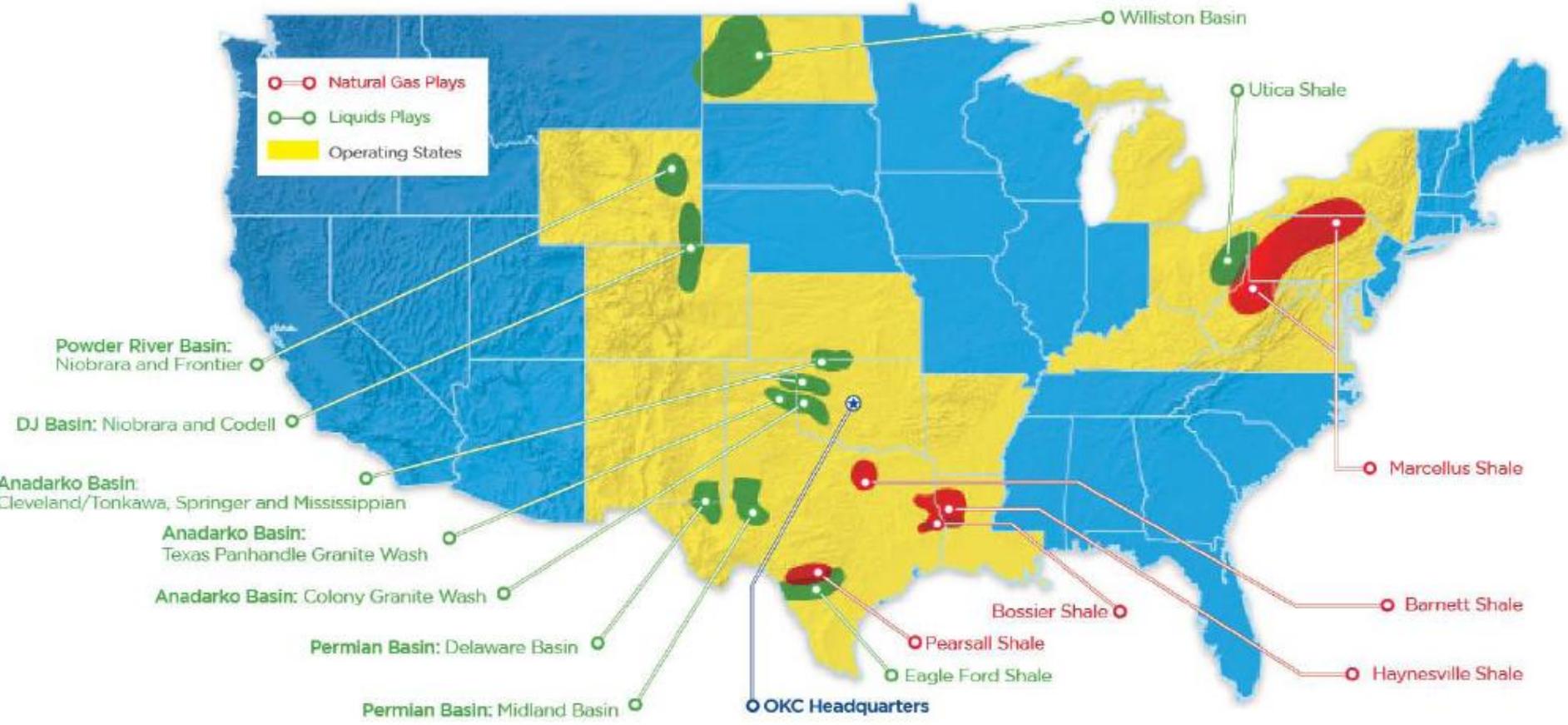
- **Most active driller in U.S. 1993-2011**
 - ▶ 156 operated rigs currently
 - 30 rigs currently drilling in the Marcellus Shale area
- **Consistent production growth**
 - ▶ 21st consecutive year of sequential production growth
- **Unparalleled inventory of U.S. onshore leasehold and 3-D seismic**
 - ▶ ~28.3 mm acres of 3D seismic data
 - ▶ Lower risk of suboptimal return on capital
 - ▶ Higher production rates

Chesapeake Energy Overview



- **~14.3 mm net acres of U.S. onshore leasehold**
 - ▶ 1.2 million acres acquired in Ohio
- **Acreage position in gas shale plays:**
 - ▶ Barnett Shale 220,000
 - ▶ Haynesville Shale 515,000
 - ▶ Marcellus Shale 1,730,000
- **Acreage position in unconventional oil plays**
 - ▶ Anadarko Basin 1,990,000
 - ▶ Eagle Ford Shale 450,000
 - ▶ Permian Basin 670,000
 - ▶ Powder River and DJ Basin 570,000
- **Advantageous joint venture arrangements and partnerships**
 - ▶ StatoilHydro, Total, Plains Exploration and Production Company, CNOOC

Chesapeake's Key Operating Areas



Characteristics of Shale Formations



- Found in organic-rich sedimentary rocks (shales) that were originally deposited as muds within tidal flats and deep water basins
 - ▶ Shale formations can be found 1 mile or more underground
- Dense rock with low permeability
- Typically requires a combination of horizontal drilling and hydraulic fracturing for the natural resources to be recovered in economic quantities

The Production Process

Five basic steps:

1. Site selection and well pad preparation
2. Drilling the well
3. Completing the well
4. Marketing the resources
5. Reclaiming the site



Site Selection



A number of factors are considered in selecting a drilling site:

- ▶ Favorable geology
- ▶ Topography
- ▶ Access roads
- ▶ Routes for pipelines and utilities
- ▶ Proximity to schools or residential areas
- ▶ Environmental factors such as wetlands and sensitive wildlife habitat
- ▶ Available water source(s)

Well Pad Preparation

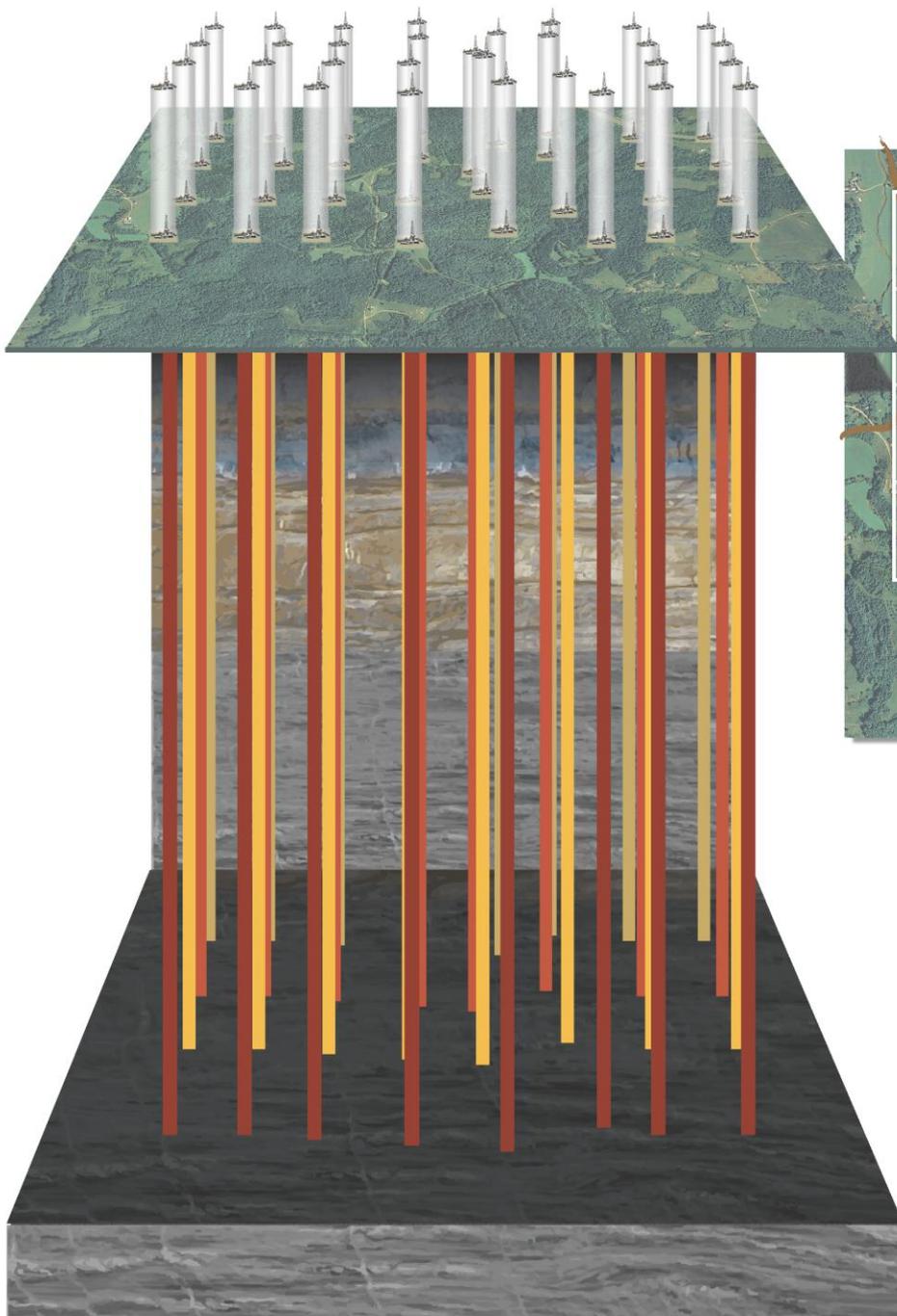
Well pads can be located in rural or urban areas

- Pad preparation requires approximately 4-6 weeks
- Typical horizontal well pad requires 3-5 acres to construct
- Appropriate erosion and sediment controls are installed

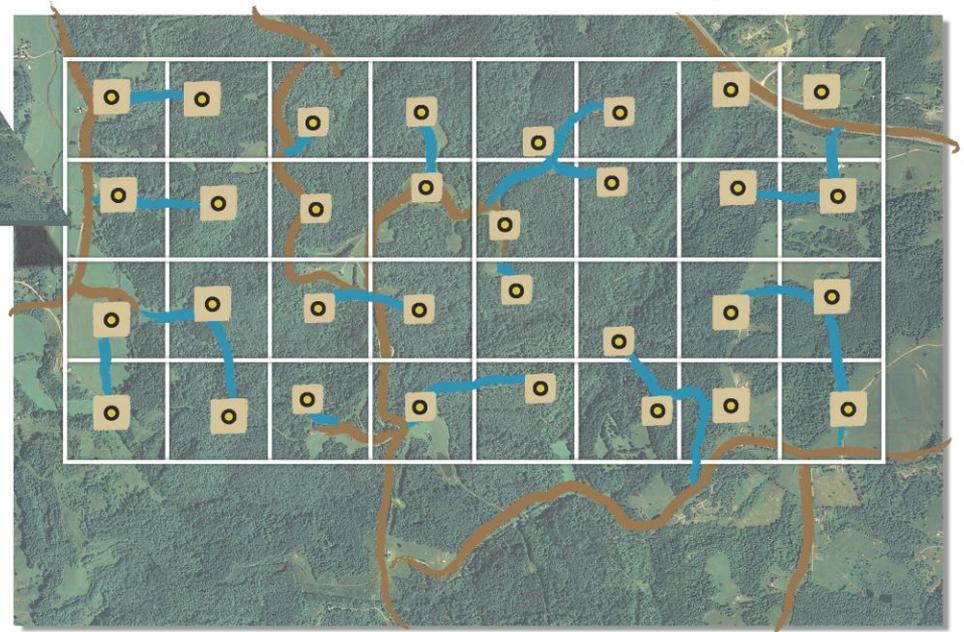


Pre-drill testing

- **Chesapeake Energy conducts pre-drill testing on water sources prior to conducting any operations in an area**
 - ▶ Specifically testing is done on all water sources within 3,000' feet from the vertical portion of a well
 - Includes springs, wells, streams and ponds
 - ▶ The testing establishes a baseline of water quality conditions for both Chesapeake and the property owner
 - ▶ The testing is free for the property owner
- **A representative from Chesapeake will collect a water sample**
 - ▶ It is preferred that the property owner be present during the collection
 - ▶ Analysis is conducted by a state-certified analytical laboratory
 - ▶ The property owner receives a copy of the laboratory's analysis

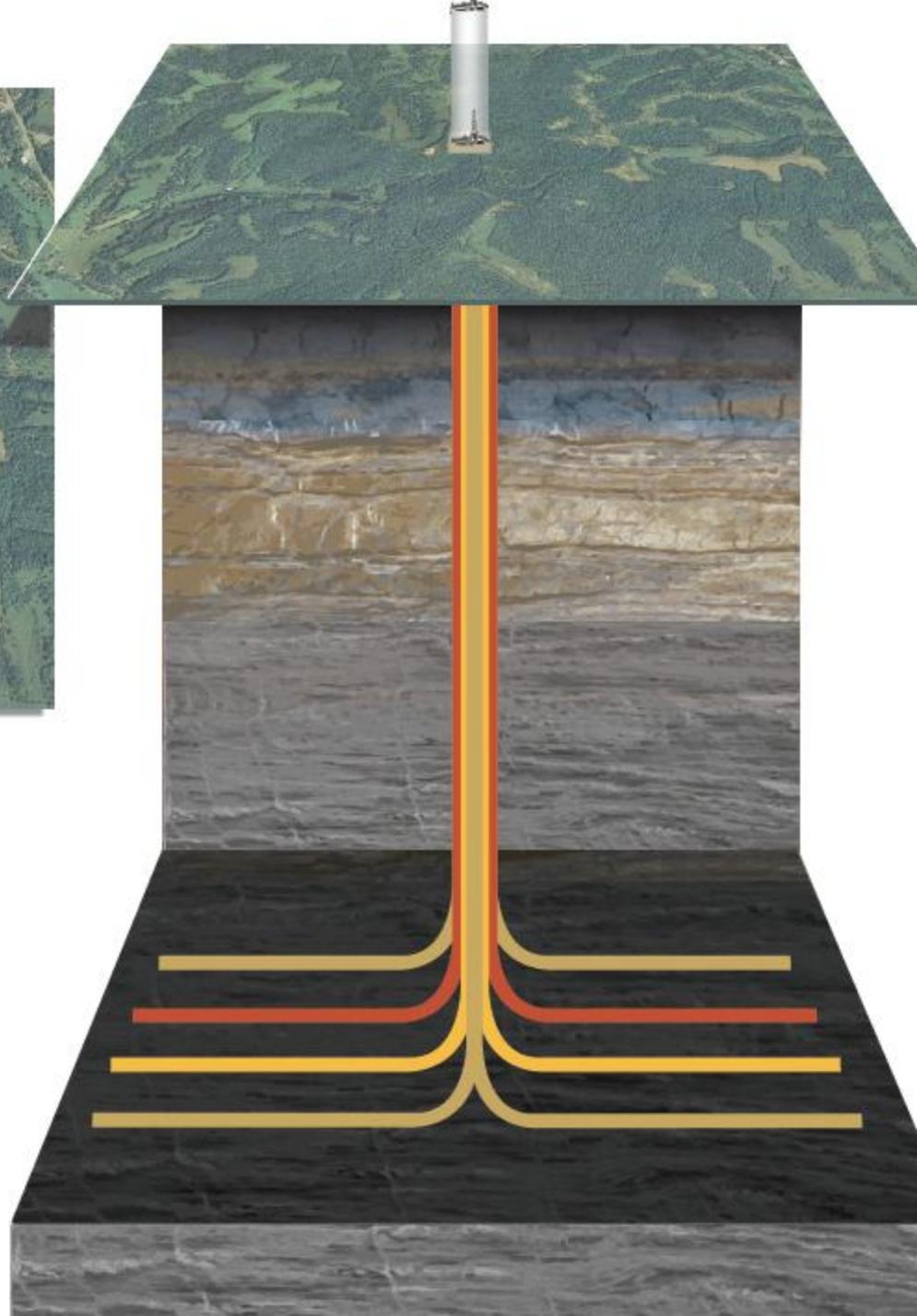
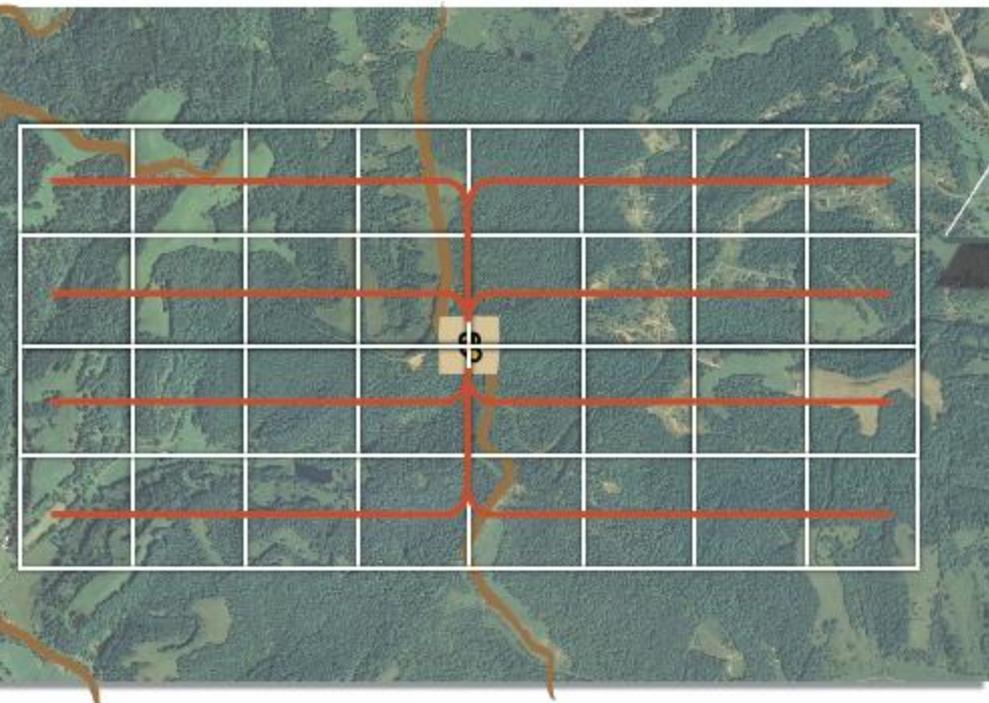


Idealized Vertical Well Spacing



Well spacing can vary due to a number of factors including state regulatory requirements, location and formation characteristics.

Idealized Horizontal Well Spacing



Well spacing can vary due to a number of factors including state regulatory requirements, location and formation characteristics.

Drilling the Well Using Today's New Technology



Wells are drilled and constructed to recover the natural resources while protecting the environment and providing for the safety of workers and area residents

- **Drilling is a 24/7 operation**

- ▶ Reduces rig time on location

- **The drilling phase is a temporary operation, typically lasting 3-4 weeks per wellbore**

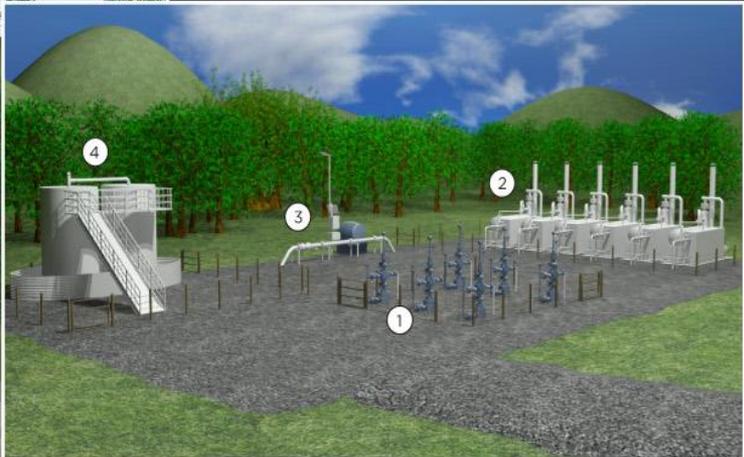
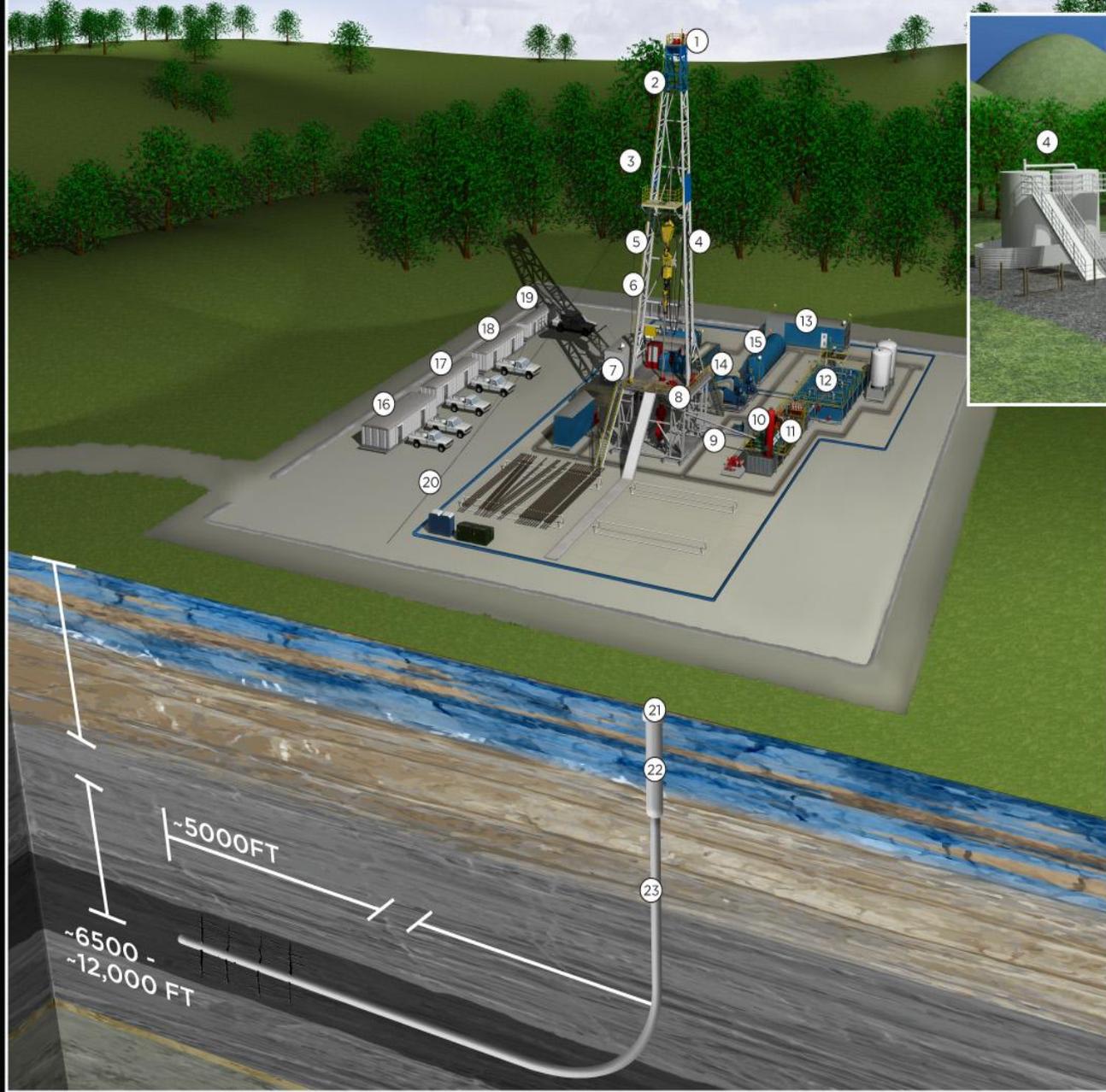
- ▶ Multiple wells may be drilled in succession

- **Chesapeake Energy utilizes a “closed-loop” drilling system**

- ▶ All drilling materials are contained

- ▶ No materials collected in earthen pits

ROTARY RIG AND PRODUCTION SITE



Rotary Rig Legend

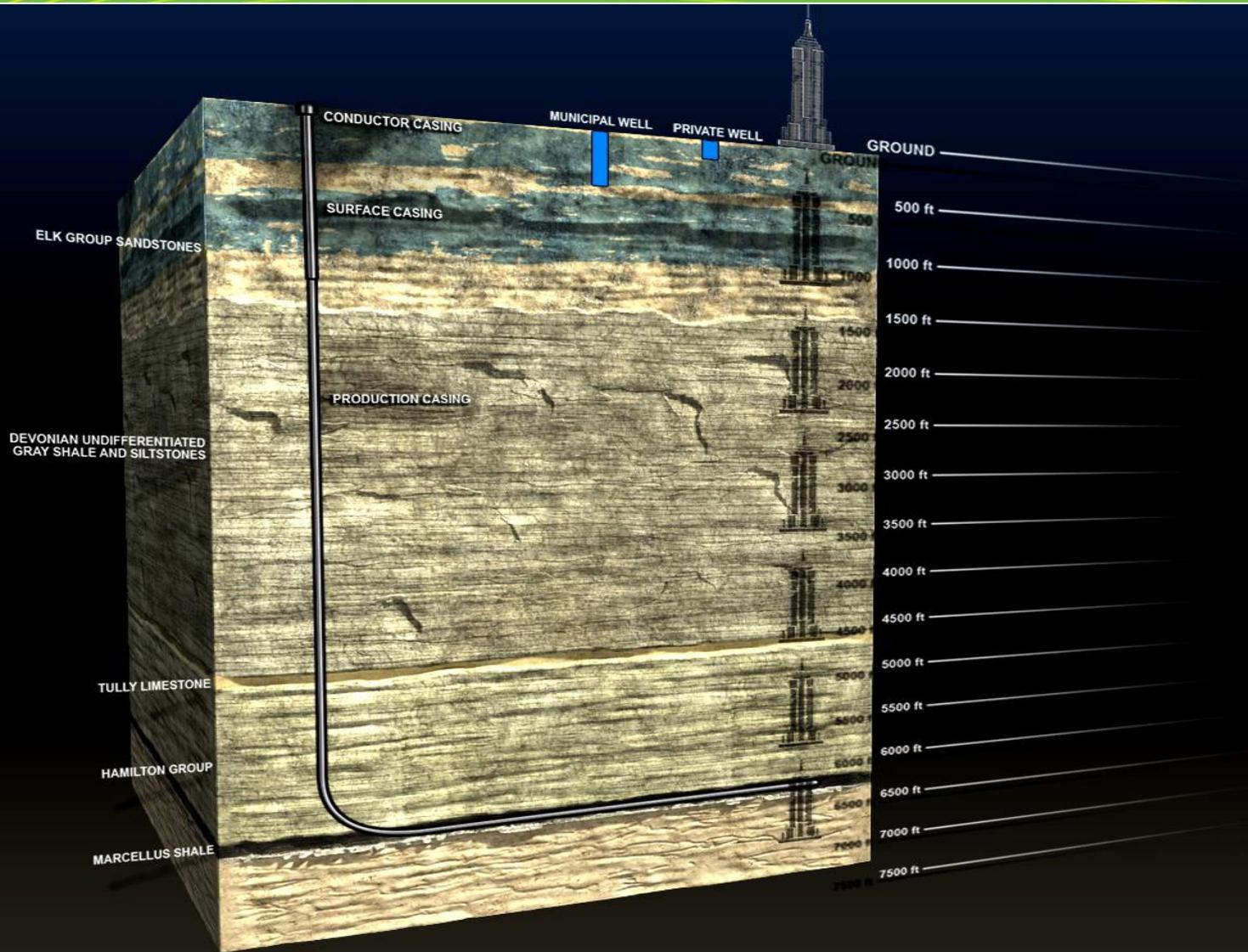
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| 1 Crown Block Assembly | 13 Mud House |
| 2 Crown Platform/Watertable | 14 Mud Pumps |
| 3 Derrick Board/Monkey Board | 15 Diesel Tank |
| 4 Mast | 16 Company Man - Quarters |
| 5 Traveling Block | 17 Toolpusher - Quarters |
| 6 Top Drive/Power Swivel | 18 Direction Drillers - Quarters |
| 7 Mouse Hole | 19 Mud Workers - Quarters |
| 8 Hydraulic/Air Hoists | 20 Geronimo Line |
| 9 Mud Return Line | 21 Conductor Casing |
| 10 Mud-Gas Separator | 22 Surface Casing |
| 11 Shale Shakers | 23 Production Casing |
| 12 Mud Pits | |

Production Site Legend

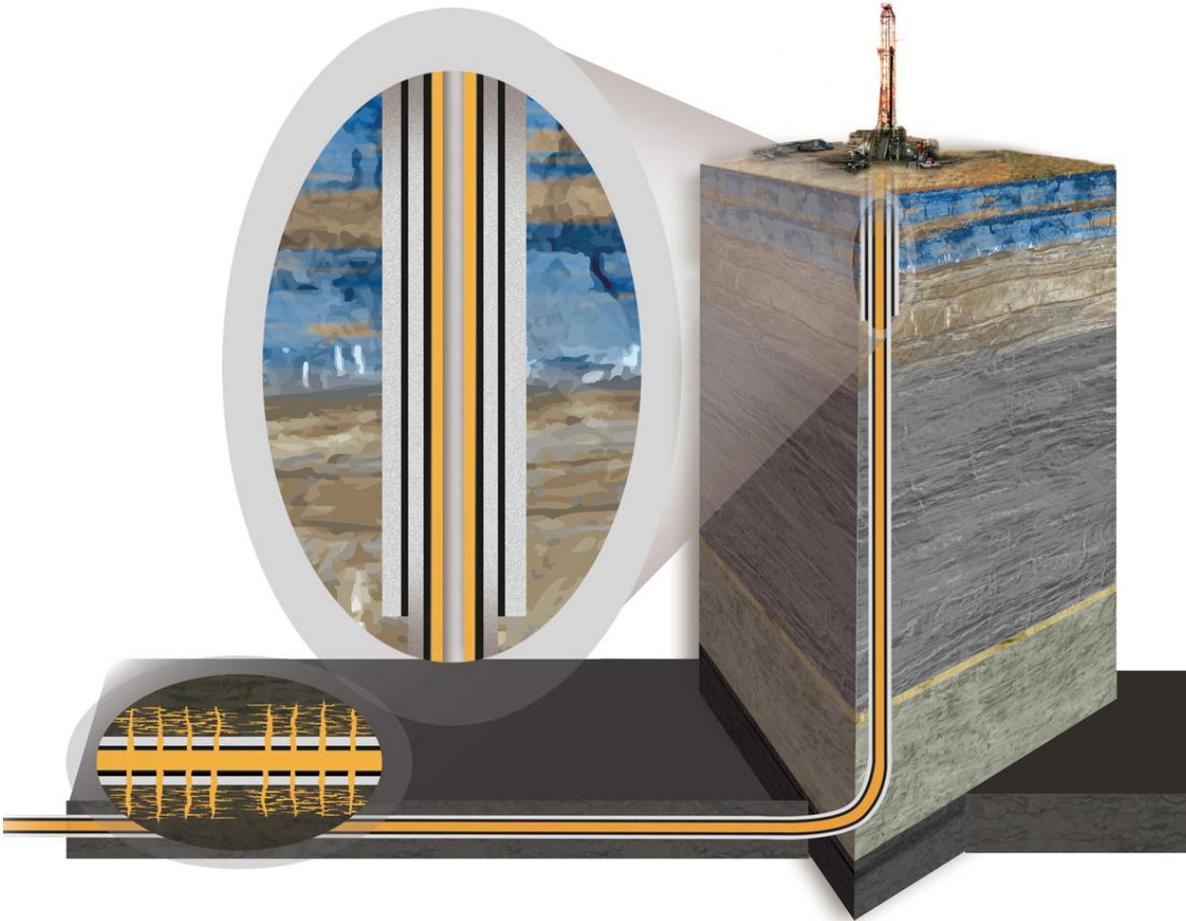
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| 1 Production wellhead | 3 Departing Pipeline with chemical treatment tank |
| 2 Gas Processing units, with line heater | 4 Brine water Production tanks, in secondary containment |

Typically housed on a 300' x 400' pad site, rotary rigs are common to the oil and natural gas industry and can be used to drill multiple wells from a single site. Standing up to 186 feet high, these rigs can drill to a variety of depths and are manned 24 hours a day by rotating five-man crews. Crews live off-site, but report to the rig manager or toolpusher who lives on-site. Chesapeake employs an on-site drilling supervisor, often referred to as a company man, to oversee the complete operation.

How Deep?



Drilling the Well-Groundwater Protection



- 4 or more layers of protection are installed in the well to isolate the well from the surrounding strata and protect groundwater supplies and the environment
 - ▶ Multiple layers of steel casing and cement are utilized
 - ▶ Casing set in place below freshwater aquifer zone
 - ▶ FIT test performed and cement logs recorded to ensure proper seal
- PA DEP must be notified prior to the installation and cementing of all casing strings

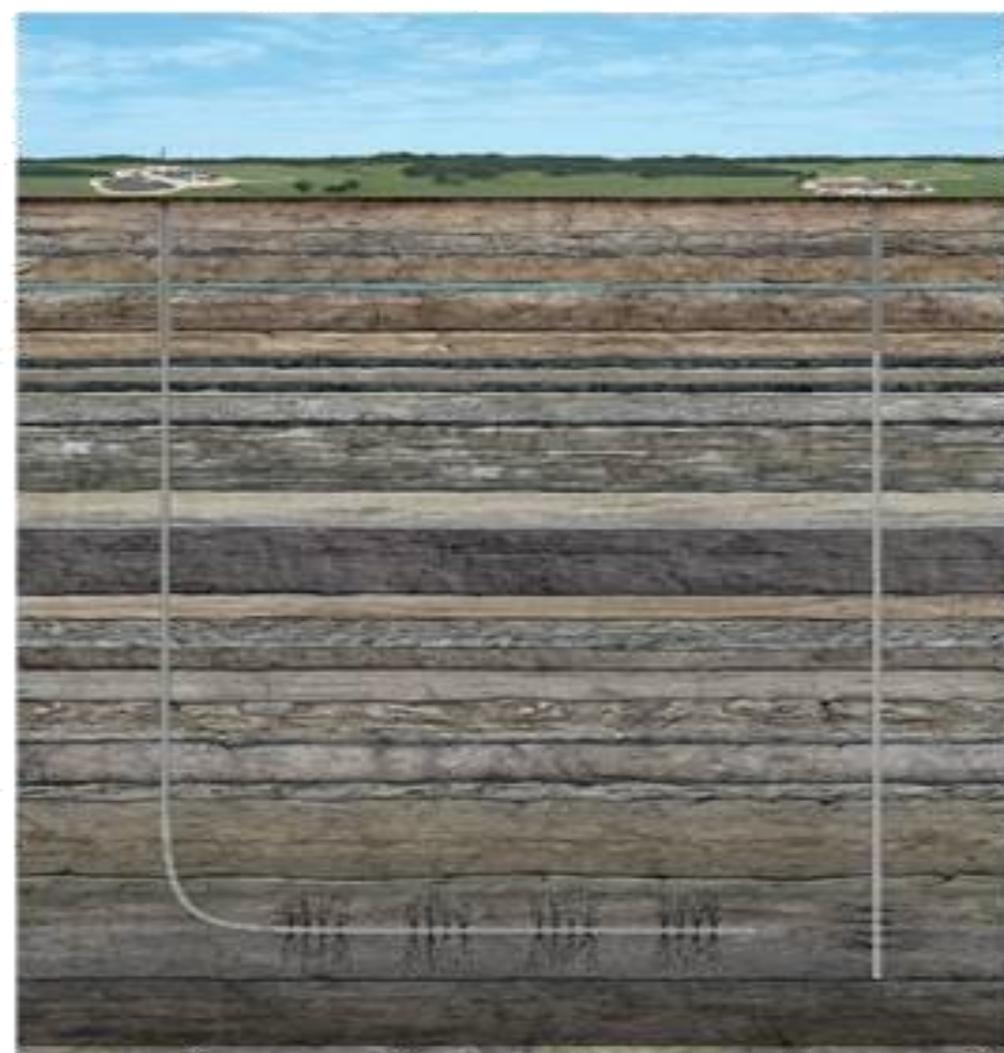
Well Completion



- After the drilling rig is removed, hydraulic fracturing (“fracing”) begins
 - ▶ Not new technology; has been in use since after World War II
- Water is mixed with proppant (such as sand) and pumped into the shale reservoir under pressure
 - ▶ 99.5% of fracturing fluid is made up of water and sand
- Generally takes several days per wellbore

For more information on hydraulic fracturing, please visit AskChesapeake.com

Hydraulic Fracturing

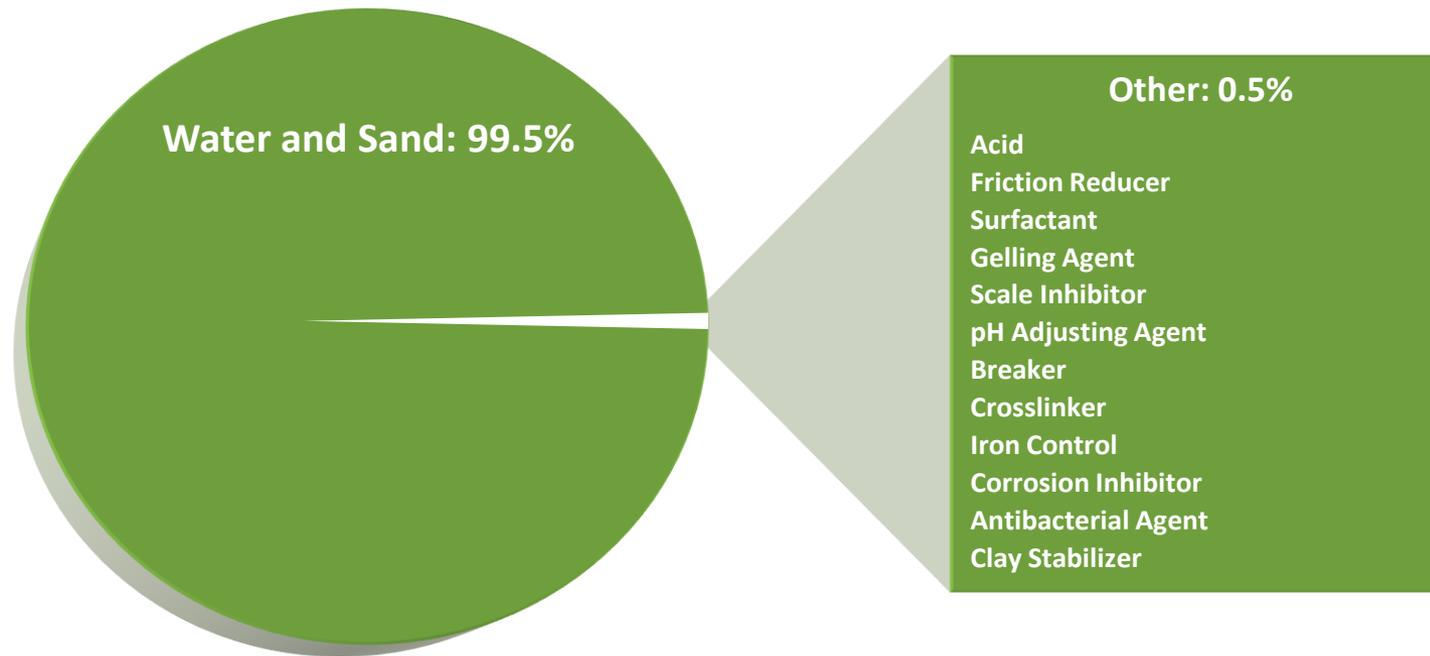


- Horizontal fracturing is done in multiple stages
- Thousands of feet of rock separate the target formation and existing freshwater aquifers
- Fractures are designed and required to remain within the target formation

Hydraulic Fracturing Site Layout



Typical Deep Shale Gas Fracturing Mixture



Fracturing Fluid Additives

Product Category	Main Ingredient	Purpose	Other Common Uses
Water	99.5% Water & Sand	Expand fracture and deliver sand	Landscaping, manufacturing
Sand (Proppant)		Allows the fractures to remain open so the gas can escape	Drinking water filtration, play sand, concrete and brick mortar
Other		~ 0.5%	
Gel	Guar gum or Hydroxyethyl cellulose	Thickens the water in order to suspend the sand	Cosmetics, baked goods, ice cream, toothpaste, sauces, and salad dressings
Friction Reducer	Petroleum distillate	"Slicks" the water to minimize friction	Used in cosmetics including hair, make-up, nail and skin products
Acid	Hydrochloric acid or muriatic acid	Helps dissolve minerals and initiate cracks in the rock	Swimming pool chemical and cleaner
Anti-Bacterial Agents	Glutaraldehyde	Eliminates bacteria in the water that produces corrosive by-products	Disinfectant; sterilizer for medical and dental equipment
Scale inhibitor	Ethylene glycol	Prevents scale deposits in the pipe	Used in household cleansers, de-icer, paints, and caulk
Breaker	Ammonium Persulfate	Allows a delayed break down the gel	Used in hair coloring, as a disinfectant, and in the manufacture of common household plastics
Corrosion inhibitor	Formamide	Prevents corrosion of the well casing	Used in pharmaceuticals, acrylic fibers and plastics
Crosslinker	Borate Salts	Maintains fluid viscosity as temperature increases	Used in laundry detergents, hand soaps and cosmetics
Iron Control	Citric Acid	Prevents precipitation of metal oxides	Food additive; food and beverages; lemon juice ~7% citric acid
Clay Stabilizer	Potassium Chloride	Creates a brine carrier fluid that prohibits fluid interaction with formation clays	Used in low-sodium table salt substitute, medicines, and IV fluids
pH adjusting agent	Sodium or potassium carbonate	Maintains the effectiveness of other components, such as crosslinkers	Used in laundry detergents, soap, water softener and dish washer detergents
Surfactant	Isopropanol	Used to reduce surface tension of the fracturing fluids to improve liquid recovery from the well after the frac	Used in glass cleaner, multi-surface cleansers, antiperspirant, deodorants and hair-color



Process

- Currently recycling/reusing nearly 100% of produced water
- Produced water is collected and stored in holding tanks onsite.
 - ▶ Then pumped from the tanks through 20-micron filter
 - ▶ Then pumped into a clean storage tank
 - ▶ Prior to reuse, the water is tested for chlorides and then blended accordingly with fresh water during the next fracturing job

Benefits

- Reduces or eliminates need for water to be sent offsite for disposal
- Reduces impact on local supplies
- Reduces truck traffic, lowers impact on roads, noise and air
- Reduces the cost of operations

Marketing / Reclaiming the Site



- Gas and liquids are separated by the “separator”
- Pipeline carries natural resources to market
- Produced water is retained on location in tanks until removed via truck
- Site is reclaimed and landscaped
 - ▶ Site is reduced to approximately 1 acre
 - ▶ Small access road will be retained
- Company returns regularly
 - ▶ Maintain equipment/monitor production rate

Use Of Roads

- **Chesapeake Energy prefers to use a Road Use Maintenance Agreement (RUMA) for dealing with potential effects on public roads**
 - ▶ Has been used extensively for Chesapeake's operations area in PA
- **Basics of the RUMA**
 - ▶ “Operator agrees to reimburse (Township, County, other) for any additional costs incurred, associated with the maintenance of said roadway as a result of the Operator's activities during construction, drilling and completion of said wells”
 - ▶ “Operator agrees to maintain roads to a condition consistent with that prior to operations”
 - ▶ “Operators assumes all liability for subcontractors working on Operators behalf”
- **Can be customized by both Operator and/or road owner depending on circumstances**
 - ▶ Municipality can perform the road maintenance if preferred or Chesapeake will perform work to municipalities specifications

Who Shares In The Revenue?



- **Mineral Owners**
 - ▶ Bonuses and royalties
- **Local Workers**
 - ▶ Wages and benefits
- **Local Business**
 - ▶ Subcontractors and service companies
- **Counties, Cities, School Districts**
 - ▶ Ad valorem and other taxes
- **Other Stakeholders**
 - ▶ Charitable organizations
 - ▶ Chesapeake shareholders

Chesapeake Energy Economic Impact: A Look to the Future for Ohio?



- 23 rigs currently operating in Pennsylvania
 - Over 1,100 employees in PA
 - ▶ Less than 250 employees in January 2009
 - Over \$1.2 billion paid to landowners since 2008
 - Over \$350 million in contracts to vendors since 2009
 - Over \$1.5 million in community investment in 2009
-
- 8 rigs currently operating in West Virginia
 - 702 Chesapeake employees living in WV
 - \$57 million paid in severance tax in the past five years
 - \$46 million in contracts to WV vendors for WV operations in 2010
 - Over the past five years, an \$800 million dollar investment to WV entities was made by Chesapeake Energy

Questions?

For more information:

AskChesapeake.com

Information provided is subject to change based on multiple factors.

