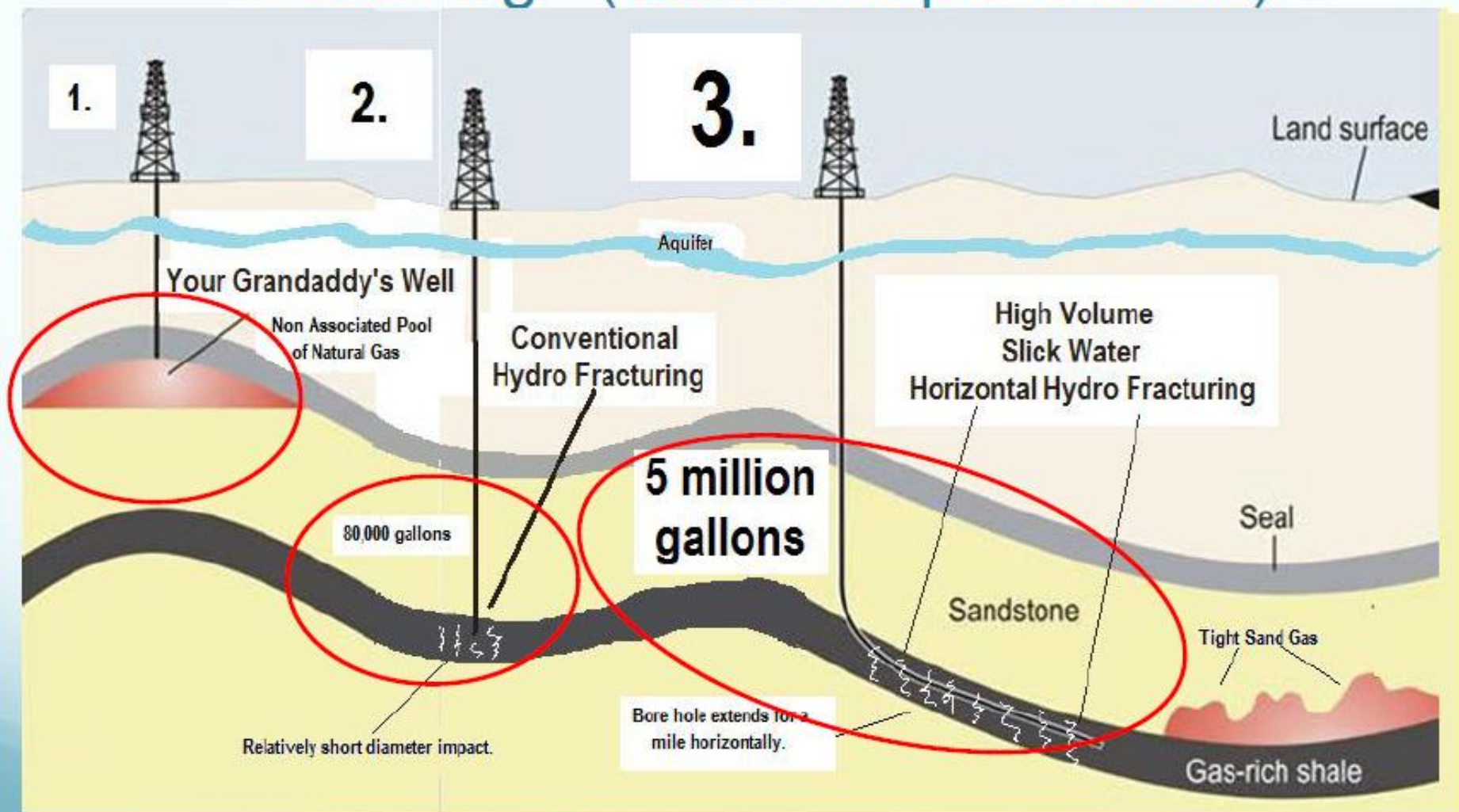


State of the Art:

High volume, slick water, horizontal hydraulic fracturing (from multiple laterals)



Fifteen Step Process of hydro-fracturing or “fracking”

The hydrofracking process has many different steps. At any point during the process an environmental, chemical or public health threat could emerge.

Steps:

1. Deciding where to place or site the well.
2. Constructing access roads & gas gathering lines
3. Clearing the well pad
4. Setting up the well pad
5. Trucking in materials & supplies
6. Storing the chemicals
7. Lowering the drill bit
8. Circulating the drill mud
9. Removing the drilling mud waste & rock from hole & sealing the hole
10. Perforating the well
11. Acidizing the well
12. Fracking the well
13. Capturing the flowback waste
14. Getting rid of wastes
15. Pumping gas to market

The Shale Gas Extraction Process

Step 1.

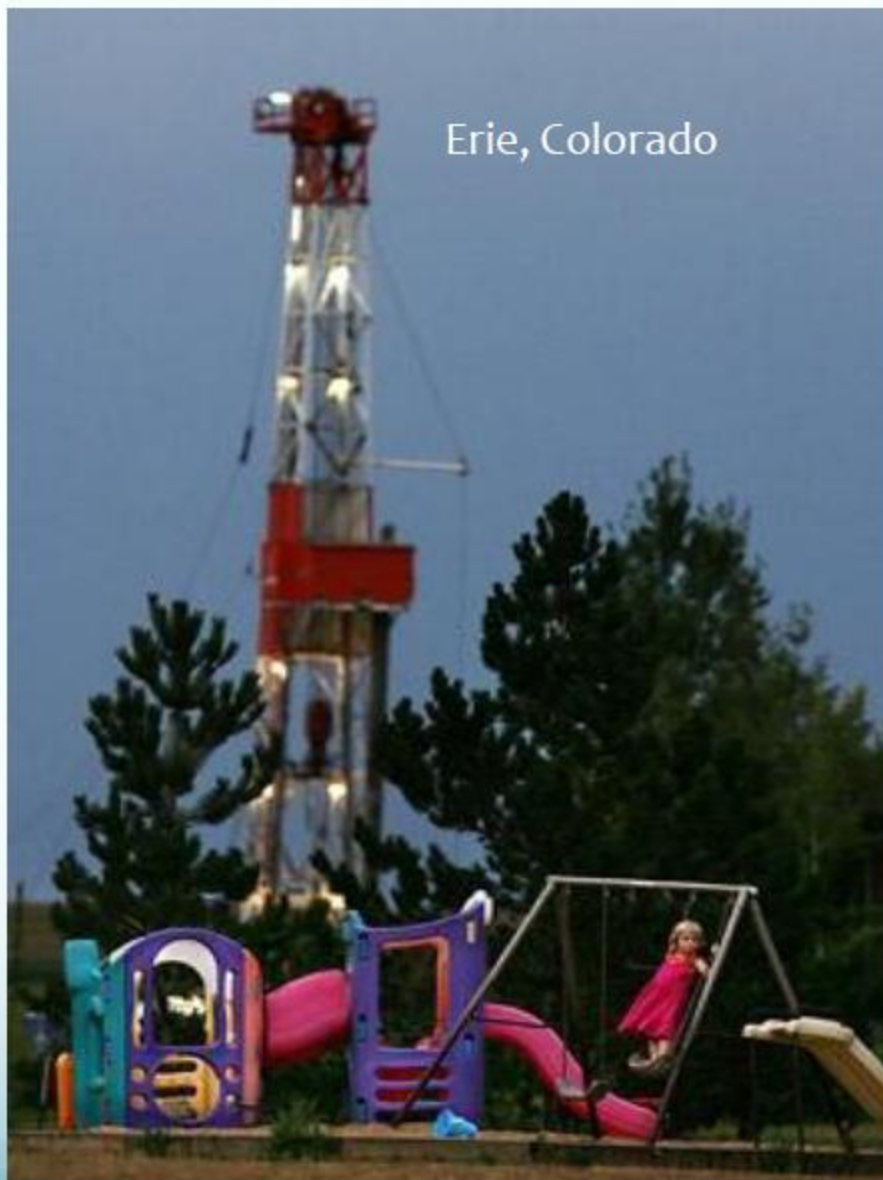
Deciding where to site the well.



Beaver Run Reservoir, Western Pennsylvania

Fracking Transforms the Landscape





Erie, Colorado



Fort Worth, Texas



Lathrop, PA

Step 2.

Constructing access roads and gas gathering lines.



Step 3.

Clearing the well pad site.



Step 4.

Setting up the well pad.



Step 5.

Trucking in materials and supplies.



This heavy traffic caused by the fracking process destroys roads and creates undesirable conditions . . .



Step 6. Storing the chemicals



Millions of pounds (of toxic chemicals) could be stored at one pad. Storage sites are at times located in a floodplain. Generally there isn't an evacuation plan.

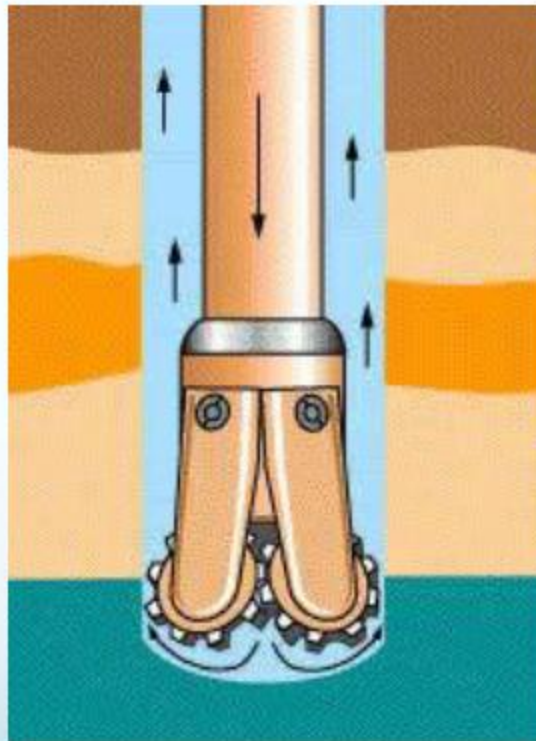
Step 7.

Lowering the drill bit



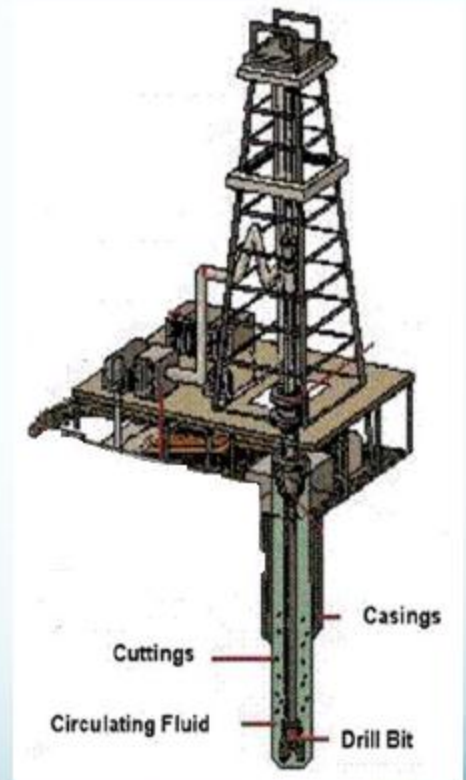
Step 8.

Circulating the drilling mud.



Mud circulation in the hole

“Float” - the cuttings out of the hole.

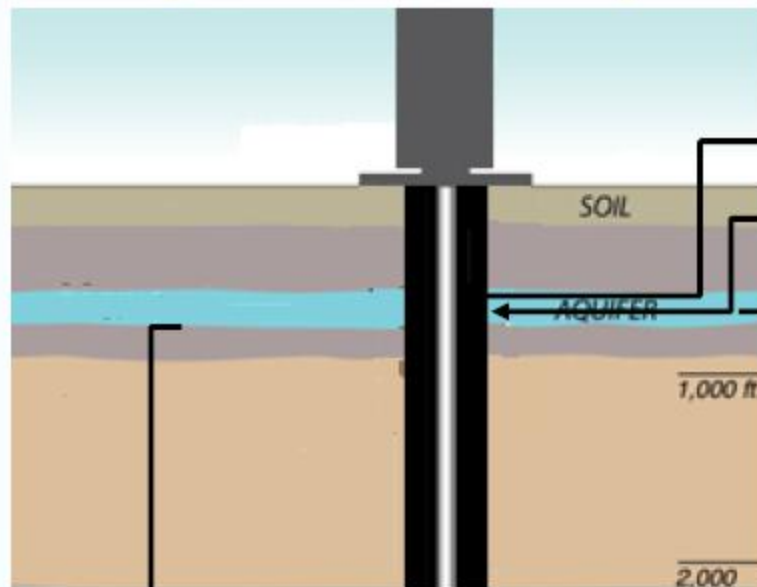


Step 9.

Removing the waste drilling mud and rock cuttings from the bore hole.



Boring the hole, temporarily exposing the aquifer



Drill string

Drill bit below, out of frame

Annulus, or bore hole

Chemicals can “daylight”

Drinking water can go turbid.



Dimock, PA



Clearville, PA

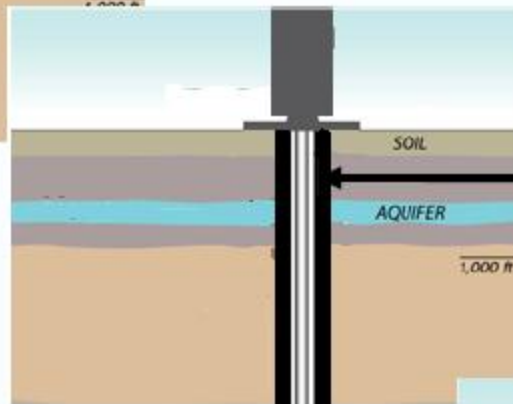
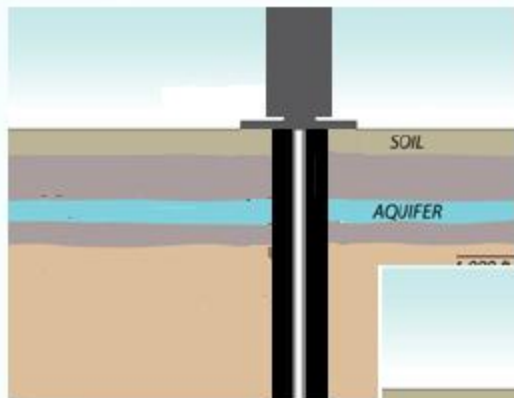


Hickory, PA

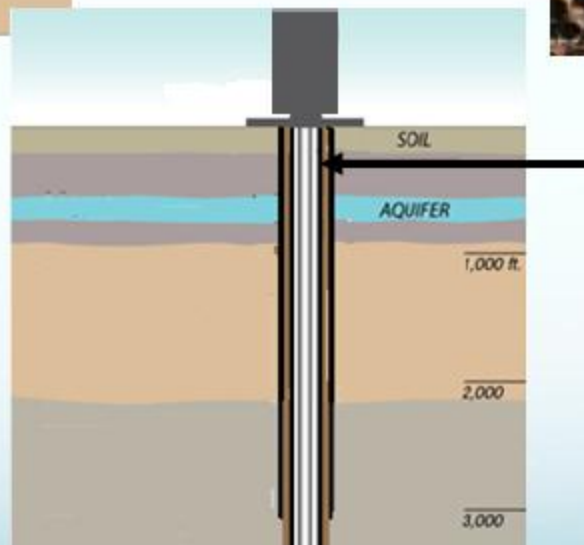


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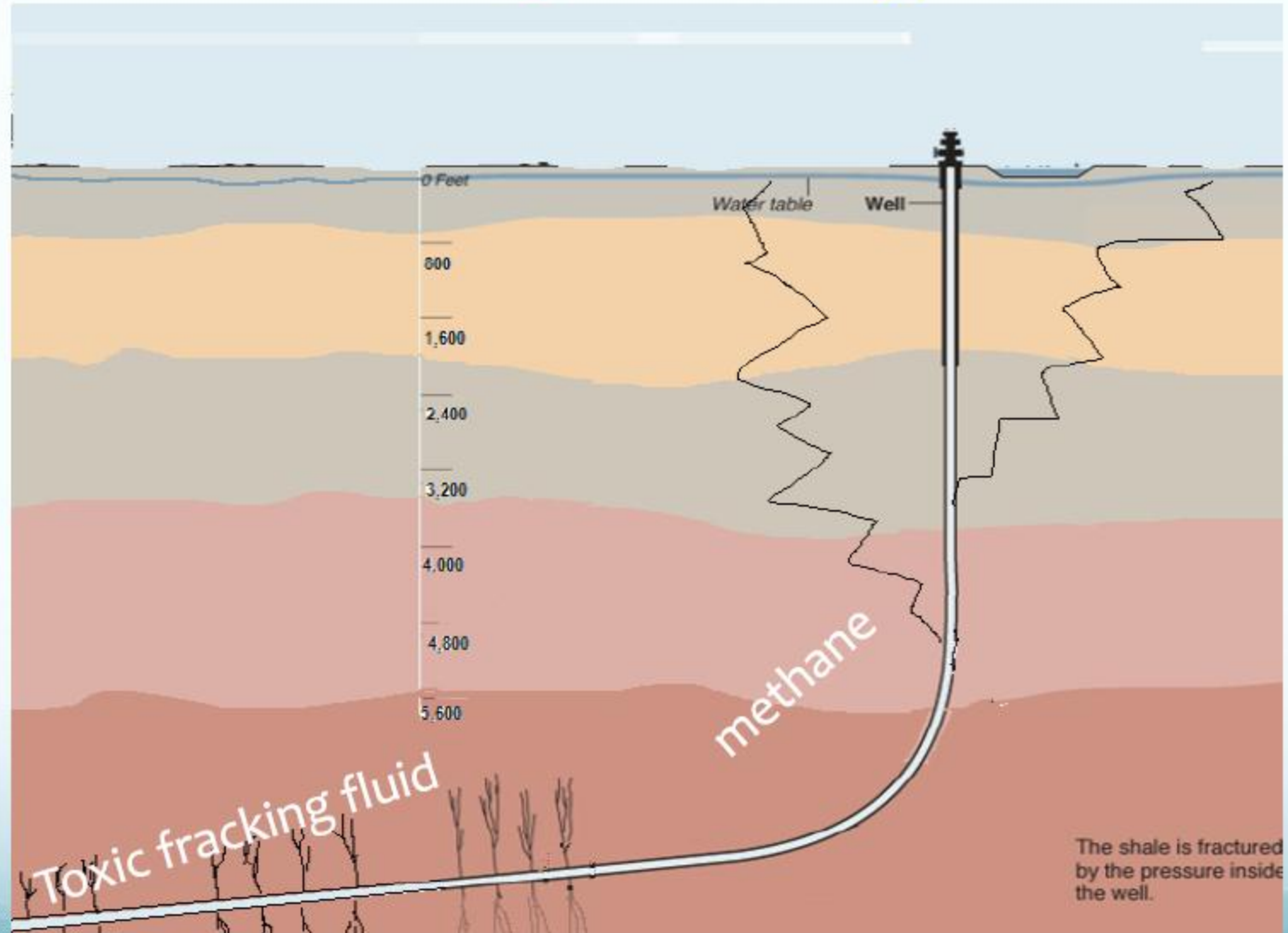
Sealing the bore hole



Adding steel casing helps seal hole from aquifer.

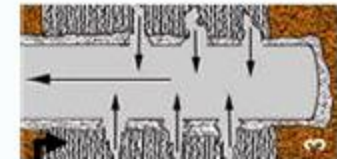
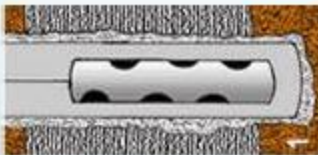
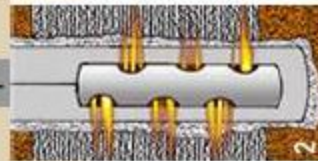
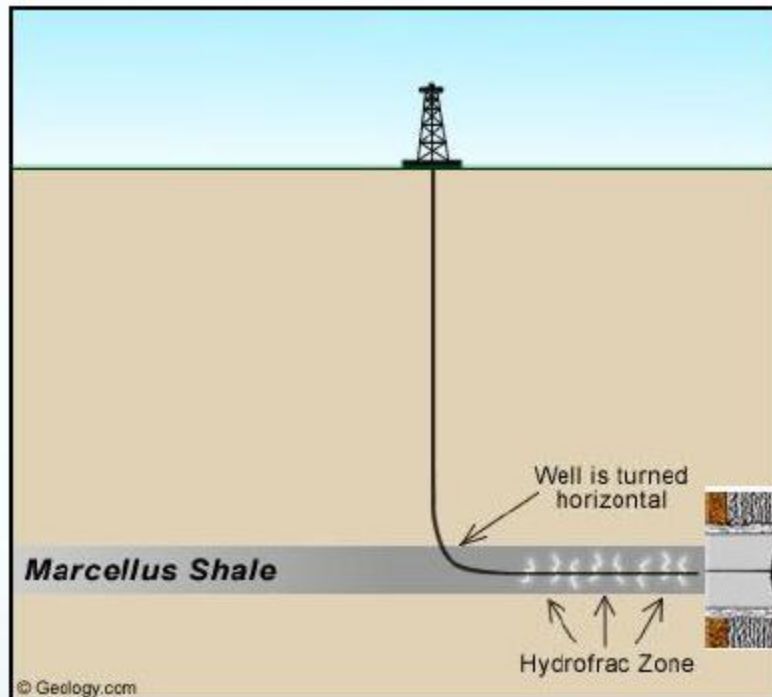


Failed Cement Job = Migration Through Natural Fissures



Step 10.

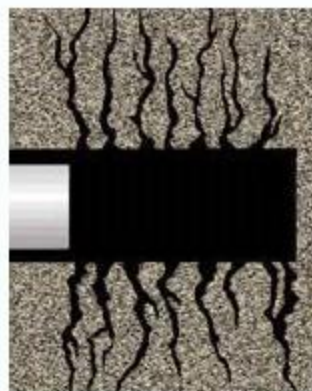
Perforating, or “perfing” the well



These ‘perfs’ can also damage the cement job, allowing methane and fluids to migrate in the annulus.

Step 11.

Acidizing the well



5,000 gallons of hydrochloric acid.

Halliburton's Acidizing Compound also often contains Hydrogen Fluoride

Step 12.

Fracking the well



Industrial in Scale



Step 13. Capturing the flowback waste



(Drilling fluid splashing past the liner, Dimock, PA, Spring 2009)

Step 14.

Trucking waste away to ...?



... waste that's 5 times saltier than sea water ...

Step 15.

Pumping the gas to market

Giant Diesel Engines



Compressor Station, Pleasant Ridge, West Virginia

Part Two: Impacts

First the Boom...



...Then the bust.

Tim and Christine Ruggiero
Denton, Texas



Waste fluid pond

Unknown gas
bubbles



Drilling mud spread on property.



Condensate tanks.



Original 2010 assessment: \$257,330.
Current 2011 Assessment: \$75,240.

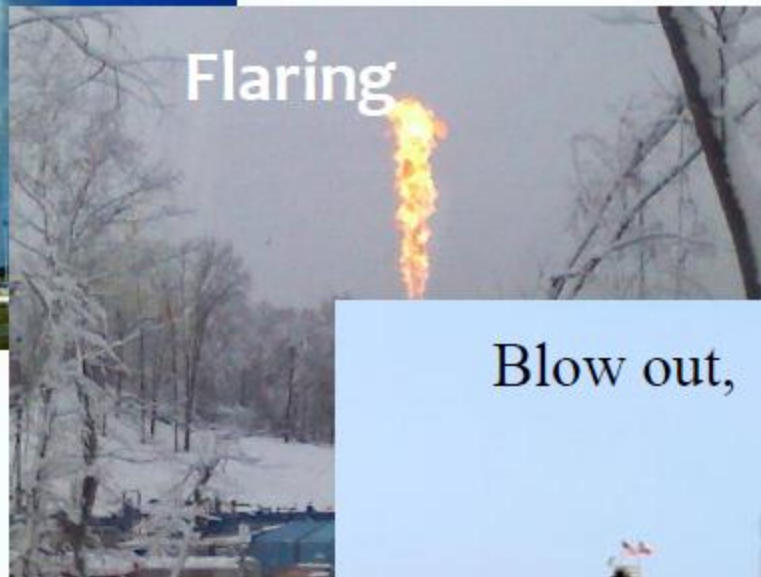
Noxious chemicals...

...from diesel-driven trucks and compressors can have serious health consequences on people, animals and plants. For humans this includes asthma, stroke, cardio-vascular disease and irritable bowel disorders.



Aruba Petroleum (Photo: Tim Ruggiero)

Gas emissions into the atmosphere



Fugitive methane (CH_4): A “greenhouse” concern

Optical Photography



Infrared photography



← Same Image →

Invisible emissions of dangerous gasses

Franklin, Texas

From: *NY Times* 10/14/09 Revkin and Krauss



Explosions and Fires



WATER: Quantity and Quality



CONSUMPTIVE WATER USAGE



Each frack job uses on average 3.5 million gallons of water. Billions of gallons of clean water used in the extraction process will be rendered toxic and radioactive - perhaps permanently.

Water, Water Everywhere & Not a Drop

...

The greatest danger in gas drilling is water pollution caused by spills, leaks, blowouts, and even methane migration.

Any contamination of ground water and aquifers is a threat to public health, wildlife and agriculture.

Water quality is not protected as drilling activities are exempted from the Clean Water Act and the Safe Water Drinking Act

Toxic Chemicals: A Threat to Our Water Supply and Public Health



- 40,000 gallons of chemicals are used in one well.
- 93% of these chemicals have adverse health effects.
- 60% are known carcinogens
- 40% are known endocrine disruptors.

Fracking is Not The Answer

- To our energy needs. Fracking creates similar environmental and health problems as oil. The U.S. already has plenty of gas but lacks the infrastructure to deliver gas to homes and businesses, so gas companies are looking to ship it overseas.
- To reducing greenhouse gases. Natural gas cannot work as a bridge fuel, because of fugitive methane emissions from production and leaking wells. Methane is a greenhouse gas 20 times more potent than carbon dioxide.
- To economic development and jobs. The extraction of gas through fracking creates jobs but destroys communities. The fracking process leaves behind a serious toxic problem rendering land in many cases unusable for farming, agriculture and residential uses.

Thank you

Many thanks to those who contributed photos and information to this presentation from across the country. A special thank you to the folks in the food and fracking network.

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