

**From:** [Gerry Wood](#)  
**To:** [fracking inquiry](#)  
**Subject:** FW: Hydraulic fracturing and water resources in Ohio  
**Date:** Tuesday, 10 October 2017 12:36:58 PM  
**Attachments:** [image001.png](#)

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I now its late but it has some good information  
Gerry

GERRY WOOD MLA  
Independent Member for Nelson  
Box 120  
Howard Springs  
Northern Territory, Australia 0835  
Nelson Electorate Office: 08 8999 6715  
[REDACTED]

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**From:** [REDACTED]  
**Sent:** Tuesday, 10 October 2017 12:19 PM  
**To:** Gerry Wood [REDACTED]  
**Subject:** Hydraulic fracturing and water resources in Ohio

## HYDRAULIC FRACTURING AND WATER RESOURCES IN OHIO: HOW TO PROTECT THE GROUNDWATER THROUGH PROPER WELL CONSTRUCTION AND CEMENTING PRACTICES



Tom Tomastik, Geologist,  
Ohio DNR, Division of Oil  
and Gas Resources  
Management

[http://www.gwpc.org/sites/default/files/event-sessions/19o\\_Tomastik\\_Tom.pdf](http://www.gwpc.org/sites/default/files/event-sessions/19o_Tomastik_Tom.pdf)

([Ground water protection Council](#))

Regards,

[REDACTED]

[REDACTED]  
Manager, Parliamentary Library Service  
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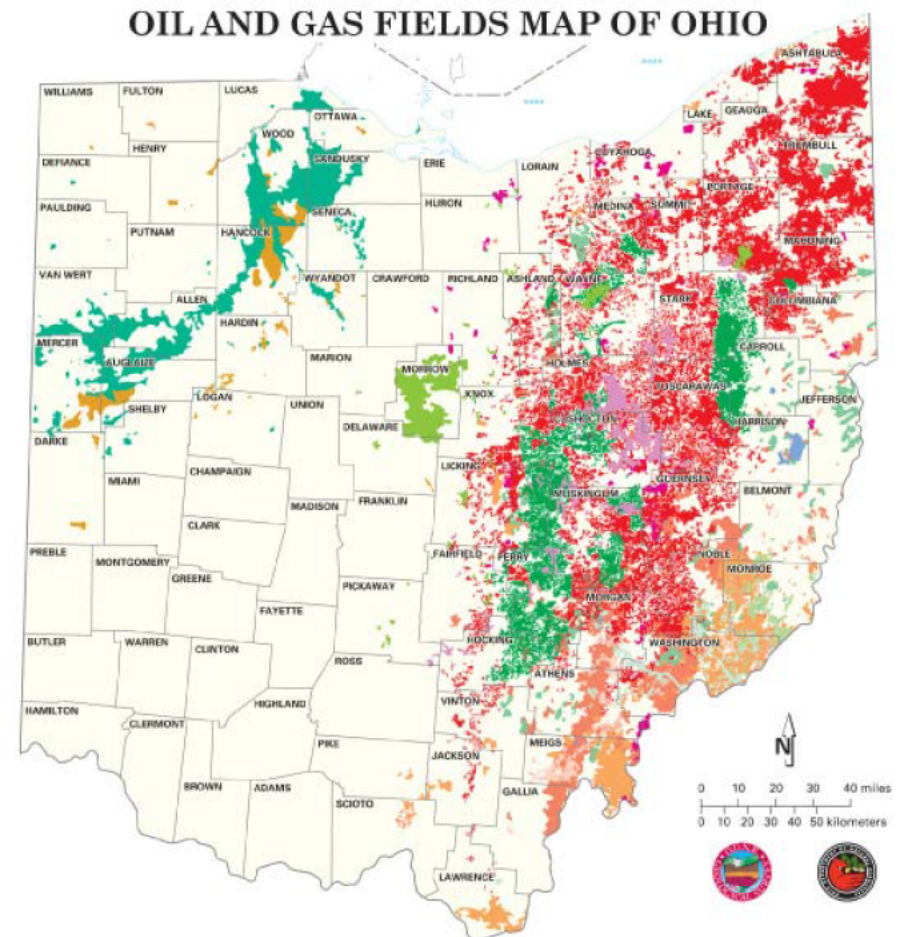
**HYDRAULIC FRACTURING AND WATER RESOURCES IN  
OHIO: HOW TO PROTECT THE GROUNDWATER THROUGH  
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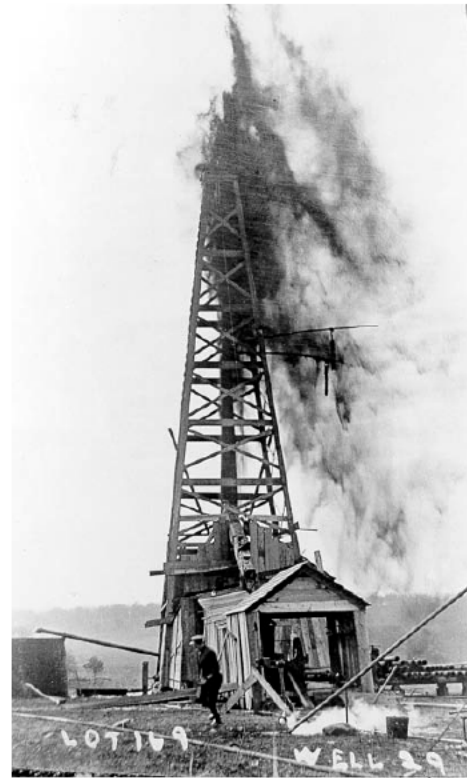
# OIL AND GAS DEVELOPMENT IN OHIO

- Historically, most oil and gas wells in Ohio have needed to be stimulated to make them economically viable
- Stimulation first started in the 1880s in the Trenton Limestone in the Lima-Findlay oilfield area



# INITIAL WELL STIMULATION TECHNIQUES IN OHIO

- Initially, oil and gas well stimulation methods used in Ohio involved explosives – mainly nitroglycerin
- Typical oil and gas wells were “shot” with one quart of nitro for every foot of reservoir rock
- This was the primary completion technique employed in Ohio until the advent of hydraulic fracturing



# HYDRAULIC FRACTURING IN OHIO

- Hydraulic fracturing was first used in Ohio in 1951 and met with considerable success – particularly in the tight, Clinton sandstone
- Hydraulic fracturing dramatically reduced the number of dry holes drilled in Ohio
- Tens of thousands of oil and gas wells have been successfully hydraulic fractured in Ohio since 1951

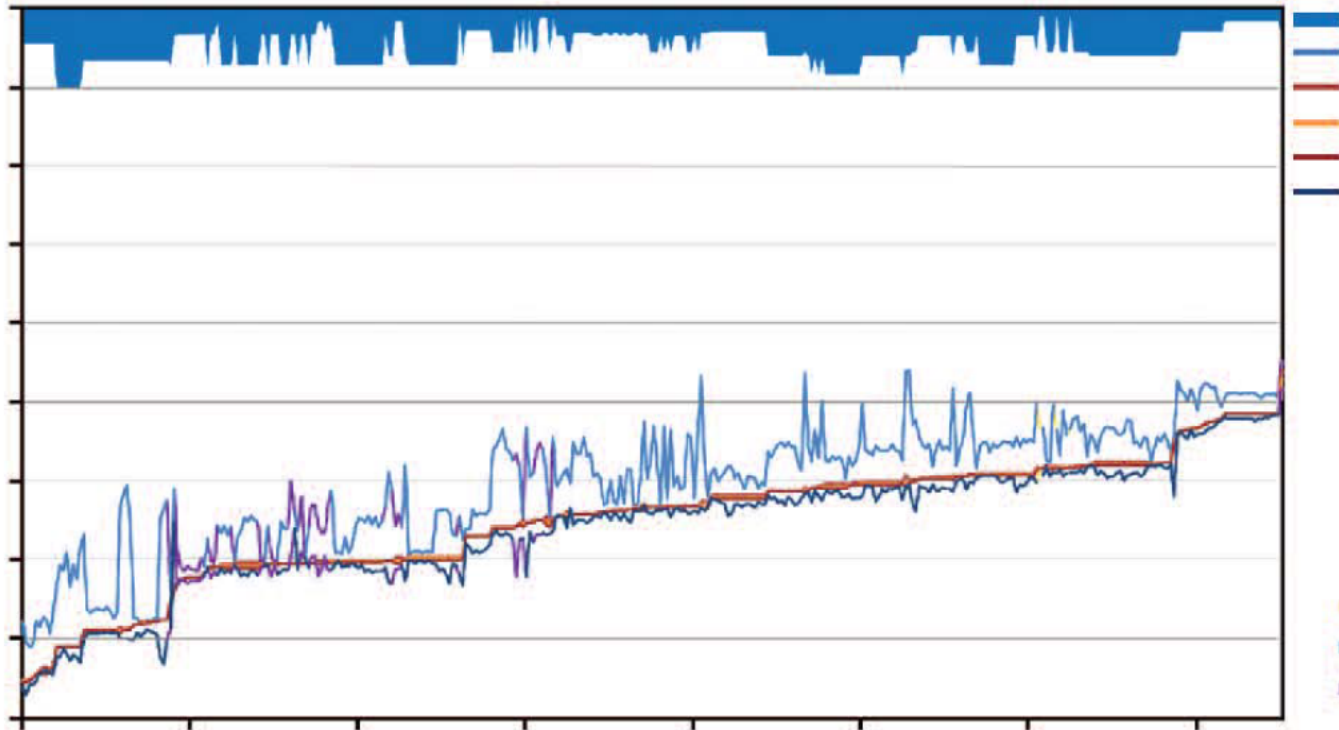


# MYTHS ABOUT HYDRAULIC FRACTURING

- There is a lot of misinformation out there regarding hydraulic fracturing!
- Ohio DMRM has conducted over 1000 groundwater investigations since 1983 and has no cases where hydraulic fracturing causing groundwater contamination



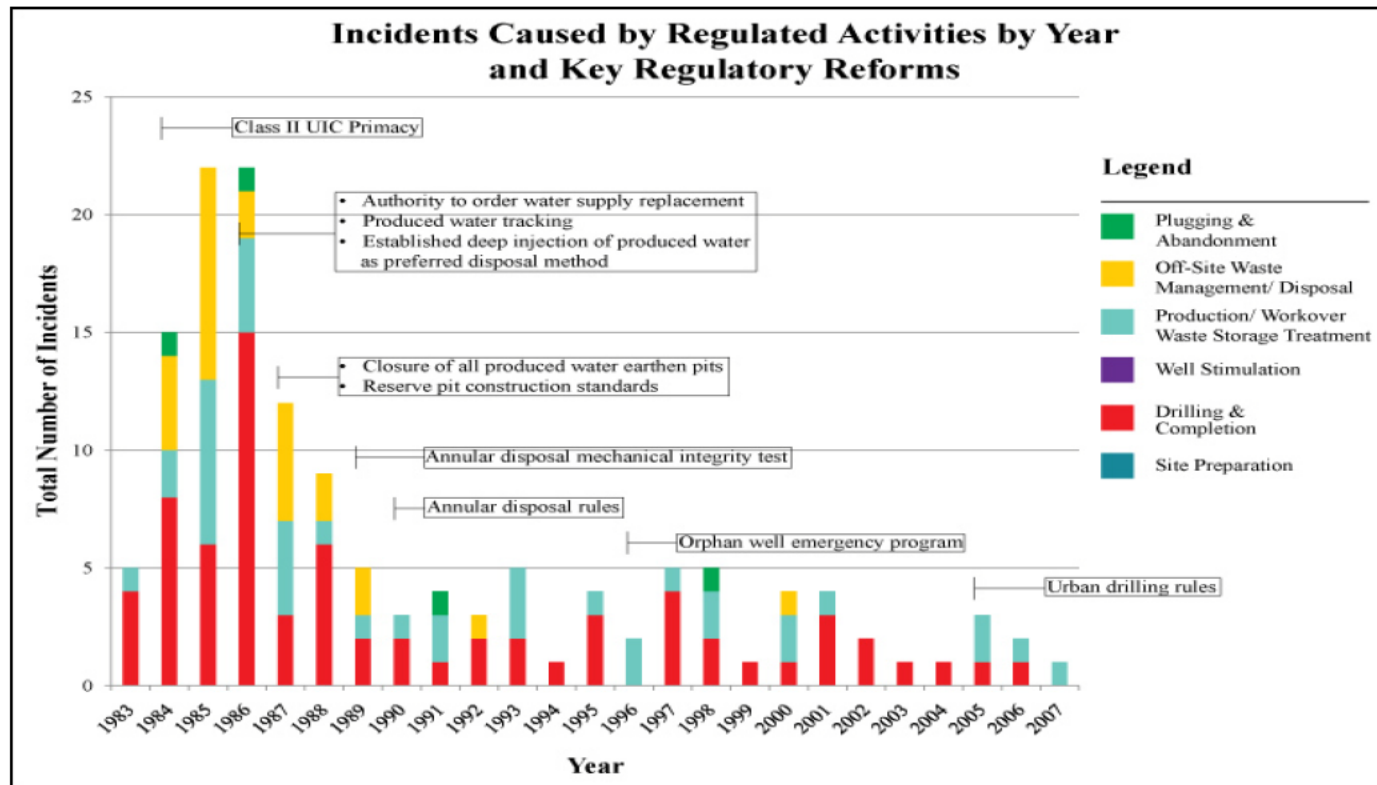
# REAL HYDRAULIC FRACTURING DATA – MARCELLUS SHALE FRAC HEIGHT DATA (FROM AMERICAN OIL AND GAS REPORTER & HALLIBURTON)



## POTENTIAL AVENUES FOR GROUNDWATER CONTAMINATION RELATED TO OIL AND GAS OPERATIONS

- Surface contamination – spills, equipment failure, pit leakage
- Bad cement jobs
- Poor or improper well construction
- Casing integrity issues
- Improperly plugged and abandon wells

# REGULATORY REFORM HAS HELPED!



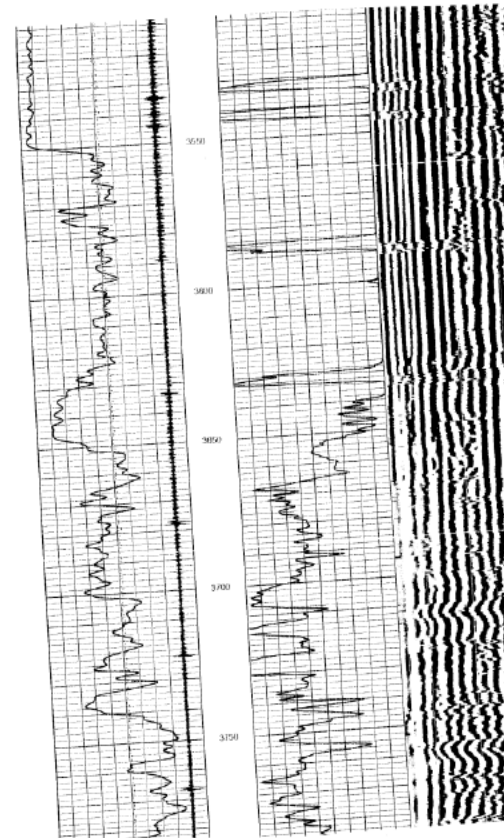
# SURFACE CONTAMINATION ISSUES

- Typically, a historical problem that has been eliminated by regulatory reforms
- Still can happen with poor practices
- More likely on conventional vertical wells



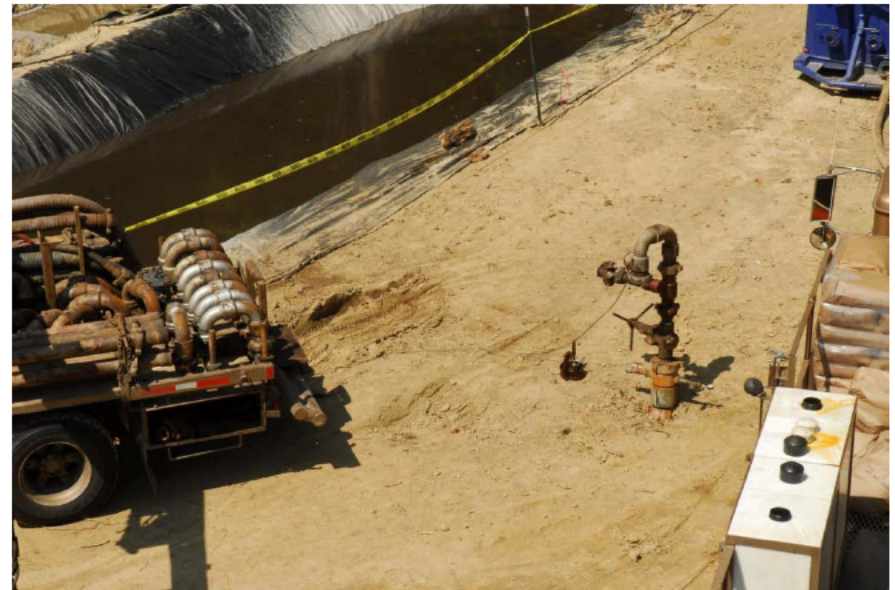
# BAD CEMENT JOBS

- Classic example of a bad cement job and a real bad stimulation decision
- Top of cement at 3648 feet on backside of production casing
- No remedial cementing prior to stimulation
- Perforated production casing from 3720 to 3740 feet
- Only 72 feet of cement above top perforation and most of that was less than 80% bond



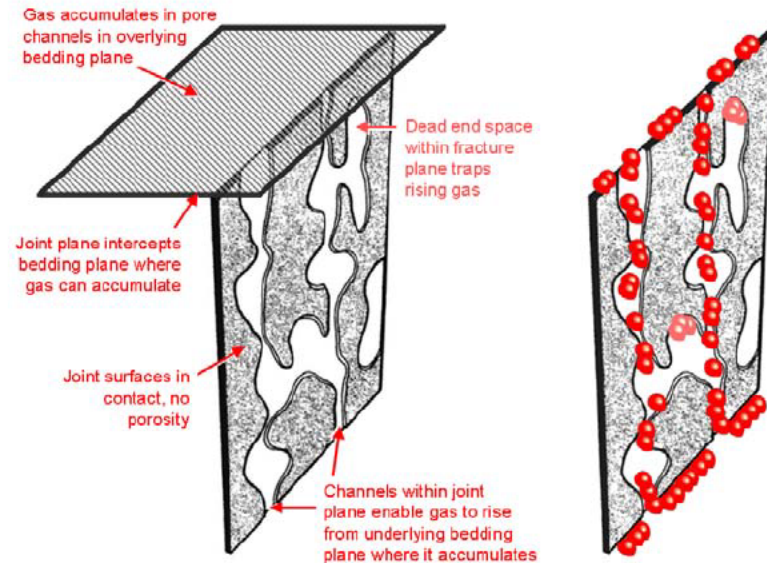
# BAD CEMENT JOB - CONTINUED

- No remedial cementing
- Well was hydraulically fractured
- Frac job circulated back to surface on backside of production casing halfway through the job
- Immediately shut down frac operation
- No contamination

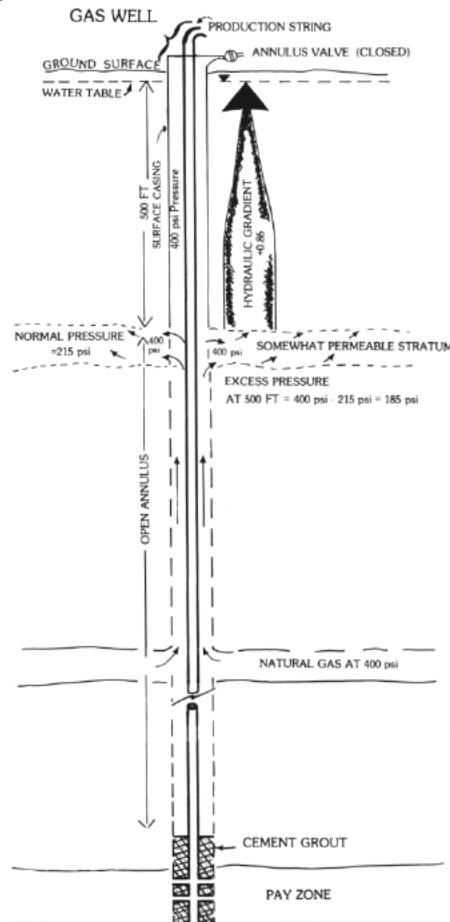


# BAD CEMENT JOB - CONTAMINATION

- Although the frac job did not cause contamination, the bad cement job allowed for natural gas migration up the backside of the production casing
- Surface-production casing annulus was shut-in, but gas pressure was occasionally blown down
- Pressure build-up allowed overpressurization of the annulus
- Allowed natural gas to migrate from annular space through natural fracture system into aquifers
- Took approximately 32 days to migrate into the aquifers



# ANNULUS OVERPRESSURIZATION



# BAD CEMENT JOB - REMEDIATION

- Remedial cementing conducted after initial contamination
- Deep natural gas source was eliminated with remedial cementing
- 26 water wells replaced due to natural gas invasion



# POOR OR IMPROPER WELL CONSTRUCTION

- Well construction issues can lead to groundwater contamination
- Inadequate surface casing or too deep of surface casing installation can lead to potential contamination from deeper brackish or brine formations
- Eliminated with required casing programs or intermediate casing strings



# CASING INTEGRITY ISSUES

- Casing integrity is a critical issue with well construction
- Ohio is drafting rules that will allow only used casing that has been drifted and tested prior to installation
- Ohio oil and gas inspectors still have the ability to reject any casing brought on site prior to installation



# IMPROPERLY PLUGGED OR UNPLUGGED ABANDONED OIL AND GAS WELLS

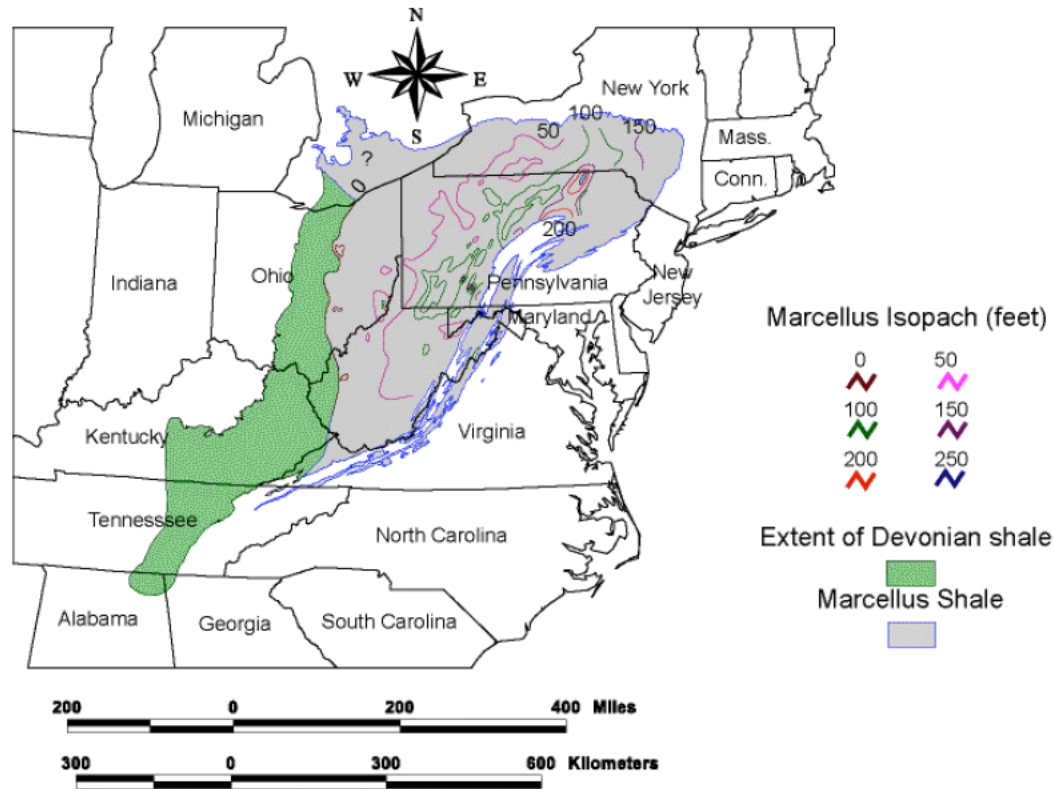
- In the Appalachian Basin, there are 1000s of old, improperly or “unplugged” oil and gas wells that pose a hazard for groundwater contamination
- Most of these wells were drilled between the 1860s to early 1900s
- Identifying historical legacy contamination versus current contamination issues can be a problem and difficult to resolve



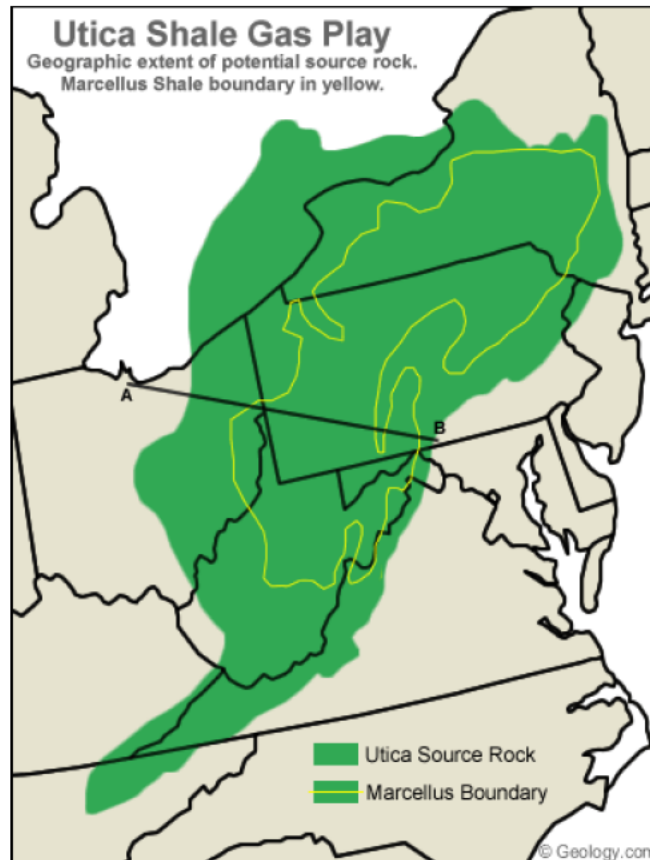
# POTENTIAL SHALE PLAYS IN OHIO

- Ohio has three potential shale plays
- Utica Shale – Point Pleasant Formation will be the dominant play – being compared to the Eagle Ford play of south Texas
- Marcellus will be pretty much limited to the eastern part of the state
- Maybe some minor activity in the Ohio Shale

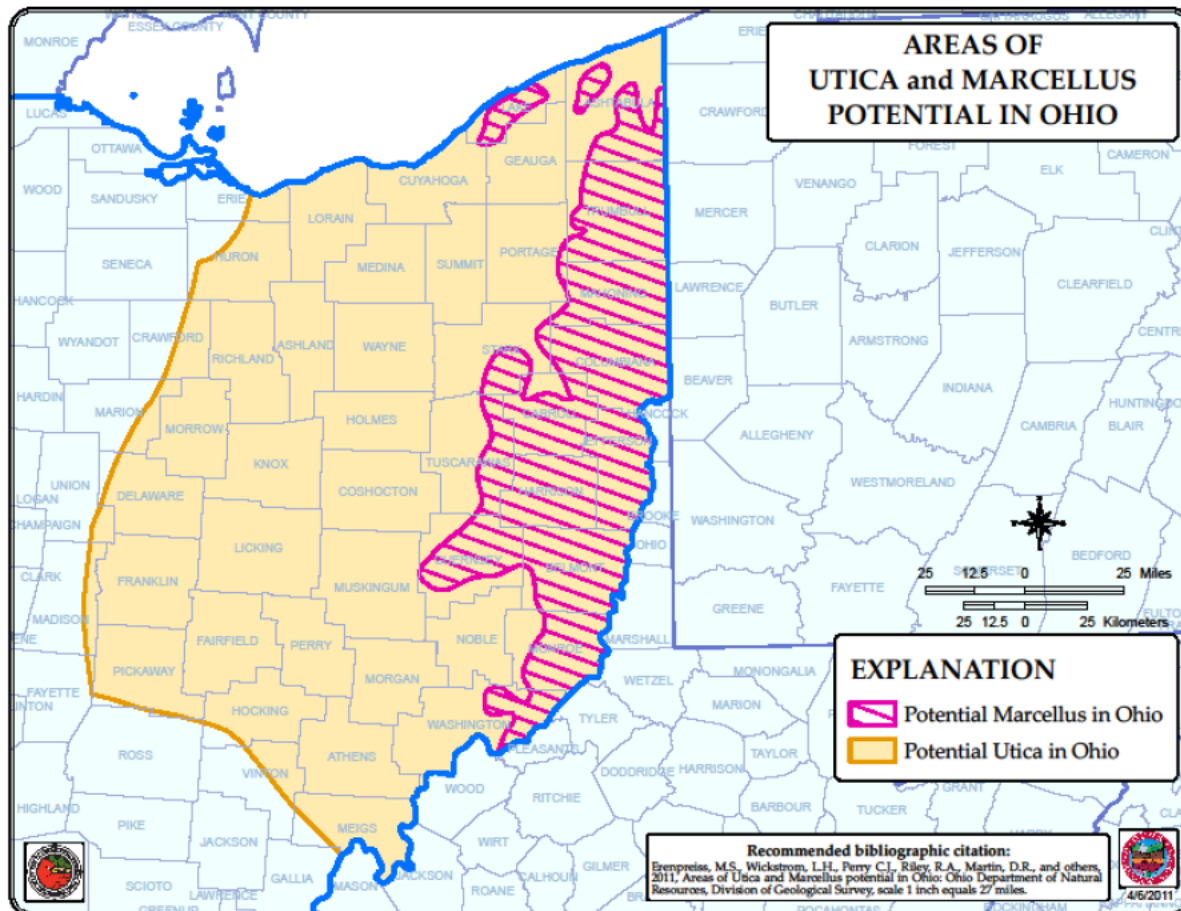
# EXTENT OF THE MARCELLUS SHALE IN THE APPALACHIAN BASIN (FROM OHIO DIVISION OF GEOLOGICAL SURVEY)



# LOCATION OF THE UTICA SHALE EXTENT IN THE APPALACHIAN BASIN

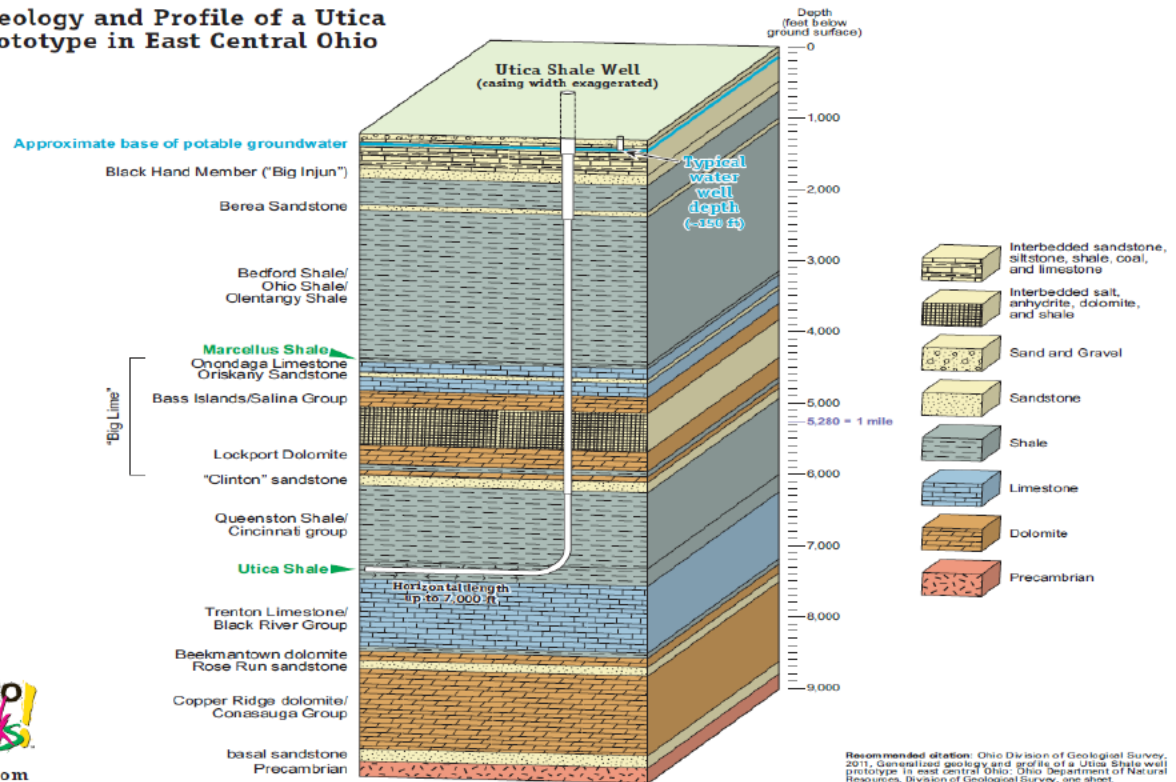


# AREAS OF POTENTIAL MARCELLUS AND UTICA PRODUCTION IN OHIO (FROM OHIO DIVISION OF GEOLOGICAL SURVEY)



# GENERALIZED GEOLOGY OF A UTICA SHALE WELL IN OHIO (FROM OHIO DIVISION OF GEOLOGICAL SURVEY)

Generalized Geology and Profile of a Utica Shale Well Prototype in East Central Ohio

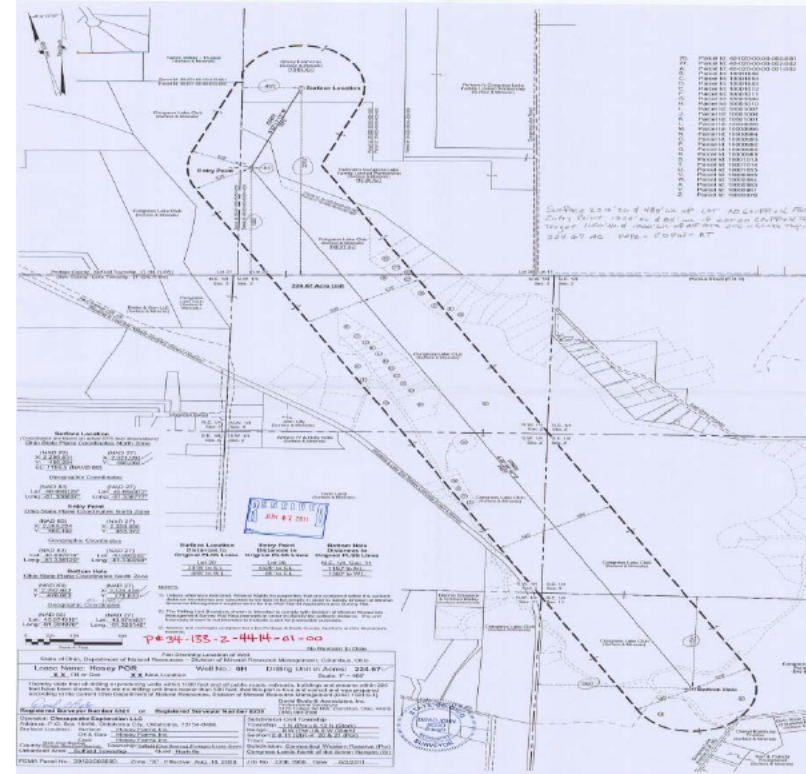


# CONCERNS WITH SHALE PLAYS AND POTENTIAL FOR GROUNDWATER CONTAMINATION IN OHIO

- The Division has identified several concerns dealing with the drilling and hydraulic fracturing of Marcellus and Utica wells
- Shallow fugitive natural gas zones that may lead to bad cement jobs or annulus overpressurization
- Potential for frac communication from new horizontal Utica wells into existing or plugged conventional Rose Run or Beekmantown oil and gas where the Utica Shale is exposed and uncemented

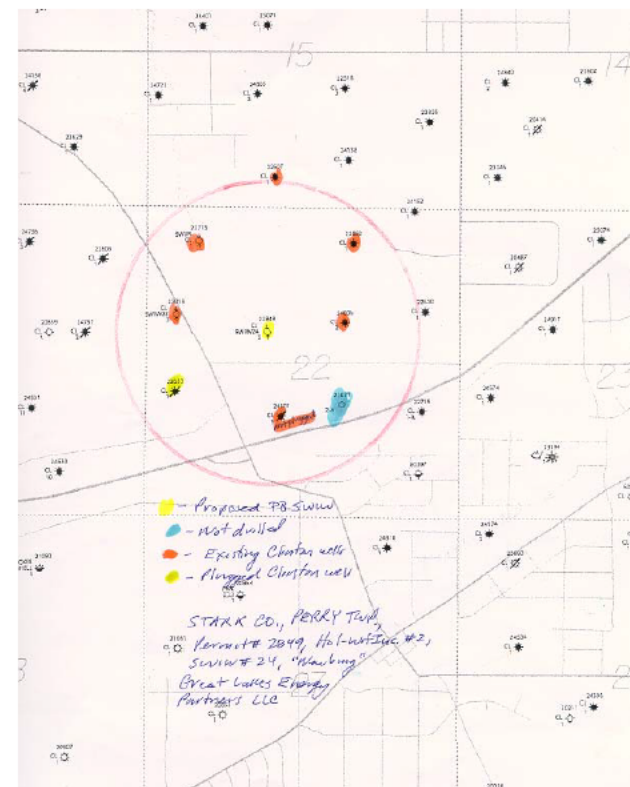
# TYPICAL LOCATION FOR UTICA HORIZONTAL WELL IN OHIO

- Horizontal Utica well unit location encompasses approximately 140 to 240 acres
- 5000 to 8000 foot laterals
- Typical existing vertical Rose Run or Beekmantown well drilled on a 40 acre spacing

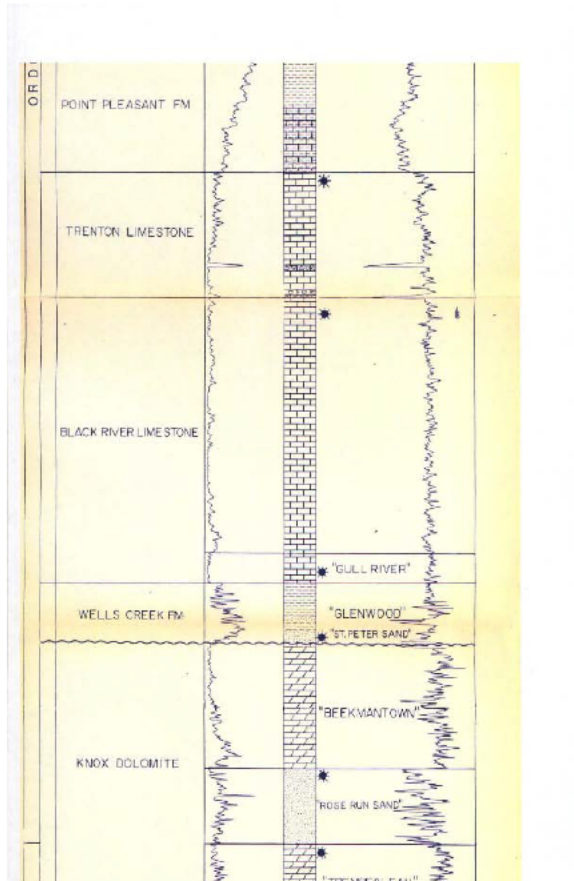


# REVIEW OF EXISTING WELLS

- We are still in exploration mode for the Utica Shale in Ohio
- Area of exploration is moving westward into central Ohio where there is existing production from deeper formations
- Need to review well construction and cementing of surrounding conventional oil and gas wells penetrating into or through the Utica Shale

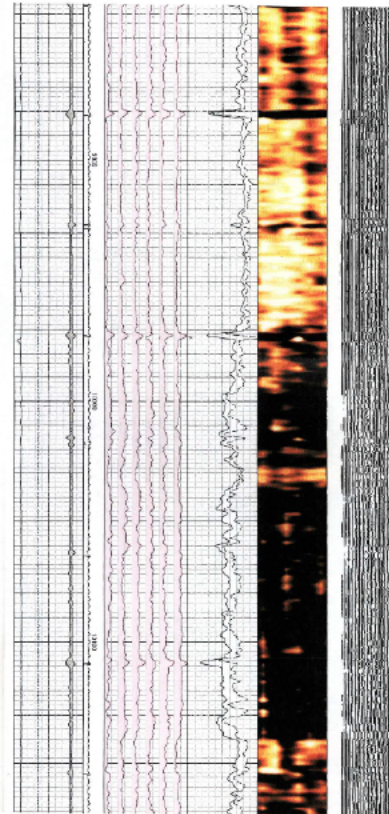


# TYPICAL DEEP PRODUCING WELL IN OHIO



# TYPICAL ROSE RUN WELL

- The Rose Run Sandstone occurs approximately 900 to 1000 feet below the Utica Shale
- Cementing of the production casing on these wells normally does not provide cement coverage across the Utica Shale
- Will need to research horizontal frac extension distances from the multiple-stage Utica Shale frac jobs to ensure no communication with existing deep vertical wells



## COOPERATION AND COMMUNICATION WITH THE OIL AND GAS INDUSTRY

- The Division has experienced good cooperation and communication with the oil and gas industry with the development of the shale plays
- Shale players have been very proactive in Ohio



# WATER SAMPLING

- The shale players are conducting pre-drilling water sampling programs in Ohio
- Sampling all water sources within 2500 to 3000 feet of the proposed drilling operation



# NEW RULES FOR WELL CONSTRUCTION

- The Division is working with the oil and gas industry in developing more stringent well construction standards for Ohio
- These rules are in draft stage and should be up for public review and comment later this fall
- Will strengthen construction standards and cementing practices

# CONCLUSIONS

- There has never been a groundwater contamination case in Ohio caused by hydraulic fracturing
- Continued changes in regulations over the years have dramatically reduced groundwater contamination caused by oil and gas activities
- New rules are being developed for more stringent well construction and cementing practices

# QUESTIONS?

