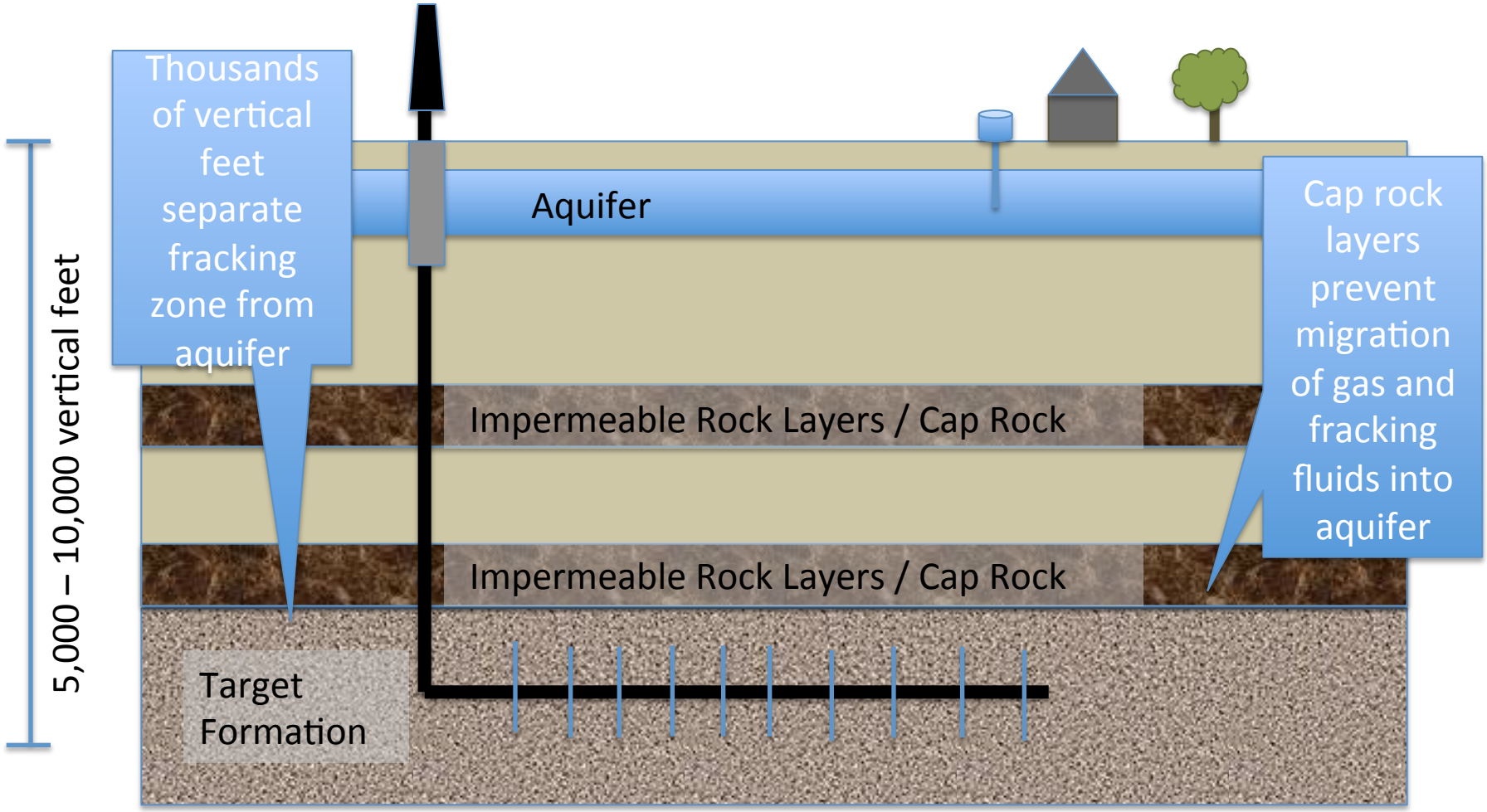
Traditional Hydraulic Fracturing

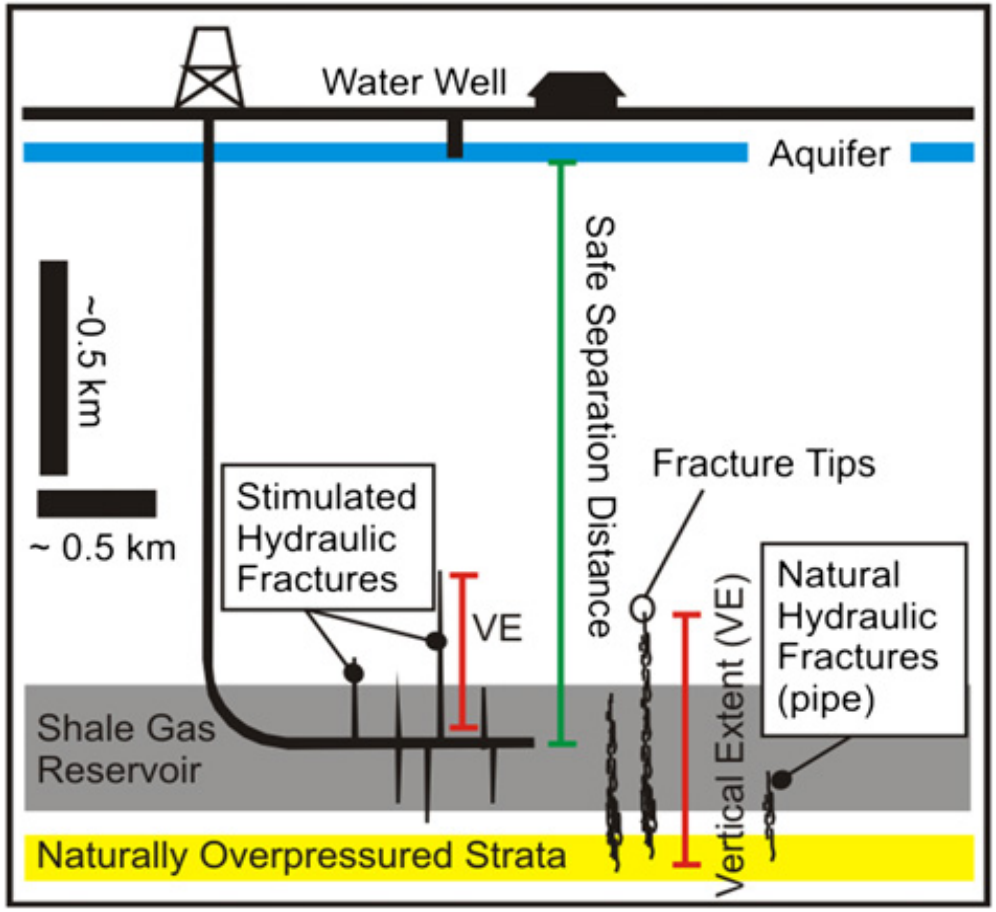


"Risks associated with leakage of the fracking fluid during the injection and fracturing job are reduced by:

- adherence to state well construction requirements;
- the vertical distance between the fractured zone and ground water;
- the presence of vertically impermeable zones between the fractured zone and the deepest ground water;
- the presence of vertically impermeable formation that act as geologic barriers to the movement of fluid from the fractured zone into ground water resources."

Department of Energy, State Oil and Gas Regulations Designed to Protect Water Resources. May 2009

Minimum Safe Vertical Distance: 0.5 km



Hydraulic fractures: How far can they go?

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a Durham Energy Institute, Department of Earth Sciences, Durham University, Science Labs, Durham DH1 3LE, UK
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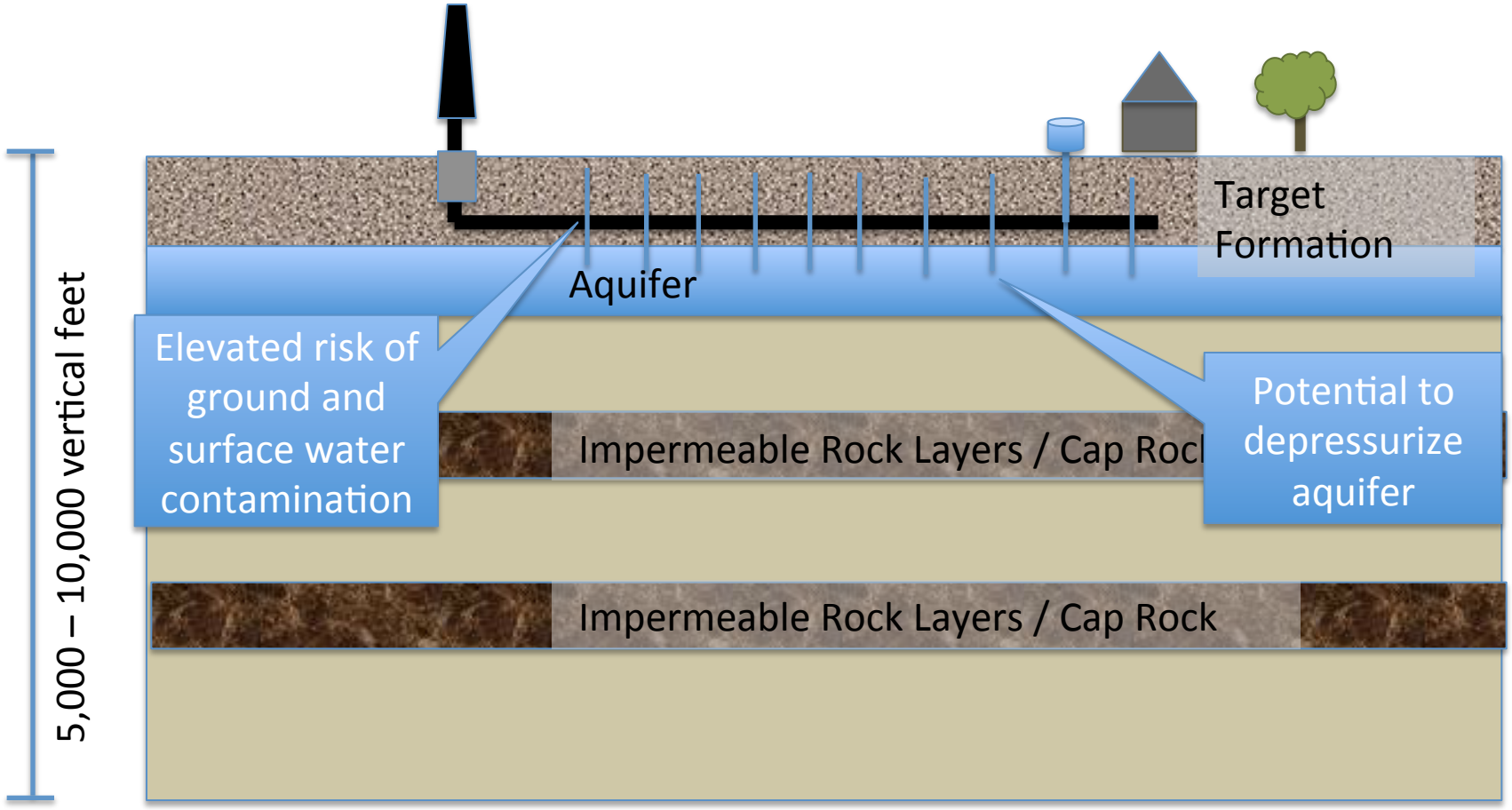
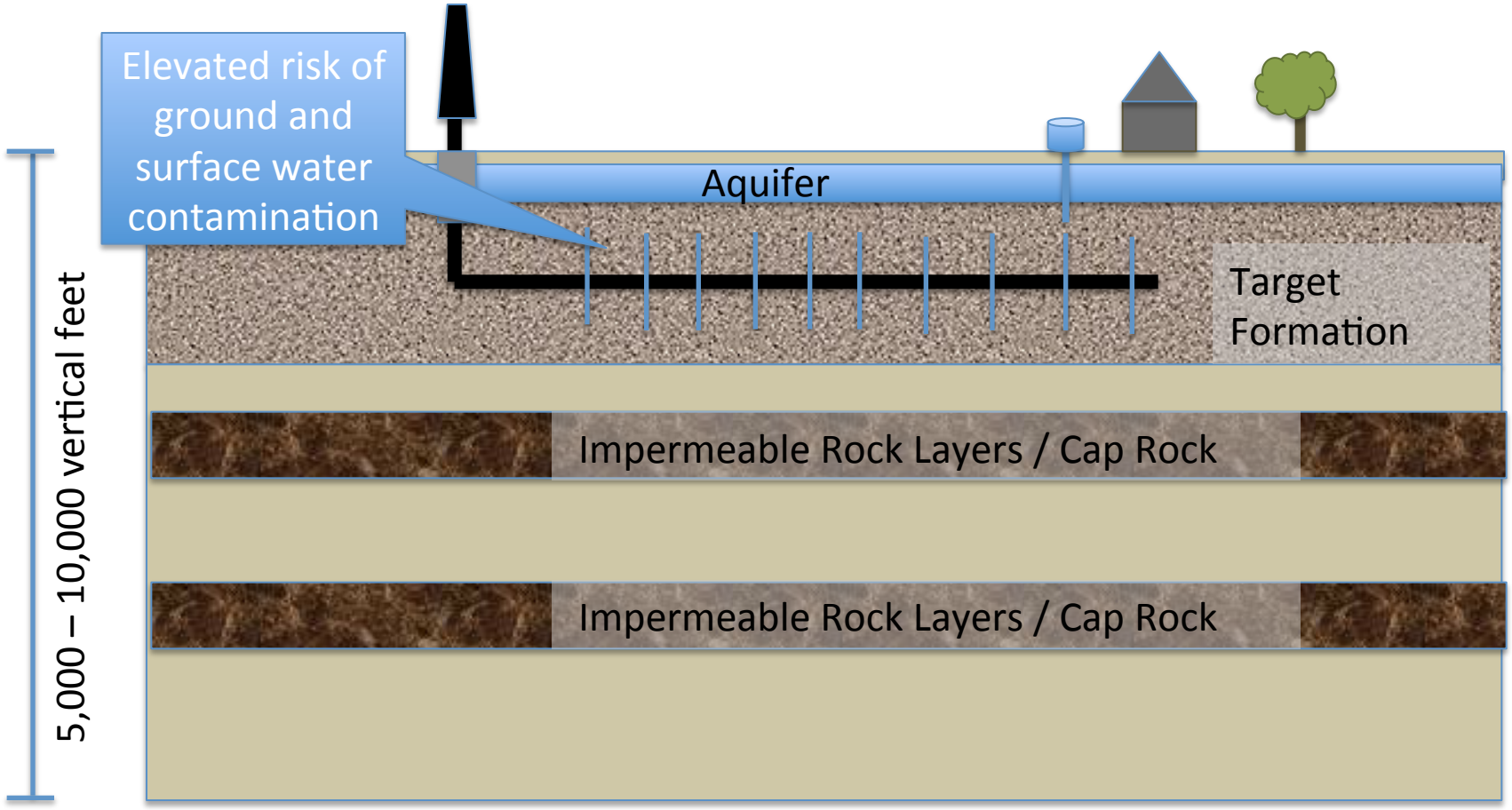
Marine and Petroleum Geology, April 21, 2012

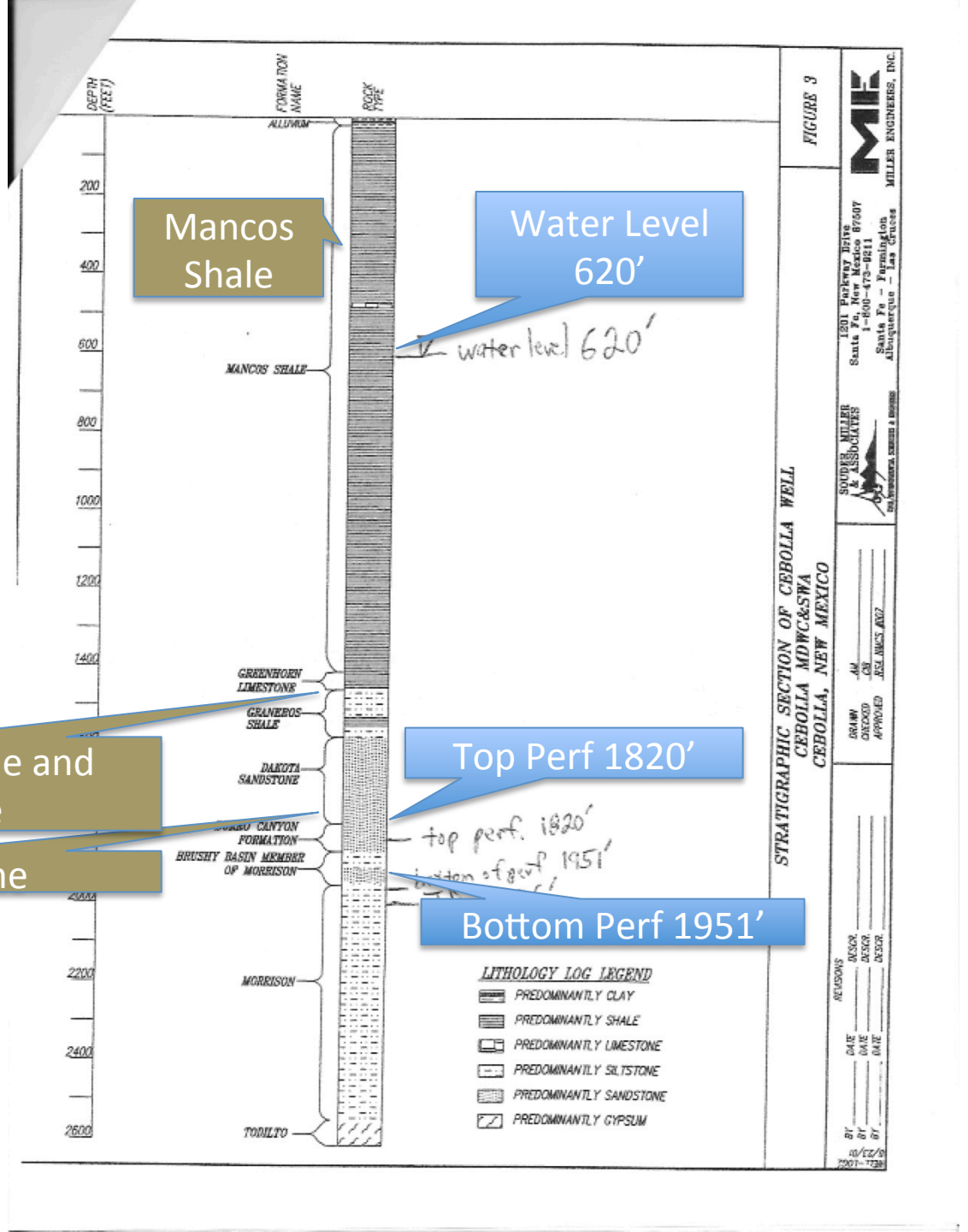
Shallow Hydraulic Fracturing with Aquifer Below Frack Zone (Cebolla)



Shallow Hydraulic Fracturing with Aquifer Above Frack Zone



Community Well Cebolla, New Mexico



Ground Water and Energy Development in the San Juan Basin

William J. Stone, *Los Alamos National Laboratory*

The San Juan Basin is classified as an arid region: most of the area receives less than 10 inches of precipitation a year. Mean annual precipitation in marginal mountainous regions may be as much as 30 inches a year, but surface water is scarce, except for the San Juan River and its tributaries in the northern part of the basin. Most water users, therefore, depend on ground-water supplies. The San Juan Basin contains a thick sequence of sedimentary rocks (more than 14,000 ft thick near the basin center). Most of these are below the water table and therefore saturated with ground water (Fig. 1). Many of these are the very same strata that contain the energy resources of the San Juan Basin: coal, oil, gas, and uranium. Water plays a key but varying role in the development of each of these energy resources. The purposes of this paper are to 1) briefly describe the ground-water resources of the San Juan Basin and 2) suggest their role in energy-resource development there. Information presented comes from various previous studies done by the New Mexico Bureau of Geology and Mineral Resources, or by New Mexico Tech graduate students funded by the bureau.

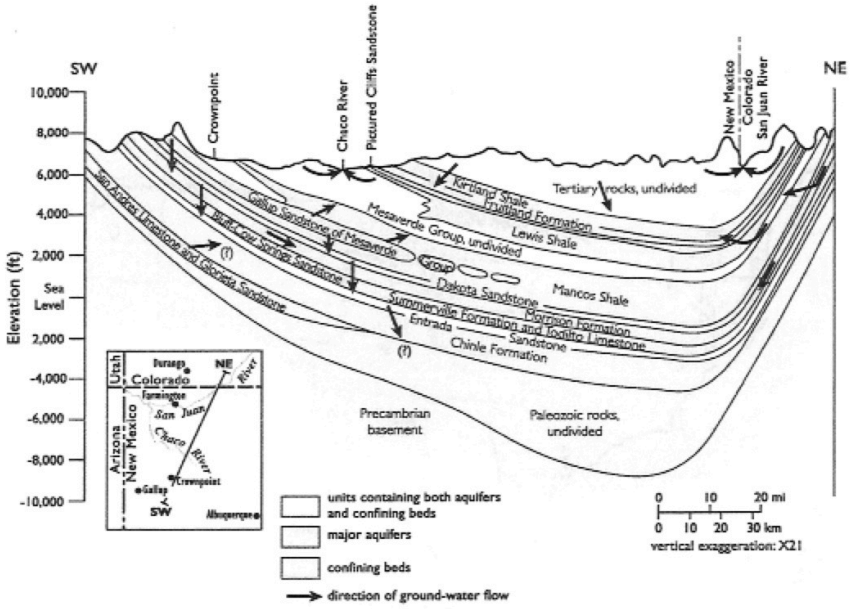
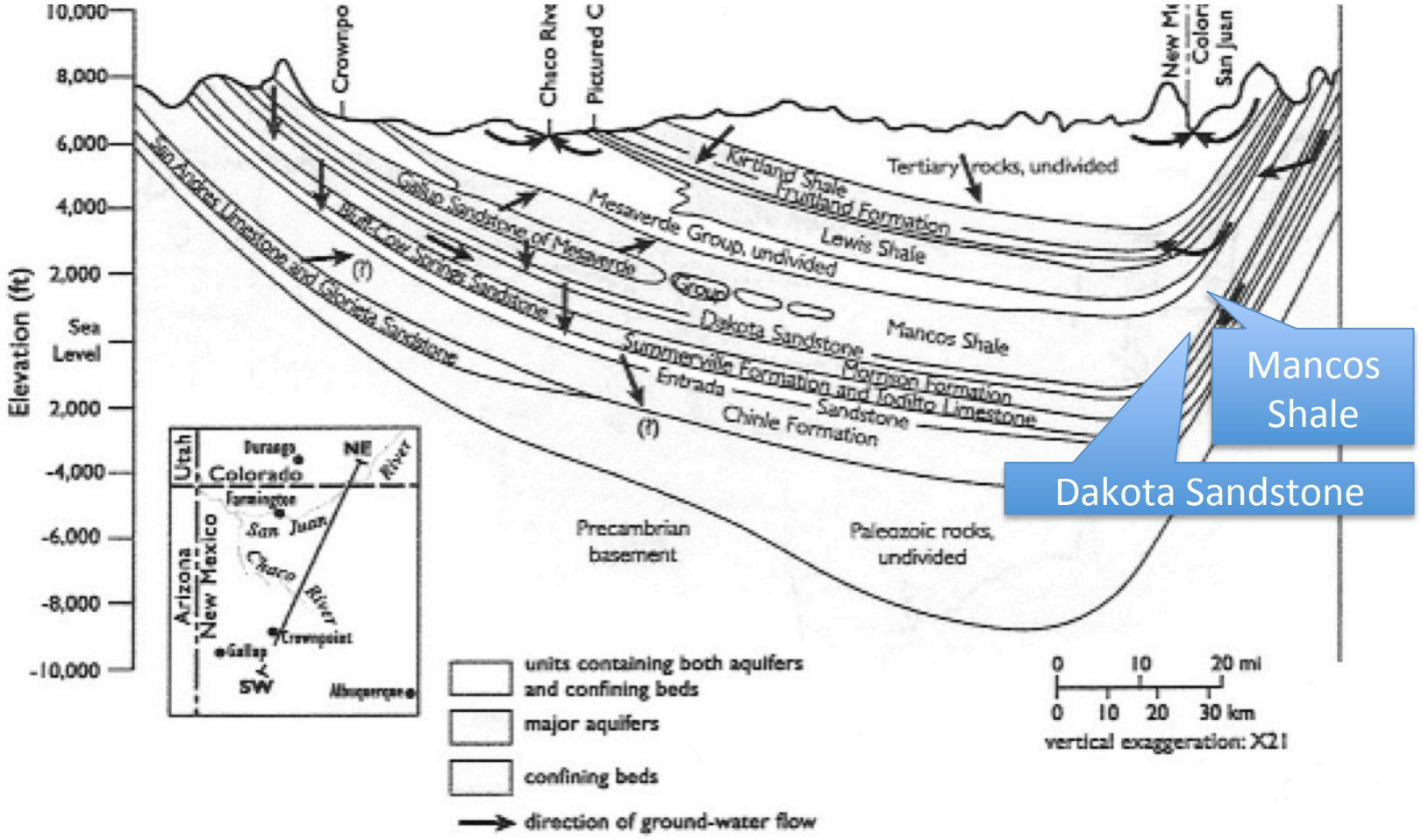


FIGURE 1 Hydrogeologic cross section of the San Juan Basin. Major aquifers are blue, confining beds are green; units containing both are crosshatched.

Geology Overview



Target Reservoirs NE San Juan Basin

"Cretaceous rocks in the southern and southwestern part of the San Juan Sag generally dip northeasterly away from the Archuleta Anticlinorium that separates the San Juan Sag from the San Juan Basin. The primary reservoirs are the Dakota and possible fractured shale of the Mancos. The Mesa Verde is also a potential objective in the northeastern part of the SJPL in the San Juan Sag area. The Dakota and fractured Mancos Shale potential is considered to be high in this part of the SJPL where Cretaceous outcrops and subcrops are not covered by thick volcanic flows."

San Juan Public Lands Draft Resource Management Plan

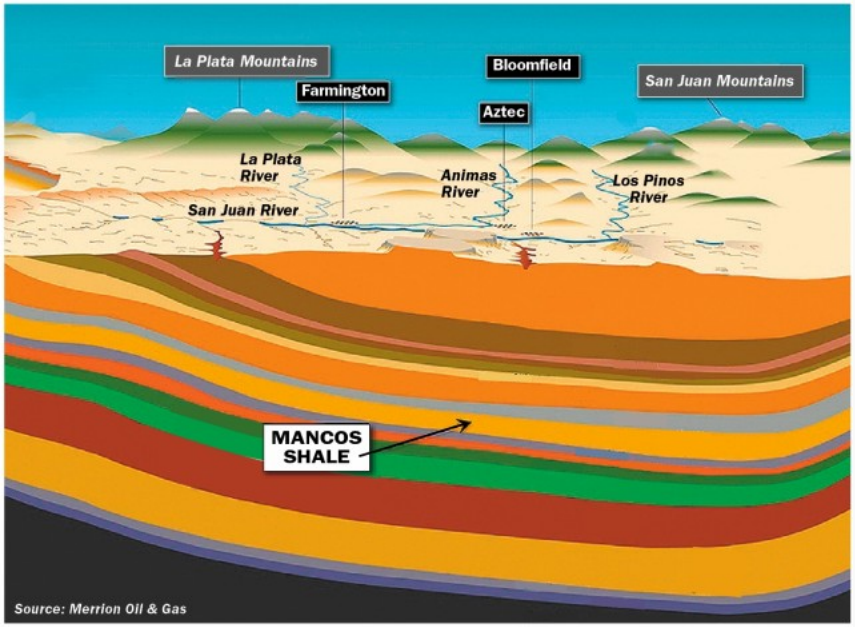
(p. 3.261 and 3.263)

MANCOS SHALE TARGET AREA
Oil Fairway - 3,400 square miles overlapping
San Juan, Rio Arriba, McKinley and Sandoval counties
Cortez
Durango
Pagosa Springs
UTAH
ARIZONA
COLORADO
NEW MEXICO
Chama
Farmington
Aztec
Bloomfield
RIO ARRIBA
64
Taos
491
SAN JUAN
84
SANDOVAL
McKINLEY
Santa Fe
25
550
Gallup
map area
40
Albuquerque
25
N
Grants
40
Albuquerque
50 miles
SOURCE: Merrion Oil & Gas
JOURNAL

Prospects good for N.M. oil, gas boom

By Kevin Robinson-Avila / Journal Staff Writer

FOR THE



(Merrion Oil & Gas)

RECORD: *This story should have said two wells drilled by WPX Energy Inc. have each produced 2 million cubic feet of natural gas and are expected ultimately to produce between 5 million and 6 million cubic feet each.*

FARMINGTON — Preliminary results from Mancos shale wells in northwestern New Mexico are boosting industry excitement about a new oil and gas boom in the region.

Companies must learn a lot more about the shale formation before any gushers explode, but some of the 22 exploratory wells drilled to date have shown solid commercial potential for oil and gas production, according to industry executives who attended a conference this week in Farmington to discuss production potential in the Mancos play, a previously untapped section of the San Juan Basin.

WPX Energy Inc.'s director for the San Juan Region, Ken McQueen, said two horizontal wells that WPX drilled in a dry natural gas section of the Mancos are some of the company's best wells anywhere. Oklahoma-based WPX is one of the nation's 10 largest natural gas producers.

"These two wells are in the top 10 best wells drilled by WPX to date," McQueen said. "They're quite extraordinary for us."

In places like Cebolla, NM and Chromo, CO the Mancos layer rises very close to the surface and to aquifers.

No impermeable formations or vertical distance exist to protect water resources.

Is Shallow Fracking a Real Threat?

- To date, shallow fracking has not been the norm because geostatic pressures at shallow levels are often insufficient to contain commercial quantities of gas

- The new quest for oil in the Mancos shale opens up the prospect of shallow fracking in northern New Mexico and southern Colorado.

- The fact that BLM leases are being nominated in areas where the Mancos shale is close to the surface indicates intent to develop this resource.

How Can We Protect Our Water?

- No local, state or federal regulation exists to address fracking at shallow depth or in immediate proximity to usable water resources.

- Communities, therefore, have no means of preventing what may be irrecoverable damage to their critical water resources.

Recommendations

- Geologic and hydrologic testing should be required prior to fracking at shallow depths to determine proximity of the target formation to water resources and potential geologic hazards

- Baseline water testing should be required prior to any drilling activity

- Assessment of water-related infrastructure (dams, domestic wells, tunnels) and potential risks to that infrastructure should be included in any environmental assessment prior to leasing or drilling.

- Safe vertical distance minimum separations, geologic conditions and technical guidelines should be developed and incorporated into state and federal rules

- Hydraulic fracturing should be prohibited where a high risk of water contamination or aquifer depressurization exists.