

NEWSLETTER

Serving the Petroleum and Geothermal Community

Nevada Petroleum Society; P. O. Box 11526; Reno, NV 89510

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Dinner Meeting: Thursday, Jan 5, 2012

Speaker: Jerry Walker
Consulting Geologist
Reno, Nevada

Title: Reservoir and Trap at Sans Spring Field
Railroad Valley, Nevada

Place: Ramada Reno Hotel, Washoe Room
1000 East 6th Street, Reno, Nevada

Agenda: Cocktails begin at 6:30 PM
Dinner Served at 7:00 PM

Dinner Costs:

NPS Members \$ 20; Non-Members \$23; Students \$10

Menu

Buffet style; including chicken & beef entrees, side dishes and salad.

****RSVP**

RSVP Tuesday Jan 3, 2012

Diane Phillips (775) 267-4663 or trailsend@pyramid.net

► **ABSTRACT – NPS Monthly Dinner Meeting – Jan 5, 2012**

Reservoir and Trap at Sans Spring Field Railroad Valley, Nevada

How can a thousand-barrels-per-day discovery be surrounded by dusters? That is the question anyone involved with Sans Spring Field has likely asked themselves. Instead of developing into a commercial Trap Spring-like accumulation, Sans Spring's initial success only encouraged continued industry investment that failed to deliver any semblance of a reasonable return. Sans Spring Field is the poster child of exploratory triumph and developmental disaster.

Cenex discovered Sans Spring Field in February 1993 at their #5-14 Federal well (SW/4 NW/4 Section 14, T7N, R56E, Nye County, Nevada) when oil flowed to the surface during a drill-stem test of volcanics from 5,720 ft to 5,803 ft. After reaching TD 8,463 ft in Paleozoic rocks, Cenex plugged back the well and completed it, flowing 1,253 barrels per day of water- and gas-free, 28° API gravity oil from celadonite*-altered and silicified, welded, rhyolitic tuff of the Tertiary Garrett Ranch volcanics. It produced 160,039 barrels of oil and 1,052,873 barrels of water through March 1998, at which time it was shut-in.

Success was quickly followed by failure and hints of complexity. The Cenex #8-15 Federal well encountered the Garrett Ranch volcanics 103 ft high to the discovery well, but a drill-stem test only recovered 717 ft of mud and water. The second attempt to confirm the discovery was initially a failure. The Cenex #12-14 Federal cut the Garrett Ranch volcanics 184 ft low to the discovery well. A drill-stem test of the volcanics, however, did recover specks of oil in the sample chamber, encouraging a re-drill.

The original wellbore was sidetracked to the north, penetrating the Garrett Ranch volcanics 89 ft low to the #5-14 discovery. This wellbore was completed pumping 168 barrels of oil and 168 barrels of water per day. The water-cut rapidly increased, and production was terminated after only five months. Cumulative production was 12,298 barrels of oil and 17,489 barrels of water. These results were interpreted to indicate that the sidetrack was completed near the oil/water contact.

A 3D seismic survey was subsequently acquired over the field prior to additional drilling, with the expectation that these seismic data would provide the necessary resolution to delineate additional drilling locations. The Cenex #12-14B Federal well was the first test drilled after the 3D seismic. Although it found the top of the Garrett Ranch volcanics nearly flat to the discovery well and 59 ft high to the volcanics in the #12-14 sidetrack, the #12-14B was plugged and abandoned after a drill-stem test only recovered 5 ft of drilling mud.

Two additional dry holes have been drilled in the elusive search for Sans Spring oil – the Cenex #14-11 Federal and the Makoil #15-41 Sans Spring. Only the Big West #5-14A Sans Spring-Federal well, a 10-acre offset to the discovery well, has been successfully drilled as a producing oil well, initially pumping 967 barrels of oil per day. Through April 2010 it has produced 110,838 barrels of oil and 3,203,201 barrels of water. Total field production through April 2010 is 283,175 barrels of oil and 4,273,563 barrels of water.

The Sans Spring prospect was defined using subsurface data from three offsetting wells, and gravity, aeromagnetic, and 2D seismic data. A fault-bounded structure in the Garrett Ranch volcanics was interpreted, with potential reservoir development analogous to the fractured welded tuffs in Trap Spring Field. The play concept was modified to include truncation of the productive volcanic unit in the #8-15 Federal well to explain

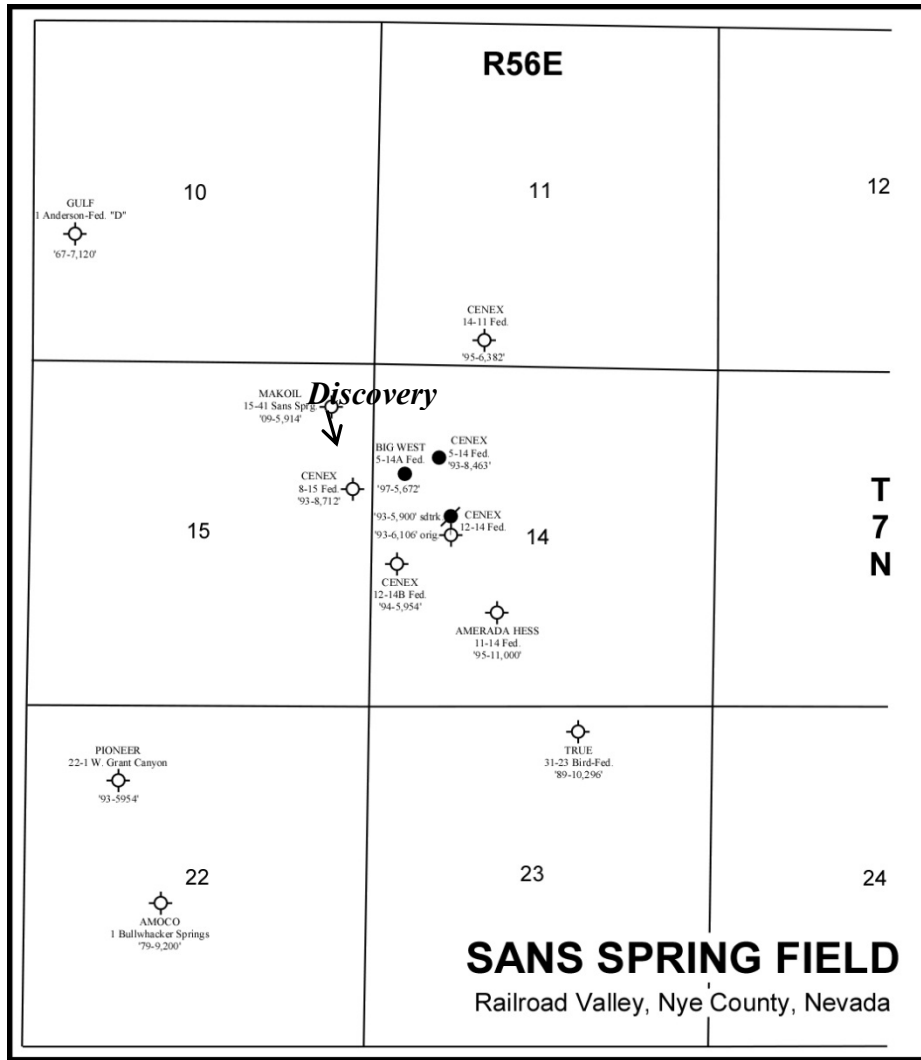
water recovery from structurally high Garrett Ranch volcanics. This model was valid until the drilling of the #12-14B Federal well. Although the productive welded tuff is present in this well, the #12-14B did not develop reservoir permeability. Thus, an explanation for the limited development of reservoir permeability is required. Petrographic analysis by Jeff Hulen of cuttings from tuffs in the discovery well indicated that the upper, productive volcanic interval is composed of hydrothermally altered rhyolitic tuff. He concluded, "Quartz-lined fractures and vesicles as well as partially open quartz veinlets clearly account for much of the porosity apparently now occupied by oil." The lower tuff, however, is a non-porous, tight, dacitic tuff that lacks vapor-phase vesicles, quartz veinlets, and silicification. Thus, reservoir-quality porosity and permeability in the welded tuff required hydrothermal alteration.

Drill-stem test data demonstrate that the upper productive tuff is characterized by both high and low permeability compartments. Horner plots show that depletion occurred in some wells during the short flow periods of the tests.

Sans Spring Field is a combination structural/diagenetic trap with an overprint of erosional truncation. The structural trap is defined by a northeast-plunging nose broken by north-northwest trending normal faults. These faults provided pathways for hydrothermal fluids to collect in a pre-valley fill structural high and selectively react with the rhyolitic tuffs, creating discrete, limited volumes of excellent permeability.

Postscript: This story of reservoir and trap could not be told with the abundant DST's and rock work initiated by Cenex during development of this oil accumulation. A wide breadth of information is required to begin to understand Nevada's complex geology. New notions and technologies must be continually tested.





**Celadonite* is a greenish, monoclinic, clay-like mineral that replaces ferromagnesian silicate minerals in altered volcanic rocks; it occurs as minute micaceous scales or earthy aggregates.

Its chemical composition is $K(Mg, Fe^{2+})(Fe^{3+}, Al)Si_4O_{10}(OH)_2$.

Key reference: Grabb, R. F., 1994, Sans Spring Oil Field, Railroad Valley, Nye County, Nevada, in R.A. Schalla and E.H. Johnson, eds., Oil Fields of the Great Basin: Nevada Petroleum Society, Reno, Nevada, 380 p.

► **Nevada BLM Oil & Gas Lease Sale – Dec 13, 2011:**

Results:

http://www.blm.gov/pgdata/etc/medialib/blm/nv/minerals/oil_gas/2011_lease_sales.Par.4052.File.dat/20111213_OG_Sale_Results_Competitive.pdf

► **Next Scheduled Oil & Gas Lease Sale – Mar 13, 2012:**

Notice, shape file, etc.:

http://www.blm.gov/nv/st/en/prog/minerals/leasable_minerals/oil_gas/oil_and_gas_leasing.html

Parcels:

http://www.blm.gov/pgdata/etc/medialib/blm/nv/minerals/oil_gas/2012_lease_sales.Par.24494.File.dat/20120313_OG_Sale_Parcels.pdf

► **Next scheduled Geothermal Lease Sale - Tuesday, January 24, 2012**

Parcels & shape file available now:

http://www.blm.gov/nv/st/en/prog/minerals/leasable_minerals/geothermal0/ggeothermal_leasing.html

► **New from Nevada Bureau of Mines & Geology:**

Submitted by:

Charlotte Stock, NBMG Publication Sales, University of Nevada

mailing address for US Mail, Fed Ex, and UPS:

Nevada Bureau of Mines and Geology

Great Basin Science Sample and Records Library, 2175 Raggio Parkway, Reno, NV 89512

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www.nbmj.unr.edu

> **Geothermal core from Rye Patch area--new Open-File Report**

Open-File Report 11-10: Descriptive Logs, Skeletonized Samples, and Photographs of Core from Presco Energy's Thermal Gradient Wells P 3-1, P 10-1, and P 32-2 in the Rye Patch Area, Pershing County, Nevada, by David A. Davis, Web-only version free on the Web at

<http://www.nbmj.unr.edu/dox/of1110.pdf>

This report, which is available as an online document at www.nbmj.unr.edu, describes the selective sampling (skeletonizing) of diamond drill core from three geothermal wells drilled in the Rye Patch area. The skeletonized samples can be viewed at the Great Basin Science Sample and Records Library (GBSSRL), and

the lithologic descriptions of the core, photographs of the entire core, and photographs of the individual samples are posted online.

About the author:

David Davis, NBMG/GBSSRL

<http://www.nbmj.unr.edu/Staff/Davis.html>

About Great Basin Science Sample and Records Library:

<http://www.nbmj.unr.edu/Departments/GBSSRL/GBSSRL.html>

About geothermal energy:

<http://www.nbmj.unr.edu/Geothermal/index.html>

> **Reese River geothermal area**

Open-File Report 11-3: Preliminary geologic map of the Reese River geothermal area, Lander County, Nevada, by Nicholas H. Hinz and James E. Faulds, 2011, 1:24,000-scale color plate, 43x24 inches, \$18.00 or available free on the Web:

<http://www.nbmj.unr.edu/sales/pbsdtls.php?sku=OF11-%203>

> **Hazen quadrangle**

Open-File Report 11-8: Preliminary geologic map of the Hazen quadrangle, Lyon and Churchill counties, Nevada, by James E. Faulds, Alan R. Ramelli, and Michael E. Perkins, 2011 (supersedes OF09-11), 1:24,000-scale color plate, 27.5x28 inches, \$15.00 or available free on the Web:

<http://www.nbmj.unr.edu/sales/pbsdtls.php?sku=OF11-%208>

> **Bunjug Mountains quadrangle**

Open-File Report 11-9: Preliminary geologic map of the Bunjug Mountains quadrangle, Churchill County, Nevada, by Nicholas H. Hinz, James E. Faulds, and John W. Bell, 2011, 1:24,000-scale color plate, 27.5x27 inches, \$15.00 or available free on the Web:

<http://www.nbmj.unr.edu/sales/pbsdtls.php?sku=OF11-%209>

> **Improved techniques for geothermal exploration**

NBMG geologist and research professor, Jim Faulds, publishes article in *North American Clean Energy*:

<http://www.nacleanenergy.com/?action=article&id=11941>

<http://nbmg.posterous.com/nbmj-geologist-jim-faulds-publishes-article-i-90190>

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John Bell: <http://www.nbmj.unr.edu/Staff/Bell.html>

Alan Ramelli: <http://www.nbmj.unr.edu/Staff/Ramelli.html>

Caetano caldera map

Map 174: Geologic map of the Caetano caldera, Lander and Eureka counties, Nevada, by Joseph P. Colgan, Christopher D. Henry, and David A. John, 2011, 35X27-inch color plate and 10 pages of text, rolled or folded, \$20.00; or free on the Web at

<http://www.nbmgs.unr.edu/sales/pbsdtls.php?sku=M174>

A 1:75,000-scale, color geologic map of the 34 Ma Caetano caldera, Lander and Eureka counties, Nevada with descriptions of 41 geologic units and one cross section. Accompanying text includes full unit descriptions and references. More than 100 percent extension beginning in the middle Miocene tilted the caldera into a set of approximately 40-degree east-dipping fault blocks that provide exceptional exposures of the entire caldera to its floor, including Paleozoic sedimentary rocks and pre-caldera volcanic rocks in the floor, intracaldera Caetano Tuff up to 4 km thick, ash-flow tuff feeder dikes, caldera collapse breccias, post-collapse resurgent intrusions, and the caldera structural margin and topographic wall.

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Joseph Colgan, USGS: <https://profile.usgs.gov/jcolgan/#Contact>

David John, USGS: <http://minerals.usgs.gov/west/menlo/djohn.htm>

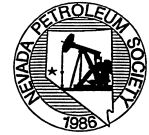
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Nevada Petroleum Society – Publication List 2010



SPECIAL VOLUMES

- NPS 1 Oil Fields of the Great Basin (1994) R.A. Schalla and E.H. Johnson, editors, 31 papers on regional and field specific geology, 4 plates, hardbound, 380 p. \$65.00**
- NPS 2** Membership Directory (only available **free on the Web** at <http://www.nbmg.unr.edu/nps/membershipdir.htm>)
- NPS 15** TerraScan's Geologic Map of the Eastern Great Basin, Nevada and Utah (1978, rev. 1987) compiled and edited by E.L. Howard, 3 sheets (includes cross-sections) ~~\$20.00/NPS or \$25.00/non-NPS~~ **order by phone only for discounted price of \$5.00**
- NPS 21** Carboniferous–Permian (Late Paleozoic) Hydrocarbon System, Rocky Mountains–Great Basin Region, U.S., Major Historic Exploration Objective (2001, updated 2003) J. Peterson, RMAG Open-File Report on CD only; 54 p., 45 illustrations, CD **\$15.00**

FIELD TRIP GUIDEBOOKS

- NPS 3 Oil Fields, Production Facilities and Reservoir Rocks of Northern Nye County, Nevada (1989) compiled by W.J. Ehni and D.M. Evans, 8 abstracts and papers, 30 p. (Xerox copy only – unbound) \$8.00**
- NPS 4** Oil Fields and Geology of the Pine Valley, Eureka County Area, Nevada (1990) D.M.H. Flanigan, L.J. Garside, and M. Hansen, editors, 15 papers and abstracts, 74 p. (xerox copy only – unbound) **\$15.00**
- NPS 5** Geology of White River Valley, the Grant Range, Eastern Railroad Valley and Western Egan Range, Nevada (1991) D.M.H. Flanigan, M. Hansen, and T.E. Flanigan, editors, 10 papers and abstracts, 74 p. **\$15.00**
- NPS 6** Structural Geology and Petroleum Potential of Southwest Elko County, Nevada (1992) J.H. Trexler, Jr., T.E. Flanigan, D.M.H. Flanigan, M. Hansen, and L.J. Garside, editors, 9 papers, 2 plates, 96 p. **\$25.00**
- NPS 7** Structural and Stratigraphic Relationships of Devonian Reservoir Rocks, East Central Nevada (1993) C.W. Gillespie, editor, 15 papers, 3 plates, 203 p. **\$33.00**
- NPS 8** Dating of Pre-Tertiary Attenuation Structures in Upper Paleozoic and Mesozoic Rocks and the Eocene History in Northeast Nevada and Northwest Utah (1994) C.H. Thorman, C.J. Nutt, and C.J. Potter, editors, 11 papers, 125 p. **\$25.00**
- NPS 9** Structural and Stratigraphic Investigations and Petroleum Potential of Nevada, with Special Emphasis South of the Railroad Valley Producing Trend (1994) S.W. Dobbs and W.J. Taylor, editors, 2 volumes, 13 papers, 22 plates, 281 p. **\$40.00**
- NPS 10** Mississippian Source Rocks in the Antler Basin of Nevada and Associated Structural and Stratigraphic Traps (1995) M.W. Hansen, J.P. Walker, and J.H. Trexler, Jr., editors, 16 papers and 7 abstracts, 166 p. **\$25.00**
- NPS 11** Cenozoic Structure and Stratigraphy of Central Nevada (1996) W.J. Taylor and H. Langrock, editors, 11 papers, 122 p. **\$25.00**
- NPS 12** The Roberts Mountains Thrust, Elko and Eureka Counties, Nevada (1997) A.J. Perry and E.W. Abbott, editors, 4 papers, 2 abstracts and reference papers/abstracts, 86 p. **\$25.00**
- NPS 13** Hydrocarbon Habitat & Special Geologic Problems of the Great Basin (1998) D.E. French and R.A. Schalla, editors and co-chair **\$25.00**
- NPS 14** Cenozoic Geology of the Northern Colorado River Extensional Corridor, Nevada and Arizona: Economic Implications of Extensional Segmentation Structures (1999) J.E. Faulds, editor, 183 p., 3 color plates **\$35.00**
- NPS 16** Structure & Stratigraphy of the Eureka, Nevada Area (2001) Marilyn S. Miller and Jerome P. Walker, editors, 108 p., 11 color plates **\$30.00**
- NPS 17** Detachment and Attenuation in Eastern Nevada and its Application to Petroleum Exploration (2002) W. Ehni and J. Faulds, editors, 163 p., book & CD **\$40.00**, book only **\$35.00** (NPS17b), CD only **\$15.00** (NPS17c)
- NPS 18** Oil, Gas, and Geothermal Occurrences in Northwestern Nevada (2003) S. Foster, editor, 102 p. **\$25.00**
- NPS 19** Megabreccias and Impact Breccias of East Central Nevada (2004) C.W. Gillespie and S. Foster, editors **\$35.00**
- NPS 20** Great Basin Paleozoic Carbonate Platform: Facies, Facies Transitions, Depositional Models, Platform Architecture, Sequence Stratigraphy, and Predictive Oil and Gas Reservoir and Mineral Host Models (2006) H.E. Cook and J.J. Corboy, 129 pages **Out of print** (bulk of report from USGS Open-File Report 2004-1078, free on Web at <http://pubs.usgs.gov/of/2004/1078/>)
- NPS 22** Geology, Geothermal Resources and Petroleum Exploration of Neogene Basins in the Reno, Nevada Area (2007, 2nd ed., includes two papers not in 1st ed.) S. Limerick, editor, 7 papers, 3 reprints, and road log, 140 p. **\$25.00**
- NPS 23** Sedimentology and Tectonic Setting of the Late Cretaceous to Eocene Sheep Pass Formation in the Southern Egan Range (2008) P. Druschke, trip leader; J. Trexler, Jr., editor **\$25.00**

These publications are only available from the Nevada Bureau of Mines and Geology (NBMG).

NBMG contact information:

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Fax: (775) 784-6690

Web: <http://www.nbmg.unr.edu/nps/>

Oil and gas resources from NBMG

The following publications are available from the Nevada Bureau of Mines and Geology. **NBMG publications that are underlined are also available free on the Web at <http://www.nbmq.unr.edu/>.**

Bulletins

B104 Oil and gas developments in Nevada: **Garside, Hess, Fleming and Weimer (1988), \$15.00, for updates, see OF01-7, OF04-1, and M162**

Databases, Lists, Indexes, and Digital Maps

List of wells by API and permit numbers; operator and well names; township, range, and section (as of October 27, 2008) at <http://www.nbmq.unr.edu/lists/oil/oil.htm>
See also: <http://www.nbmq.unr.edu/Oil&Gas/index.html>

Educational Series

E-6 **Oil and gas in Nevada** (Student book for grades 4-8, 23 pages) \$3.45
E-24 **Nevada oil: Division of Minerals** (Brochure, 1996) free

Lists

L-8 **List of oil and gas wells drilled in Nevada since 1907:** Hess, Davis, and Boldi (2001, updated 2003) *superseded by OF04-1, see also OF01-7*
L-12 **Nevada oil and gas well catalog (NVOILWEL),** *superseded by OF04-1, see also OF01-7*
Complete list of Nevada oil and gas well exploration data, 1906-present. Listed logs and cuttings are housed at NBMG. Selective data searches and index lists available upon request. Shows, geologic tops and tests are given when available.

Maps

M162 **Petroleum data map of Nevada:** Garside and Hess (2007), 1:1,000,000, \$15.00

Mineral Industry Series

The Nevada Mineral Industry is **published annually**, beginning in 1979. Each volume has a **section on oil and gas** in Nevada. Most of these reports are available *free on the Web* at <http://www.nbmq.unr.edu/>.

Open-File Reports

OF83-5 **Nevada oil shale:** Garside, 10 pages, \$4.00 (for more oil shale information, see also USGS MF-1546 and MF-2091)
OF86-13 **Nevada petroleum production statistics, 1954-1986:** Hess, Loomis and Garside, 14 pages, \$5.00
OF92-5 **Nevada oil and gas source-rock database:** Hess, compilation of source-rock analyses performed on cuttings samples taken at varying depth intervals from oil and gas exploration wells in Nevada up to 1992, complete print-out, \$20.00
OF96-6c **Nevada oil and gas wells, 1907-1996:** 1:1,000,000 color digital map of Nevada showing major roads, county boundaries, and locations of oil wells drilled since 1907, original printout, \$20.00, *see also OF01-7*
OF01-7 **Nevada oil and gas well database map:** Hess, CD and 4 page text, \$15.00
Contains the following: L-12; updated OF96-6, partial; L-8; B104 text; digital base layers of Nevada data in Shapefile and Arc/Info export file format designed for use at scale 1:1,000,000 (county, towns, roads, USGS topo boundaries for 1:100,000 and 1:24,000, Township and Range); georeferenced raster graphic of the Nevada state base map, B&W, scale 1:1,000,000; 18 USGS digital raster graphic maps (DRG), 1:250,000-scale, topo maps in tiffw format
OF00-2 **Hydrocarbon assessment of the Yucca Mountain vicinity, Nye County, Nevada:** French, 78 pages and 4 plates, \$44.40
OF04-1 **Nevada oil and gas well database (NVOILWEL):** Hess (2004), \$86.40 for photocopy
OF07-7 **Assessment of the potential for carbon dioxide sequestration with enhanced oil recovery in Nevada:** LaPointe, Price, and Hess (2007), 24 pages, \$7.20

Reports

R51 **Preliminary assessment of the potential for carbon dioxide disposal by sequestration in geological settings in Nevada:** Price and others (2005), CD-ROM or paper copy, 35 pages, \$15.00
R52 **Assessment of the potential for carbon dioxide sequestration by reactions with rocks in Nevada:** Sturmer, LaPointe, Price, and Hess (2007) \$22.00 paper

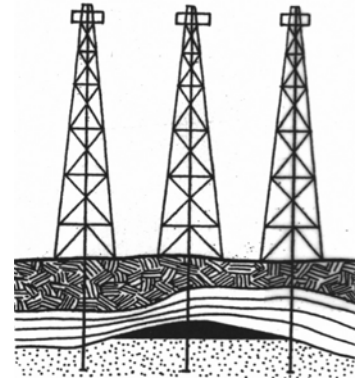
USGS

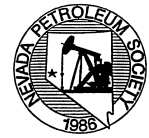
Assessment of undiscovered oil and gas resources of the Eastern Great Basin Province, 2005, Fact Sheet
FS-2005-3053, free at <http://pubs.usgs.gov/fs/2005/3053/>
Basin and Range Carbonate Aquifer System Study:
<http://nevada.usgs.gov/barcass/data.htm>

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