

# Nevada Division of Minerals

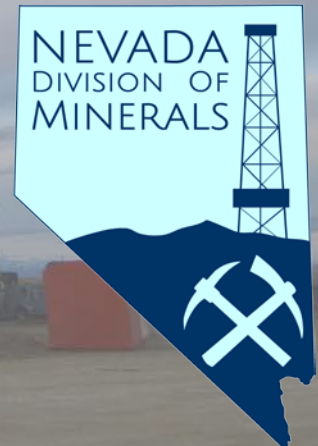
*Mineral Production and Mining Activities*  
*Geothermal Production and Activities*

*Hydraulic Fracturing Regulations and Oil Activity*

**AEG GREAT BASIN SECTION**

**April 16, 2015**

**Richard Perry, Administrator**



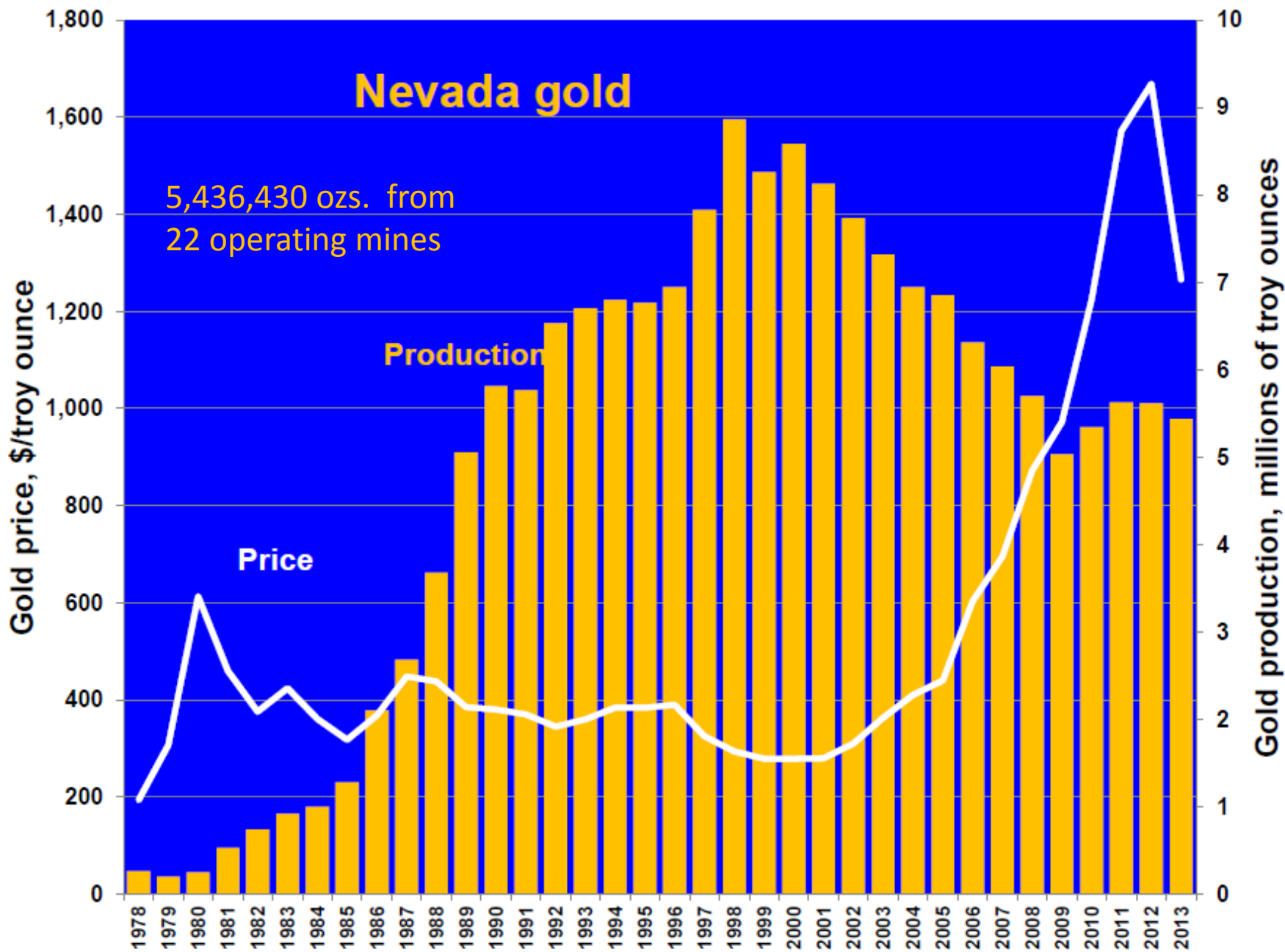
# WHO WE ARE

- **State Agency and part of the Commission on Mineral Resources NRS 513**
- **CMR is 7 members appointed by the Governor from minerals, OGG industries**
- **Offices in Carson City (9 employees) and Las Vegas (2 employees)**
- **Revenues from fees, no general fund monies (mining claim fees, oil/gas fees, geothermal fees, etc.)**

# WHAT WE DO

- **“Encourage and assist in the exploration for and production of oil, gas, geothermal energy and minerals within this state” – NRS 513**
  - **Minerals Education to public, schools, organizations**
  - **Supply information on the minerals industry**
  - **Abandoned Mine Lands Program – public safety**
  - **Record annual production of mines, oil & gas, and geothermal energy.**
- **Permit Oil and Gas drilling & production NRS 522**
- **Permit Geothermal drilling & production NRS 534A**
- **State Reclamation Bond Pool NRS 519A.290**
- **Mining Claims, Mill Sites and Tunnel Rights NRS 517**





# Nevada copper

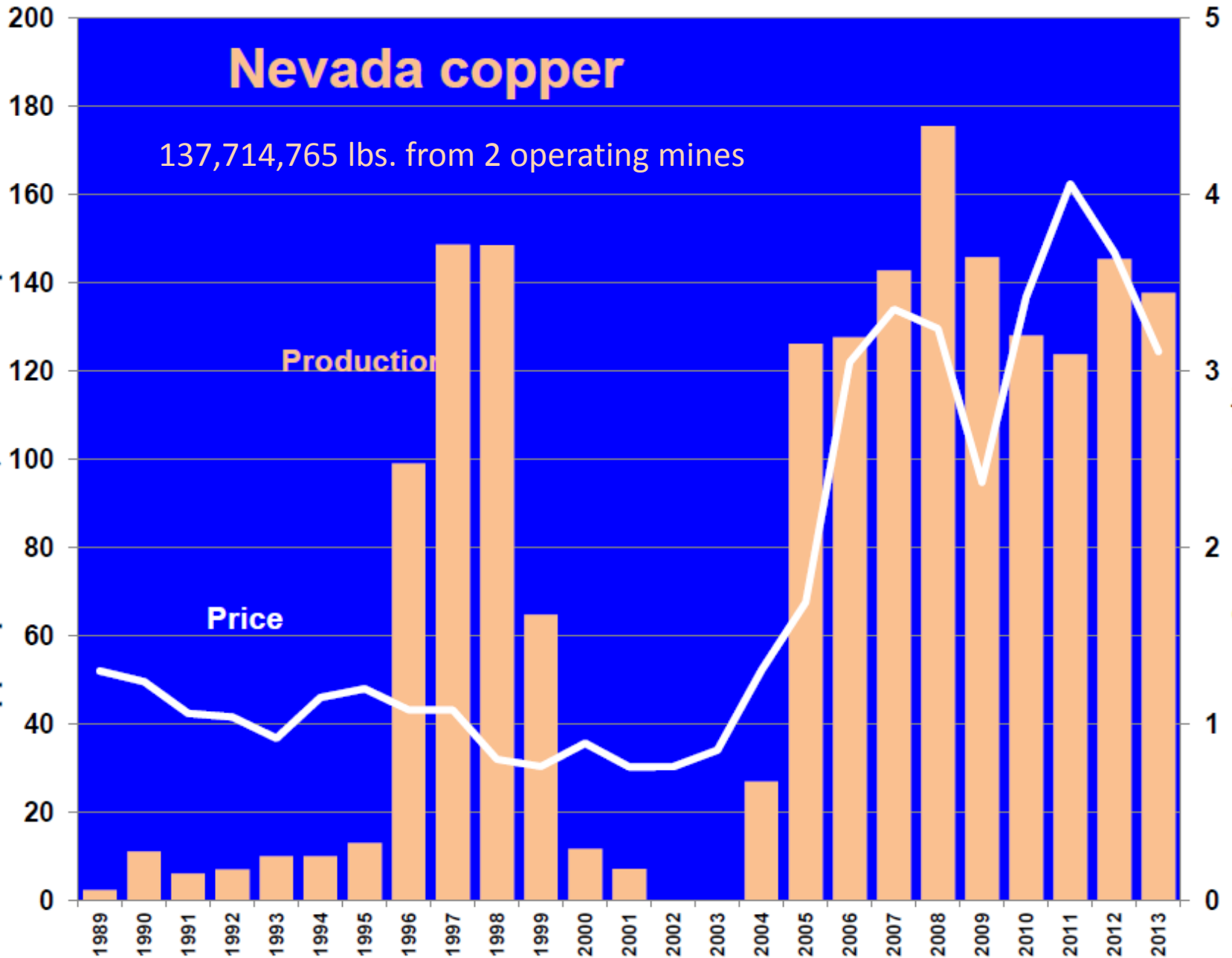
137,714,765 lbs. from 2 operating mines

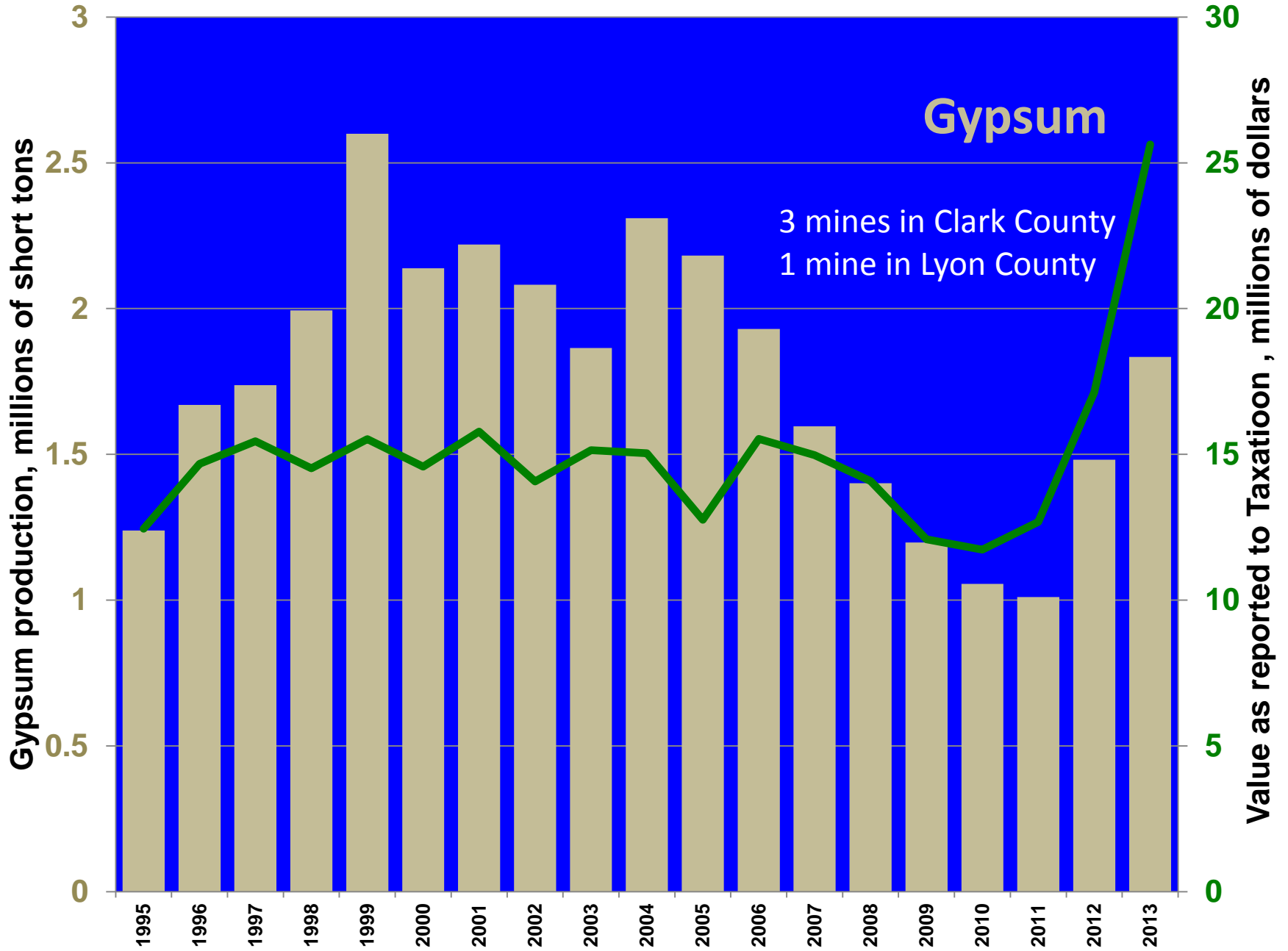
Copper production, millions of pounds

Production

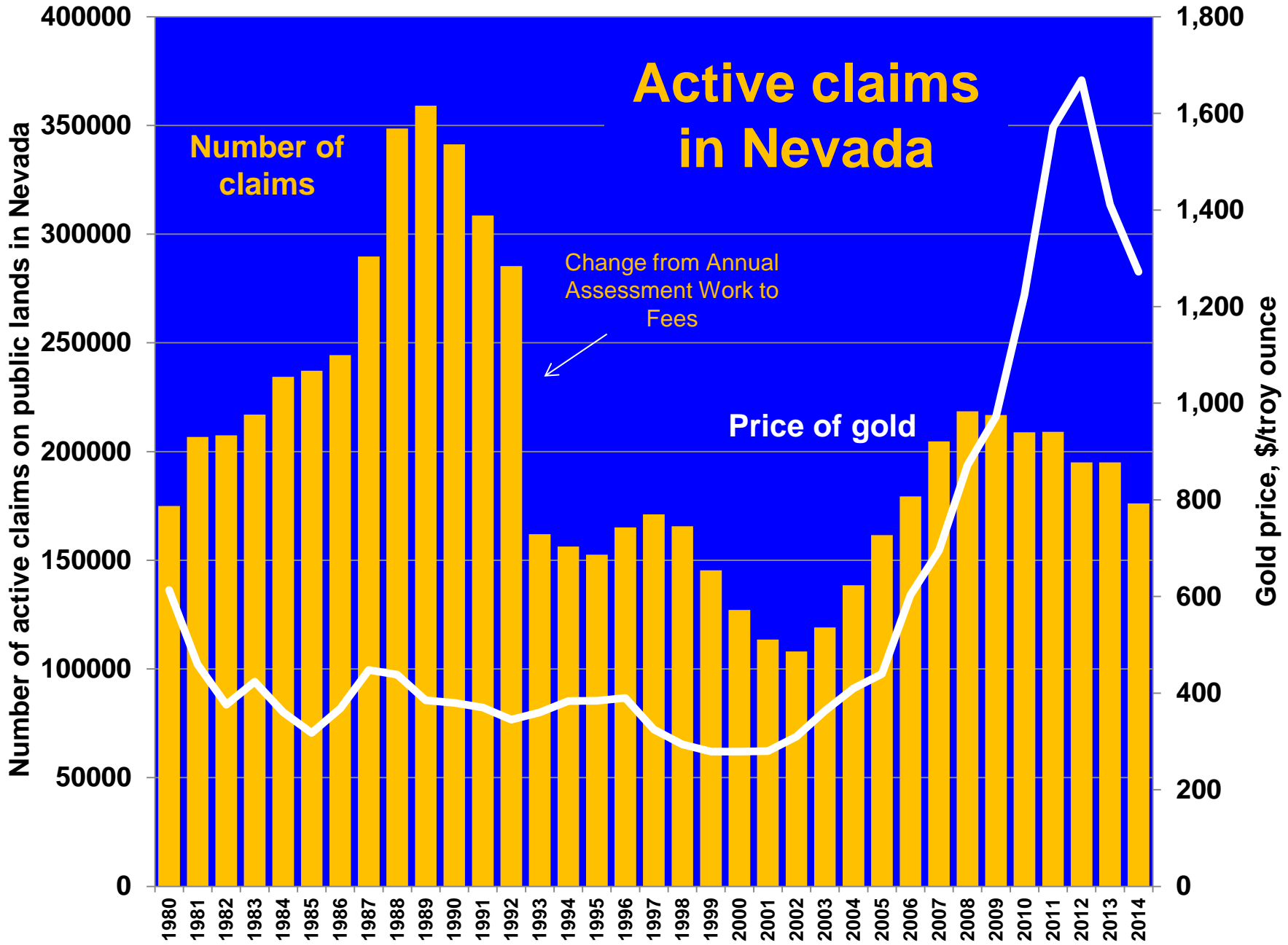
Price

Copper price, \$/pound





# Active claims in Nevada





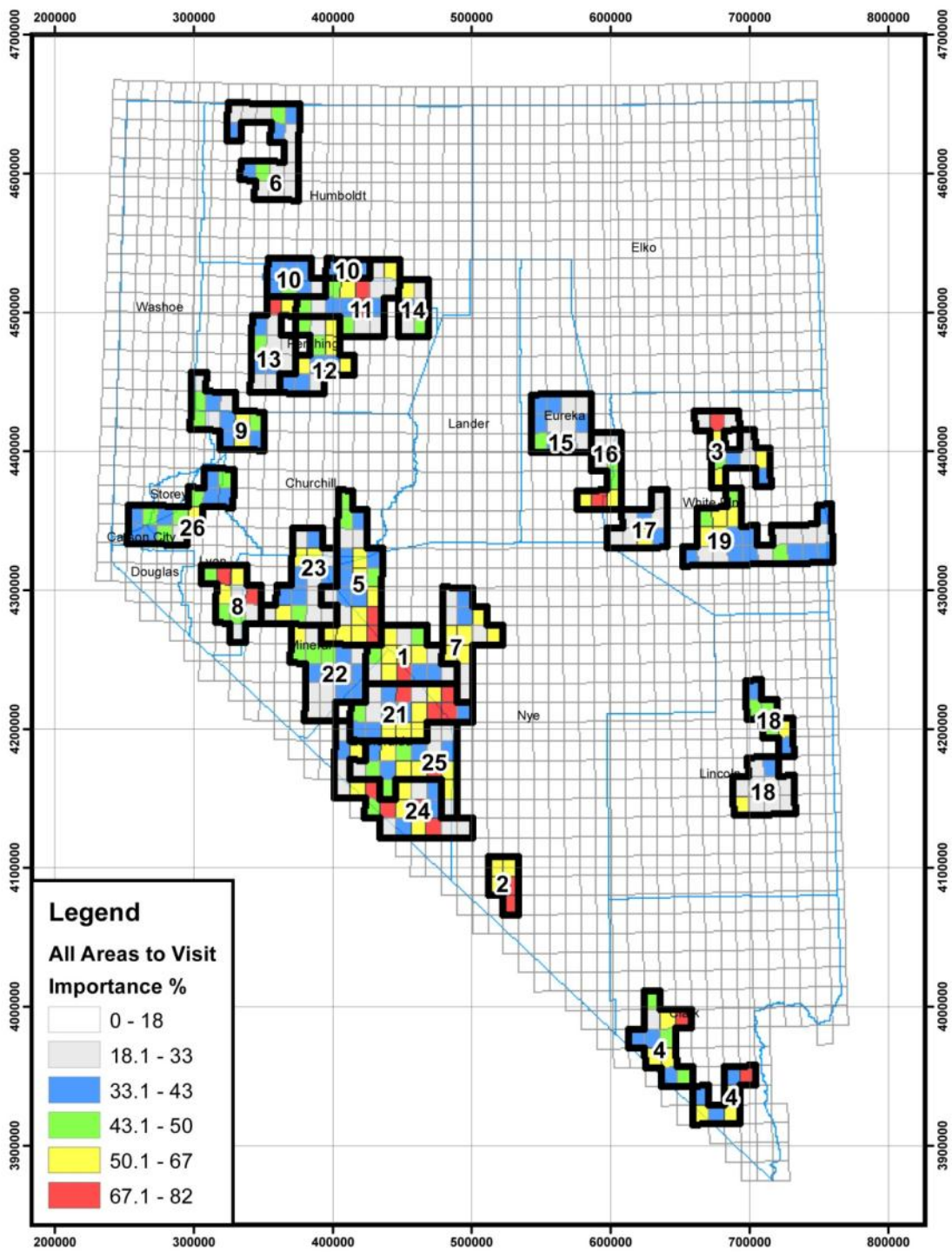


# AML Activities by County

COUNTY	SITES DISCOVERED	SITES SECURED	% SECURED	TOTAL UNSECURED	% UNSECURED STATEWIDE
Carson	76	76	100%	0	0.00%
Churchill	707	570	81%	137	3.74%
Clark	2,151	1,686	78%	465	12.68%
Douglas	204	201	99%	3	0.08%
Elko	783	579	74%	204	5.56%
Esmeralda	2,793	2,376	85%	417	11.37%
Eureka	774	709	92%	65	1.77%
Humboldt	797	700	88%	97	2.65%
Lander	591	508	86%	83	2.26%
Lincoln	722	576	80%	146	3.98%
Lyon	1,035	962	93%	73	1.99%
Mineral	1,620	1,355	84%	265	7.23%
Nye	2,614	1,958	75%	656	17.89%
Pershing	1,593	1,141	72%	452	12.33%
Storey	197	186	94%	11	0.30%
Washoe	445	402	90%	43	1.17%
White Pine	1,554	1005	65%	549	14.98%
<b>TOTAL (Since 1987)</b>	<b>18,656</b>	<b>14,990</b>	<b>80%</b>	<b>3666</b>	<b>100.00%</b>



SECURING  
ACTIVITIES  
PRIORITIZED  
ANNUALLY  
USING A RISK  
EQUATION  
2015 >>>>>>>



# 2014 SUMMER INTERN PROGRAM

Eight UNR-UNLV students investigated 4,012 abandoned mine features in 13 counties, logged 451 hazards and secured 284

## NEVADA DIVISION OF MINERALS ABANDONED MINE LANDS 2014 SUMMER INTERN PROGRAM



Many Thanks to These  
Hard Working Students:  
Sean Diggins  
Alain Nowakowski  
Ralston Pedersen  
Vince Ugalde  
Sarah Ullrich  
Nolan Weintz  
Alex Wheatley  
Gunnar Young



2014 Accomplishments:  
Logged 2,945 Non-Hazards  
Identified 451 New Hazards  
Secured 284 Hazards  
and Revisited or Repaired 332 Hazards



Flat tire...the impossible is happening



# AML BACKFILL PROJECTS

3,125 Backfills thru January 2015





# EAGLE SCOUT SECURING PROJECTS



**154 projects since 1992 resulting in 696 securings**  
(through 12/31/2014)

# MINERALS EDUCATION



## 2014 ACTIVITIES:

- 167 educational presentations by staff that reached 7,408 citizens
  - 113 classroom presentations
  - 28 to civic groups, clubs and trade orgs.
  - 21 to Boy Scout and youth organizations
  - 88 in Northern Nevada
  - 72 in Southern Nevada



# Midway Gold: Pan Project

Located 22 miles southeast of Eureka, NV & 50 miles west of Ely, NV

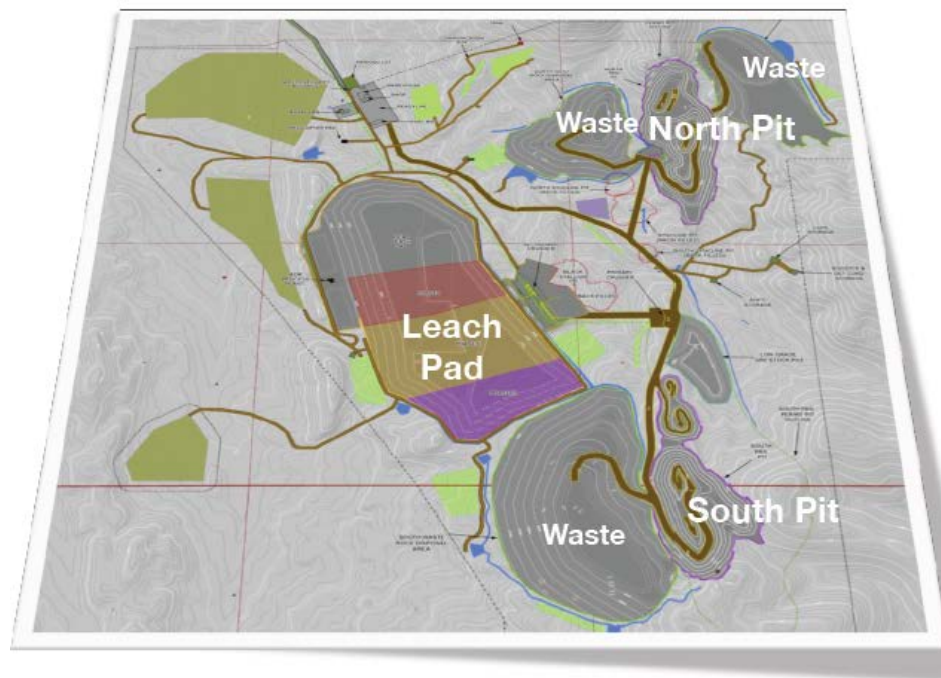
*Carlin-type, disseminated, sediment hosted gold deposit*

*Open-pit mining, processing by heap leaching*

- NEPA completed with full EIS in 25 months.
- Construction began early 2014
- First ore on pads in September, 2014
- First Gold poured March 27, 2015
- 150 new jobs, employees from Eureka and Ely



Reserves	Tonnes	Grade	Contained
	('000s)	(g/t)	('000s oz)
Proven	25,245	0.6	487
Probable	23,067	0.51	377
P & P	48,311	0.56	864



# Newmont Corp: Long Canyon Project

Located 60 mi southeast of Wells NV & 10 mi south of I80 in the Pequop Mountains

*Carlin-Type Gold Deposit*

## Overview:

- Modern gold exploration in the Pequop Mountains was not conducted until 1994
- Regional BLEG sampling indicated anomalous gold from the western flanks of the mountains
- Claims were initially staked in 2000
- The first drill holes including the discovery hole were also drilled in 2000 (LC-03 intersected 21 meters averaging 2.7 g/t au)



## Geology/Mineralization:

- Ore is hosted at the contact with the Ordovician Pogonip Group and the Cambrian Notch Peak Formation
- Ore bodies are generally northeast trending
- Ore body is at surface and is entirely oxide



½ oz Au Road Cut Exposure



# NEWMONT LONG CANYON PROJECT

## Current Activities

- Ore body expansion-exploration in younger potential host units
- Waiting on record of decision for Long Canyon EIS (1<sup>st</sup> Quarter 2015)
- Production expected to begin in the 3<sup>rd</sup> quarter of 2016
- Average Annual grades will be roughly 0.05 opt with 2.5 to 3 million ore tones/year
- Total annual tons will begin at 20 million and ramp up to roughly 35 million tons
- Mine life is ~8 years

Reserve 1.0 M oz  
Resource 1.85 M oz



# Cortez Camp / Goldrush



**Cortez Camp**  
18 Moz production to date  
11 Moz reserves<sup>(1)</sup>  
4.9 Moz M&I resources<sup>(1)</sup>  
0.9 Moz inferred resources<sup>(1)</sup>

Cortez Hills

Portal  
Conceptual Exploration Decline  
Open and untested



**Goldrush**  
10 Moz M&I resources<sup>(1)</sup>  
5.6 Moz inferred resources<sup>(1)</sup>

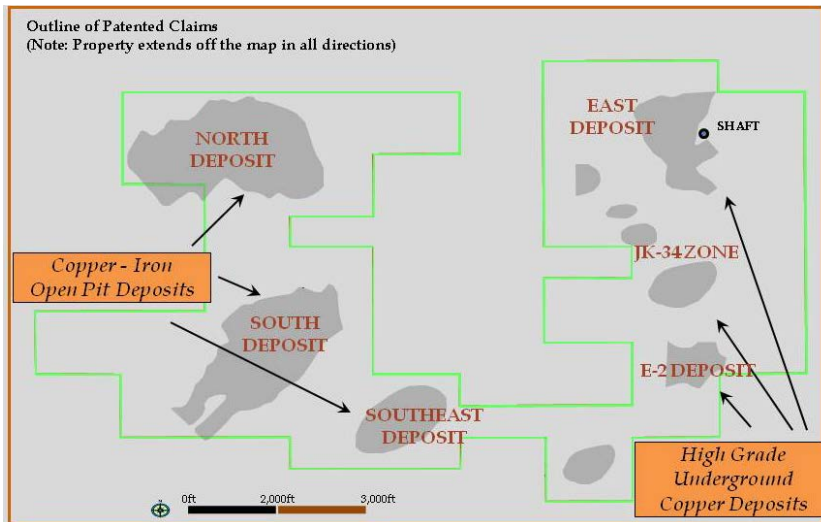
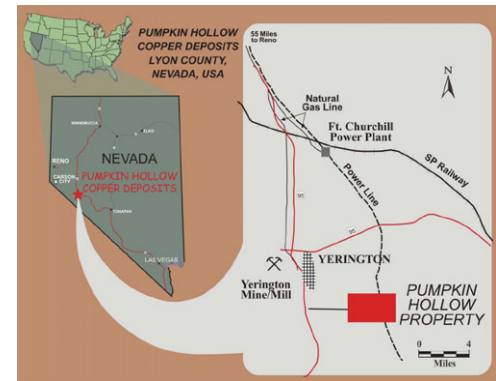
(1) See final slide #4.

# Nevada Copper: Pumpkin Hollow

Located 8 miles southeast of Yerington, Nevada

*Hybrid IOCG Chalcopyrite-Magnetite Skarn, Underground Mine with on-site Concentrator*

- Located within the Yerington Copper Porphyry district
- Blind deposits originally discovered in 1959 by US Steel Corp
- Sinking shaft to 2160 feet
- Plan for 6500 ton per day milling rate
- 200+ employees when fully operational
- Proven and Probable reserves of 5.22 billion lbs copper, 989,000 ounces of gold and 32.9 million ounces of silver
- Commercial underground mining in 2016
- Concentrator (mill) to be built
- Smelting and refining off-site

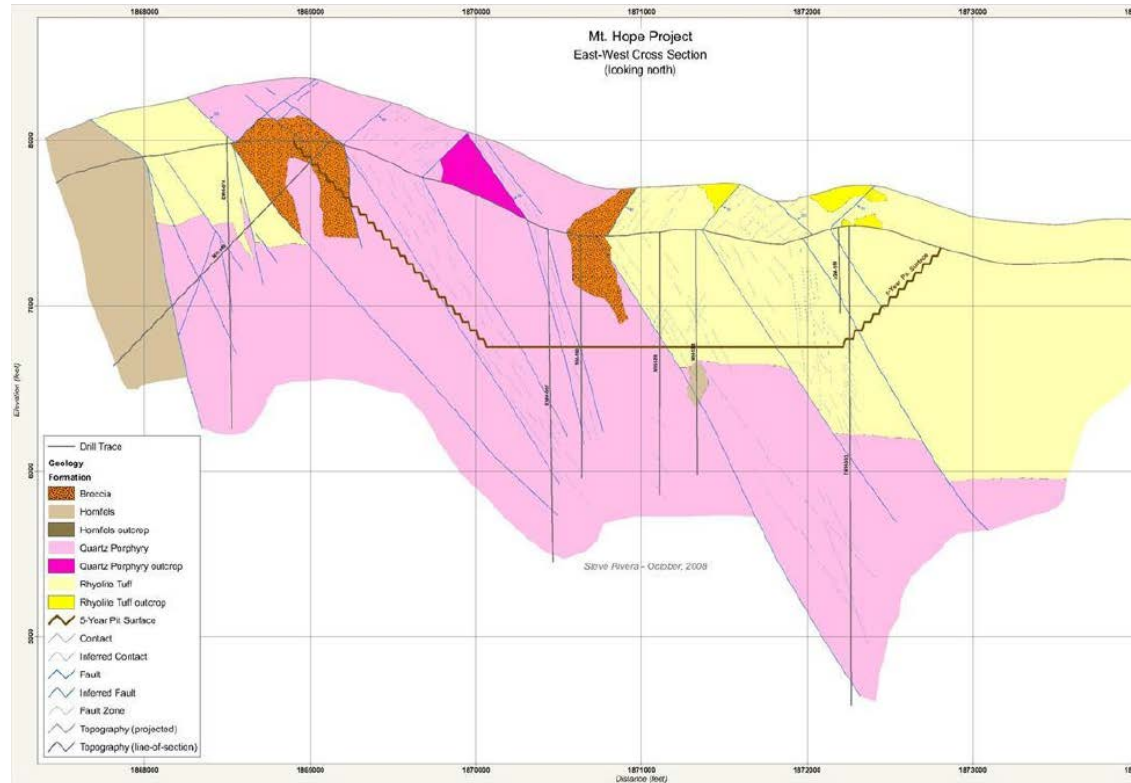


# General Moly: Mt. Hope

Located 22 miles northwest of Eureka, Nevada  
*Molybdenum Porphyry Deposit*

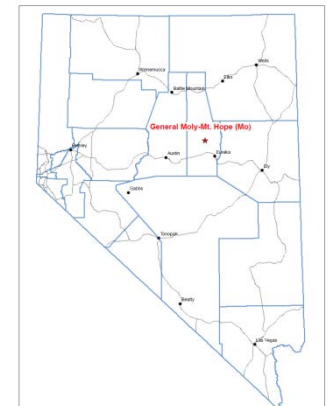
## Geology:

- Classic Molybdenum Porphyry hosted within porphyritic igneous rocks and the Vinini hornfels
- Well zoned molybdenum mineralization where the grade zoning surrounds the central zone of the deposit
- Multiple mineral centers are adjacent horizontally rather than juxtaposed over the same porphyry center
- Mineral zones consist of porphyry rocks that have been veined by quartz stockwork containing molybdenite



## Mineral Reserves

Classification	Cutoff Sulfide Mo	Tons X 1000	Sulfide Mo %
Proven	0.034%	320,473	0.084
Probable	0.034%	664,129	0.063
Proven + Probable	0.034%	984,602	0.070



# American Vanadium: Gibellini

Located 25 miles south of Eureka, Nevada  
*Low Grade Disseminated Heap Leach Vanadium Deposit*

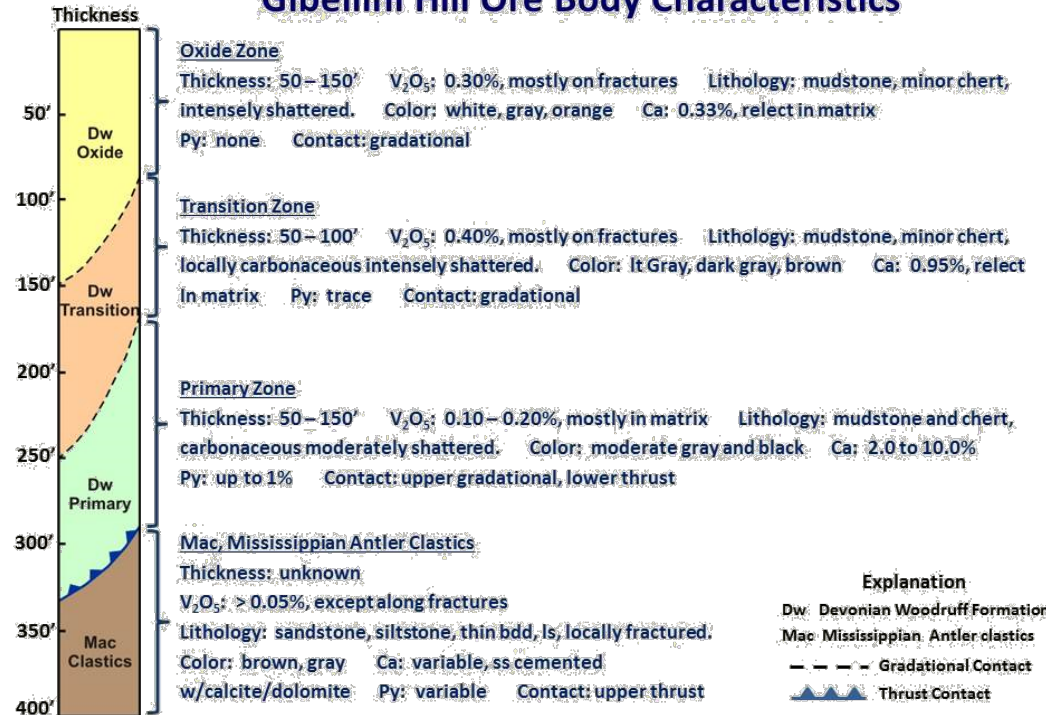
## Overview:

- 100% controlled by American Vanadium
- 7,539 acres, comprising 435 contiguous active unpatented lode and placer claims on federal land
- Solidly tracking towards production which would make American Vanadium the only primary vanadium mine in the U.S.

## Geology/Mineralization:

- Ore is hosted in the Devonian Woodruff Formation which is in thrust contact with Mississippian Antler Clastics
- The ore body transitions from an upper oxidized zone to a lower unoxidized zone
- The transition zone between the two hosts the highest grades on the property

## Gibellini Hill Ore Body Characteristics



AMEC Feasibility Study Summary				
Class	Tons (1,000 lbs)	V <sub>2</sub> O <sub>5</sub> (%)	Cut-off Grade (V <sub>2</sub> O <sub>5</sub> %)	V <sub>2</sub> O <sub>5</sub> Contained (pounds)
<b>RESOURCE</b>				
Total Measured & Indicated (inclusive of Reserves)	23,050	0.285	0.066 – 0.077	131,369,000
Total Inferred	14,226	0.172	0.066 - 0.088	48,960,000
<b>RESERVE</b>				
Proven and Probable	19,969	0.302	0.131 – 0.153	120,510,000

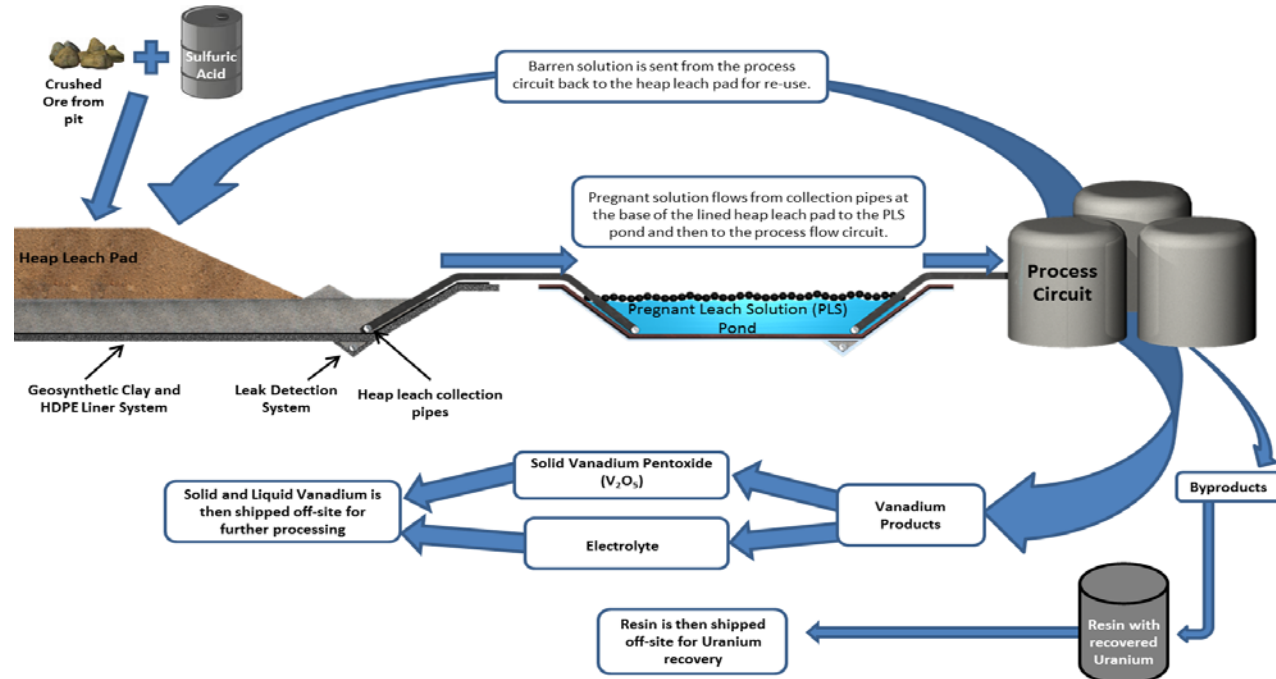
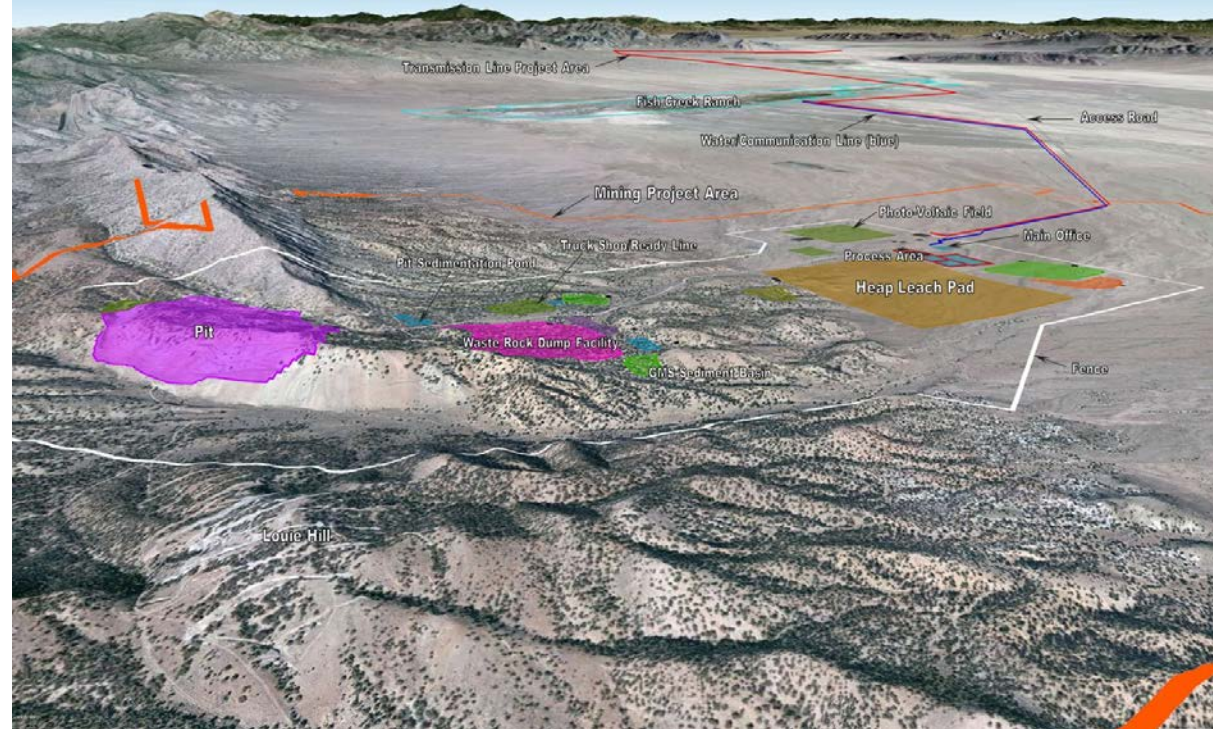


# AMERICAN VANADIUM GIBELLINI PROJECT 25 MILES S. OF EUREKA

- Mine will produce 2 products: Vanadium Pentoxide and Vanadium Electrolyte
- Will be an open pit-heap leach and shovel mining operation
- Mine will process 3.4 million Tons/year
- Annual production = 11.4 million pounds  $V_2O_5$
- Waste:Ore = 0.21:1
- Mine life is approximately 7 years, 90 new jobs

## Current Activity

- Actively working on baseline for EIS

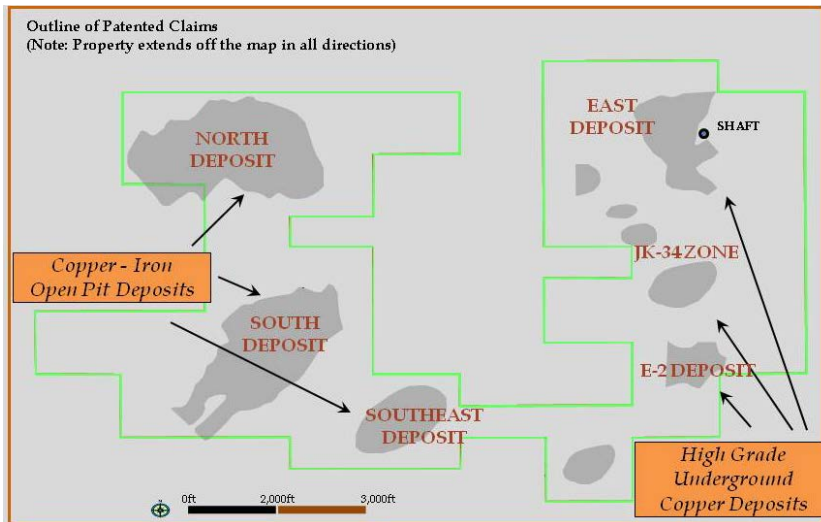
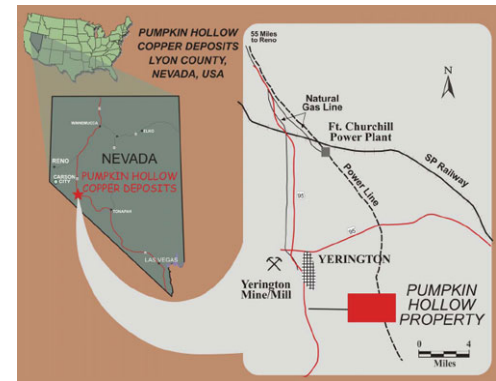


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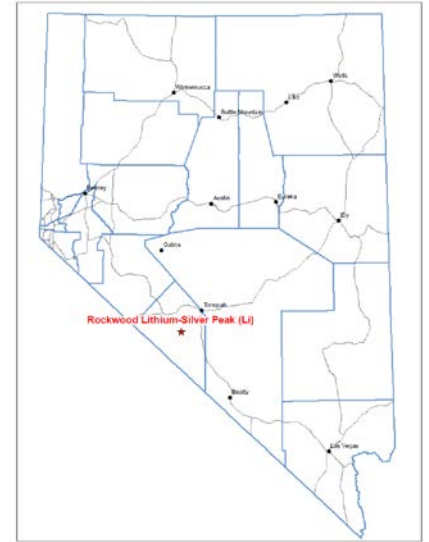
# Rockwood Lithium: Silver Peak

Located in Silver Peak, NV

*Lithium Brine Deposit*

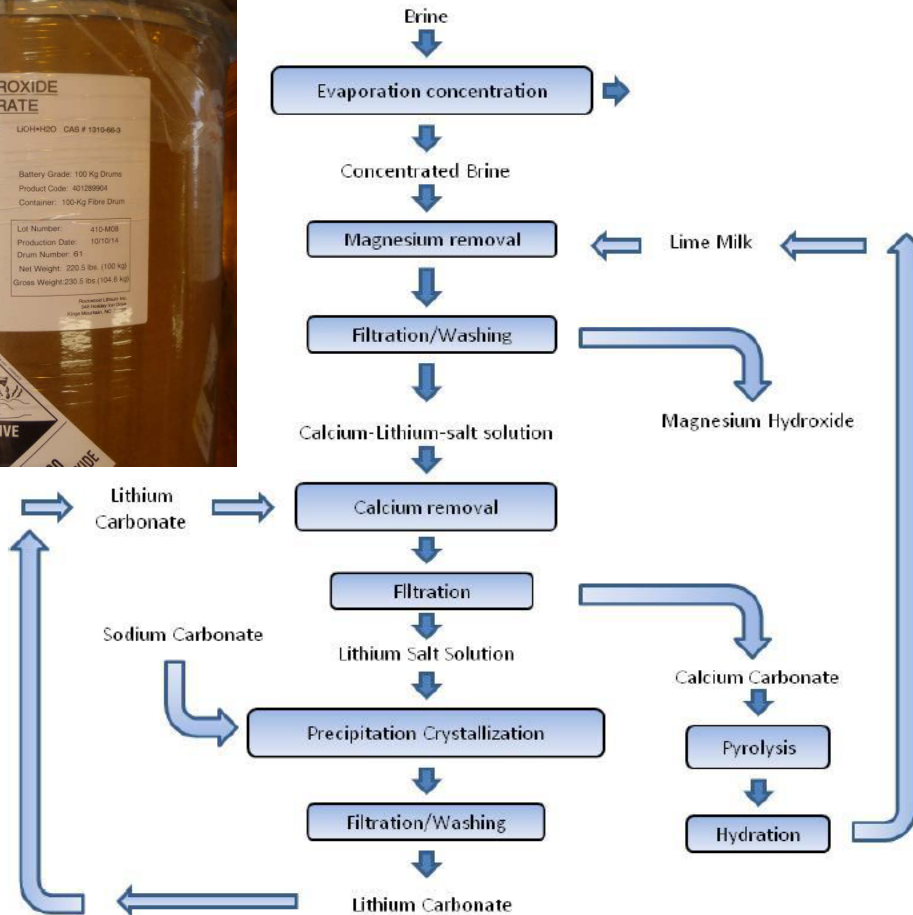
## General Overview:

- First lithium Carbonate was produced in 1967
- Brine is pumped from 4 aquifers which are bound in the Clayton Valley by high angle faults
- 1<sup>st</sup> ore body ran 300ppm Li in 200-300' aquifers (Main Ash Aquifer)
- Other aquifers include the Tufa, Silts-Gravel, and Halite aquifers
- Tufa Aquifer: Least amount of Li
- Employs 75 directly + 10 contractors





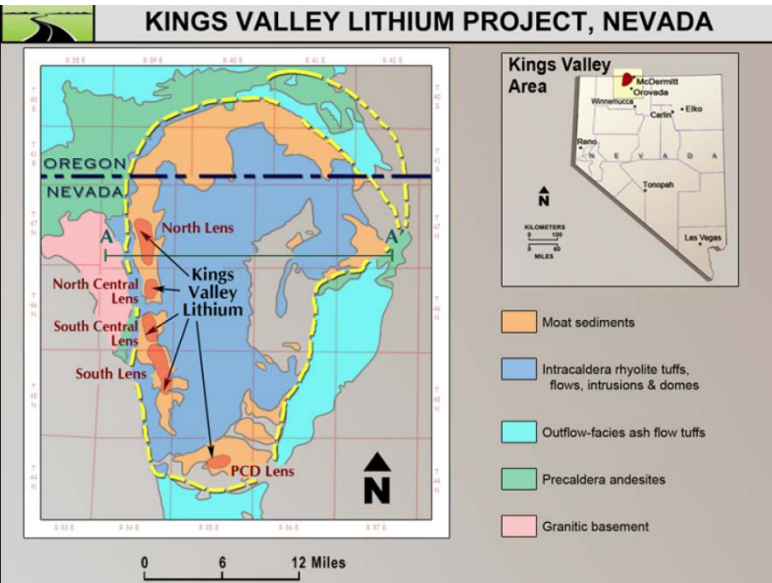
# General Lithium Carbonate Production (2 Year Process from brine to Li Concentrate):



# Western Lithium: Kings Valley

100 km north-northwest of Winnemucca, NV and 40 km west-northwest of Orovada, NV

*Lithium/Organoclay Drilling Additive Supplier*



- Western Lithium has ownership of a rare hectorite clay deposit in the moat deposits of the McDermitt Caldera
- It is a near surface clay exposure that is right next to a major highway
- Hectorite is an effective additive to drilling muds and has emerged as the enabling mineral with thermal stability superior to bentonite clays to perform in challenging environments i.e. High Pressure & High Temperature
- This allows for the US to target deeper oil and natural gas sources in turn decreasing foreign oil imports and increasing our natural gas supply
- Environmental approvals have been received for the extraction of the clay

High Purity Hectorite Clay



## WESTERN LITHIUM KINGS VALLEY

- PLANT LOCATED OFF I-80 IN FERNLEY
- NOW SHIPPING HIGH-PRESSURE, HIGH-TEMPERATURE DRILLING MUD PRODUCT
- 20+ NEW JOBS IN NEVADA



# St. Cloud Mining: Ash Meadows

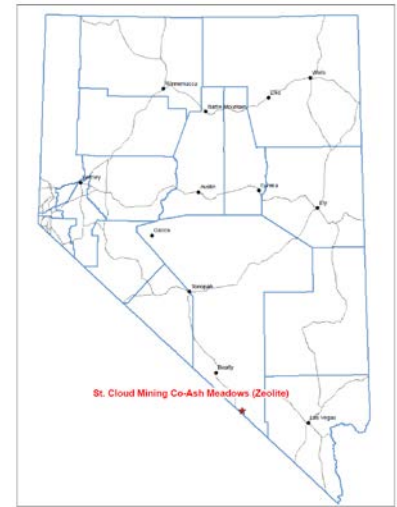
Largest zeolite producer in Western, Ash Meadows Processing Plant is located in Nye County, NV

## General Overview

- Zeolites have natural properties that allow for cation exchange, gas adsorption, and water absorption/desorption
- Clinoptilolite (Clino) is mined in CA near border and hauled to plant for processing, testing and bagging. Clino is used for ammonia removal in water treatment, as an odor eliminator and as an animal feed supplement.
- Chabazite is mined in Arizona and trucked to plant for processing . Used in radioactive waste control and cleanups.

## Geology

- Formed through alteration of a Tertiary vitric (glassy) ash-flow tuff by alkaline ground water (possibly supplemented by hydrothermal solutions)



## Reserves/Resources

- Area # 1 – occurs in Nevada and contains an estimated 18.9 million tons of proven reserves
- Area # 2 – Situated north of Area 3 and contains an estimated 11.7 million tons of inferred resources
- Area #3 – Encompasses the California Mine and contains an estimated 3.0 million tons of proven reserves
- First discovered by Anaconda, quarry has been in operation since 1970. Seasonal contract mining.

## Processing Plant

- Crushing and screening plant processes 2.5 tph of 4x8 mesh to -300 mesh product.
- Bagging plant produces 2000 lb. super sacks and 50 lb bags. 7 full-time staff.

## FUKUSHIMA DAIICHI NUCLEAR CLEAN UP

- Kurion Inc., (a company specializing in permanent disposal of nuclear and hazardous wastes) using St. Cloud Zeolite and their proprietary processing techniques, was responsible for 70% of the clean-up in the first 9 months after the disaster



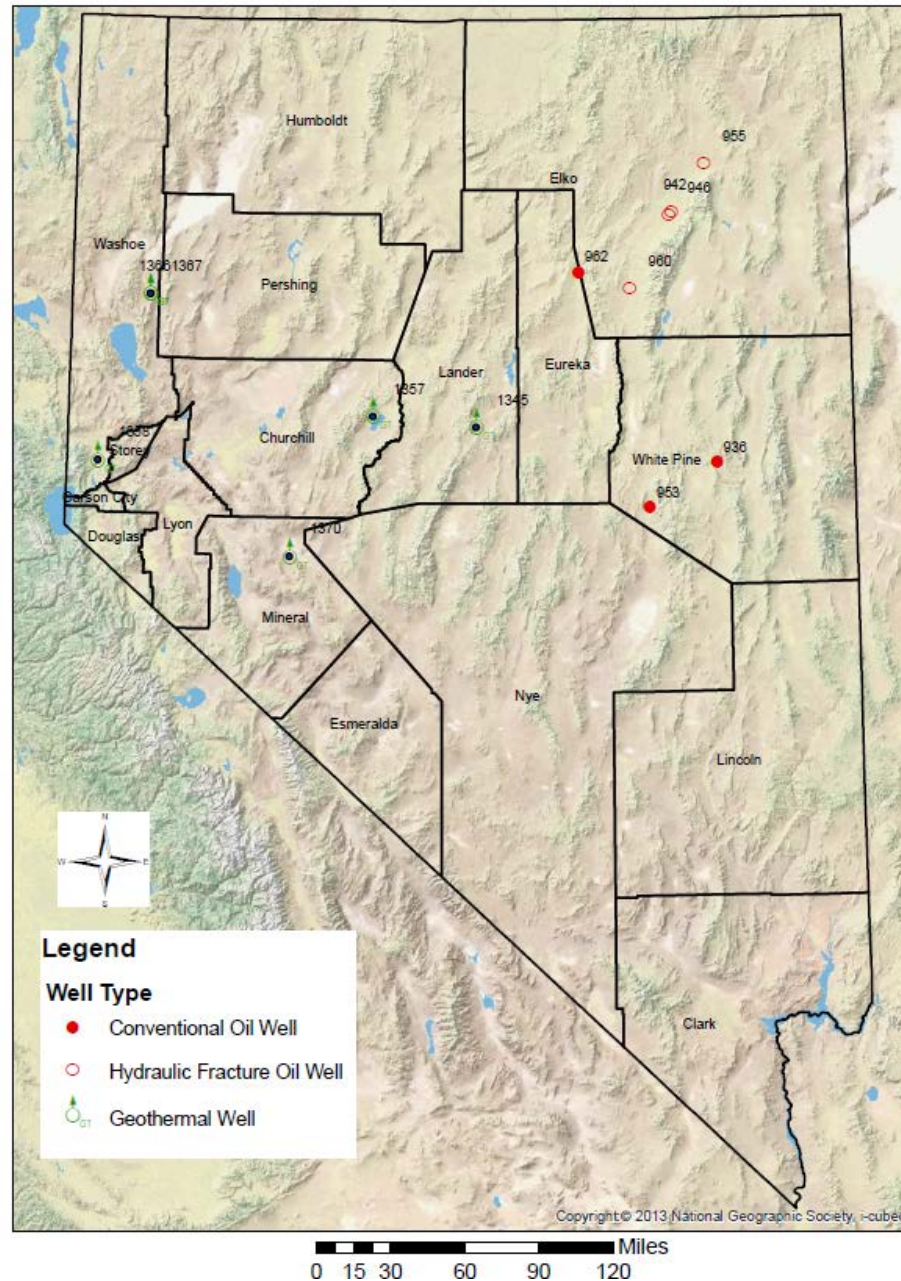


# Oil and Geothermal Wells Drilled Since 9/1/2013 to 12/31/2014

## FLUID MINERALS PERMITTING AND DRILLING ACTIVITY

7 OIL EXPLORATION WELLS DRILLED

5 GEOTHERMAL EXPLORATION OR PRODUCTION WELLS DRILLED



# Nevada Geothermal Energy

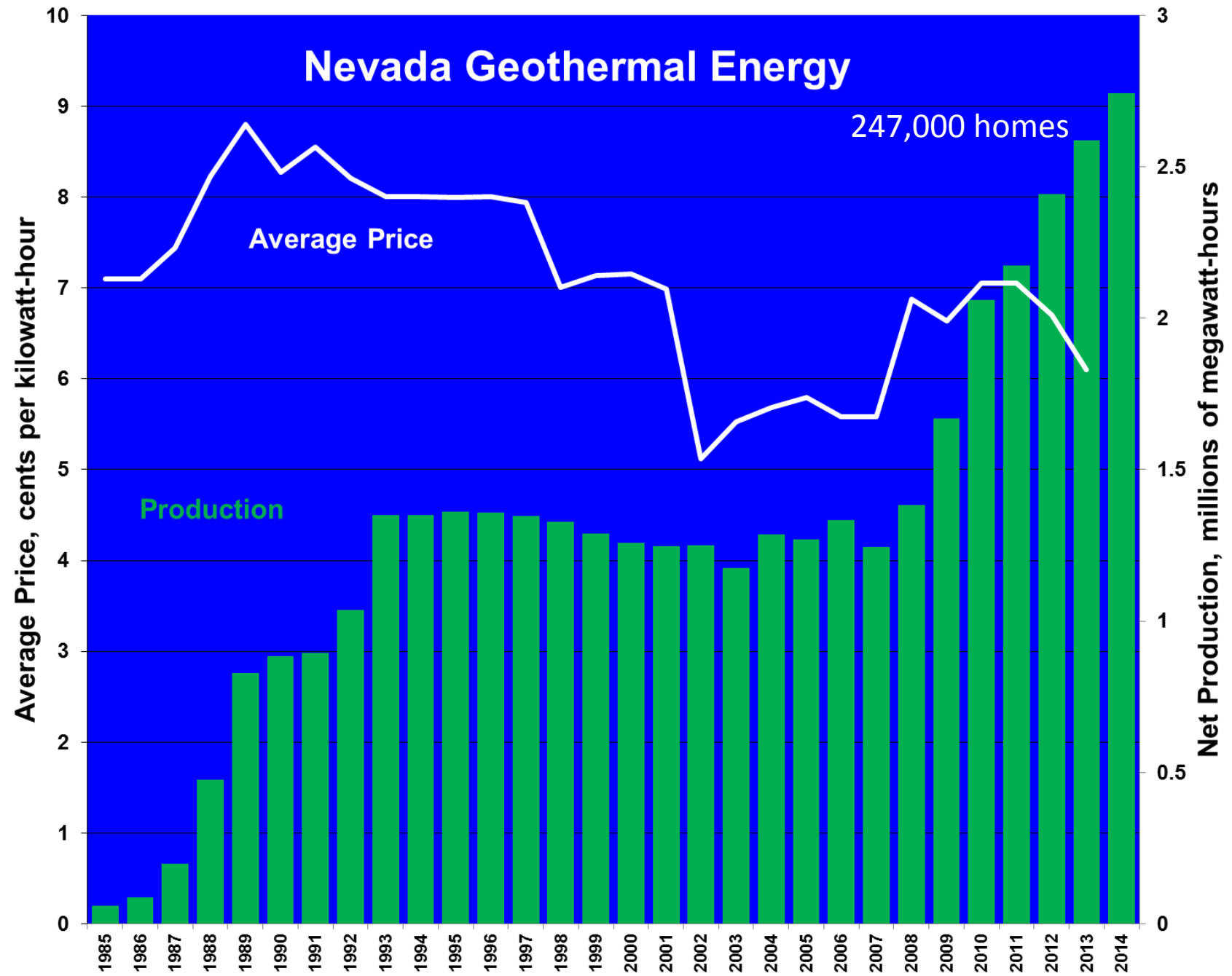
247,000 homes

Average Price, cents per kilowatt-hour

Net Production, millions of megawatt-hours

Average Price

Production





# Ormat Technologies Inc: McGinness Hills

Located in Lander County northeast of Austin  
*Geothermal Power Plant*

## General

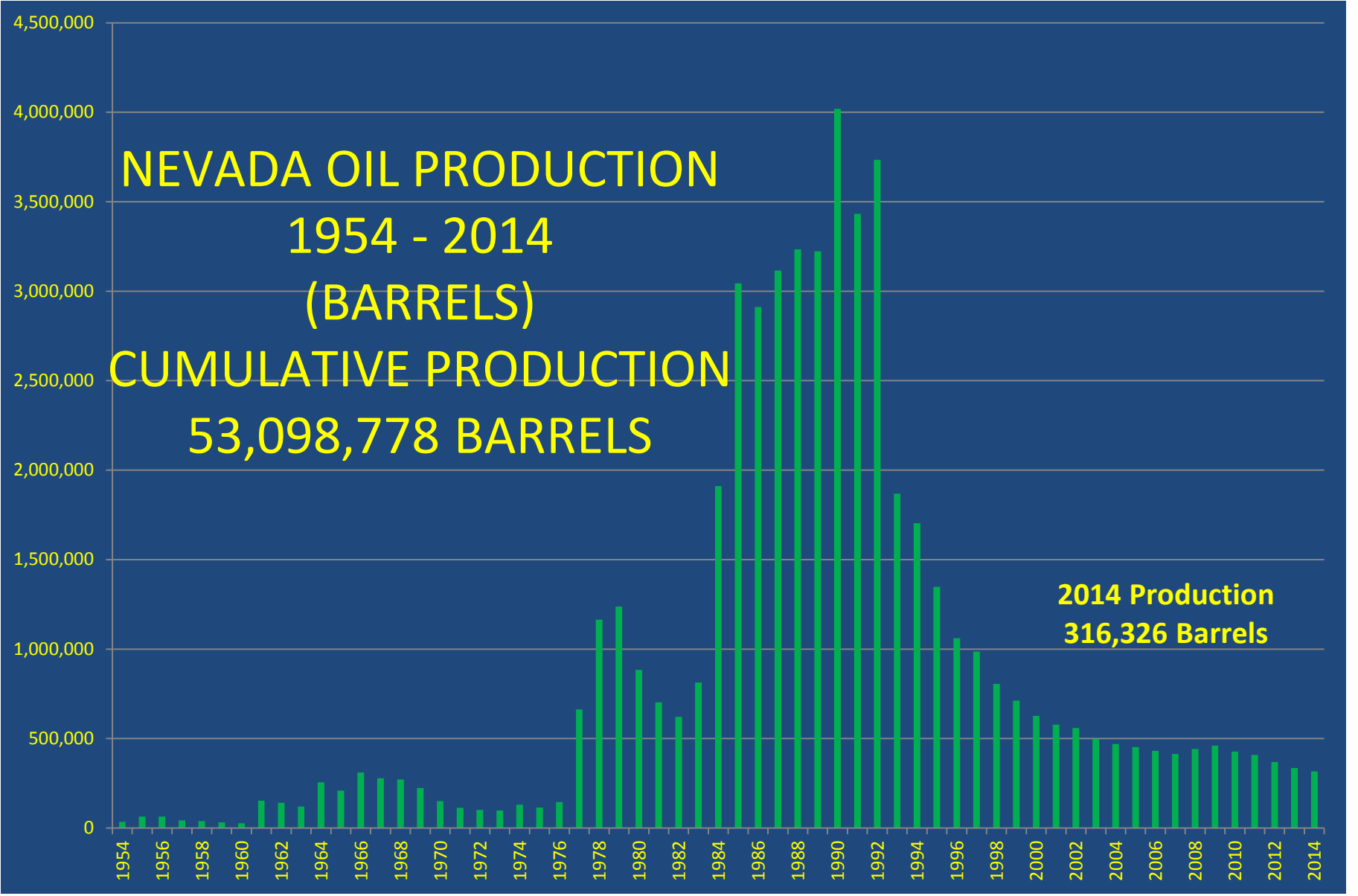
- **First explored for gold in the 1980's due to exposure of high-sulfidation and low-sulfidation hydrothermal alteration products**
- **In 2004 Newcrest Resources encountered hot water during exploration drilling**
- **Each 300 meter exploration hole punctured the sinter cap and intercepted near-boiling waters**
- **Geysering action was observed in one hole**
- **Ormat leased the McGinness Hills Property in 2009**
- **Phase I at 30 MW began operations on June 15, 2012**
- **Phase 2 of commercial operation began February 4, 2015. Total = 72 MW**

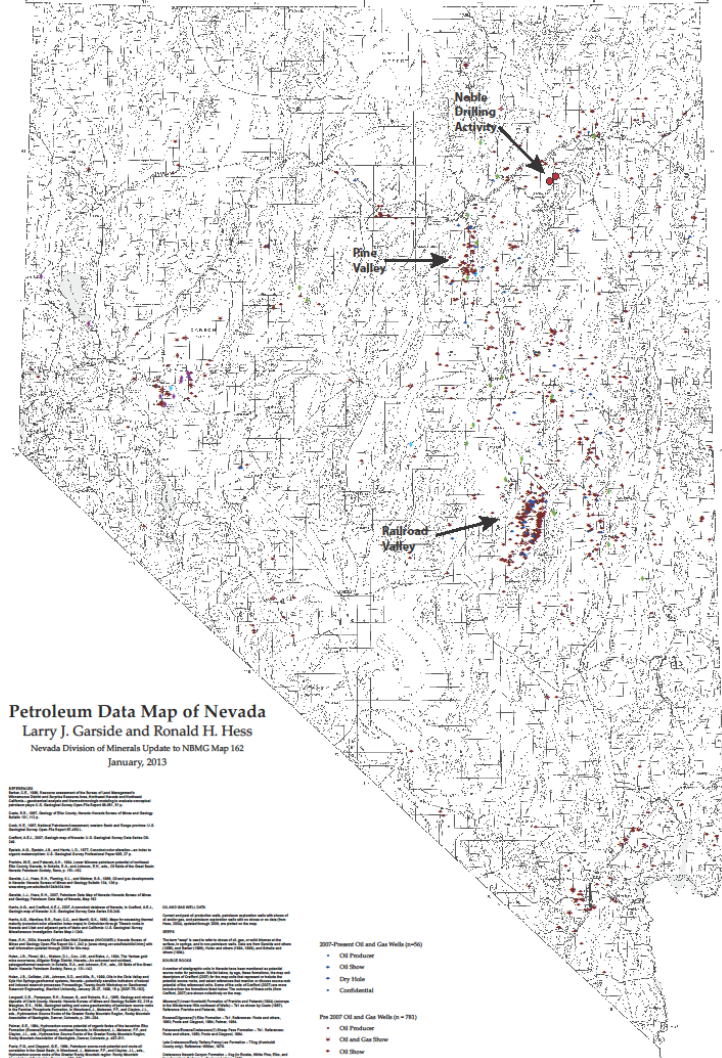




# NEVADA OIL PRODUCTION 1954 - 2014 (BARRELS) CUMULATIVE PRODUCTION 53,098,778 BARRELS

**2014 Production  
316,326 Barrels**





# PETROLEUM EXPLORATION WELLS AND PRODUCTION FIELDS IN NEVADA

826 oil & gas exploration wells drilled since 1907

FIELD	BBLS OIL (2014)
-------	-----------------

Eagle Springs	34,217.00
Trap Spring	136,651.30
Bacon Flat	6,223.00
Currant	143.00
Grant Canyon	46,263.00
Kate Spring	28,933.76
Duckwater	124.00
Sans Spring	1,604.00
Ghost Ranch	15,563.93
Sand Dune	7,467.00

<b>Total RR Valley</b>	<b>275,341.99</b>
------------------------	-------------------

<b>Blackburn</b>	<b>32,217.00</b>
<b>Tomera Ranch</b>	<b>1,916.00</b>

<b>Total Pine Valley</b>	<b>34,133.00</b>
--------------------------	------------------

<b>Humboldt</b>	<b>2,755.77</b>
<b>Huntington</b>	<b>2,247.52</b>

<b>Total Elko County</b>	<b>5,003.29</b>
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<b>Total Nevada</b>	<b>316,326.28</b>
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# NRS 522.119 (SB 390)

- **NRS 522.119 Development of program; regulations.**
  1. **The Division of Minerals and the Division of Environmental Protection shall, jointly, develop a hydraulic fracturing program to:**
    - (a) **Assess the effects of hydraulic fracturing on the waters of the State of Nevada**
    - (b) **Require a person who engages in hydraulic fracturing to disclose each chemical used to engage in hydraulic fracturing; and**
    - (c) **Provide for notice to members of the general public concerning activities relating to hydraulic fracturing in this state.**

# **DEVELOPMENT OF NEVADA'S HF REGULATIONS – UPDATE OF NAC 522**

- 1. 7 Member team developed regulations**
- 2. IOGCC - Reviewed regulations of oil-producing states**
- 3. Reviewed BLM proposed rule on hydraulic fracturing**
- 4. Staff discussed what works and what does not with regulators in Arkansas, California, Colorado, Kansas, North Dakota, Ohio, Pennsylvania, Texas and Utah.**
- 5. Benchmarked regulations against other states.**
- 6. LCB review**
- 7. Held public workshops in CC, LV, Elko in March**
- 8. Addressed all comments, modified first draft**
- 9. 2<sup>nd</sup> LCB review**
- 10. New regulations approved by CMR in August, 2014**
- 11. Recommended for approval by MOAC**
- 12. Approved by Legislative Commission on 10/24/14**

# NEVADA HF REGULATIONS SUMMARY

## (Update to NAC 522)

### APPLICATION:

- application to include minimum 1-mile radius Area of Review
- Groundwater baseline sampling and monitoring of up to 4 existing water wells by operator before and 2X after HF.
- Approved applications with COA's on NDOM web site.

### DRILLING

- Cement bond logs and pressure testing to ensure casing integrity
- Intermediate casing required
- Minimum 500' cement for surface, intermediate, production casing

### HYDRAULIC FRACTURING

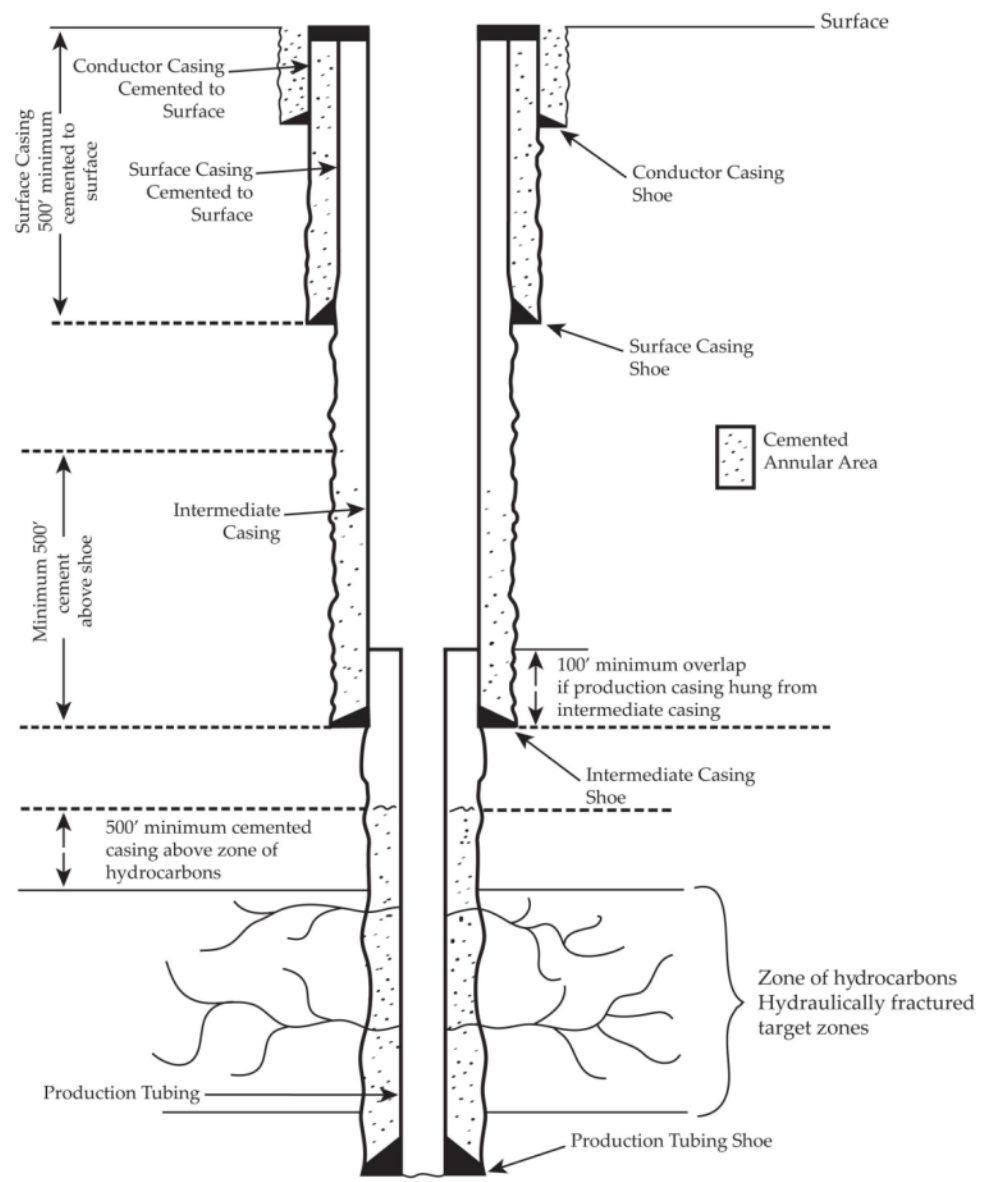
- Pre-approval sundry process for chemicals to be used in HF
- 14 day notification to county commissioners and neighbors

### POST-DRILLING

- Operators post HF list on [Fracfocus.org](http://Fracfocus.org) within 60 days.



# Oil & Gas Resource Well Proposed for Hydraulic Fracturing Vertical





# Water-Quality Data, Hydraulic Fracturing in the Upper Humboldt River Basin, Aquifer Quality Assessment Program, Report 2

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Ronald L. Hershey  
Susan Rybarski  
James M. Thomas  
Greg Pohll

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*December 2014*

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**Publication No. 41259**

*Prepared by*  
Desert Research Institute, Reno, NV

*Prepared for*  
Noble Energy

AQUA study  
By Noble,  
NDOM  
NDEP, DRI.

Reports 1  
and 2 show  
no  
degradation  
of surface or  
groundwater

# FOUR AGENCIES CAN BE INVOLVED WITH DRILLING AN OIL WELL IN NEVADA

- BLM – drilling on Federal lands, leasing process, NEPA process
- NDEP – Air permits for surface area disturbance, UIC permits if water is to be re-injected, water pollution control permits if water is to be discharged outside of containment.
- NDOM – Permits to drill on private/state lands, coordinates w/ BLM for drill permits on Federal lands.
- NDWR – For any water used in drilling, dust control or hydraulic fracturing





# Noble Energy: NE Nevada Oil Play

Unconventional Oil Prospect/Wilson Project

## Exploration Stage Unconventional Oil Prospects

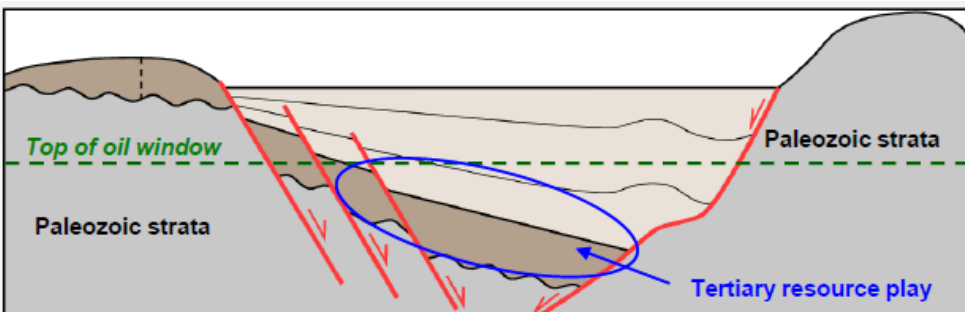
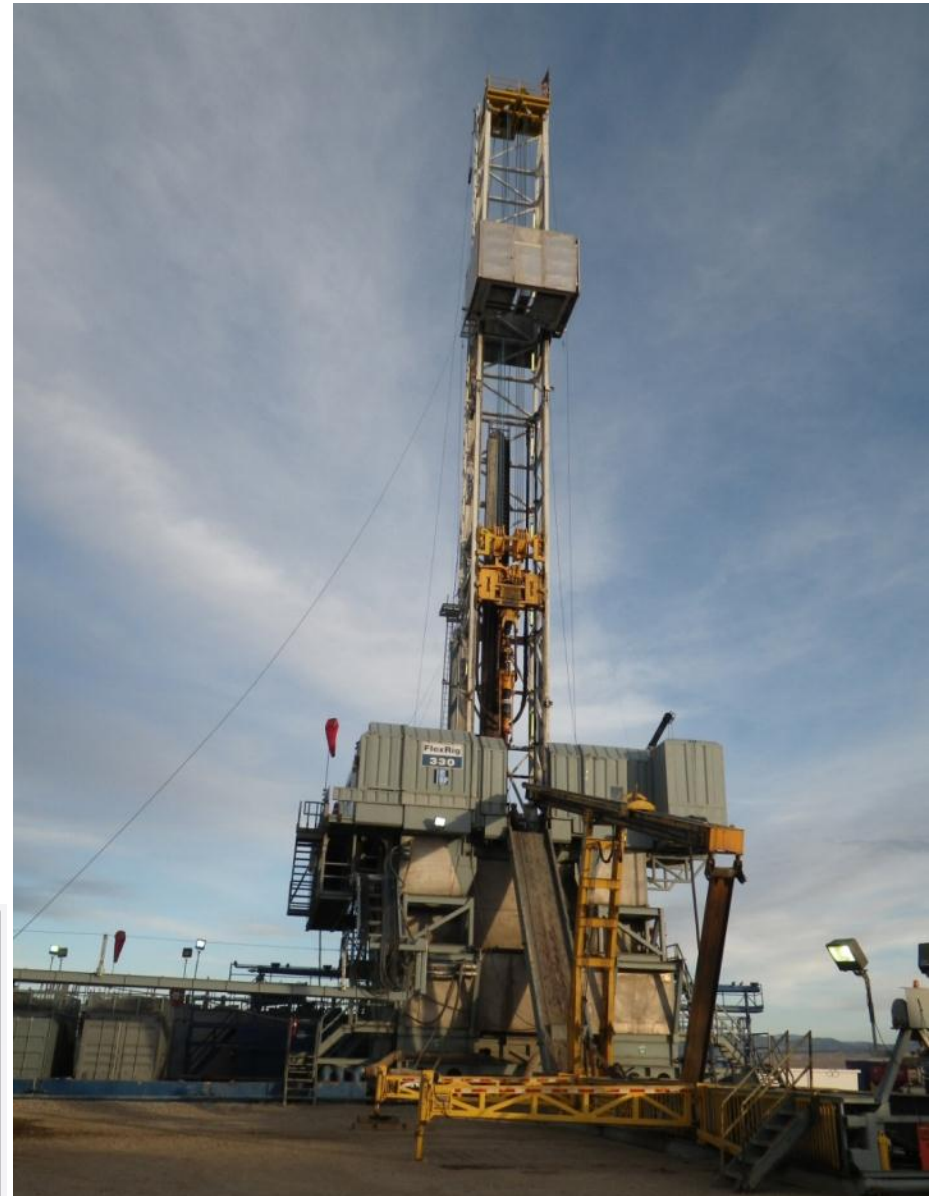
- Targeting Tertiary age lacustrine shale (Elko Formation) with play at depths between 6,000 – 12,000 ft
- Unconventional tight oil prospect
- 4 Wells drilled to date, 3 hydraulically fractured

## Results:

- Hydrocarbon saturation up to 70%
- Thermal maturity in peak oil generation window
- Total organic content 1-24%
- 2 wells recorded oil production

## Looking Forward:

- Complete Analysis of data from wells
- Design Completion and conduct production tests



# U.S. Onshore – NE Nevada

*Large-scale organic exploration opportunity*

## ▶ NBL Operated

- ⌘ 372,000 gross acres, 66% fee

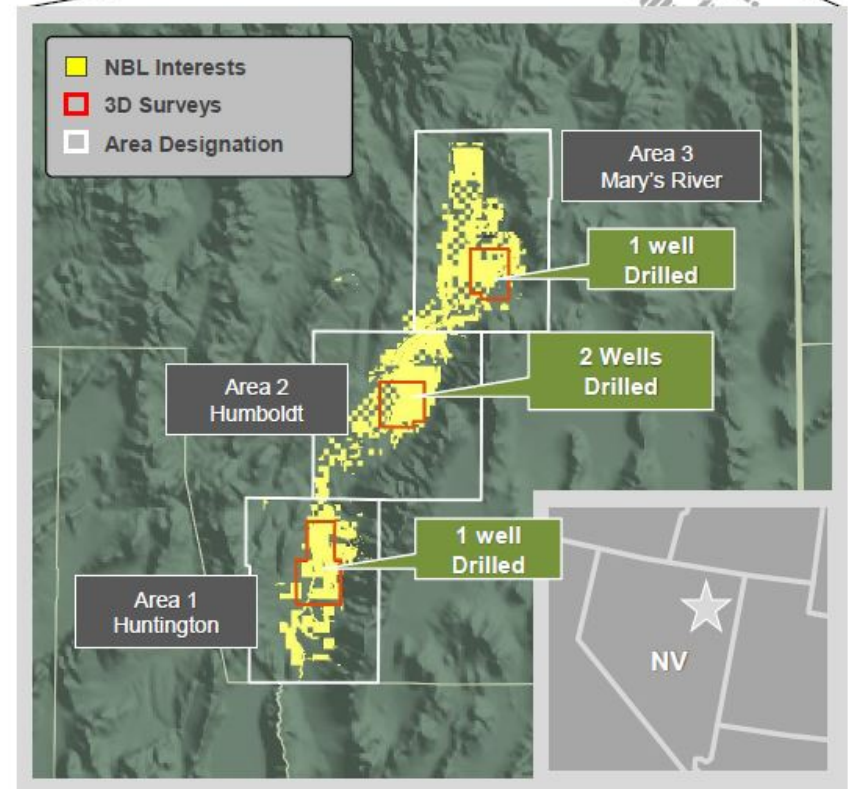
## ▶ Play Characteristics

- ⌘ Depth range 6,000 - 12,000 ft.
- ⌘ Unconventional tight oil prospect, similar deposition to Uinta Basin

## ▶ Initial Wells Proved Productive Nature of the Targeted Reservoir

- ⌘ Four wells drilled across acreage position
- ⌘ Initial vertical completion in Humboldt area currently producing
- ⌘ Initial completion in Mary's River awaiting long-term production facilities

## ▶ Assessing Next Steps for Appraisal





State of Nevada  
Commission on Mineral Resources  
**Division of Minerals**



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Noble Energy oil exploration well in Elko County



### Important Links

- [Nevada Excellence in Mine Reclamation Award Winners Named](#)
- [Final Approved Regulations for Hydraulic Fracturing](#)
- [Nevada Mineral, Oil and Geothermal Energy Production and Selected Projects – Presentation to MOAC December 2, 2014](#)
- [NDOM YouTube Channel](#)
- [Nevada Bureau of Mines and Geology](#)

### Employment Announcement(s)

- [Recruitment Announcement for Public Service Intern 2015](#)

### Programs

