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An Introduction to *In-Situ* Recovery (ISR)

DEVELOPING ALTERNATIVE ENERGY FOR AMERICA

WWW.URANIUMENERGY.COM

UEC

Uranium Energy Corp


Yellowcake

u•ra•ni•um

Pronunciation: (yoo-ra'ne-*u*m),
—*n. Chem.*
a white, lustrous, radioactive, metallic element, occurring in pitchblende, and having compounds that are used in production of nuclear power and in coloring glass. More plentiful than zinc and tin it also is the heaviest natural occurring element. It is ubiquitous and is found commonly throughout the world. Trace amounts are found in seawater.

Symbol: U; *at. wt.:* 238.03; *at. no.:* 92; *sp. gr.:* 19.07.

Why

Nuclear?

Facts:

1. United States long term goal is to become Energy Independent.
2. Nuclear Power has no emissions of CO_2, NO_2 and SO_2 which cause Global Warming and Acid Rain.
3. Costs/Kwhr
   A. Nuclear 1.7 ¢
   B. Coal 2.1¢
   C. Natural Gas 7.5 ¢
4. Material needed to light a 100 watt light bulb continuously for a year.
   A. 876 lbs of Coal
   B. 324 lbs of Natural Gas
   C. 508 lbs of Oil
   D. .0007 lbs of Uranium

Energy Demand and Growth

Why is there a need to explore and produce uranium?

- World Electrical consumption will double by 2030.
- USA produces 3 million lbs U3O8 each year, yet consumes 60 million lbs.
- 95% of all our nation's nuclear fuel is being imported.
- 2006 CO2 emissions = 23 Billion tons/year. It is projected that by 2030 this will increase by 72% or 43 Billion tons/year.

U.S. Electricity Generation Fuel Shares

1973 vs. 2005*

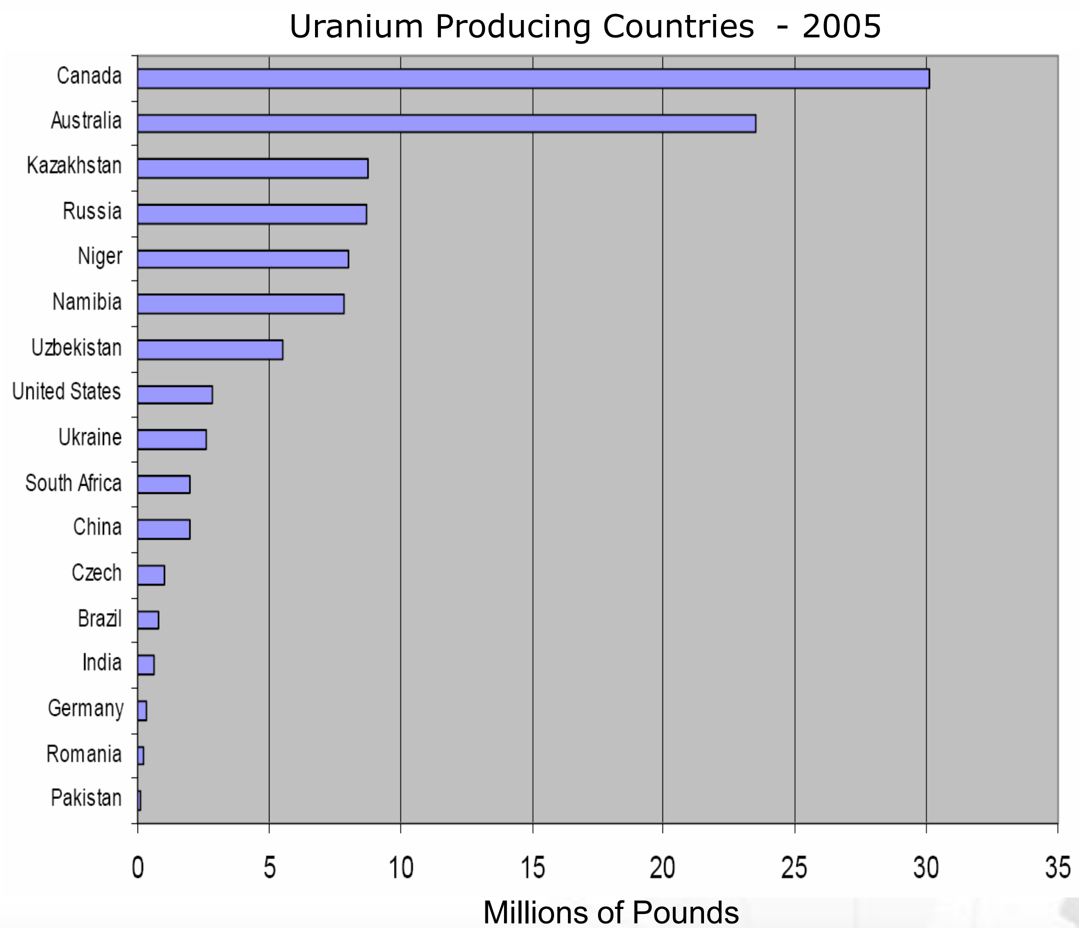
Fuel	1973	2005
Coal	45.5%	49.9%
Nuclear	4.5%	19.4%
Gas	18.3%	18.6%
Hydro	14.8%	6.4%
Oil	16.9%	3.0%
Other	0.1%	2.7%

* Preliminary

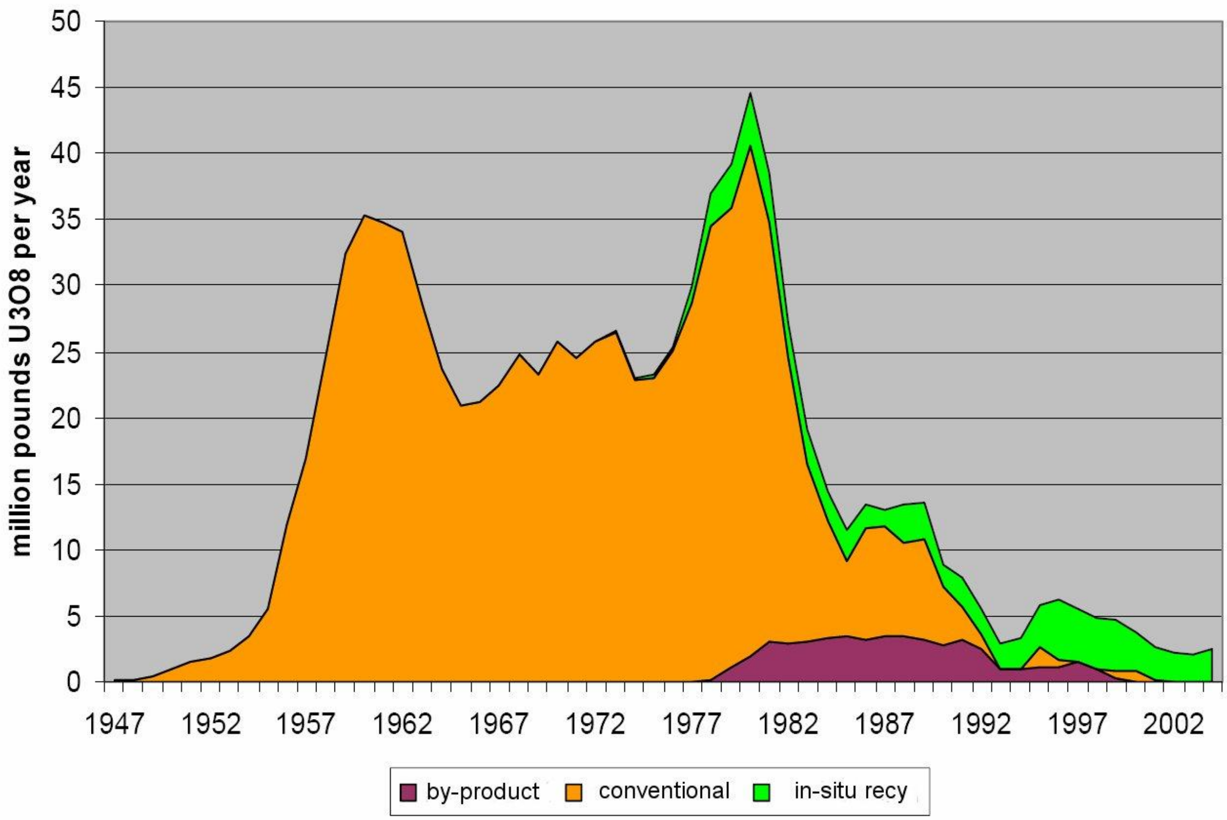
Source: Global Energy Decisions / Energy Information Administration

Updated: 4/06

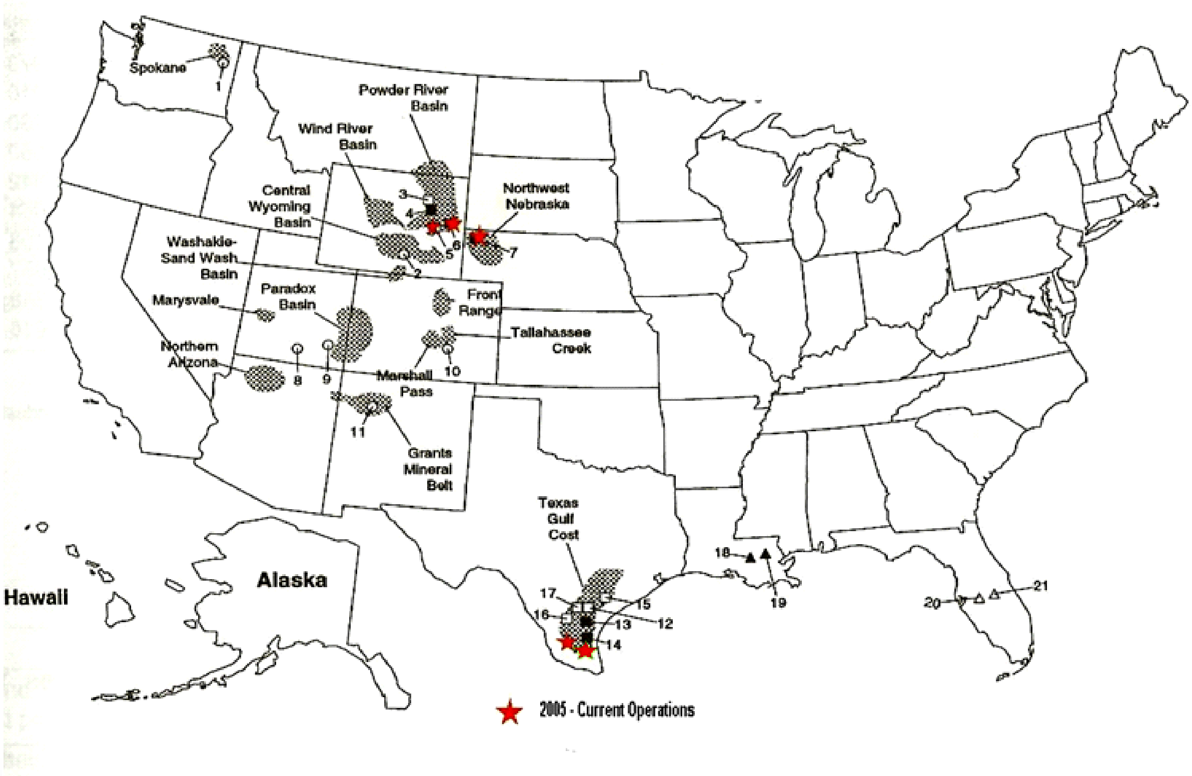
NEI


Uranium Producing Countries - 2005
Canada
Australia
Kazakhstan
Russia
Niger
Namibia
Uzbekistan
United States
Ukraine
South Africa
China
Czech
Brazil
India
Germany
Romania
Pakistan
0
5
10
15
20
25
30
35
Millions of Pounds

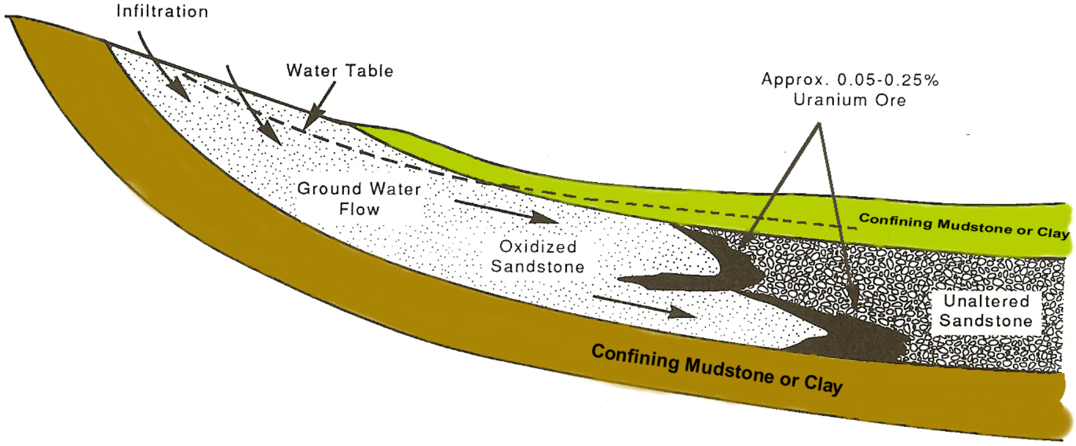
Historical U.S. Uranium Production



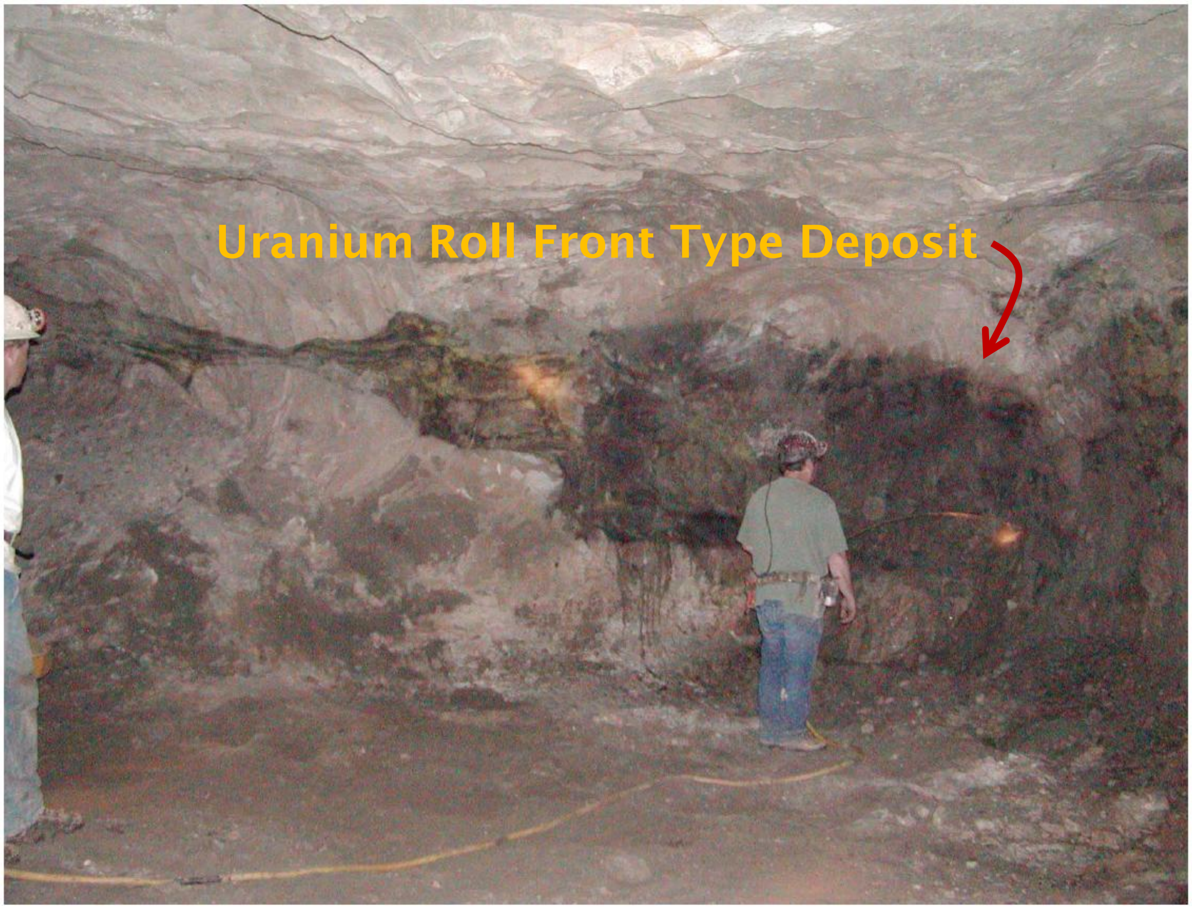
Uranium Mining Centers in the USA



Uranium Depositional Process



Uranium is ubiquitous and is easily dissolved in the presence of water, oxygen, and carbon dioxide. The source of the uranium is from volcanic actions eons ago originating from the Big Bend area. Tuffaceous soil containing trace amounts of uranium were deposited throughout South Texas and constitute the source. Over geologic time, meteoric rains mix with oxygen and carbon dioxide in the atmosphere and solubilize trace amounts of uranium in the soils . The oxidized waters now containing dissolved uranium flow down-dip through the aquifer until contacting areas where high levels of sulfur in the water is encountered. At this interface the uranium precipitates as a coating on sand grains. After millions of years of this process a uranium ore body is formed.

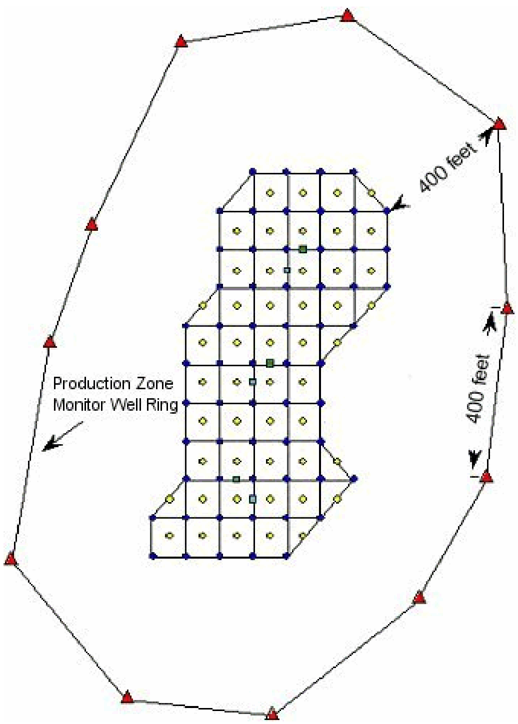

Uranium Roll Front Type Deposit

Regulatory Agencies and Permits required to conduct mining

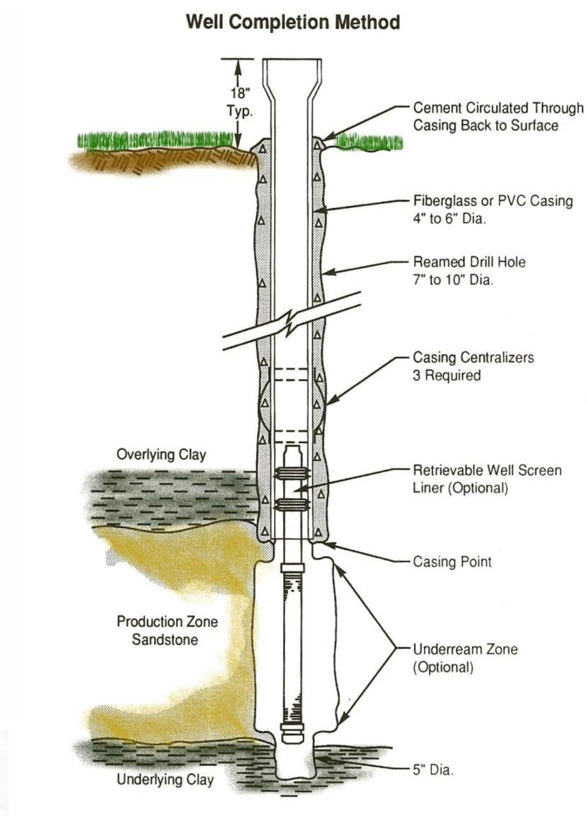
1. Texas Railroad Commission - Exploration
2. Texas Commission of Environmental Quality– TCEQ – Mining
    a. Mine Permit and Permit Area Authorizations
    b. Air Exemption Permit
    c. Radioactive Material License
3. US Environmental Protection Agency– EPA –
    a. Aquifer Exemption

Also Texas Parks and Wildlife, Corp of Army Engineers, and the Texas Historical Office have to sign off.

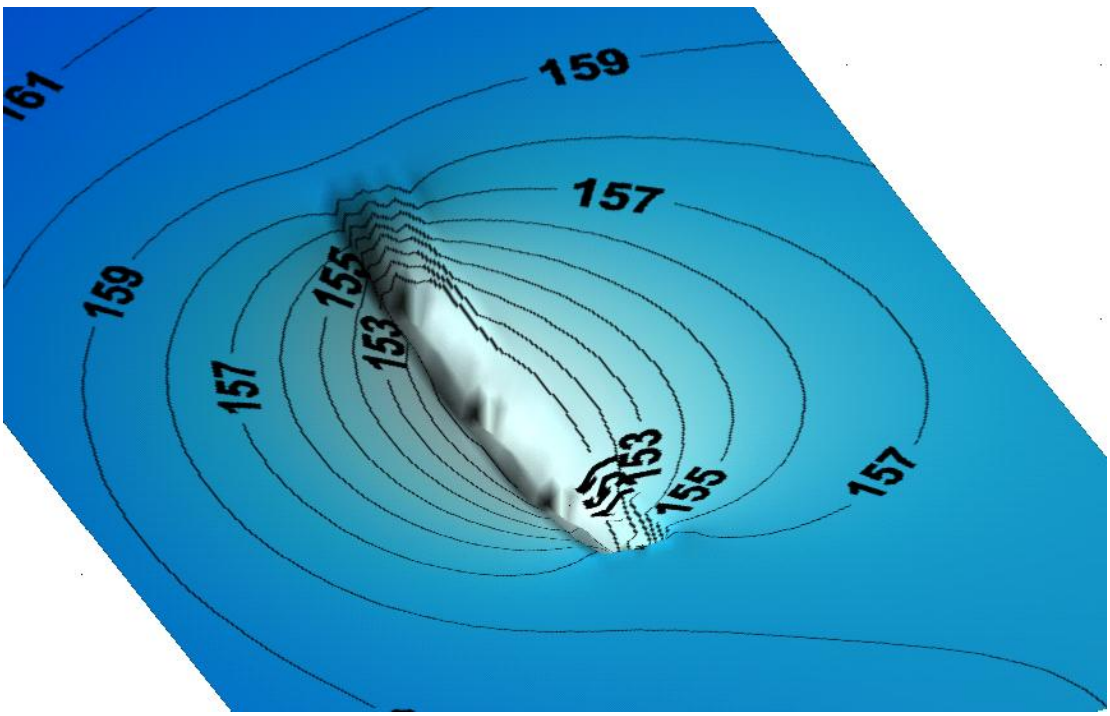
The Wellfield



- Production Well
- Injection Well
- Production Zone Monitor Well
- Overlying Aquifer Monitor Well
- Underlying Aquifer Monitor Well

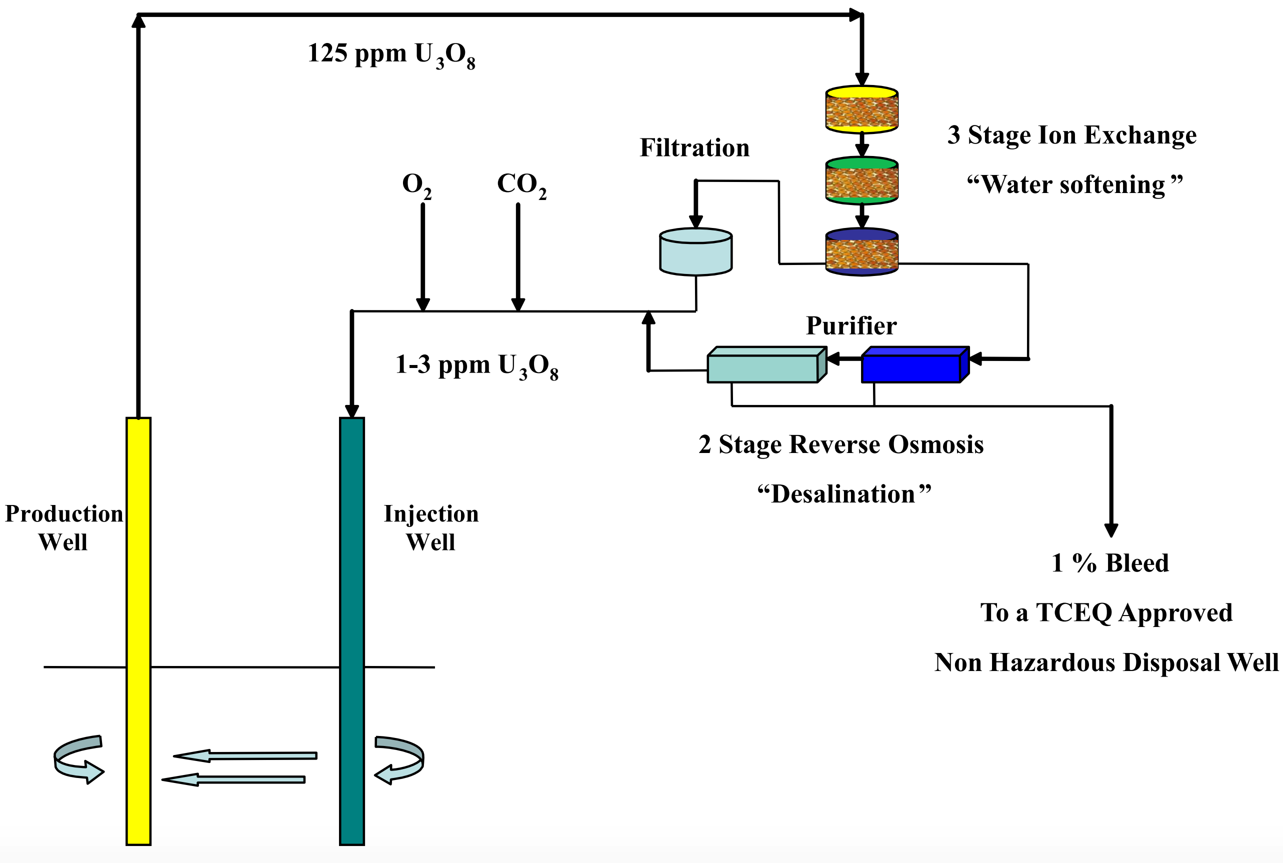


Localize “sink” with groundwater flowing into the center.

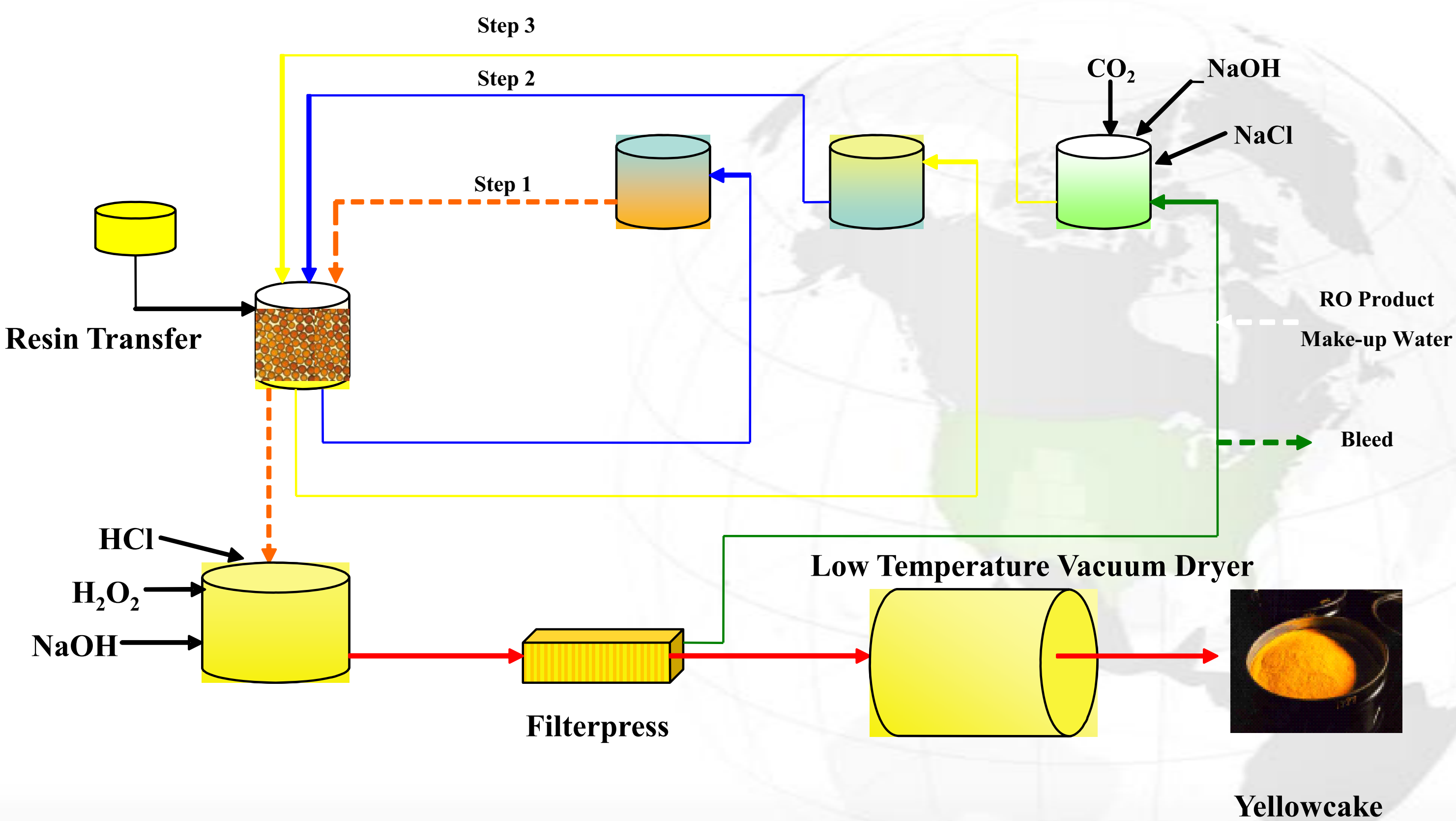


EPA Drinking Water Standards	Typical Premining Water Conc.
Uranium - 0.03 ppm	0.10 – 1.0 ppm
Arsenic - 0.01 ppm	0.03 – 0.1 ppm
Radium 226 - 5 picocuries/liter	25 - 380 picocuries/liter
Radon - 4,000 picocuries/liter	2,000 – 20,000 picocuries/liter

In-Situ Recovery



Stripping, Precipitation, and Drying



Groundwater Restoration

After mining, one pore volume of groundwater will be flushed and disposed from the mine area into the operation's nonhazardous disposal well at an approved rate. This action will further collapse the cone of depression surrounding the mine area bringing in fresh water from the surrounding area and removing the bulk of the elevated ions. Water will continue to be pumped from the mine area which will undergo further polishing using Reverse Osmosis (RO) treatment. RO is essentially an ion filter. Filtering out Sulfate (**SO_4**$^{-2}$), Calcium (**Ca**$^{+2)}$), Chloride (**Cl**$^{-1)}$, Uranyl Oxide (**UO_3**$^{+2)}$, Bicarbonate (**HCO_4**$^{-1)}$, and essentially all (98%) dissolved salts, the water produced by this equipment is of drinking water quality. This produced water will be blended with the circulating groundwater until the groundwater quality meets or exceeds the pre-mining use category.

The application of utilizing sulfate reducing bacteria to aid in the restoration of mine waters was conducted at TAMUK in 1994. This technology has been successfully employed at several commercial ISR mines to enhance geochemical precipitation of heavy metals.

Texas Major Aquifers

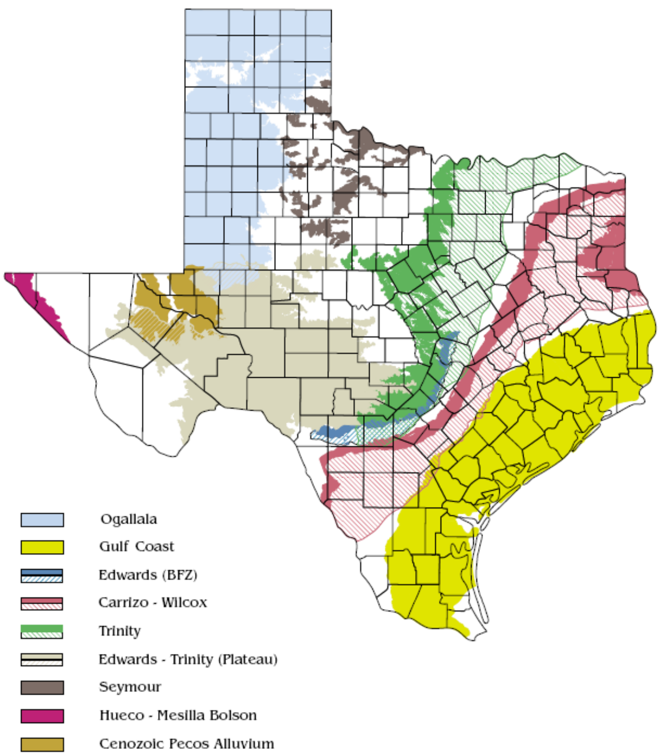


Figure 1. In Texas there are nine major aquifers, which account for 96.3 percent of all groundwater withdrawals in the state.

Texas Water Sources and Uses

62% of all water consumed in Texas is used for agriculture.

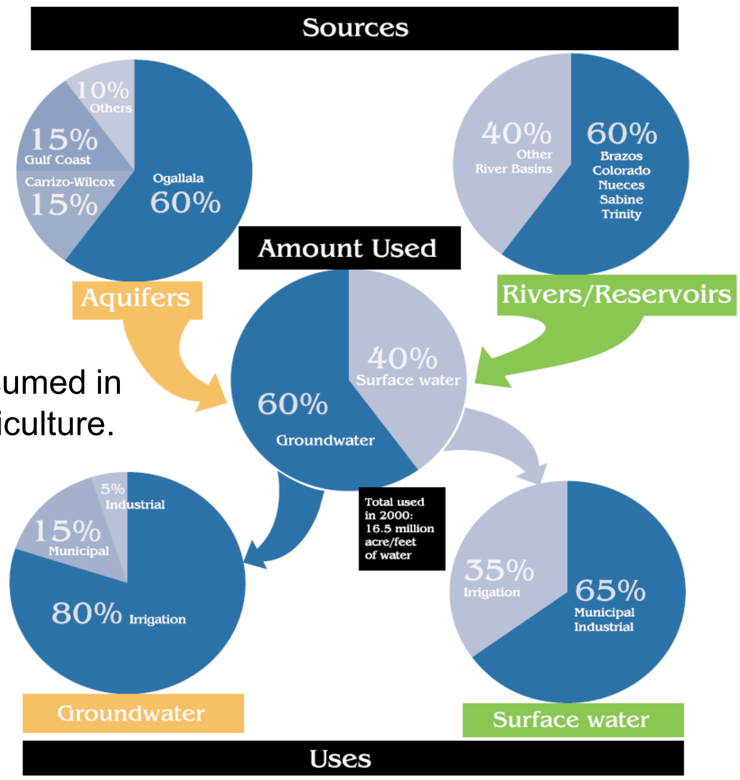


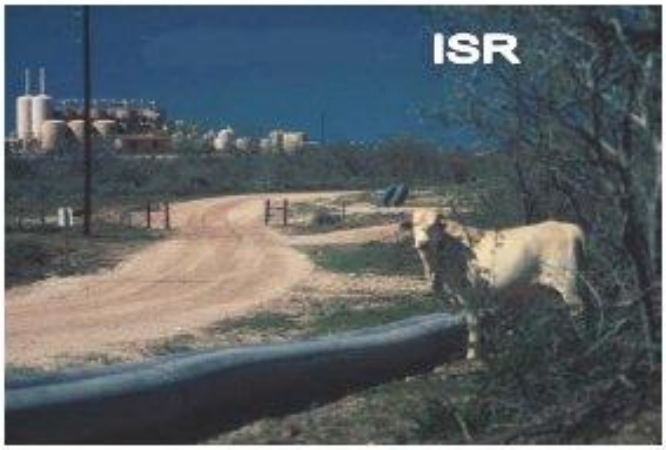
Figure 2. Texas water uses and sources in 2000. Estimated from 1997 and 2002 Texas State Water Plan. Percentages could vary by + or - 5 percent.

If it isn't Grown, It's Mined!

Iron, aluminum, silica, oil & gas, tin, copper, tungsten, molybdenum, vanadium, chromium, coal, gravel just to name a few.

Every American uses 45,500 pounds of newly mined minerals a year. This includes 3.7 tons of coal and 0.25 pounds of uranium.

Agriculture and mining do co-exist.



Positive impact from industry

- High paying jobs – more $$s circulating throughout the community.
- Taxes paid to the School District and County.
- Community Involvement and Participation.
- Purchasing from local businesses.
- Hiring locally.

UEC's contribution to the community

- Provide free water sampling within 1 kilometer of any of its pr ojects.
- Contribute this information to the GCGCD at no cost to further their database on water quality within the county.
- Water analyses will define where "bad" water exists which is not being analyzed currently.
- UEC pledges to purchase locally and use local labor to build an d operate its facilities.

- **<u>If "mining" is a beneficial use of water</u>** as defined by the GCGCD: Texas Water Development Board; and the Texas Commission on Environmental Quality, then what other issues remain that we need to address?

▪The "U" word – URANIUM – Radiation???

<u>Uranium</u> has a very long half-life which means that it is barely radioactive. Also it is an alpha emitter which means this form of radiation cannot penetrate paper.

<u>Radon</u> – It is anticipated that approximately 200 curies of radon will be released annually. This equates to 0.13 ml of radon gas at standard temperature and pressure for the **<u>entire year</u>**. Less than a test tube amount. You can imagine how ***<u>1/3 milliliter</u>*** of gas over an entire year is easily dispersed and is not detected above baseline within several hundred feet of the project.

If **Radiation** is not an issue, is in-situ recovery and groundwater restoration the concern?

Oxygen and CO_2 are the two main ingredients (gases) used in in-situ recovery. The solution is very selective to just dissolving the uranium mineral. There will be a slight build-up of calcium (Ca^{++}), sulfate (SO_4^{--}), and bicarbonate (HCO_3^{-}) ions during active mining.

We are purposing using *desalination* and *ion exchange* from the beginning to restore the mine waters as we mine, and also during the active restoration phase to remove these same ions. This will:

- Retard the build up these ions during mining.
- Allow for a faster restoration after recovery has been completed.
- **Pure** drinking water will be returned to the groundwater until its quality is consistent with baseline.

This technology has over 30 years of successful experience. **Never** has a public, or private well been contaminated.

Typical ISR Facility in South Texas

Upflow Ion Exchange Vessels

Satellite Operations

Downflow Ion Exchange Columns

Water Filtration and Injection Pumps

Low Temperature Rotary Vacuum Dryer

Uranium Energy Corp

DEVELOPING ALTERNATIVE ENERGY FOR AMERICA

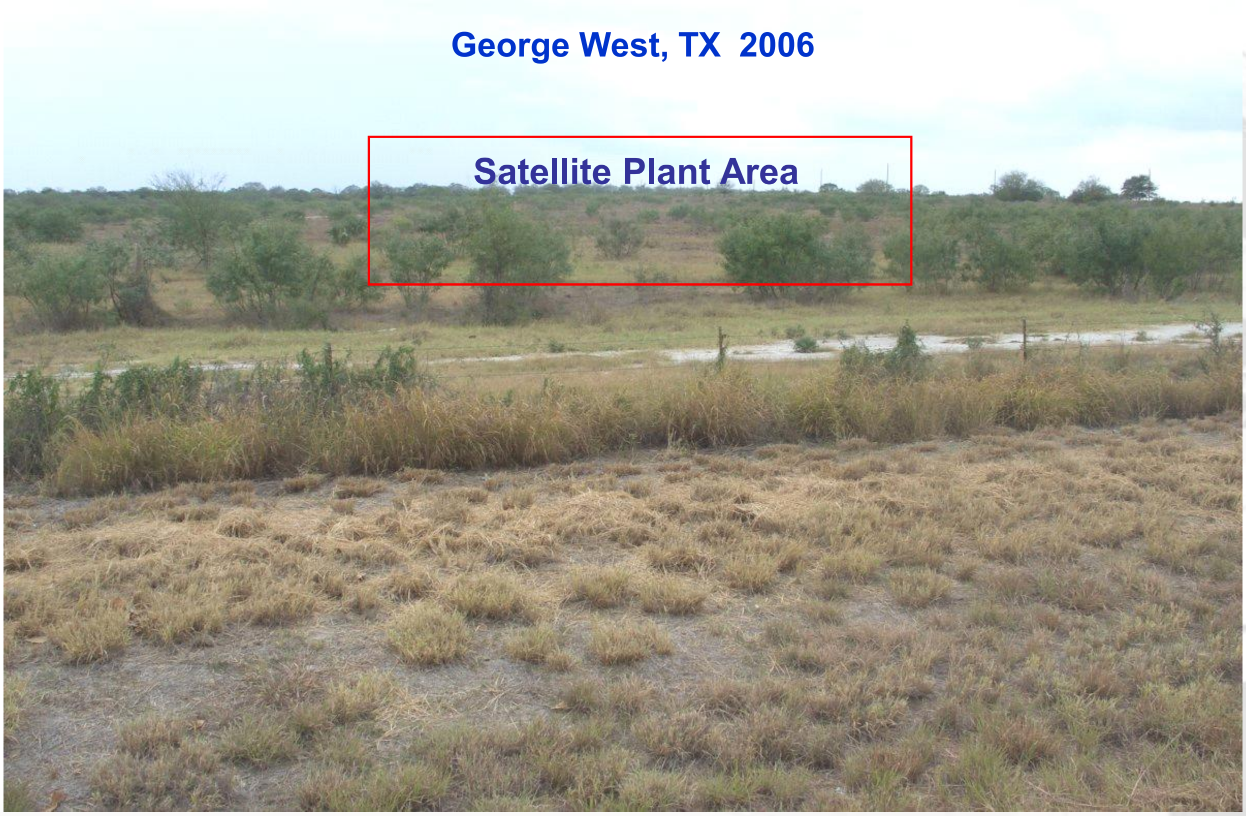
Operating Wellfield – South Texas 2006 after Spring Rains

Cogema's Wellfield Prior to Well Plugging, 2006

Hebbronville, TX – 2006

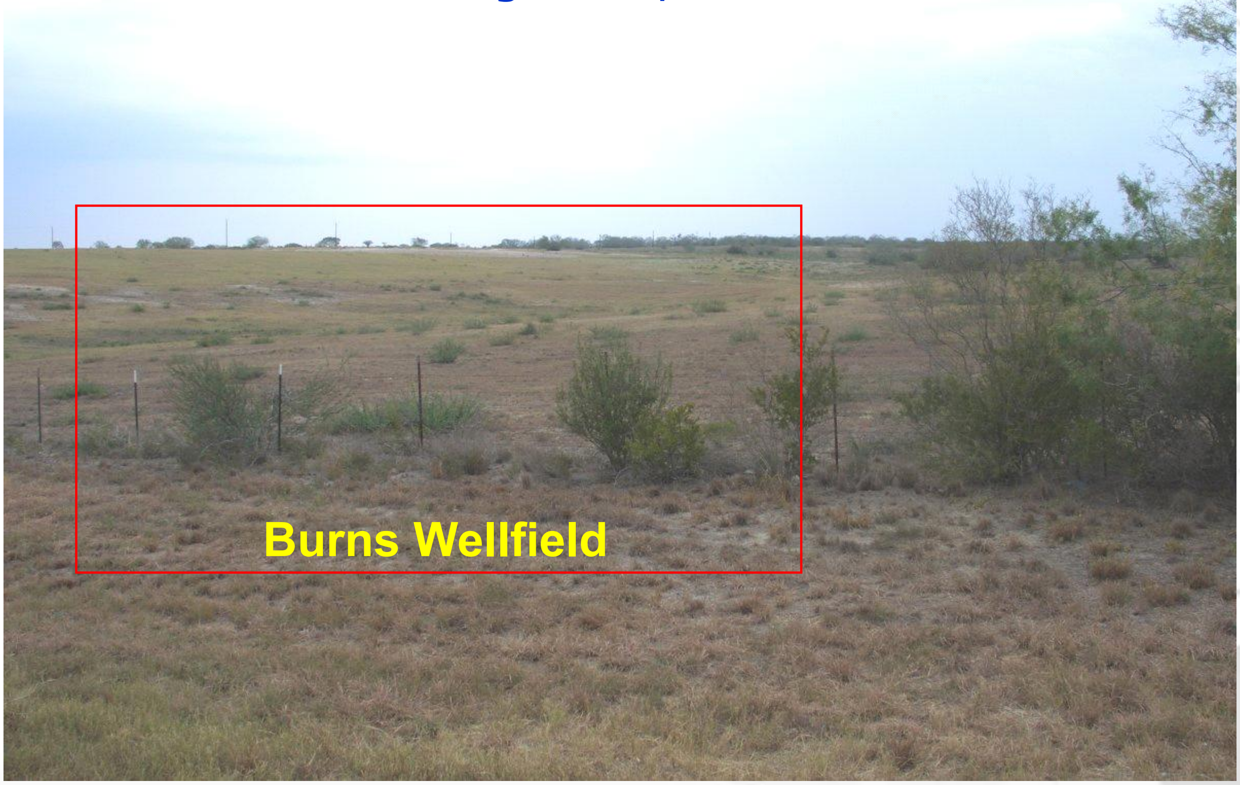
Reclaimed ISR Surface Facility– US Steel's Burns

George West, TX 2006



Reclaimed Wellfield – US Steel's Burns

George West, TX- 2006




Pawnee Satellite
and Plant Area
Pawnee Wellfield

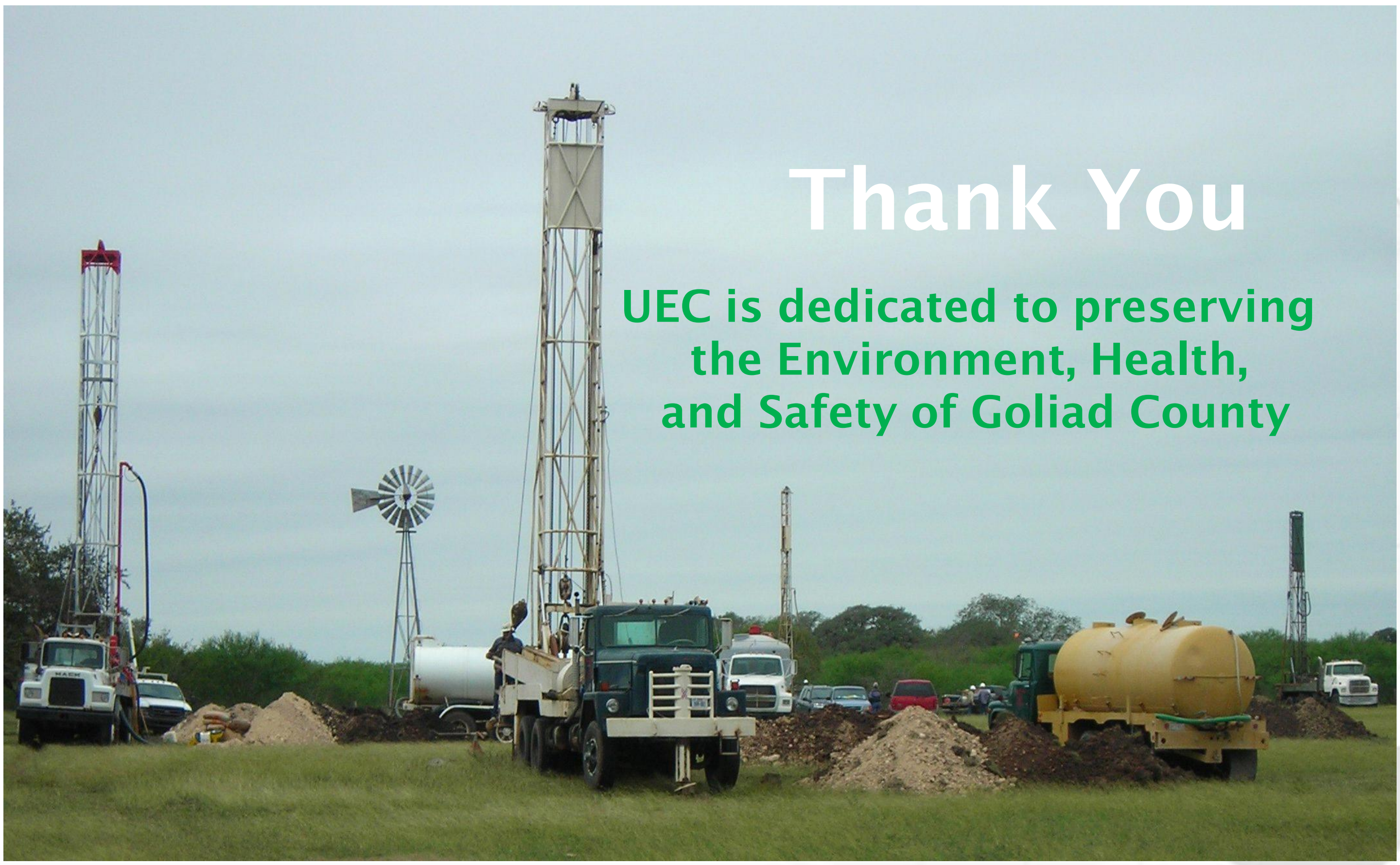

Pawnee Wellfield

Benefits and Facts:

- Employment ~ 80 employees and contractors
- Tax Base – County and School District
- Retail and Industrial Sales

  Vehicles, pvc pipe, vehicle repair, electrical, plumbing supplies, fuel, drilling contractors, etc.

- Environmentally friendly
- No surface destruction
- Negligible use of water.
- The process is tested over 30 years of safe operations at 26 different locations in Texas.
- **No private or public wells have ever been contaminated by this process**.
- It is a safe, environmentally benign way of recovering a strategic mineral needed for America to insure its Energy Independence.


Thank You
UEC is dedicated to preserving
the Environment, Health,
and Safety of Goliad County