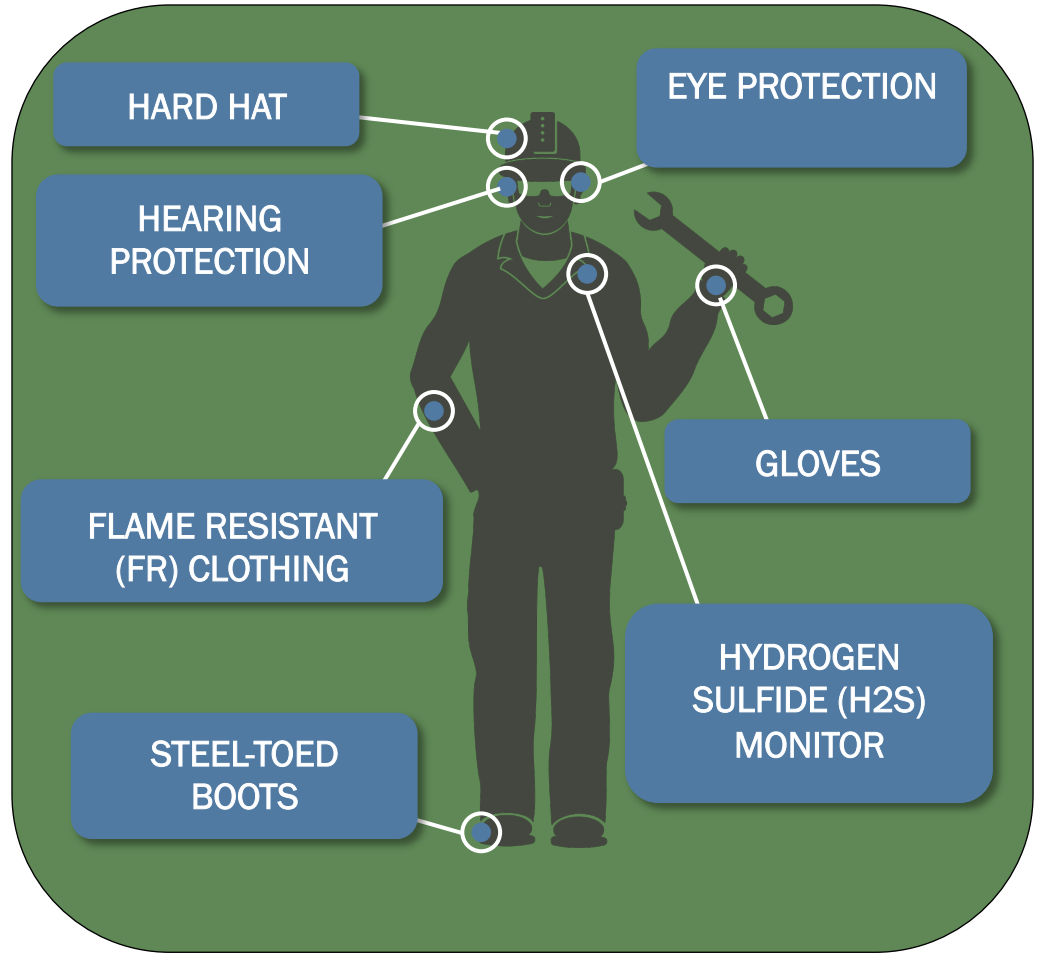




South Texas Energy
& Economic Roundtable

Insights into Water Utilization & Engagement in the South TX Oil Field

Safety is the Top Priority

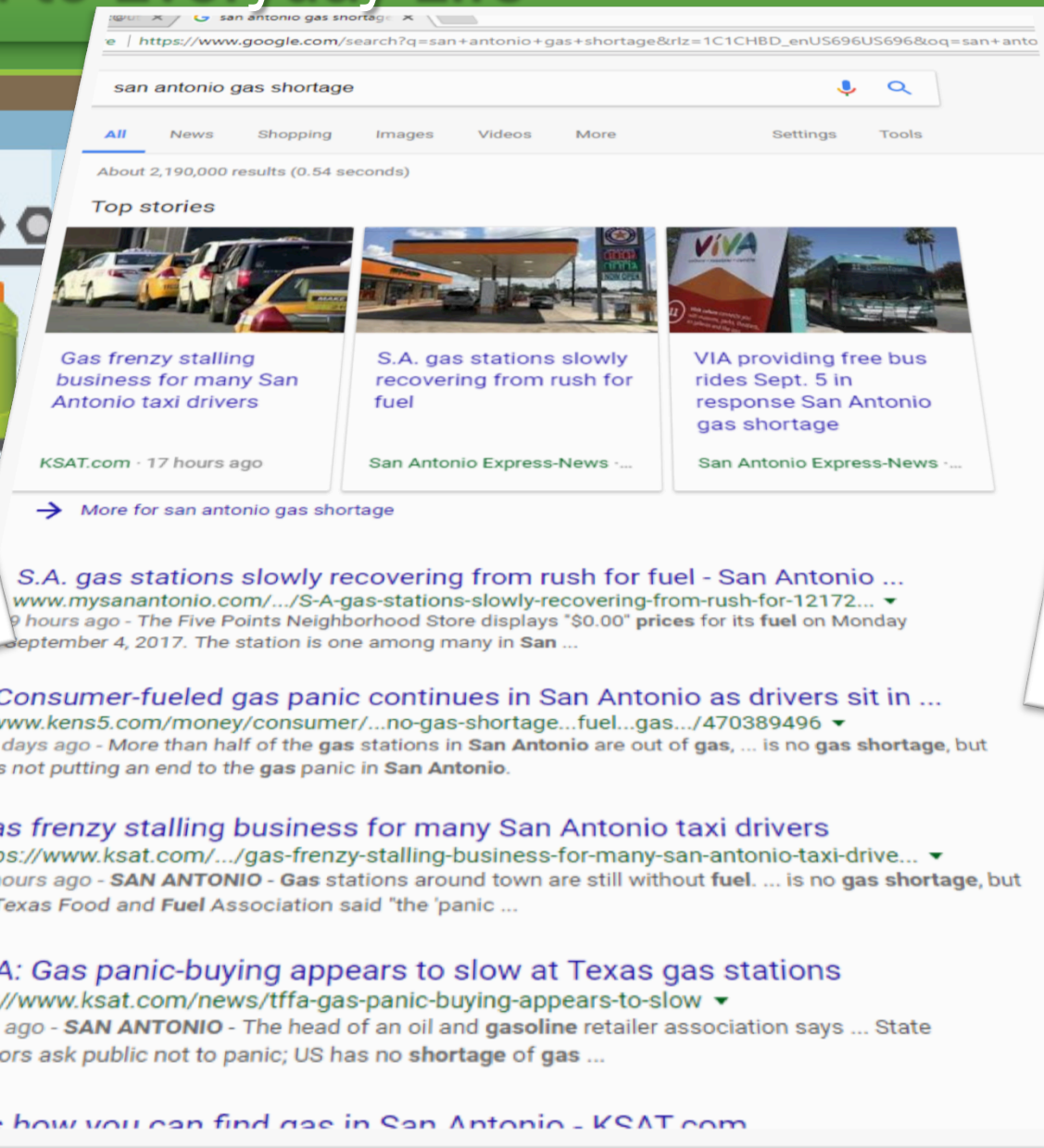


<https://www.txdot.gov/driver/share-road/be-safe-drive-smart.html>

Oil and Gas is Vital to Everyday Life






Oil and Gas is Vital to Everyday Life



san antonio gas shortage

About 2,190,000 results (0.54 seconds)

Top stories

- 
Gas frenzy stalling business for many San Antonio taxi drivers
KSAT.com · 17 hours ago
- 
S.A. gas stations slowly recovering from rush for fuel
San Antonio Express-News · ...
- 
VIA providing free bus rides Sept. 5 in response San Antonio gas shortage
San Antonio Express-News · ...

→ More for san antonio gas shortage

S.A. gas stations slowly recovering from rush for fuel - San Antonio ...
www.mysanantonio.com/.../S-A-gas-stations-slowly-recovering-from-rush-for-12172...
9 hours ago - The Five Points Neighborhood Store displays "\$0.00" prices for its fuel on Monday September 4, 2017. The station is one among many in San ...

Consumer-fueled gas panic continues in San Antonio as drivers sit in ...
www.kens5.com/money/consumer/...no-gas-shortage...fuel...gas.../470389496
3 days ago - More than half of the gas stations in San Antonio are out of gas, ... is no gas shortage, but it's not putting an end to the gas panic in San Antonio.

Gas frenzy stalling business for many San Antonio taxi drivers
<https://www.ksat.com/.../gas-frenzy-stalling-business-for-many-san-antonio-taxi-drive...>
18 hours ago - SAN ANTONIO - Gas stations around town are still without fuel. ... is no gas shortage, but the Texas Food and Fuel Association said "the 'panic ...


TFFA: Gas panic-buying appears to slow at Texas gas stations
<https://www.ksat.com/news/tffa-gas-panic-buying-appears-to-slow>
3 days ago - SAN ANTONIO - The head of an oil and gasoline retailer association says ... State regulators ask public not to panic; US has no shortage of gas ...

[Here's how you can find gas in San Antonio - KSAT.com](#)



Gas frenzy stalling business for many San Antonio taxi drivers

KSAT.com · 17 hours ago



VIA providing free bus rides Sept. 5 in response San Antonio gas shortage

San Antonio Express-News · ...

South Texas Energy & Economic Roundtable

- Trade Association connecting the oil and natural gas industry to South Texas communities
- Represented by the largest operators in the Eagle Ford Shale region
- Mission to facilitate and coordinate communication, education and public advocacy surrounding the production of energy resources in South Texas

Sustaining Members



The Sustaining Members section displays logos for the following companies:

- bhpbilliton
- Chesapeake ENERGY
- ConocoPhillips
- devon
- encana
- ENERVEST
- eog resources
- Marathon Oil
- MURPHY OIL CORPORATION
- PIONEER NATURAL RESOURCES
- Statoil
- SM ENERGY
- noble energy
- CHEVENNE
- SANCHEZ ENERGY CORPORATION
- EP ENERGY
- XTO ENERGY

Supporting Members

- Baker Hughes
- Halliburton
- NGL Energy Partners
- Schlumberger
- Weatherford

Resource Members

- AEP Texas
- Aggreko
- Cheniere Energy
- HOLT CAT
- Port of Corpus Christi
- Port of Victoria
- Union Pacific
- Tenaris

Associate Members

- Free Trade Alliance
- Victoria Economic Development Corporation

STEER Impacts Through Collaboration

- STEER Water Sustainability, HSE, Operations, Communications, Stakeholder Relations, and Millennial Committees
- Alamo Area Council of Governments (AACOG) Eagle Ford Emissions Inventory
- Roads: TxDOT/DPS/STEER
- UTSA Economic Impact Study
- San Antonio River Authority (SARA) on Eagle Ford Shale Handbook
- San Antonio River Authority
- Groundwater Conservation Districts
- Texas Parks & Wildlife
- Taking Care of Texas
- EDF
- And the list goes on...



“Taking Care of Texas is about building on existing conservation efforts. We want Texas to be a leader in meeting the nation’s energy needs while conserving soil and habitat and boosting the economy in South Texas.”

- Laura Bush, *Taking Care of Texas*

The Eagle Ford Shale

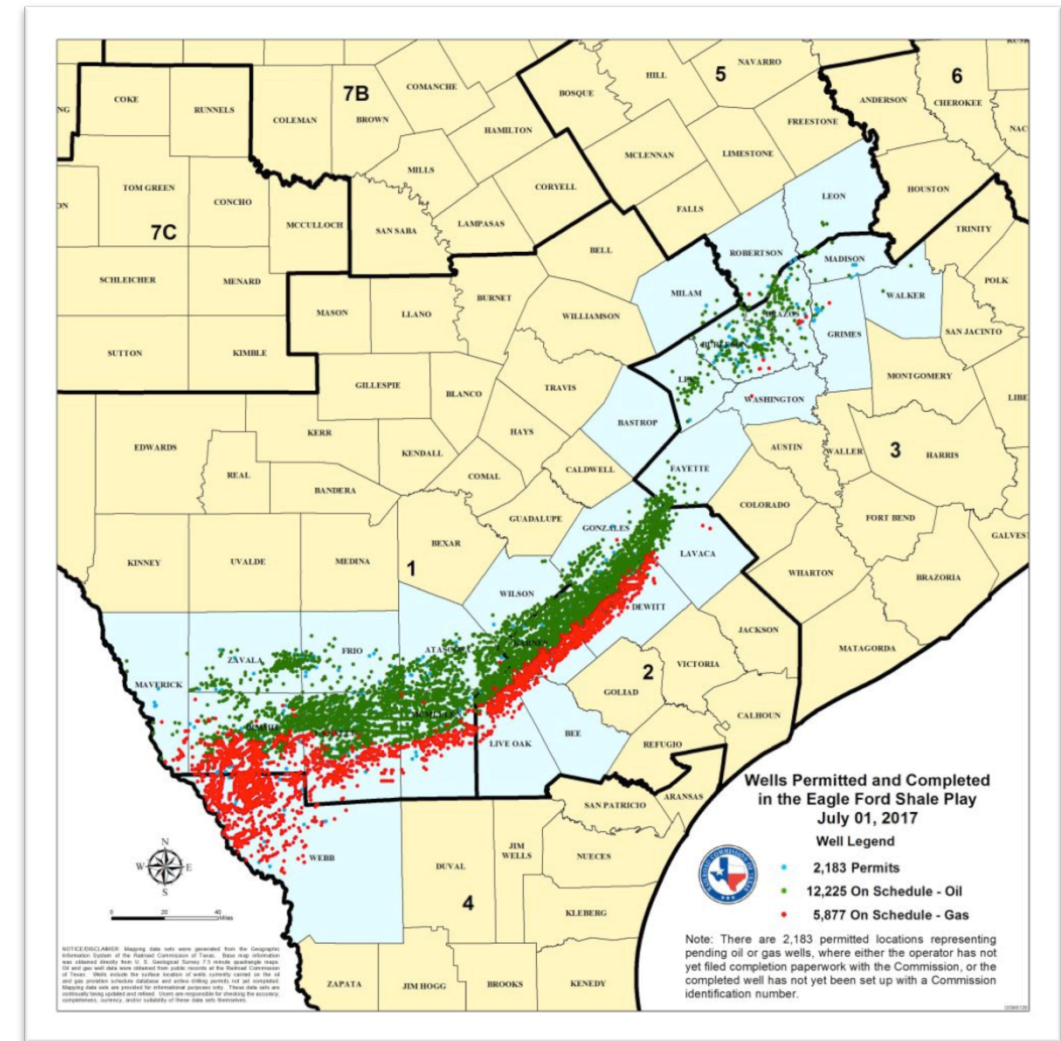
- Named after Eagle Ford, Texas, the town where the shale outcrops can be found in clay form on the earth's surface
- Made up of sedimentary rock that contains oil and natural gas
- Extends approximately 50 miles wide, 400 miles long
- Primary 15 - county region includes: Atascosa, Bee, DeWitt, Dimmit, Frio, Gonzales, Karnes, La Salle, Lavaca, Live Oak, Maverick, McMullen, Webb, Wilson, and Zavala



Source: Institute for Economic Development Center for Community and Business Research – The University of Texas At San Antonio - 2012 Economic Impact Study

Eagle Ford Data & Stats

- September 2017: 1,601 wells permitted, 1,119 all of 2016 (Railroad Commission of Texas)
- 82 rig count (EagleFordShale.com)
- EIA estimates average Eagle Ford EUR at **168,000 bbl/well**
- EIA: Eagle Ford producing over **1.393 million daily barrels** in August (oil)
- Wood Mackenzie predicts production will reach **2 mill b/d** of oil and condensate by 2020
- **EAGLE FORD HAS PRODUCED OVER 2.1 BILLION BARRELS OF OIL AND CONDENSATE TO-DATE!**

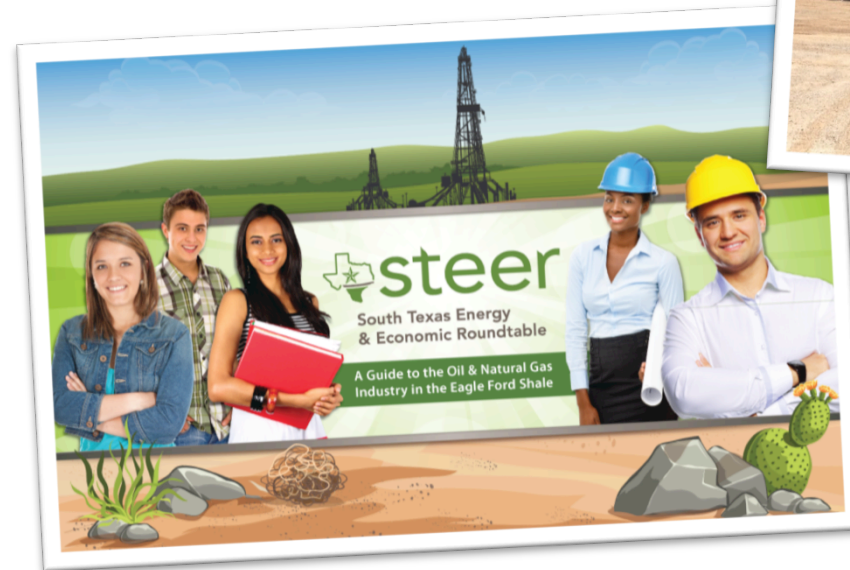


Source: Railroad Commission of Texas

South Texas Engagement



- Supporting education and outreach initiatives in South Texas
 - STEER Oil & Gas Education Guide and Presentation
 - Speaking engagements
- Continually foster relationships with stakeholders
- Media relations and rapid response
- Share positive industry news and stories
 - Eagle Ford Excellence Awards
 - Social Media
- Public Forums
 - Town Halls, Commissioner Courts, Neighbors of Oil & Gas, etc.



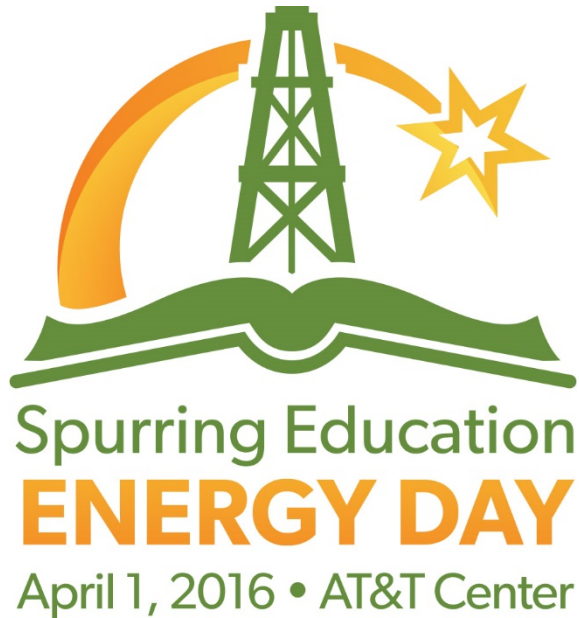
STEER Programs



- Awards to showcase companies making a difference in the community, in safety and environmental stewardship
- Awards for 2016 include: Community and Social Investment, Environmental Stewardship, Safety Performance and The STEER Impact Award.
- Previous Environmental winners include: Alphabet Energy, Aggreko, Energy Waste, Schlumberger, NuStar, Caesar Kleberg Wildlife Research Institute at Texas A&M University Kingsville, HOLT CAT, and others.
- Companies have won for water management technologies, emission reduction technologies, reclamation projects, alternative fuel technologies, and more...



STEER Programs

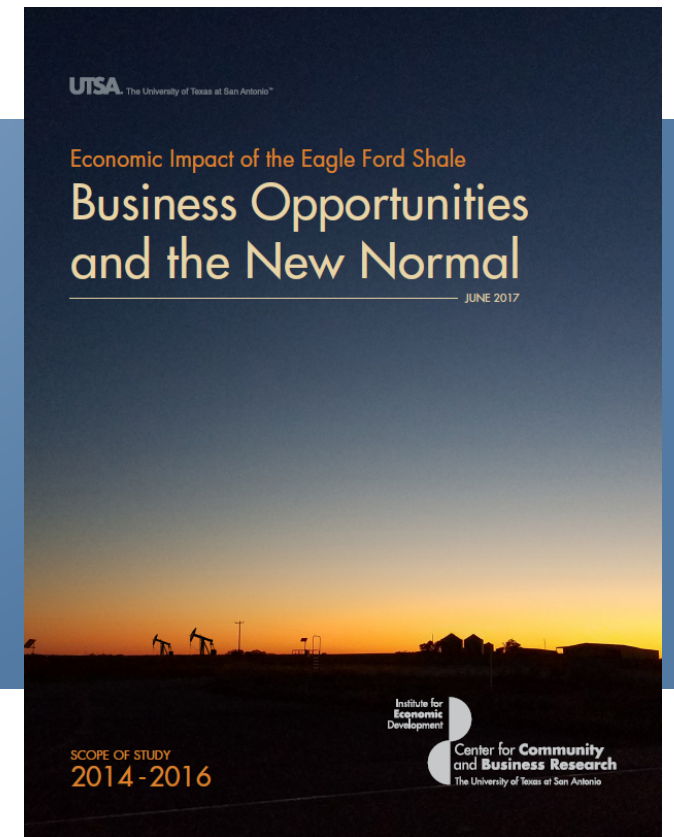
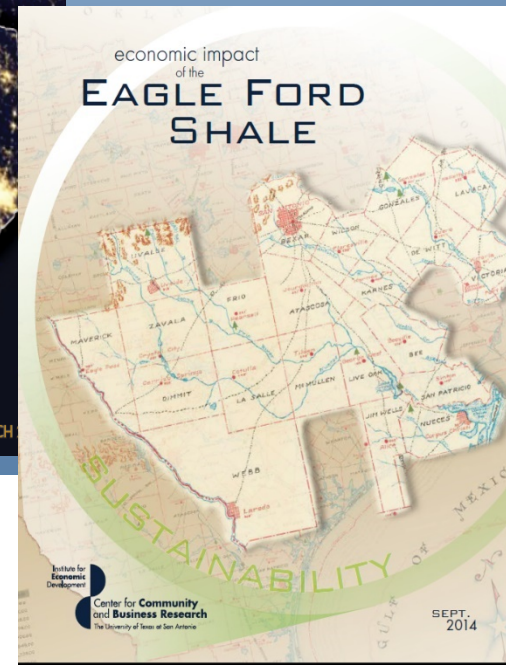
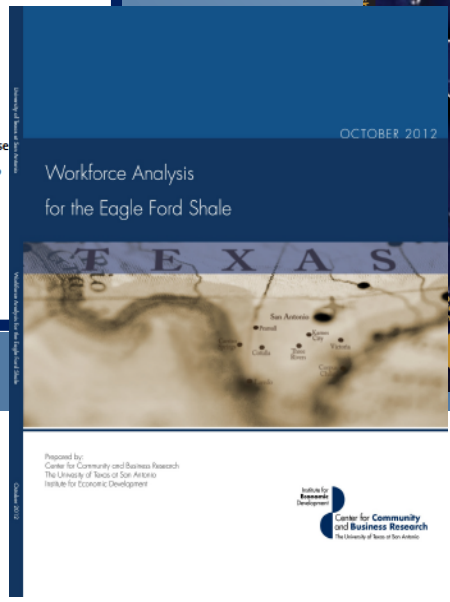


- STEER partnered with the San Antonio Spurs, HOLT CAT, and Shale Magazine for a one-day oil and gas education program.
- Over one thousand students from South Texas and San Antonio with a desire to learn more about STEM careers/oil and gas attended the Spurring Education Energy Day event.
- The event showcased oil and gas industry and STEM career opportunities available upon graduation from high school or college.
- The Day provided students with an explanation of the process of drilling and producing oil and gas, and offered interactive quizzes and games. Students were informed of the various careers related to science, technology, engineering and math as well as the many opportunities that are available beyond STEM fields.



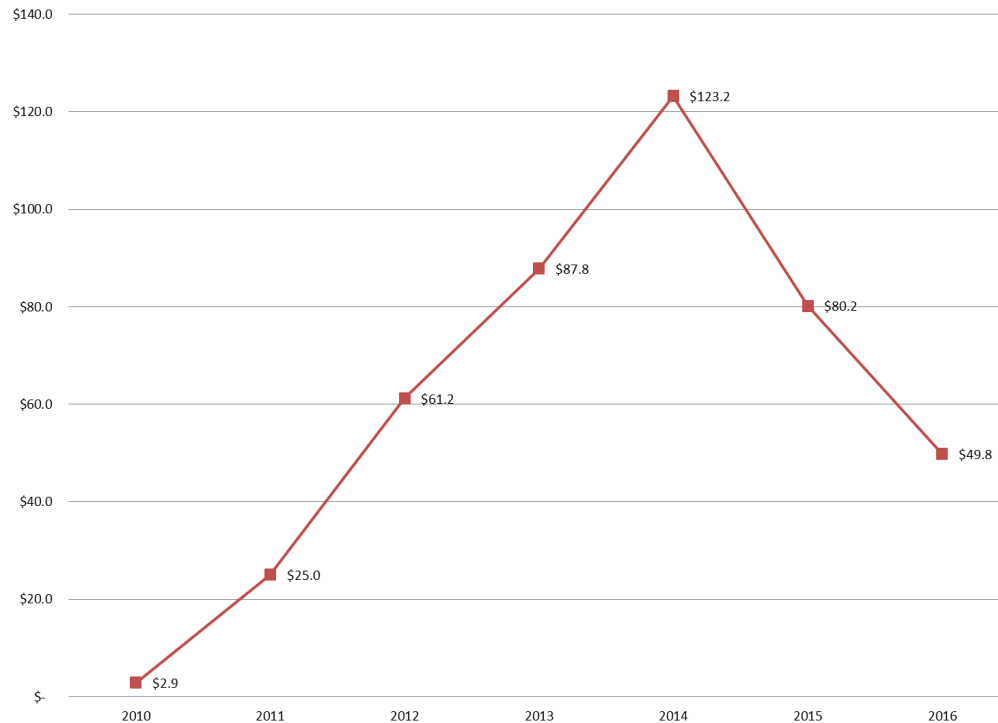
"We are grateful to STEER and Spurs Sports and Entertainment for providing our students with this unique and educational experience," said Nancy Dunn Thompson, Ph.D., Director of Community Outreach and Communications for the School of Science and Technology.

Eagle Ford Economic Reports



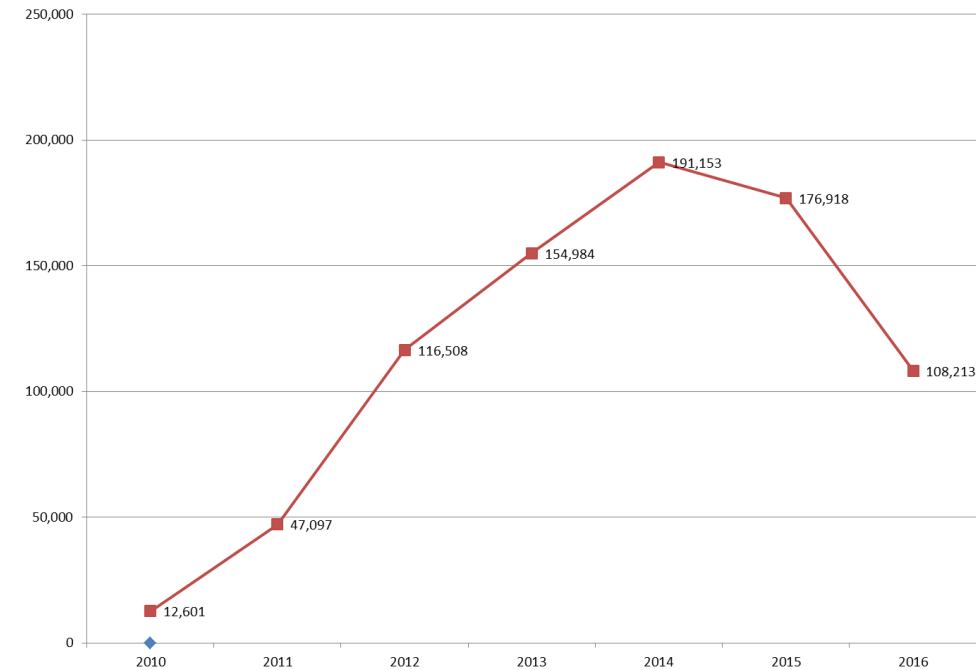
Total Economic Impact (21 County Area)

Economic Impact (billions)



- 2014 - \$123.2 billion
an all-time high to date
- 2015 - \$80.2 billion
- 2016 - \$49.8 billion

Job Supported

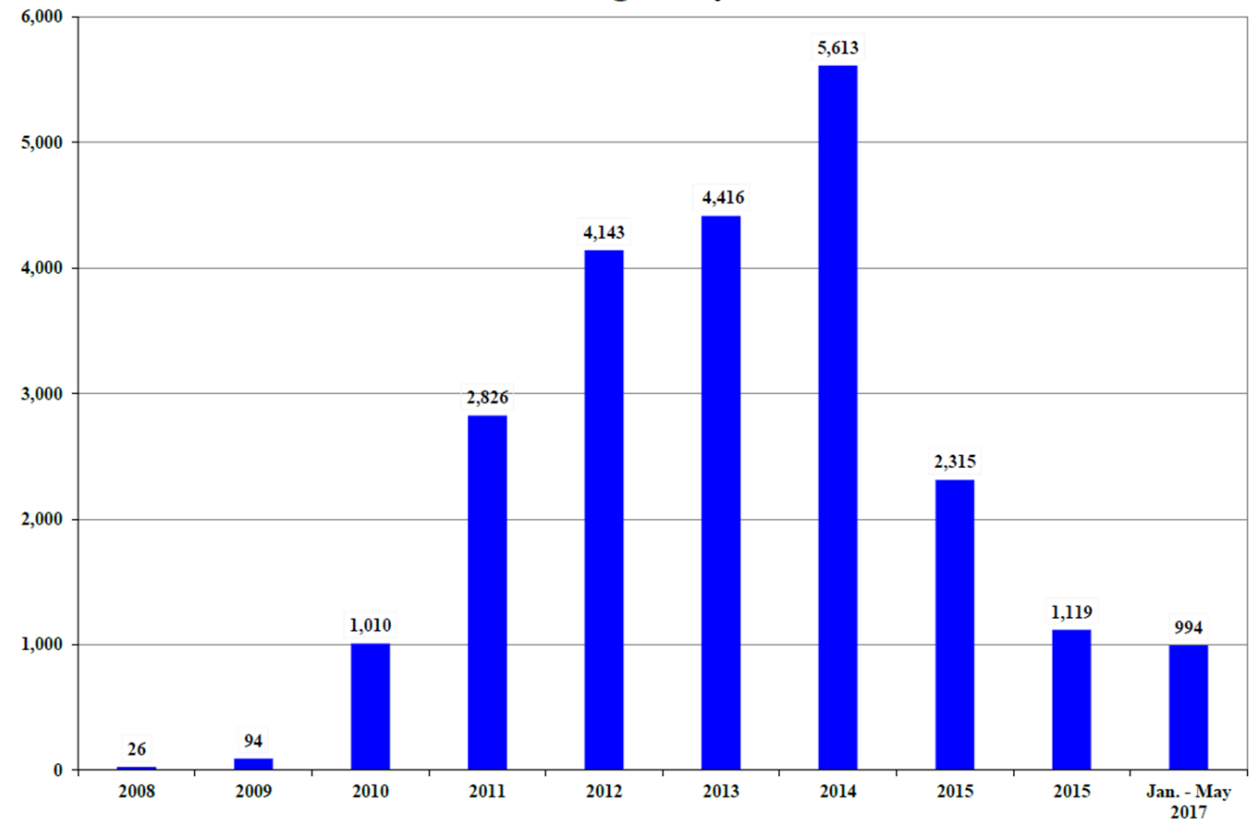


- 2014 - 191,153 jobs
(direct and indirect)
- 2015 - 176,918 jobs
- 2016 - 108,213 jobs

Drilling Permits Issued in the Eagle Ford

- 2014 – 5,613
- 2015 – 2,315
- 2016 – 1,119
- As of October 2017 – 1,601

Texas Eagle Ford Shale
Drilling Permits Issued
2008 through May 2017

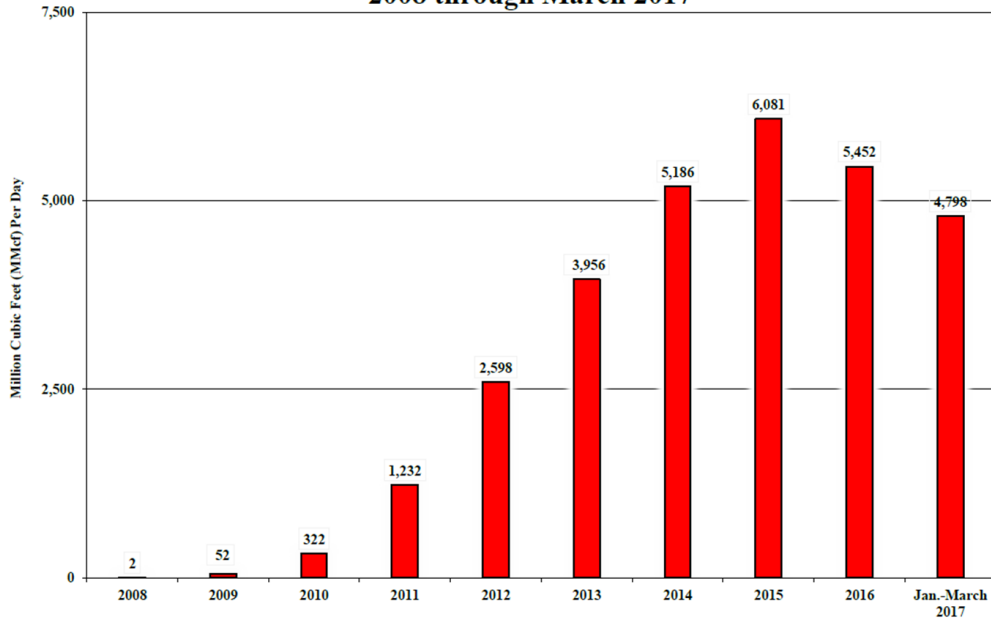


06/06/2017

Source: Texas Railroad Commission DrillingPermitQuery(Includes New Drill & ReEnter Permits)

Total Eagle Ford Shale Production

**Texas Eagle Ford Shale
Total Natural Gas Production
2008 through March 2017**

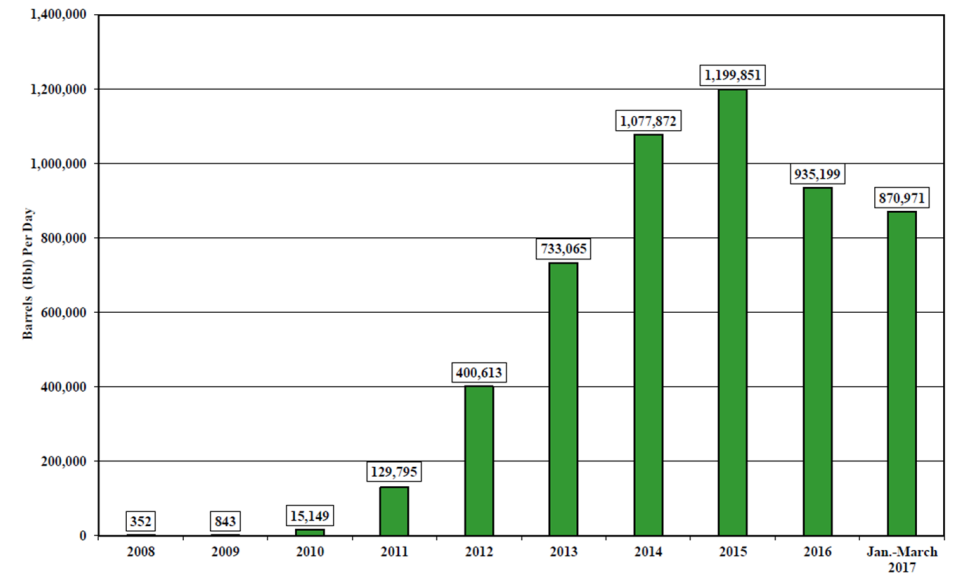


05/22/2017

Source: Railroad Commission of Texas Production Data Query System (PDQ)

- 2014 – 5,186 million cubic feet
- 2015 – 6,081 million cubic feet
- 2016 – 5,452 million cubic feet

**Texas Eagle Ford Shale
Oil Production
2008 through March 2017**



05/22/2017

Source: Railroad Commission of Texas Production Data Query System (PDQ)

- 2014 – 1,077,872 barrels per day
- 2015 – 1,199,851 barrels per day
- 2016 – 935,199 barrels per day
- **2017 - 1.393 m daily barrels August**

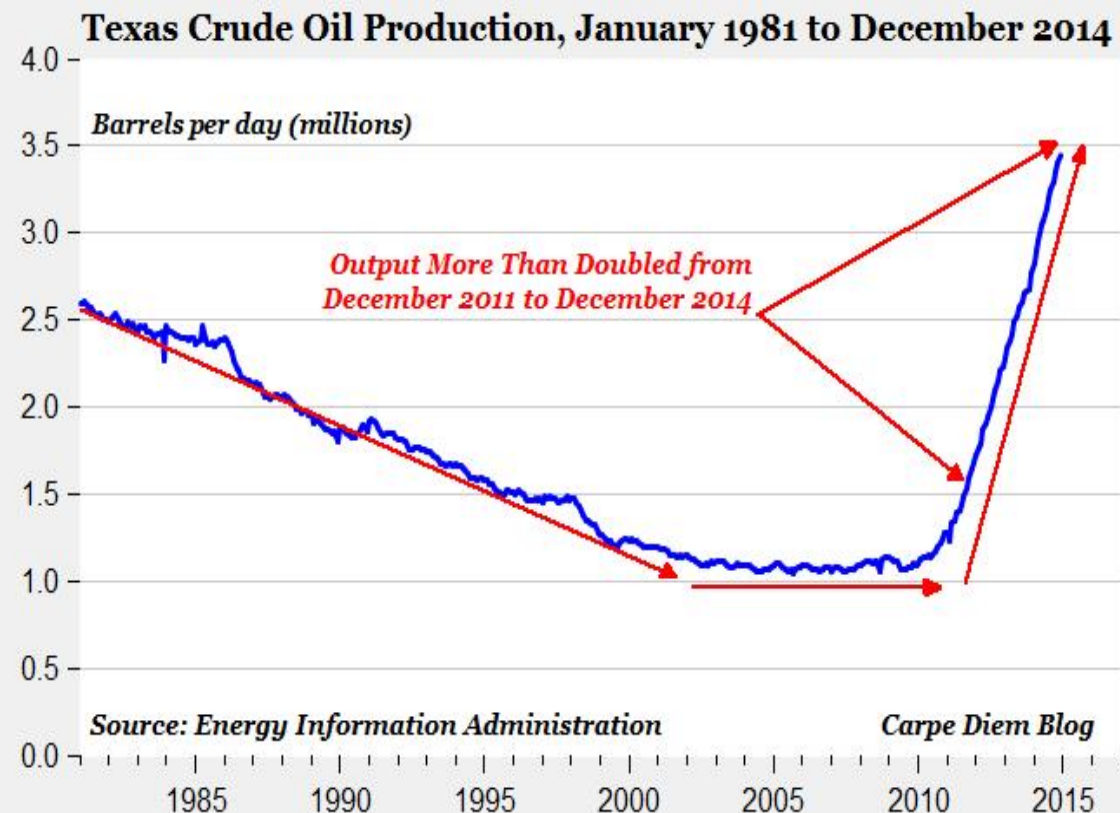
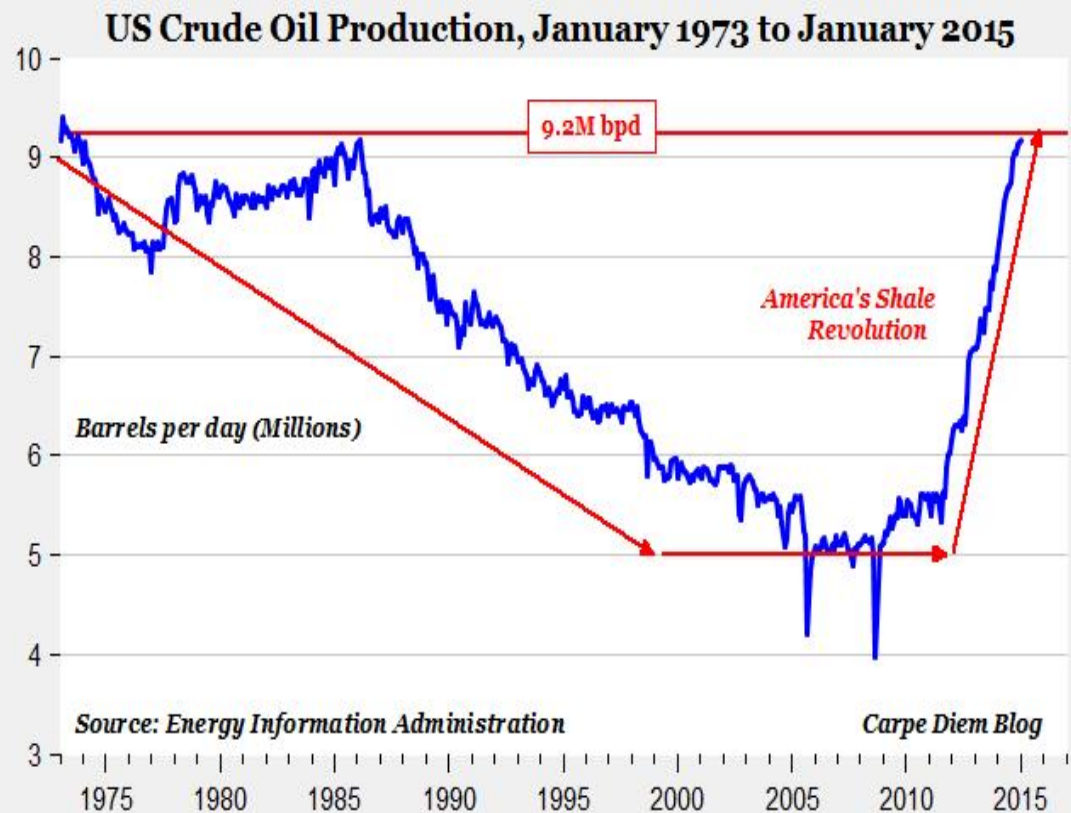
**History doesn't
repeat itself.
But it does rhyme.**

Mark Twain



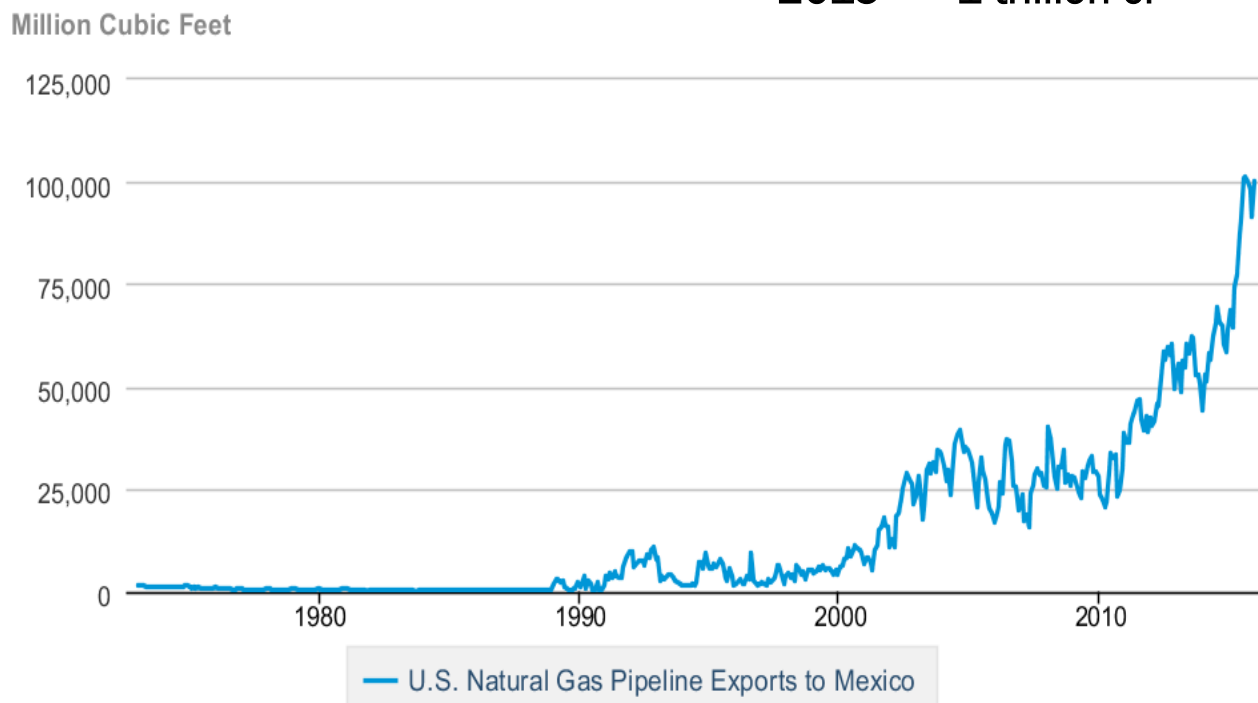
KAL

International Impact

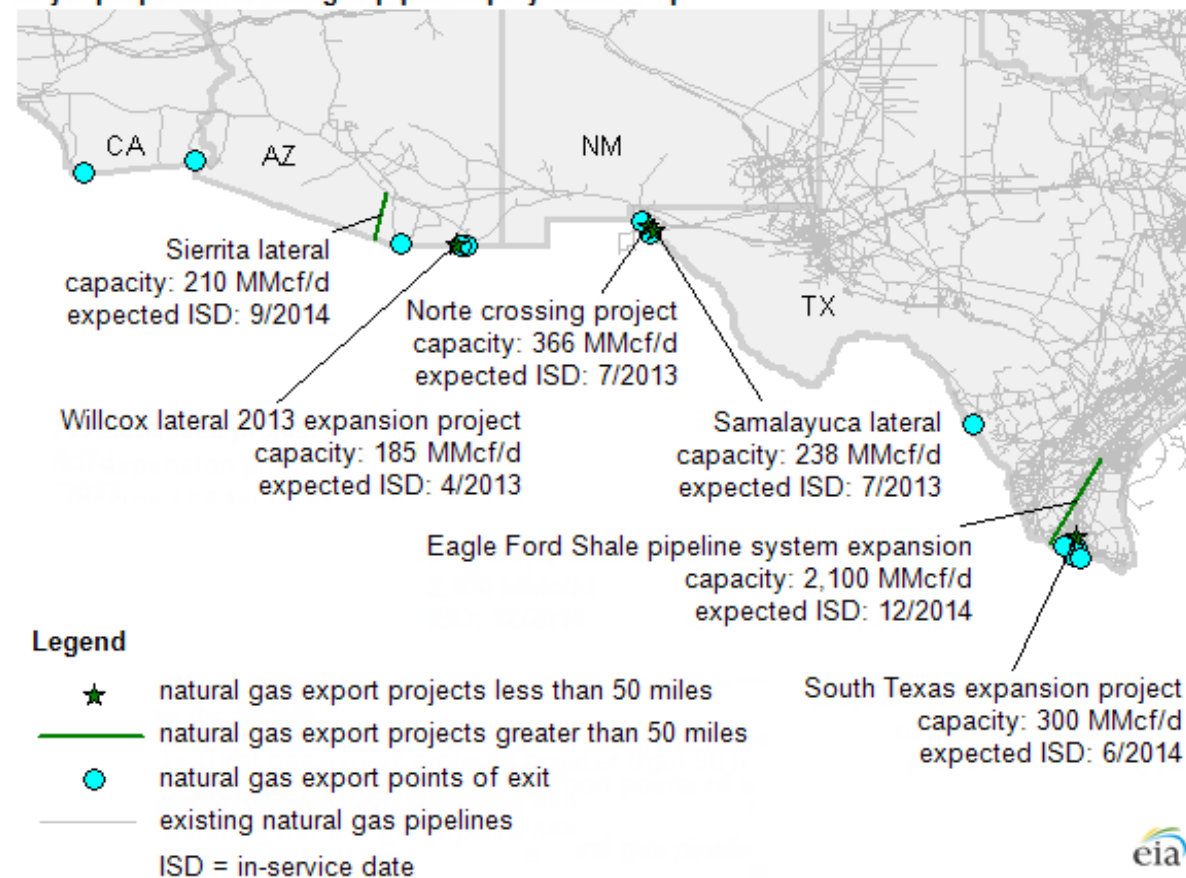


International Impact

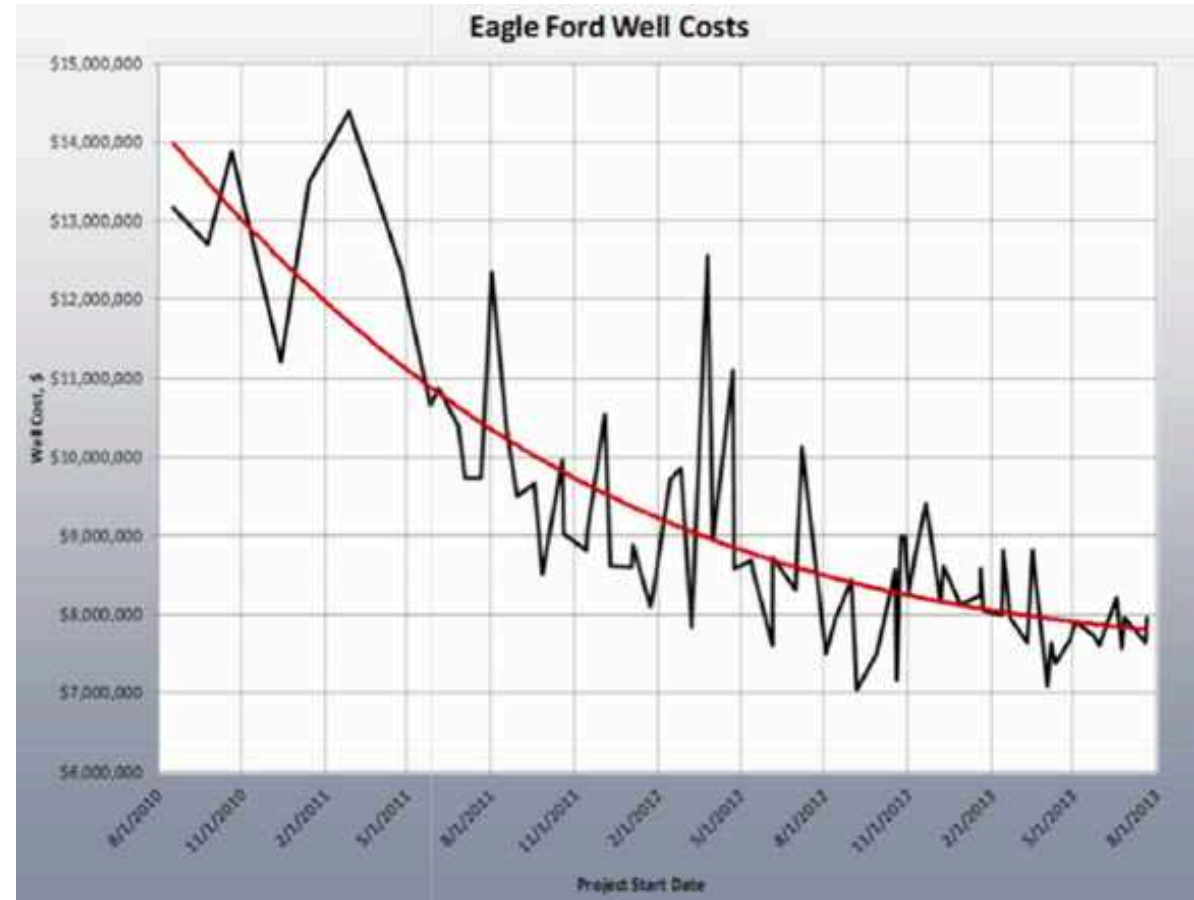
U.S. Natural Gas Pipeline Exports to Mexico
 2013 – 660 billion cf
 2014 – 730 billion cf
 2015 – >1 trillion cf



Major proposed natural gas pipeline projects for exports to Mexico



Not your Parent's Oil Well

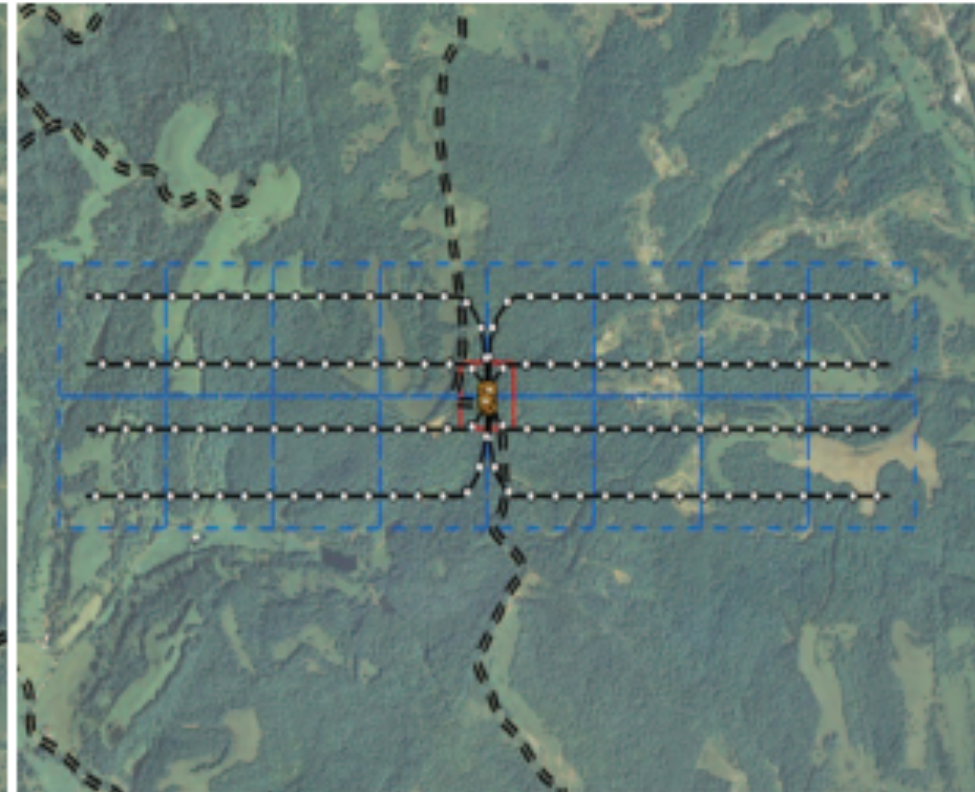


Not your Parent's Oil Well

640 with verticals



640 with horizontal wells



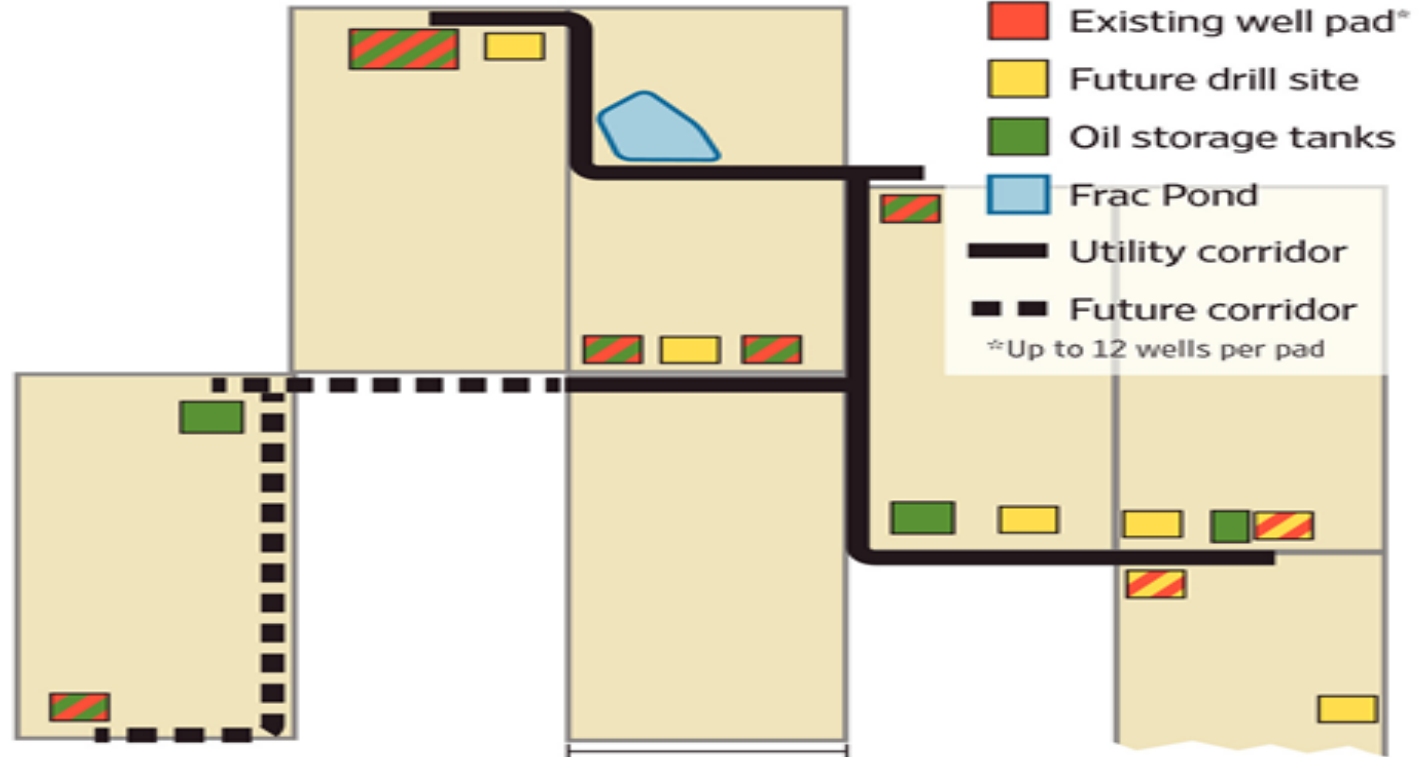
Not your Parent's Oil Well

Building an Oil Factory

Instead of drilling wells on an ad hoc basis, Liberty Resources is developing a 96-well North Dakota development called Stomping Horse in a methodical manner to reduce costs. The company has built a "utility corridor" that connects and services the well pads, reducing the need for heavy truck traffic and long runs of pipeline to isolated units.



- ◆ A network of 16-inch pipe will collect the natural gas for sale; a 6.5-inch oil pipeline will gather the oil.
- ◆ Natural gas will also be captured and piped around the project to power drilling rigs and other equipment.
- ◆ Water for hydraulic-fracturing operations in the 96 wells will come from a single "frac pond" connected by pipeline to the well pads.
- ◆ A saltwater disposal well will take wastewater via pipeline from oil-extraction operations.



Source: Liberty Resources LLC

1 mile

THE WALL STREET JOURNAL.



One Well in South Texas

Used One Time to Last 30 Years

Same amount of water consumed by:



Corn Field Over
5 Acres per
season



Average Golf
Course Every
28 days



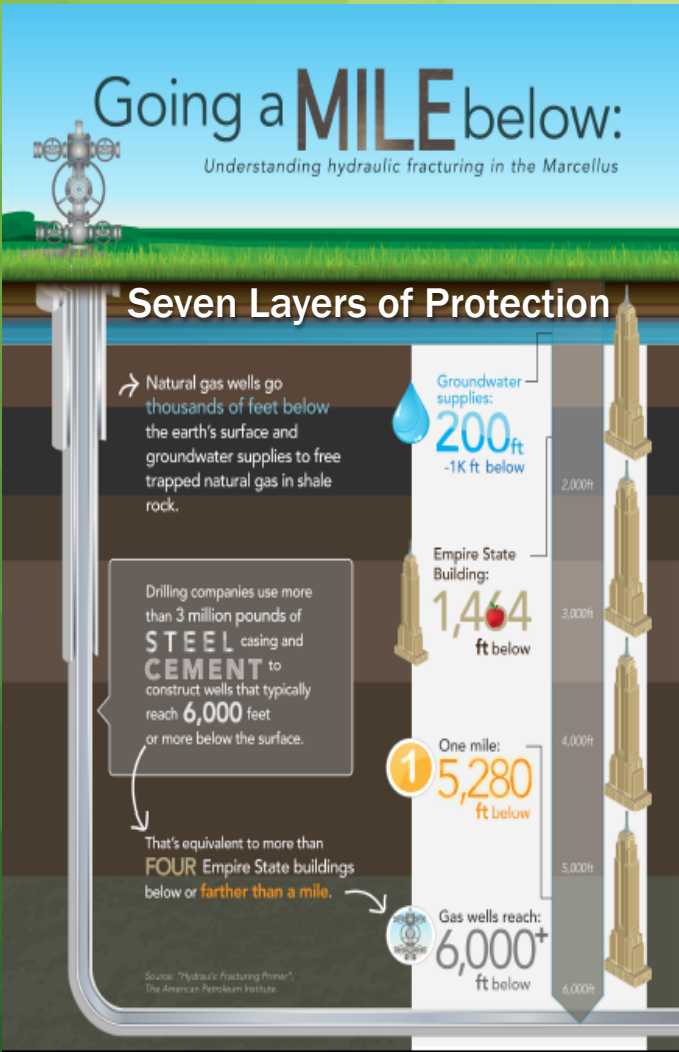
The City of
San Antonio in
~20 minutes



Texas' Cattle
Herds in about 16
minutes

Used Every Day for 30 Years

Innovative Technologies to Find Oil and Natural Gas

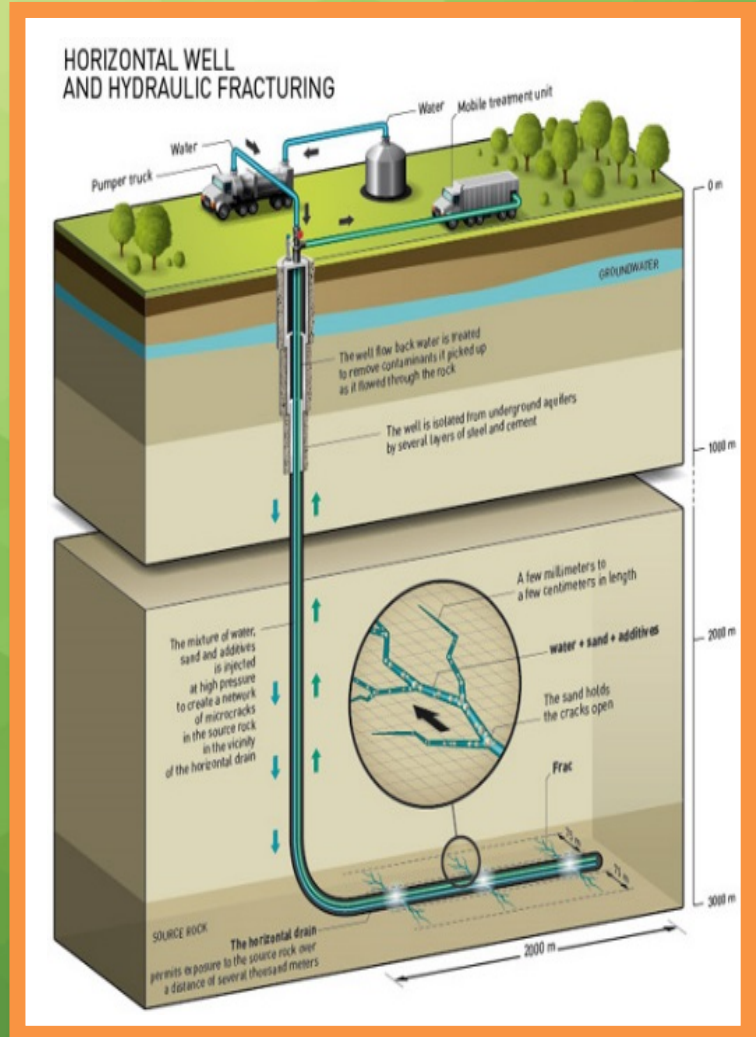


A proven technology that has been used for more than 60 years to safely enhance the production of oil and natural gas from more than 1 million wells in the United States.



These extraordinary technological achievements enable operators to maximize returns from each well, which in turn means higher royalty payments to mineral owners, and higher tax revenues for local and state taxing authorities.

- Horizontal Drilling: A Technological Marvel Ignored, Forbes, 1/28/2013



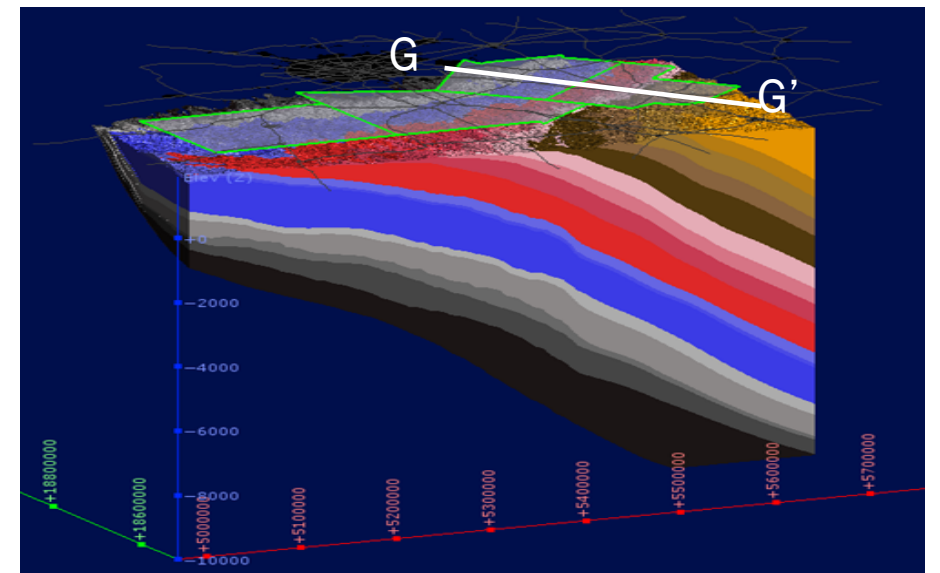
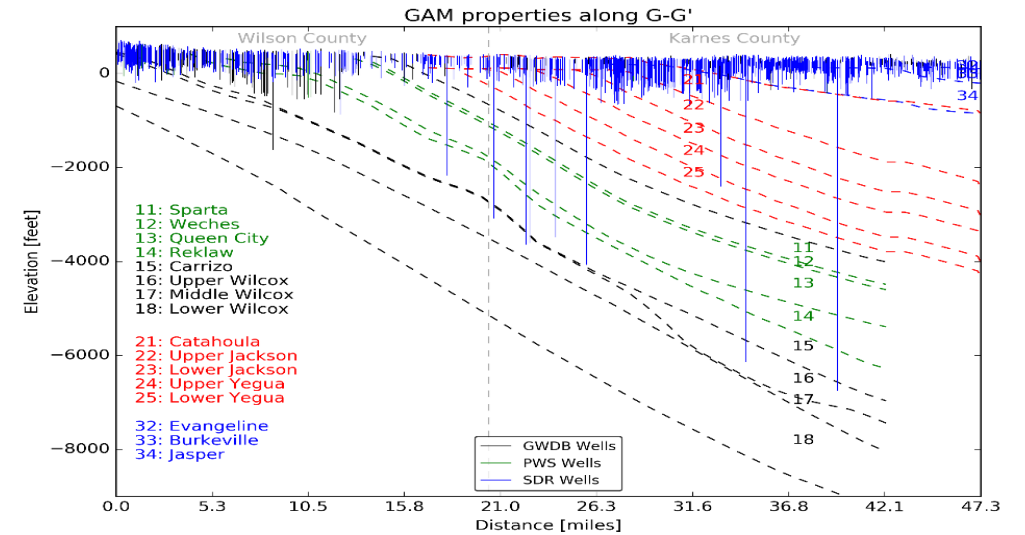
STEER Evergreen Underground Groundwater Conservation District Study

• EUWCD Background Info

- Permits groundwater wells in counties overlying Eagleford Shale
- High level of autonomy in establishing and enforcing rules
- Considerable flexibility with developing rules different from other GCDs
- Rules are 10-years old and are not as favorable for pumping brackish groundwater as rules for some nearby GCDs
- Prior to project, EUWCD had a very limited understanding their aquifer systems and well locations

• Why Sponsor a Project

- Provide District with data and science necessary to develop prudent management policies based on science
- Educate District to management approaches used by other GCDs that are beneficial to oil & gas industry but are protective of existing the residential well owner with a shallow well



STEER Evergreen Underground Groundwater Conservation District Study

• Project Activities

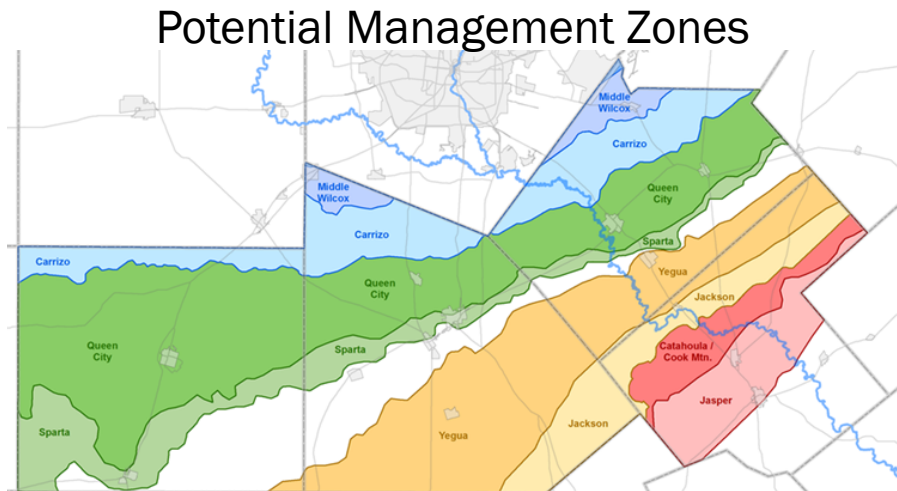
- Five workshops with EUWCD staff and board members on GIS, Aquifer and well data, and data
- 10 presentations to the Board over a 2-year period

• Project Accomplishments

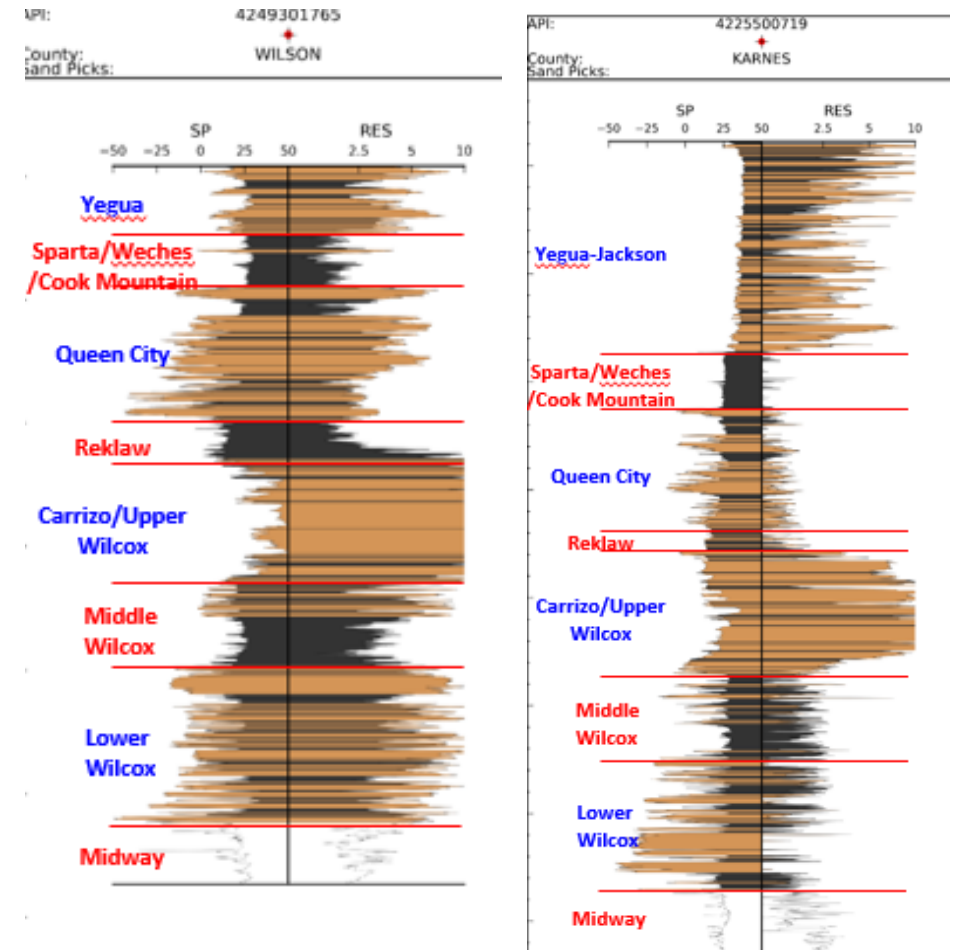
- Significant overhaul of District GIS capabilities, aquifer and well data, and data
- Detailed maps developed of shales and water quality with depth based on geophysical log analysis
- Identified problems with existing rules and solutions for improving rules

• Potential Benefits

- Rules are currently being updated to include improvements that will provide more flexibility and benefits to oil & gas industry

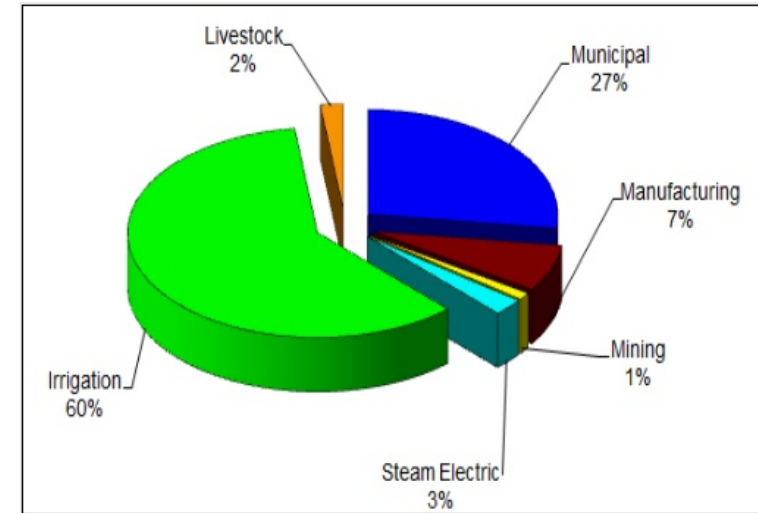


Potential Importance of Shale Layers



- Impossible to provide an adequate clean water supply in the State of Texas without oil and gas.
- Through oil and gas operator and land owner relationships our industry has been able to share water resources and data to ensure safe water.
- STEER members have shared scientific well log data worth tens of millions of dollars and assisted in sponsoring independent studies to improve the water management planning process, protecting the communities they live and operate in.
- Oil and gas industry is constantly revolutionizing technology for future water recovery and management.
- The Rainy Day fund is an essential component to paying for the next 50 years of water infrastructure projects.

Water Consumption by Texas Sector



Source: Kert Zammit, Viability and Impacts of Implementing Various Power Plant Cooling Technologies, 2012 Technical Report, Electric Power Research Institute (EPRI) (Oct. 2012)



What is Industry Doing



Our Partnership with AACOG

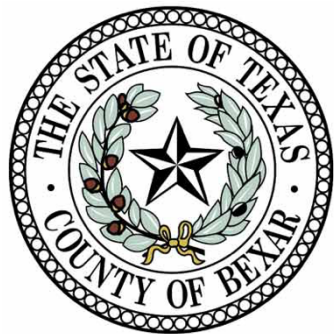
Valuable Partnership with AACOG, oil and gas Industry, and organizations like CPS Energy in sharing data



Participating in the Planning Process



We ALL have a role in air quality – it is not one contributor!



Drive Clean Texas

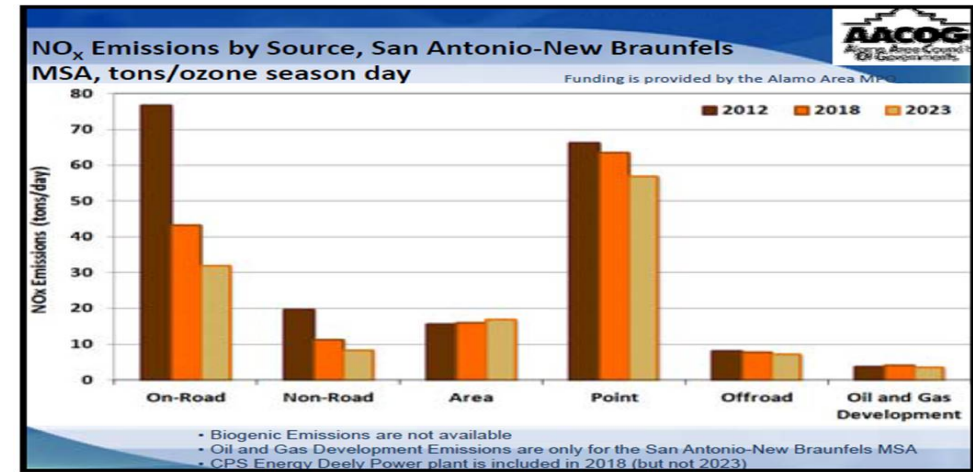


What is Industry Doing



AACOG Eagle Ford Emissions Inventory

- The study is conducted by Alamo Area Council of Governments (AACOG) funded by Texas Commission on Environmental Quality (TCEQ) to study air quality in the San Antonio MSA. The goal is to develop comprehensive air quality planning document to determine how to remain below EPA Non-Attainment qualifications.
- STEER and member companies work with AACOG to supply data for Eagle Ford and serve on committees to continue dialogue.
- STEER Communications Committee gathered talking points for use with media and key stakeholders to educate the community about programs in place to lower emissions



Who regulates emissions in Texas?
The Railroad Commission of Texas (RRC) has primary regulatory jurisdiction over the oil and gas industry. Through its Oil and Gas Division, RRC regulates the exploration, production, and transportation of oil and natural gas in Texas. The Texas Commission on Environmental Quality (TCEQ) is the environmental agency for the state that facilitates all permitting requirements. Additionally, some facilities may be subject to regulations under the U.S. EPA.

What are emissions?
Emissions are gases and particles released into the air by various sources. Types of emissions include water vapor from powerplants to nitrogen oxide from cars and off-road equipment. The amount of an emitted substance is typically related to changes in the nation's economy, industrial activity, technology improvements, traffic, and many other factors. Air pollution regulations and emission controls also have an effect on the amount of an emitted substance. The United States Environmental Protection Agency (EPA) is mainly concerned with emissions which are or could be harmful to people, termed criteria pollutants. The criteria pollutants are carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO₂), ozone (O₃), particulate matter (PM), and sulfur dioxide (SO₂).

What is industry doing?
The oil and natural gas industry is focused on meeting and/or exceeding requirements of regulatory agencies like the RRC and the TCEQ. STEER member companies have voluntarily participated with the Alamo Area Council of Governments (AACOG) and TCEQ sharing data on equipment used and other relevant information for the AACOG Eagle Ford Emissions Inventory Study, granted through the TCEQ. On the back of this fact sheet, you can learn more about what industry is specifically accomplishing through innovation and to reduce emissions.

The Eagle Ford shale is being developed with:

- Cutting-edge technology that lowers surface impact and emissions
- Innovative, efficient equipment

Projected Volatile Organic Compound (VOC) Emissions in San Antonio-New Braunfels Metro Region, by Source Year: 2018

San Antonio Express-News
In raw numbers, the volume of flared gas continued to grow in 2014 as production skyrocketed in the Eagle Ford. But the newspaper's analysis also showed the overall rate of flaring dropped to nearly 4 percent of total production in the first seven months of 2014. That's the lowest rate of flaring in the shale since the same seven-month period in 2011, when more than a tenth of the natural gas was lost to flaring in the Eagle Ford.

Advocates for Clean Air

- Operators in the Eagle Ford are continually testing new technologies and implementing programs to lower emissions.
- Operators are committed to minimizing the number of days of flaring that may occur between bringing a well on line and installing infrastructure to transport gas to sales.
- Practices such as reduced emissions completions and installing vapor recovery units avoid the unnecessary venting and flaring, and send more gas to the sales pipeline.
- Industry began voluntary emissions monitoring across Eagle Ford operations using infrared cameras for detection of fugitive emissions.
- Operators, along with contractors, continue to design, test and implement innovative technology and procedures to improve operations and reduce emissions, such as on-bleed pneumatic pumps, utilize more natural gas to power operations, and using more solar power on production sites.

Practices that reduce emissions:

Reduced Emissions Completions (RECs) or "green completions"
The practice of capturing natural gas produced during well completions and well workovers following hydraulic fracturing. Portable equipment is brought on well pads to separate natural gas from produced liquids during the completion period. This practice decreases flaring times, reduces vented emissions, and puts more product in the sales line in the Eagle Ford region.

Vapor Recovery Units (VRU)
A system composed of a scrubber, a compressor and a switch designed to recover vapors formed inside completely sealed crude oil or condensate tanks. When triggered, the VRU sucks the vapors through a scrubber, where trapped liquids is returned to the liquid pipeline system or to tanks, and recovered vapor is pumped into gas lines. This practice decreases flaring times and reduces vented emissions in the Eagle Ford region.

Equipment Efficiencies
Companies and vendors have answered the call for better equipment by offering engines and compressors that run cleaner and more efficient. Companies like STEER members HOUT CAT and Aggreco are testing and selling equipment that runs on natural gas to power operations and Tier 4 Final diesel engines. This allows the operator to switch to natural gas, a cleaner burning fuel. Companies are also conducting pilot programs to find an efficient process to clean up field gas to be used in fuel operations.

Compressed Natural Gas (CNG) Stations
All across South Texas, from Laredo to San Antonio, natural gas filling stations are being built for on-site loading of fleet vehicles. Additionally, some companies compress natural gas to dispense into storage containers and relocate to drilling sites for on-site loading of drilling rigs, lowering the amount of diesel used in operations.

Monitor Site	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Comp-Bldg-C18	11	17	20	21	21	21	21	21	21	21	21	21	21	21
San Antonio WW-C21	76	60	60	60	60	60	60	60	60	60	60	60	60	60
California-Like-C19	09	03	00	00	04	04	04	04	04	04	04	04	04	04

The oil and natural gas industry continues to advocate for installation of efficient pipeline infrastructure, effectively reducing the need to flare gas and lower truck traffic.

IN 2013, TEXAS HAD 374,318 MILES OF PIPELINE INFRASTRUCTURE.
Efficient pipeline infrastructure offers clean air advantages by reducing the need to flare gas.

What is Industry Doing

Eagle Ford Well Pad Design Improvements

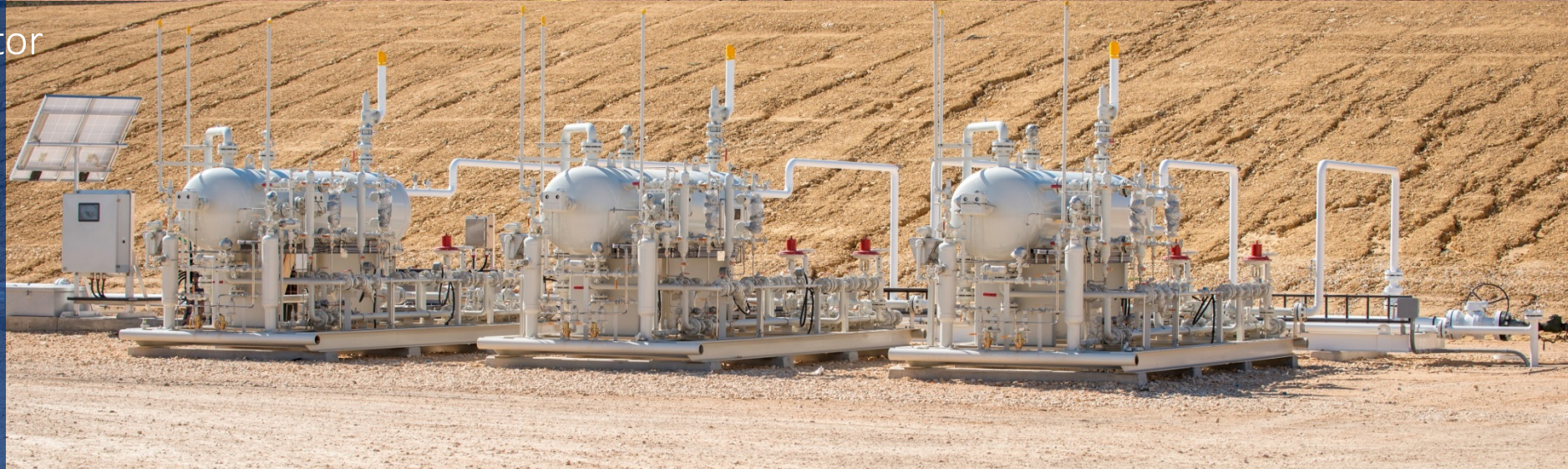
Standard Tank Battery

- Vertical separators – instrumentation above eye level
- Tank connections
- Truck traffic
- Large footprint
- Higher chance of spills due to loading/unloading



Commingled Allocation Separator

- Horizontal separators – instrumentation at eye and ground level
- Fewer connections
- No Truck traffic
- Greatly reduced footprint
- Reduced chance of spills





Finding the ways that work

Statoil, Technology Developer and Environmental Defense Fund Partner to Deploy Innovative Methane Detection Device for the Methane Detector's Challenge



JOHN DAVIDSON

Norwegian oil giant Statoil is using one of its wells near Karnes City to test methane leak detection that was developed in San Antonio.

New technology developed in San Antonio to detect methane gas leaks in oil fields is getting its first real life test in the Eagle Ford Shale.

Statoil ASA (NYSE: ADR) has deployed low-cost laser technology to detect methane emissions at one of its well pads off State Highway 72 just west of the Karnes County town of Kenedy.

Developed as part of the Environmental Defense Fund's Methane Detectors Challenge, the solar and battery powered equipment was designed by Colorado-based startup Quanta3 LLC at San Antonio's Southwest Research Institute. It provides a 24-hour monitoring service that will alert company officials the moment a natural gas leak happens.

Statoil Senior Researcher Desikan Sundararajan said the company aims to be the most carbon efficient oil and gas producer by using cost-effective and innovative technology. If successful, Sundararajan said the technology being field tested just south of San Antonio could have much wider implications.

"This creates lasting value in the communities where we work and has a global effect," Sundararajan said. "Sensors providing real-time data on ambient facility level emissions will allow us to act upon this information in a timely manner."

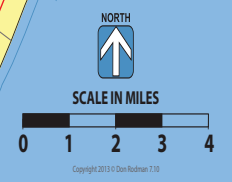
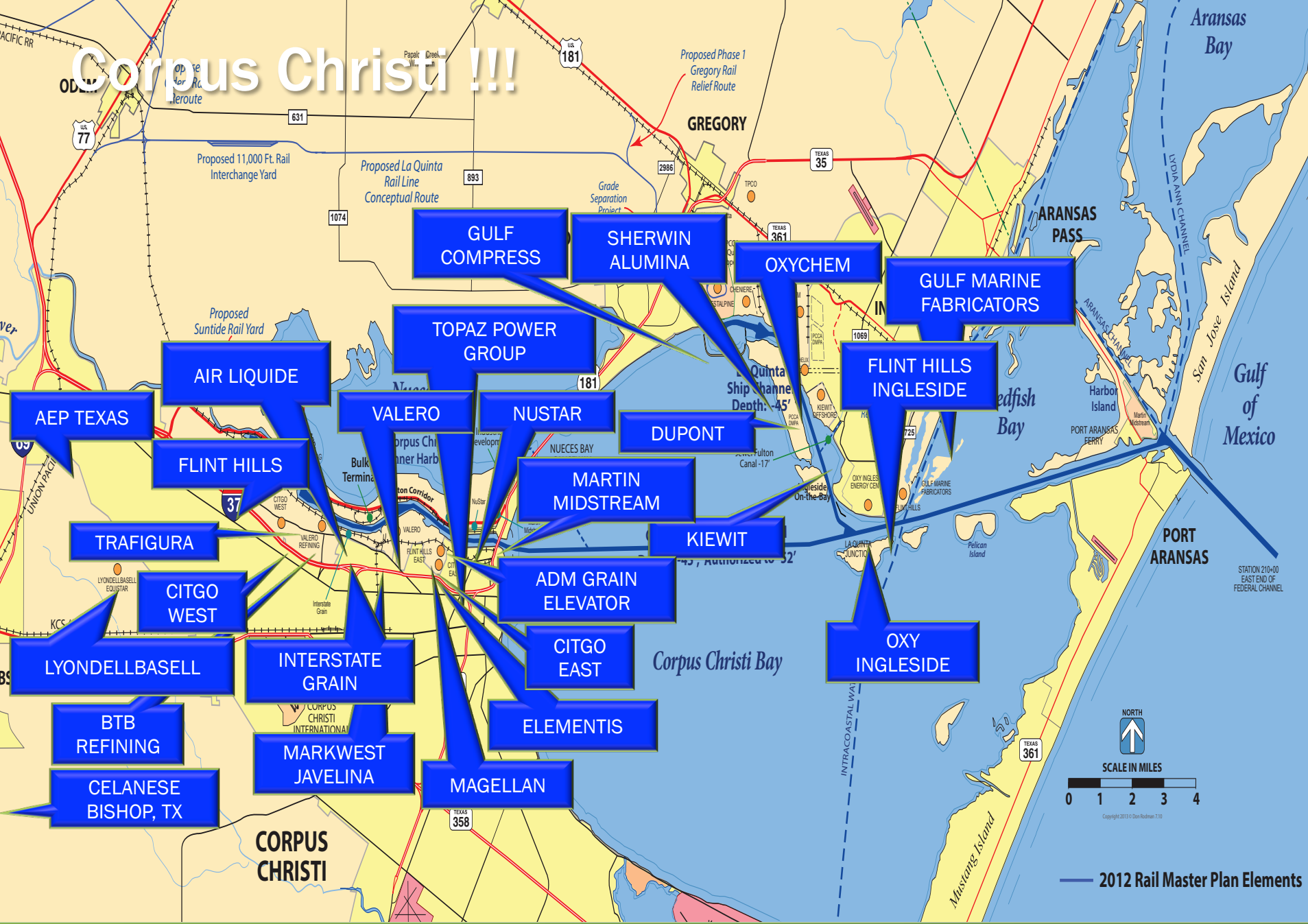
Courtesy San Antonio Business Journal, Sergio Chapa

What is Industry Doing

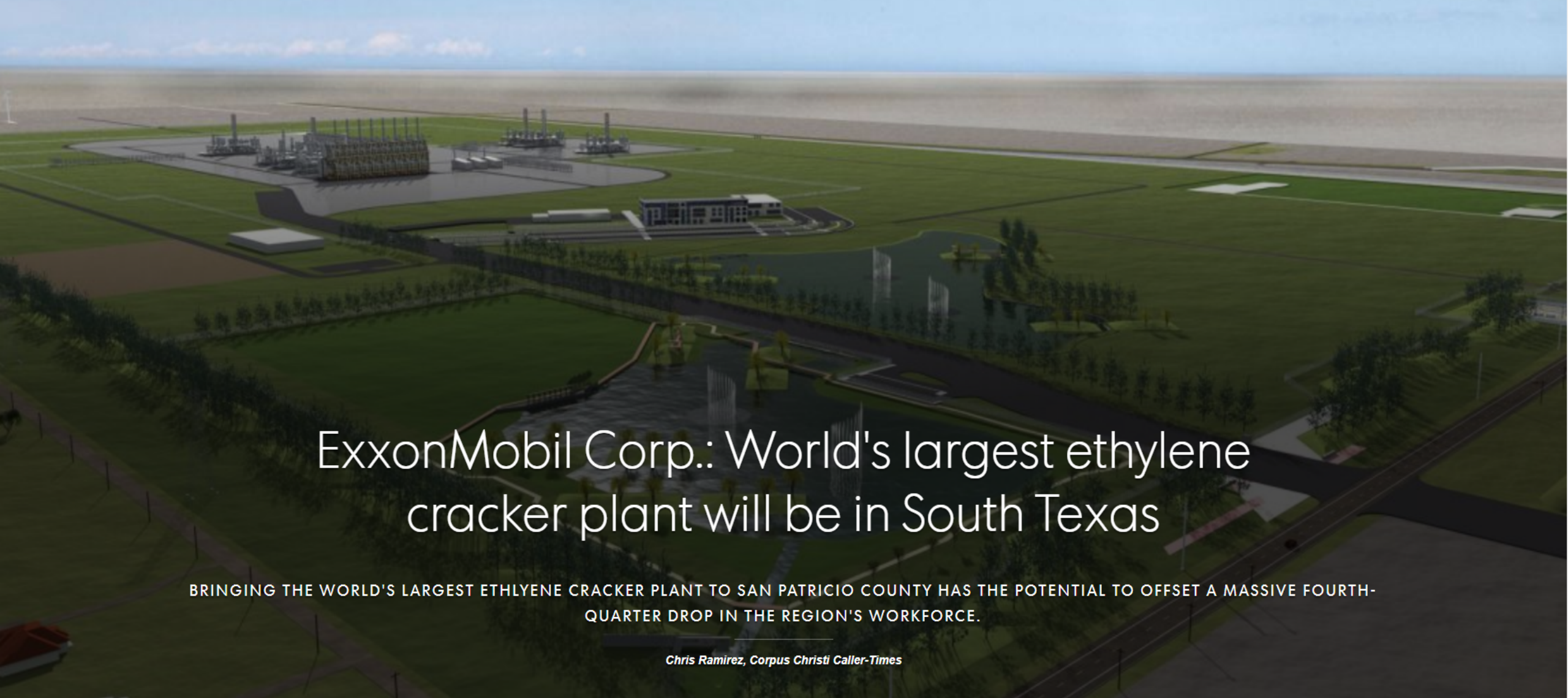


- Converting production facilities from natural gas use to instrument air use. The variable bleed controllers will release compressed air instead of gas on pneumatic controllers and pumps. Although small they quickly add up.
- Putting more facilities on oil gathering systems to reduce loading and vapor. Big reduction on truck traffic.
- Optimize flares to burn more efficiently.
- Leak Detection and Repair (LDR) programs.
- Implementing Green Completions

Corpus Christi !!!



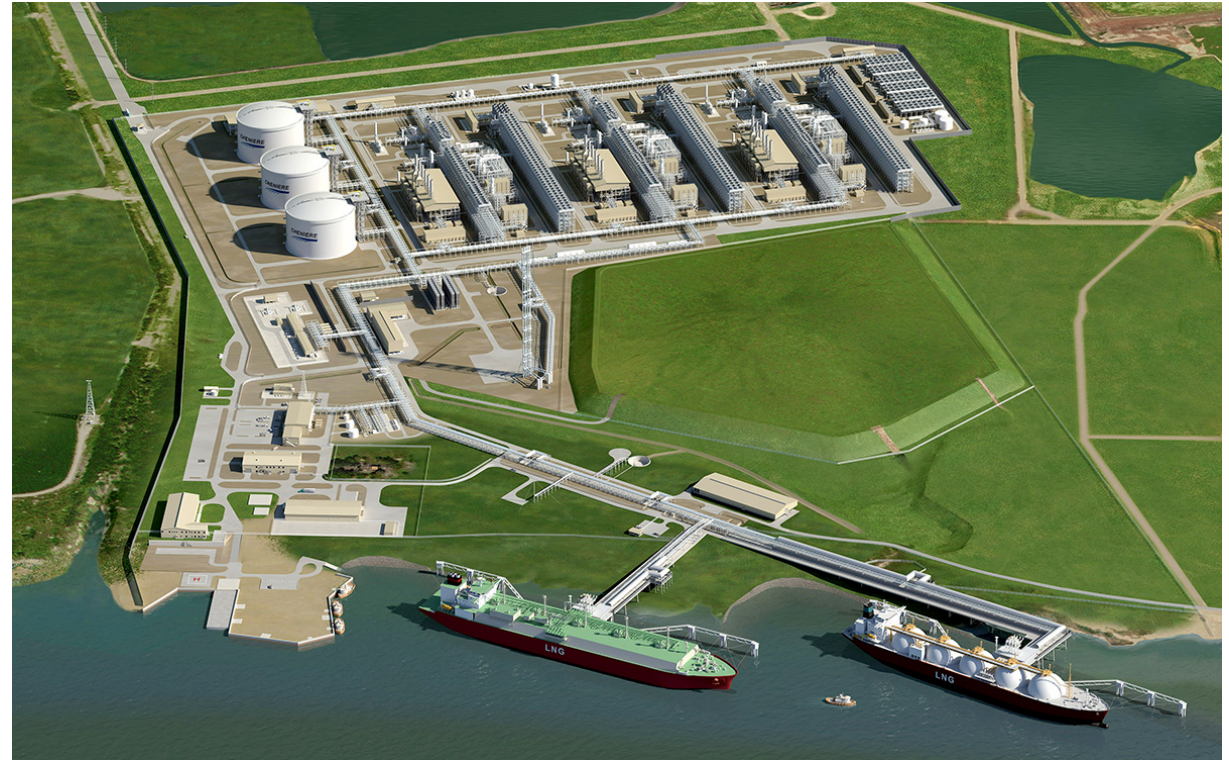
— 2012 Rail Master Plan Elements



ExxonMobil Corp.: World's largest ethylene cracker plant will be in South Texas

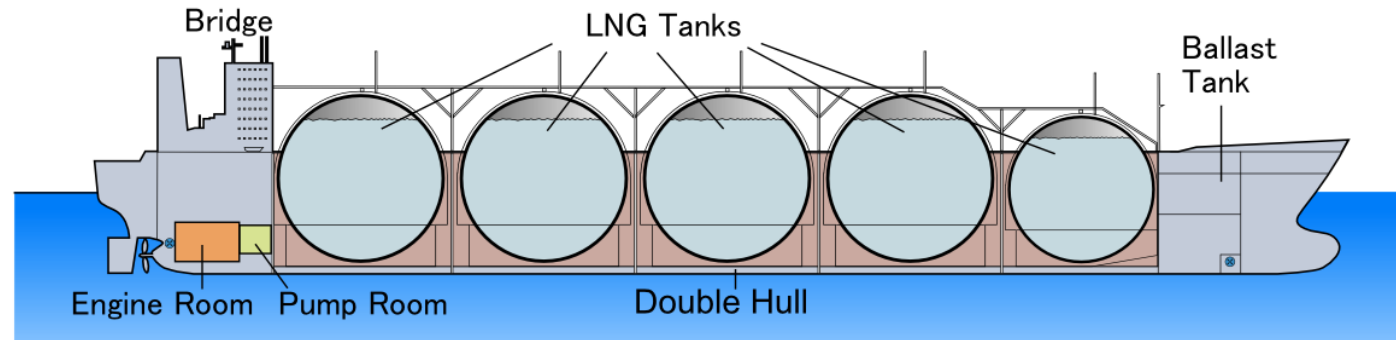
BRINGING THE WORLD'S LARGEST ETHYLENE CRACKER PLANT TO SAN PATRICIO COUNTY HAS THE POTENTIAL TO OFFSET A MASSIVE FOURTH-QUARTER DROP IN THE REGION'S WORKFORCE.

Chris Ramirez, Corpus Christi Caller-Times

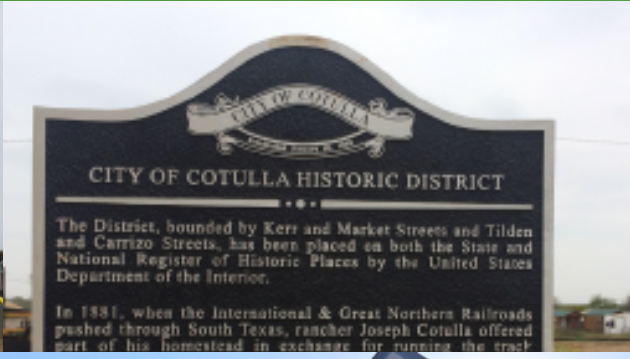


Texas, the Future of Exports

LNG tanker (side view)



Across the Eagle Ford



Future of Oil?



Beautification Programs

Roadside trash pickup programs in DeWitt, Karnes, and McMullen Counties: Over 72,000 lbs. of roadside trash annually, this does not include McMullen County



Beautification Programs

AERIAL VIEW LOOKING SOUTH TO RIVER CONFLUENCE



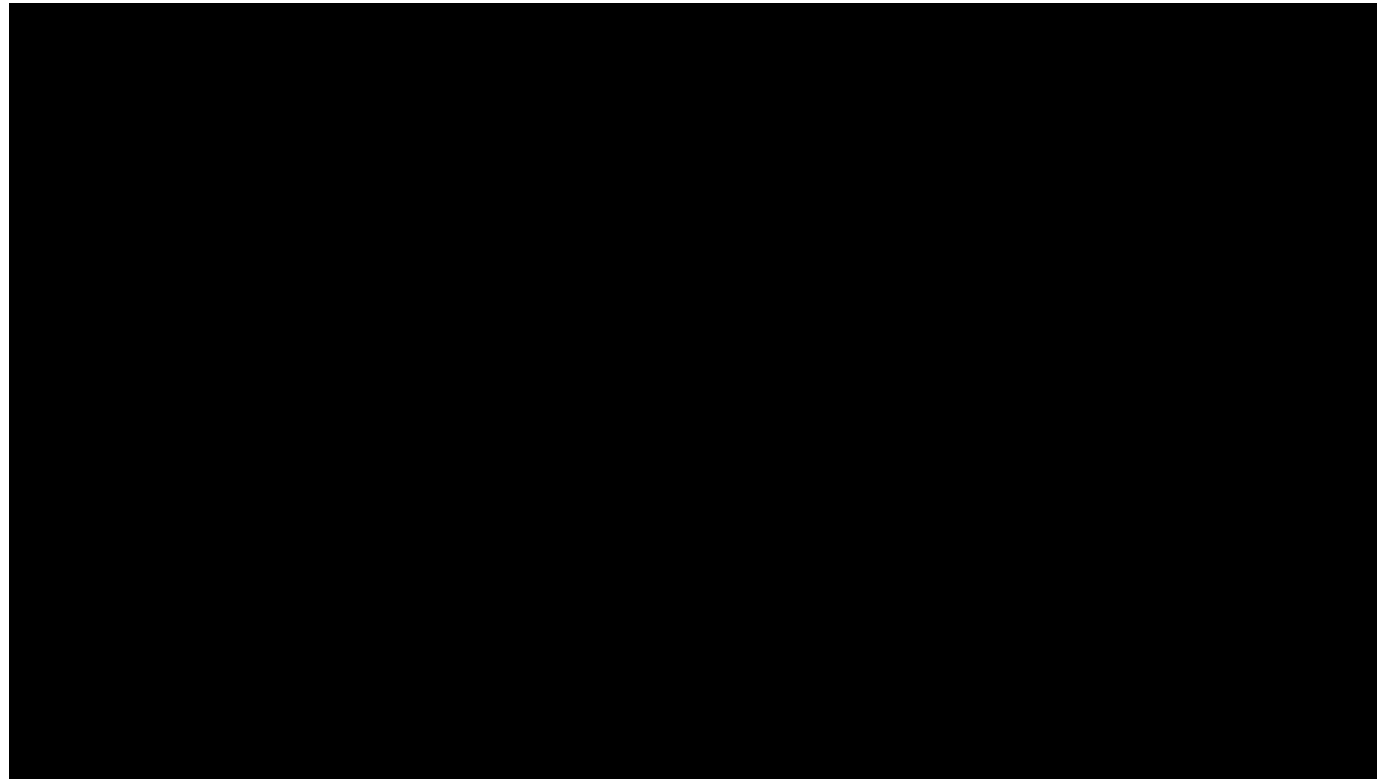
VIEW OF PAVILION FROM SOUTH PLAZA



Beautification Programs

- **Eagle Ford Reclamation:**

Numerous STEER Operators like Anadarko have partnered with organizations such as the Caesar Kleberg Wildlife Research Institute to reclaim the native habitats



Time to get Home



Thank You

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Questions?

