Developing Over Oilfields – The Inevitable Collision

Texas Association of Environmental Professionals
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Presented By:

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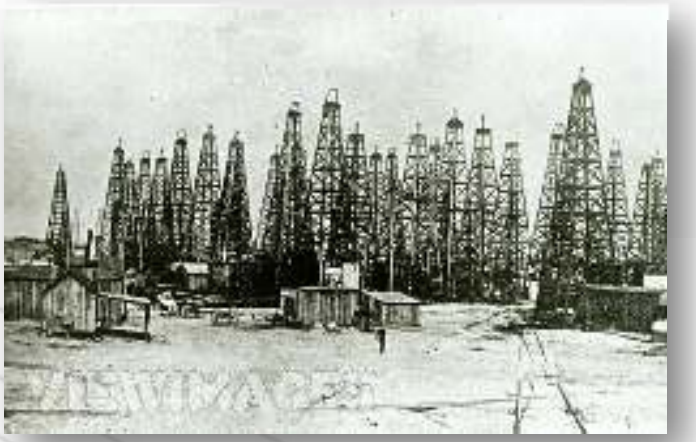
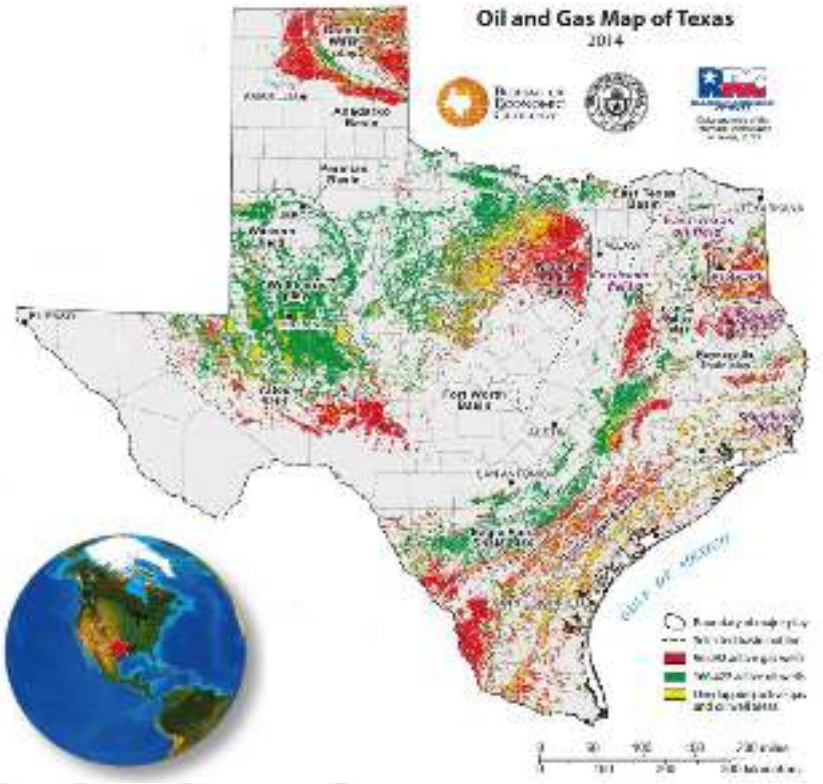
Objectives

- Why is this collision inevitable?
- What problems can result from this collision?
- How can this collision be managed?



The Inevitable Collision

- 5 million wells (oil, gas & dry hole) in U.S.
- 1.5 million wells in Texas
- 15 thousand wells in Harris County (ten per square mile!)
- 50 thousand wells in adjacent counties



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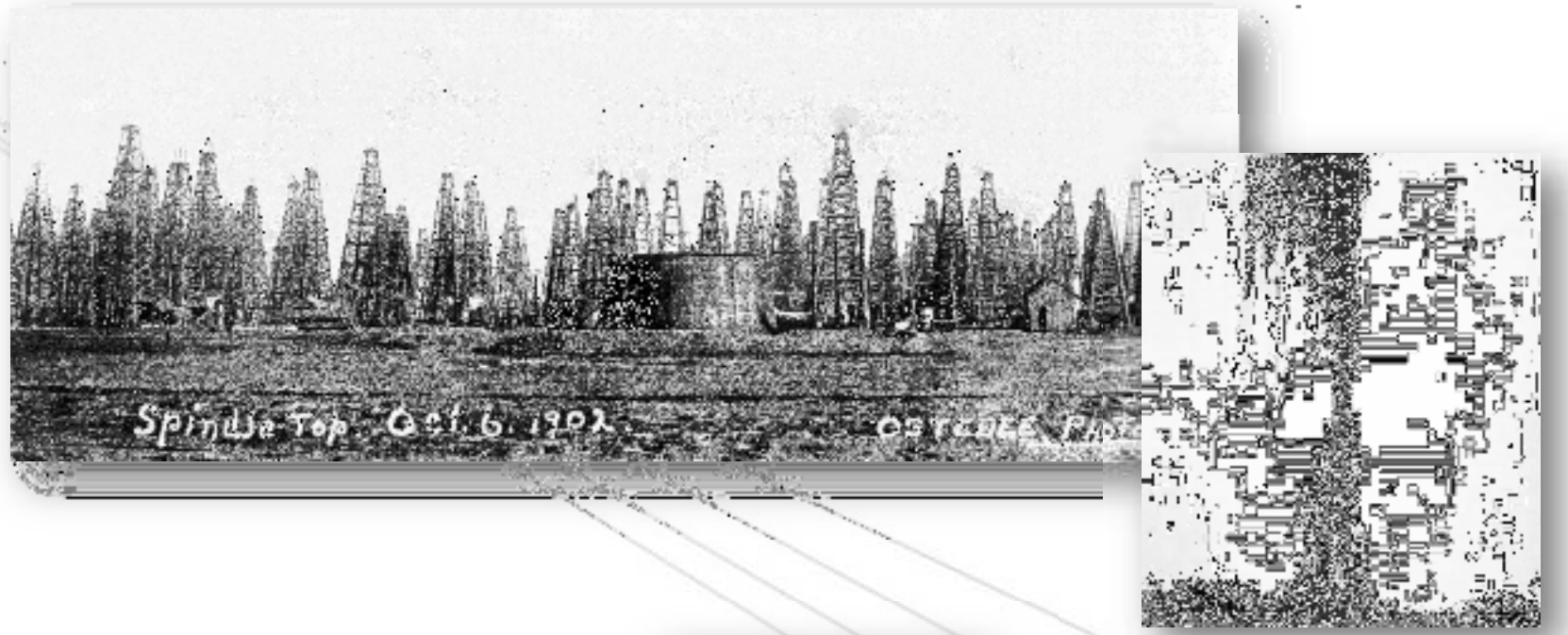
History of Oil/Gas Exploration

- Oil seeps recorded back to 1000 B.C.
- "Accidental" wells in the US, 19th century
- Drake Well – Pennsylvania, 1859
- Oil was used for kerosene, 19th century

History of Oil/Gas Exploration

- Spindletop – Beaumont, 1901



- Model A, 1903

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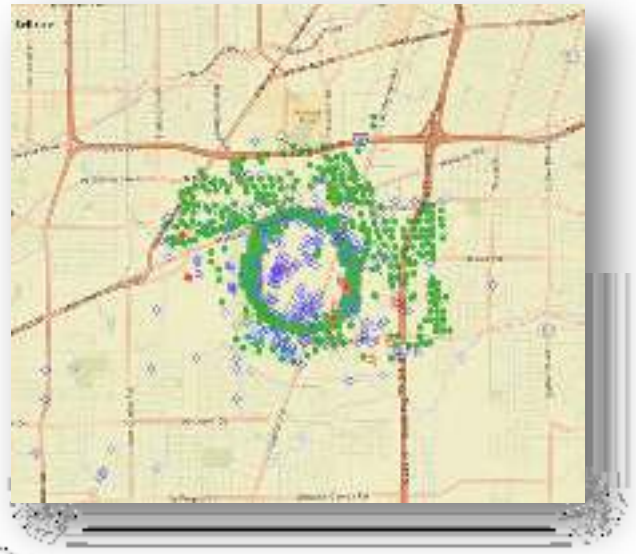
History of Oil/Gas Exploration

- Houston Area Oilfields
  - Humble - 1905
  - Goose Creek (Baytown) – 1908
  - Damon Mound (Brazoria County) – 1915
  - Barbers Hill (Chambers County) - 1916
  - Hull (Liberty County) – 1918
  - West Columbia – 1918
  - Pierce Junction – 1921
  - High Island – 1922
  - Sugarland – 1928
  - Conroe – 1931
  - Manvel – 1931
  - Tomball – 1933
  - Dickinson – 1934
  - Hastings East – 1934
  - Old Ocean (Brazoria County) – 1934
  - Anahuac – 1935
  - Webster – 1936
  - Oyster Bayou - 1941



History of Oil/Gas Exploration

- Significant Events
  - Houston Ship Channel, 1914
  - World War II
  - Pipelines
  - Petrochemical Plants
  - OPEC
  - Clean Air Act
  - Unconventional Drilling (hydraulic fracturing)

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Oil Well Drilling - Mid-20th Century

- Negotiate lease and obtain permit
- Clear area to construct well pad
- Obtain water and electricity
- Excavate mud pit
- Start drilling

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Oil Well Drilling - Mid-20th Century

- Complete drilling in ~4 weeks
- Inspect/test cuttings and cores
- Log well
- Outcomes
  - Dry hole
  - Producer

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Oil Well Drilling - Mid-20th Century

- Dry Hole
  - Outcome 8 times out of 9 for wildcatters
  - Remove equipment
  - Plug well
  - Bulldoze mud pit

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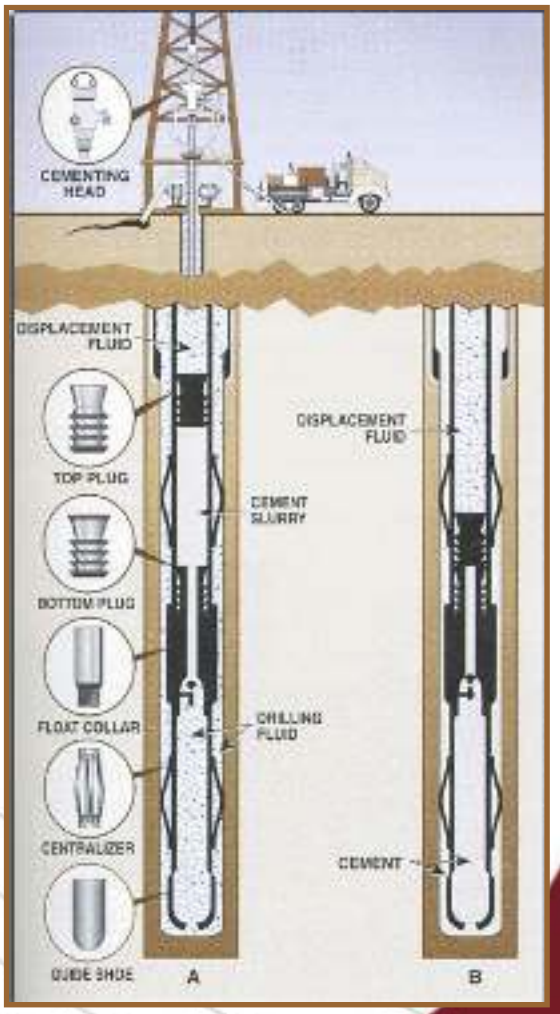
Oil Well Drilling - Mid-20th Century

- Production Well
  - Production tubing
  - Device to pump oil to surface
  - Production equipment to separate oil, gas & water
  - Flow lines / pipelines
  - Storage units

Plugging and Abandoning a Well

- Procedures
  - Remove production piping
  - Set cement plugs at multiple intervals to separate production zones from usable aquifers
  - Cement the upper 10-15 feet of the well
  - Cut off well casing below agricultural use depth (~3 feet)
- Procedures never intended for a building to be constructed over the well
- Current typical cost ~ $15,000



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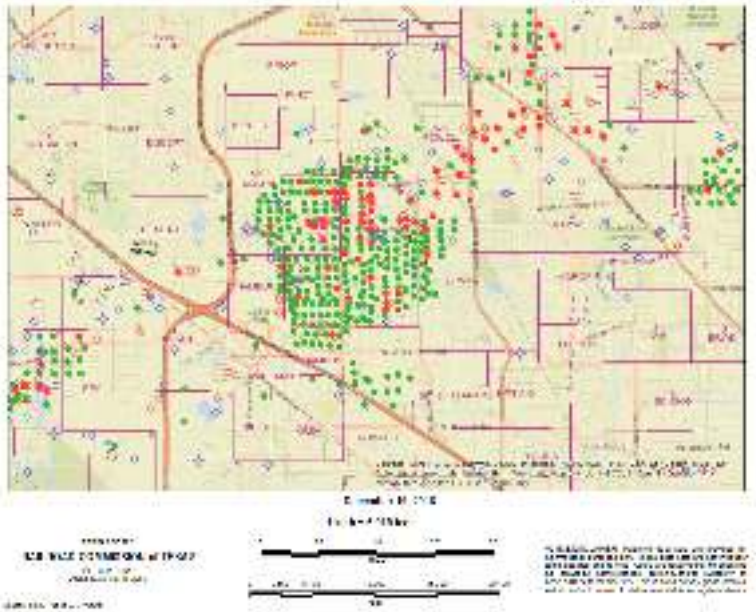
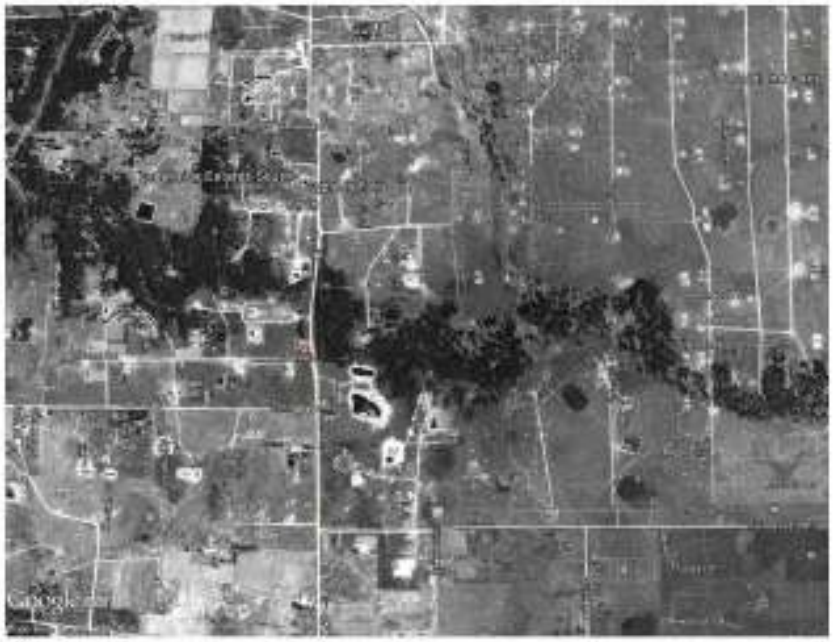
Due Diligence - Locating a Plugged Well

- Railroad Commission maps
- Aerial photographs
- Topographic maps
- Site reconnaissance





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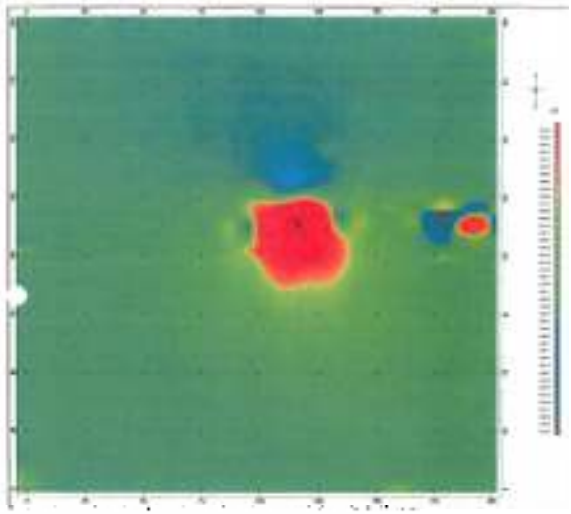
Locating a Plugged Well

- Railroad Commission records
- Geophysical investigation
  - Electromagnetic
  - Magnetometer
  - Ground penetrating radar
- Excavation to expose
  - Survey location
  - Measure depth
  - Inspect condition



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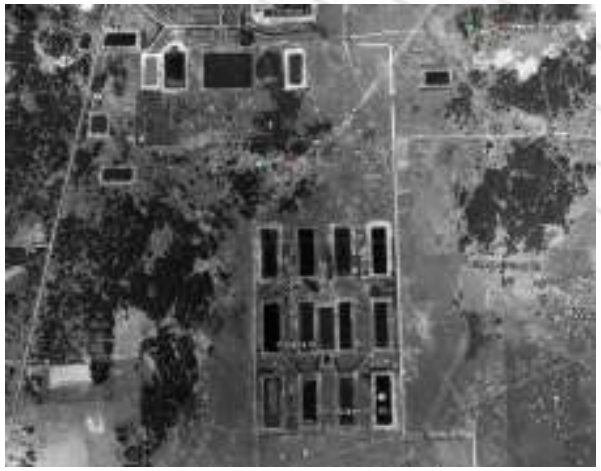
Where is the contamination?

- Wellhead
  - Soil and groundwater
  - Methane gas
- Mud pit
  - Metals (especially barium)
  - Chlorides
  - Oil
  - Other wastes
- Reserve pit



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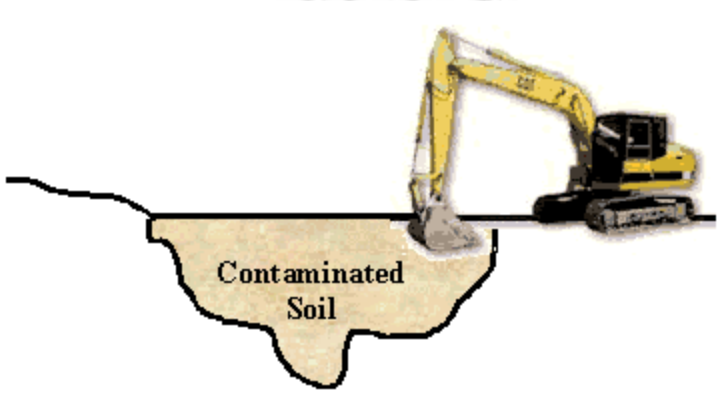
Where is the contamination?

- Storage tanks
  - Oil, brine
- Production equipment
  - Mercury meter, glycol
- Flow lines
- NORMs

Contamination Solutions

- Risk assessments
- Restrict land use or relocate affected soil
- Prohibit use of groundwater
- Excavate hot spots
- Larger scale remediation



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Problems with the Collision

- Investigate/remediate contamination discovered from environmental due diligence
  - Time, money, financing problems
- Unexpected discoveries *during* development
  - More time and money
- Unexpected discoveries *after* development
  - Litigation, bankruptcy, non-performing loans, foreclosure

Unexpected Discoveries During Construction

- Stained soils
- Pipelines / flow lines / metal debris
- Waste materials discarded in former pits
- Wellheads

Unexpected Discoveries After Construction

- Odors
- Oil seeps
- Saltwater (brine) seeps
- Gas seeps
  - Natural gas, methane, hydrogen sulfide, carbon dioxide
- Swimming pool excavations
  - Wellheads
  - Contaminated soil
- Building explosion

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Tomball-Magnolia Tribune

March 31, 2003

- **"How would you like to find out that there is a natural gas well in your front yard, the source of untraceable gas leaks for four years? Better yet, how about looking out your window and seeing a large oil and gas rig sitting in the yard, gearing up to fix the problem? Farfetched? Maybe. But this is exactly what happened to one resident of the exclusive North Star Estates subdivision in north Tomball this past week."**

- **"… with gas leaks bubbling up through cracks in the driveway."**

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Houston Press

April 12, 2007

- **“Then ugly rumors began to circulate. That a chunk of the subdivision had been built on a former oil and gas field. That deadly pollution from old sludge pits, burn pits and even an oil refinery lurked directly beneath their houses and yards.”**

- **“High-ranking public officials have admitted they would not risk moving with their own families into certain areas of Woodwind Lakes, even after repeatedly assuring residents that the contamination that has been found poses no threat to human health.”**

The dirt just below the surface of one backyard was stained with potentially hazardous chemicals from past oil and gas activities.

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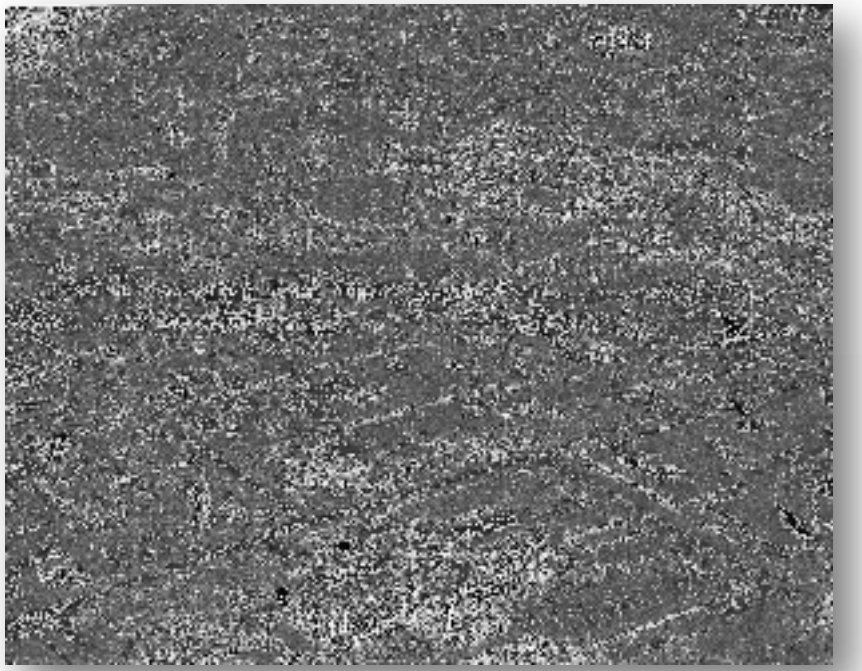
Managing the Collision



- Environmental due diligence
  - Oil/gas well search
- Investigate and remediate contamination (VCP or corrective action)
  - Remediate beyond regulatory requirements in some cases
- Locate wellhead
- Avoid development over wellhead
- Disclosure to future landowners and tenants
  - Different land uses have different risks

Avoiding a Located Well

- Outside footprint of building
- Outside residential lot
  - Right-of-ways, roadways
  - Landscaped areas (reserves)
  - Property line
- Select low risk development type

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Summary

- Building development (and redevelopment) will continue to encounter oilfields
- Liabilities escalate if discovered after development is complete
- Locate and avoid wellheads

Questions

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