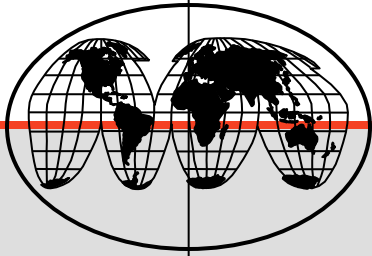


# Well Location – Current Performance

	Total # of wells	# of wells <100 ft	% better than 100 ft	# of wells > 100ft	% > 100 ft
12 Studies of Surface Well Locations	11975	8860	74%	3115	26%
	Total # of wells	# of wells <200 ft	% better than 200 ft	# of wells > 200ft	% > 100 ft
1 Study of Bottom Hole locations	534	400	75%	134	25%

- **Field Surveys usually correct**
- **Problems with:**
  - **Vendor Data**
  - **Spatial references**
  - **Staff miscalculation**
  - **Wrongly loaded data**
  - **Bad software**
  - **Multiple instances**
  - **Master Data Management Systems**
  - **No QC of ETL process**



# STIGANT

ENTERPRISES Incorporated

Geospatial Consulting for the Oil and Gas Industry

*"Finding Oil and Gas through Excellent Geospatial Quality Management"*

*Do You Know Where Your Wells Are?*

*Leasing Through Production*

*How Much Is It Worth?*

**ESRI PUG**

Jonathan Stigant

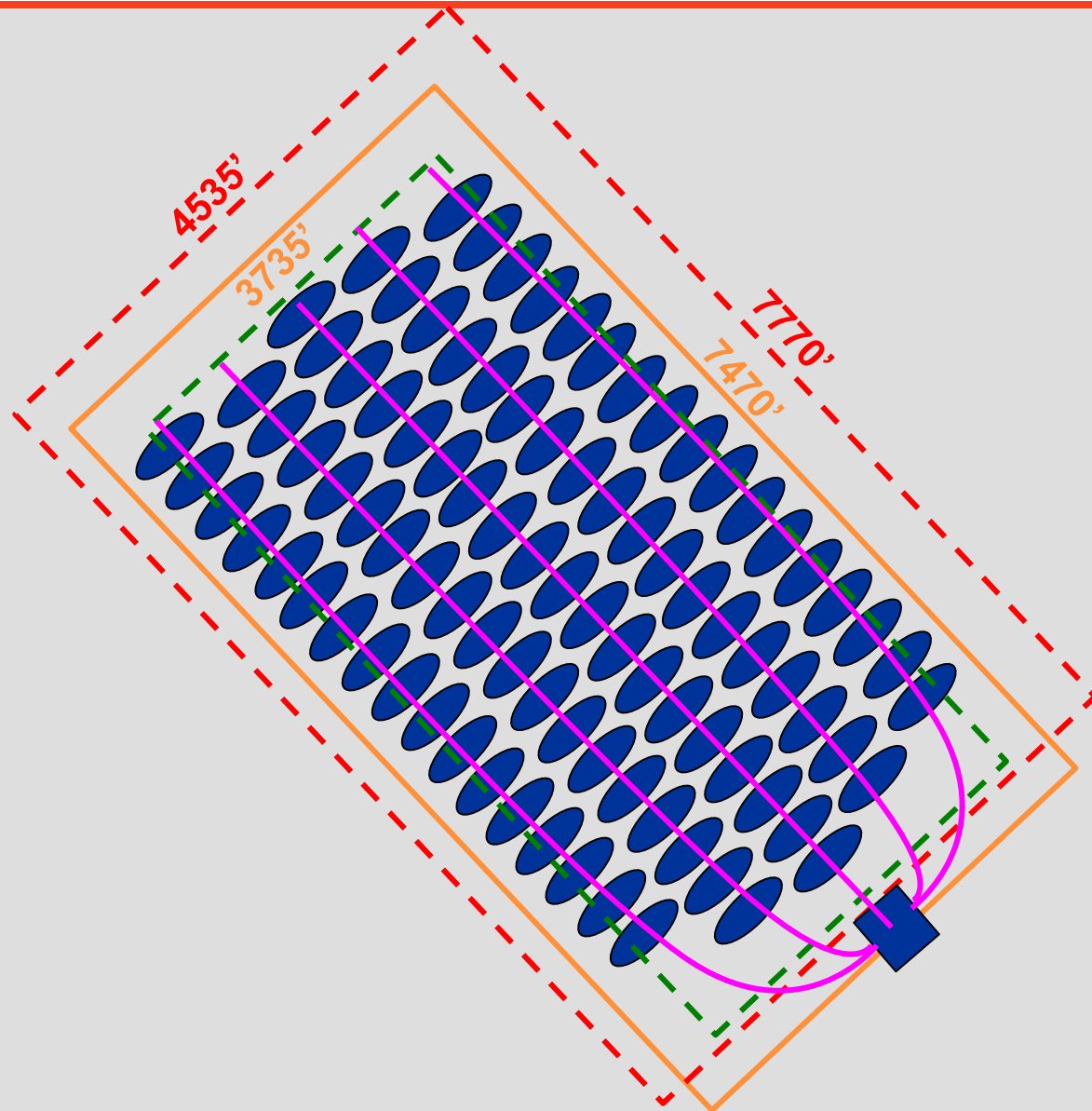
May 1, 2012

# *Area Discrepancy due to Incorrect Grid*

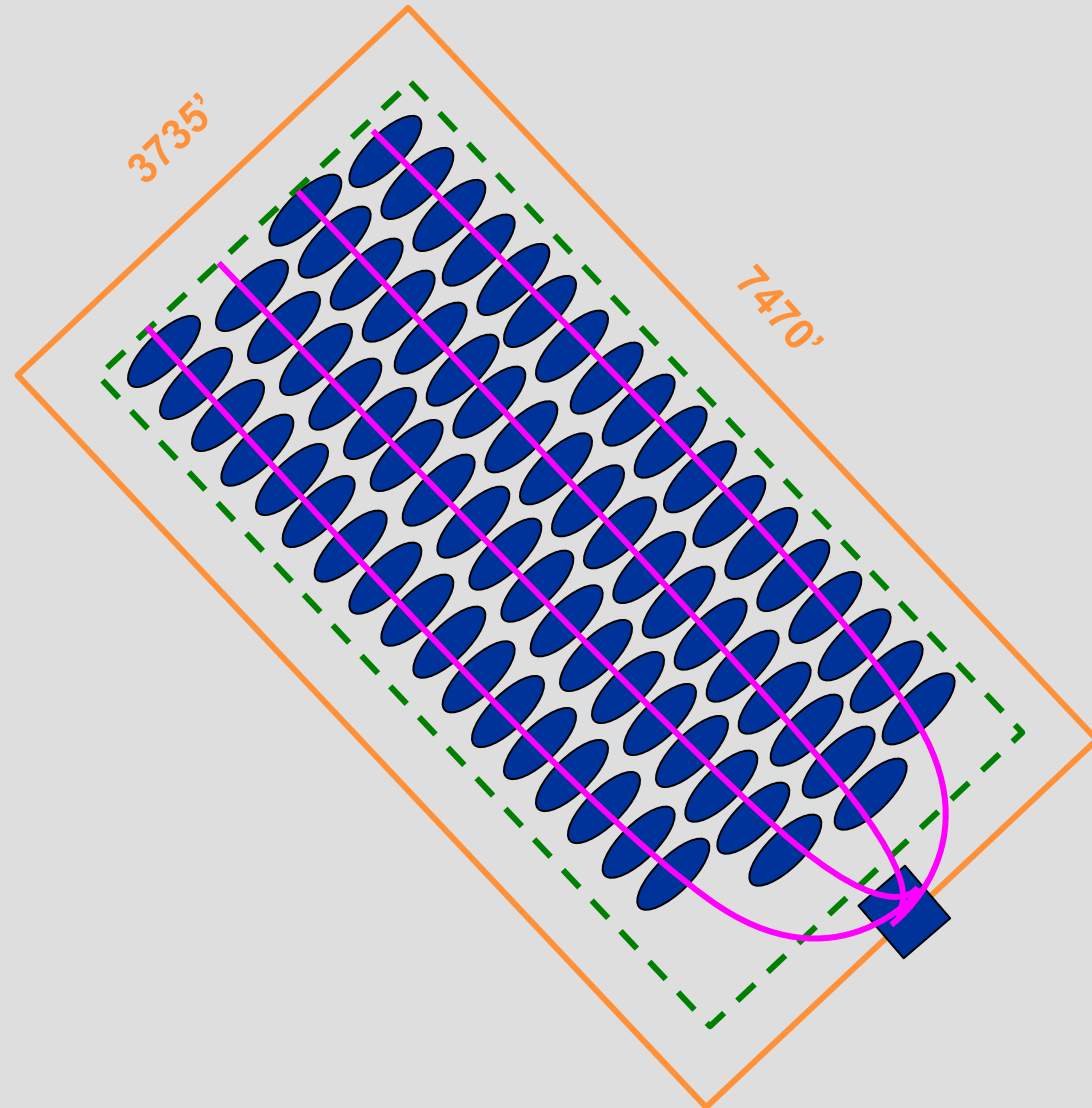


**Overpayment of royalties?**

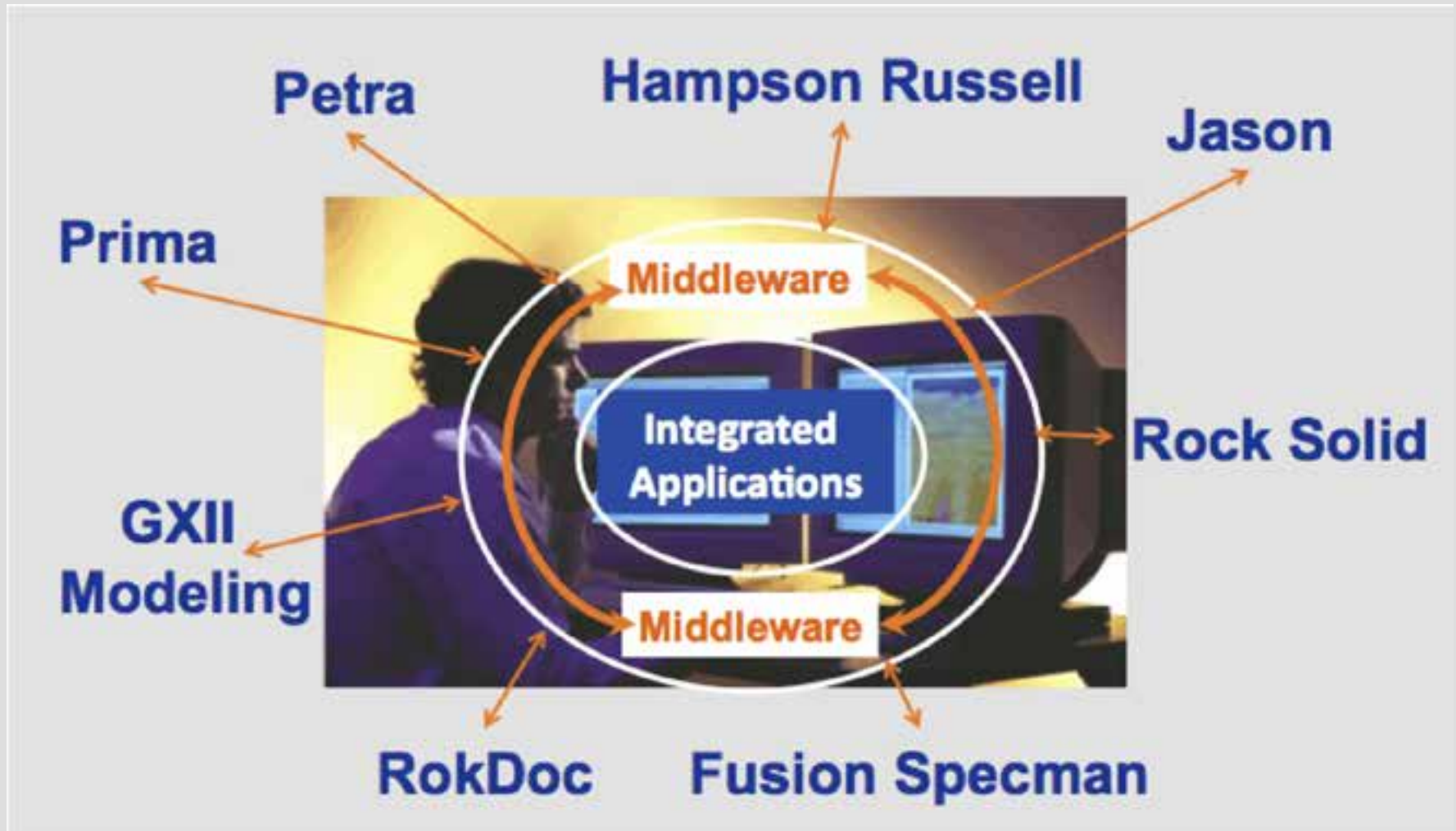
# Geospatial Impact on Shale Wells - Boundaries



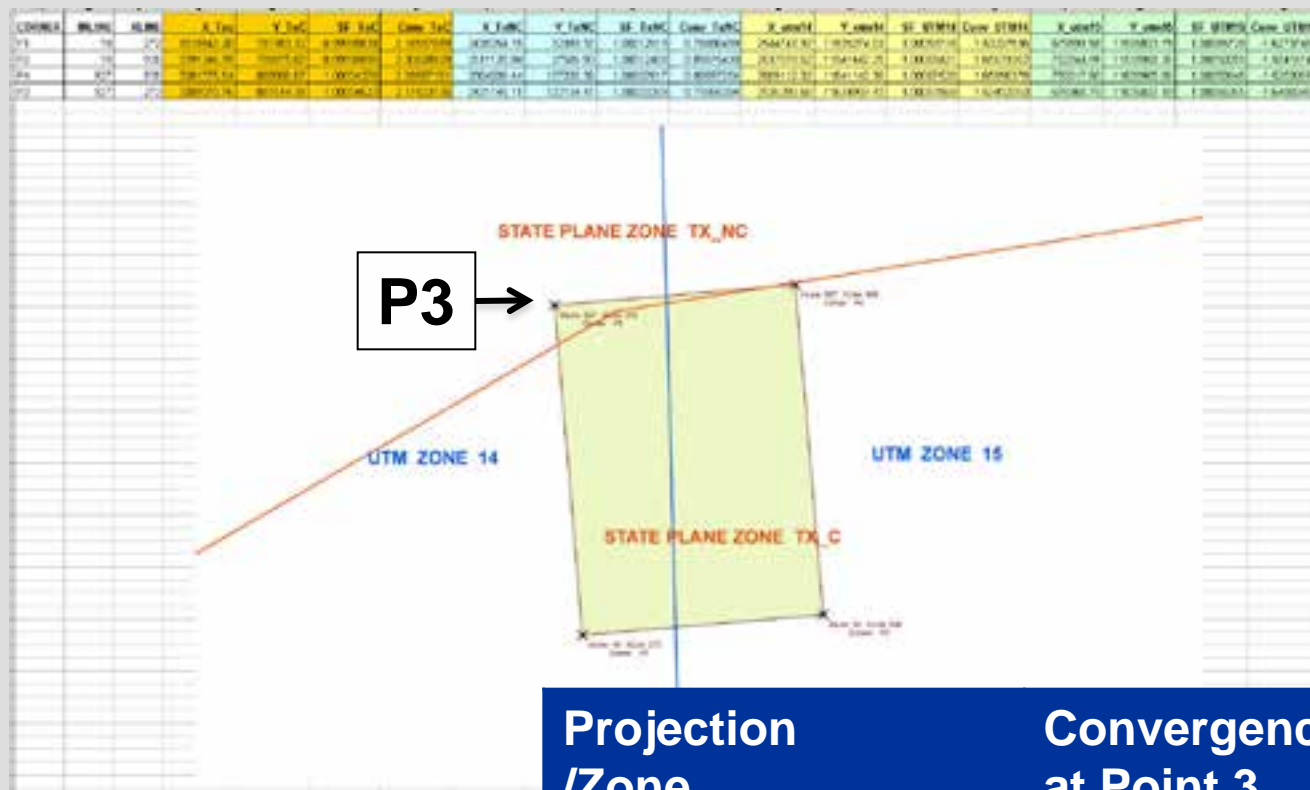
# Geospatial Impact on Shale Wells - Boundaries



# He is 'Doing' GIS Too!



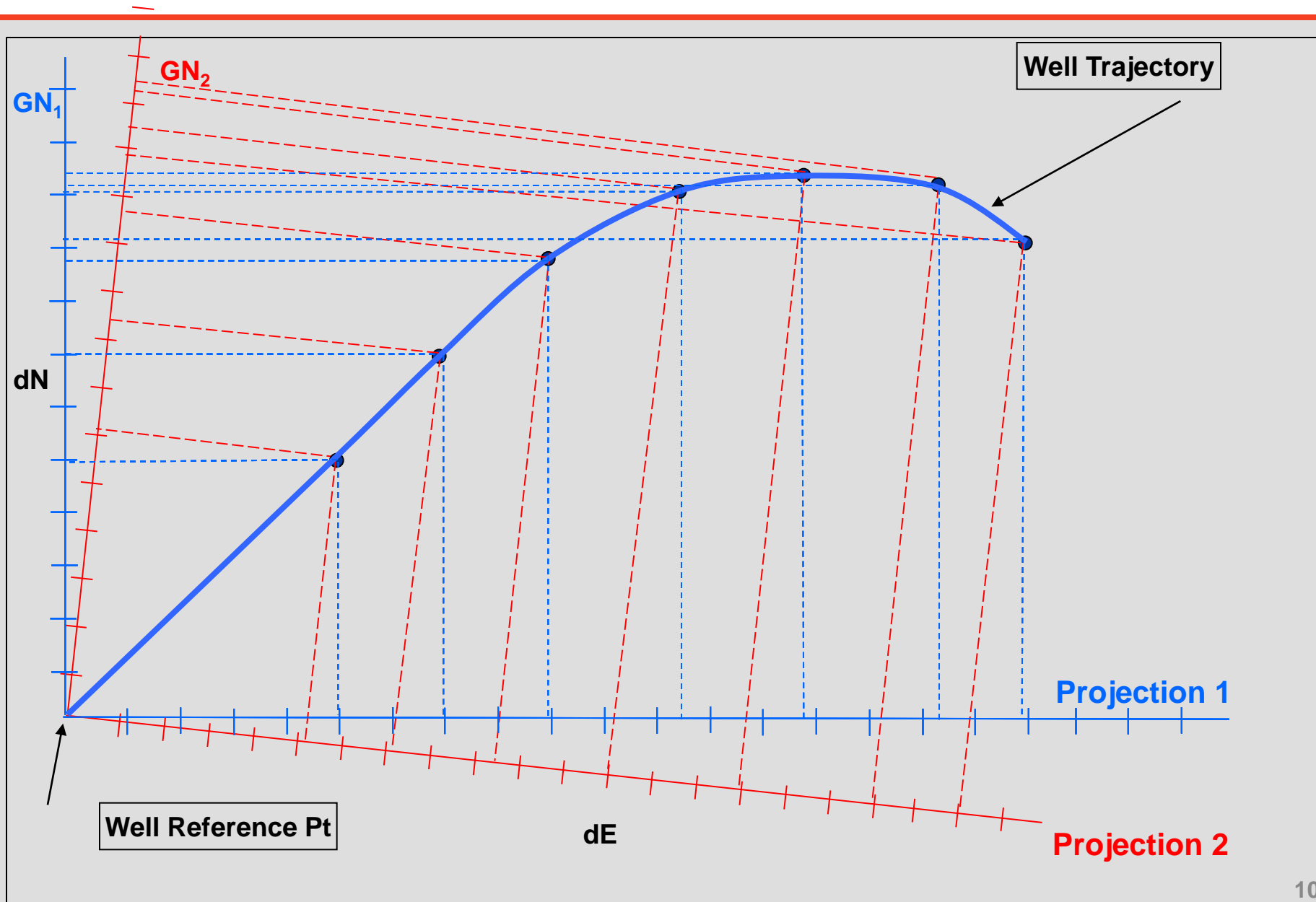
# Scale Factor & Convergence – Zone Boundary



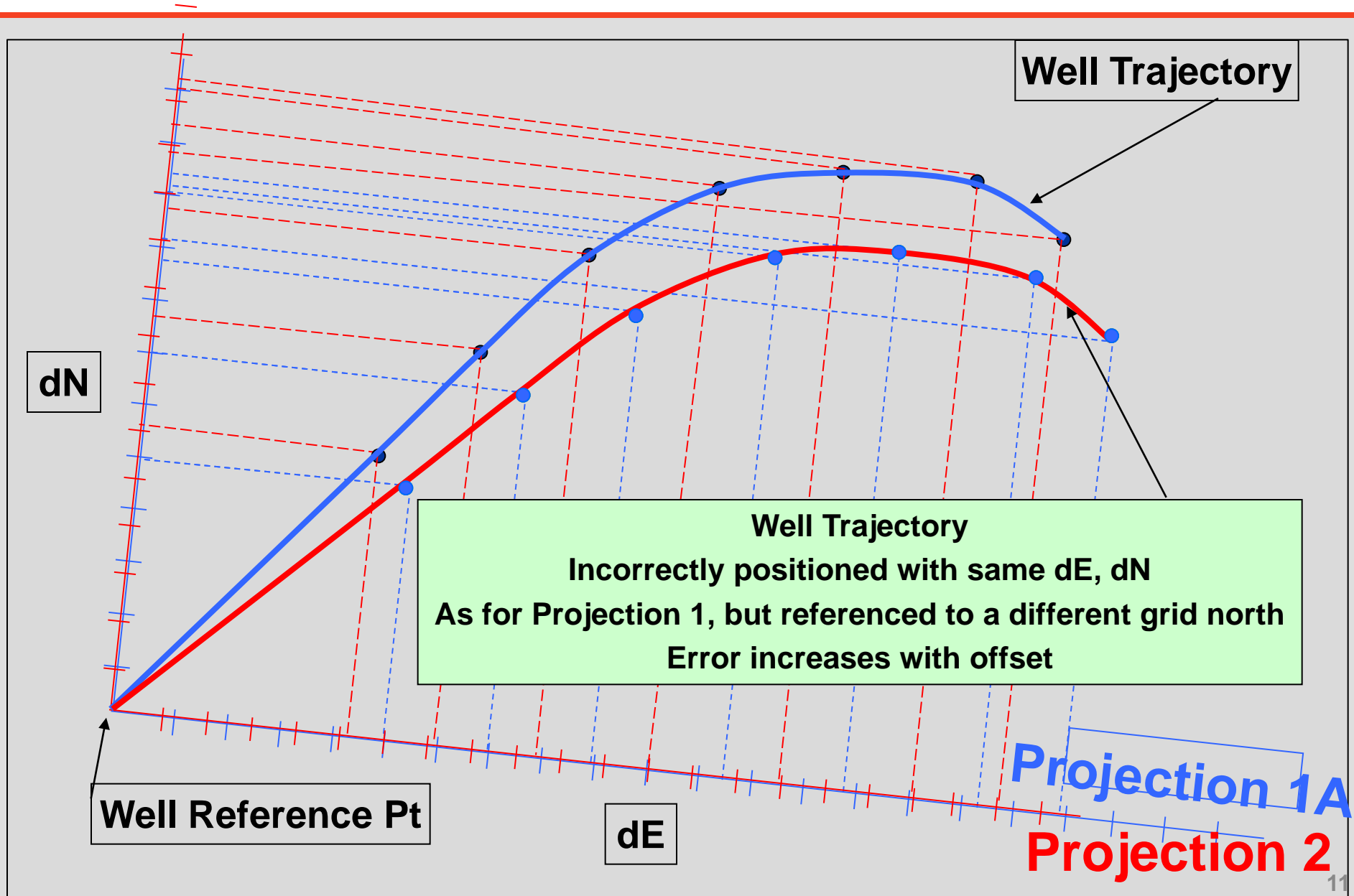
Projection /Zone	Convergence at Point 3	Rotational Error at 10,000 ft offset
Texas/Central	2.18	284 ft
Texas/North Central	0.76	Correct
UTM/14N	1.53	Correct
UTM/15N	-1.65	636 ft



# Grid to Grid Transform



# DE and DN not Adjusted Correctly



# One Digit Error

In the ASCII Loader, Select Edit – Format. The screen shots show how one column could cause a multitude of errors and creation of twice as many wells.

The screenshot displays the 'ASCII Format Edit' window for a file named 'who\_well\_hdr.wdl'. The window is divided into several sections:

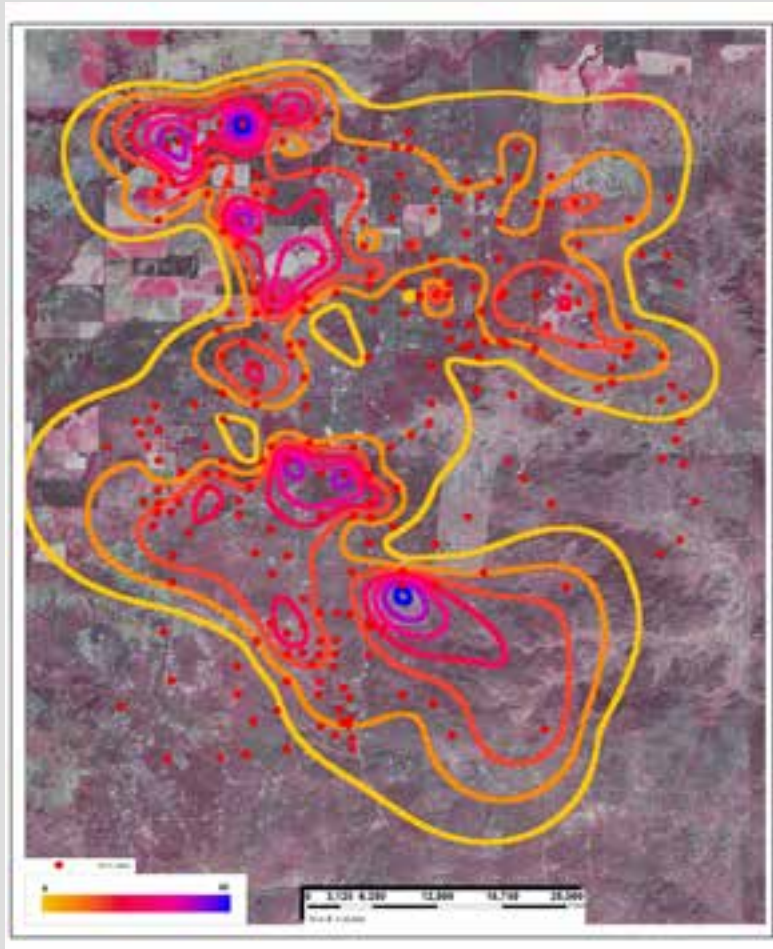
- Format Header:** This format reads in well header information from an Finder 8.5 Extract ASCII file.
- Format Definition:** A list of format definitions for well header information, such as 'Well Header, Common Well Name, Occ 1, Read From File' and 'Well Header, Completion Date, Occ 1, Read From File'.
- Data Categories:** A list of data categories including 'Options', 'Well Header', 'Bdb Archive', 'Bdb Object', and 'Bdb Project'.
- Data Items:** A list of data items including 'Dai, R', 'Authorization No', 'Basin, FK', 'Borehole No', 'Borehole Type', 'Common Well Name', 'Completion Date', 'Country', 'County', 'Currency, FK', and 'Current Class, FK'.
- Start Col:** 128
- End Col:** 138
- Line No:** 1
- Occurrence:** 1
- Multiplier:** 1
- Source:** Read From File
- Value:** 09-Jun-1986

The **Data Previewer** section at the bottom shows a table with columns for DataFile, FilePosition, and various data fields. A red arrow points to the value '09-Jun-1986' in the last column of the first row of the data preview table.

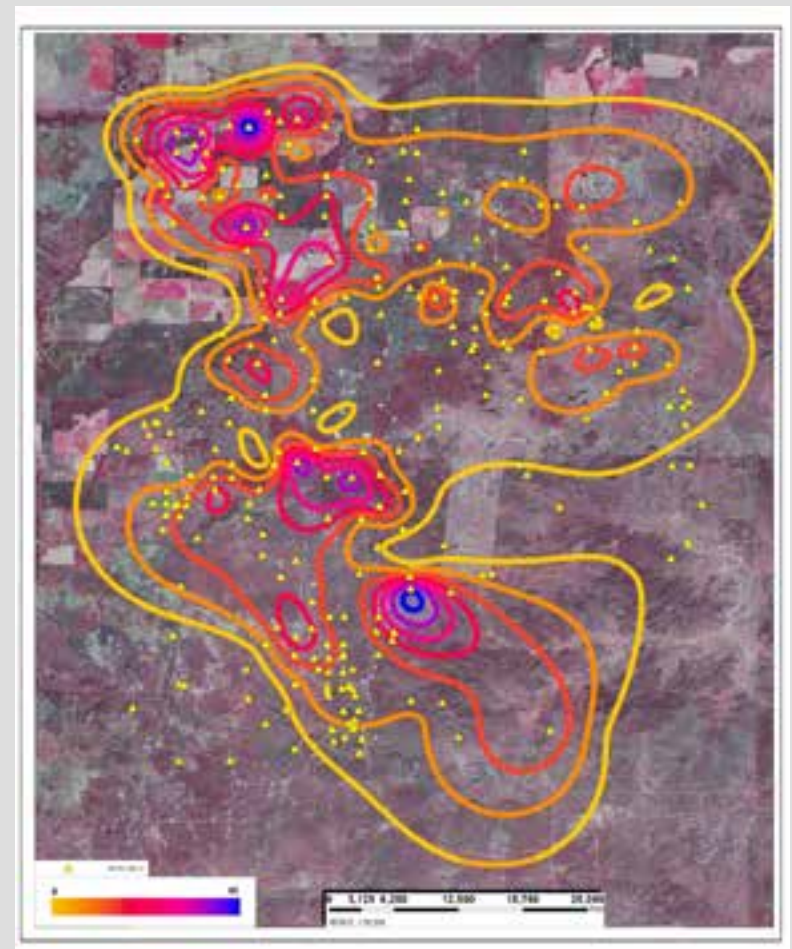
DataFile	FilePosition									
508184000000	2635217.2500	10148551.0000	2635196.5219	10148534.6873	KB	72,000	FWA	99	09-Jun-1986	
508184001500	2647404.5000	10091353.0000	2646557.7740	10092750.3989	KB	63,000	PLUGGED & ABANDONED	99	12-Aug-2000	
508184000900	2696079.0078	10102169.5078	2696641.4311	10100253.0946	KB	73,000	PLUGGED & ABANDONED	99	27-Apr-1998	
508184005902	2755642.5000	10108188.0000	2755642.5000	10108188.0000	KB	88,000	PLUGGED & ABANDONED	99	11-Dec-2006	
508184004200	2731178.5000	10093119.0000	2731094.9670	10093208.9778	KB	75,000	PLUGGED GAS	32	06-Jul-2003	
508180000001	2731173.6534	10093098.6232	2731569.4115	10093355.3751	KB	0,000	UNKNOWN	1		
508184004201	2731176.0000	10093116.0000	2732204.2229	10091919.1353	KB	75,000	PLUGGED & ABANDONED	99	31-Aug-2003	
508184003100	2806078.8381	10086241.0224	2806075.7571	10086031.0497	KB	93,000	PLUGGED & ABANDONED	99	30-Nov-2002	
508184000370	2666136.1112	10064037.0470	2666596.6378	10066733.2247	KB	46,000	PLUGGED GAS W/OIL SHOW	64	29-Jul-1991	
508184000300	2666136.1122	10064037.0475	2667279.8948	10066690.5951	KB	46,000	PLUGGED GAS W/OIL SHOW	64		
508184000301	2666136.1100	10064037.0470	2667282.1700	10066690.5951	KB	46,000	PLUGGED GAS W/OIL SHOW	26		

One extra column shifts the corresponding columns one extra column to the right

# Interpretation Impact - MidTex

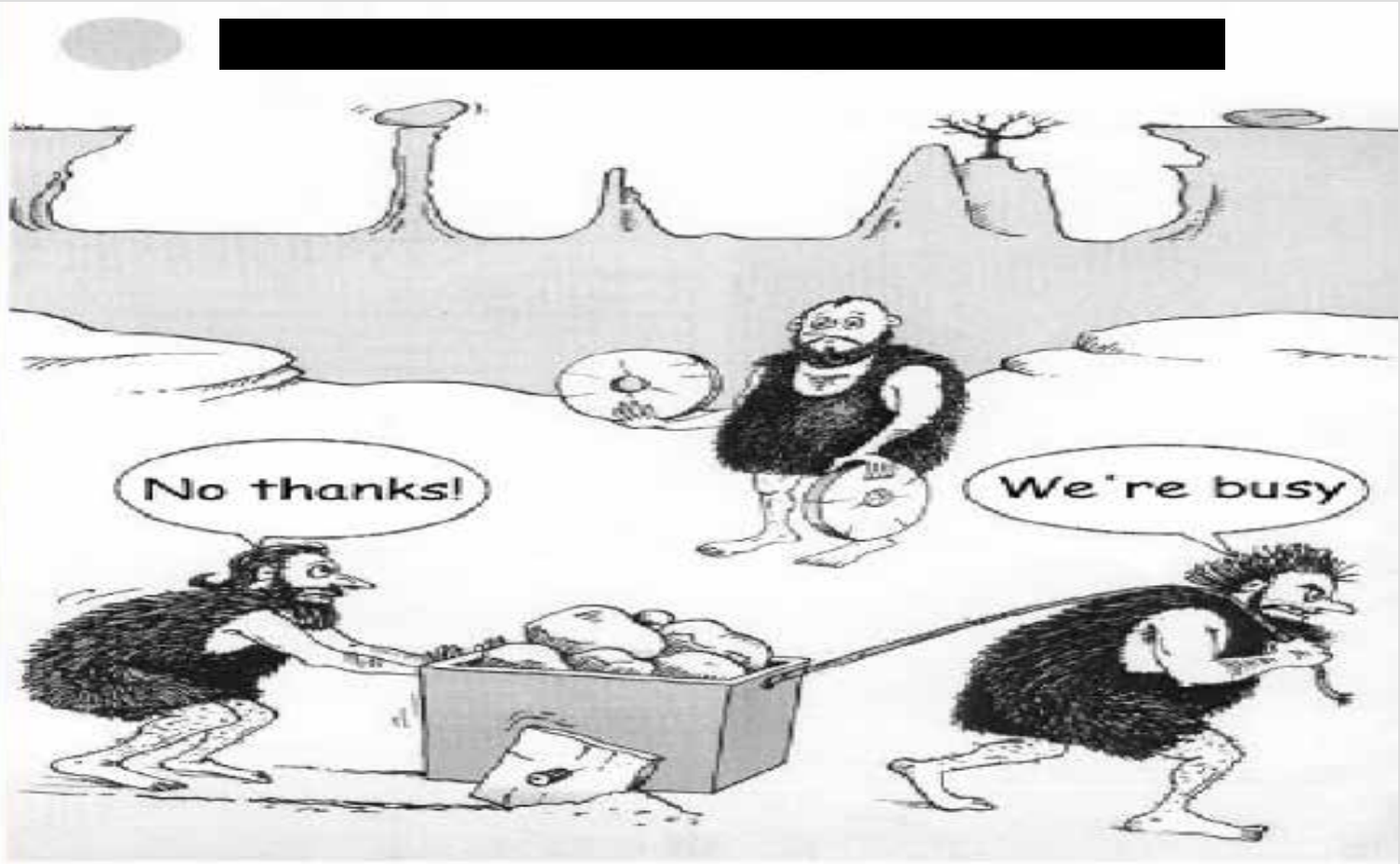


**STRUCTURE DIGITIZING**



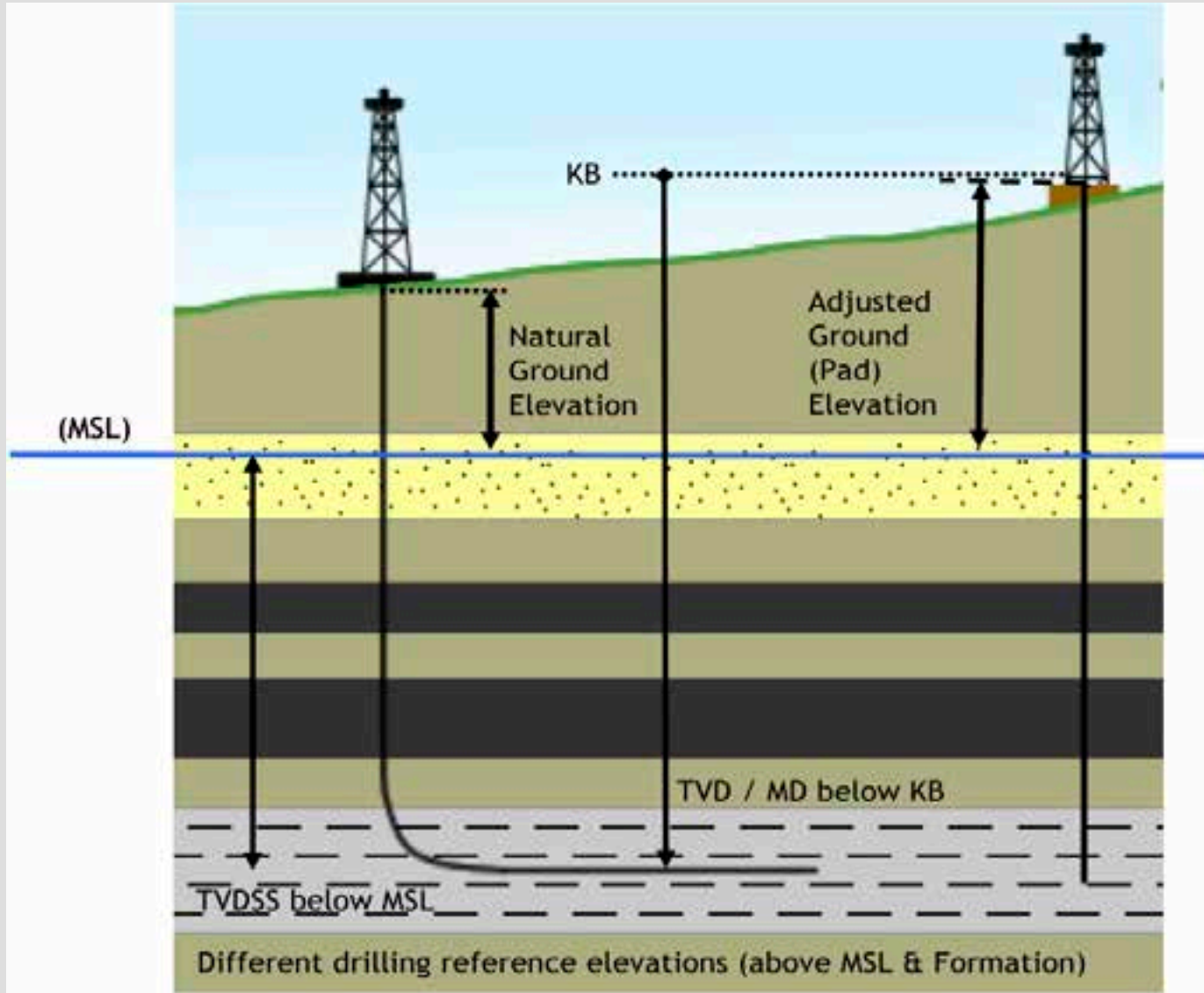
**MIDTEX WELL LOCATIONS**

# Geospatial Impact on Shale Wells



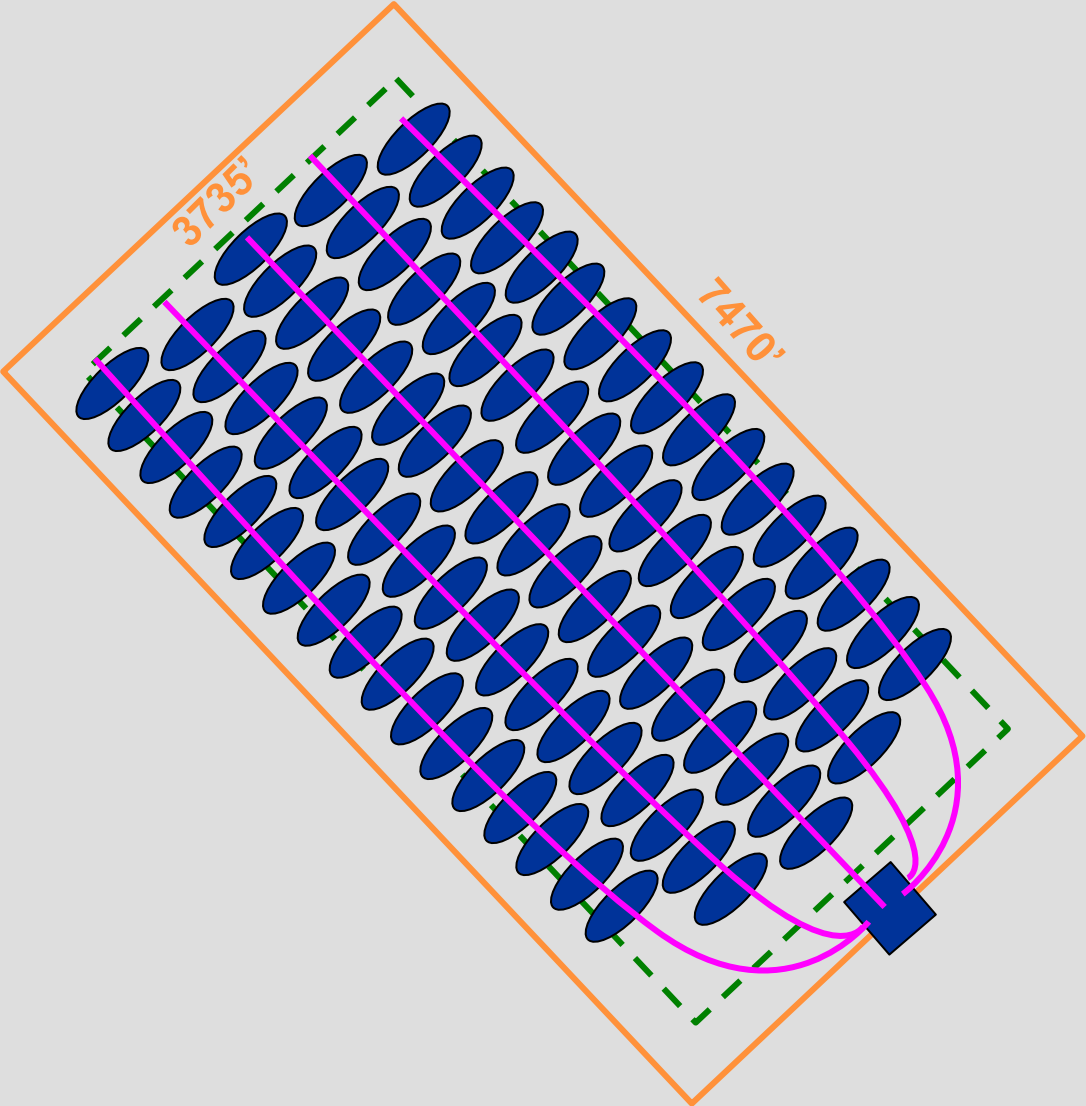
*Is there a better way?*

# Multiple Rigs, One Well, Elevation Reference Anyone?

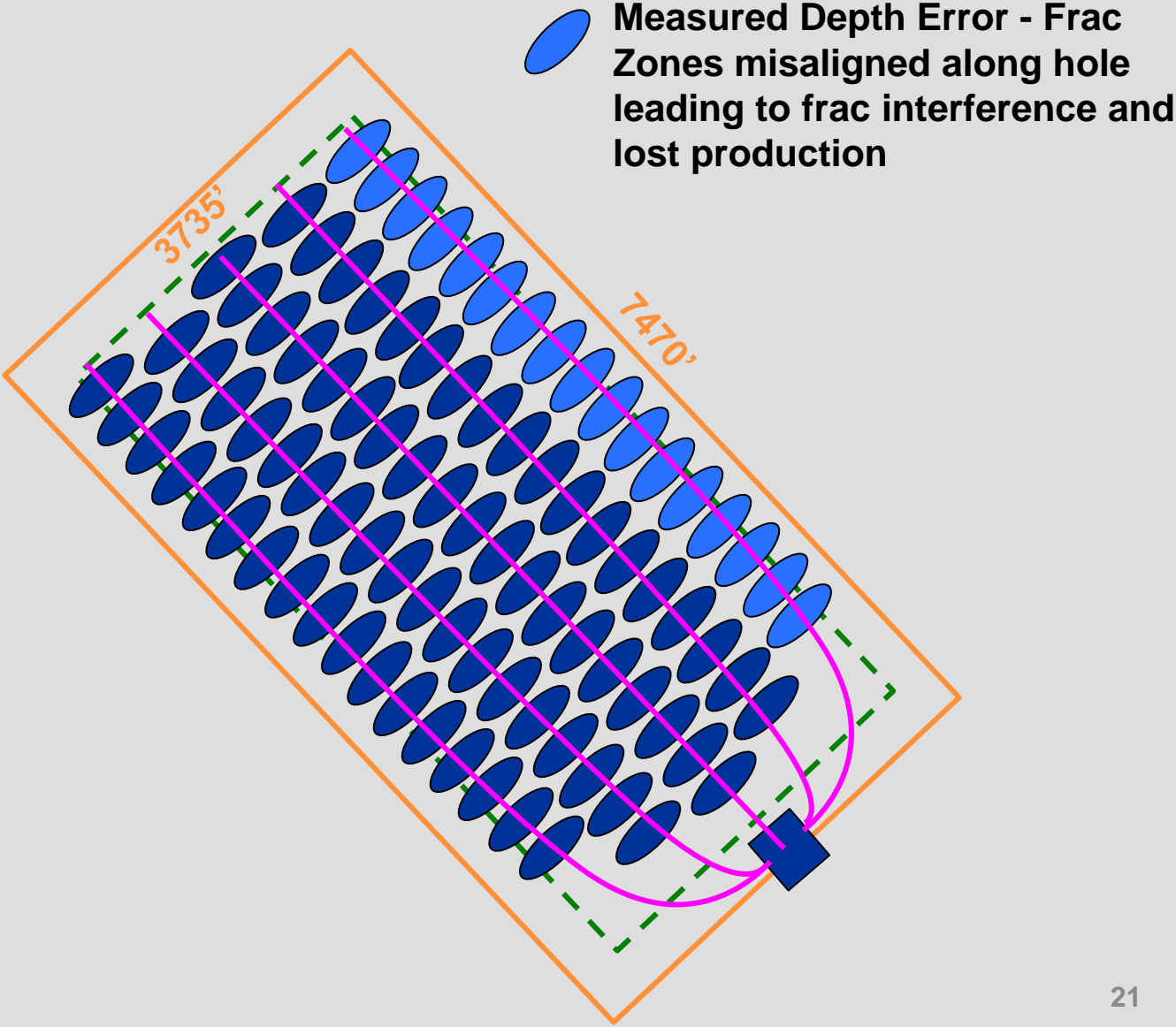


**Measured Depth Error Potential?**

# Geospatial Impact on Shale Wells – MD Error

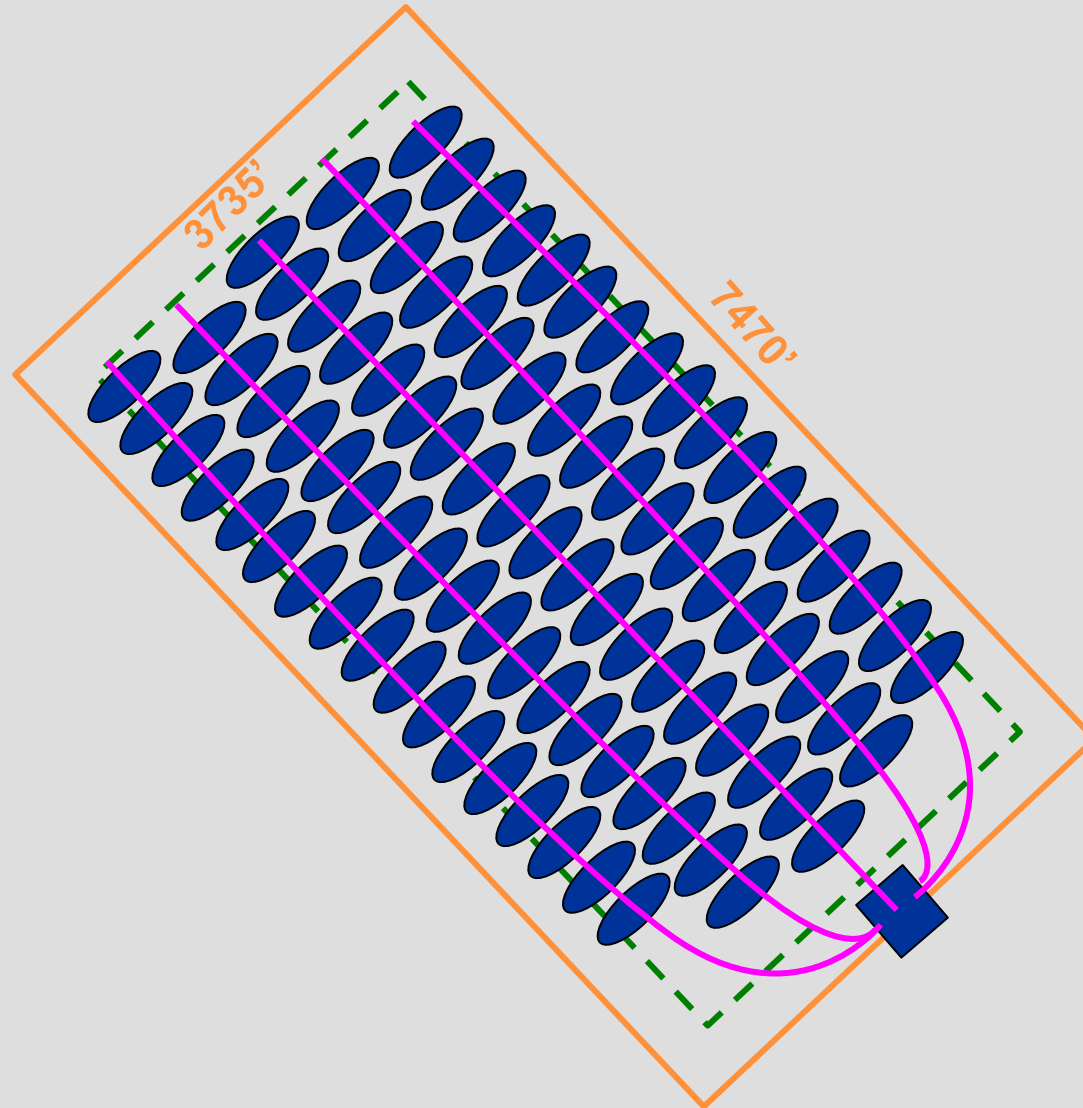


# Geospatial Impact on Shale Wells – MD Error

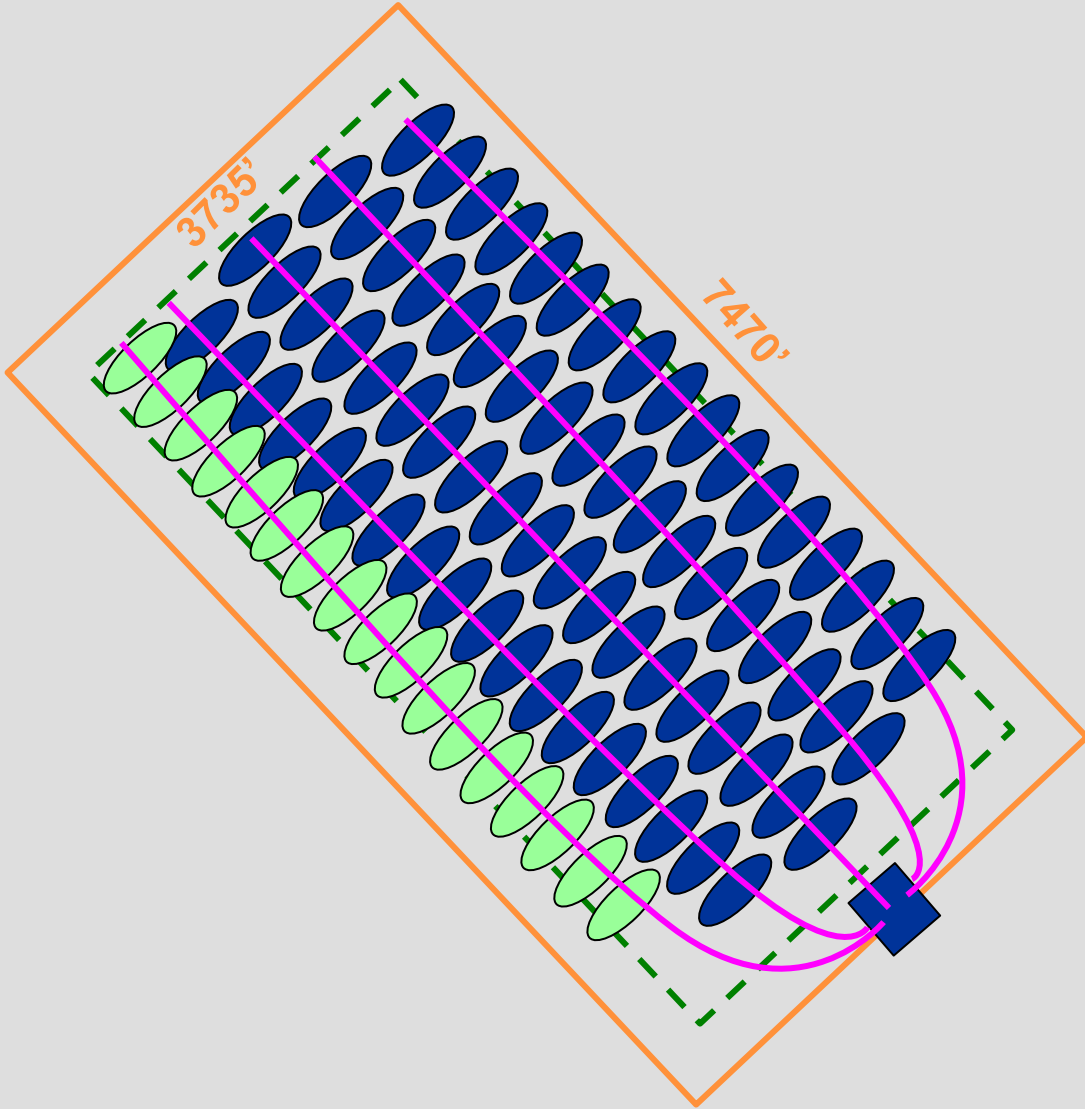




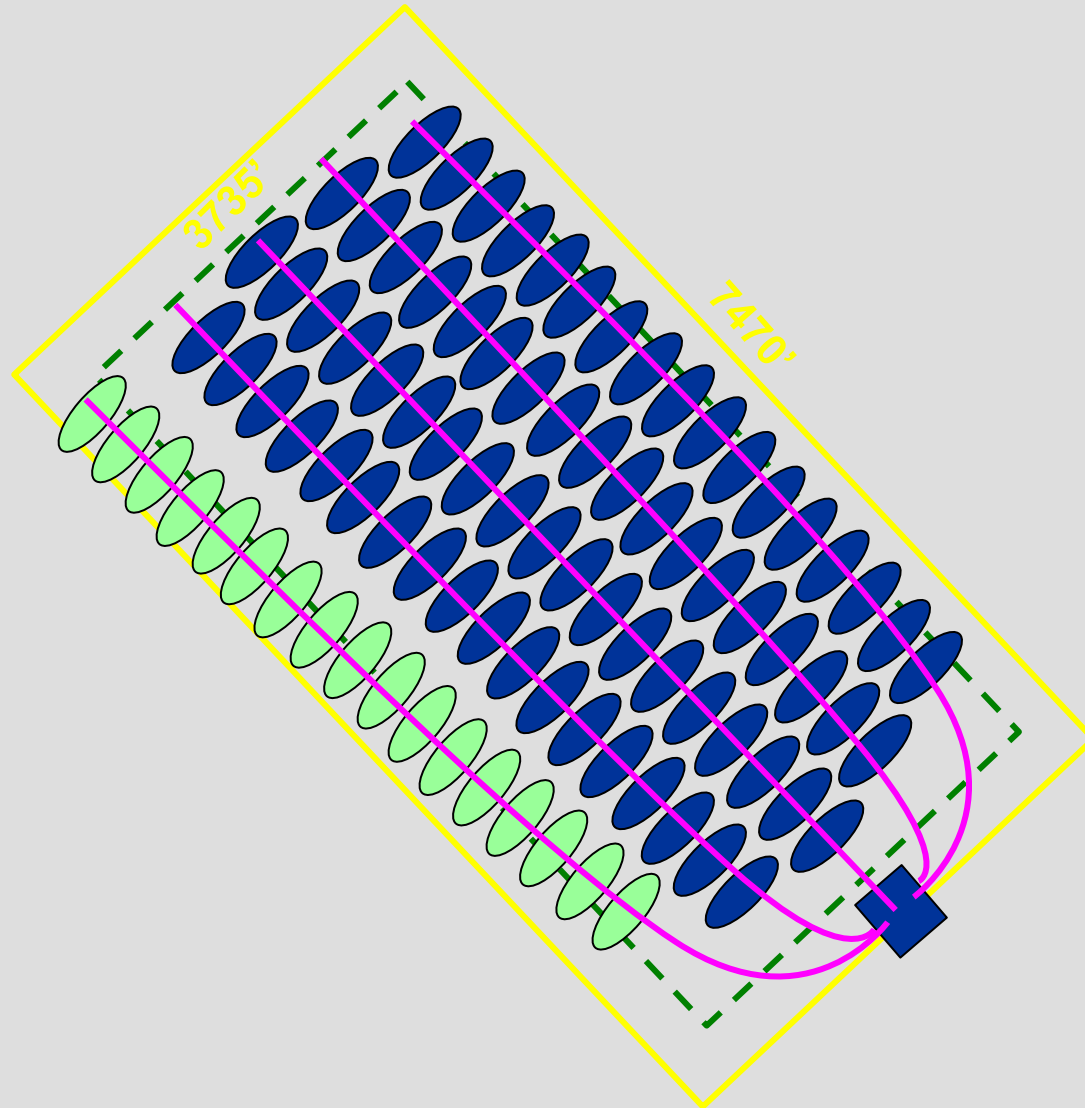
# Geospatial Impact on Shale Wells - Azimuth Error



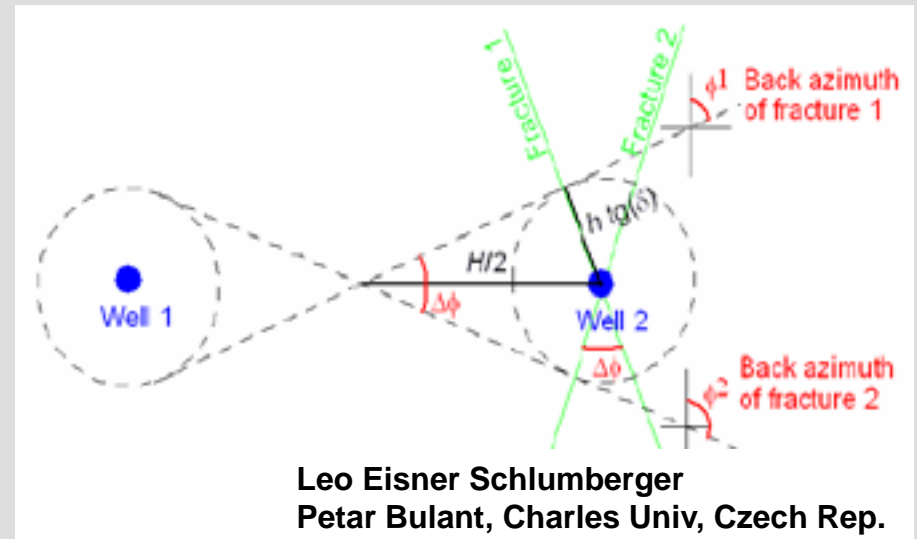
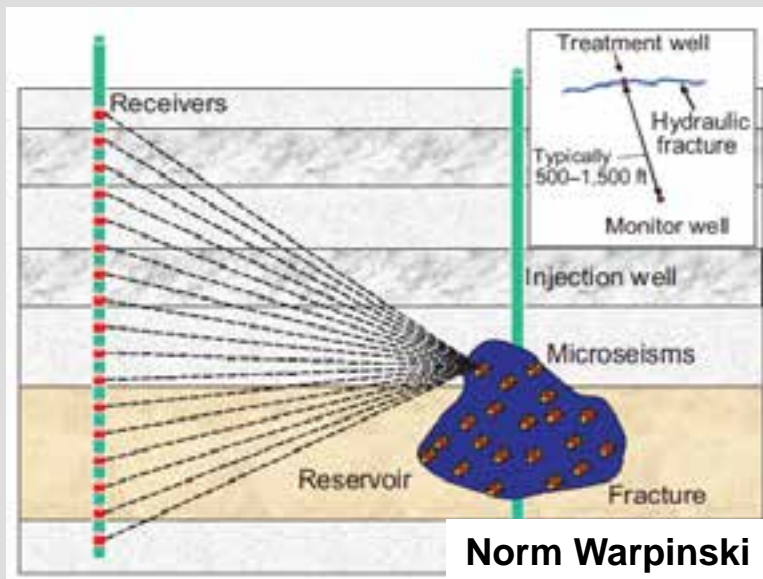
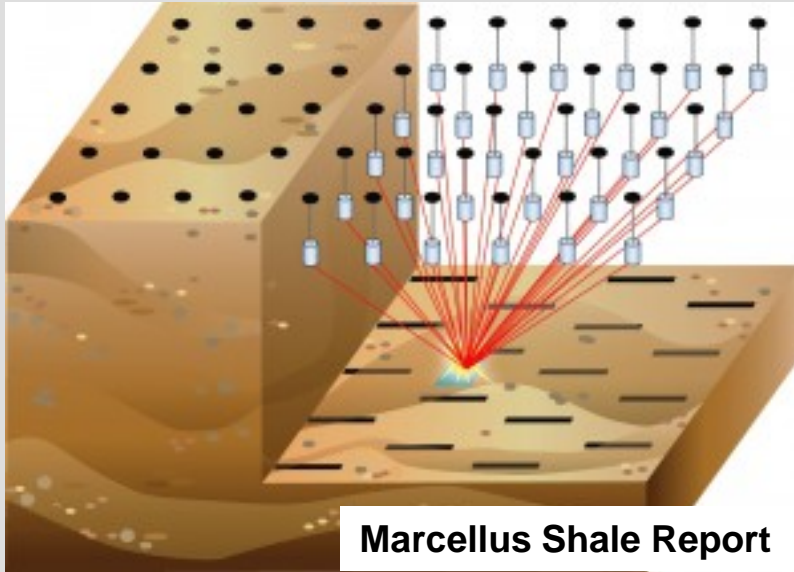
# Geospatial Impact on Shale Wells – Azimuth Error



# Are you Draining the Lease?



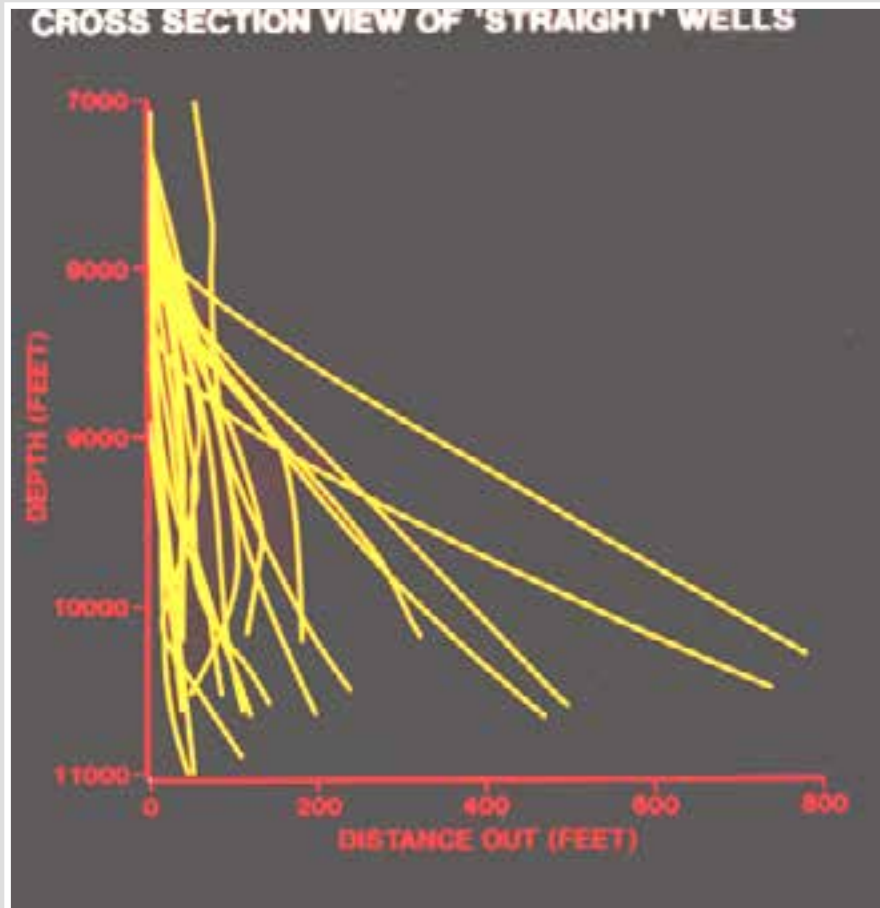
# Micro-seismic – Positioning Implications



# Errant Wells!



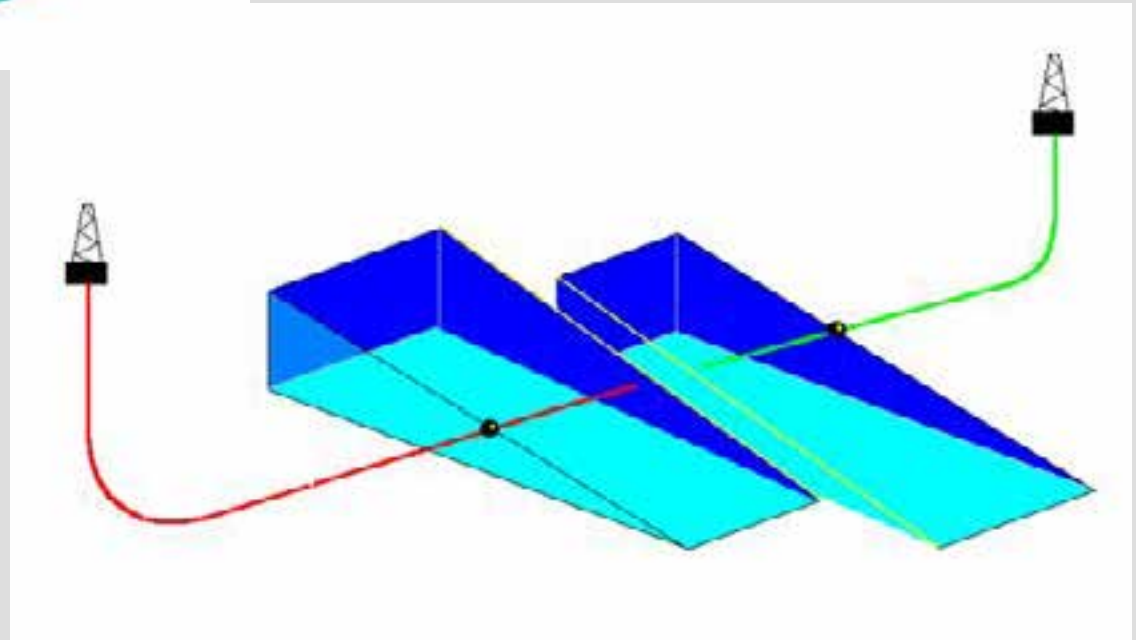
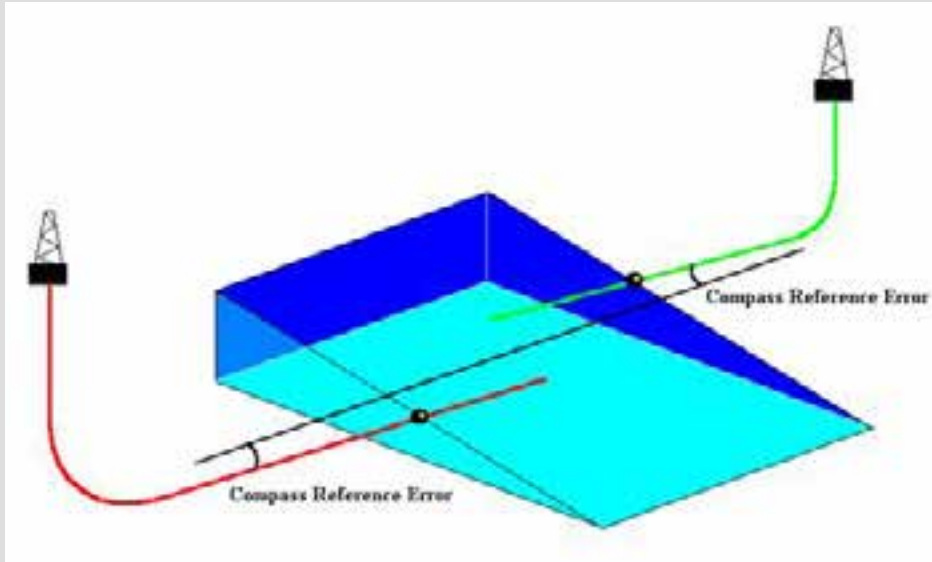
# Angle of Dangle!!



**One manager estimated that his staff of 5 geologists spent 80% of their time figuring out where wells were and 20% interpreting the geological horizons!!**

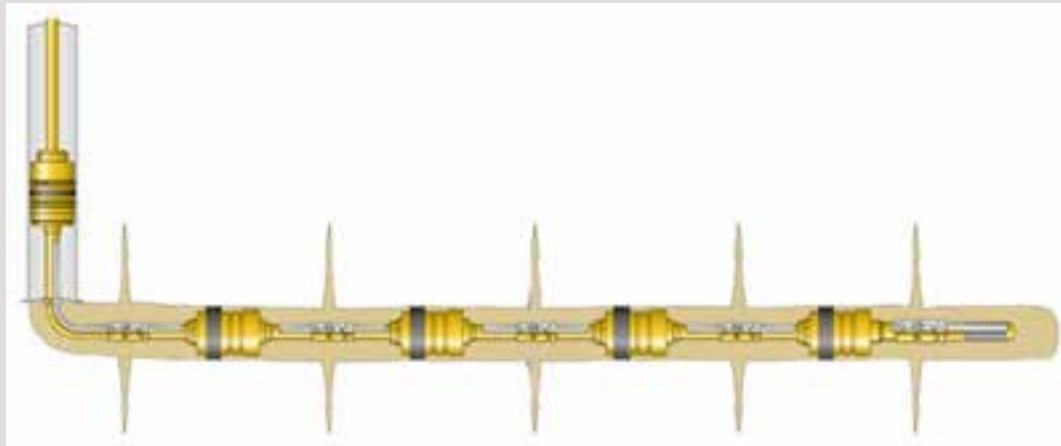
**All posted as 'straight wells'!!!**

# *Ghost Faulting from Poor Azimuth Errors*



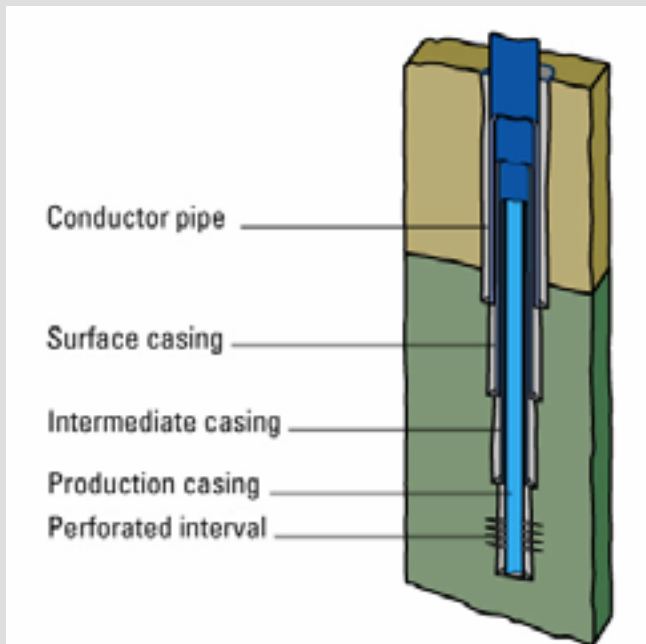
Courtesy Tech21

# Casing

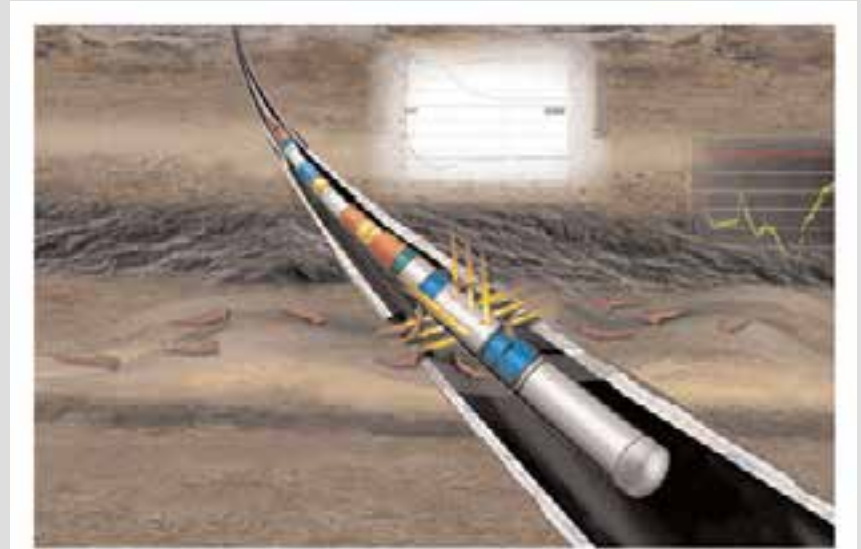


Open Hole

Baker Hughes



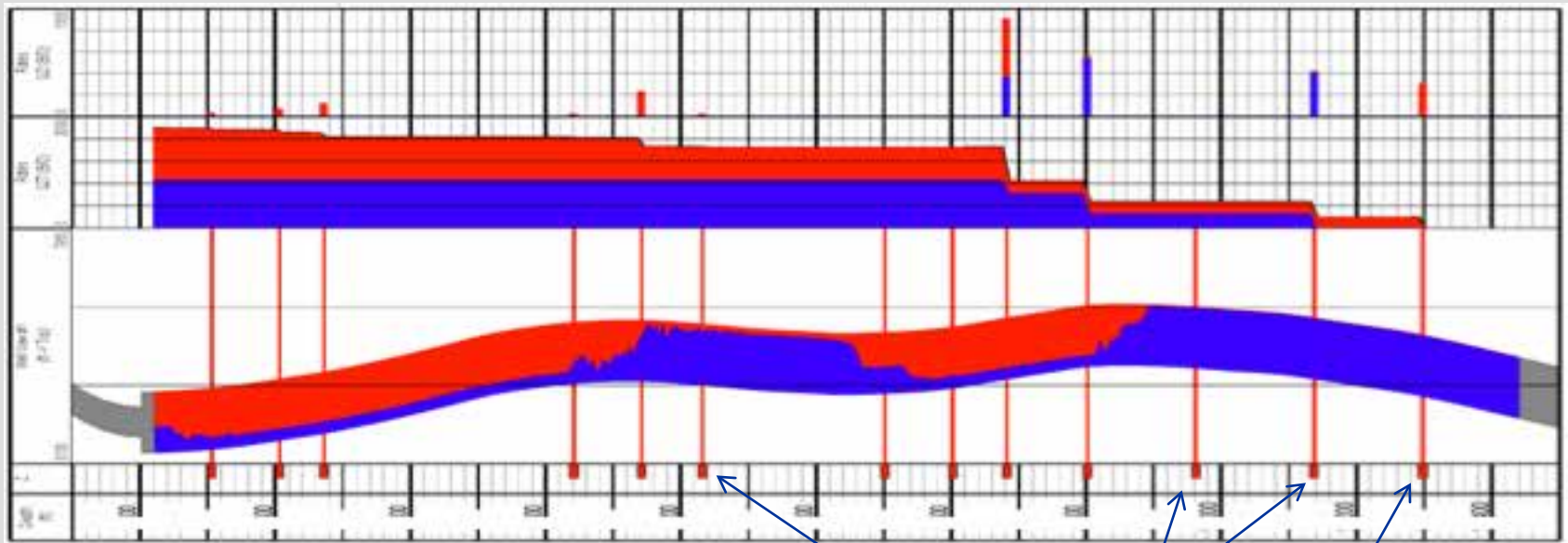
Cased Hole



[www.rigzone.com](http://www.rigzone.com)



# Water or Gas – Less Fracturing – Lower Cost



Camron Miller - Schlumberger

Water Stages

4 water producing stages plugged with no loss of gas production

Production logs show non performing stages. Use LWD (\$50-75K) and avoid wasted fracturing? Many wells have 50-60 stages and may only be producing from 40% of them! Save \$25K per stage – Do the math!

# Summary – Data Challenges

- API, UWI Numbering
- Database Numbers vs. Project Numbers
- Duplicate Wells
- Sidetracks
- Well naming
- Attribute naming
- Slot Identification
- Tie-In Location
- Tool Error Model
- Calculation methods
- Elevation, depth control
- Deliberate coordinate misplacement
- Plat Provenance
- Switching Rigs

- **Can we use data models and retain history of changes to data with the data?**
- **Can we tie it all together so the perforations and hydraulic fractures end up where they need to be – in the right formation and producing the maximum return at the lowest reasonable cost?**

# **Good Spatial Data Management is....**



**.....a delicate balancing act requiring training and skill!**