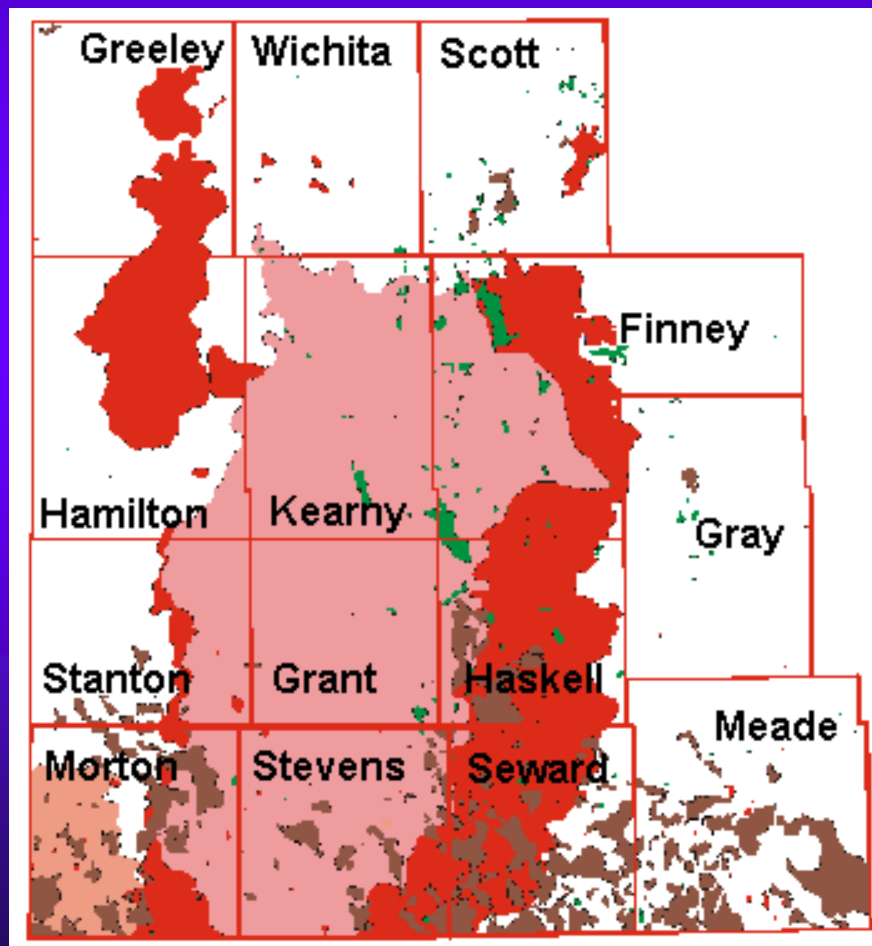


Kansas Digital Petroleum Atlas

A Step Toward a Cyberinfrastructure
for the
Oil and Gas Reservoirs of Kansas



Co-Authors

- ◆ John Victorine
- ◆ Jeremy Bartley
- ◆ Melissa Moore
- ◆ Asif Iqbal
- ◆ Keith Hunsinger
- ◆ Praveenkumar Ponnusamy
- ◆ Kurt Look

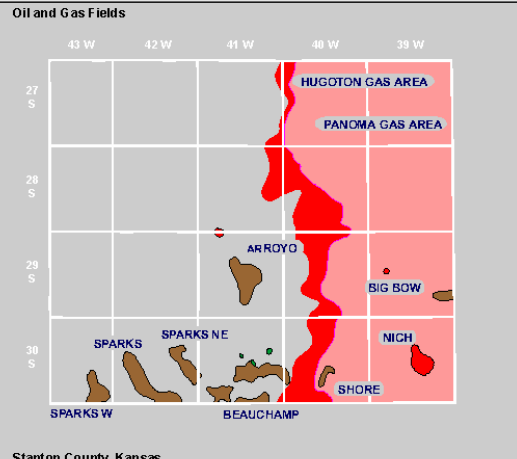
Approach

- ◆ ONLINE - Internet access to basic production, geologic and engineering data.
 - Field, Lease and Well Scales
- ◆ UP-TO-DATE – Data access to data directly from the Kansas Geological Survey database.
 - Management Tools to Update Databases
 - Potential to Link Remote Databases
- ◆ FLEXIBLE – Maps and visualization tools can access and analyze data to meet user needs.
- ◆ DYNAMIC – System is “easily” maintained and enhanced.

County Page

Deep Pools Information - Microsoft Internet Explorer

File Edit View Favorites Tools Help



Oil and Gas Fields

Stanton County, Kansas

Field Name	Status	Produces		Wells	LAS Files	% of Wells with				Catalog Status
		Gas	Oil			Tops	DST	Core Data	Core Images	
ARROYO	Active	Yes	Yes	55	38	89	7	2	2	Complete
ARROYO NORTHEAST	Active	Yes	Yes	10	10	100	20	0	0	Partial
BEAUCHAMP	Active	Yes	Yes	68	0	81	13	0	0	Complete
BEAUCHAMP NORTH	Active	Yes	Yes	6	0	100	0	0	0	Partial
BEAUCHAMP NORTHEAST	Active	No	Yes	13	8	62	0	0	0	Partial
BEAUCHAMP NORTHWEST	Active	No	Yes	5	0	100	0	0	0	Partial
BIG BOW	Active	Yes	Yes	49	69	88	4	0	0	Complete
BIG BOW WEST	Active	Yes	Yes	15	20	67	7	0	0	Partial
JOHNSON CITY	Active	No	No	5	0	80	0	0	0	Partial
JOHNSON CITY TOWNSITE	Active	Yes	Yes	3	0	100	0	0	0	Partial
LIVERPOOL CFMTERY	Active	Yes	Yes	9	56	100	44	0	0	Partial

Done Internet

Field Page

DPA Catalog General Information - Mozilla



Digital Petroleum Atlas Arroyo Field General Information



Arroyo Field Oil & Gas Data

- Production
- Geology
- Field Viewer
- Wells
- Petro Physics
- DST
- Help

General Field Information

Produces Oil: Yes **Produces Gas:** Yes

Geologic Province: Hugoton Embayment of Anadarko Basin

Surface Formation: Quaternary Loess, Miocene Ogalla

Oldest Formation Penetrated: Mississippian (Spergen)

Drilling Casing Practices: Conductor Casing: 20 inch set in 30 inch hole at 50 feet with 4 cubic yards of Redi-Mix Surface Casing: 8.625 inch set in 12.25 inch hole at 1650 feet with 550 sacks of Poz "C" Production Casing: 5.5 inch set in 7.785 inch hole at 5800 feet two-staged through DV tool with 1200 sacks of Poz "H"

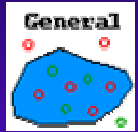
Drilling Fluid Practices: Water-based gel to displacement point at 3600 feet Chemical Gel to rotary total depth

Treatment Practices: Lower Morrow: Acidize with 1500 gallons of 7.5% Fe HCL containing additives Lower Morrow: Fracture with 28,000 gallons of CO2 foam and 27,000 lbs. of 20/40 sand Mississippian: Acidize with 1500 gallons of 15% Fe HCL containing additives

Electric Logging Practices: Dual Induction: SFL, Spontaneous Potential, Gamma Ray Compensated Neutron, LithoDensity Long Spaced Sonic MicroLog

Applet DPA started

DPA – Field Contents



- ◆ General Field Information.



- ◆ Kansas Oil and Gas Field Viewer.
- ◆ Table of all Oil & Gas Wells in the Field.



- ◆ Field Production Plot Applet & Decline Curve Analysis Calculator.



- ◆ Petrophysics – Displays all Wells with core data within 10 Miles of the Minimum and Maximum Field Boundaries.



- ◆ DST Measurements to process digital drill stem test data to compute permeability knowing the thickness of the zone being tested, obtain the reservoir pressure through a Horner Plot.

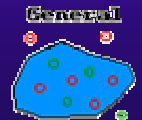


- ◆ Geology - Color Contour Mapping - Dynamic Cross Sections and Well Display



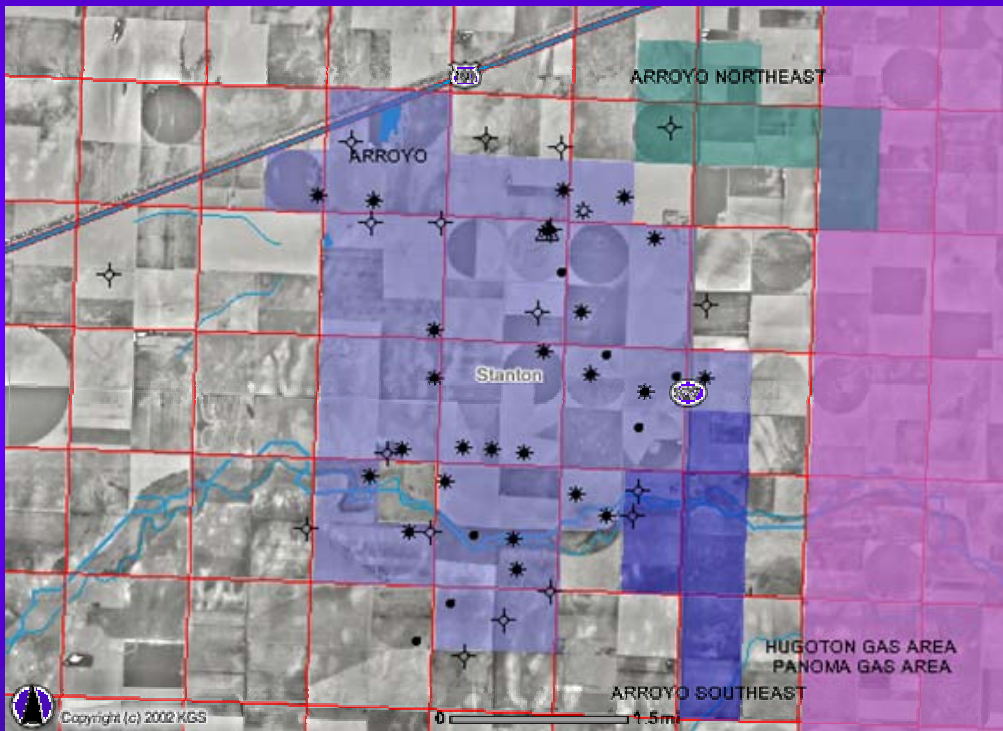
General Field Information

- ◆ Dynamic Web Page generated by RDBMS accessing Field Information from the KGS Database.
- ◆ Displays General Field Information, i.e., Geologic Province , Oldest Formation Penetrated, Drilling Practices, etc.
- ◆ Displays the Discovery Wells of the field and allows the user to access the data or view the available with online tools.
- ◆ Summary of Production Information.
 - Information about Field Size, Total Wells, Cumulative Totals, etc.
- ◆ A List of Producing Formations for the Field.
 - General Formation Information about Tops, Lithology, Geometry, Trap Type, etc,
 - Average Porosity and Permeability,
 - Oil, Gas and Water Chemistry and Properties
 - All Data Display When Available





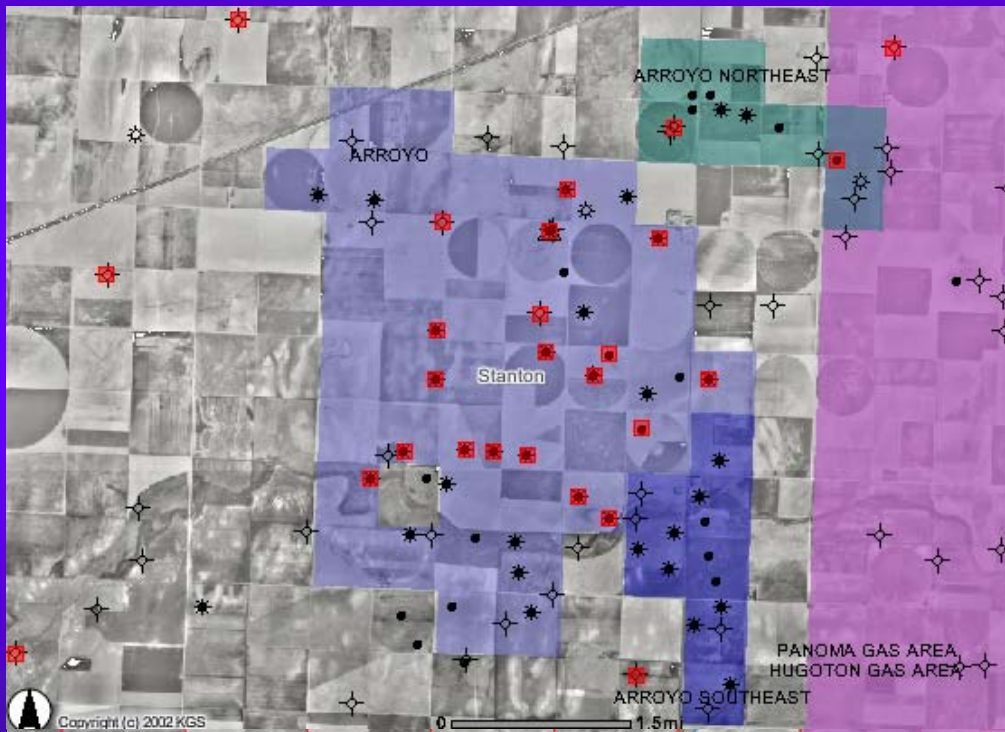
Oil and Gas Field Viewer



- ◆ Provides visual means of selecting wells and presenting the available data from KGS Database.
- ◆ Allows the user access to many of the Web Application Tools provided for viewing data for a well.
- ◆ Allows



Oil and Gas Field Viewer



Restrict Wells - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Refresh Home Search Favorites Links

Total Number of Wells	110	
Number of Wells with Scanned Elogs	15	<input type="checkbox"/>
Number of Wells with LAS Files	24	<input type="checkbox"/>
Number of Wells with Paper Logs	77	<input type="checkbox"/>
Number of Wells with Cores	1	<input type="checkbox"/>
Number of Wells with DSTS	13	<input type="checkbox"/>

Highlight Wells

Done Internet



Field Oil & Gas Wells

- ◆ Dynamic Web Page generated by ORACLE Stored Procedure Listing all the Oil & Gas Wells for a Field.
- ◆ Identifies visually what data is available for each well.
- ◆ Icons are provided as a visual means to
 - Download the oil & gas data to your PC or,
 - Run Dynamic Web Application Tools that will plot the data.


Wells



Field Oil & Gas Wells

Deep Pools Catalog Oil & Gas Wells - Microsoft Internet Explorer

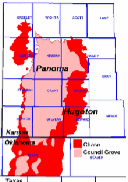
File Edit View Favorites Tools Help








Deep Pools Atlas

Arroyo Field

Oil & Gas Wells



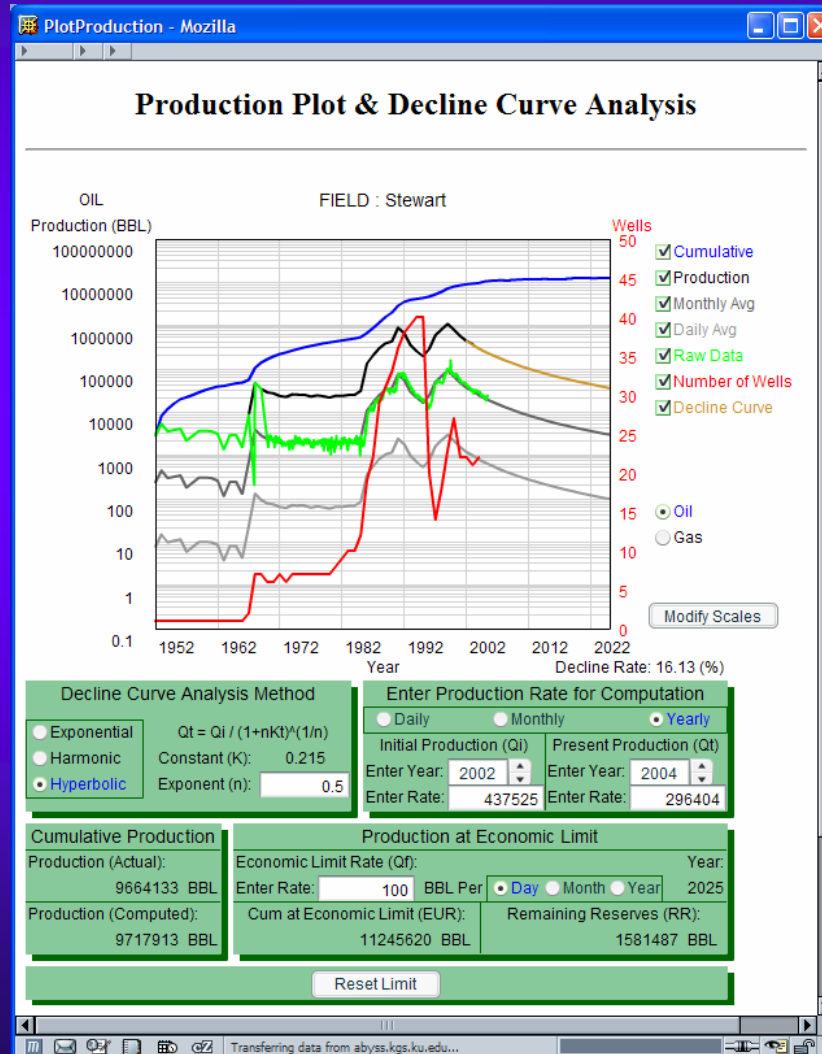
(Select either Lease Name, Operator or Well Status to modify the order of the wells)

<u>Well Name</u>	<u>Operator</u>	<u>Well Status</u>	<u>Available Well Data</u>	<u>Oil Production</u>	<u>Gas Production</u>	<u>LAS Files</u>	<u>Core Image</u>	<u>Core Data Table</u>	<u>Core Cross Plots</u>
ARNOLD 1	JAMESON MARTIN	D&A		No Oil Production	No Gas Production		No Core Images	No Core Data	No Core Data
ARNOLD 23-1	HUBER J M CORP	O&G				No Digital LAS Files	No Core Images	No Core Data	No Core Data

Done Internet



Field Production Plot Decline Curve Analysis





Tops Mapping Tool

- ◆ Display Tops Color Contour Map.
- ◆ View LAS Type Log centered at selected top.
- ◆ Change LAS Type Log
 - LAS File Selector of all LAS Files available for field.
- ◆ Identifies Top by
 - Production Zone in Red
 - Selected Top
- ◆ Dynamically build up to 26 Cross Section Plots with up to 4 wells each and to center the cross section plot around the selected top

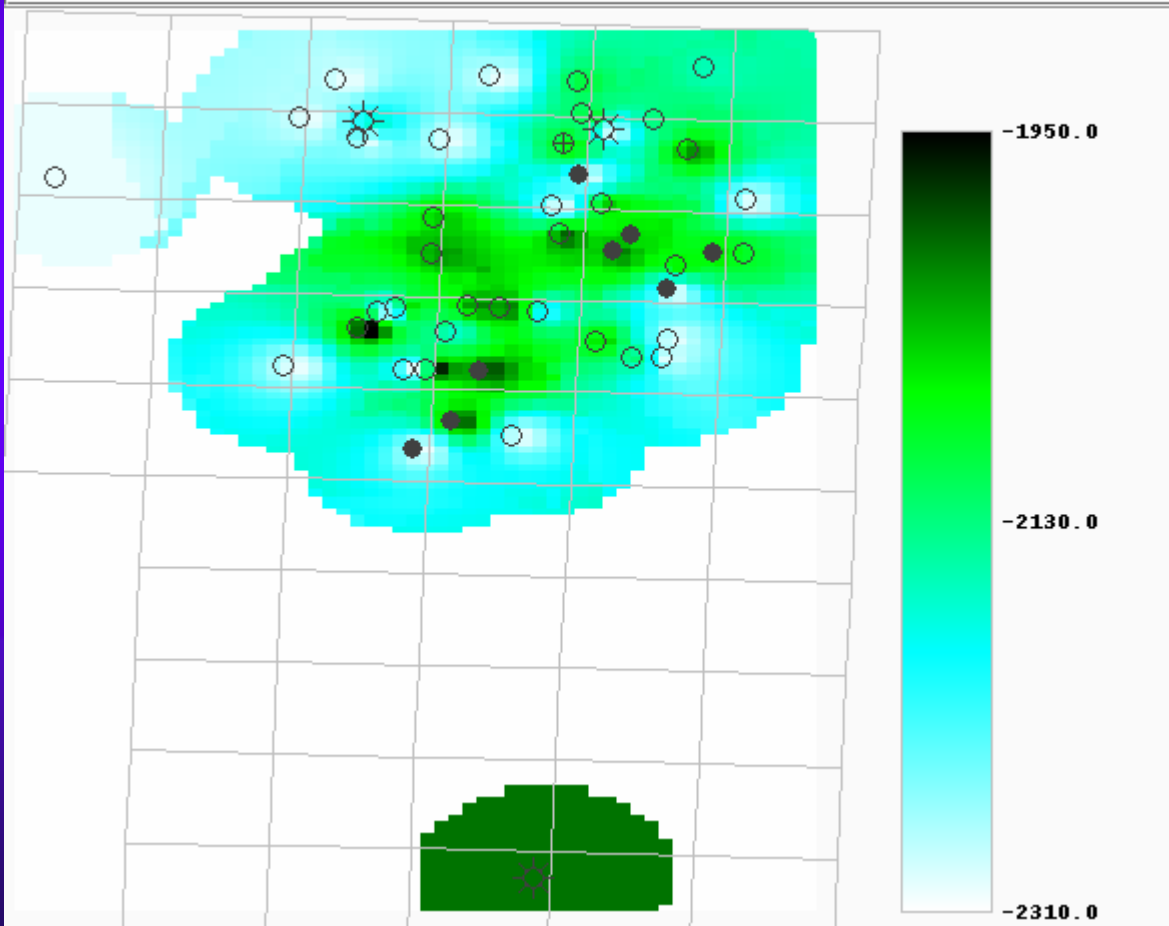


Tops Mapping Tool

ARROYO Field

Horizon Map: Keyes Sandstone Bed

Horizon Depth (ft): -2147.26



ARROYO Field Horizons

County Grid Lines: Off On

Well Status Symbols: Off On

Horizon Isopach

Field Producing Zones in Red

Tops in LAS Depth Range in Blue

- Verdin Limestone Member
- Atokan Stage
- Atoka Shale Bed
- Upper Kearny Member
- Morrowan A Sandstone Bed
- Morrowan C Sandstone Bed
- Morrowan F Sandstone Bed
- Middle Morrowan Limestone Bed
- Middle Morrowan Sandstone Bed
- Lower Kearny Member
- Lower Morrowan Sandstone Bed
- Keyes Sandstone Bed**
- Mississippian System
- Chesteran Stage

LAS Plot Cross Section Print Close

Java Applet Window



Tops Mapping Tool

ARROYO Field Horizons _ □ ×

County Grid Lines: Off On

Well Status Symbols: Off On

Horizon Isopach

Field Producing Zones in Red

Tops in LAS Depth Range in Blue

- Verigins Limestone Member
- Atokan Stage
- Atoka Shale Bed
- Upper Kearny Member
- Morrowan A Sandstone Bed
- Morrowan C Sandstone Bed
- Morrowan F Sandstone Bed
- Middle Morrowan Limestone Bed
- Middle Morrowan Sandstone Bed
- Lower Kearny Member
- Lower Morrowan Sandstone Bed
- Keyes Sandstone Bed
- Mississippian System
- Chesteran Stage

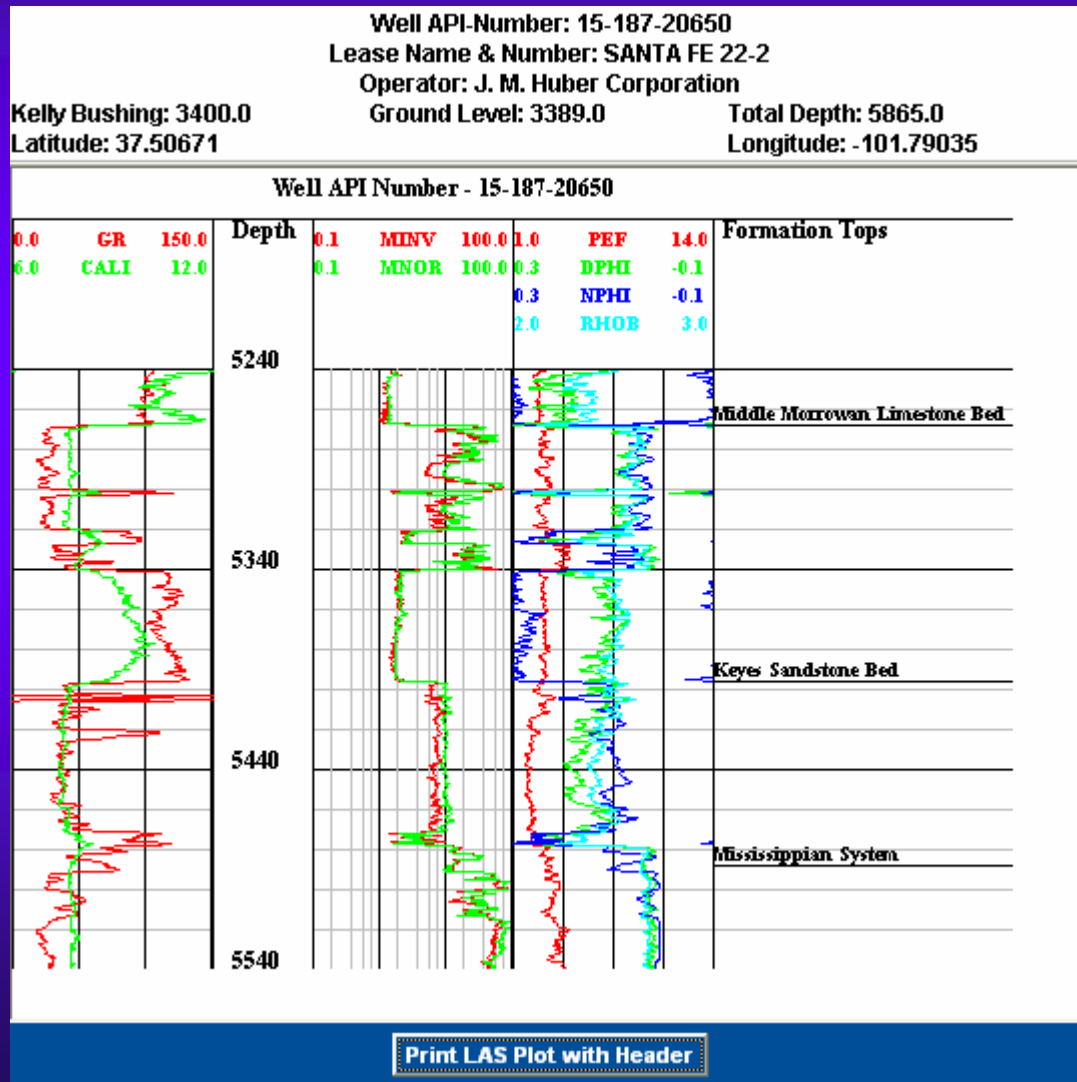
LAS Plot

Cross Section

Print

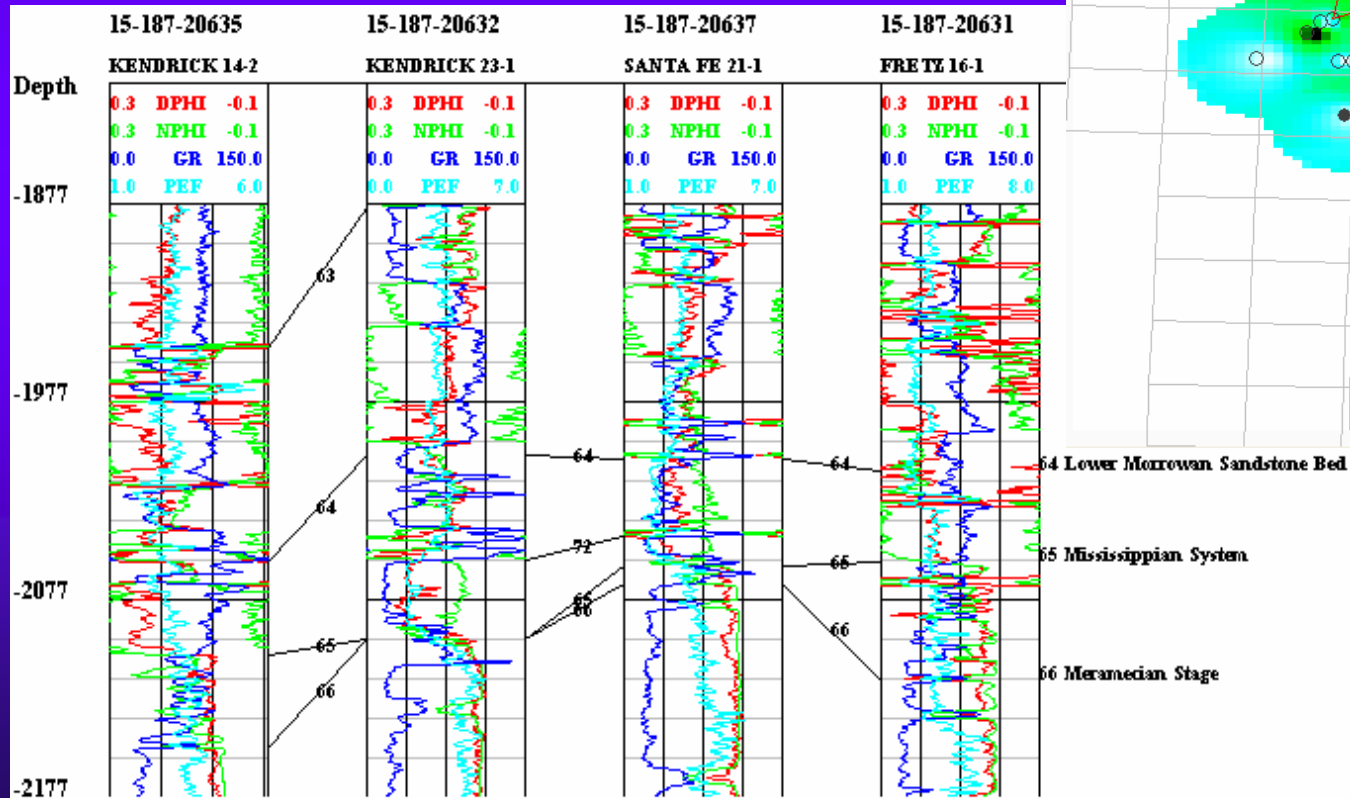
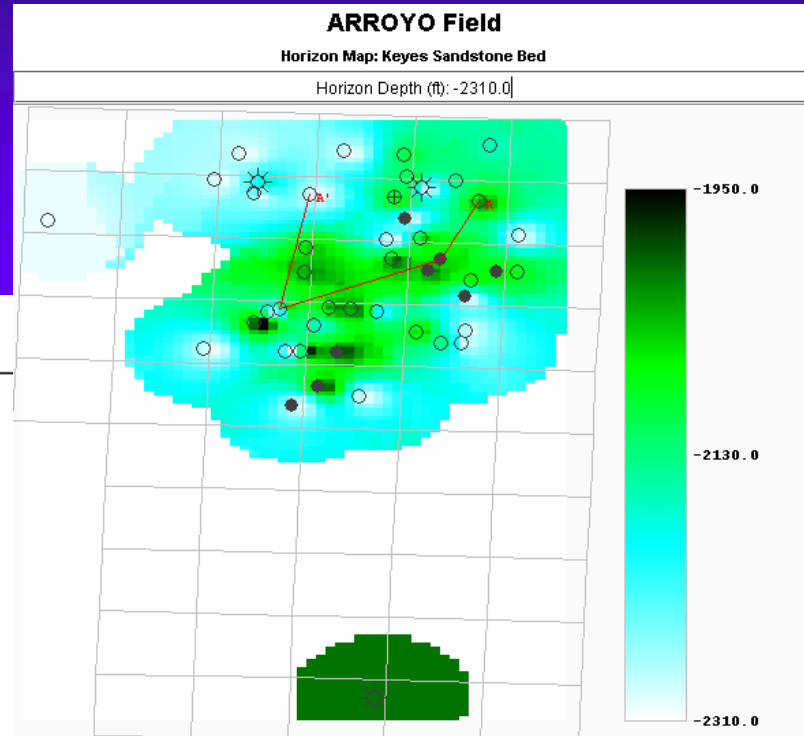
Close

Java Applet Window





Cross Section Plot






DPA - Petrophysics

- ◆ Dynamic Web Page generated by ORACLE Stored Procedure Listing all the Oil & Gas Wells with Core data within 10 Miles of the Minimum and Maximum Field Boundaries.
- ◆ Identifies visually what data is available for each well.
- ◆ Icons are provided as a visual means to
 - Download the oil & gas data to your PC or,
 - Run Dynamic Web Application Tools that will plot the data.

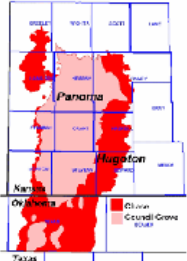


DPA - Petrophysics













Digital Petroleum Atlas Petrophysics Information - Mozilla



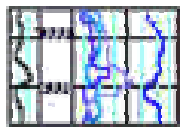
Digital Petroleum Atlas Arroyo Field Petrophysics



Well(s) with Measured Core Data, Images and/or Digital LAS Files within 10 Miles of the Arroyo Field Minimum and Maximum Field Boundary

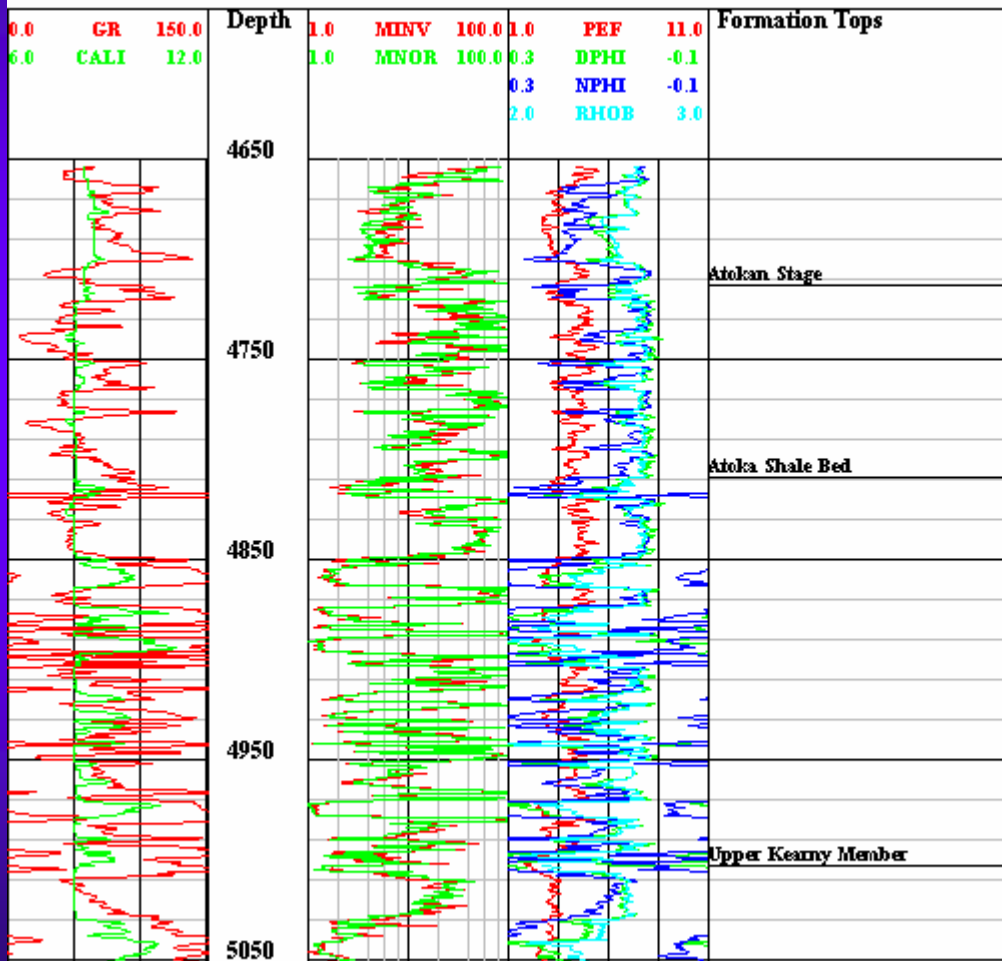
Well Name	Latitude	Longitude	Oil & Gas Field	Core Images	Core Data Table	Core Cross Plots	LAS File Viewer
PIPER Gas Unit 2	37.6385	-101.6263	PANOMA GAS AREA	No Images	Core Data 	Core Cross Plots 	LAS Plot 
MONTGOMERY Gas Unit 'A' 2	37.54055	-101.62101	PANOMA GAS AREA	No Images	Core Data 	Core Cross Plots 	LAS Plot 
JONES Gas Unit 'B' 3HI	37.50077	-101.62126	HUGOTON GAS AREA	No Images	Core Data 	Core Cross Plots 	No Digital LAS Files
KENDRICK 23-1	37.51855	-101.77389	ARROYO	Core Images 	Core Data 	Core Cross 	LAS Plot 

LAS Plot



LAS File Viewer

Well API Number - 15-187-20639

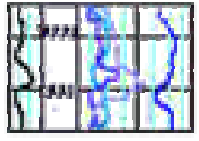


Modify LAS Plot Depth Range & Depth Scale

Depth Range		Log Depth Scale
Original Depth Range		5 Feet / Inch
From: 4654.0	To: 5850.0	10 Feet / Inch
Modify Depth Range		20 Feet / Inch
From: 4654.0	To: 5850.0	50 Feet / Inch
Modify Depth	Reset to Original	Close
		100 Feet / Inch

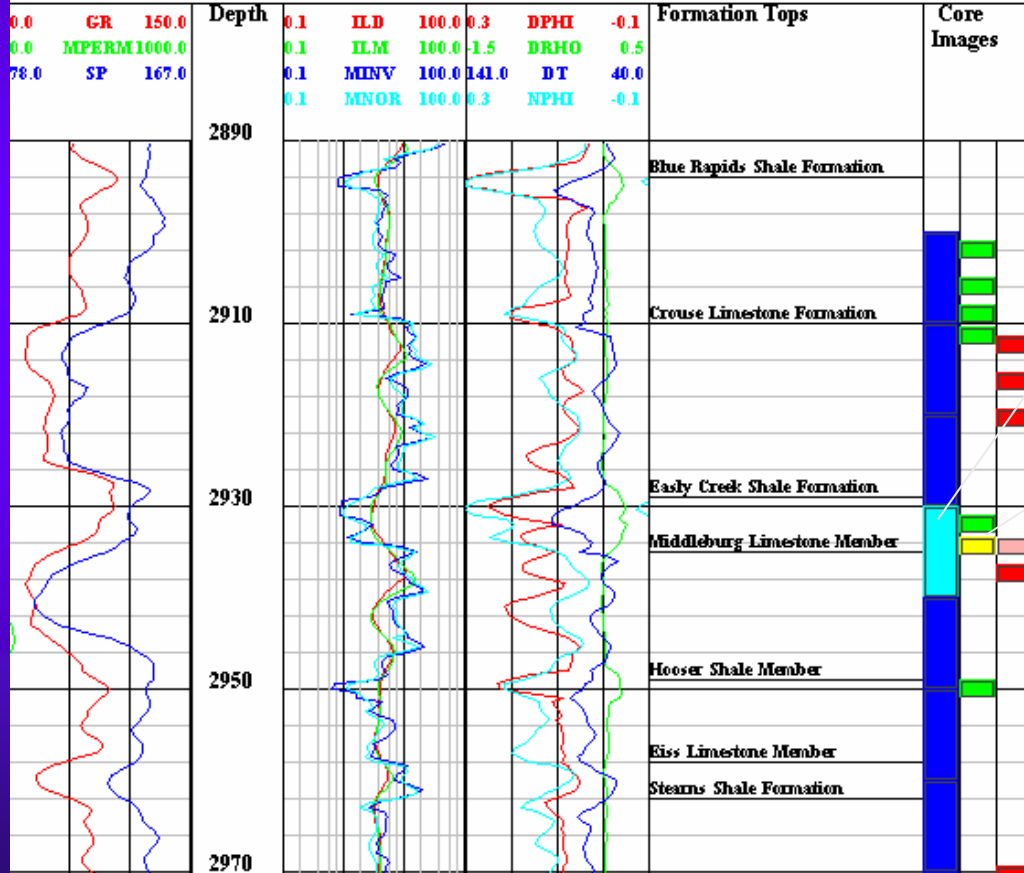
Java Applet Window

LAS Plot

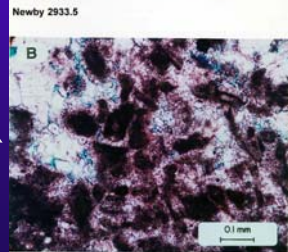
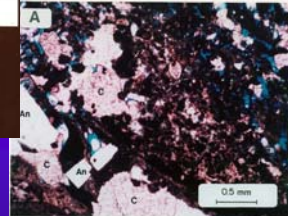
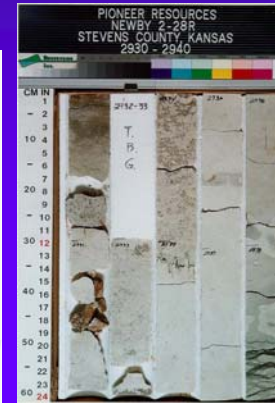


LAS File Viewer Core Images

5-189-22225 - NEWBY 2-28R Operator: Pioneer Natural Resources USA Inc.



Print LAS Plot with Header

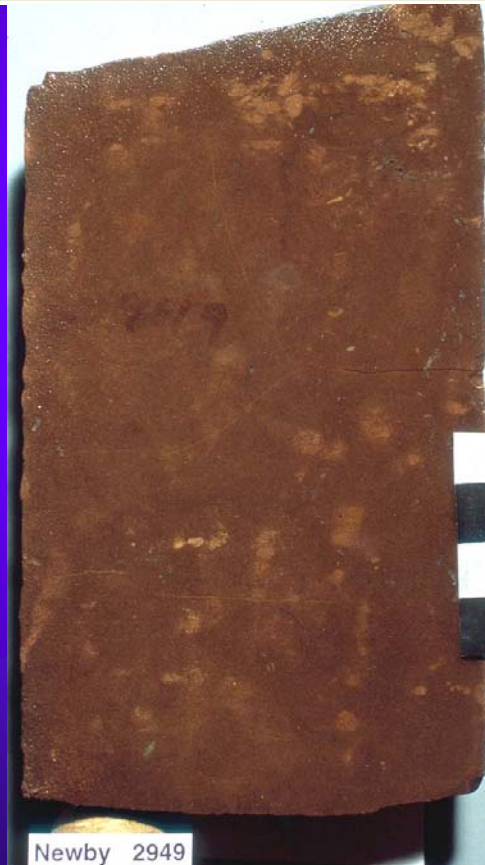




Core Images



API Number: 15-189-22225
 Lease Name & Well Number: Newby 2-28r
 Operator: Pioneer Natural Resources Usa Inc.
 Latitude: 37.31715 Longitude: -101.35454
 Kelly Bushing: 3119 Ground Level: 3112 Total Depth: 3155
 Well Status: GAS
Core Image
 Depth Range: 2949 To 2949



Newby 2949

Measured Core Data

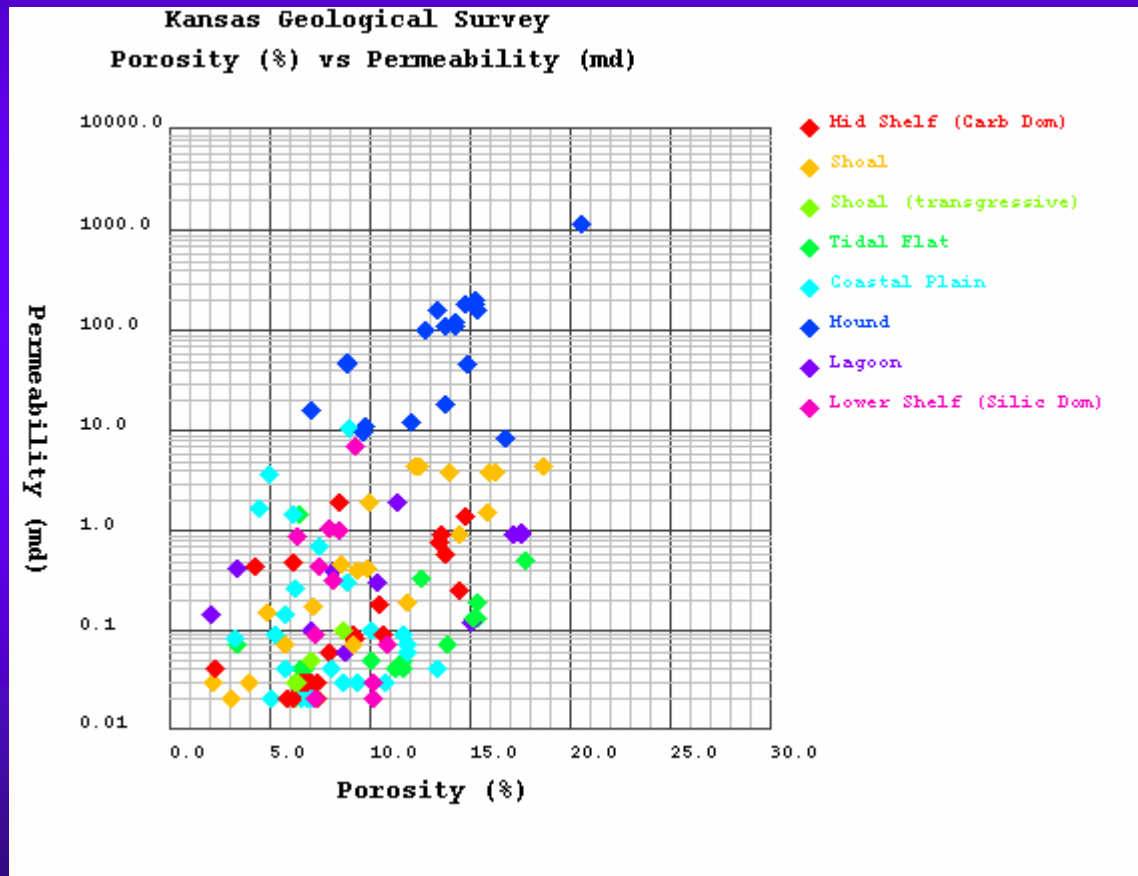
(Core Data Mnemonics)

Top (ft)	Base (ft)	Corr (ft)	STU	STN	ENV	LITHO	PPlug	KPIg	GMCC
2944	2944	5	Council Grove Group	B3 Sh	Coastal Plain	Nm Shly Silt	5.3	.09	2.68

- ◆ Dynamic Web Page
- ◆ Retrieves the Depth of the Image and Core Data that is corrected to that depth.



Core Data - Cross Plots



-
□
✕

Cross Plot Control

Select Data Type(s):

- Porosity (PHI)
- Permeability (K)
- Oil Saturation (Soil)
- Water Saturation (Sw)
- Grain Density (gm/cc)
- Archie Cementation (M)
- Archie Saturation (N)

Group the Core Data By:

- All Data
- Curve Type
- Stratigraphic Unit
- Stratigraphic Name
- Depositional Environment
- Lithology

Plot
Print
Clear
Close

Data Table
Mnemonics

Java Applet Window

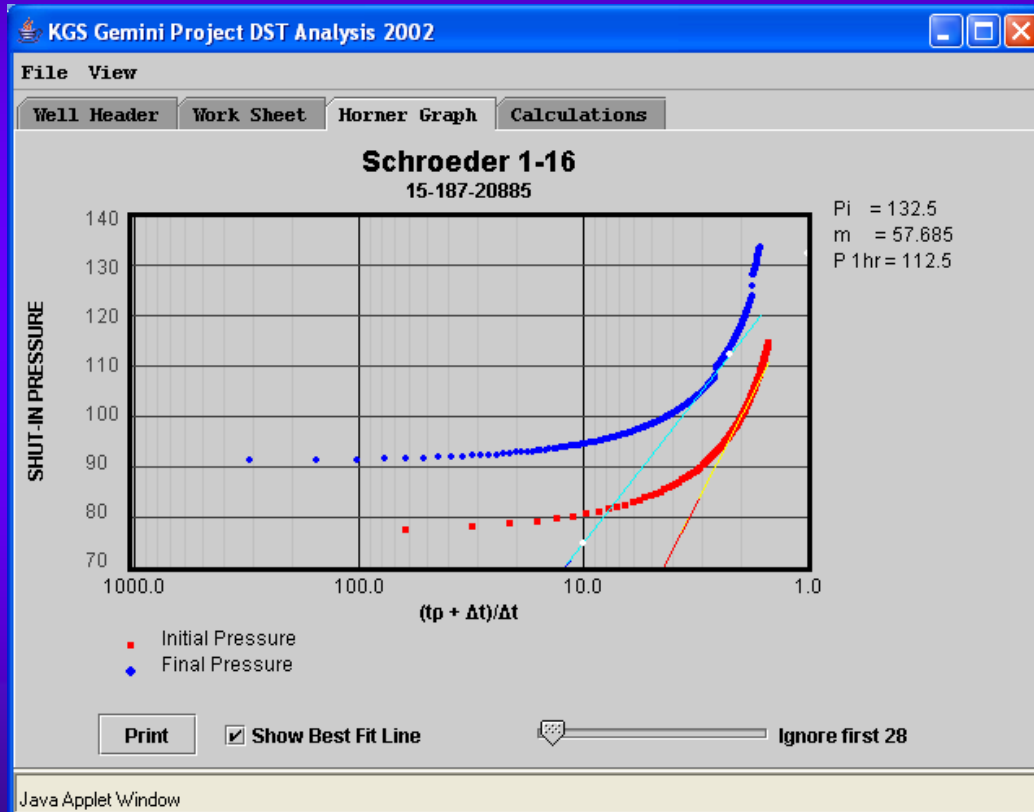


DST Measurements

- ◆ Dynamic Web Page generated by ORACLE Stored Procedure Listing all the Oil & Gas Wells with DST Data for a Field.
- ◆ Identifies visually what data is available for each well.
- ◆ Icons are provided as a visual means to
 - Download the oil & gas data to your PC or,
 - Run Dynamic Web Application Tools that will plot the data.



DST Measurements




Digital DST Data processed
Compute permeability Obtain reservoir
pressure

Intent To Drill

2003511.pdf (application/pdf Object) - Mozilla

Save a Copy Print Email Search Select Text 80%

Special offer for Bell Customers



KANSAS CORPORATION COMMISSION 2003511 Form C-1
OIL & GAS CONSERVATION DIVISION December 2003
NOTICE OF INTENT TO DRILL
Form must be Typed
Form must be Signed
All blanks must be Filled

Must be approved by KCC five (5) days prior to commencing well

For KCC Use: _____
 District #: _____
 SGA? Yes No

Expected Spud Date: 08/22/2005
month day year

OPERATOR: License# 00100
 Name: Kansas Geological Survey
 Address: 1930 Constant Ave.
 City/State/Zip: Lawrence, Kansas 66049-3726
 Contact Person: Tim Carr
 Phone: 785-864-2135

CONTRACTOR: License# 09999
 Name: DrillM Fast & Straight

Well Drilled For: Oil Gas OWD Seismic Other Scientific Core Hole
 Well Class: Enh Rec Storage Disposal # of Holes _____ Other _____
 Type Equipment: Infield Pool Ext. Wildcat Mud Rotary Air Rotary Cable

If OWWC: old well information as follows:
 Operator: _____
 Well Name: _____
 Original Completion Date: _____ Original Total Depth: _____

Directional, Deviated or Horizontal wellbore? Yes No
 If Yes, true vertical depth: _____
 Bottom Hole Location: _____
 KCC DKT #: _____

Spot NE SW SW Sec. 10 Twp. 20 S. R. 15 East West
1300 feet from N S Line of Section
650 feet from E W Line of Section
 Is SECTION Regular Irregular?
(Note: Locate well on the Section Plat on reverse side)
 County: Wilson
 Lease Name: Lafarge Well # 2
 Field Name: _____
 Is this a Prorated / Spaced Field? Yes No
 Target Formation(s): Mississippian
 Nearest Lease or unit boundary: _____
 Ground Surface Elevation: 315 feet MSL
 Water well within one-quarter mile: Yes No
 Public water supply well within one mile: Yes No
 Depth to bottom of fresh water: 150
 Depth to bottom of usable water: 300
 Surface Pipe by Alternate: 1 2
 Length of Surface Pipe Planned to be set: 20
 Length of Conductor Pipe required: 2
 Projected Total Depth: 1200
 Formation at Total Depth: Mississippian
 Water Source for Drilling Operations:
 Well Farm Pond Other City Tap
 DWR Permit #: _____
(Note: Apply for Permit with DWR)
 Will Cores be taken? Yes No
 If Yes, proposed zone: Surface to Top Mississippian

AFFIDAVIT
 The undersigned hereby affirms that the drilling, completion and eventual plugging of this well will comply with K.S.A. 55 et. seq.
 It is agreed that the following minimum requirements will be met:

1. Notify the appropriate district office prior to spudding of well;
2. A copy of the approved notice of intent to drill shall be posted on each drilling rig;
3. The minimum amount of surface pipe as specified below shall be set by circulating cement to the top; in all cases surface pipe shall be set through all unconsolidated materials plus a minimum of 20 feet into the underlying formation.
4. If the well is dry hole, an agreement between the operator and the district office on plug length and placement is necessary prior to plugging;
5. The appropriate district office will be notified before well is either plugged or production casing is cemented in;
6. If an ALTERNATE II COMPLETION, production pipe shall be cemented from below any usable water to surface within 120 days of spud date. Or pursuant to Appendix "B" - Eastern Kansas surface casing order #133,891-C, which applies to the KCC District 3 area, alternate II cementing must be completed within 30 days of the spud date or the well shall be plugged. In all cases, NOTIFY district office prior to any cementing.

I hereby certify that the statements made herein are true and to the best of my knowledge and belief.

Date: _____ Signature of Operator or Agent: _____ Title: _____

For KCC Use ONLY

API # 15: _____
 Conductor pipe required: _____ feet
 Minimum surface pipe required: _____ feet per Alt. 1 2

Approved by: _____
(This authorization void if drilling not started within 9 months of effective date.)

Spud date: _____ Agent: _____

Remember to:

- File Drill Pit Application (form CDP-1) with Intent to Drill;
- File Completion Form ACO-1 within 120 days of spud date;
- File acreage attribution plat according to field proration orders;
- Notify appropriate district office 48 hours prior to workover or re-entry;
- Submit plugging report (CP-4) after plugging is completed;
- Obtain written approval before disposing or injecting salt water.

If this permit has expired (See authorized expiration date) please check the box below and return to the address below.
 Well Not Drilled - Permit Expired
 Signature of Operator or Agent: _____
 Date: _____

Mail to: KCC - Conservation Division, 130 S. Market - Room 2076, Wichita, Kansas 67202

8.5 x 11 in 1 of 3

Intent To Drill

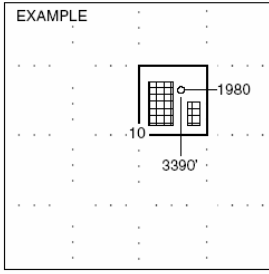
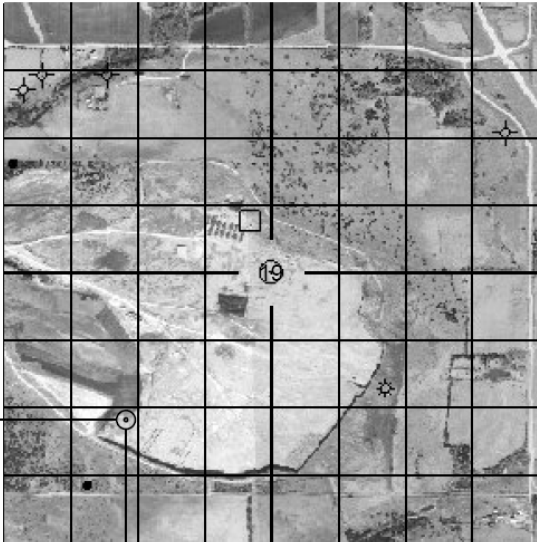
2003513.pdf (application/pdf Object) - Mozilla

Save a Copy Print Email Search Select Text 125% Send files anyone can view in free Adobe Reader

Number of Acres attributable to well: _____
QTR / QTR / QTR of acreage: NE - SW - SW

If Section is Irregular, locate well from nearest corner boundary.
Section corner used: NE NW SE SW

PLAT
(Show location of the well and shade attributable acreage for prorated or spaced wells.)
(Show footage to the nearest lease or unit boundary line.)



NOTE: In all cases locate the spot of the proposed drilling location.

1200 ft.

1200 ft.

In plotting the proposed location of the well, you must show:

1. The manner in which you are using the depicted plat by identifying section lines, i.e. 1 section, 1 section with 8 surrounding sections, 4 sections, etc.

8.5 x 11 in 2 of 3

Stratigraphic Tops Viewer

Kansas Well Top Depth Stratigraphy Viewer - Mozilla

http://hercules.kgs.ku.edu/kgs/oilgas/strat_welltops/top_viewer.cfm?RequestTimeout=280

State of Kansas Geographic Information Systems Policy Board, Data Access and Support Center, and the Kansas Geological Survey
Please email questions and comments to [Jeremy Bartley](mailto:Jeremy.Bartley@kgs.ku.edu)

Kansas Well Top Stratigraphy Viewer

help reset

Beginning Top: -----Winfield Limestone Formation (37044)
Ending Top: -----Winfield Limestone Formation (37044)
Well Top Sea Level Corrected

The number in () is the number of well tops we have for that member. [View Current Viewing Extent Stats](#) [Download Tops](#) [View Tops 3D](#)

Overview Map

Zoom Level: 10 Zoom In Zoom Out Pan Identify Section Profile Full Extent

Table of Contents

Visible

- Dynamic Stratigraphic Map
- County Boundary
- LEGAL FIELD BOUNDARIES

Legend

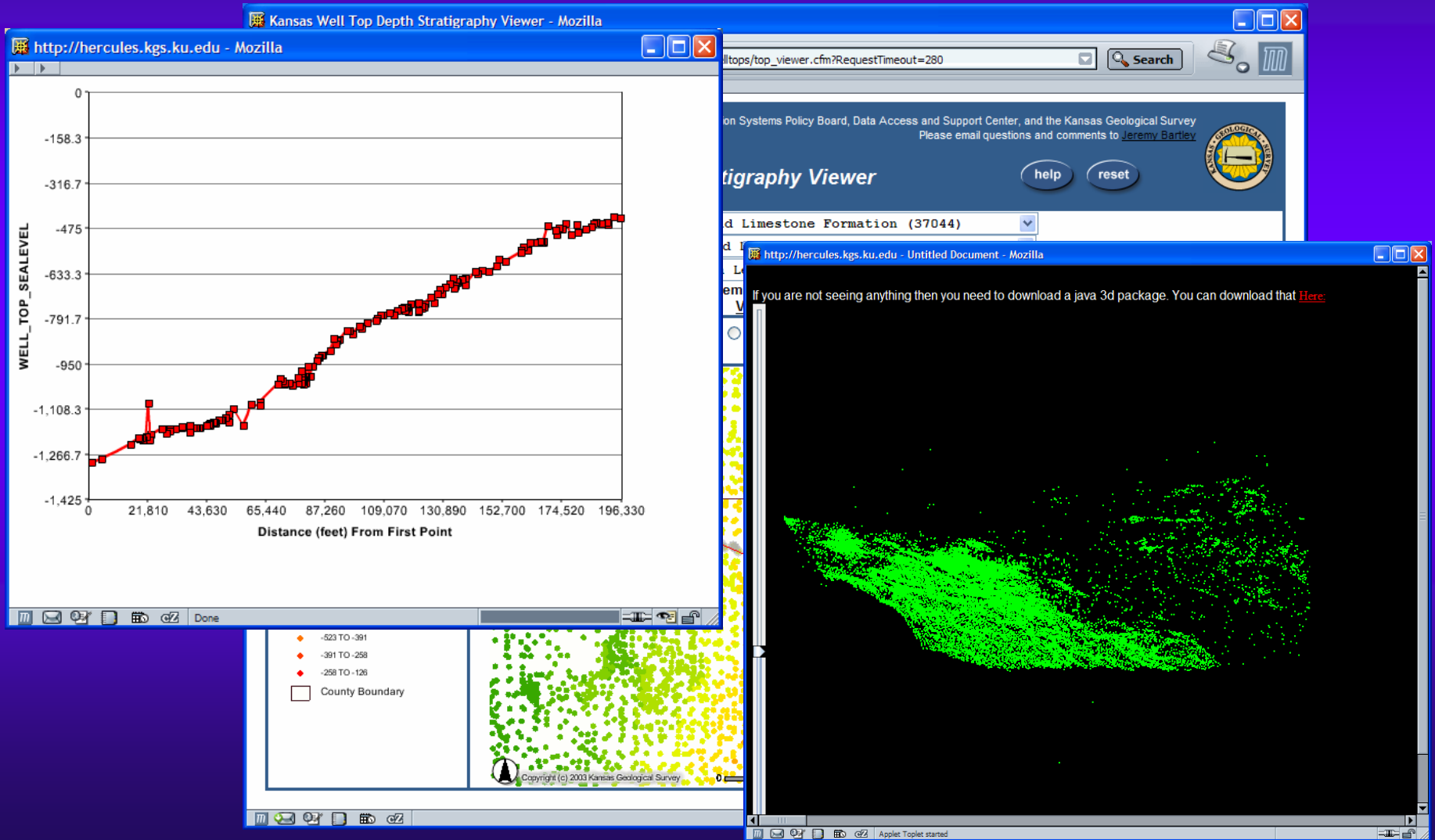
Depth

- 2208 TO -1319
- 1319 TO -1186
- 1186 TO -1054
- 1054 TO -921
- 921 TO -788
- 788 TO -656
- 656 TO -523
- 523 TO -391
- 391 TO -258
- 258 TO -126

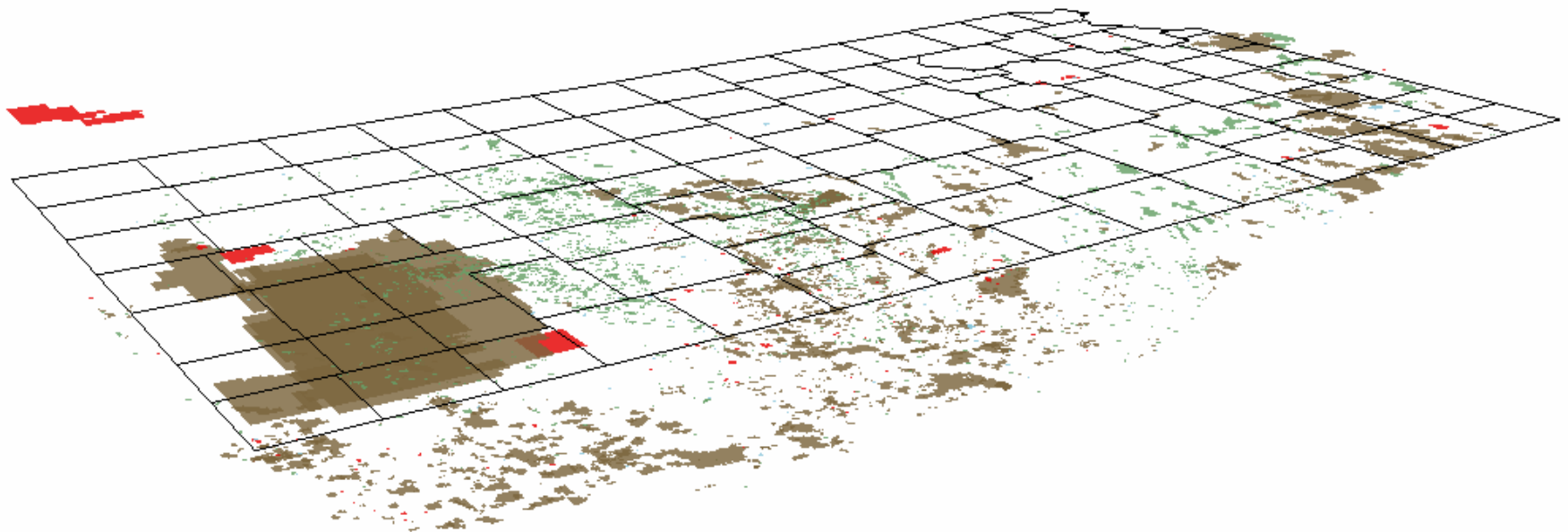
County Boundary

Copyright (c) 2003 Kansas Geological Survey 0 7.4 mi

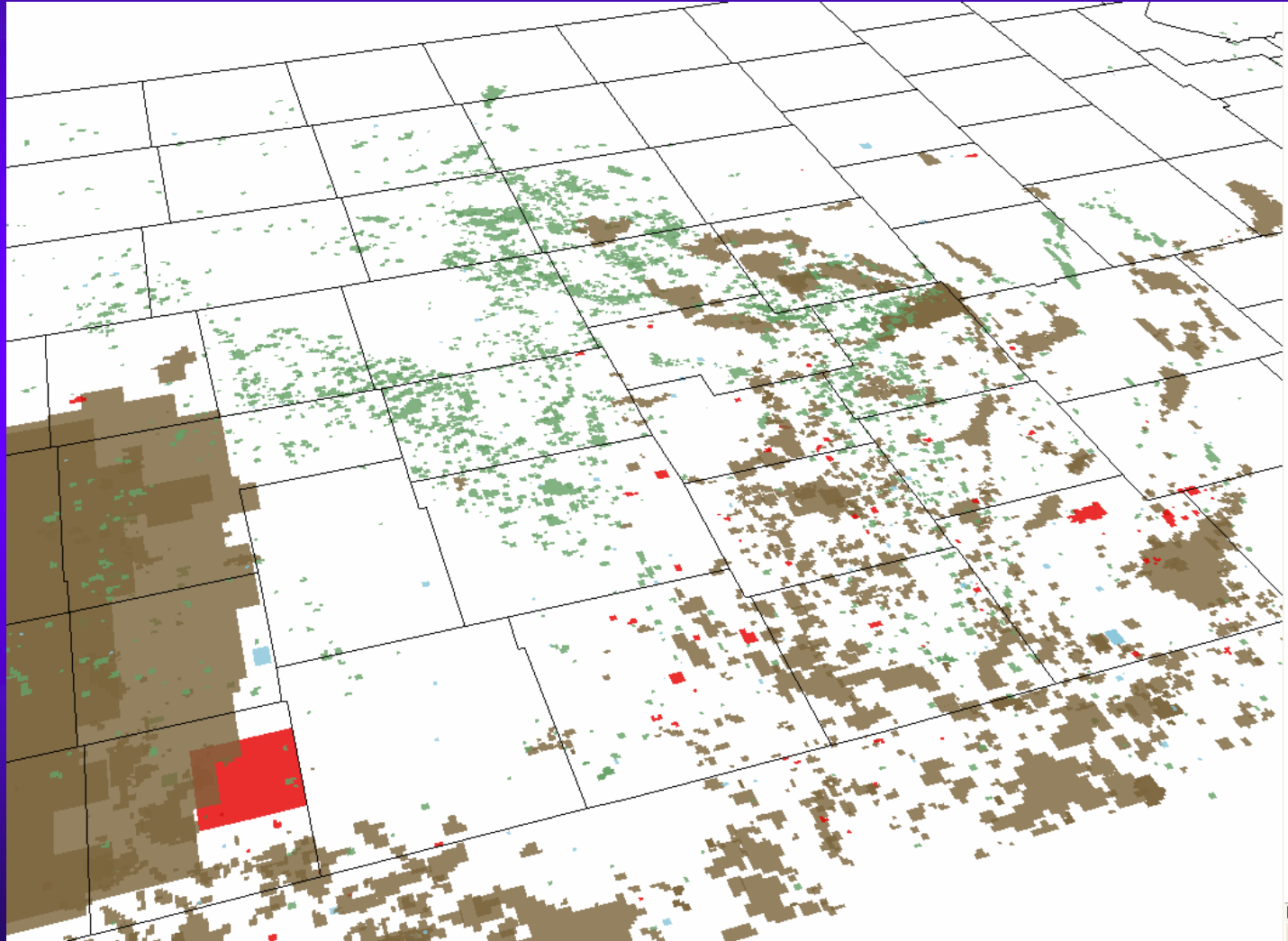
Stratigraphic Tops Viewer



3D Field Viewer



3D Field Viewer



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