Kansas Digital Petroleum Atlas
A Step Toward a Cyberinfrastructure for the Oil and Gas Reservoirs of Kansas
Co-Authors

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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](image)

### Field Name
- **ARROYO**
  - Status: Active
  - Produces: Yes
  - Oil Wells: 55
  - LAS Files: 38
  - Tops: 89
  - DST: 7
  - Core Data: 2
  - Core Images: 2
  - Catalog Status: Complete

- **ARROYO NORTHEAST**
  - Status: Active
  - Produces: Yes
  - Oil Wells: 10
  - LAS Files: 10
  - Tops: 20
  - DST: 0
  - Core Data: 0
  - Core Images: 0
  - Catalog Status: Partial

- **BEAUCHAMP**
  - Status: Active
  - Produces: Yes
  - Oil Wells: 68
  - LAS Files: 0
  - Tops: 81
  - DST: 13
  - Core Data: 0
  - Core Images: 0
  - Catalog Status: Complete

- **BEAUCHAMP NORTH**
  - Status: Active
  - Produces: Yes
  - Oil Wells: 6
  - LAS Files: 0
  - Tops: 100
  - DST: 0
  - Core Data: 0
  - Core Images: 0
  - Catalog Status: Partial

- **BEAUCHAMP NORTHEAST**
  - Status: Active
  - Produces: No
  - Oil Wells: 13
  - LAS Files: 8
  - Tops: 62
  - DST: 0
  - Core Data: 0
  - Core Images: 0
  - Catalog Status: Partial

- **BEAUCHAMP NORTHWEST**
  - Status: Active
  - Produces: No
  - Oil Wells: 5
  - LAS Files: 0
  - Tops: 100
  - DST: 0
  - Core Data: 0
  - Core Images: 0
  - Catalog Status: Partial

- **BIG BOW**
  - Status: Active
  - Produces: Yes
  - Oil Wells: 49
  - LAS Files: 69
  - Tops: 88
  - DST: 4
  - Core Data: 0
  - Core Images: 0
  - Catalog Status: Complete

- **BIG BOW WEST**
  - Status: Active
  - Produces: Yes
  - Oil Wells: 15
  - LAS Files: 20
  - Tops: 67
  - DST: 7
  - Core Data: 0
  - Core Images: 0
  - Catalog Status: Partial

- **JOHNSON CITY**
  - Status: Active
  - Produces: No
  - Oil Wells: 5
  - LAS Files: 0
  - Tops: 80
  - DST: 0
  - Core Data: 0
  - Core Images: 0
  - Catalog Status: Partial

- **JOHNSON CITY TOWNSITE**
  - Status: Active
  - Produces: Yes
  - Oil Wells: 3
  - LAS Files: 0
  - Tops: 100
  - DST: 0
  - Core Data: 0
  - Core Images: 0
  - Catalog Status: Partial

- **LIVERPOOL CEMETERY**
  - Status: Active
  - Produces: Yes
  - Oil Wells: 9
  - LAS Files: 56
  - Tops: 100
  - DST: 44
  - Core Data: 0
  - Core Images: 0
  - Catalog Status: Partial
Field Page

Digital Petroleum Atlas
Arroyo Field
General Information

General Field Information

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

**Geologic Province:** Hugoton Embayment of Anadarko Basin

**Surface Formation:** Quaternary Loess, Morrow Ogalla

**Oldest Formation Penetrated:** Mississippian (Spangen)

**Drilling Casing Practices:**
- Conductor Casing: 20 inch set in 3D inch hole at 50 feet with 4 cubic yards of Redi-Mix Surface Casing; 8.625 inch set in 12.25 inch hole at 1050 feet with 550 sacks of Poz “C” Production Casing: 5.5 inch set in 7.765 inch hole at 5800 feet two-staged through DV tool with 1200 sacks of Poz “H”
- Water-based gel to displacement point at 3000 feet; Chemical Gel to rotary total depth

**Drilling Field Practices:**
- Lower Morrow: Acidize with 1500 gallons of 7.5% Fe HCl containing additives; Lower Morrow: Fracture with 26,000 gallons of CO2 foam and 27,000 lbs of 20/40 sand; Mississippian: Acidize with 1500 gallons of 15% Fe HCl containing additives

**Treatment Practices:**
- Upper Morrow: Acidize with 1500 gallons of 15% Fe HCl containing additives

**Electric Logging Practices:**
- Dual Induction: SP, Spontaneous Potential, Gamma Ray Concentrated Neutron, LithoDensity Long Spaced Sonic MorLog
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

Well Counts for Current Viewing Window

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Number of Wells</td>
<td>110</td>
</tr>
<tr>
<td>Number of Wells with</td>
<td></td>
</tr>
<tr>
<td>Scanned Elogs</td>
<td>13</td>
</tr>
<tr>
<td>Number of Wells with</td>
<td></td>
</tr>
<tr>
<td>LAS Files</td>
<td>24</td>
</tr>
<tr>
<td>Number of Wells with</td>
<td></td>
</tr>
<tr>
<td>Paper Logs</td>
<td>77</td>
</tr>
<tr>
<td>Number of Wells with</td>
<td></td>
</tr>
<tr>
<td>Cores</td>
<td>1</td>
</tr>
<tr>
<td>Number of Wells with</td>
<td></td>
</tr>
<tr>
<td>DSTS</td>
<td>13</td>
</tr>
</tbody>
</table>

Highlight Wells
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.
# Field Oil & Gas Wells

## Deep Pools Atlas
### Arroyo Field
#### Oil & Gas Wells

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

<table>
<thead>
<tr>
<th>Well Name</th>
<th>Operator</th>
<th>Well Status</th>
<th>Available Well Data</th>
<th>Oil Production</th>
<th>Gas Production</th>
<th>LAS Files</th>
<th>Core Image</th>
<th>Core Data Table</th>
<th>Core Cross Plots</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARNOLD 1</td>
<td>JAMESON MARTIN</td>
<td>D&amp;A</td>
<td><img src="image" alt="Download" /></td>
<td>No Oil Production</td>
<td>No Gas Production</td>
<td><img src="image" alt="LAS FILE" /></td>
<td>No Core Images</td>
<td>No Core Data</td>
<td>No Core Data</td>
</tr>
<tr>
<td>ARNOLD 23-1</td>
<td>HUBER J M CORP</td>
<td>O&amp;G</td>
<td><img src="image" alt="Download" /></td>
<td><img src="image" alt="Oil Production" /></td>
<td><img src="image" alt="Gas Production" /></td>
<td><img src="image" alt="No Digital LAS Files" /></td>
<td>No Core Images</td>
<td>No Core Data</td>
<td>No Core Data</td>
</tr>
</tbody>
</table>
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
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.
## 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**

<table>
<thead>
<tr>
<th>Well Name</th>
<th>Latitude</th>
<th>Longitude</th>
<th>Oil &amp; Gas Field</th>
<th>Core Images</th>
<th>Core Data Table</th>
<th>Core Cross Plots</th>
<th>LAS File Viewer</th>
</tr>
</thead>
<tbody>
<tr>
<td>PIPER Gas Unit 2</td>
<td>37.6385</td>
<td>-101.6256</td>
<td>PANAMA GAS AREA</td>
<td>No Images</td>
<td></td>
<td></td>
<td>LAS Plot</td>
</tr>
<tr>
<td>MONTGOMERY Gas Unit 'A' 2</td>
<td>37.54055</td>
<td>-101.62101</td>
<td>PANAMA GAS AREA</td>
<td>No Images</td>
<td></td>
<td></td>
<td>LAS Plot</td>
</tr>
<tr>
<td>JONES Gas Unit 'B' 3HI</td>
<td>37.50077</td>
<td>-101.62126</td>
<td>HUGOTON GAS AREA</td>
<td>No Images</td>
<td></td>
<td></td>
<td>No Digital LAS Files</td>
</tr>
<tr>
<td>KENDRICK 23-1</td>
<td>37.51055</td>
<td>-101.77399</td>
<td>ARROYO</td>
<td></td>
<td>Core Data</td>
<td></td>
<td>LAS Plot</td>
</tr>
</tbody>
</table>
LAS File Viewer
Core Images

Print LAS Plot with Header
Core Images

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

Kansas Geological Survey
Porosity (%) vs Permeability (md)

- Mid Shelf (Carb Dom)
- Shoal
- Shoal (transgressive)
- Tidal Flat
- Coastal Plain
- Mouth
- Lagoon
- Lower Shelf (Silic Dom)
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

### Section 1: Notice of Intent to Drill

- **ReRec Date:** [Date]
- **Operator:** [Operator Name]
- **Address:** [Address]
- **City:** [City]
- **County:** [County]
- **State:** [State]
- **Phone:** [Phone]
- **Address:** [Address]
- **City:** [City]
- **County:** [County]
- **State:** [State]
- **Phone:** [Phone]

### Section 2: Affidavit

The undersigned hereby affirms that the drilling, completions, and overall plugging of the well will comply with RSA 13. Oil and Gas Commission.

1. Notify the appropriate district office prior to starting work.
2. A copy of the approved method of drill shall be posted on each drilling rig.
3. The advance notice of the amount of oil and natural gas shall be issued by the oil and gas commission.
4. The completion of the well shall be approved by the oil and gas commission prior to the start of operations.
5. The operator shall comply with RSA 13. Oil and Gas Commission.

### Section 3: Affidavit of Operator

- **Signature:** [Operator's Signature]
- **Address:** [Operator's Address]
- **City:** [City]
- **County:** [County]
- **State:** [State]
- **Phone:** [Operator's Phone]

### Section 4: Certificate of Completion

- **Date:** [Date]
- **Signature:** [Signatory's Signature]

### Section 5: Certificate of Acceptance

- **Date:** [Date]
- **Signature:** [Signatory's Signature]

### Section 6: Certificate of Completion

- **Date:** [Date]
- **Signature:** [Signatory's Signature]

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**NOTICE OF INTENT TO DRILL**

- **ReRec Date:** [Date]
- **Operator:** [Operator Name]
- **Address:** [Address]
- **City:** [City]
- **County:** [County]
- **State:** [State]
- **Phone:** [Phone]

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- **Operator:** [Operator Name]
- **Address:** [Address]
- **City:** [City]
- **County:** [County]
- **State:** [State]
- **Phone:** [Phone]
PLAT

(Show location of the well and shade attributable acreage for perforated 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.

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.
Stratigraphic Tops Viewer
Stratigraphic Tops Viewer

[Graph and images related to stratigraphic tops viewing]
3D Field Viewer
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Pioneer Natural Resources USA, Inc.