



King Fahad University of Petroleum and Minerals  
City and Regional Planning Department  
CRP 514: Introduction to GIS  
Term 122



# GIS in OIL Exploration

Term paper presentation

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# Outlines:

- Objective.
- GIS for oil exploration.
- Subsurface mapping by GIS.
- Gulf of Oman, case study.
- Gulf of Mexico, case study.
- Conclusions.

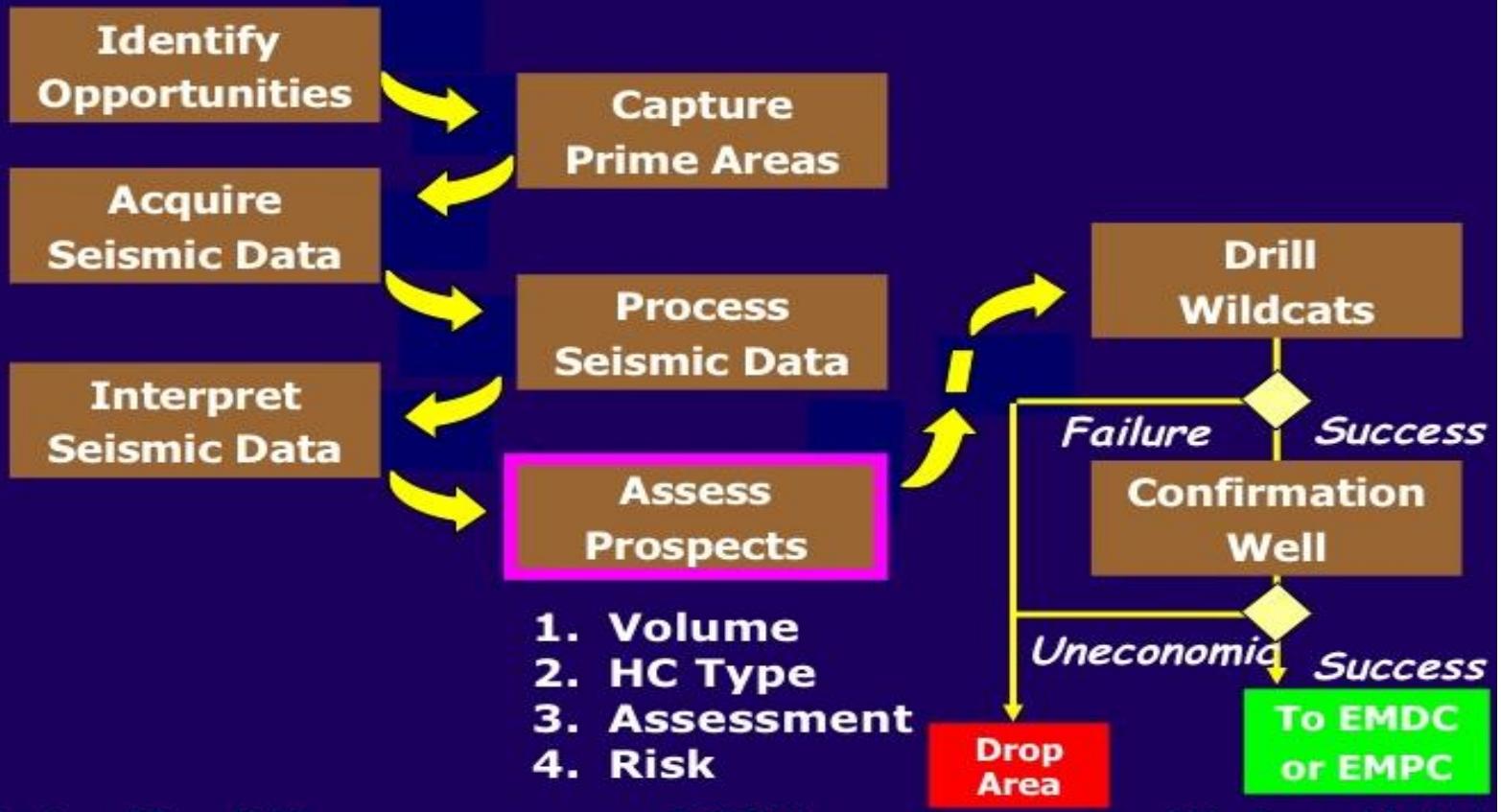
# Objective:

- To show how GIS can help in many aspects related to oil exploration.
- Evaluating the potentiality of oil.
- Subsurface modeling.
- Save time and money.
- Favorable locations for oil accumulations.
- Decision Making.

# Workflow of oil explorations:



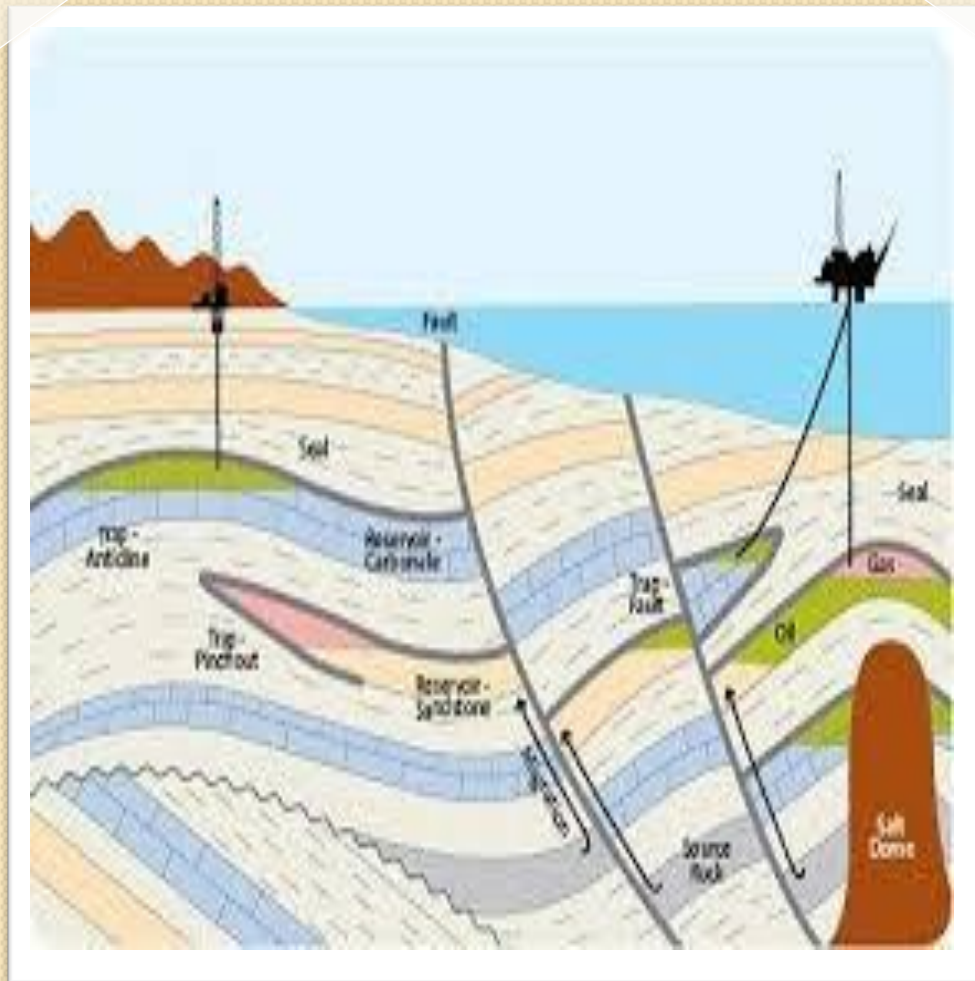
## Exploration's Task



# GIS for oil exploration:

- data collection, management, analysis, and reporting.
- Engineers and operations staff.
- GIS can be used to integrate well and seismic design.

## Oil accumulations:



**Favorable geologic features for oil accumulations.**

Special geologic mechanisms:  
1- Structural mechanism, such as;  
Faults.  
2- Hydrothermal mechanism, such as;  
organic maturation.

# Data sources for oil exploration:

- Geological maps.
- Structural features maps.
- Geophysical survey data.
- Satellite images.
- Geochemistry of oil samples.

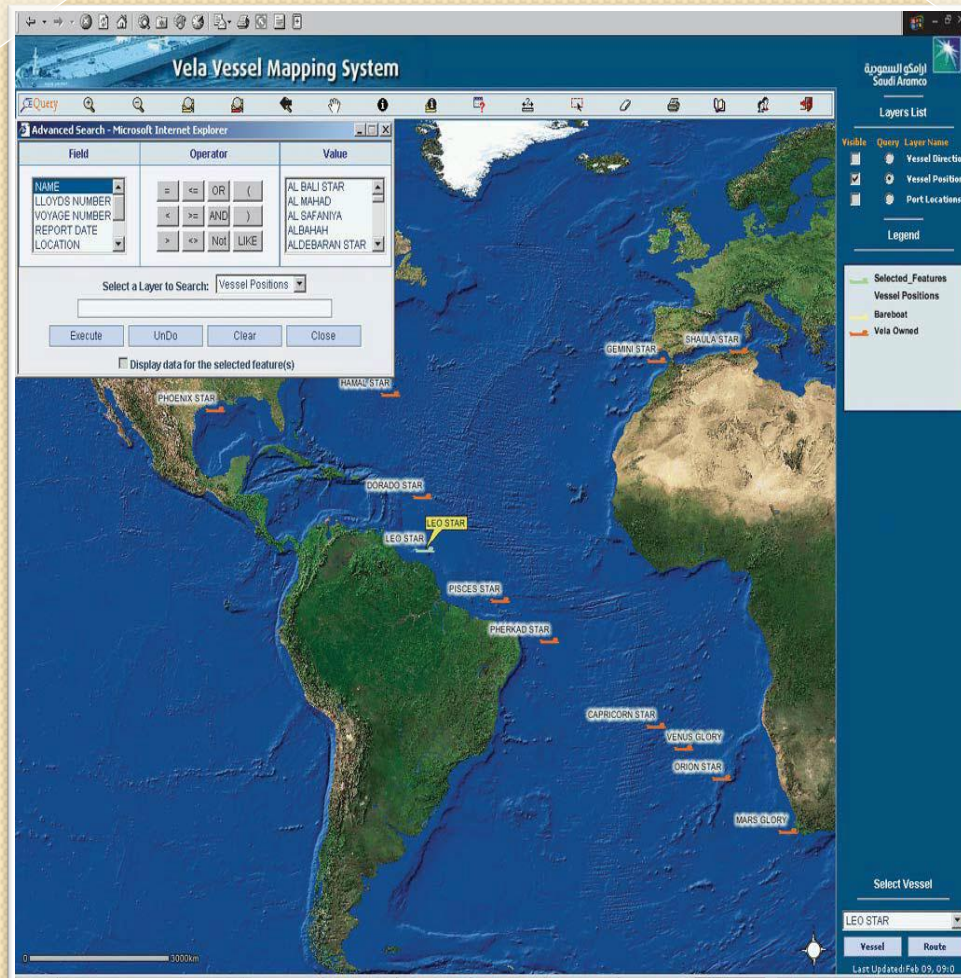


# Literature review



**Saudi Aramco**

**infrastructures  
management  
portal project  
oil & Gas assets**

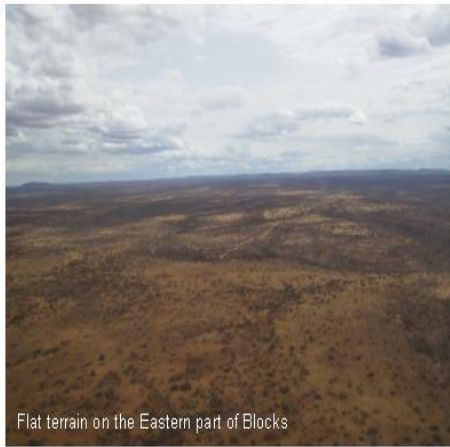


**Saudi Aramco oil tanker**



# Petronas

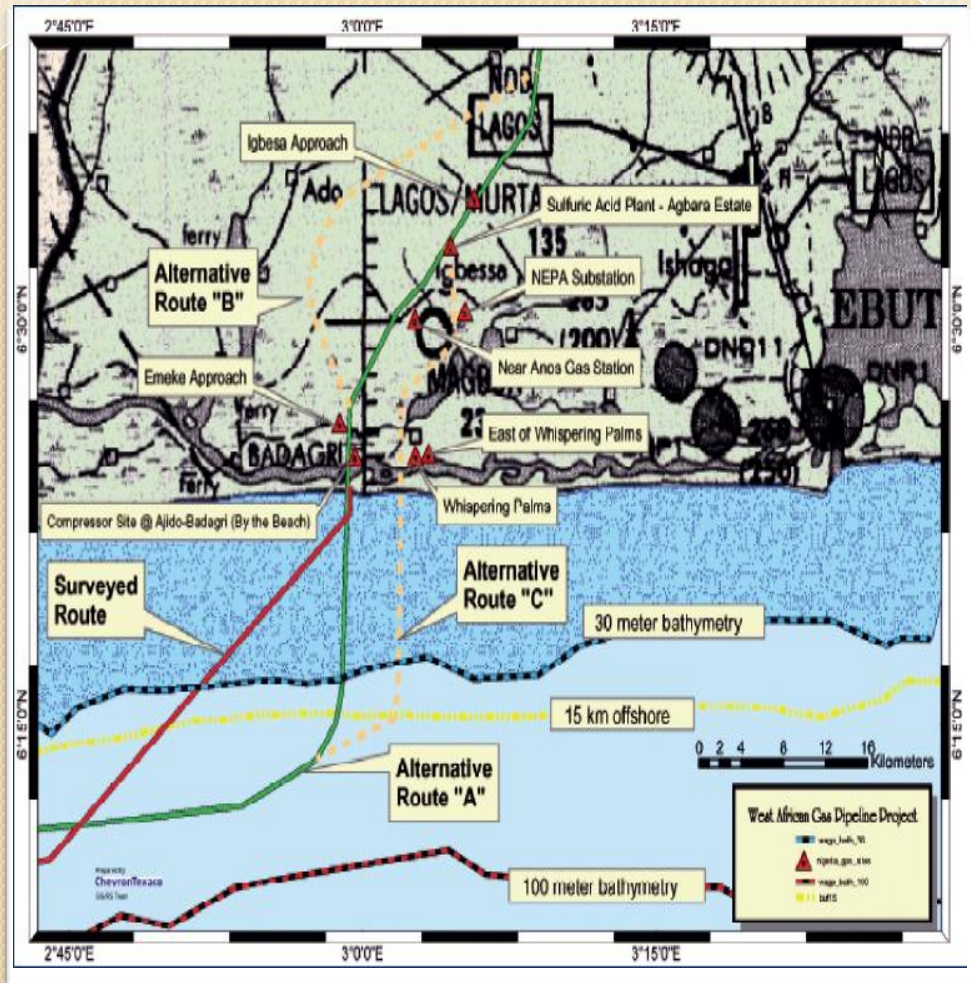
## 3D design rough terrain ops





Chevron

pipeline manager  
portal projects





**Petrobras**

**transnational  
pipeline  
new construction**

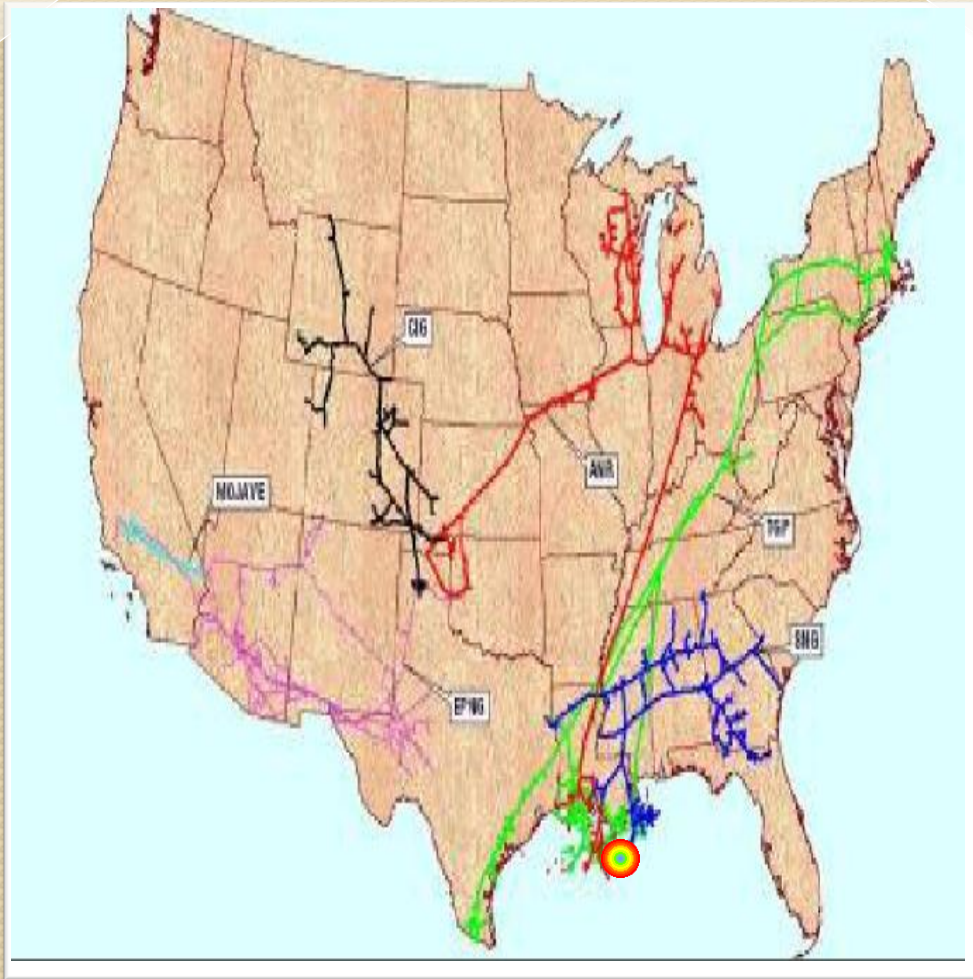






**BP**

**work flow  
management  
pipeline routing  
3d**



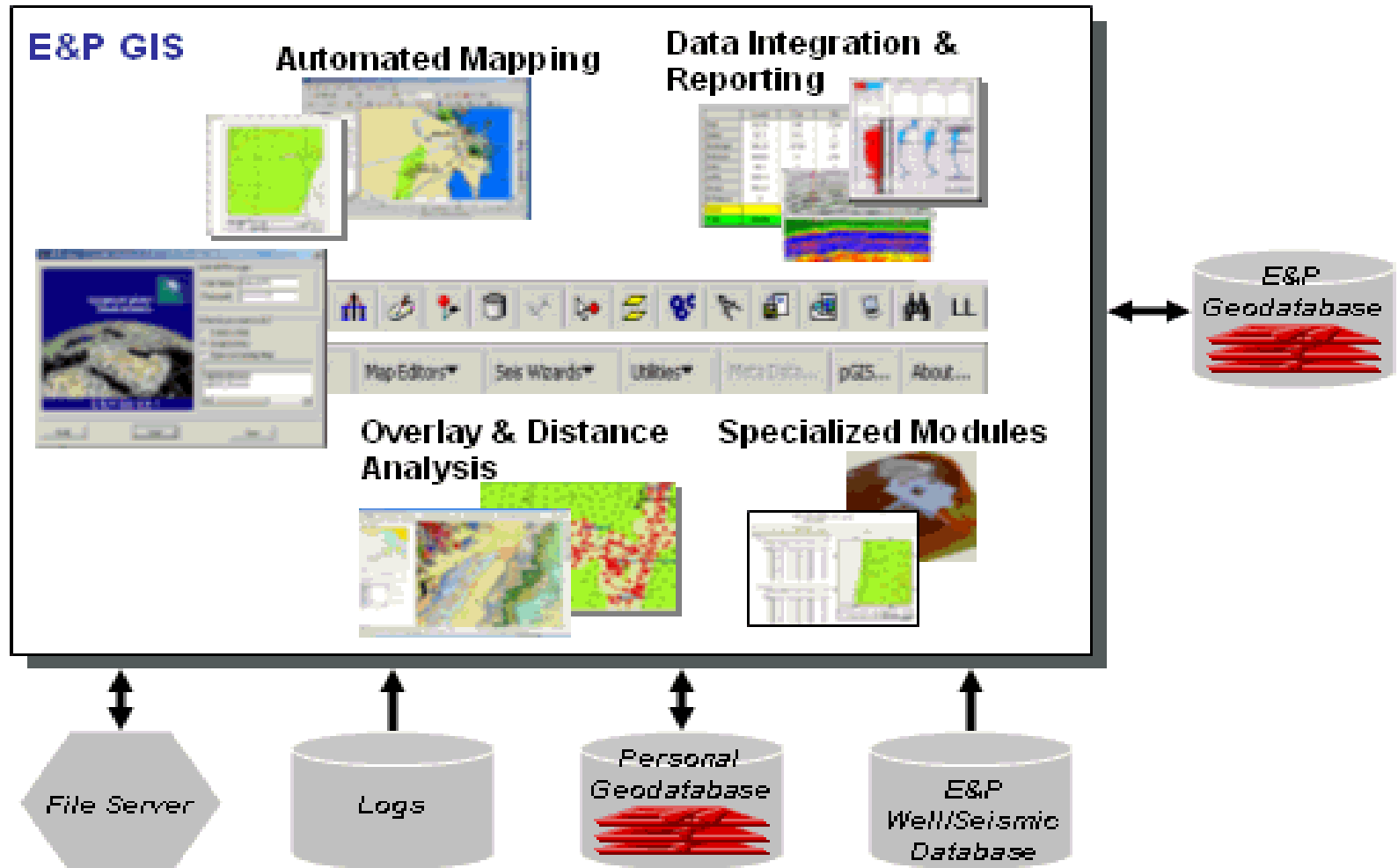
**April, 20 2010**

# Data Challenges:

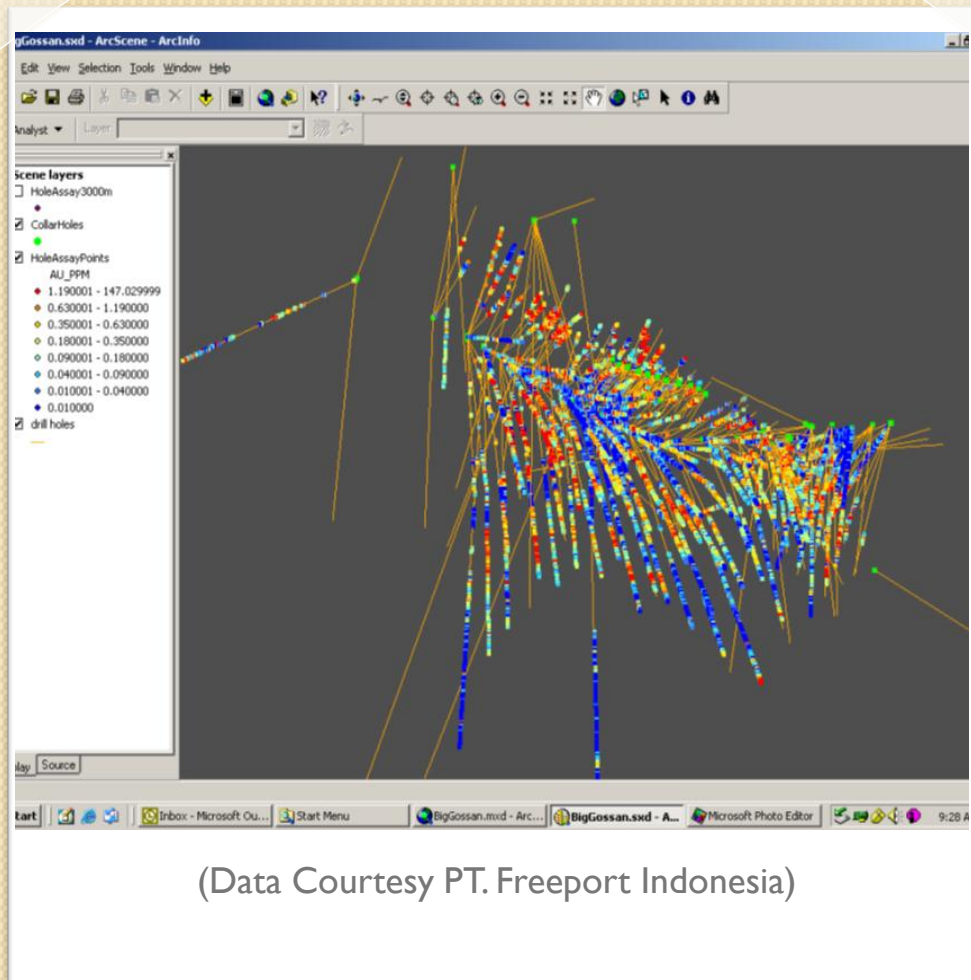
- Data Integration & Analysis.
- Data updating & quality concerns.
- Time and Money.

# GIS contribution:

- The best platform to bring all these data together and get a precious result is GIS.







(Data Courtesy PT. Freeport Indonesia)

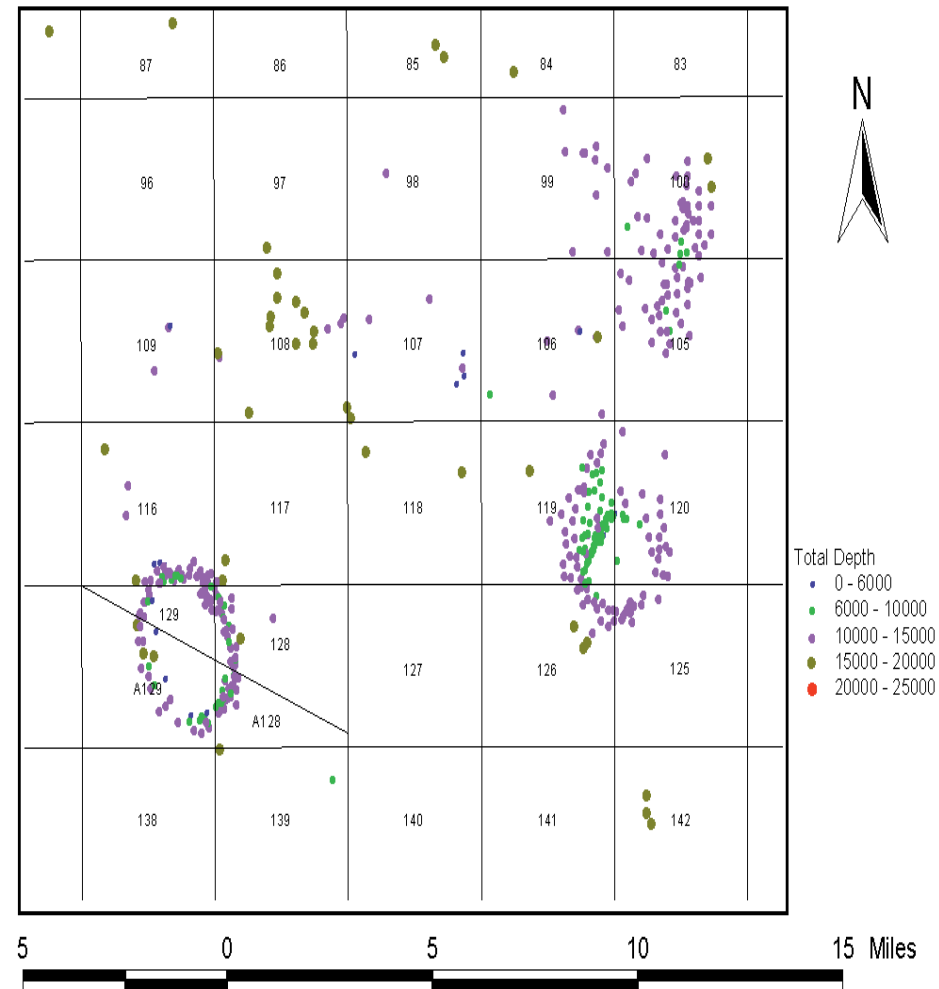
## Displaying 3D Borehole Data Using ArcGIS 3D Analyst.

GIS subsurface modeling tools allow the geologists to present well and subsurface data.

# Case studies

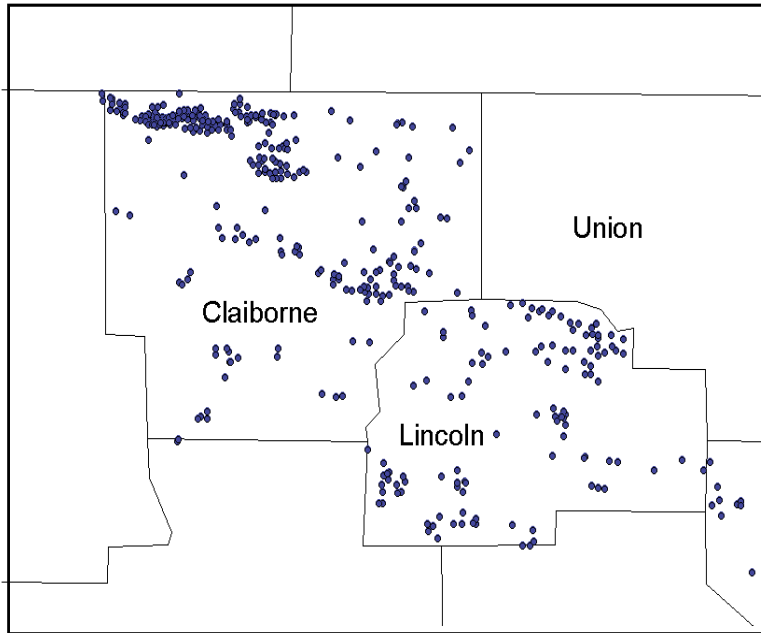
## Gulf of Mexico:

- One of the biggest oil producing fields in the world.
- Extensive exploration work was done on this area.



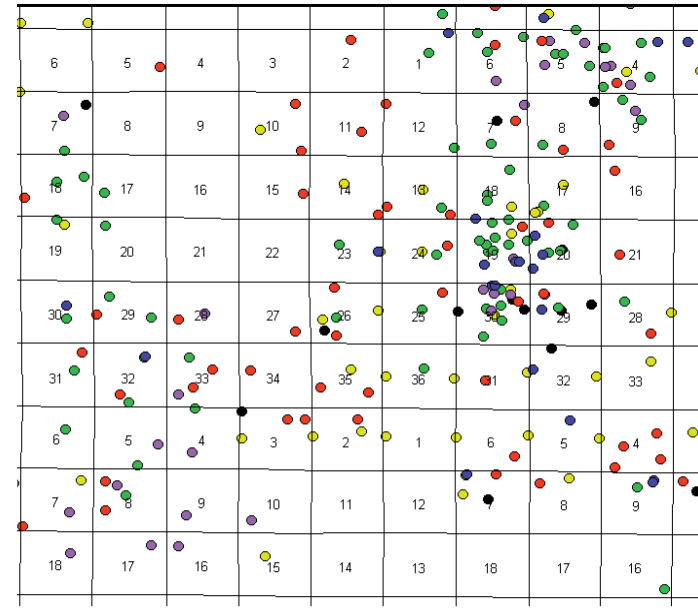
Gulf of Mexico oil wells

# Exploration and geodatabases:



0 2 4 6 8 10 Miles

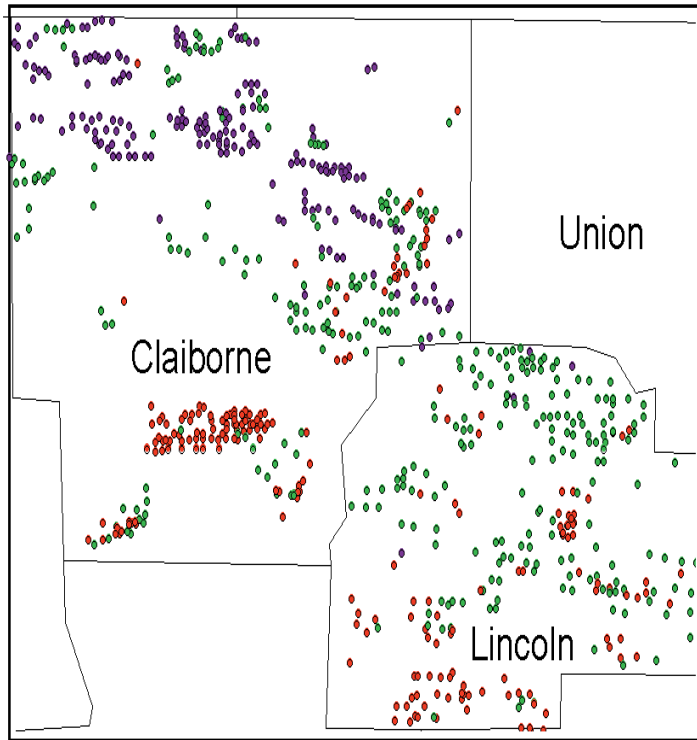
SPUD DATE  
 • 1990 - Present



SPUD DATE  
 ● 1900 - 1950  
 ● 1950 - 1960  
 ● 1960 - 1970  
 ● 1970 - 1980  
 ● 1980 - 1990  
 ● 1990 - Present

1 0 1 2 3 4 5 Miles

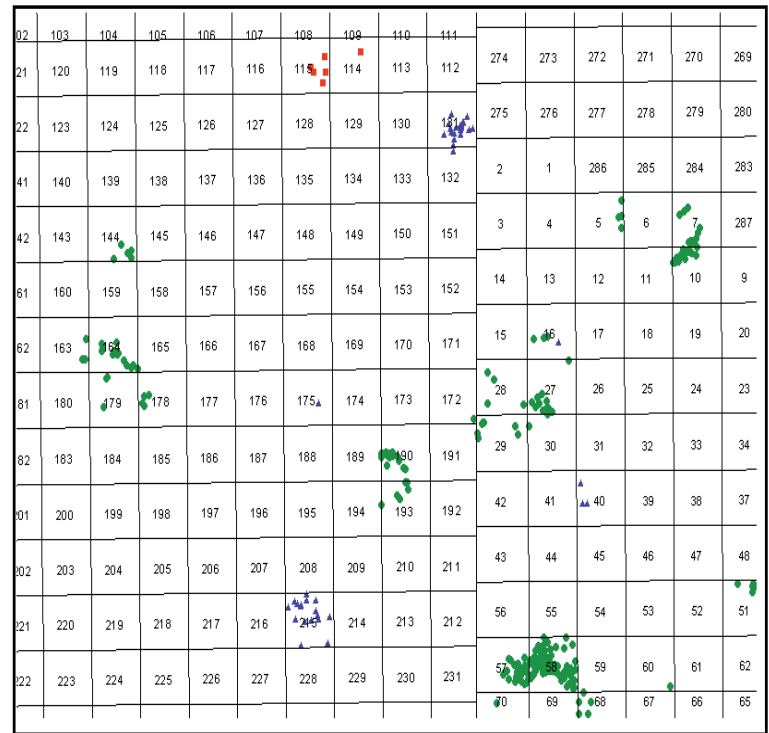




0 2 4 6 8 10 Miles

PRODUCING FORMATION

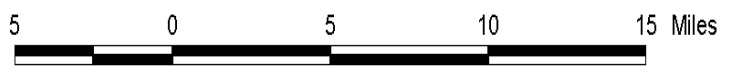
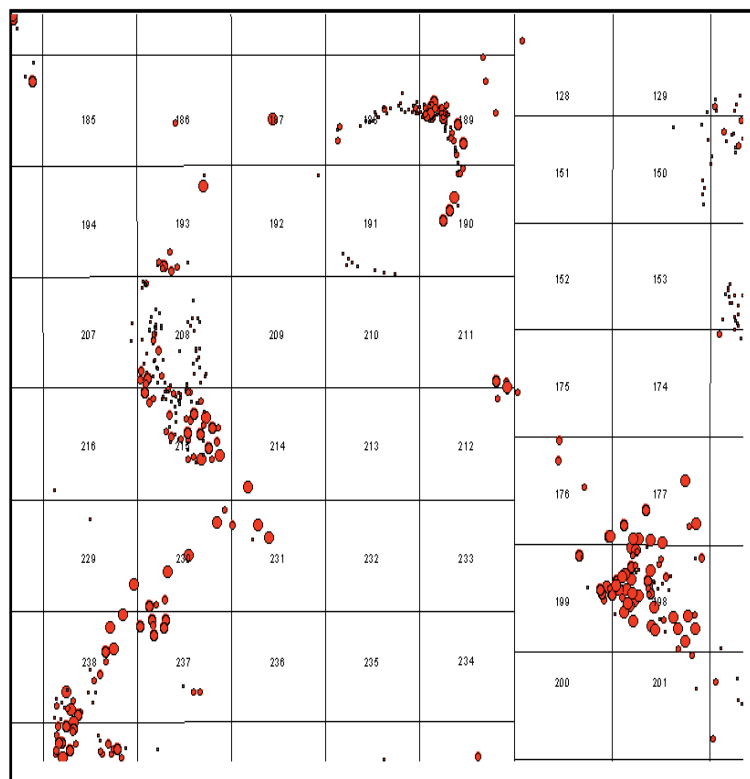
- COTTON VALLEY
- HOSSTON
- SMACKOVER



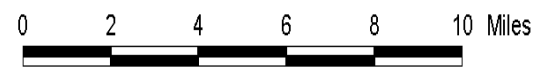
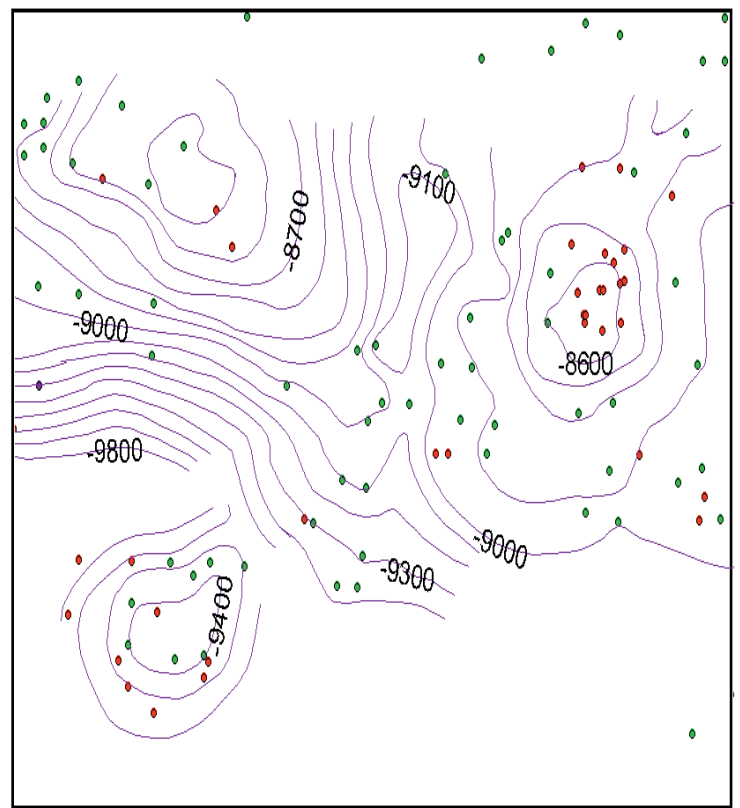
5 0 5 10 15 Miles

Operator

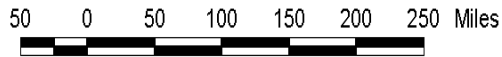
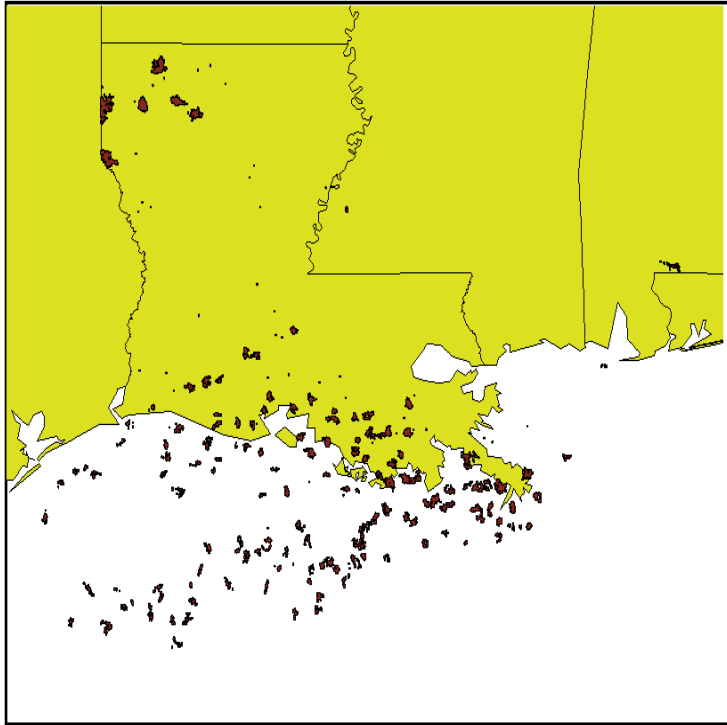
- ▲ MOBIL OIL
- PHILLIPS OIL
- SHELL OIL



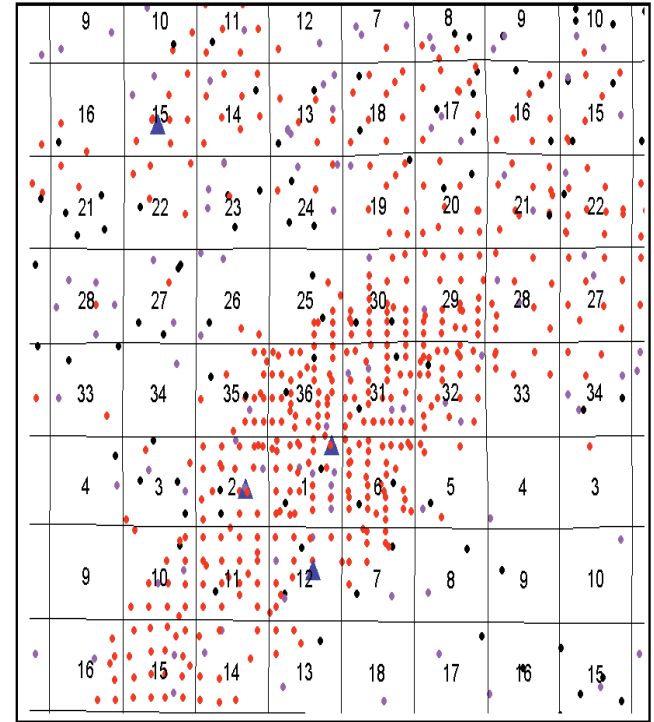
- Cumulative Gas
- 0-1 BCF
  - 1-3 BCF
  - 3-5 BCF
  - 5-10 BCF
  - 10-30 BCF



- △ COTTON VALLEY STRUCTURE
- PRODUCING FORMATION
- COTTON VALLEY
- HOSSTON
- SMACKOVER



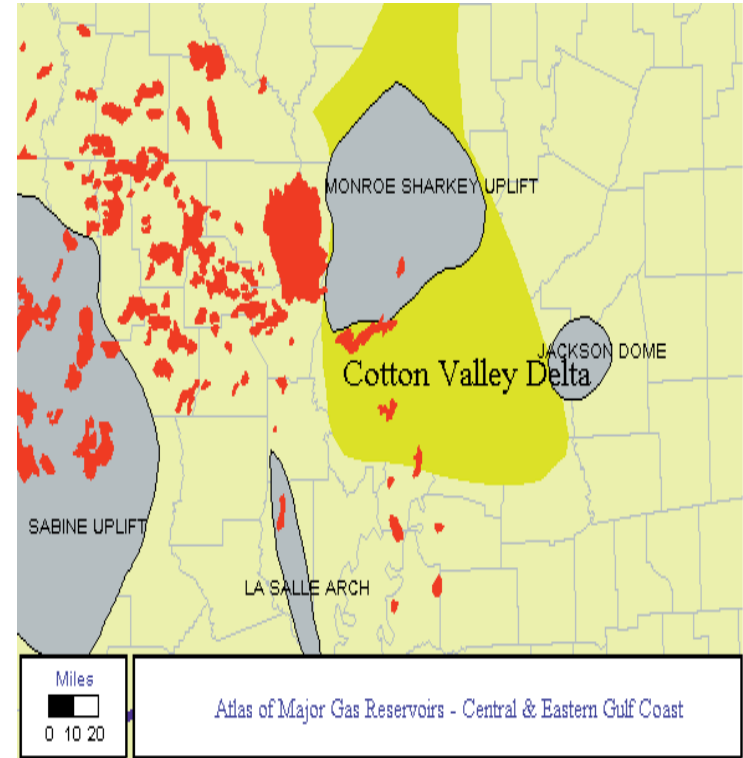
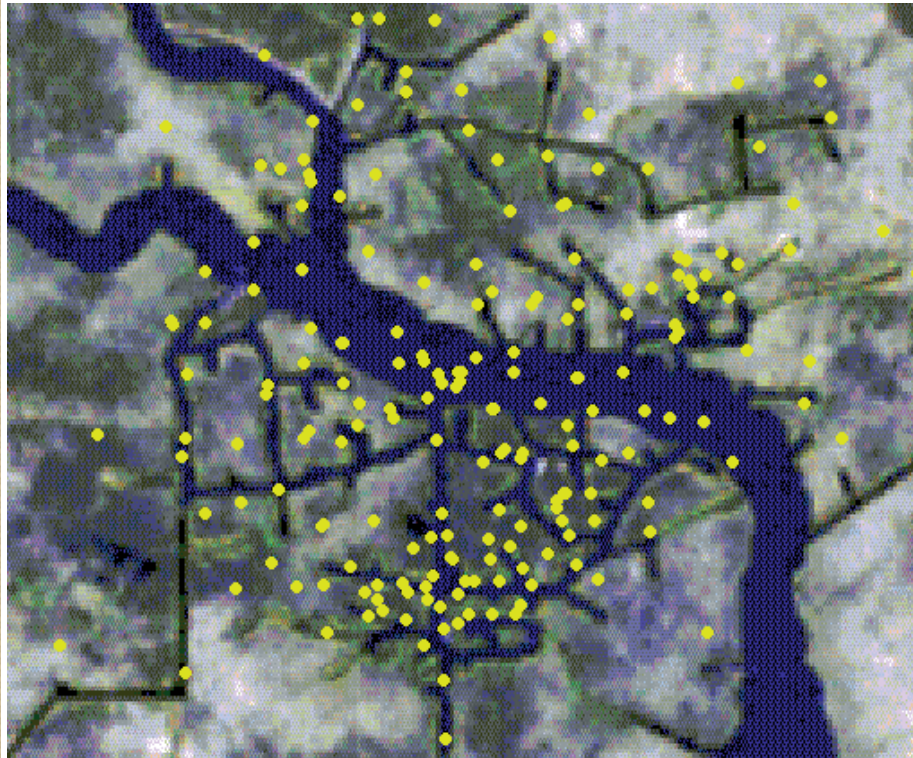
GAS FIELDS  
 500 - 1500 BCF

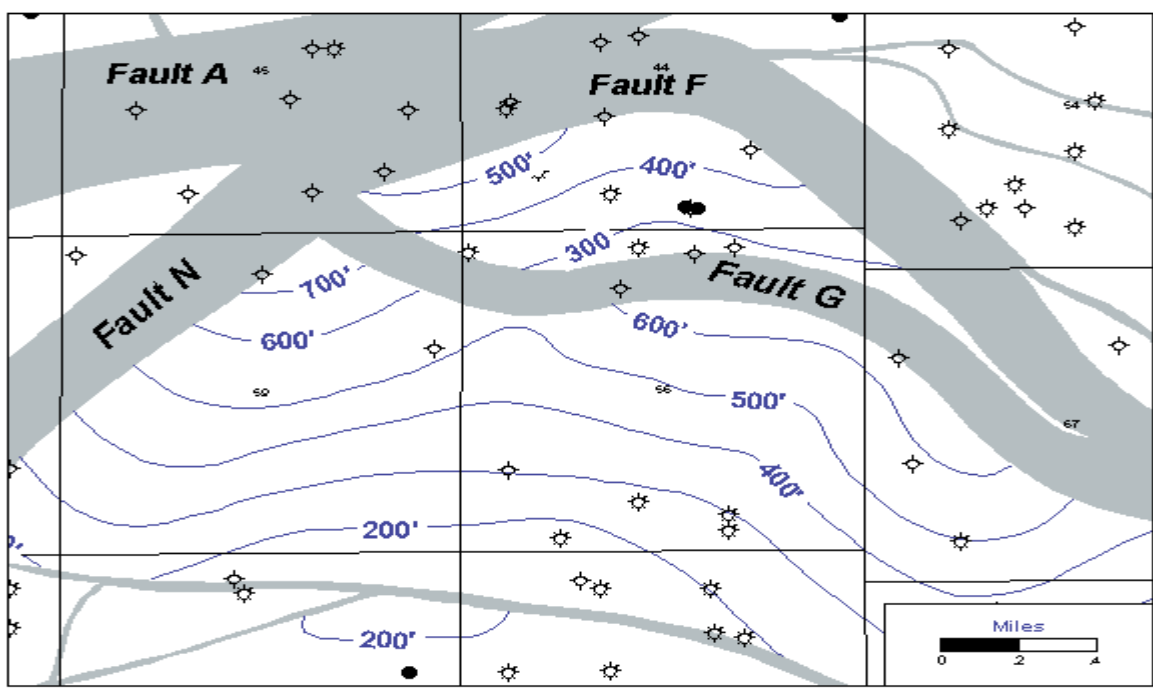
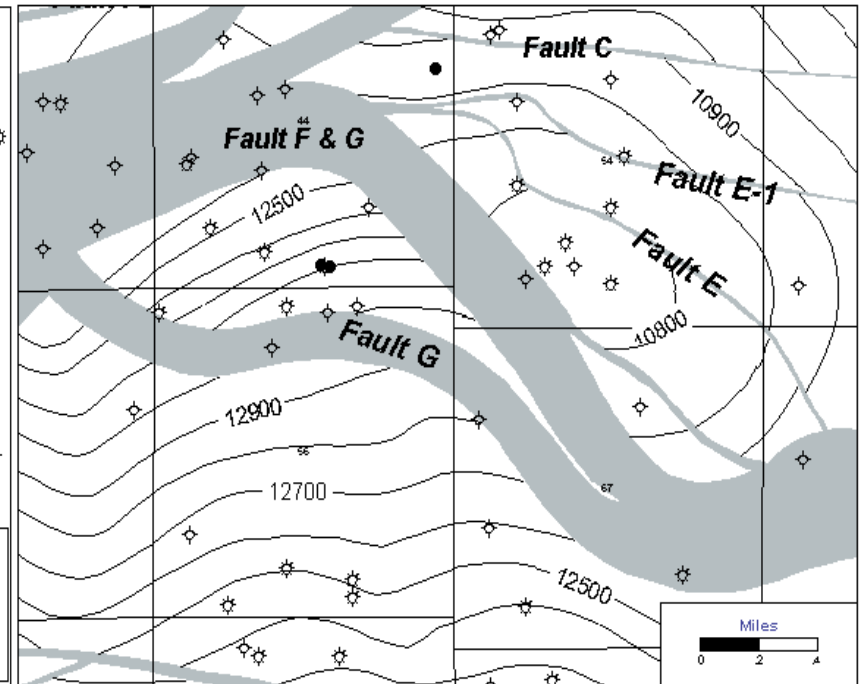
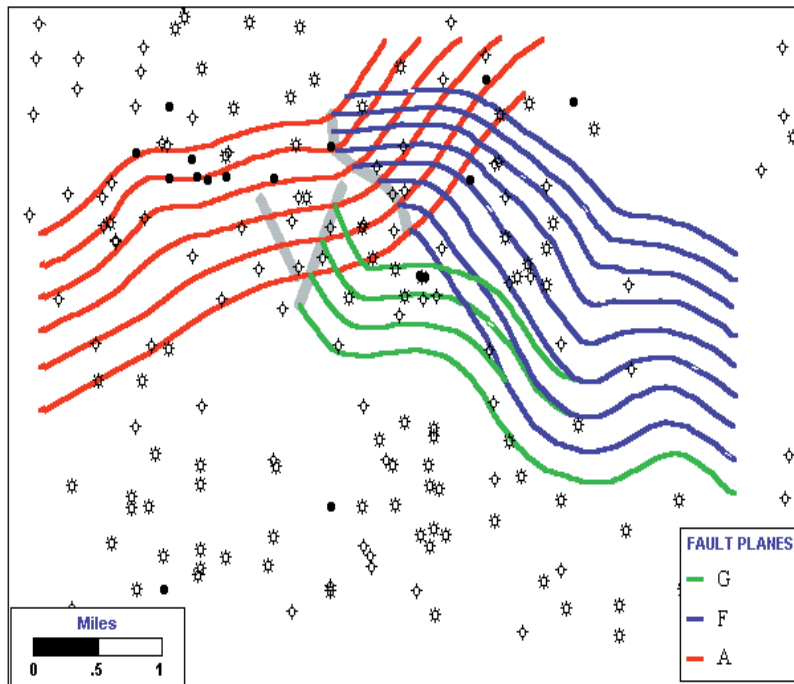


WELL CLASSIFICATION  
 FIELD EXTENSION  
 DEVELOPMENT  
 DEEPER POOL TEST  
 WILDCAT



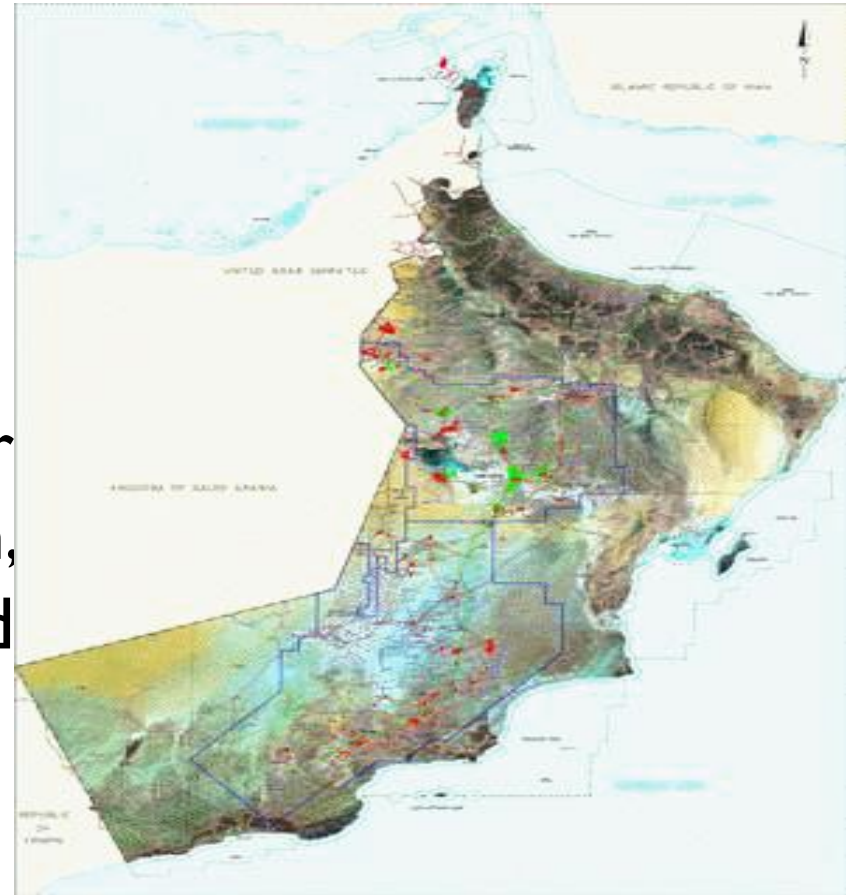


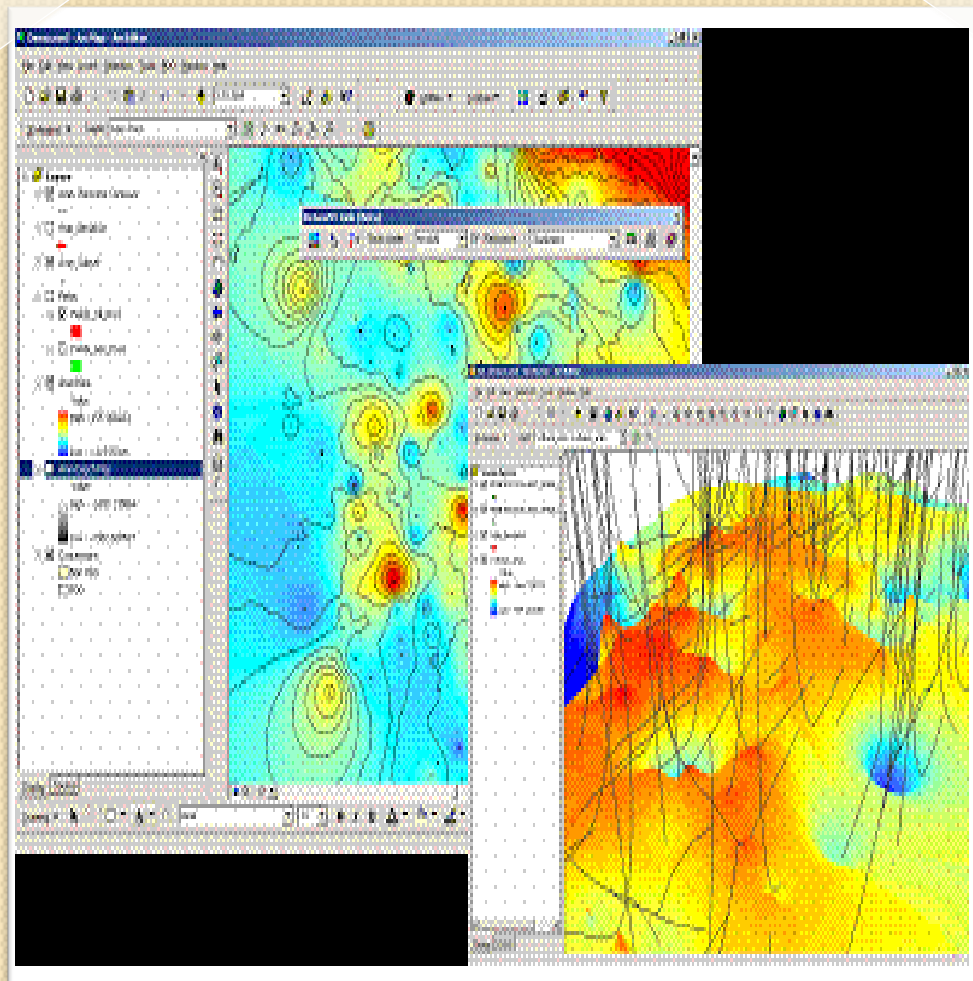




# PDO:

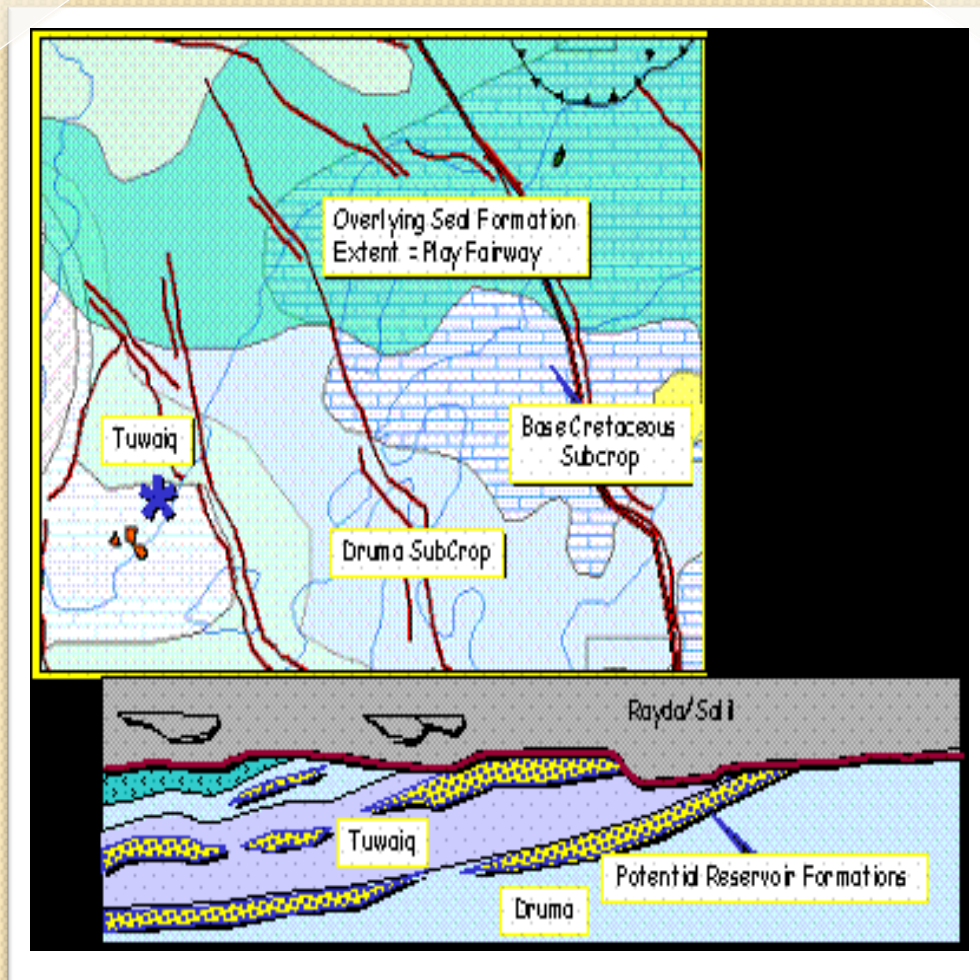
- Works in Oman.
- Generating favorability map for oil exploration, production, and transportation.



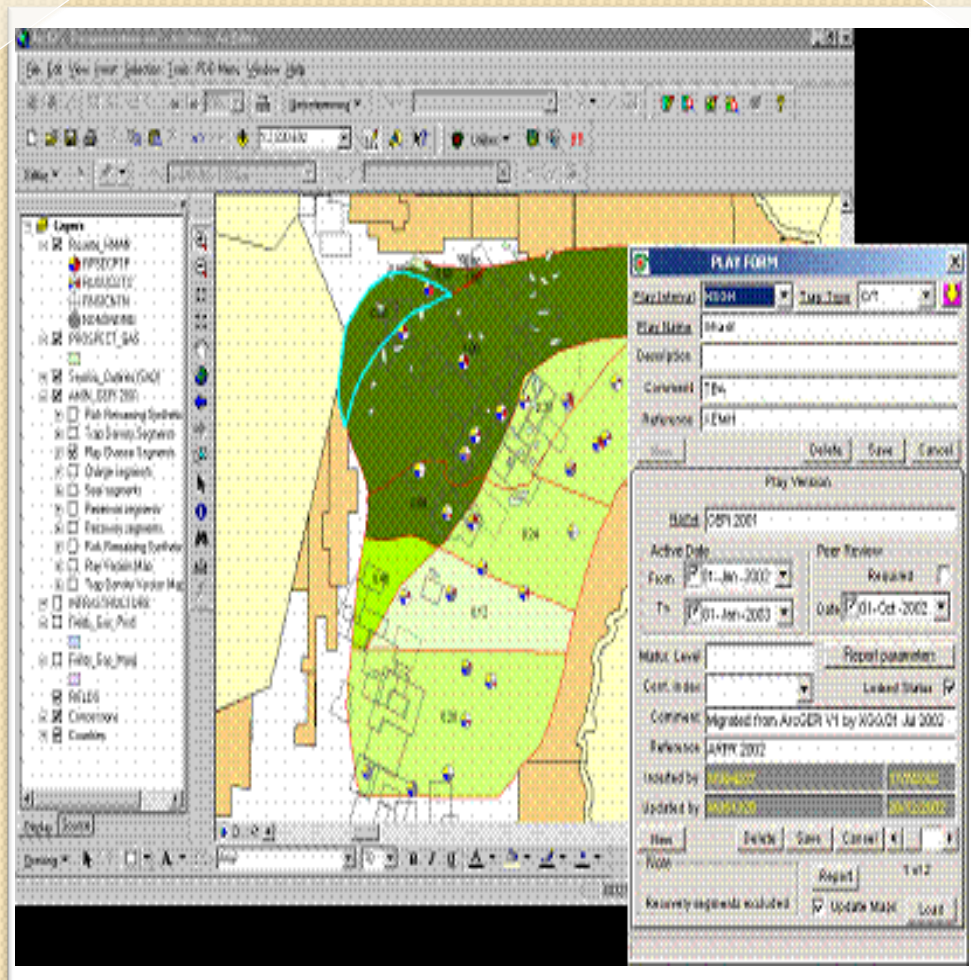


**Well Database Module  
(ArcMap) and a 3D view of  
well track combined with  
stratigraphic depth map**





**Geological map of the PDO.**



## Play Analysis System within ArcGIS.



## Prospects and leads identification

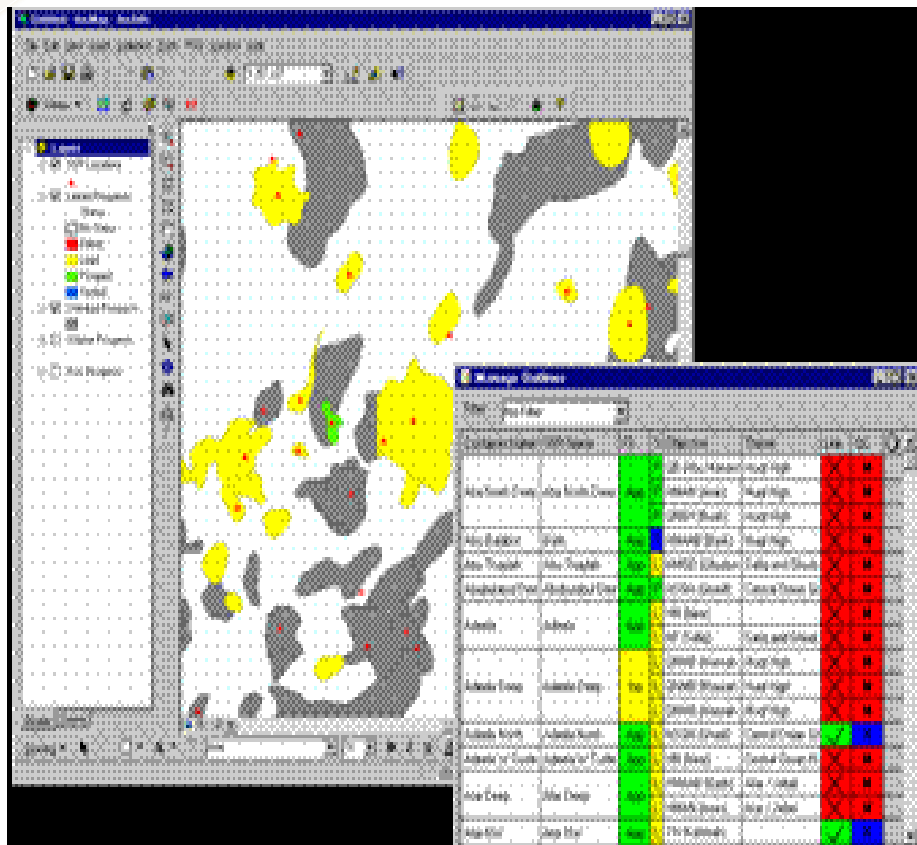
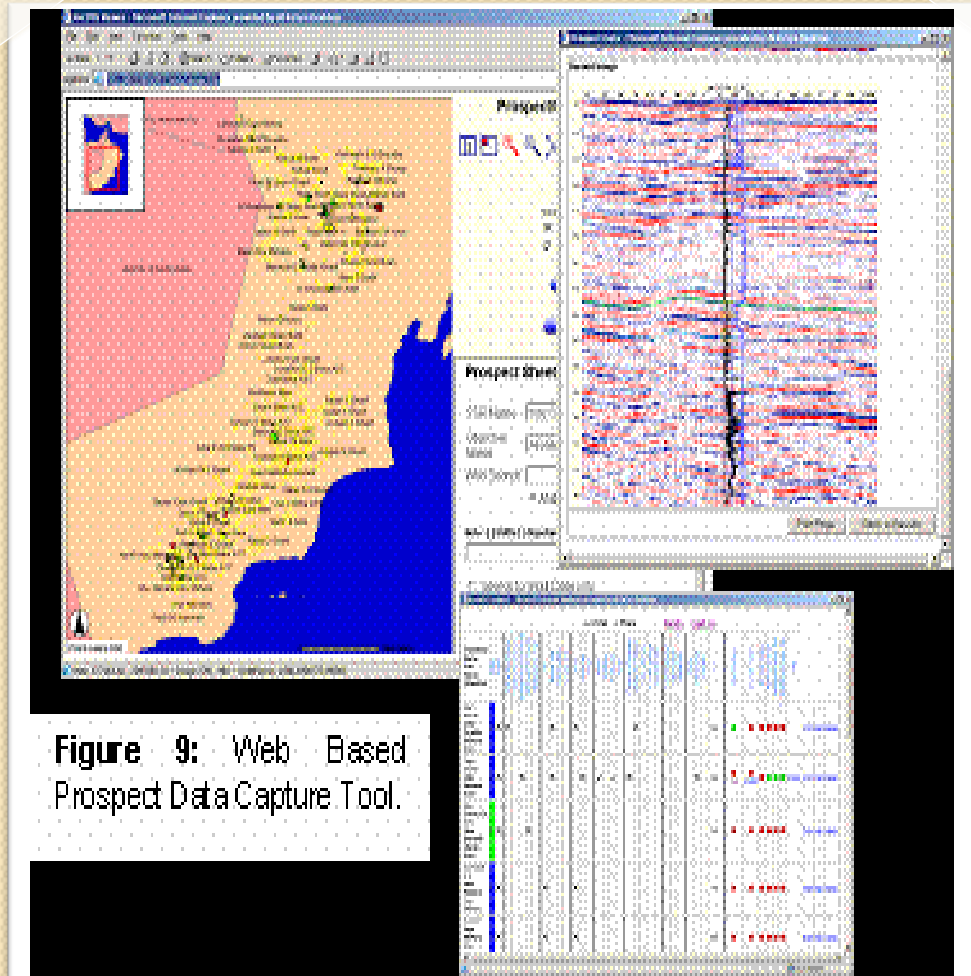


Figure 8: Filter tool within prospect module.



**Figure 9:** Web Based Prospect Data Capture Tool.

## Project data capture tool

# conclusions

- Displaying a wide range of data.
- Importing diverse map inputs, graphics and creating fruitful database.
- Integration of various data, area analysis, and modeling.

