

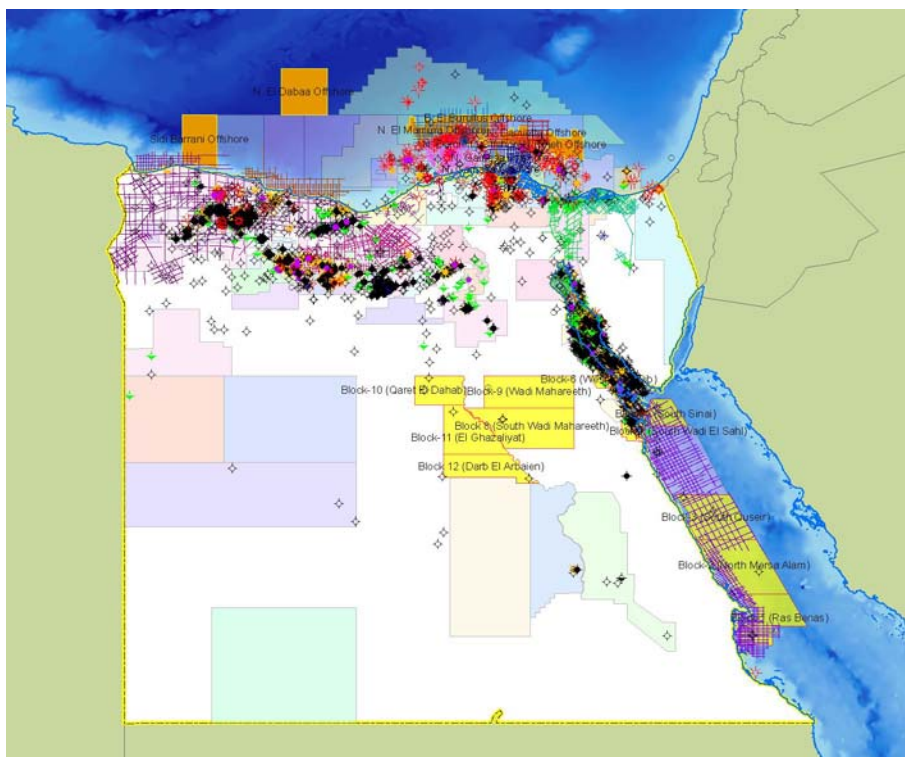
Lynx Information Systems Ltd.

Fairway Exploration Consultants

Hydrocarbon Potential of Egypt

GIS Exploration Adviser – Overview

The Lynx-Fairway project for Egypt comprises a **Report, GIS and Exploration Database** detailing the hydrocarbon exploration potential of the entire country. The project has been compiled from a number of regional studies undertaken by these two companies, who have been closely involved with exploration in Egypt over the last twenty years. The project contains a wealth of information on wells, production, seismic and potential field data which has been compiled and linked to the GIS, and brings together individual evaluation reports on the hydrocarbon potential of the Western Desert, the Gulf of Suez, the Nile Delta, Sinai, Upper Egypt and the Red Sea and is updated annually with new information.



In each of these areas a series of **Regional Structure Maps and Isopachs** for key horizons, originally mapped at a scale of 1:250,000 using wells, seismic and potential field data, is used to identify structural trapping mechanisms and provide a structural framework for exploration. Maps have been made in each area to show the distribution of producing and potential reservoirs, source and cap-rocks for a basin-by-basin analysis of the prospective sedimentary section.

These maps are tied by a series of **Geoseismic Cross-sections** linked to the well and field databases and illustrating the regional structural setting of the major plays, wells and producing trends. These cross-sections may be edited and displayed by age, lithology or depositional environment to illustrate the tecto-sedimentary controls on the deposition of source, reservoir and seals in relation to the structural configuration of the basin. Using these maps and cross-sections each of the producing trends has been evaluated and a large number of prospective hydrocarbon plays and leads have been identified.

Regional LAYERS in the database provide an integrated geological/geophysical framework for exploration covering the entire area of Egypt, with information on potential field data, seismic, licence information, well data, production, bathymetry, culture, geology, landsat, etc.,

The **Concessions Database** is updated on a regular basis and contains licence information such as award/expiry dates, operator, company interests, etc. The **Well Database** contains a file of data for each well in the country and is linked to well database tables containing information on stratigraphy, hydrocarbon shows, test results, reservoir properties and geochemistry, which are highlighted when a well is selected. The **Tops Finder** searches the well database and compiles selected formation tops, which can be posted and contoured to produce additional maps.

The **Field Database** is compiled from information supplied by the operating companies and provides a systematic inventory of technical data for each producing field and major discovery in the country, containing information on interests, structural style, reservoir parameters, reserve estimates, hydrocarbon type and production characteristics, each of which may be searched and the results shown on the maps. The fields are linked to a database of cross-sections, structure maps and well data.

A series of **Lithostratigraphic Columns** and regional **Paleogeographic Maps**, produced by correlating wells in the report, illustrate the stratigraphic development of each area with special reference to sedimentary environments, facies distribution and the association of hydrocarbon bearing source rocks, reservoirs and seals. In each basin the lithostratigraphic columns may be linked to the text in the report describing the deposition, thickness, facies distribution, source/reservoir potential, sedimentological and petrophysical characteristics of each formation.

Our client's seismic data can be added to the GIS to form a seismic database which may be displayed from the GIS using the **Lynx SEG-Y Viewer** included in the project (1 year licence).

Also included (1 year licence) is the **Lynx LAS/LIS Viewer** for viewing any client specific digital well log data via a hyperlink to the well locations from within the GIS database.

An 800-page illustrated digital **Report** explains how the evaluation was undertaken and synthesizes the geological, geochemical and geophysical data integrated to evaluate the hydrocarbon potential for each basin within Egypt.

GIS Contents List

EGYPT REGIONAL MAP LAYERS

Coastline, Borders, Towns, Rivers
Well Data Base (over 5600 well locations)
Formation Tops Data Base (ca. 900 wells)
Formation Tops finder
Geochemistry Data Base (474 records derived from 243 wells)
Fields Data Base (over 400 fields)
Seismic lines (links to ca. 50,000 km of fully processed and reconciled seismic data)
Block Line Grid Overlay
Block Names
Bathymetry
Concessions and Licence Information
Pipelines and Production Infrastructure
Satellite Gravity
Bouguer Gravity (Onshore)
Sandwell Marine Gravity V11.1
Relative Bouguer Anomalies (Sinai)
Depth to Basement
Structural Features
Basin Margin Regional Faults
Landsat 14.25m ETM (3-band)
Surface Geology
Topographic Relief (SRTM) 90m grid and hillshade

REGIONAL PALEOGEOGRAPHY MAP LAYERS

Lower-Middle Pliocene Paleogeography
Upper Miocene Paleogeography
Middle Miocene Paleogeography
Lower-Middle Pliocene Facies
Upper Miocene Facies
Lower Miocene Paleogeography
Middle Miocene Facies
Oligocene Paleogeography
Paleocene – Earliest Eocene Paleogeography
Maastrichtian Paleogeography
Santonian-Campanian Paleogeography
Turonian-Santonian Paleogeography
Turonian Regression Paleogeography
Cenomanian Transgression Paleogeography
Albian Regression Paleogeography
Barremian-Aptian Paleogeography
Barremian-Aptian Facies
Neocomian Paleogeography
Neocomian Facies
Late Jurassic Paleogeography
Late Jurassic Facies
Late-Mid Jurassic Paleogeography
Late-Mid Jurassic Facies
Early – Mid Jurassic Paleogeography
Early – Mid Jurassic Facies
Upper Safa Facies
Lower Safa Facies

Paleozoic Paleogeography
Paleozoic Isopach
Paleozoic Clastic Input

NILE DELTA MAP LAYERS

Major Structural Features
Field Structure Maps
Kafr el Sheikh (Pliocene) Structure
Kafr el Sheikh Isopach
El Wastani Isopach
Abu Madi Isopach
Abu Madi (Messinian) Structure
Abu Madi Sand Distribution
Qawasim (Upper Miocene) Structure
Qawasim Isopach
Qawasim Sand Distribution
Sidi Salim (Middle Miocene) Structure
Sidi Salim Isopach
Qantara (Lower Miocene) Structure
Qantara Isopach
Qantara Sand Distribution
Dabaa (Oligocene) Structure
Dabaa Isopach
Reservoir Depositional Facies
Play Fairway and Risk Analysis Maps

GULF OF SUEZ MAP LAYERS

Coastline, Borders, Towns, Rivers
Seismic lines (links to approx. 8,000 km of fully processed and reconciled seismic data)
Bathymetry
Concessions
Satellite Gravity
Field Structure Maps
Bouguer Gravity (Onshore)
Relative Bouguer Anomalies (Sinai)
Landsat Imagery
Surface Geology
Photogeological Interpretation
Field Structure Maps
Hydrocarbon Plays
Hydrocarbon Occurrences and Production
Source Kitchens
Reservoir Depositional Facies
Belayim Formation Isopach
Kareem Gross Sandstone Isopach
Kareem Formation Isopach
Upper Rudeis Gross Sandstone Isopach
Upper Rudeis Formation Isopach
Lower Rudeis Gross Sandstone Isopach
Nukhul Gross Sandstone Isopach
Nukhul Formation Isopach
Top Kareem Structure
Kareem Fault Zone
Kareem Structural Features
Eocene Isopach
Matulla Formation Gross Isopach
Brown Limestone Isopach
Nubian Formation Isopach
Basement Structural Features

Basement Fault Zones
Field Structure Maps
Structural Features and Basement Depth
Play Fairway and Risk Analysis Maps

WESTERN DESERT MAP LAYERS

Coastline, Borders, Towns, Rivers
Seismic lines (links to approx. 17,500 km of fully processed and reconciled seismic data)
Bathymetry
Topographic Relief
Concessions
Hydrocarbon Occurrences and Production
Field Structure Maps
Lower Cretaceous Isopach
Alamein Dolomite Structure
Jurassic Structure
Jurassic Basins
Paleozoic Structure
Paleozoic Isopach
Structural Features and Basement Depth
Basement Fault Zones
Hydrocarbon Plays
Source Kitchens
Safa Maturity
Safa Facies
Reservoir Depositional Facies
Major Structural Features
Satellite Gravity
Bouguer Gravity (Onshore)
Relative Bouguer Anomalies (Sinai)
Landsat Imagery
Surface Geology
Play Fairway and Risk Analysis Maps

LITHOSTRATIGRAPHIC COLUMN LAYERS

A series of stratigraphic charts illustrating the stratigraphic nomenclature, lithology, depositional environments, unconformities, reservoir and hydrocarbon source rock potential.

Dakhla - Desouqi and Nile Basins
Gulf of Suez
Nile Delta
Red Sea
Sinai
Western Desert

GEOLOGICAL STRUCTURAL CROSS-SECTION LAYERS

A series of fifteen (15) structural cross-sections based on seismic lines tying important wells and major discoveries throughout the country.

Desouqi-Faghur
Bahariya-Meleiha-Mersa Matruh
Central Abu Gharadig Basin-Alamein
Gindi Basin-Kattaniya Horst
Northern Basin
North Darag Basin
Issaran - October Basins
West Bakr - South Belayim Basins
Shukheir - Morgan Fields
Zeit Basin - B Trend
Esh El Mellaha - Shoab Ali
North Sinai
Nile Delta - Sinai
Dakhla-Desouqi Basin
Dakhla-Desouqi - Nile Basin

WELL DATABASE

A compilation of basic well information from over five thousand six hundred (5600) released wells including well name, operator, license, basin, status, elevation, TD, Tvd, well location.

Well name	Basin	Field	Block
Operator	Location	Elevation	Water Depth
Reference	Reference Depth	Latitude	Longitude Datum
	Result	Well Status	Spud Date
Completion Date	TD	Deviation	

From these a sub-set of over 1200 wells also have formation tops, hydrocarbon shows and/or DST information, reservoir parameters and/or geochemical source rock data detailed in a linked database including

Well name	Depth	Formation	Age
Lithology	Porosity	Permeability	Thickness
Test Data	API	Source Rock	Kerogen Type
Maturity	HI	Comments	

LYNX CLICK/RELATE TOOL

Lynx Click Relate ArcGIS extension allows direct access from the maps to oilfield and well information held in each of the databases as well as individual Acrobat pdf pages.

PLAY FAIRWAY ANALYSIS MAPS

The data in the report has been used to produce new play fairway maps for each of the major producing and potential reservoirs in the Nile Delta, Gulf of Suez and Western Desert.

COMMON RISK SEGMENT MAPS (CRS)

The new reservoir, source and seal distribution maps produced to illustrate the Hydrocarbon Play Fairway Analysis were used to create component risk maps for reservoir, source and

seal presence in the Western Desert, Nile Delta and Gulf of Suez. This methodology has been significantly improved by using the Spatial Analyst Tool extension for ArcGIS which allows the layers to be combined mathematically based on risk values and yields composite maps of play risk.

GEOCHEMISTRY

A database of geochemical data from 243 wells has been compiled and summarised to illustrate the distribution, type, quality and maturity of the major source rocks throughout Egypt. A series of new shapefiles illustrates the distribution of source rocks and kitchen areas in the Western Desert, Gulf of Suez and Nile Delta.

Twenty-three (23) digital well logs in LAS format:

Well Name	Curves/Tools	Start ft	End ft
Khnum 1	MSFL, LLS, LLD	280	13814
Mamura 1	SP, SN, ILD	64	12384
Dawabis 1	GR, SN, ILD, SNP	100	13508
Faghur -Sahara 1	SP, SN, ILD	700	10914
Faghur West 1	SN, ILD	1506	10474
Giddiya 1	GR, CALI, SN, ILD, CILD, DT	60	11504
Marakia 1-1	GR, CALI, LLS, LLD, RHOB, NPHI, DT	1	4332
KK 84 02	GR & DT	200	2680
KK 84 03	GR & DT	176	2550
G 1	RES	350	5106
G 2	RES	364	4804
K 1	GR, RES, DT	3200	6969
EE 85 2	GR, RES & DT	5060	12562
GG 83 1	GR, MSFL, LLS, LLD & DT	5500	10668
Morgan 008A	RES	364	10064
Shukheir Marine 2	RES	5900	7032
KK 84 01	GR & DT	660	3000
Zeit Bay A-2	GR, CALS, DT, SP, MSFL, LLS, LLD, GRD, CALI, RHOB	714	5054
Saffron 01	GR, CALI, MSFL, LLS, LLD, RHOB, APLC, DTCO	1451	2374
Scarab 1	GR, CALI, MSFL, LLS, LLD, RHOB, APLC, DTCO	1283	2099
ETCH-1	RES	350	9220
EE85-3	GR, RES & DT	5070	12500
EE85-1A	GR & DT	5130	12550

FIELD DATABASE

A systematic inventory of technical data for over four hundred (400) producing fields and major discoveries, presenting information on reserves, reservoir parameters, structural style, production characteristics and history, producing facilities and ownership; illustrative cross-sections, seismic data, logs, stratigraphic columns and sketch structure maps are hyperlinked to many of the fields.

Field Name	Hydrocarbon Type	Discovery Date	Onstream
JV Interest	Interest %	Depth	Closure
Vertical Closure	Pay Zone	Age	Lithology
Facies	Production Depths	Gross Reservoir	Net Reservoir
Porosity (min.)	Porosity (max.)	Porosity (avg.)	OWC
Permeability (min.)	Permeability (max.)	Permeability (avg.)	GOC
Sw (min.)	Sw (max.)	Pressure	Depth
Temperatures	Gas/oil column	Gas Cap	Oil in Place
Recoverable Reserves	Recovery Factor	Drive Mechanism	Prod Rate
Cummulative Production	Prod. Units	Production Dates	API (min.)

API (max.)	Peak Production Rate	Peak Production Date	GOR
Viscosity	Well Head Pressure	Sulphur	Pour Point
Water Depth	Platform	Wells	Prod Well
Total Number of Wells	Distance to Coast	Structure	

HYDROCARBON POTENTIAL REPORT

An eight hundred (800) page report detailing the “Hydrocarbon Potential of Egypt” including four volumes of text, tables and figures is produced digitally as an Adobe Acrobat document.

During the last decade the success ratio in Egypt has improved considerably. Prolific reservoirs and mature source rocks associated with a wide variety of trapping mechanisms have been identified and many new fields have been brought on stream. The results of this recent exploration and production activity have provided a wealth of new geological, geophysical and geochemical data, which has been synthesized and interpreted to form this report. For each area the report follows the following format: -

INTRODUCTION

General information providing a background for operations; the principle geographic, political and economic features such as terrain, climate, population, government, trade and oil industry infrastructure.

EXPLORATION AND DEVELOPMENT HISTORY

The historical development of exploration and production; discussed with reference to those technical and politico-economic factors which have accelerated or decreased activity.

RESERVES AND PRODUCTION

Analysis of exploration activity, the rights holding situation, relinquishment, acreage availability, current licensing rounds; providing a systematic documentation of acreage currently available or to become available in the near future.

TECTONICS AND STRUCTURAL HISTORY

The structural evolution of the sedimentary basins in the context of a regional plate tectonic framework illustrating the development of the major prospective trends. Documentation of the tectonic history and structural framework of each basin; structural growth and hydrocarbon entrapment for individual hydrocarbon plays and leads are highlighted.

STRATIGRAPHY AND PALEOGEOGRAPHY

The stratigraphic development of sedimentary environments, facies distribution and paleogeography with special reference to the deposition of hydrocarbon source rocks, reservoirs and seals. A description of each formation emphasizing sedimentological and electric log characteristics for the purposes of well correlation and prognosis.

PETROLEUM GEOLOGY

Basin-by-basin analysis of the prospective sedimentary areas defining the widespread development and distribution of hydrocarbons, producing and potential reservoirs, hydrocarbon bearing source rocks, cap rocks and the influence of structural development on both hydrocarbon entrapment and reservoir distribution.

RESERVOIRS, LITHOFACIES AND SEALS

Each producing and potential reservoir is reviewed and mapped with reference to its origin of deposition, facies distribution, thickness, petrophysical and producing characteristics, field size, cap rock and productivity.

HYDROCARBON SOURCE ROCKS

The results of geochemical analyses with reference to the stratigraphic and geographic distribution of hydrocarbon bearing source rocks, maturation, migration pathways, geothermal gradients and burial history analysis.

EXPLORATION GEOPHYSICS

An interpretation of seismic and potential field data to establish basin configuration, structural elements, prospective trends and trap geometries. Factors affecting the quality of geophysical data are reviewed.

PETROLEUM POTENTIAL AND PROSPECTS

The hydrocarbon bearing potential for each of the productive trends and exploration plays is evaluated in terms of regional setting, previous exploration results, source, reservoir, seal, structure, production, operating conditions and success ratio. In each basin examples are given of untested hydrocarbon leads and prospects.

Contacts

Roger Bignell (drdb@btinternet.com)

Lynx Information Systems Ltd. (lynx@lynxinfo.co.uk)