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MENAPS 2022

MIDDLE EAST AND NORTH AFRICA PERFORATING SYMPOSIUM

Challenging Well with Sand Production Risk is Economically Developed Using Oriented Perforation

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Field Background

Location : Offshore Gulf of Suez .

Reservoir Depth : 4150 FT TVDSS

Reservoir Type: Sandstone

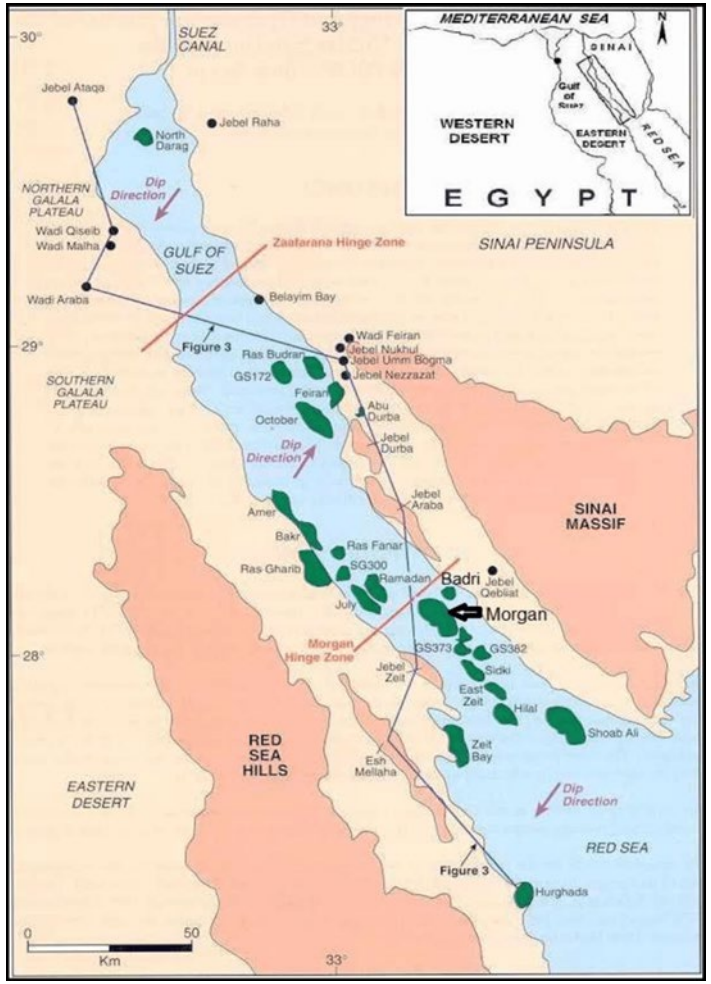
Cutting Description : Weak to Moderate consolidated Sand.

Porosity : 21 – 28 %

Permeability : 100 md to 1 Darcy

Initial Reservoir Pressure : 1932 PSI

First Production : 1983



Sanding Issues

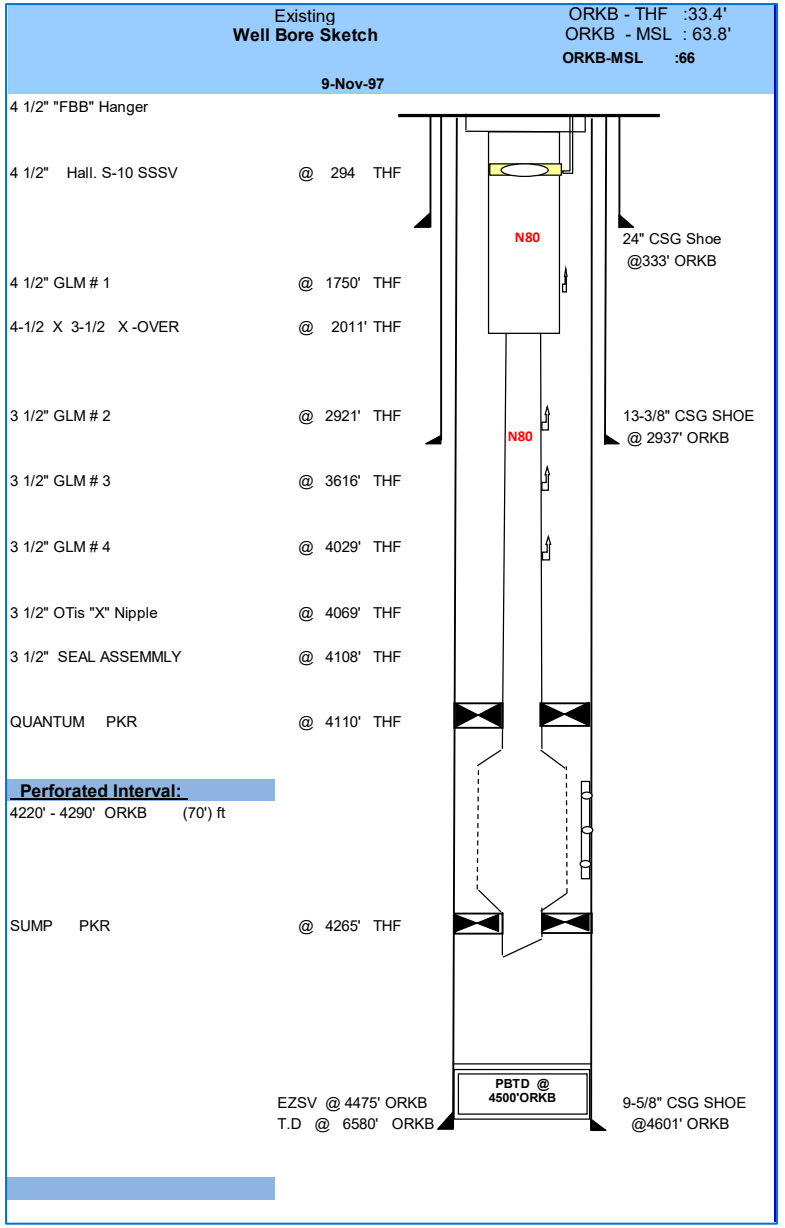
Depletion & Water Injection: Field Produced under depletion till start up of water injection in 1996 at that time pressure was down to 750 PSI.

Productivity Impairment : before 1996 wells were just cased and perforated and with depletion many Coiled tubing clean outs performed but the gain value was very short term only few months before well is filled back with sand.

Lost Injectivity : during start up of Injection in 1996 In three injectors , injectivity dropped dramatically to Nill due to sanding due to water Hammering.

Dramatic Sanding during start up : During Drilling Campaign in 1996, starting up two new wells directly after perforation , Wells Sanded up to the extent of No Production.

Shifting Completion Strategy: Since 1996 A new Completion Strategy was adopted using Cased Hole Gravel Pack for Producers and injectors, as a start 5 wells had completion change out 3 producers and 2 injectors.



Subject Well

Background

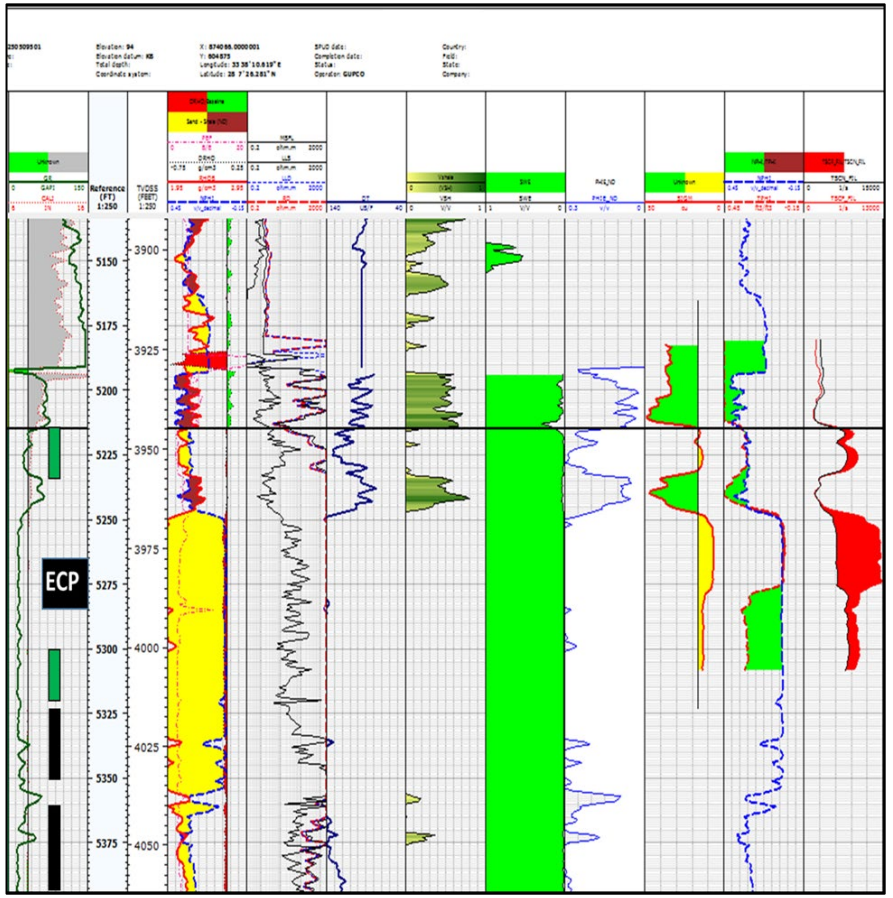
Well Placement : well was drilled as attic well in the reservoir for future development of the field.

Findings : well experienced Long Secondary Gas Cap due to depletion with small Oil Leg.

Completion Strategy: It was decided not to install gravel pack and do only casing and perforation to allow future adding perforations after Water injection start up.

Perforation : 2” TT 6 SPF , 60 deg.

Well experienced frequent CTU CO due to sand fill



Subject Well

Value & Challenge

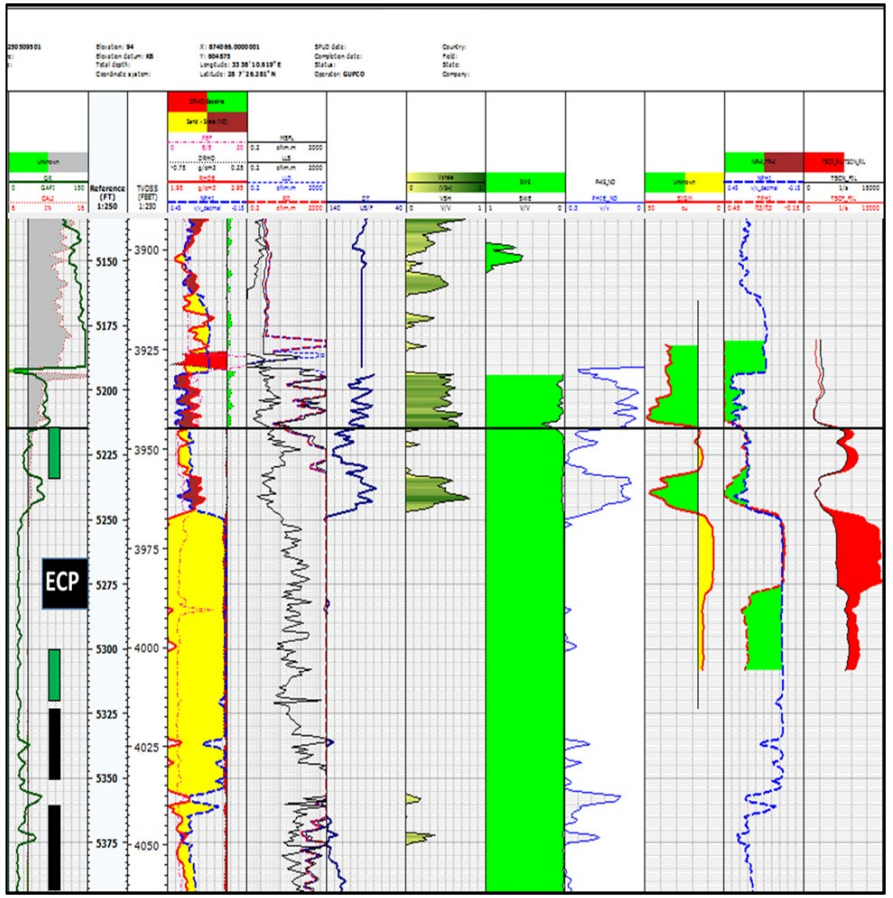
Time Lapse RST: Time Lapse Sigma Log between 2003 and 2017 showed Collapse of Gas cap and larger Oil Leg to be perforated

Value : add 300 BOPD

Challenge :

- Previous perforations showed frequent sand fill and impact on production .

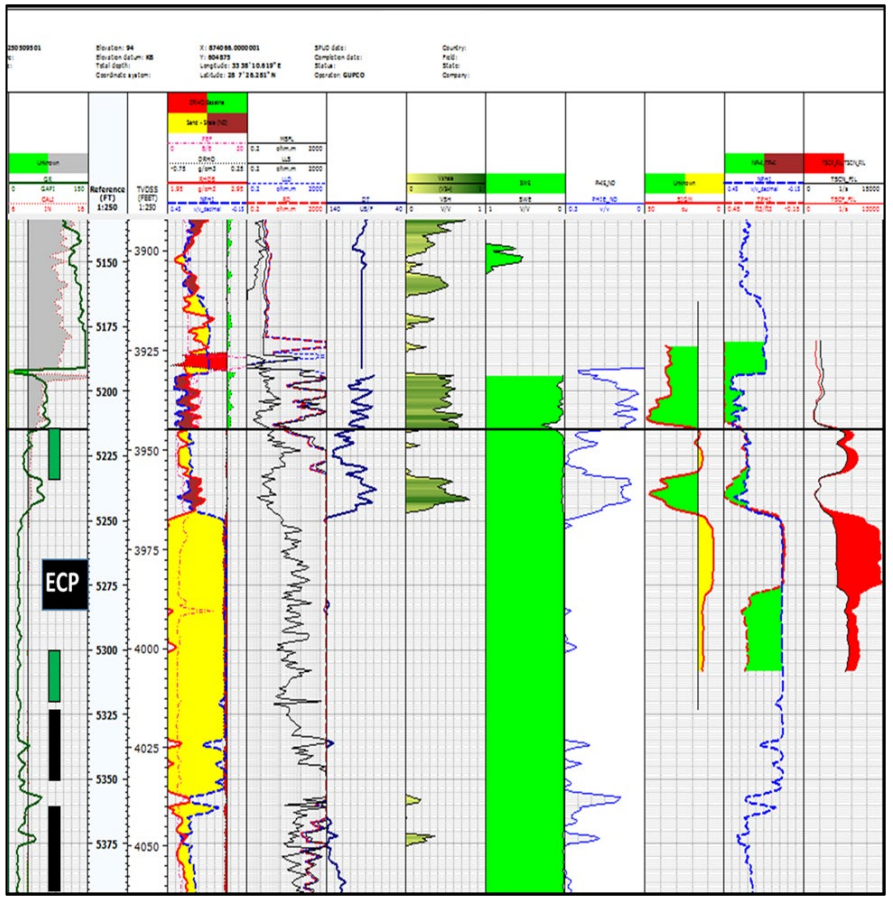
- Upper interval is Weaker and UCS Less than 600 PSI which risk the well losing the current 500 BOPD in case of Failure.



Subject Well

Options

- Cased Hole Gravel Pack
- Cased Hoe Screen
- Oriented Perforation

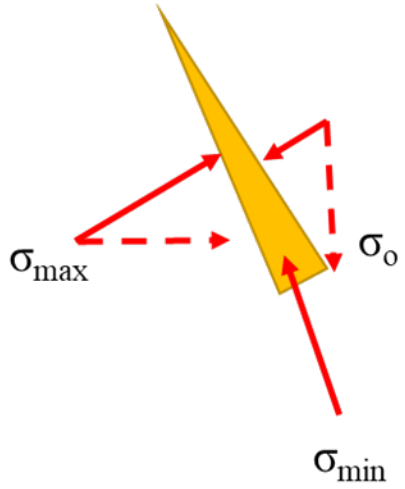


Cost was prohibitive For cased hole Gravel Pack

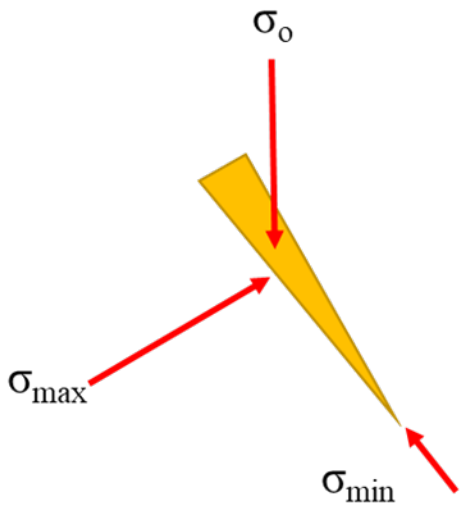
During drilling campaign in 2016 we acquired image log in the area and got more confident Geomechanical Model with direction and some estimates of Stresses

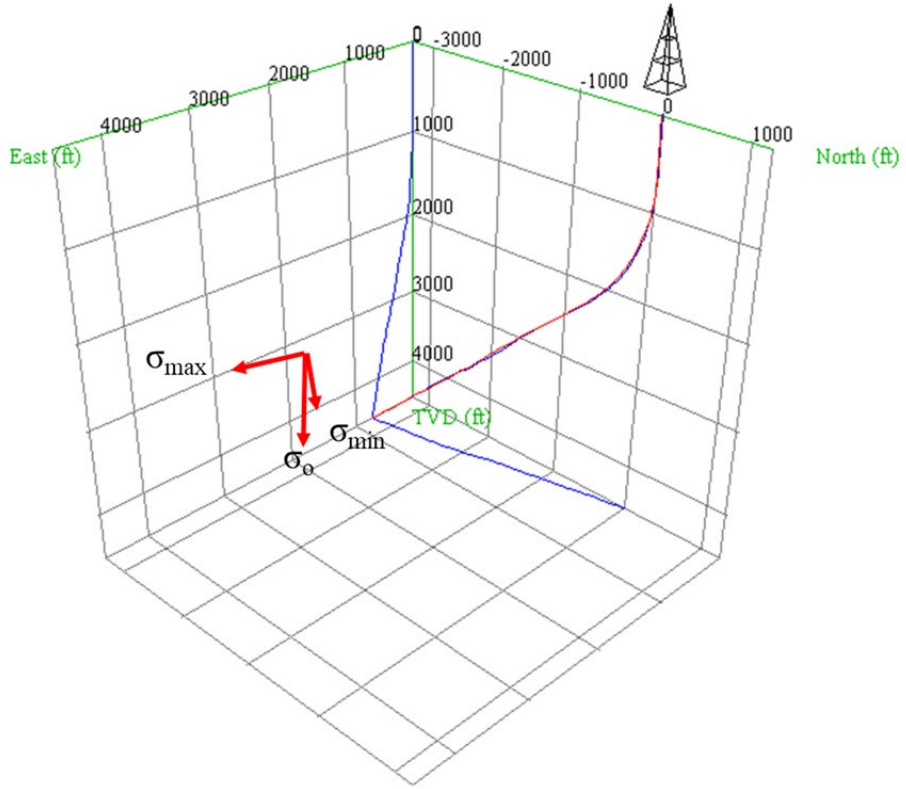
Oriented Perforation

Stable Perforation Tunnel
180° Azimuth



Unstable Perforation Tunnel
90° Azimuth



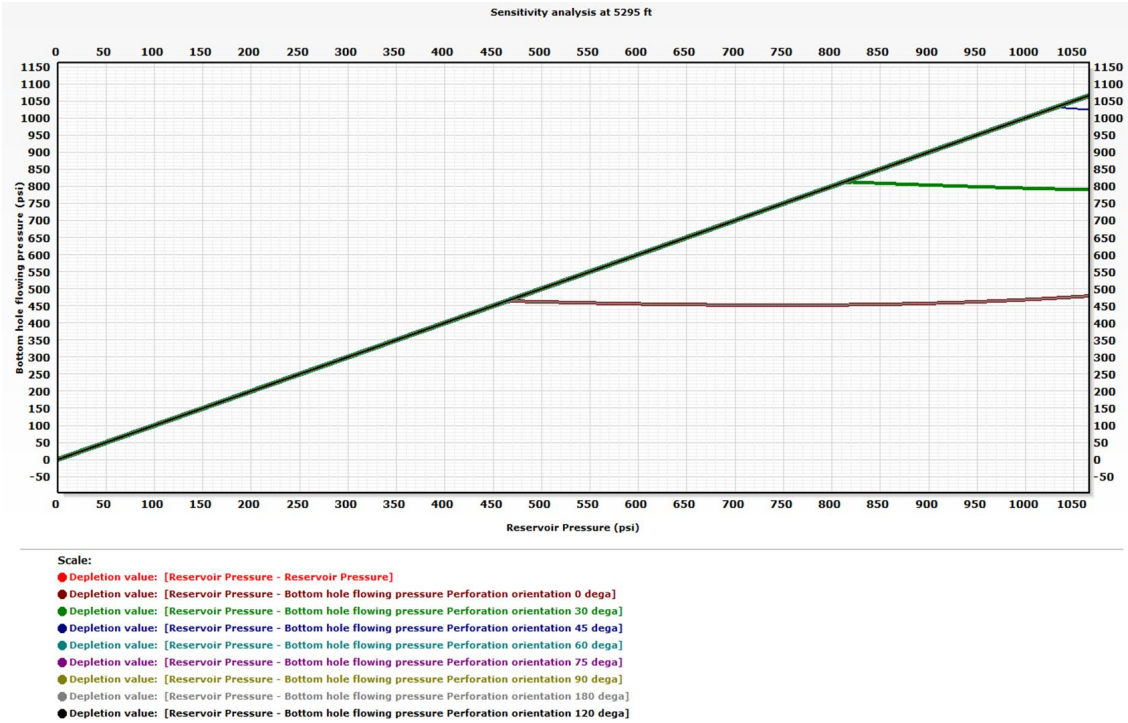


Oriented Perforation

Adjusting Azimuth of perforation to around 170 deg

Sand Free Operating Envelope For the Selected Orientation

Effect of Perforation Orientation on the Sand Free operating Envelop



Oriented Perforation

Technique

- Through Tubing Active Orientation
- Anti-Rotation Centralizer
- Relative Bearing
- Motor Sub
- Zero Phasing 4 SPF Gun.
- Strict Unloading Procedures.

Results

- Job Was Done in 2017
- Reservoir Pressure was 1300 PSI
- Immediate Gain ***300*** BOPD
- Between 2017 & 2022 Many Gauging Runs were done and looks Sand fill is not progressing .
- Current reservoir pressure is Less than 900 PSI and yet we safe Production to 600 PSI reservoir pressure.

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Q&A

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