



Weatherford®

Petroleum Consulting

Optimizing your unconventional
and conventional assets around the world



Global Expertise

Our Petroleum Consulting service deploys approximately 300 geoscience and engineering experts across more than 30 countries to help clients optimize their conventional and unconventional assets. We develop solutions tailored to your specific reservoir challenges, anytime within the E&P life cycle.

300
Consultants

30
Countries

300
Projects

Real Results

North America

Weatherford deployed a proprietary framework to reduce the duration of a well optimization study from several months to 3 weeks, and identified optimal well spacing that required fewer wells per section. This saved the operator more than US\$16 million.

North America

As part of a 15-client collaborative exploitation project in the Haynesville shale play, Weatherford provided detailed reservoir modeling and analysis for 70 geographically diverse wells. The information gained enabled the operators to accelerate development in each well.

Latin America

Weatherford well engineers and project managers successfully drilled and cased critical wellbore sections in multiple wells with challenging and hostile environments. This enabled the operator to mitigate unstable formations and loss zones.



A Multidisciplinary Approach

To maximize your reservoir potential, our Petroleum Consulting services include four distinct disciplines: Consulting Services, Interpretation and Processing Services, Real-Time Data Services, and Well Engineering Project Management.

PETROLEUM CONSULTING

Consulting
Services

Interpretation &
Processing Services

Real-Time
Data Services

Well Engineering
Project Management

North Sea

On a hydrate-frozen well, Weatherford recommended a hydrate-modeling-based solution that melted the hydrate plug and saved the operator more than 3 weeks of nonproductive time (NPT) and US\$10 million.

Middle East

Weatherford leveraged workflow automation to reduce deferred production on a closed-loop drilling operation, which achieved sustainable production increases for the client and averted the cost of facility upgrades.

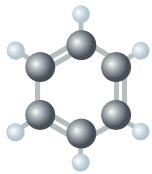
Asia Pacific

Weatherford used seismic interpretation to identify prospective drilling locations, which increased the operator's resource in place and potential to maximize the reserves.



Consulting Services

Consulting Services is a multidisciplinary network of engineers and geoscience experts who can solve the most challenging subsurface issues around the globe. With deep experience over a breadth of domains and a suite of differentiated technologies, we help answer critical questions over the life of an unconventional or conventional asset.



Are hydrocarbons present?



What are the economics?



How do we reduce time to first production?



How can we maximize recovery?



When should we sell or abandon the asset?

Real Results

Multi-Operator Collaborative Exploitation Project

Marcellus Shale

Weatherford used a collaborative exploitation project (CEP) model to facilitate data acquisition and sharing among participating operators. Our consultants created a data-sharing platform to enable collaboration, identify data gaps, and perform all data processing and analysis, field development planning, and resource/reserves progression. Insights gained led the operators to revise their drilling and completion practices—such as wells per section, completion design, and spacing—and contributed to significant cost savings and enhanced production.

Saved \$15 million

by drilling fewer wells per section,
as recommended in optimized completion
and well spacing plans

400 wells

underwent a performance evaluation
and reservoir- and rock-quality mapping

10x increase

in the number of wells from which
operators could collect data

Services:

- Prospectivity Analysis
- Reservoir Characterization
- Geo Prospect Analysis
- Geomechanics
- Field Development & Revitalization Planning
- Well Performance
- Enhanced Oil Recovery
- Reserves Progression
- Asset Optimization
- Economics & Risks Analysis
- Unconventional Reservoir Consulting
- Joint Industry Projects



Real Results

Well Spacing

Llanos Basin – LatinAmerica

After the operator had drilled 40 prospecting wells, we assessed three geographical areas. Because of our proprietary framework, the study lasted 3 weeks rather than several months. As a result of our assessment, we identified optimal well spacing and advised the operator to drill four to six wells per section instead of the previously planned eight wells per section. This saved a total of eight wells, or US\$64 million, while resulting in the same estimated ultimate recovery (EUR)—but with significantly higher net present value.

**3-week
study duration**

compared to several months

**25% to 50%
reduction**

in the number of wells drilled per section

Saved \$64 million

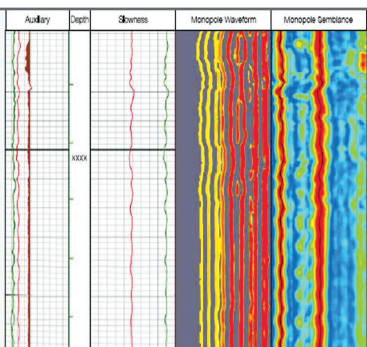
in undrilled wells

Interpretation & Processing Services

Weatherford is a premier provider of formation evaluation solutions that inform critical operational decisions and help you monitor, understand, and optimize the performance of your well.

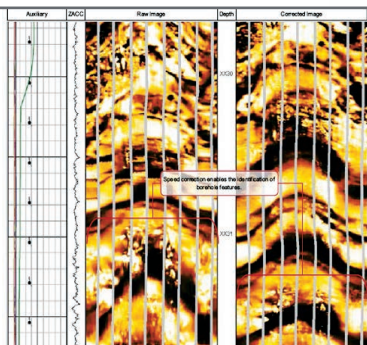
Answer Products

Our portfolio of answer products combines the technical expertise and experience of our consultants with the intellectual property of our R&D department. They give you valuable insight into your reservoir for defining reservoir and petrophysical properties, planning completion and production, and maintaining well integrity.



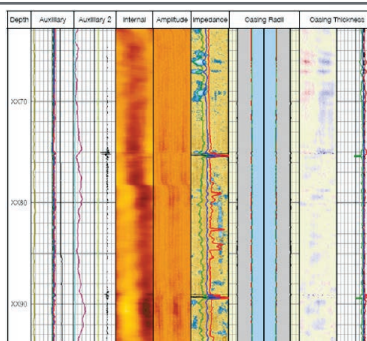
Acoustic Logging Services

- Optimize hydraulic fracturing
- Maximize wellbore stability
- Mitigate sand production
- Derive primary porosity, which is critical to determining production potential and to identifying fluids in the reservoir



Borehole Imaging

- Interpret images obtained from either our wireline or logging-while-drilling (LWD) technologies
- Reveal fracture dynamics for both natural and pre-treated fractures using microseismic mapping
- View the wellbore in multiple ways, even in unconventional environments such as heavy-oil and horizontal wells



Well Integrity Threat Identification

- Get a complete measurement suite that includes industry-leading technologies, analysis tools, and evaluation expertise
- Uncover problems that conventional technology may not detect
- Discover the extent of well risks from surface to total depth, and identify the most secure, cost-effective way to remediate them



Real Results

Accurate Interpretation of Structural Bedding Dip and Identification of Strikes and Dips of Faults

Llanos Basin

The operator sought to develop the field safely and efficiently despite the presence of faults and a lack of geological control, which required advanced LWD azimuthal imaging and interpretation to inform well placement. After azimuthal LWD imaging services helped identify the geological structural behavior, the operator was able to place an additional five wells according to geological constraints to maximize production and the profitability of the project.

0 lost-time incidents

incurred

2-week turnaround

on LWD imaging services

100% pay zones

logged

Services:

Geology

- Geological Interpretation
- Fracture Characterization
- Depositional & Stratigraphic Interpretation

Geomechanics

- Rock Properties
- Borehole Stress Analysis

Petrophysics

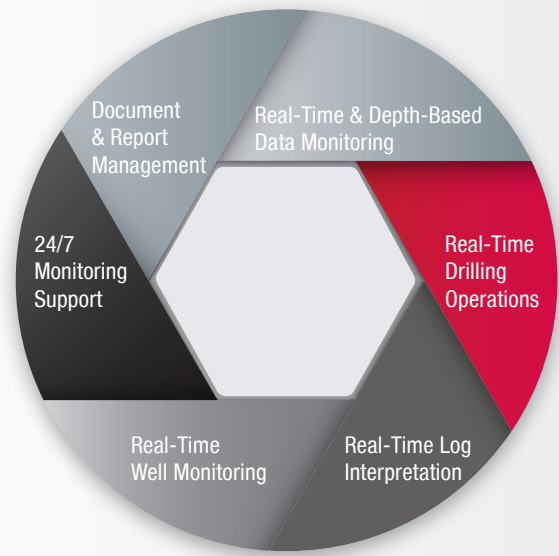
- Petrophysical Interpretation
- Acoustic Slowness
- NMR Interpretation
- Unconventional Analysis

Well Integrity

- Casing Integrity
- Cement Integrity

Real-Time Data Services

Our Real-Time Data Services (RTDS) integrates formation evaluation and drilling optimization data across a common, web-enabled platform. Real-time data enables you to make accurate, time-critical decisions that help avoid potential hazards, manage costs effectively, and optimize performance.



Key Features

Secure
Best-in-class security

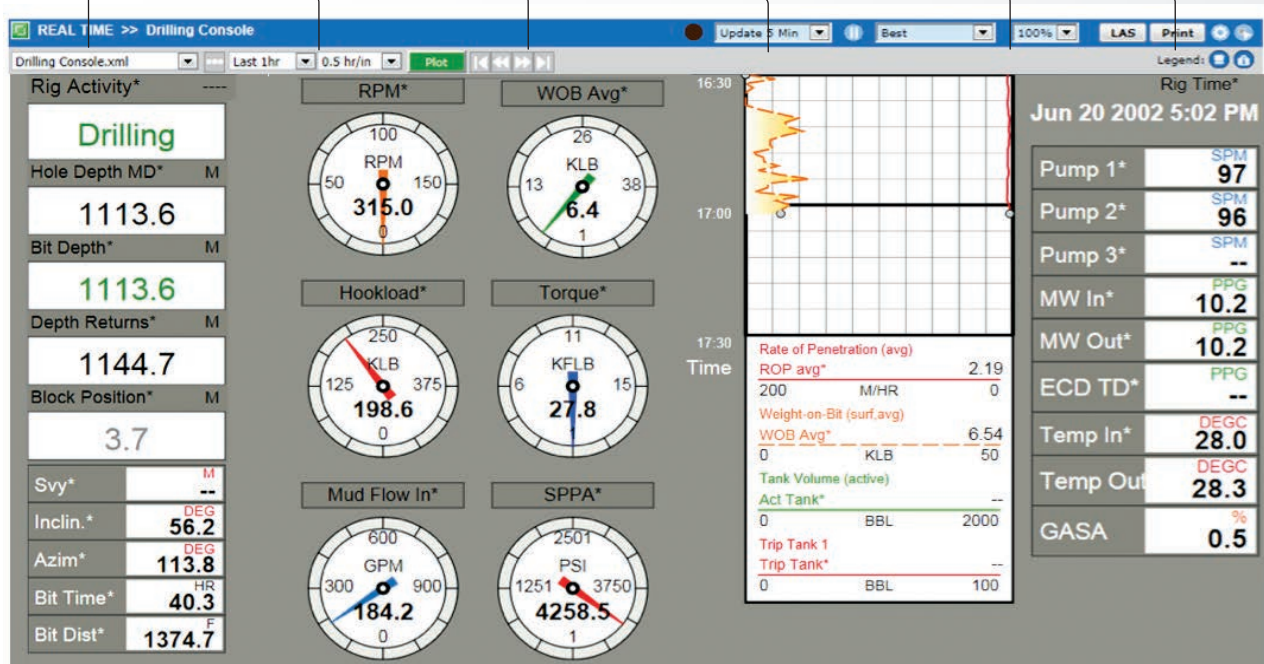
Store and Categorize
Both WITSML and WITS converted data

Expert Assistance
24/7 Weatherford support

Real-Time Solution
Integrated data streams can be viewed in a secure, redundant, and globally accessible environment through a web browser

Reliable Access
Proven technology that operates effectively even in remote locations with low bandwidth connection

Browser Neutral
Supports three browsers: Internet Explorer, Chrome, and Safari



Well Engineering Project Management (WEPM)

Our service to you is about more than offering technology. We also acquire an in-depth understanding of your challenges and deploy sound engineering principles to develop custom technical solutions. This process allows for informed decision-making, proper well planning, and enhanced service delivery and execution.

WEPM Services

We approach each project with a framework that encompasses all critical well engineering needs, from exploration to execution.

Explore Engineering

- FEED Studies

Engineer Well Solutions

- Hazard Risk Mitigation & Elimination
- Geomechanics

Well Re-engineering

Project Management of Well Delivery

- Initial Optimized Planning
- Final Project Execution

Real Results

**Solution for a Series
of Problem Wells**
Offshore Latin America

**Saved
\$80 million**
in reduced drilling-related NPT

**Delivered
4 hole sections**
in multiple wells previously
deemed undrillable

**100% unstable
or fluid-loss
zones drilled**
with our engineered MPD solutions

Unconventional Capabilities

We understand the challenges associated with developing and producing from unconventional reservoirs, and we know how to overcome them. From deciding where and how to drill through heterogeneous formations to reach sweet spots, to selecting the most effective stimulation method and responding to wide production variances, unconventional plays are complex, costly, and consume a large amount of your resources—and margins can be slight. Maximizing shale recovery calls for a skillful balance between minimizing costs and optimizing well productivity—and we deliver.

Weatherford draws on our shale expertise—honed through extensive experience in major North American plays—to optimize recovery while reducing costs. We have managed full-scale collaborative exploitation projects (CEPs) and other related projects for operators in the Marcellus, Haynesville, and Montney shale plays. Additionally, we have provided services for operators in the Barnett, Eagle Ford, Fayetteville, Granite Wash, Horn River, and Woodford plays.

We help operators maximize their return on investment in unconventional plays through multiple services: evaluating asset potential, optimizing well spacing, design completions, hydraulic fracturing, and informing full-field development strategies.

Understanding Unconventionals

Achieving the necessary balance between costs and production requires accurate data and expert analysis for answering critical questions, such as:

- Where should we drill?
- How can we optimize the landing point?
- How can we keep the well in zone?
- How do we characterize the reservoir?
 - Which are the best sections to frac?
 - How many to frac?
 - How many stages?
- How can we best measure frac performance?
- Should we refrac?
- What is the initial production of the well?
- How do we monitor the production profile?
- How can we use experience for future development decisions?

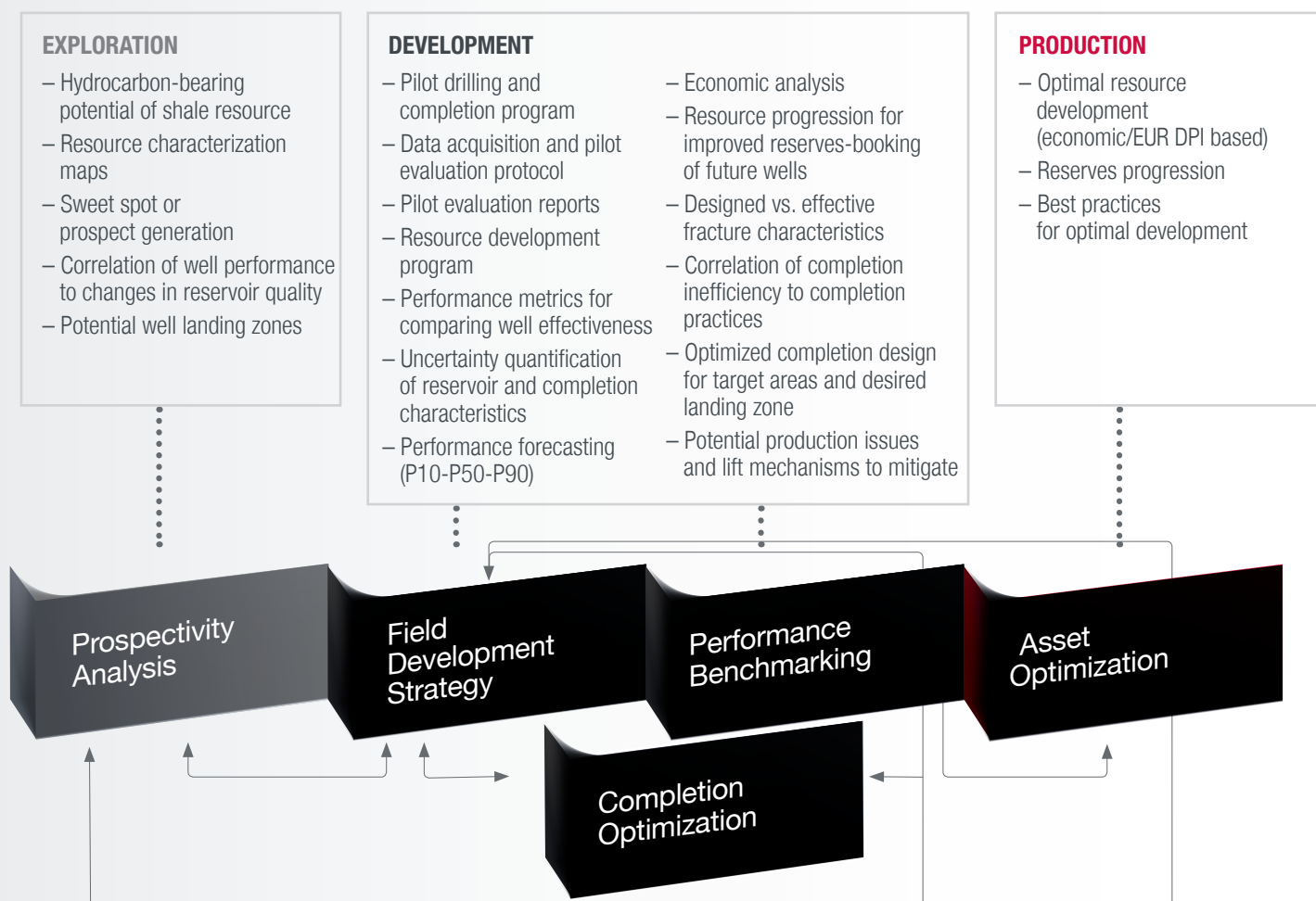
Weatherford Shale Analysis Framework

Our proprietary Weatherford Shale Analysis Framework (WSAF™) encompasses the entire life cycle of your shale well. We collect, integrate, and analyze asset-wide data to improve production and capital efficiency. Armed with this information, you can optimize well placement; improve well design, construction, and completions; enhance your recovery; and positively impact your economics. We're here to advise you along each step of exploration, development, and production, and to manage all the complicated moving parts necessary to extract your valuable hydrocarbon resources and bring them to the surface efficiently.

We have successfully deployed the WSAF in multiple shale plays across North America, including the Haynesville, Marcellus, Woodford, and Montney plays.

The Weatherford Shale Analysis Framework helps asset teams:

- Reduce the number of appraisal or experimental wells needed to evaluate a completion design
- Shorten the field development planning cycle
- Improve capital efficiency



For more information about how Petroleum Consulting can help you overcome your reservoir challenges, visit **weatherford.com/petroleumconsulting** or email **consulting@weatherford.com**.



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