



# D520: Coastal, Deltaic and Shallow Marine Clastic Reservoir Characterisation (*Distance Learning*)

Tutor(s): Stuart Archer, Gary Nichols, Ron Steel

2 Days

Competence Level:  
Skilled Application



Virtual Course

## Summary

**Business Impact:** A better understanding of these depositional systems will lead to **improved exploration risking of reservoir presence and quality**, and **add value during reservoir appraisal and development**.

Clastic successions in coastal, deltaic and shallow marine settings are controlled by sediment supply characteristics, the interaction of fluvial, wave and tide processes and sequence stratigraphic context. The sandy sediment bodies that can be formed in these settings are very variable in dimensions, internal heterogeneity and connectivity resulting in a complex array of reservoir types and characteristics. A better understanding of these depositional systems can lead to improved exploration risking of reservoir presence and quality, reservoir appraisal and development.

This course uses modern and ancient analogues and a series of case studies of successful paralic fields in these depositional settings to provide a users guide to reservoir characterisation.

## Learning Outcomes

Participants will learn to:

1. Recognise how sediment supply and accommodation control sequencing at a large scale.
2. Contrast how fluvial, tidal and wave processes help to determine the characteristic of coastal and deltaic successions.
3. Interpret paralic and shallow marine successions in terms of the effect of tidal ranges and storm processes.
4. Appreciate the controlling factors on 3D geometry and internal heterogeneity of reservoir sandstone bodies formed in these settings.
5. Recognise how a sequence stratigraphy provides a predictive framework for the distribution of facies and stacking patterns.
6. Understand how key characteristics of these reservoir units can be recognised in core, well-log and seismic profiles.

## Duration and Training Method

A virtual classroom course divided into 4 webinar sessions, comprising lectures, discussion, case studies, and practical exercises to be completed by participants during and between sessions.

## Who Should Attend

The course is structured to appeal to all geoscientists who wish to broaden and deepen their knowledge of clastic reservoirs formed in coastal, deltaic and shallow marine settings. The course will provide an effective working knowledge of these systems for all geoscientists and provides further insights to those who require a more detailed application to subsurface projects.



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## Prerequisites and Linking Courses

There are no prerequisites for this class, although a general understanding of clastic sedimentology is assumed.

Related field courses are N011 (High Resolution Sequence Stratigraphy: Reservoir Applications (Utah, USA)), N096 (Recent Depositional and Stratigraphic Analogues for Fluvial and Shallow Marine Reservoirs (South Carolina, USA)), N432 (Clastic Reservoir Characterisation for Appraisal and Development (Southern Pyrenees, Spain)), and N499 (Shallow Marine Reservoir Analogues and their Application to the Jurassic of the North Sea (Isle of Skye and Raasay, UK)).

For those looking to apply and build upon the learnings of this course, the following courses and workshops may be of interest: D385 (Workflows for Seismic Reservoir Characterisation (Distance Learning)), D412 (A Critical Guide to Reservoir Appraisal and Development (Distance Learning)) W011 (North Sea Reservoirs Series - New Perspectives on North Sea Plays), W013 (North Sea Reservoirs Series - Devonian Reservoirs Overview), W017 (North Sea Reservoirs Series - Triassic Reservoirs Overview).

## Course Content

The principal clastic depositional systems in coastal, deltaic and shallow marine settings will be considered in terms of process controls that determine reservoir setting and characteristics. Evidence from modern depositional settings, surface exposures and subsurface data will be used to develop a framework for interpreting and predicting the sediment body geometries and internal heterogeneities of these depositional units.

Case studies from working petroleum systems from around the world in successions deposited in these settings will be used to illustrate how the data sets may be interpreted and used for predictive reservoir characterisation.

### Key topics

- Sediment supply characteristics: how the nature, volume and rates of supply of clastic material through rivers controls the form and distribution of sediment bodies in coastal and deltaic settings.
- Sequence stratigraphy: variations in sea level, their magnitude and the effect of different bathymetric configurations impact on sediment body distributions.
- The controls on and spatial arrangement of tidal currents that determine how sediment is redistributed at coasts, on deltas and most importantly in shallow seas.
- The role of wave activity in shoreline settings and storm episodes in shallow seas as effects on sandstone characteristics and reservoir quality.
- Examples of modern depositional environments that provide insights into the processes and products in these depositional settings.
- Outcrop examples, to illustrate sediment body geometries and depositional characteristics and provide analogues for subsurface studies.
- Seismic, core and well-log data from case studies which provide guides to how data can be



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interpreted in terms of reservoir characterisation. These data will form the basis of a series of exercises that will form part of the course.

## Planned Schedule

### Session 1 - Introduction

- Getting to know you
- Introduction to paralic reservoir characterisation and key concepts.
- Ice breaker exercise - Delta types from google earth.
- 15 minute break.
- The importance of big rivers in the delivery of sediment to clastic shelves.

### Session 2 - Shallow Marine Fundamentals

- Shallow marine fundamentals (1): small scale process and product, including a short exercise on facies.
- Shallow marine fundamentals (2): reservoir characterisation considerations.

### Session 3 - Shallow Marine Fundamentals

- Shallow marine fundamentals (3): an introduction to sequence stratigraphy and its pragmatic deployment in shallow marine reservoirs.
- Shallow marine fundamentals (4): large scale sequencing and allogenic controls (e.g. greenhouse vs. icehouse, high vs. low subsidence and high vs. low sediment supply), including a short exercise on sequence stratigraphy.

### Session 4 - Current themes & case studies

- Transgressive shoreline successions (Eocene of the Barito Basin, Borneo).
- Shallow marine reservoirs in active half grabens (Middle Jurassic of Skye), including two short exercises.
- A comparison of delta types from the Cretaceous Interior Seaway (Cretaceous of Utah and Wyoming etc.), including an exercise on well log signatures through wave, tide and river dominated deltas.

### Session 5 - Current themes & case studies (continued)

- Shelf sand ridge reservoirs generated by tides & storm waves and stratigraphic trapping potential (examples from the Yellow and Celtic Seaways, the Norwegian Sea and the North Sea; recognition and application to stratigraphic record).
- Tidal shelf sand ridges and stratigraphic trapping potential (Eocene of the Pyrenees).
- Implications for Exploration and Production (with oil field examples and insights from the participant group).
- Summary and conclusions.