

*Depth migrated profile  
overlay by interval velocities (gravel above clay).*

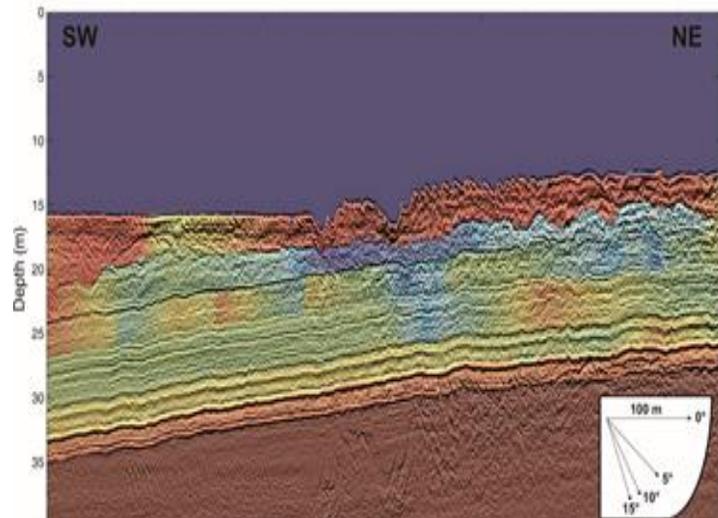
## Quantitative Imaging

Derive useful quantitative information about the nature of the seabed and near-surface sediments to aid offshore construction and geotechnical engineering.

Amplitude, phase, and frequency content of seismic reflection data contain quantitative information regarding the nature of the seabed and near-surface sediments.

SAND have developed techniques tailored for application to very-high-resolution seismic reflection data acquired using Pinger, Chirp, Boomer, Sparker and small Airgun sources.

Derive and map bulk elastic properties, such as: acoustic impedance; P-wave velocity; bulk density; and porosity.



### 1. Interval Velocities

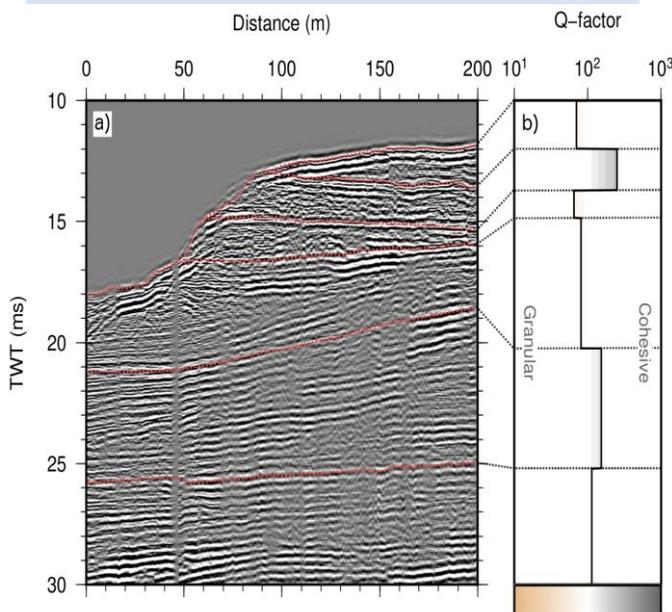
High-resolution interval velocity model building for detailed pre-stack depth migration and sediment discrimination (image above).

### 2. Q-Factor Quantification

Providing useful information about the compressibility of near-surface sediments, Q-Factor can differentiate between granular/cohesive sediments units (image left) and provide gas saturation estimates for shallow gas fronts.

### 3. Seismic Inversion

SAND's in-house QSI software utilises a unique stochastic seismic inversion procedure to accurately model the sub-surface acoustic impedance from single or multi-channel seismic reflection profiles. Further machine learning can be used to derive a variety of bulk elastic, lithological, and geotechnical properties, allowing spatial characterisation controlled by seismic reflection data rather than interpolation of sparse borehole/CPT data (see reverse).



## Key Features

- Improved confidence → Lower risk
- Added-value – can apply to existing data
- Built in QC of input data sets
- Improved interpretability & accuracy
- Quantitative not qualitative results
- Best model with statistical confidence limits

All three QI methods benefit from rigorous assessment of the statistical confidence of the final outcome. SAND therefore provides both a 'best' model and associated 95% confidence limits on all quantitative deliverables.

## Geotechnical Properties

Utilising cloud computing, SAND's Neural Network based workflow can derive geotechnical properties from seismic reflection data calibrated against minimal coincident CPT information.

Allows critical geotechnical properties to be mapped across whole site using seismic reflection data. Provides more flexibility and confidence for engineering design, foundation and cable route planning, by identifying areas that will need further site investigation and those where it is not necessary.

Mapping of:

- CPT tip resistance and sleeve friction
- Drained versus undrained behaviour
- Undrained shear strength
- Relative density

