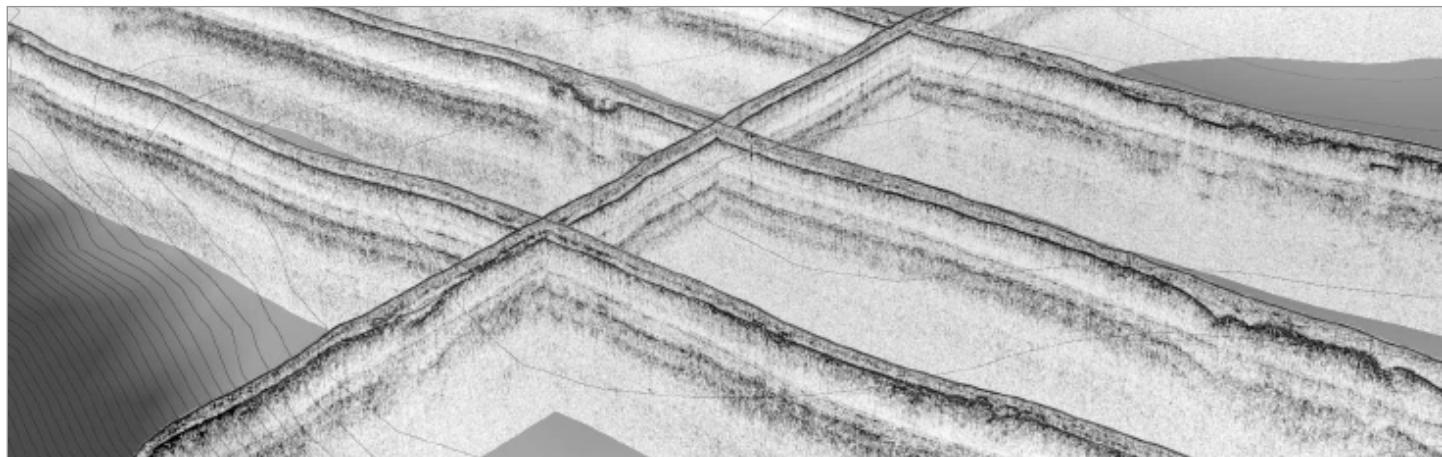
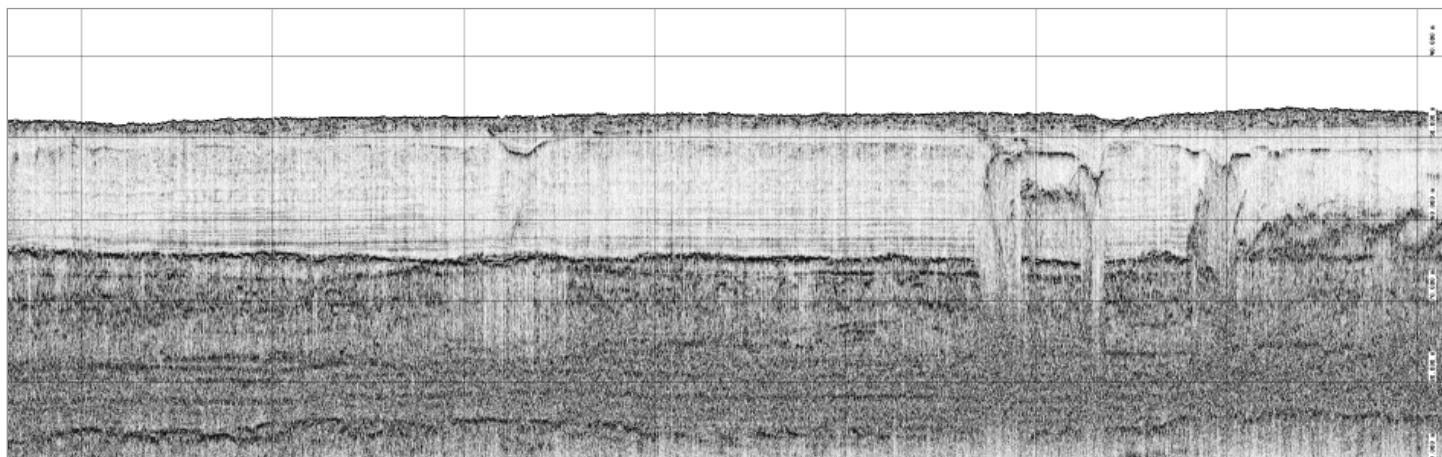


Echoes Series & Delph software

Sub-bottom profiler solution.
iXblue optimized way to gather
geophysical Georeferenced Data



FEATURES

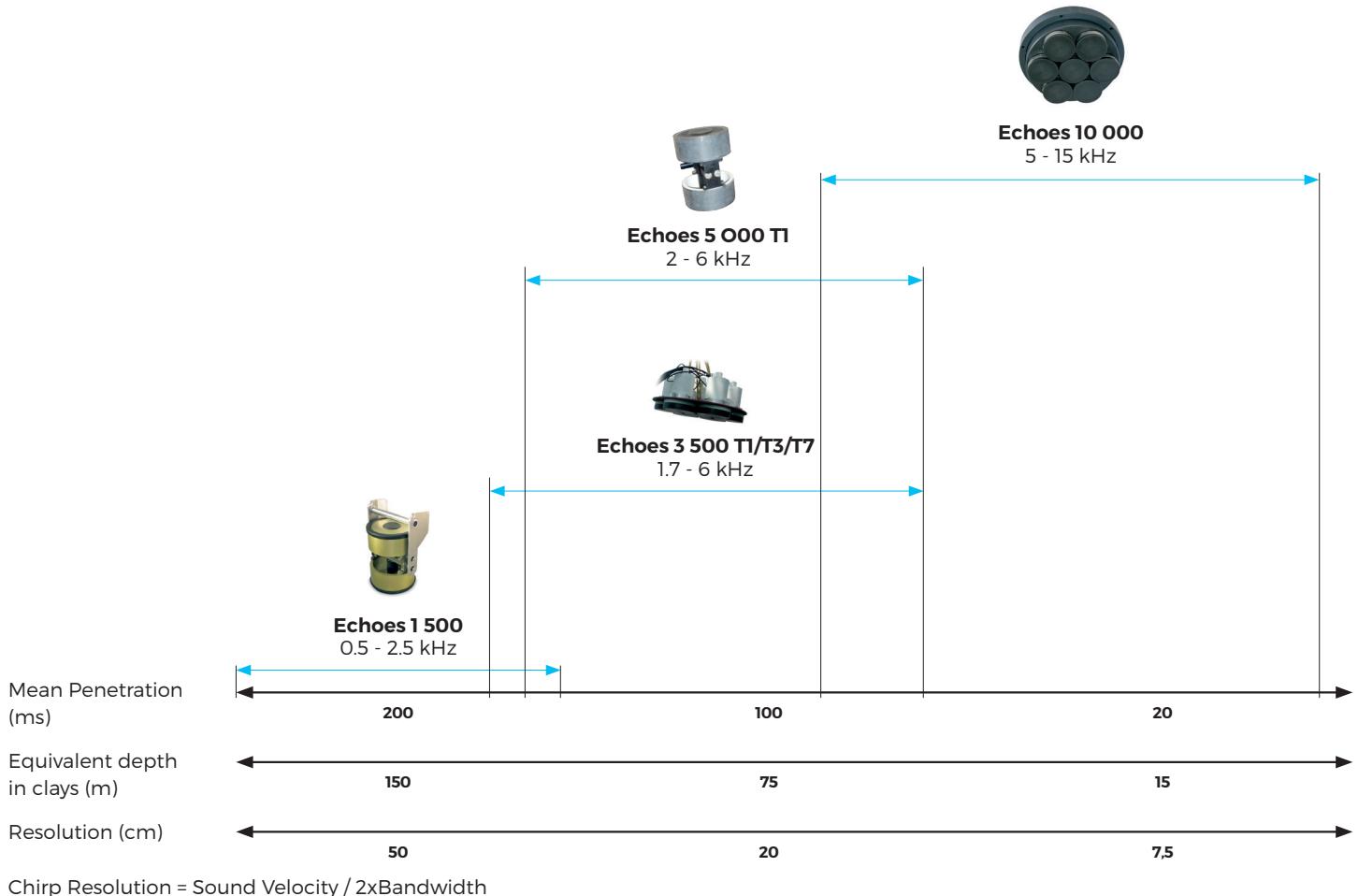
- Any integration:
Hull or Pole Mounted, Towed
or Autonomous Vehicle integrated
- Any application:
Geosciences, Geo-Archaeology, Dredging,
Offshore Energy

BENEFITS

- The widest spectrum coverage
(150Hz-15kHz Transducers)
- True Flat Bandwidth Ultimate resolution capacity
& power efficiency
- Optimized processing and data interpretation software

PRODUCT RANGE

Echoes product range



Software

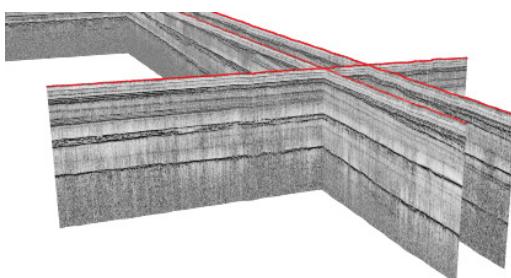
Analog Single/ Multi-Channel Seismic

Delph Analog Acquisition Unit
1 to 24 channels
High-resolution analog seismic –
Sparkers – Boomers – Airguns –
Marine geology – Geophysical Survey



Acquisition & Interpretation Software

Delph Acquisition Raw data logging, QC
Delph Interpretation Processing, Interpretation, Mapping



APPLICATIONS

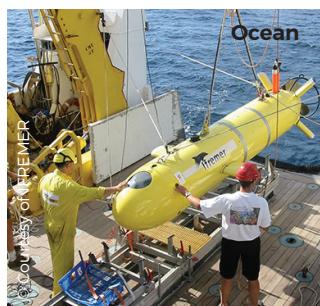
Marine/lacustrine geosciences - Paleoclimate

ECHOES 5 000

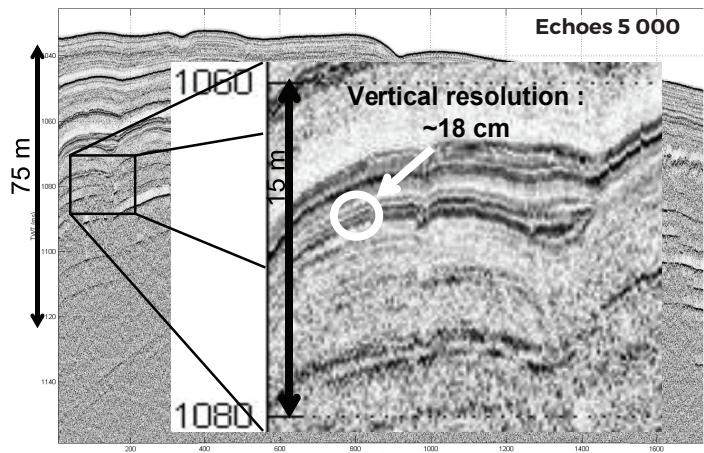
- **Frequency:** 2000-6000 Hz
- **Array:** 213/291 mm (diam x H)
- **Weight (air/water):** 11/7 kg
- **Set-up:** Pole & Tow-Fish
Mounted, AUV/ROV
- **Resolution:** 18 cm
- **Mean penetration:** 50 m

Relevance

- High-resolution seismic reflection profiles
- Operable from shallow to deep waters
- Sedimentary dynamics related to:
 - Hydrological variability,
 - Geo-hazard,
 - Flood,
 - Earthquake,
 - Tsunami,
 - Erosion,
 - Anthropisation, etc.



Lake



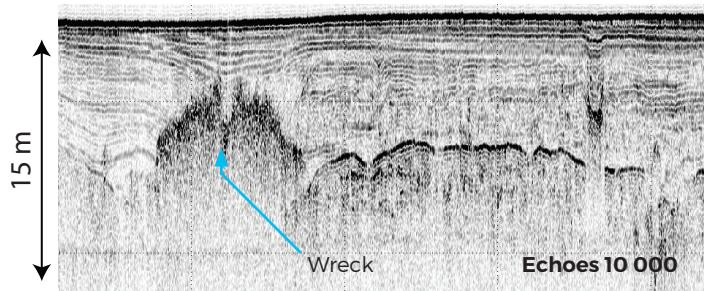
Archaeology & Geo-Archaeology

ECHOES 10 000

- **Frequency:** 5000-15000 Hz
- **Array:** 380 x 191 mm (diam x H)
- **Weight (air/water):** 26/12 kg
- **Set-up:** Pole/Hull-Mounted
- **Resolution:** 8 cm
- **Mean penetration:** 20m

Relevance

- Identify artefact buried in sediments
- Designed for shallow waters
- High-resolution seismic reflection profiles for:
 - submerged prehistoric archaeology,
 - estimation of site volume,
 - post-excavation interpretation,
 - sedimentary processes.



APPLICATIONS

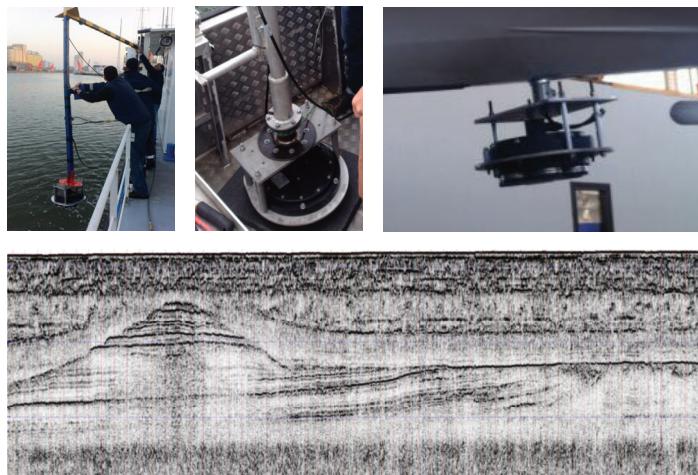
Pre & post dredging

ECHOES 10 000

- **Frequency:** 5000-15000 Hz
- **Array:** 380x191 mm (diam x H)
- **Weight (air/water):** 26/13 kg
- **Set-up:** Pole/Hull-Mounted
- **Resolution:** 8 cm
- **Mean penetration:** 20 m

Relevance

- High resolution seismic reflection profiles
- Operable from shallow to deep waters
- Stability and distribution of sediments
- Nature and volume of sediments to be dredged
- Estimation of consistency and strength of sediments using Delph software



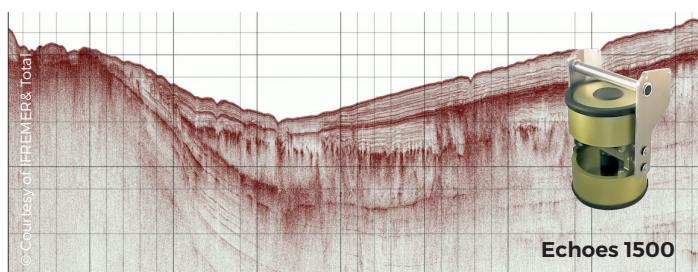
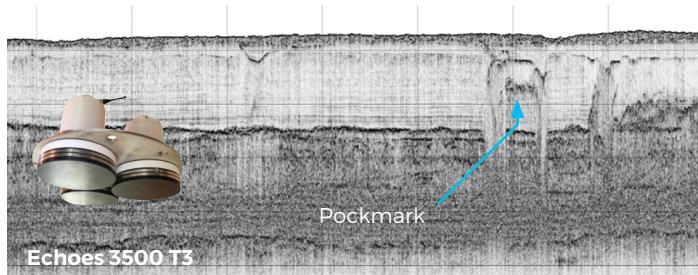
Offshore energy

ECHOES 3500 T3 // 1500

- **Frequency:** 1700-5500 // 500-2500 Hz
- **Array:** 680x384 // 455X584 mm (diamxH)
- **Weight (air/water):** 161/120 // 90/60 kg
- **Set-up:** Pole/Hull Mounted // Fish, Tow-fish, AUV, ROV
- **Resolution:** 20 // 50 cm
- **Mean penetration:** 50 // 100 m

Relevance

- 3500 // 1500: shallow to -medium // - full ocean depth
- Nature and structure of the first 300 meters of sediments
- High-resolution seismic reflection profiles for:
- Marine platforms implantation,
- Route/boulder clearance,
- Pockmark detection,
- Seabed roughness,
- Bedrock depth.
- Geo-acoustic inversion modeling



FOCUS ON IXBLUE TECHNOLOGY

Echoes Natural Frequency beam opening Vs Parametric system

CASE STUDY 1: GEOLOGICAL STRUCTURES

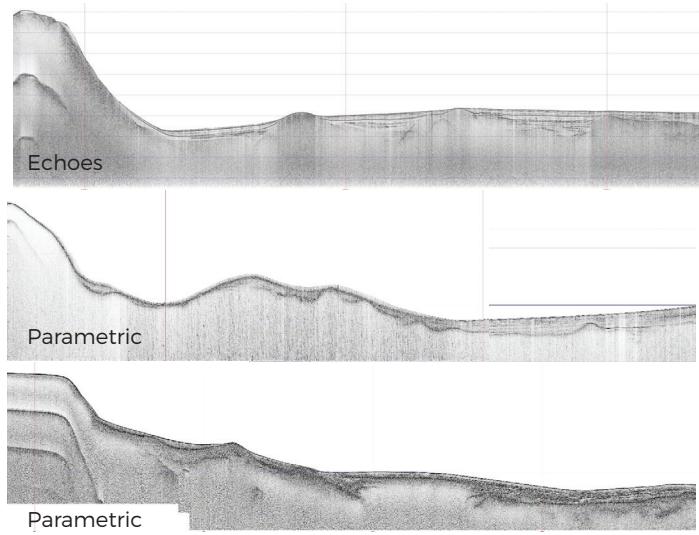
Parametric 3.5°



CHIRP 15° to 20°

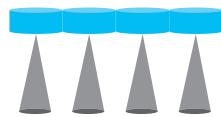


Whether through rough weather or environmental conditions, Echoes performs equally in without performance degradations.

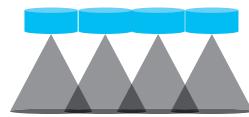


CASE STUDY 2: BURIED OBJECT

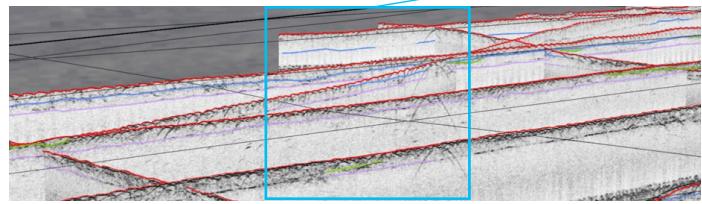
Parametric 3.5°



CHIRP 15° to 20°



15° to 20° aperture with CW short signal at 10 Hz makes rings pipe lauder.



ECHOES

Penetration in sediment

- Full power on the primary frequency in the range 1.5kHz to 15kHz (shallow water models)
- Processing gain function of the bandwidth & SNR function of pulse duration

Vertical resolution is function of the pulse acoustic bandwidth:

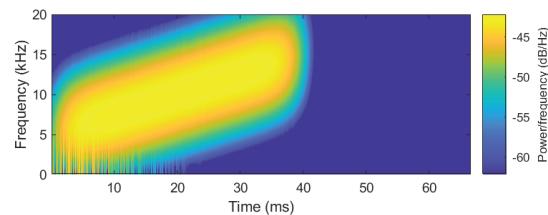
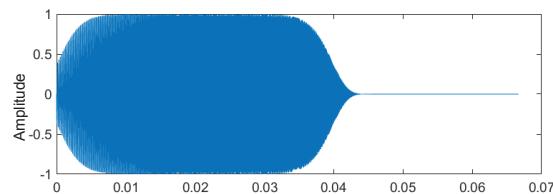
- Bandwidth must be considered at -3dB (efficient power)
- Output level must be linear on the total bandwidth (low distortion)

Horizontal resolution is function of the directivity, pulse rate, vessel speed

- High repetition rate
- Average beam directivity (Single / multi-transducer): 10° – 30°

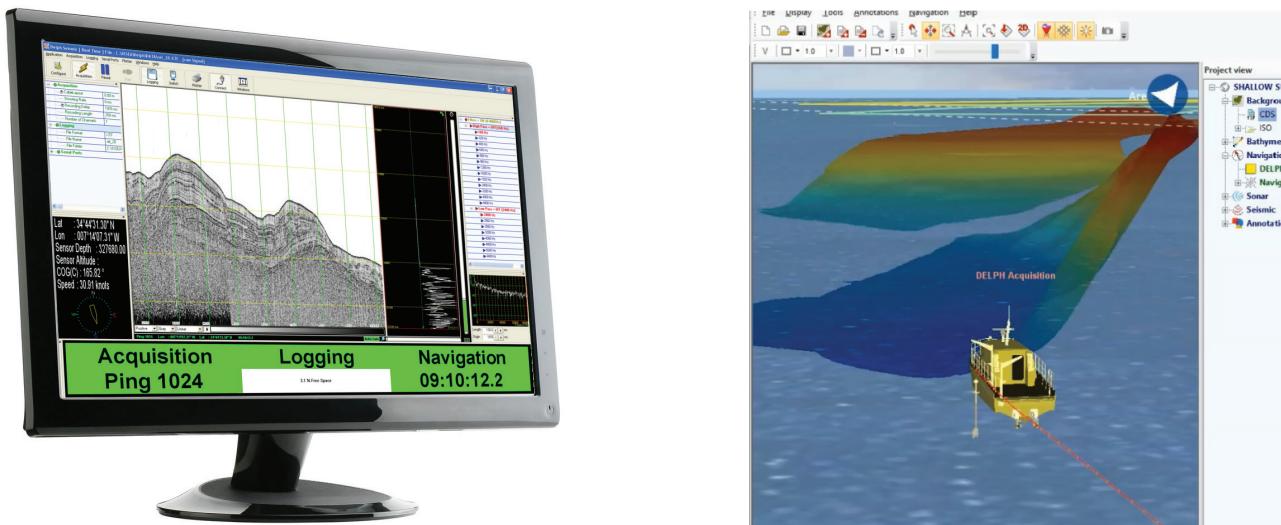
Echoes equipment mobilization

Mechanical: Pole mounting	30'
Wiring: System interconnection	10'
Positioning: Lever arms with MRU & GPS	10'
Software: Echoes & Delph set-up	10'
Total mobilisation time	1 hour

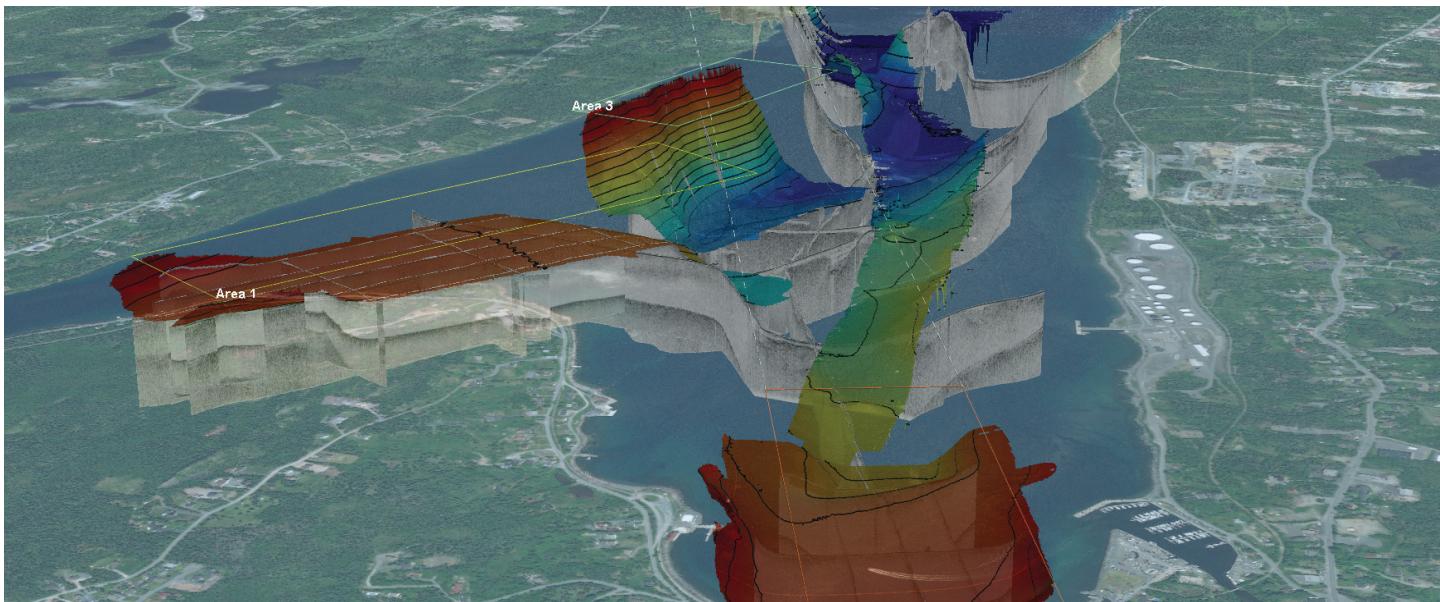


IXBLUE SOLUTION ON THE FIELD

Acquisition & real time monitoring software



3D SBP data processing, interpretation, mapping software



I - Portable & Plug & Play Sensors

II - Perfect geo-referencing

III - Multi-sensor & High-resolution data

IV - Industry standard data formats

V - Efficient data processing

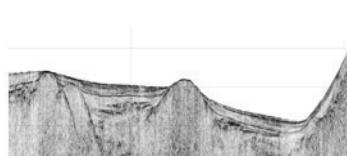
I.



II.



III.



IV.



V.

