



Advancing Offshore Wind Data Management Strategies for Nova Scotia

Nova Scotia Offshore Wind R&D Forum 2025

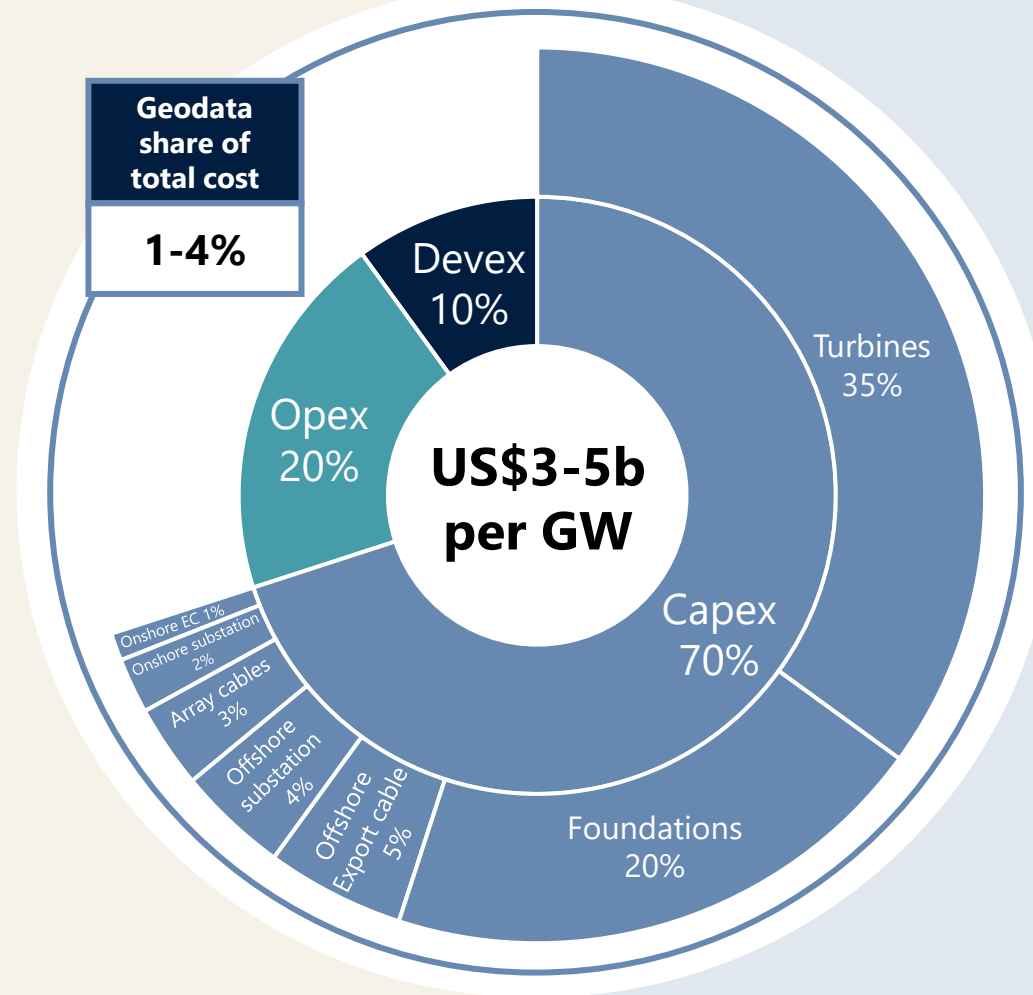
Kevin Smith, PG Principal Geoscientist

Geo-Data Value to Wind Farm Development

Cost breakdown for a typical wind farm

What geo-data provides

- Site screening studies
- Wind, wave and current measurements
- Seabed composition and characteristics
- Earth models
- Marine ecology studies
- Interpretative analyses and insights
- Engineering design inputs
- Construction risk mitigation
- Asset condition surveillance
- Biodiversity monitoring



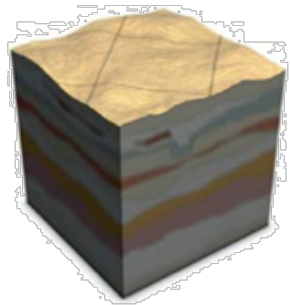
What geo-data influences

- Wind resource quantification
- Turbine selection
- Foundation and cable design
- Floater and mooring selection
- Development consent applications
- Layout optimisation
- Business cases and decision making
- Operational planning
- Maintenance regimes and budgets
- Asset performance and lifespan

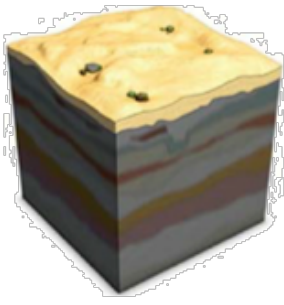
Earth Model Evolution

Geo-data collected through complimentary, iterative phases that build an Earth model

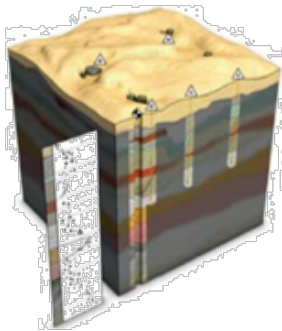
- Atmosphere, water column (waves & currents), seafloor and sub-seafloor
- Define existing and project lifetime conditions
- Planning, design, construction, and operation of wind farm



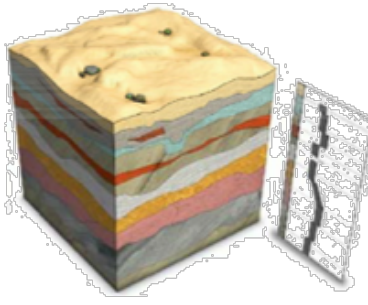
Desktop Study



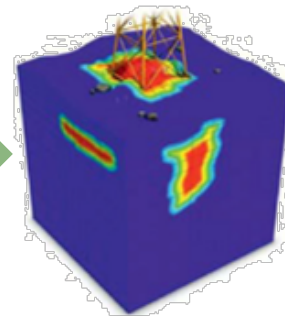
Geophysical
Surveys



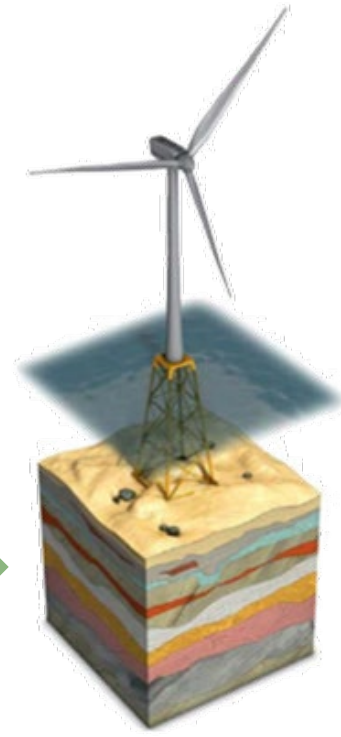
Geotechnical
Investigations



Laboratory
Testing



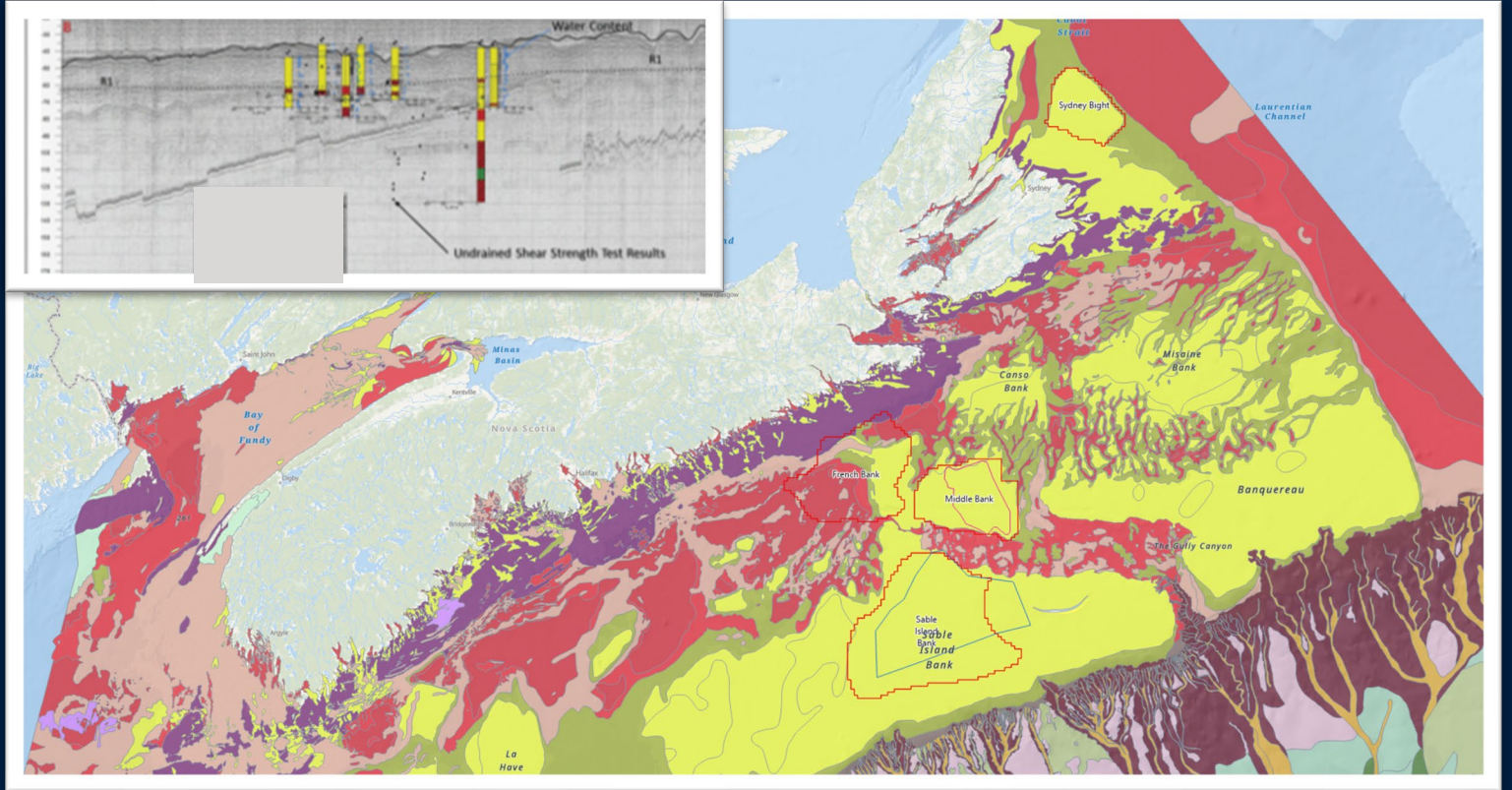
Engineering
Analyses



Optimized
Ground Model

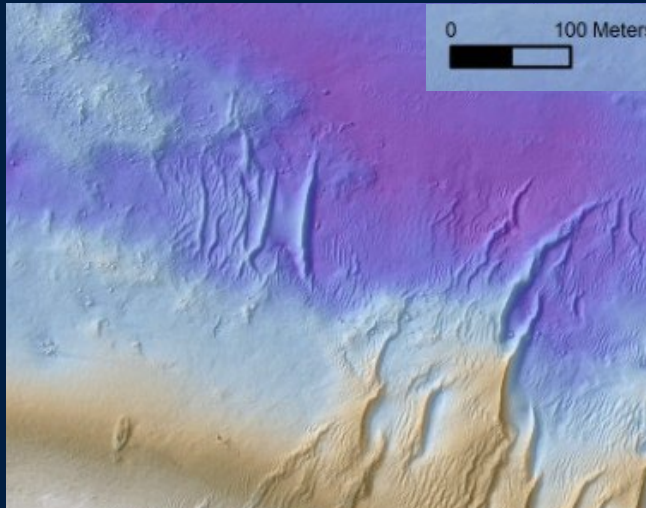
Early Site Screening Activities

- Desktop studies: existing data and information
- Government funded surveys
- Define initial framework and constraints
- Foundation concept screening and risk register



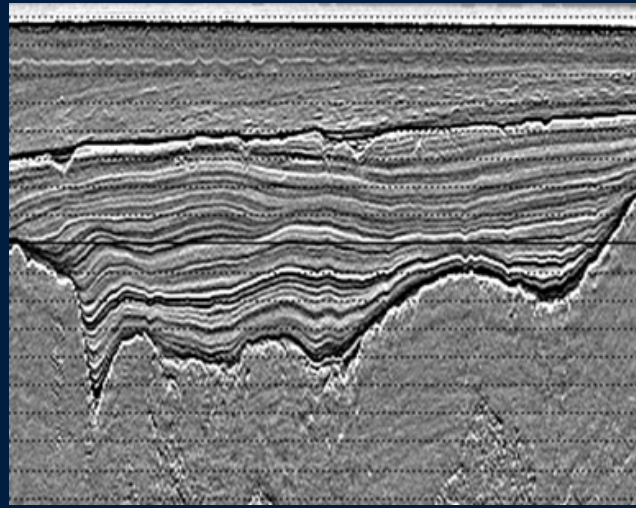
Site Characterization and Design Stages

Geophysical and Geotechnical Investigations



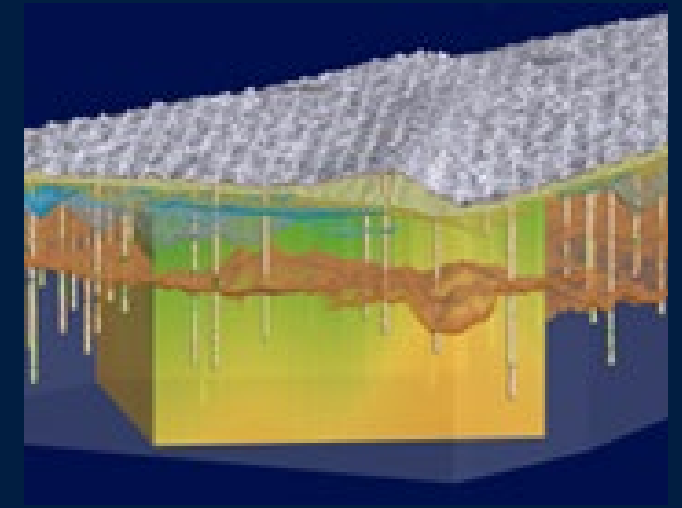
Seafloor mapping

- High resolution
 - 0.25m multibeam
 - 0.1m side scan
- Machine learning interpretation
 - 1.8million boulders mapped on one site



2D or 3D Seismic Reflection

- 0.2m vertical resolution
- Revolutionizing engineering surveys

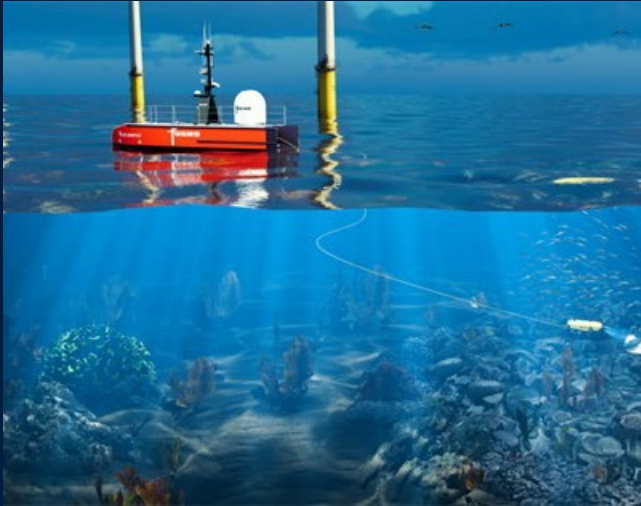


Quantitative Integrated Ground Model

- Seismic inversion
- Multiple geotechnical parameters
- Machine learning
- Voxel 3D ground models

Operational and Regulatory Review Stages

Biodiversity Surveys and Asset Inspection Surveys



Biodiversity Surveys

- Monitoring benthic changes
- Uncrewed vessels
- eDNA, 3D photogrammetry, ML



Asset Inspection Surveys

- Scour protection
- J-tubes
- Cable burial
- *Remote Operations Center St. John's, NL*



Data Management

- Project stakeholders
- Regulatory reviews
- First Nation, Fishers
- 30 to 60 TB data
- Need guidance documents, some data standards exist



How will this data be managed, reviewed and disseminated?

From paper copies to data viewer and management systems

Offshore Wind: A VirGeo® Case Study

“In fewer than nine months, the site has provided over 200 users access to over 45 TB of geodata and more than 11,000 documents and supporting files through interactive spatial displays *enabling informed decisions earlier in the development process*. As of January, BOEM staff have joined the user community allowing the government regulators to view and manipulate the same information as project engineers – increasing transparency, building public trust, and streamlining review and construction”

*Embracing Digital Transformation
Sea Technology April 2022*



A photograph of an offshore wind farm at sunset. The sun is low on the horizon, creating a bright orange glow that reflects on the water. Several wind turbines are visible, their silhouettes standing against the colorful sky. The water is calm, with gentle ripples.

fugro

Unlocking Insights
from Geo-data

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