Unveiling the Seafloor: A Novel Integrated Approach to Cable Route Characterization

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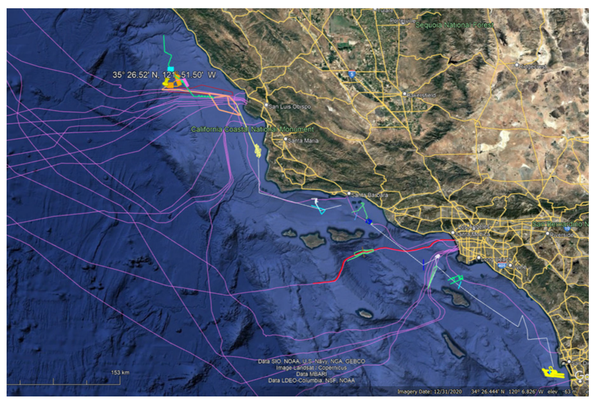
Smarter Data = safer routes, faster timelines, and lower costs.

This new paradigm unlocks AUV-level subsea imaging—without the autonomous underwater vehicle (AUV). By leveraging hull-mounted systems and patented techniques, project teams gain unmatched visibility, speed, and confidence in cable route planning and risk management.

INTRODUCTION: WHY THIS MATTERS

Demand for subsea connectivity is soaring—but outdated, expensive survey practices are holding the industry back.

This study presents a next-generation approach that **combines hull mounted high-resolution multibeam echosounders (MBES) and subbottom profilers (SBP)** for **full-spectrum seafloor characterization**. The result: reduced risk, faster execution, and lower operational costs.



SURVEY GOALS

High Resolution, High-Speed Surveys

Match AUV data quality using hull-mounted MBES & SBP at speeds up to 12 knots.

Geohazard Identification

Pinpoint slope failures, faults, and sediment movement zones that threaten cable integrity.

Environmental and Cultural Safeguards

Detect benthic habitats, submerged structures, and paleo-landforms to inform permitting and stewardship.

Smarter AUV Use

Reserve AUVs for high-risk zones. Use hull-mounted systems to cover 90%+ of routes.

Optimize Route Design

Build with confidence using robust bathymetry and stratigraphy to support permitting, trenching, and maintenance.

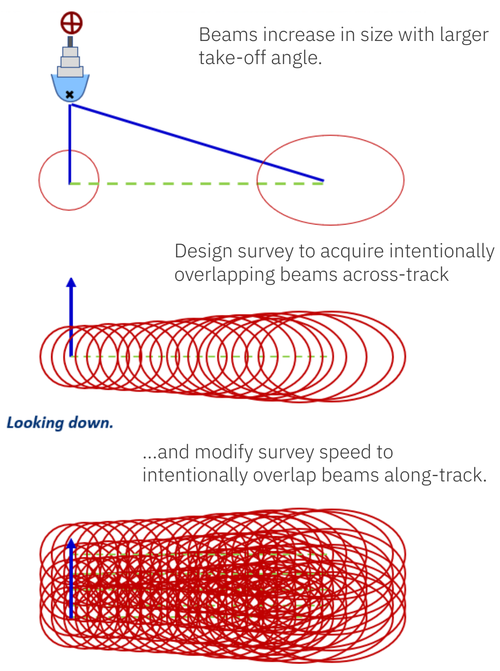
METHODOLOGY AT A GLANCE

Survey Platform

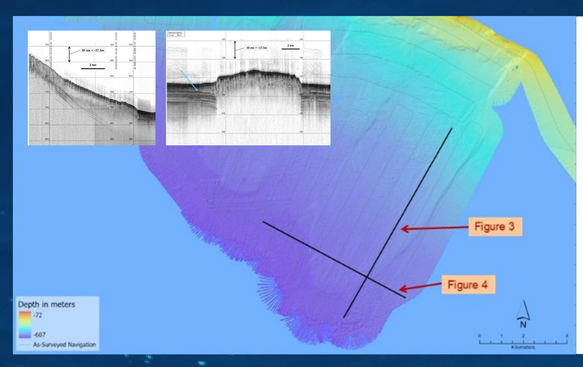
- *R/V SALLY RIDE*, Cruise SR2414 (ONR Funded)
- State-of-the-art MBES (EM124/712) and SBP (SBP29)
- Real-time visualization, dynamic positioning, and quality control

Technology Innovations

- **Overlapping Beam Acquisition:** Increases signal-to-noise ratio and resolution
- **Dynamic Calibration:** Patented pitch/roll/heading correction
- **Integrated MBES + SBP Workflows:** 3D views of seabed and sub-seafloor structure

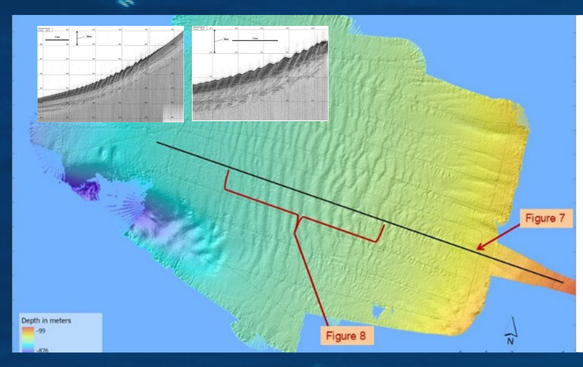


FIELD-PROVEN RESULTS



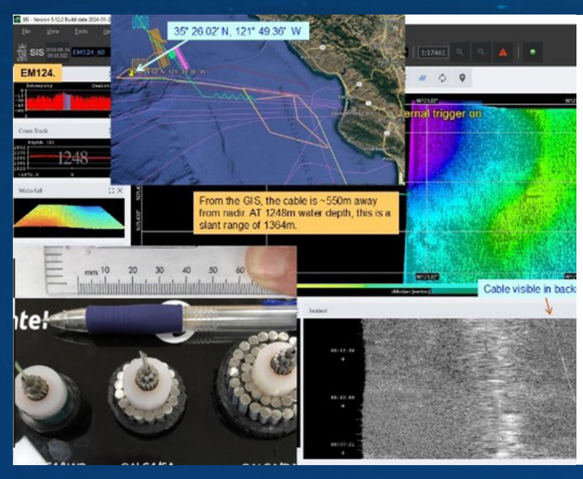
Goleta and Conception Slides

- Complex, high-risk zones for slope failure and seismic activity
- SBP revealed translational blocks, gas pockets, and basal detachment surfaces
- **Result:** Route avoidance, risk-informed cable design.



Humboldt Mega-Dune Field

- Initially flagged as unstable—but proven to be stable, depositional terrain
- Identified upslope-migrating mega-dunes with >17,000 years of layered sediment
- **Result:** Avoid costly reroutes and design for realistic burial challenges.



Fiber Optic Cable Imaging with Hull-Mounted Multibeam

- Successfully imaged 32mm double-armored cables at depths >1,000 m
- Survey speeds: 6–12 knots
- Used MBES alone—no AUV or remotely operated vehicle (ROV) needed
- **Result:** Rapid, accurate “as-laid” assessments and monitoring-ready baselines.

DELIVERING BUSINESS VALUE

Cut Time on Site

- Up to 50% faster than AUV-based campaigns
- Real-time onboard QC and flexible deployment

Reduce Survey Costs

- Fewer vessels, fewer assets
- Maximize ROI on every kilometer/nautical mile mapped

De-Risk Cable Routes

- Early identification of hazards
- Improve trenching success, reduce repair needs

Win Faster Permits

- Environmental clarity supports efficient approval
- Clear documentation of cultural/benthic avoidance

Future-Proof Infrastructure

- Establish a high-resolution baseline for long-term monitoring
- Easily repeatable for change detection and adaptive route planning

WHY IT WORKS

- **Patented Beam Overlap Strategy:** Increases detail beyond conventional resolution limits
- **Dynamic Calibration and Quality Control:** Ensures consistent, trusted data
- **Geophysical Fusion:** Combines MBES bathymetry/backscatter with SBP stratigraphy for unmatched 3D insight
- **Field Validation:** From Santa Barbara to Morro Bay, from Goleta Slide to Unity Cable—this approach delivers.

“We don’t just map the seafloor—we understand it. That’s how we build smarter cable networks.”

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