

CONSULTING SERVICES FOR MARINE AND
OFFSHORE ENGINEERING PROJECT, RISK ANALYSIS
AND MANAGEMENT, AND INTEGRITY ASSESSMENT

Fifteen years of experience +

Sixty-five projects +

- 1 The Company
- 2 Marine Surveys
- 3 Research Barge
- 4 Design and Engineering
- 5 Integrity Assessments
- 6 Project Management and Auditing
- 7 Risk Analysis

To our current and future clients:

SLEM S.A. thanks you for trusting us during these 15 years. We have dedicated ourselves to marine and port projects, focusing on security, integrity, and risk reduction.

We commit ourselves to walk with you along all project stages to guarantee success, following the highest standards. Your success is our success.

We combine all our capabilities to develop your ideas to fruition, with high quality and competitive costs.

This presentation summarizes the services we can offer to support your project.

Yours truly,

Diego Mantilla J.
General Manager

*"How inappropriate to call this planet
Earth when it is clearly Ocean."
--Arthur C. Clarke*

SLEM S.A.

Av. Carlos Julio Arosemena Km. 2,5
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The Company



Security, Logistics, Environment & Management (SLEM) was founded November 19, 2003. It is an Ecuadorian firm based in Guayaquil and dedicated to providing consulting for marine and offshore projects, as well as risk assessments.

Mission

Providing consulting services for marine and offshore projects, as well as risk and integrity assessments.

Vision

To become leaders in the offshore and marine surveys segments, providing our clients a complete set of services.

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Capabilities

Consulting and technical assistance in every stage of a project.

Identifying
problems or
opportunities

Feasibility

Design
(engineering)

Project completion
control

- ✓ Tailored surveys for marine, port, and offshore projects
- ✓ Design and engineering
- ✓ Integrity surveys
- ✓ Project management and auditing
- ✓ Risk assessment



Trained professionals in naval and civil engineering, with PMI, CP1, and CPP-CEPI certifications.

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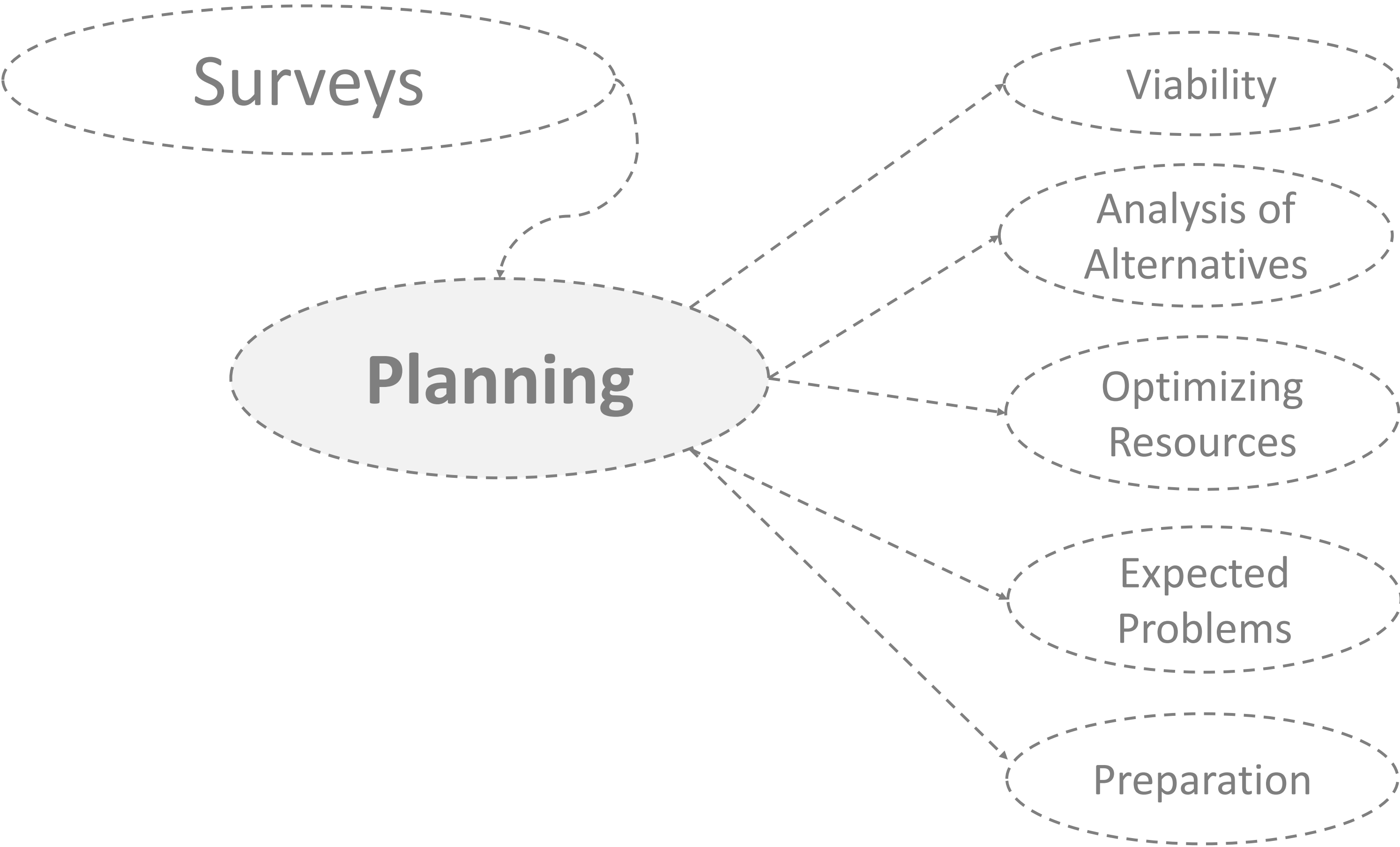
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Why invest in surveys?



“By failing to prepare, you are preparing to fail.”
--Benjamin Franklin

Marine Surveys

Sea- and river-bottom mapping

- ✓ Single- and multi-beam depth sounding
- ✓ Side scan sonar inspection
- ✓ Submarine photography
- ✓ Superficial sampling
- ✓ Identifying sunk objects with magnetometer



Sub-bottom profiling

- ✓ Geophysical survey
- ✓ Geotechnical survey on water



Integrity

- ✓ Thickness gauge
- ✓ Cathodic protection survey



Consulting

- ✓ Project planning and feasibility
- ✓ Oceanographic and hydrographic surveys for port projects



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Marine Surveys

Single-beam depth sounding

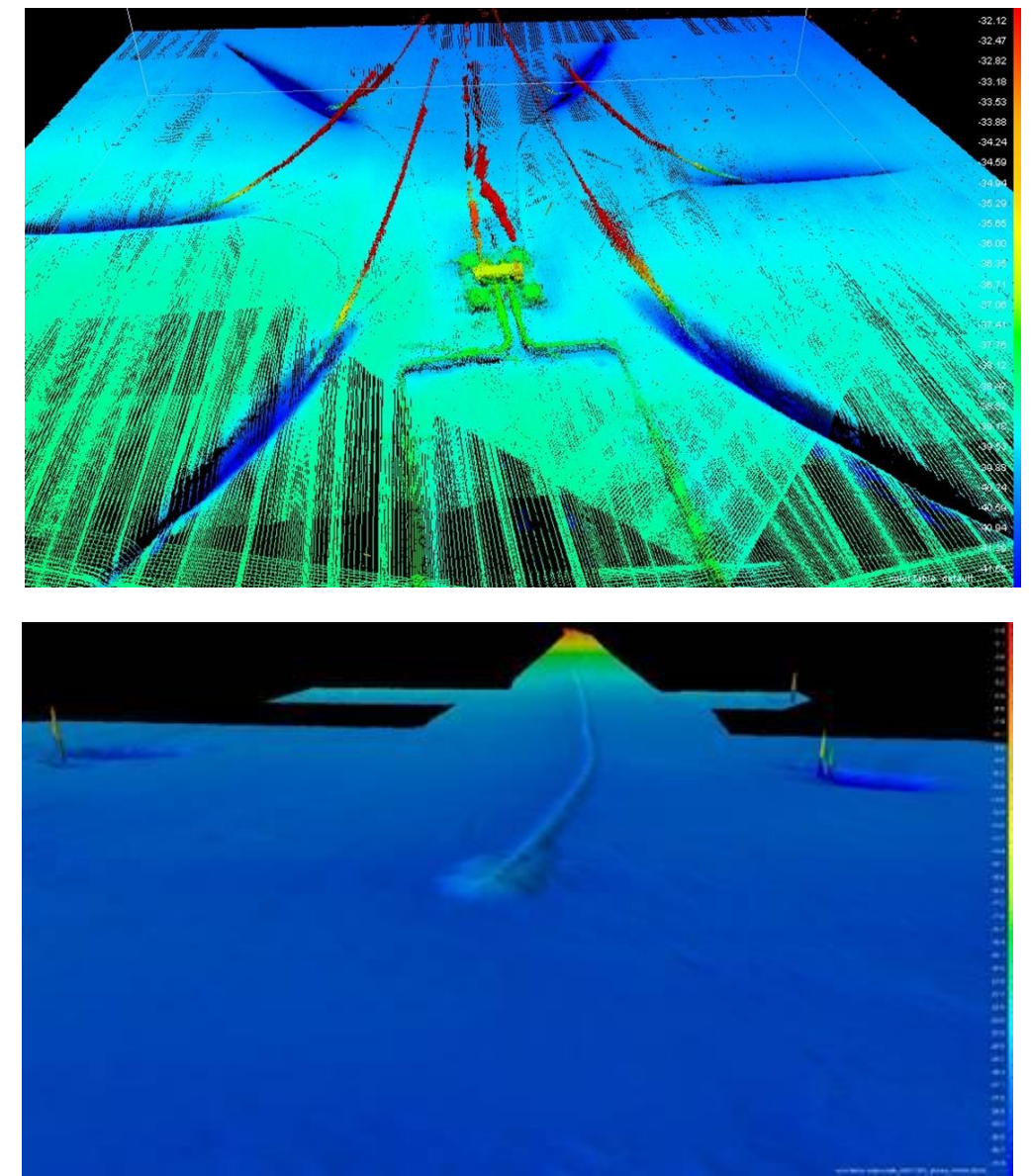
We can map the sea bottom, identifying sediments or Banks through measurements and sounding in determined areas.

We have a double-frequency echo-sounder and differential GPS receivers to guarantee the accuracy and precision of the work.



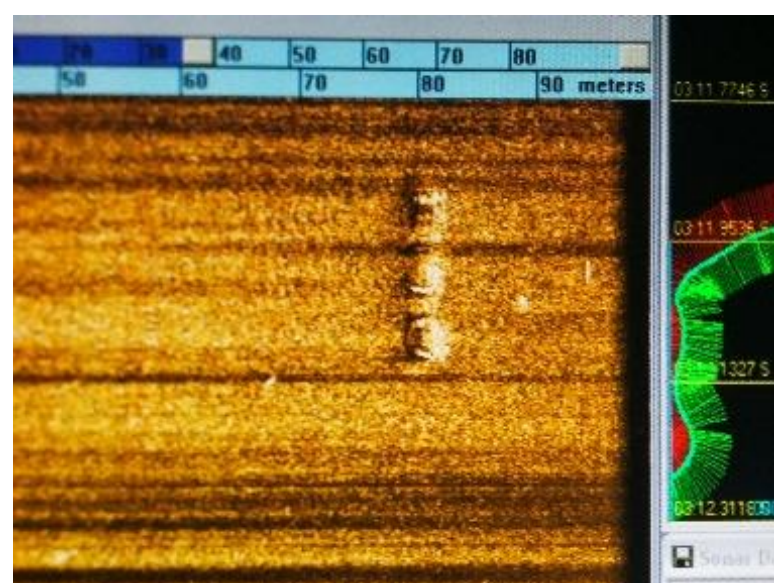
Multi-beam depth sounding

We carry out high-resolution, multi-beam surveys, which allow total-coverage mapping of the sea bottom.



Side scan sonar inspection

We use sonar technology to get digital images of an area of the sea bottom. This allows of to obtain an acoustic image of the features of the bottom and see obstacles or objects.



Magnetometer inspection

We can carry out surveys to find ferrous-metal objects with a magnetometer that can find such magnetic anomalies.



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Marine Surveys

Submarine photography

We can assess the integrity of submarine structures using a diver-operated camera optimized for low visibility operations up to a depth of 40 m.



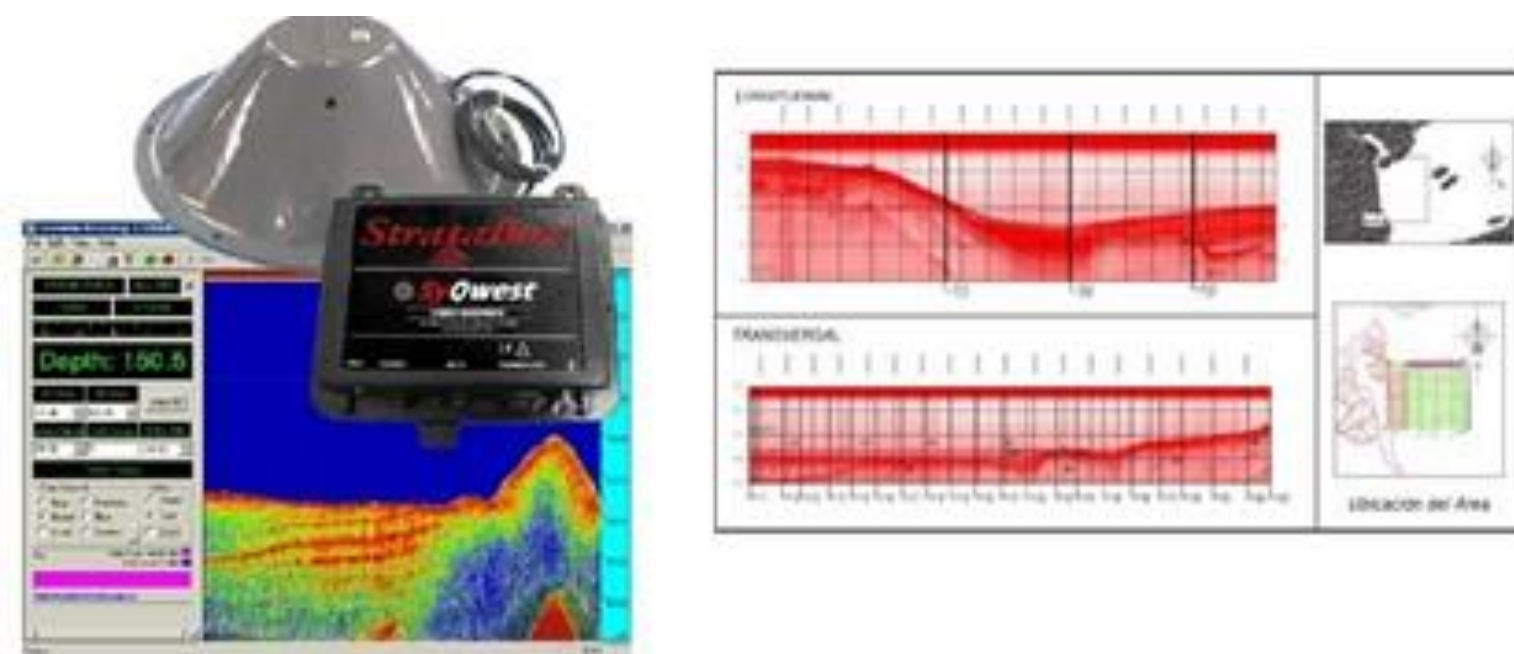
Superficial sampling

With the use of the manual dredger, we extract surface samples that allow us to know the characteristics of the stratum type.



Geophysical surveys

We offer high-resolution imaging of the sub-bottom profile, in order to find out geological faults or discontinuities that can be sources of risk for the operation of terminals, and sources of instability for marine structures.



Geotechnical surveys

We offer geotechnical surveys, with standard penetration tests (SPT) and cone penetration tests (CPT), as well as lab services regarding soil mechanics, according to the needs of each project.



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Marine Surveys

Thickness measurement

In order to measure the integrity of submarine Steel structures, we offer point measurements of metal thickness, using a submarine gauge.

Cathodic protection surveys

We carry out measurements of cathodic protection to gauge the degree of protection of submarine structures that use sacrificial anodes or impressed-current systems.

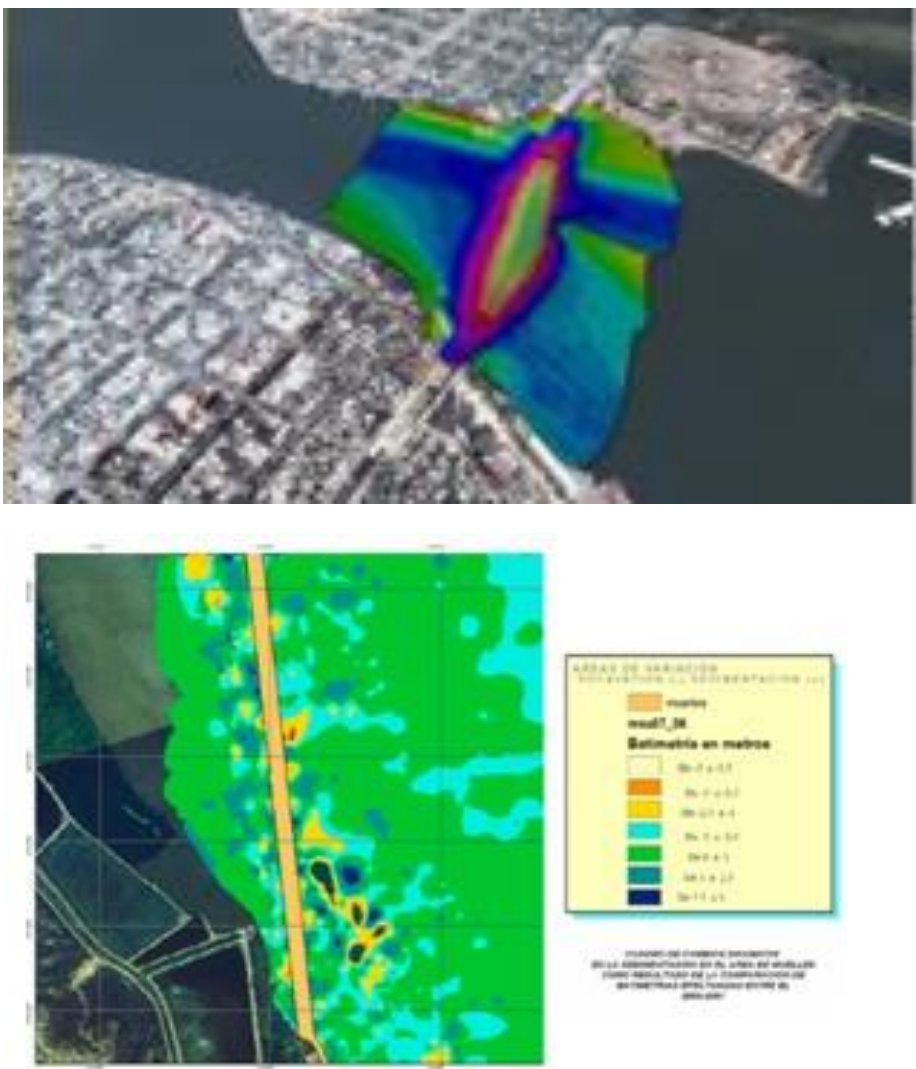


GIS data integration

Integration of hydrographic and topographic data:

- ✓ Digital mapping
- ✓ 2D and 3D aerial photogrammetry
- ✓ Automatized topography
- ✓ GPS positioning
- ✓ Vertical control (geometric leveling network)
- ✓ Orthophoto maps
- ✓ Digital images processing

Our technicians integrate de data acquired, such as topography, bathymetry, geophysics, etc., in a single 3D database.



We offer the services that can be provided by our research barge, Sarabby I, a self-propelled barge with a hydraulic lifting system. It is made up of four individual modules tan can operate as a single unit.



Dimensions (four modules joined together)

Eslora (L, Lpp, L _{LAD})	12.2	m
Manga total (B, B _{LAD})	6.436	m
Calado de diseño (T _{LAD})	0.5	m
Puntal (D)	1.0	m
Área de trabajo en cubierta	52.96	m ²
Desplazamiento (Δ)	28.84	ton
TRB	20.012	

Dimensions of each module

Eslora (L, Lpp, L _{LAD})	6.00	m
Manga total (B, B _{LAD})	2.40	m
Calado de diseño (T _{LAD})	0.50	m
Puntal (D)	1.00	m
Área de trabajo en cubierta	7.34	m ²
Desplazamiento (Δ)	6.18	ton
TRB	5.04	



Projects Carried Out by Sarabby I



- ✓ Geotechnical drilling, Guayas River - Malecón 2000, complementary world project.
Client: Astinave EP



- ✓ Geotechnical drilling, Posorja, Gulf of Guayaquil – deepwater port project.
Client: DP World Posorja



- ✓ Geotechnical drilling, Guayas River – Pier enlargement project.
Client: Ecuabulk

- ✓ Geotechnical drilling, Guayas River – Aerovía cable car system.
Client: Geoestudios

- ✓ Logistical service for geotechnical drilling around El Palmar Islet.
Client: Servicio de Dragas de la Armada del Ecuador



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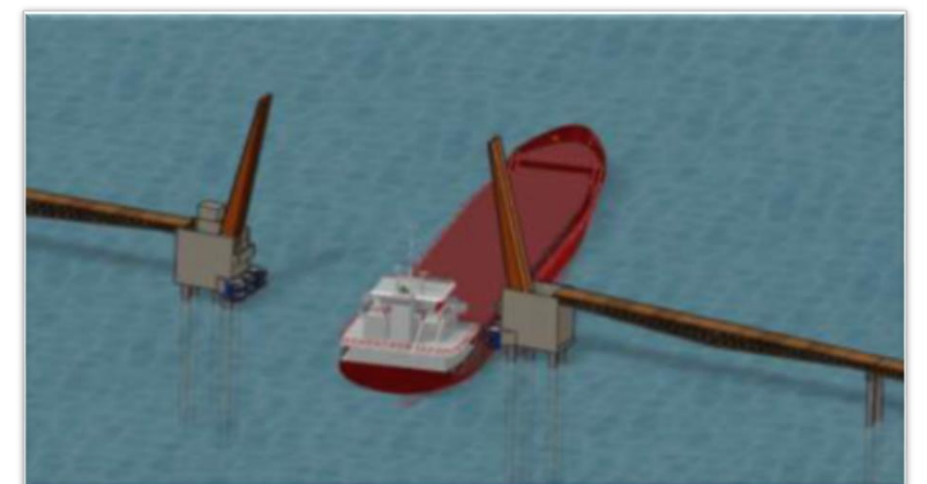
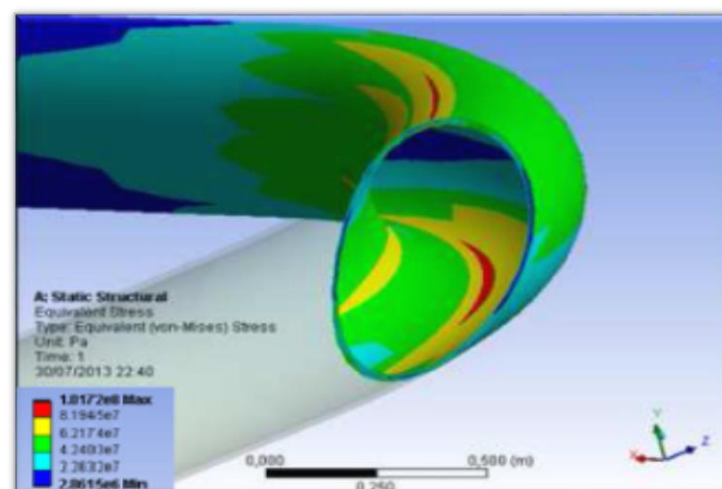
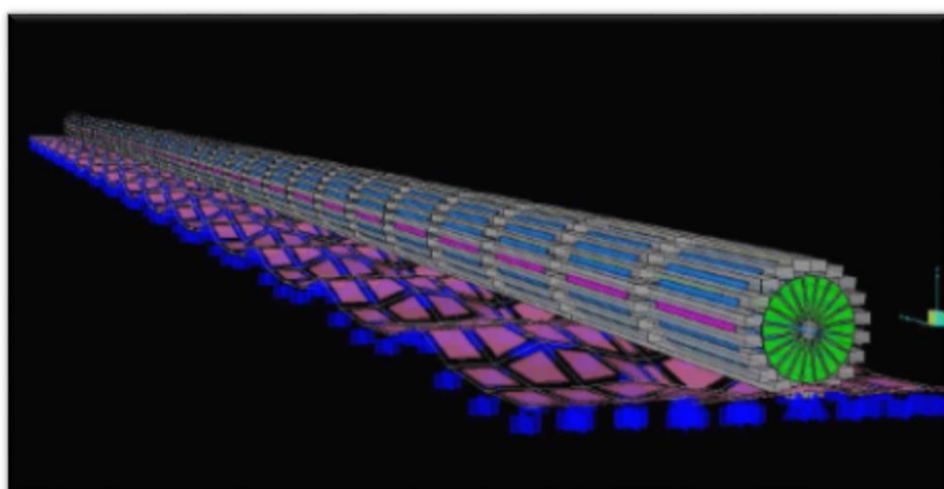
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We offer a complete consulting package and technical advice, including design and engineering:

- ✓ Feasibility studies for projects in diverse engineering areas, such as naval, port, civil and fire systems engineering.
- ✓ Development of conceptual, basic and detailed engineering for marine, port, and offshore projects.
- ✓ Complete documentation for works contracting and construction.
- ✓ 3D design and modeling.
- ✓ Project control in diverse areas, such as naval, port, civil, mechanical, and fire control engineering, based on PMBOK guidelines.
- ✓ Determining the mooring capacity of single-point moorings.
- ✓ Studies of erosion and sedimentation around submarine pipelines.
- ✓ Forensic engineering and root-cause analysis of marine terminal incidents.
- ✓ Integrated planning of mooring and loading maneuvers.



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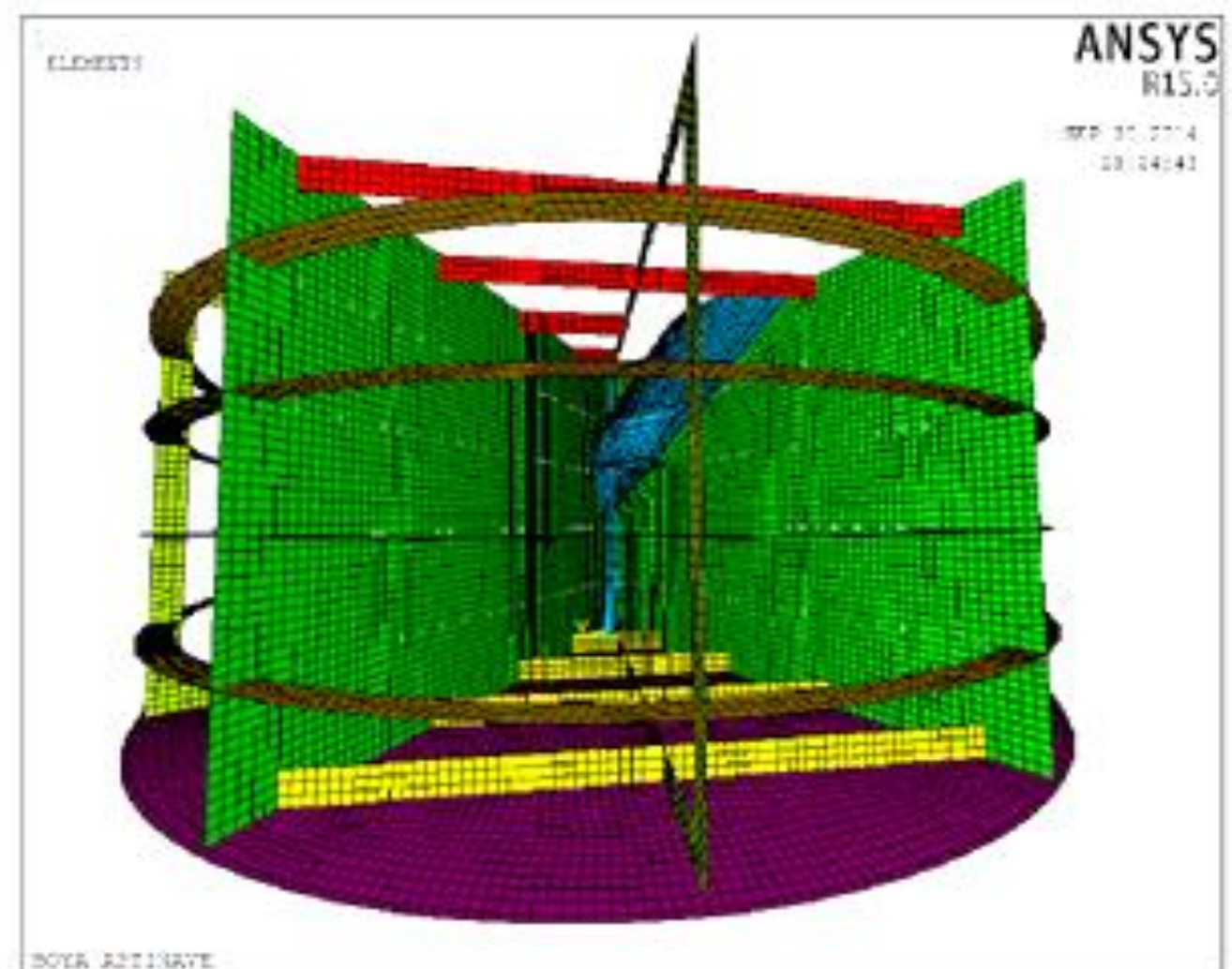
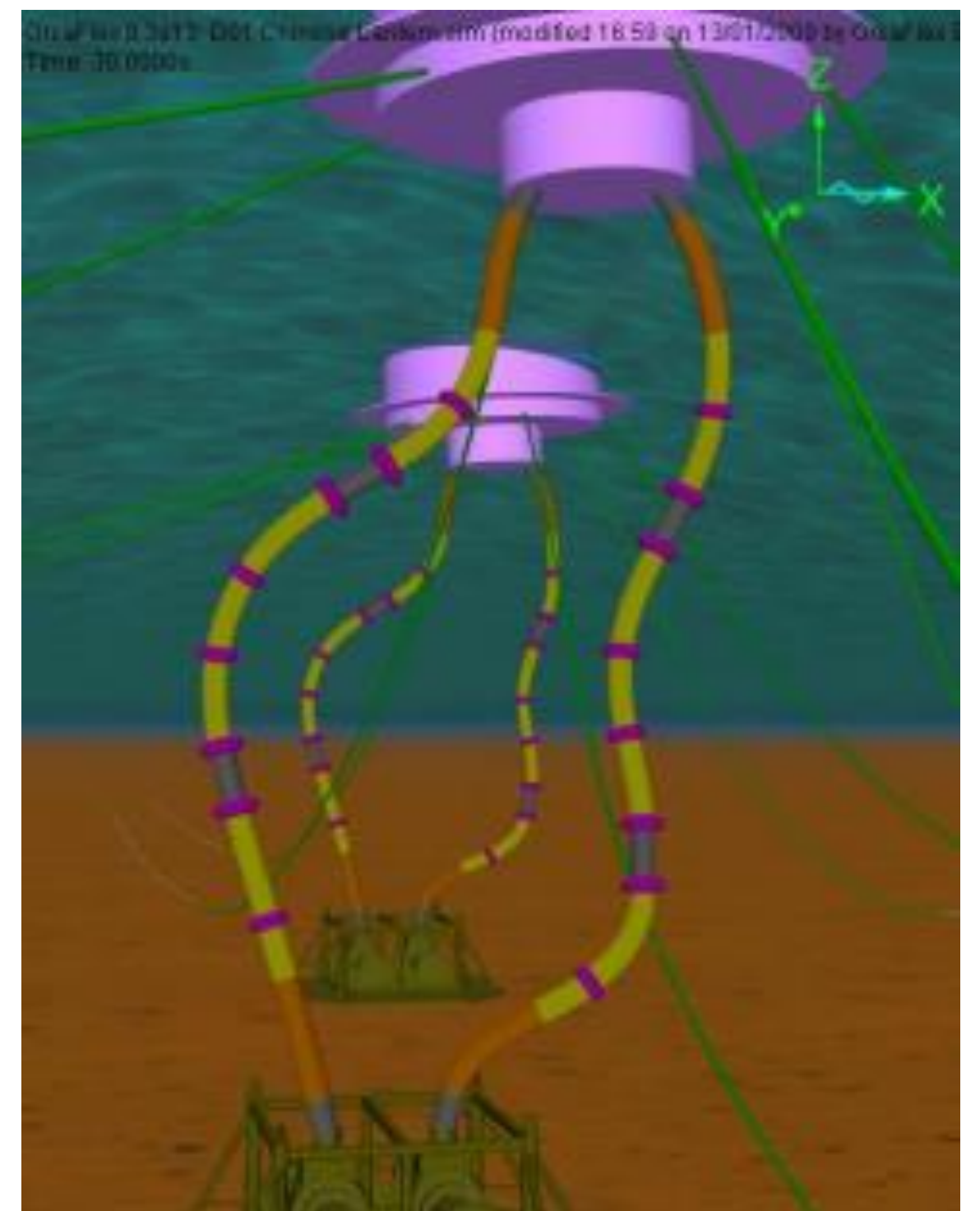
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Design and Engineering

Design software

ANSYS, OrcaFlex, SHIPMA, STAAD.Pro, MAXSURF, HydroComp

- ✓ Marine infrastructure simulations and structural calculations with finite elements.
- ✓ Design of mooring works with structural models.
- ✓ Statistical and probabilistic analysis of oceanographic parameters.
- ✓ Breakwater and protection works design.
- ✓ Mathematical simulation of maneuverability.
- ✓ Integrity assessment of onshore and offshore terminal structures.
- ✓ Speed and propulsion efficiency analysis.
- ✓ Static velocity assessment.
- ✓ Vessel modeling, as well as floating platforms and barges.



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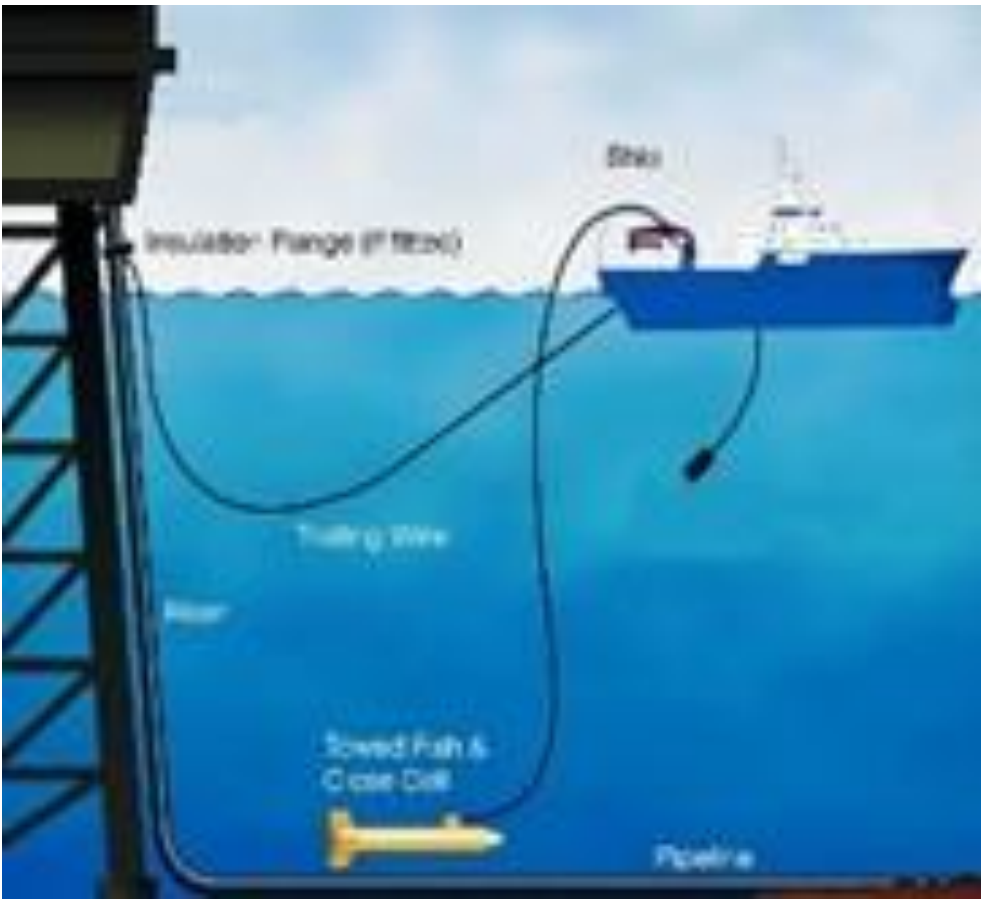
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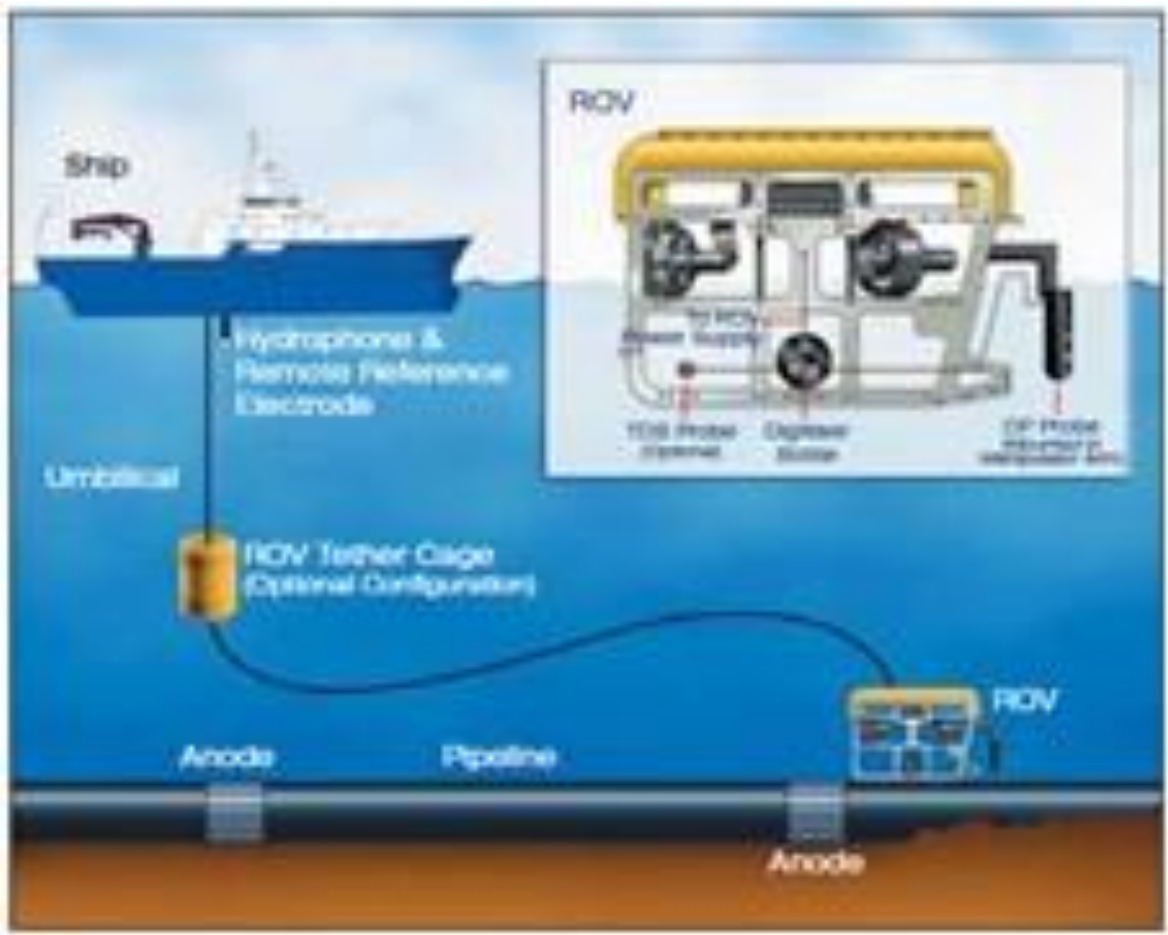
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Trailing wire cathodic protection surveys

Cathodic protection survey using trailing wire. This method is ideal for submarine pipes of up to 40 km in length.



ROV cathodic protection surveys



This is a highly-precise, dependable method to collect data during cathodic protection surveys. It requires no continuous contact and can be complemented with the information gathered via a visual and bathymetric surveys, which provide a complete picture of the condition of the pipe.

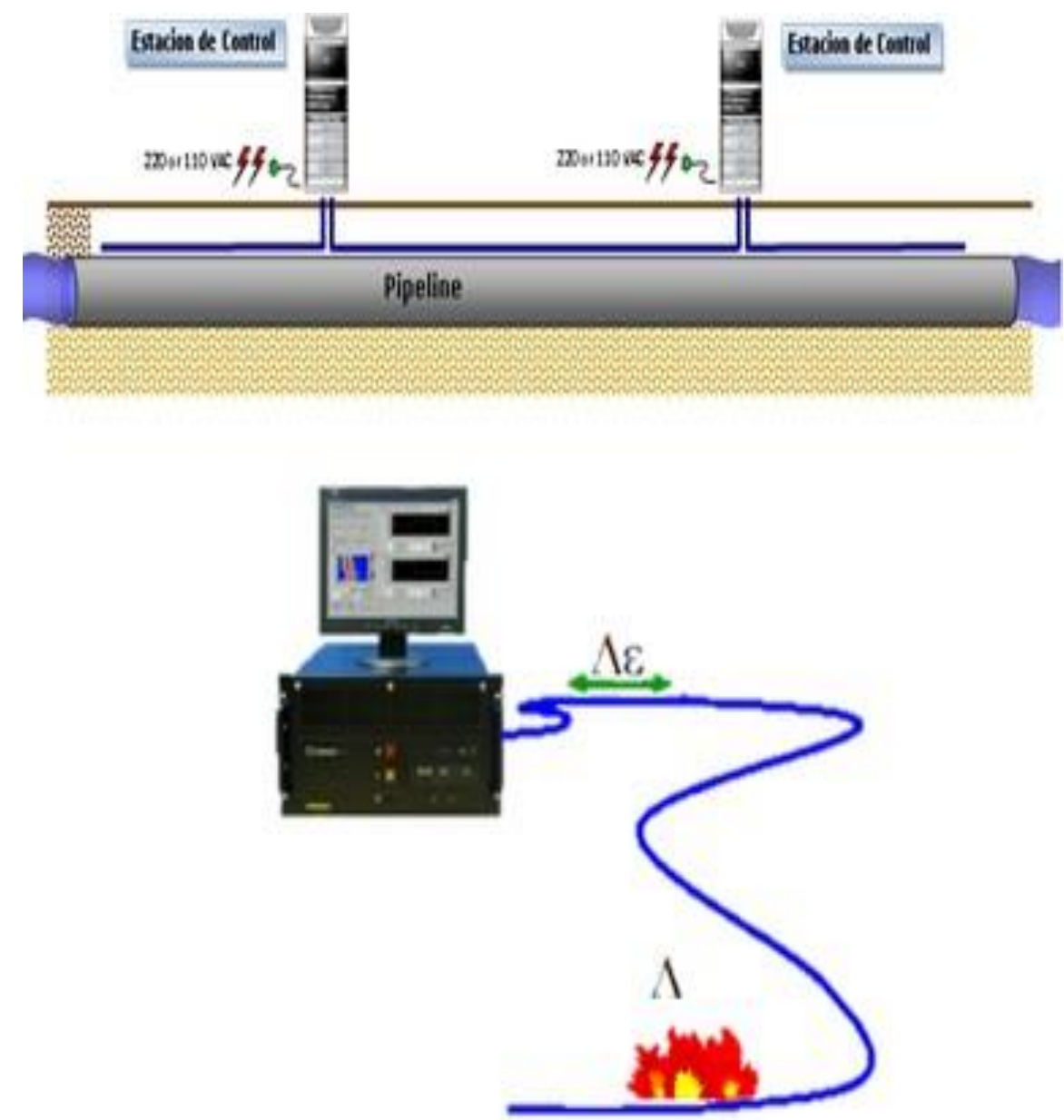
Close interval potential surveys (CIPS)

These are surveys done to monitor the potential difference of the pipeline on the ground in small intervals (1 to 5 m), giving as result a complete measurement of the cathodic protection level.

Integrity Assessments

Stress monitoring

Temperature and stress monitoring with fiber-optic sensors to monitor structures such as pipelines, oil Wells and bridge and pier structures. Measurement systems can be used to detect gas leaks.



In-line pipeline inspections

We can use a “smart pig” to gather data inside the pipeline. This is an efficient and effective way to get data that would be impossible to get otherwise.

To carry out the in-line inspection, we use high-resolution tools based on MFL (Magnetic Flux Leakage) and UT (Ultra-Sonic) technologies.



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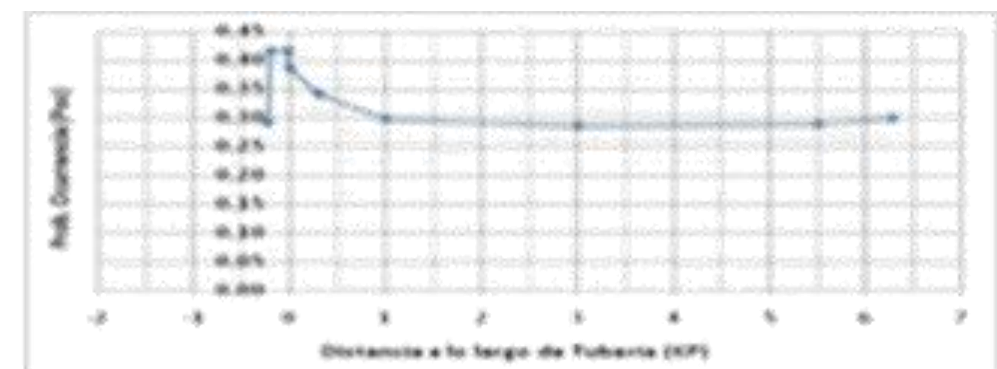
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Quantitative analysis of risks to onshore and offshore structures

We offer a quantitative risk analysis for all businesses and all industry sectors. SLEM develops tailor-made methods for each client, such as:

1. Calculation of the occurrence probability of an accident.
2. Calculation and modeling of accident consequences. Calculations include:
 - a) Volume of the spill.
 - b) Theoretical model of the wind.
 - c) Movement of the slick.



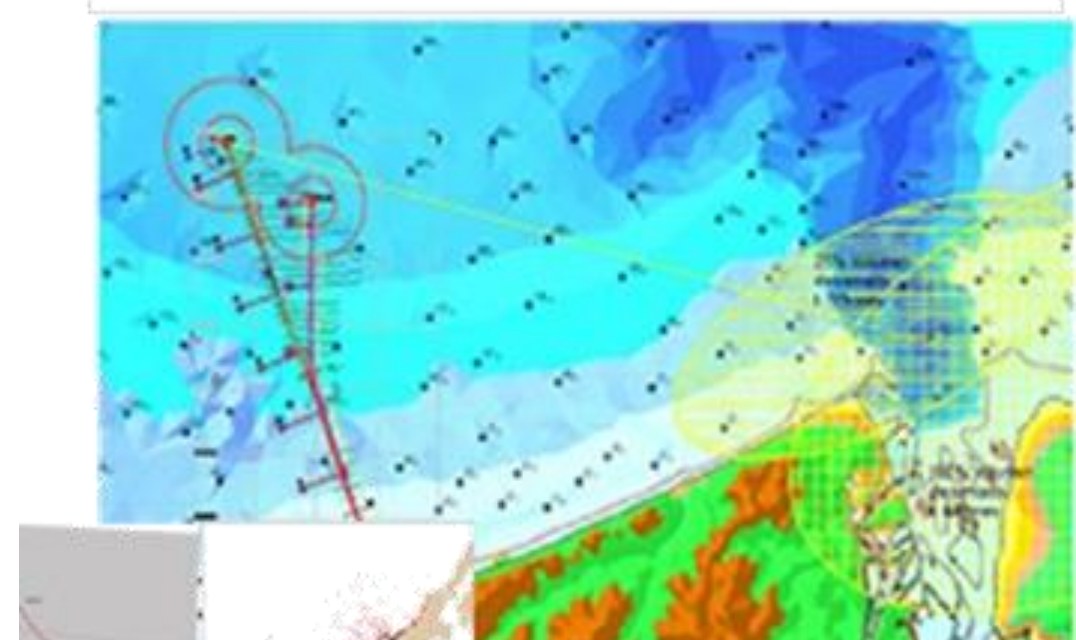
$$I_{Total} = I_T + I_C + I_D + I_{OI}$$

$$I_T = I_{TC} + I_{TA} + I_{TE} + I_{TOV} + I_{TV}$$

$$I_C = I_{CA} + I_{CB} + I_{CC} + I_{CD} + I_{CE} + I_{CF} + I_{CG} + I_{CH} + I_{CI} + I_{CJ} + I_{CK} + I_{CL}$$

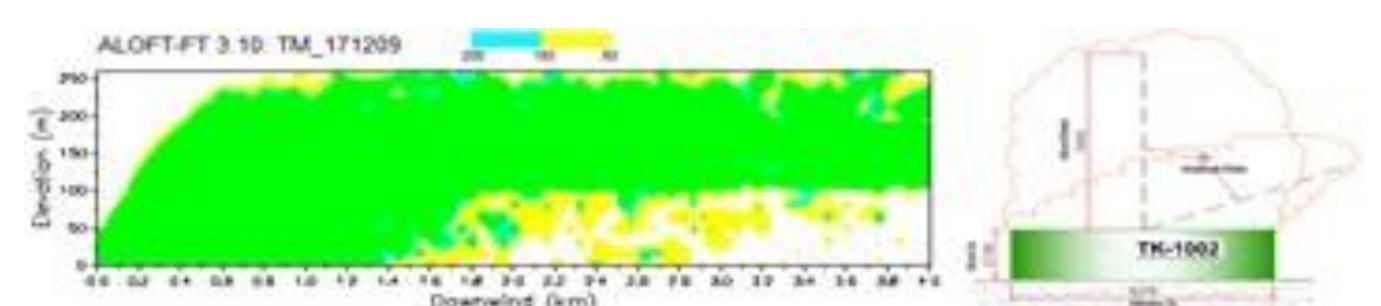
$$I_D = I_{DA} + I_{DB} + I_{DC} + I_{DD} + I_{DE} + I_{DF} + I_{DG} + I_{DH} + I_{DI} + I_{DJ} + I_{DK} + I_{DL}$$

$$I_{OI} = I_{OIA} + I_{OIB} + I_{OIC} + I_{OID} + I_{OIE} + I_{OIF} + I_{OIG} + I_{OIH} + I_{OII} + I_{OIJ} + I_{OIK} + I_{OIL}$$



Quantitative analysis of fire risks in critical infrastructure

- Assessment of the on-site protection systems.
- Fire simulation in critical infrastructure.
- Plume-trajectory simulation.
- Fire hazard analysis (FHA).
- Assessment of compliance.



Using these analyses, the design of security systems is proposed.

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Risk Assessment

Operational risk assessment

- We carry out risk assessments for each process or activity according to the applicable norms.
- Risk analysis matrix.
- Process hazard analysis (PHA).



▪ Total risk analysis

▪ Hazard and operability study (HAZOP)

▪ Risk management plan

We have developed risk analysis systems based on specific norms and regulations that fit PBIP, C-T PAT, ISO-27000, ISO 28000, ISO 22301, and ICAO.

SLEM has broad experience in quantitative risk analysis, working with the main insurance company in Ecuador, developing complex risk analyses for its main corporate clients. Our experience includes hydroelectric plants, banks, hospitals, oilfields, port and oil terminals, oil and gas distribution systems, transport firms, industrial plants, etc.

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Risk Assessment with CounterMeasures

Do you know your risk?



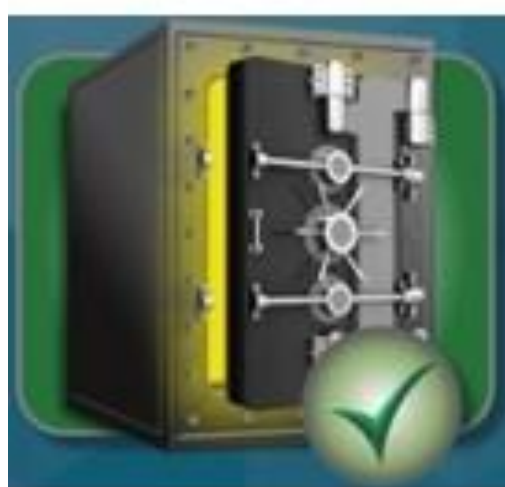
We use the web-based CounterMeasures software, which applies a wide range of risk disciplines, including physical, operational, and information security.



Web-based risk assessment software.



Adaptable to a wide range of standards and regulations.



Identifies, quantifies, and evaluates the threats the institution faces, according to its operating conditions.



Standardizes inspections to create a repeatable and auditable process.



Risk level calculated based on the compliance with norms.



Facilitates follow-up assessment of the risk profile.

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- ✓ Project management according to the PMBOK guidelines
- ✓ In situ technical inspections using measuring tools
- ✓ Budgets and unitary costs according to type of project
- ✓ Terms of reference for port or marine construction projects

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PRINCIPALES PROYECTOS

- Consulting for geotechnical and geophysical studies for Block 6, Campo Amistad – Petroamazonas EP.
- Single-beam and multi-beam bathymetric surveys for the OCP pipeline.
- Consulting for studies of complementary works for Malecón 2000 in Guayaquil.
- Geotechnical survey for the Posorja multi-purpose terminal.
- Logistical service for Posorja multi-purpose terminal.
- Inspection of the mooring systems of the Balao and Esmeraldas maritime oil terminals.
- Studies to determine the erosion rate and the burial depth of a secondary pipeline across the Napo River.
- Certification of single-mooring points for 107,000 DWT ships.
- Consulting for the feasibility of development alternatives for the Esmeraldas marine terminal.
- Consulting service for the conceptual, basic, and detailed engineering of a 40,000 DWT single-mooring point for the Astinave EP.
- Offshore engineering and environmental studies for the expansion of the oil-products terminal at Esmeraldas (TME2).
- Developed local contingency plan to face oil spills at the Monteverde gas terminal.
- Evaluated, under PBIP guidelines, the physical protection plan for the Monteverde gas terminal.



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PRINCIPALES PROYECTOS

- Safety Audits and Risk Analysis of the Fluvial and Land Transport Operations in the Petroleum Block 16 for Repsol UN Ecuador
- Risk Assessment of the Land Transportation Routes of the Petroleum Block 16 for Repsol UN Ecuador
- Risk Analysis of Oil Pipeline, LPG Storage Tank and Fuel Additives Facilities for Swissoil del Ecuador S.A.
- Fire Risk Analysis of the Fuel Additives Facilities for Swissoil del Ecuador S.A.
- Technical Auditing and Integral Security System for Zofraport
- Quantitative Fire Risk Analysis for heavy crude transportation facilities for OCP Ecuador S.A.: Pump Stations Cayagama (PS2), Sardinas (PS3) and Páramo (PS4); Pressure Reduction Stations Chiquilpe (PRS1) and Puerto Quito (PRS1), Tanks Farm & Pump Station Amazonas (PS1); and Automatic Block Valve ABS Station.
- Development of Security Assessment and Risk Analysis of the Distribution Infrastructure for Petrocomercial Regional Sur.
- Development of a Quantitative Risk Analysis for the Electric Generation Company.
- Quantitative Risk Analysis for the Esmeraldas Marine Terminal.
- Integral Risk Analysis of Zofraport.



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Strategic Partners



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