



Unmanned Bathymetric Surveys for Mining Applications

Applications for Seafloor Unmanned Vessels in Mining

The HyDrone and EchoBoat-160 offer the flexibility and precision needed for a wide range of mining applications. They deliver reliable bathymetric data in tough environments, helping teams improve safety, streamline planning, and meet regulatory demands. The visual material for this document is from mining operations in Latin America. The following applications highlight their value across the mining sector:

1. Tailings Pond Management:

Monitor tailings accumulation and optimize storage capacity planning.

2. Water Resource Management:

Analyze water depth and volume to ensure sustainable usage in ore processing.

3. Flood Risk Assessment:

Develop mitigation strategies using detailed water body maps in open-pit mines.

4. Environmental Monitoring:

Track changes in water bodies to assess the environmental impact of mining.

5. Infrastructure Development:

Facilitate the design and construction of safe dams, reservoirs, and drainage systems.

6. Safety Monitoring:

Detect subsidence, erosion, or sinkholes early to prevent operational hazards.

7. Reclamation Planning:

Aid in restoring water bodies during mine closure to meet environmental standards.

8. Geotechnical Analysis:

Enhance slope stability and underwater structure assessments for safer mine layouts.

9. Regulatory Compliance:

Provide data to meet legal requirements and maintain operational transparency.

Innovative Solutions: HyDrone and EchoBoat-160



Figure 1 - HyDrone-ANP with HydroLite Plus Dual.



Figure 2 - EchoBoat-160 with HydroLite Plus Dual.

The HyDrone-ASV, HyDrone-ANP (Autonav Plus), and EchoBoat-160, equipped with the HydroLite Plus Dual echosounder and GPS/GNSS integration, revolutionize bathymetric surveys by addressing these challenges:

Challenges in Conventional Bathymetric Surveys

Bathymetric surveys in mining environments present unique challenges, especially when relying on conventional methods such as manned vessels equipped with single beam echosounders.

Key issues include:

Safety Risks:

- Structural instability of tailings ponds and water bodies risks breaches or collapses.
- Toxicity and hazards in tailings ponds pose health risks for survey personnel.

Accessibility Issues:

- Remote locations and rugged terrain hinder access for survey equipment and launching of conventional vessels.
- Traditional vessels often struggle in shallow water and confined spaces.



Figure 3 - HyDrone-ASV - Preparation for the survey.



Figure 4 - HyDrone-ASV surveying a water reservoir.

Environmental Concerns:

- Adverse weather conditions, like heavy rain or storms, can delay surveys.
- Manned vessels powered by fossil fuels risk water contamination.

Technical Challenges:

- Precise calibration and maintenance are essential for accurate data, especially in harsh environments.
- Surveys require skilled personnel with necessary certifications and permits.

Regulatory and Compliance Barriers:

- Complex permitting processes and strict environmental regulations can delay operations.
- Surveys may disturb local ecosystems, affecting wildlife and water quality.

Enhanced Safety:

- Unmanned operations eliminate human exposure to hazardous environments.
- Capable of navigating unstable banks and submerged obstacles safely.

Superior Efficiency and Precision:

- Pre-programmable survey paths ensure comprehensive and consistent data collection.
- Compact and agile design allows navigation in shallow waters and tight spaces.



Figure 5 - Deployment of the HyDrone-ASV in a tailings pond.



Figure 6 - HyDrone-ASV Surveying the tailings pond.

Cost-Effectiveness:

- Reduced manpower and maintenance requirements lower operational costs.
- Faster survey times translate to significant savings and timely data acquisition.

Environmentally Friendly:

- Minimal ecological disturbance and no reliance on fossil fuels.
- Compliance with strict environmental standards and reduced contamination risks.

The USV Advantage

The advantages of utilizing portable Unmanned Surface Vessels (USVs) for safe and efficient bathymetric surveys in mining environments have been demonstrated in different mining sites around the world. The visual material for this document is from Latin America mines operations.

Target Audience

Mining companies, consultants, and surveying firms seek innovative, safe, and efficient methods for conducting bathymetric surveys in challenging and hazardous conditions. These organizations prioritize solutions that reduce risk to personnel, minimize environmental impact, and streamline data collection for decision-making, regulatory compliance, and long-term site management.

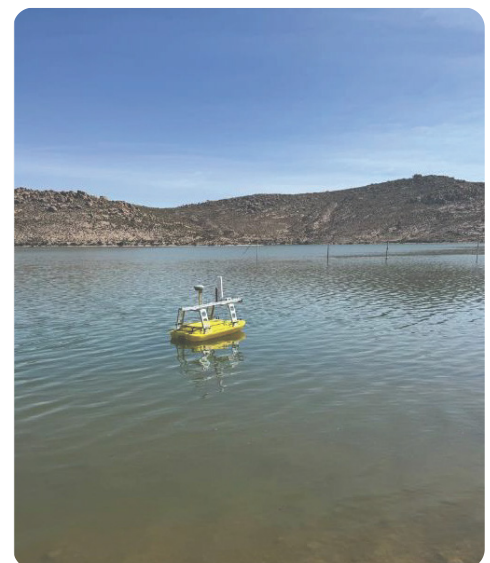


Figure 7 - Unmanned survey of a freshwater pond.



Figure 8 - Preparation of the EchoBoat-160 ASV for the survey.

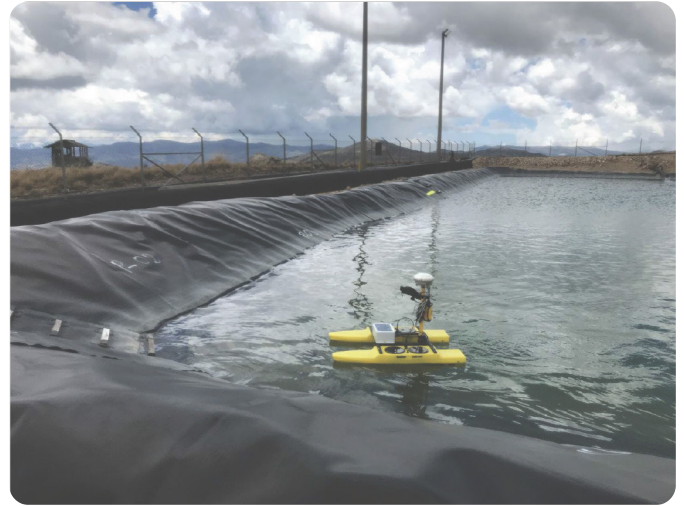


Figure 9 - Preparation of the EchoBoat-160 ASV for the survey.

What's Next?

The EchoBoat-160 offers flexibility to integrate advanced multibeam echosounders, such as the SeaRAY from Seafloor Systems. This integration expands the potential for bathymetric surveys in mining by providing greater coverage and higher resolution when needed. By utilizing multibeam technology, mining operations can obtain more detailed underwater mapping, improving decision-making for water management, safety assessments, and regulatory compliance.

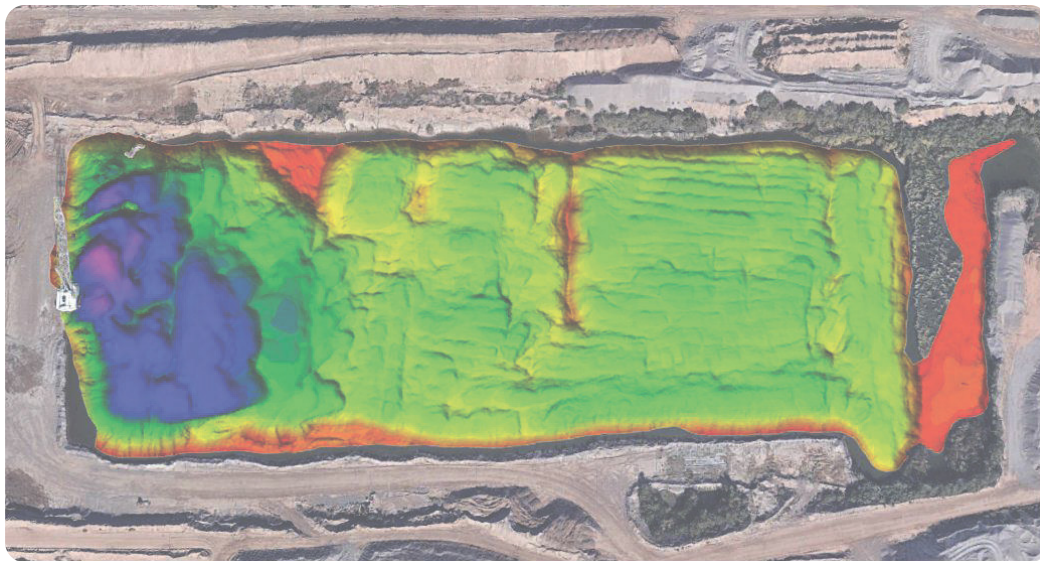


Figure 10 - Multibeam survey of a pond with the EchoBoat-160 with the SeaRAY MBES.

As bathymetric survey technology evolves, the combination of unmanned surface vessels (USVs) with multibeam echosounders will further enhance the accuracy and efficiency of data collection in mining environments. This advancement ensures that companies can adapt to increasing industry demands while maintaining the highest standards of safety and environmental responsibility.

Conclusion

By addressing key challenges and enabling safer, more efficient operations, the HyDrone and the EchoBoat-160 serve as indispensable tools for modern mining operations. Their versatility and advanced capabilities position them as the preferred choice for sustainable bathymetric surveys in the mining industry. These unmanned systems not only reduce safety risks and operational costs but also deliver accurate, high-quality data in environments where traditional methods fall short. As regulations tighten and the demand for efficient, low-impact surveying grows, the HyDrone and EchoBoat-160 stand out as forward-thinking solutions for water management, infrastructure planning, and environmental compliance across mining sites.



Figure 11 - HydroLite SF200 integrated on a HyDrone AutoNav Plus