> *Past success with Dwyka Mining Technology Platforms, meant that investing in new technology was an easy decision. Once again, delivery was exceptional!*

APACHE 4 HYDROGRAPHIC SURVEY SOLUTION

MINE/PROJECT LOCATION:
Zambia - Africa

OBJECTIVE:
Apache 4 Sonar System for Tailings Storage Facility Monitoring

CLIENT:
Barrick Lumwana Mine

BARRICK

CHCNAV

OBJECTIVE:

Improve monitoring of the tailings storage facility (TSF) to comply with international safety standards, reduce manual inspection risks, and enhance early detection of potential structural issues below water surfaces.

CHALLENGE:

The Lumwana TSF system consists of multiple large water pond used for sedimentation of fine tailings. The pond's bathymetry changes frequently due to sediment movement, affecting water capacity and dam stability.

Traditional monitoring methods involved:
• Periodic manual surveys using boats and pole-mounted sonar systems.

• Safety risks to personnel.

• Inaccurate or incomplete data due to limited access and line-of-sight issues.

• Infrequent updates due to logistical challenges.

SOLUTION:

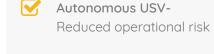**Apache 4 Sonar System Deployment**

Technology Overview:

• **Platform:** Apache 4 USV (Unmanned Surface Vehicle)

• **Sonar Payload:** Single-beam and multibeam echosounders for high-resolution bathymetric surveys.

• **Navigation:** RTK GPS for precise georeferencing.

• **Control System:** Remote autonomous control via a ground station.

• **Data Integration:** GIS and mine monitoring platforms.

KEY TAKEAWAYS:

☑ Autonomous USV- Reduced operational risk

☑ High-Resolution Sonar- Accurate sediment mapping

☑ Frequent Surveys- Real-time decision support

☑ Data Integration- Seamless into existing GIS and geotech platforms

IMPLEMENTATION:

Phase 1 – Site Assessment & Planning
• Conducted an initial survey to identify launch points and communication blind spots.
• Mapped out zones of concern, including decant pond proximity to dam walls.

Phase 2 – Survey Deployment
• Launched the Apache 4 USV remotely from the TSF perimeter.
• Conducted sonar mapping of the pond bottom and identified sediment deposition zones.
• Executed survey in minimal time, but congruent with the size of the TSF.

Phase 3 – Data Processing & Analysis
• Processed bathymetric data using CHCNav software.
• Integrated depth contours into the mine's geotechnical model.
• Compared against historical surveys to detect sediment buildup and movement.

RESULTS:

• Improved Accuracy: Achieved ±5 cm vertical accuracy in bathymetric data.

• Increased Frequency: Enabled monthly surveys instead of quarterly.

• Enhanced Safety: Zero personnel needed to enter the water.

• Decision Support: Data used to optimize decant pump locations and sediment removal scheduling.

• Adhering to regulated monitoring of these key areas on site.

CONCLUSION:

The Apache 4 Sonar Solution is significantly improving the mine's TSF monitoring by providing fast, accurate, and safe bathymetric data. The drone's mobility and sonar precision enabled proactive management of tailings and dam stability, reducing environmental risk and operational uncertainty.

For more information on this case study and/or general info on Dwyka Mining Services, send us an email, or visit our website.

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