

# Sulmara demonstrates new robotic solution for UXO investigations



Sulmara recently successfully completed an unexploded ordnance (UXO) and multibeam (MBES) survey of Ardersier Port, Scotland. The port is currently undergoing a significant regeneration project involving construction and dredging to meet future Scotwind requirements. The primary objectives of the survey were to identify potential UXO targets and collect detailed bathymetry data in the dynamic water environment, ranging from depths of one to ten metres.

To carry out the survey, Sulmara used an advanced uncrewed surface vessel (USV) named WAMV-16, equipped with innovative technology. This included a high-resolution NORBIT Subsea MBES system to acquire detailed bathymetric data, ensuring safe towing operations and generating accurate seafloor mapping and charting. The wide coverage

angle of the NORBIT MBES system allowed efficient data acquisition in the shallow water environment.

The WAMV-16 USV towed two G882 magnetometers provided by SafeLane Global. These magnetometers detected magnetic anomalies associated with submerged UXOs, aiding in the identification and classification of targets. Careful positioning of the magnetometers minimized interference from the USV's operations.

## Natural features and UXO targets

The survey covered the challenging waters of Ardersier Port with four-metre line spacing to achieve optimum coverage over an area of approximately 450,000 square metres. The Sulmara USV field operations team established a mobile remote operating centre (ROC) and continuously monitored the USV's onboard control system to ensure safe navigation through constrained areas such as jetties, docks, submerged hazards, dredging equipment and other infrastructure.

Throughout the survey, the UXO detection systems continuously measured and recorded magnetic field variations. These measurements were correlated with the multibeam data, allowing for the identification of potential UXO signatures in relation to seafloor features. The data was remotely monitored in near real time at Sulmara's US office.

After the survey, the collected data underwent post-processing and analysis. The multibeam bathymetric data was processed to generate digital terrain models and seafloor contours. This information facilitated the identification of shallow areas, potential navigational hazards and areas requiring further investigation. Advanced algorithms and pattern recognition techniques were applied to differentiate between natural seabed features and potential UXO targets, ensuring accurate identification.

Additionally, the magnetic field data collected by the UXO detection systems was processed and analysed to identify magnetic anomalies associated with potential UXOs. The analysis integrated all available information, including bathymetric data and magnetic signatures, resulting in a comprehensive report highlighting the location and classification of potential UXOs in Ardersier Port.

## Advances of an uncrewed asset

The utilization of an uncrewed asset allowed the field operations team to navigate a towed body through a challenging environment. The WAMV-16 USV provided a better vantage point for assessing hazards and offered greater manoeuvrability compared to traditional vessels. In addition to enhanced navigational safety, the USV's quiet operation and stable platform ensured a higher quality of data compared to crewed vessels. The [WAMV-16 USV](#) is considered a low-carbon solution, generating zero CO<sub>2</sub> emissions.

The survey outcomes include accurate bathymetric charts, high-resolution seafloor imagery and the identification of multiple ferrous objects and potential UXOs. These findings will contribute to the port's safety and aid in future decision-making related to UXO.