

Precision Hydrographic Services – Object detection and debris clearance

ACTIVITIES conducted in, on, or under the sea are made safer knowing the depth and nature of the seafloor, by identifying any dangers to navigation, as well as understanding tides and currents. Hydrographic surveyors obtain this knowledge and use it to maintain safety of our waterways and contribute to the maritime economy.

Hydrographic surveyors look for features such as wreckages, debris, pipelines and other hazards to navigation. A feature is defined as any item on the seafloor which is distinctly different from the surrounding area. It can be anything from an isolated rock on a flat sand seafloor to a wreck or an obstruction.

Detection of small objects and debris are very important when conducting surveys in support of Dynamic Under Keel Clearance (DUKCTM) and harbour safety where every centimetre counts. Objects not only have the risk of puncturing hulls but also blocking intakes and fouling propellers causing significant damage and/or possible delays. Often small objects can represent the controlling depth of an area. Therefore, by removing the object an increased depth can be achieved.

Side Scan Sonar (SSS) and Multibeam Echo Sounder (MBES) are specialised systems which are utilised for the detection and visualisation of underwater objects, and enable a complete and detailed description of the seabed.

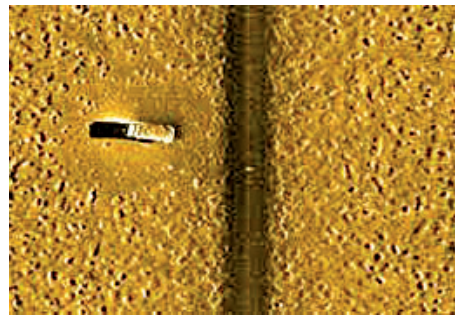
A SSS system consists of a topside processing unit, a cable for electronic transmission and towing and a subsurface unit (a tow fish) which transmits and receives acoustic energy for imaging. A side scan transmits sound energy and analyses the return signal that has bounced off the seafloor or

other objects. The strength of the return echo is continuously recorded, creating a 'picture' of the ocean bottom. For example, objects that protrude from the bottom create a light area (strong return) and shadows from these objects are dark areas (little or no return) or vice versa, depending on operator preference. Heights of objects above the seafloor can be determined from the length of the shadow and height of the tow fish above the seabed. Accurate depth of the object is difficult to define from a side scan record and therefore another method must be employed to determine if the object poses a risk to navigation.

SSS data can be used to detect changes in seabed type and together with seabed sampling will enable seabed classification maps to be produced. Seabed classification is used for environmental assessment and habitat mapping. Likewise, knowledge of the seabed type is useful when determining suitable anchorage locations.

Unlike SSS, MBES map the seafloor by transmitting a narrow fan of sound towards the seafloor. Focused beams receive the echoed sound from the seabed and the elapsed time between transmit and receiving is converted to a depth value using the measured speed of sound through water. This process enables the seafloor to be mapped very quickly with 100% coverage and high horizontal and vertical accuracy. High resolution multi beam systems are also capable of detecting small objects and debris on the seabed.

Although both SSS and MBES systems describe the morphology and nature of the seabed, they have inherent differences. SSS is a suitable tool when searching for debris on the seabed as it can cover large areas very quickly. However, accurate depth cannot be determined from side scan data. A MBES system can produce excellent results for object detection. Modern systems are capable of detecting objects less than 0.5m in size, and have been known to detect narrow pipes, cables and



Above: Seabed object with shadow

ropes. It is common practice to run two passes of multi beam to confirm or disprove an object. This is done to eliminate the possibility of erroneous data, such as the detection of fish making its way through to the final data, resulting in a false representation of the available depth.

When SSS and MBES systems are used together they provide complementary findings and increase the validity of the obtained survey results. Nonetheless, factors to consider when choosing which system to use include the objectives of the survey, the nature of the seafloor, scale or extent of work to be done, the minimum requirements for the project and the cost of procuring the technique.

While it may be desirable to investigate every feature this will not be possible in complex areas. After considering available resources and the intended use of the area, hydrographic surveyors will need to use their judgement as to which features they will investigate further. For example, a shoal of 26m in general depths of 28m may not warrant further investigation if the draught of vessels using the area is only 12m.

Investment in extensive survey data collection may appear to be costly, but in the long term quality surveys are worthwhile. There is strong evidence which recognises the critical value of hydrographic services as an essential element of national infrastructure and a critical enabler of other maritime activities. Improved charts may allow for faster transits of ships with deeper draughts resulting in a greater amount of goods moving

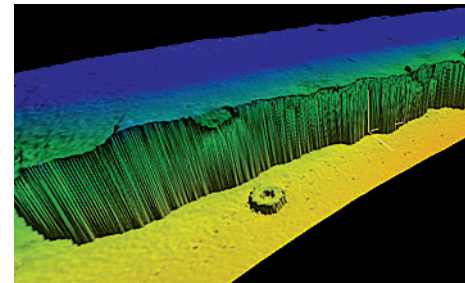
through navigational points and ports.

Generally, the value of hydrographic services are understated and are beyond the obvious benefit of improved nautical charts. Perhaps just as important is the need for hydrography and bathymetry to support the development of national and local strategies to preserve and protect ocean resources. Coastal zone management, hazard response and mitigation, national defence and maritime boundary delimitation are but a few examples of activities that require knowledge of the seafloor.

Neil Hewitt, PHS Managing Director states, "Removal of an object that represents the controlling depth in an area can result in a significant depth advantage. Identification of these objects requires high quality data acquisition and detailed processing of data. Object identification is a critical activity when conducting surveys for the safety of navigation in channels and coastal areas."

PHS has extensive experience in conducting hydrographic surveys in support of various marine activities including navigational safety, nautical charting, coastal zone management, dredging operations and habitat mapping. Their name is testament to their precise data collection and analysis. They are an experienced consultancy and surveying service who specialise in the acquisition, interpretation and reporting of seabed information.

If you are involved in planning a coastal or marine infrastructure project, speak with Neil and his team of experienced and certified Level 1 hydrographic surveyors. Call 08 8351 1203 or email info@precisionhydrographic.com.au



Above: Image shows the detection of a tyre



Above: Rock removal

We do it once, we do it right

PHS
PrecisionHydrographicServices

PHS is an experienced consultancy and hydrographic surveying service specialising in the acquisition, interpretation and reporting of seabed information.

Our name is testament to our precise data collection, analysis and reporting.

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