ALL AT SEA: ADDING ARCHAEOLOGICAL VALUE TO AN OCEAN OF BIG DATA

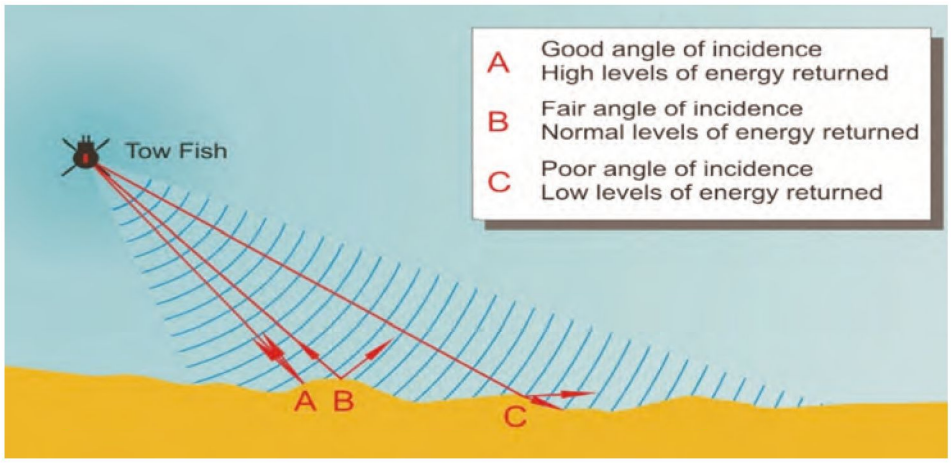
Scott Chaussée ACIfA (7007) and Tim Marples, with contributions from the Marine Geophysics team at Wessex Archaeology

In writing an article on marine geophysics, we thought it would be useful to provide a narrative in the form of a retrospective. The 'industry' has changed markedly over the last ten years, and continues to do so. There is continuity with aggregate extraction but the rise of offshore renewables, with power and data interconnectors, plus new concerned parties has created a new stakeholder landscape. In the age of climate change, infrastructure development is both required and nationally significant; it also occurs on a completely different scale.

We maintain a strong working relationship with dedicated site-survey contractors who collect the bulk of the data we assess. The increases in project scales have necessitated adoption of better technology and techniques, but also substantial increases in data volumes: marine geophysics datasets routinely approach of tens of terabytes. Big-data issues provide both challenge and reward, allowing for greater insight through high-resolution examination of the seabed over hundreds of square kilometres. In this article we look specifically at seabed assessments comprising SideScan Sonar (SSS), Multi-Beam Echo Sounder (MBES), and magnetometer data. Marine geophysics for archaeology requires the highest fidelity data density commercially achievable: we have no 'lower limit' of detection.

Our specialism is in teasing out the archaeological signal from the geotechnical and geophysical noise. The value-add for commercial clients is in timely avoidance and mitigation of potential archaeology before costly decisions are baked into the design. Fortunately, the data is usually acquired already for geological, engineering or Unexploded Ordnance (UXO) purposes and we are able to work with whatever is thrown at us; the higher resolution the better for heritage and all at small incremental survey cost.

Within Wessex, the Marine Geophysics Team is situated alongside our Terrestrial colleagues in our Geoservices directorate servicing internal and external clients with projects scopes that range from several days to year(s)-long assessment commitment. On a daily basis, our team routinely classifies the likely origin and significance of small (sub-metre) anomalies while features at the wreck scale - ship or aircraft – are the exception; but it is these exceptions that drive the enthusiasm of our team.



SideScan Sonar (SSS). Credit: Wessex Archaeology

As a suite of complementary techniques, marine geophysics is the only remote, non-intrusive method of risk reduction available to our clients and sits between desk-based research and focused ground truthing. In choosing a case study, we reference an older study encompassing the acquisition, processing, assessment, and mitigation/recommendation scope. Our chosen example was a survey undertaken in 2011 for the London Gateway Port development, which proposed to widen and deepen the approach channel to accommodate larger vessels, forming one of the largest dredging projects ever planned in the UK (Scott and Gane 2015).

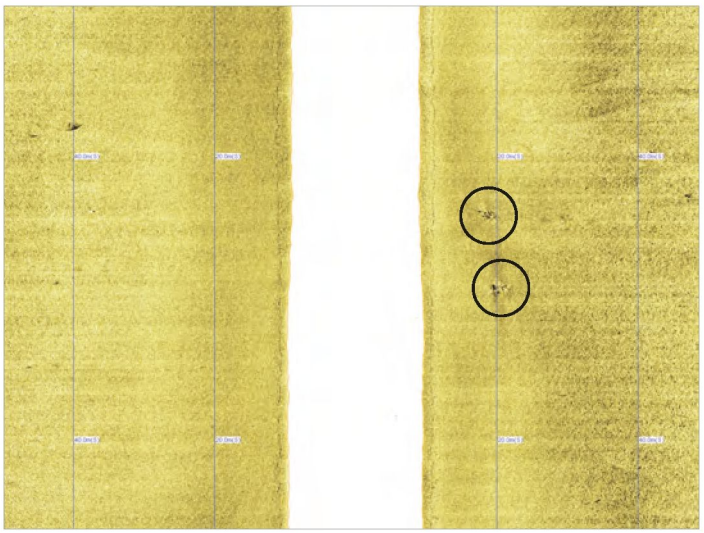
The geophysical assessment produced a total of over 540 anomalies. Two small SSS anomalies were located within 25m of each other. A small but distinct magnetic anomaly associated with the SSS features suggested the presence of ferrous material. Our team synthesises a wide array of documentary material to support our interpretations, including so-called 'strike reports' produced by dredge operators. A strike report is generated when unexpected material is recovered during dredging. In this case, a strike report corresponded with a dredging track over the area where the anomalies were detected.

Finds recovered by the dredger included fragments of aluminium airframe and parts from a large format camera, some stamped 'R8.88', which indicated that it must have come from a German Junkers 88 bomber (Ju 88), lost during World War II. Wessex's Coastal and Marine teams dived the locations identified in the geophysical data

and observed further excavation by grab-dredger. The complete assemblage numbered 351 objects and comprised elements which helped identify the wreck as a Ju 88T; the only one of these known to have been lost was shot down by a Norwegian fighter ace on 20 April 1943 (Scott and Gane 2015: 80-86).

The sea has shaped human communities and their relationships with each other since the earliest times. Contributions of marine geophysics to the human story have ranged from elucidating submerged prehistoric landscapes to examining the tragic reflections of human conflict, demonstrated by wreckage of ships and aircraft. We are uniquely placed to continue sharing our privileged view of submerged sites and landscapes and generating value for the clients and communities we serve.

Steph Arnott on deck preparing for SSS data acquisition. Credit: Wessex Archaeology



Sidescan sonar waterfall image with anomalies indicated. Credit: Wessex Archaeology

BMW 801G-2 radial aero engine recovered from one of the locations identified in the marine geophysics. Credit: Wessex Archaeology

References

Scott, G and Gane, T, 2015 'Aviation archaeology offshore', *Journal of Conflict Archaeology* 10(2).

Scott Chaussée

Scott is a marine geophysicist based in the Salisbury office. Marine Geophysics at Wessex Archaeology is a close-knit team that provides technical authority and subject-matter expertise in support of offshore projects including renewable energy, infrastructure, and community engagement.

Tim Marples

Tim is the manager of the Marine Geophysics team. He joined Wessex Archaeology in 2019 after over 30 years as a geophysicist in global oil and gas exploration, choosing to make a change in support of a more sustainable future.