

Underwater Metal Detectors for MEC/UXO Detection



Tetra Tech has developed, refined, and deployed custom underwater MEC/UXO detection systems for more than a decade.

Leveraging proven land-based metal detection systems, our marine scientists have adapted and improved the technology for use in marine settings. Our customized detection systems continually evolve and improve with each deployment. Proven at real-world underwater munitions sites, these systems are fully operational, tested, and ready to survey in water depths from centimeters to over 100 m deep. Highly adaptable, our systems have also been used for other projects where metal detection is required, such as:

- Cable and pipeline route surveys
- Pipeline/cable location and O&M monitoring
- Search, salvage and debris surveys
- Archeological/cultural surveys

Tetra Tech Developed Detector Systems

The Innovative Towed Electromagnetic Array (TEMA)

The TEMA has multiple form factors, with two deployment types, each with a 3-m swath width which is selected based on site conditions. The TEMA uses the high-power variant of Geonics EM61 (EM61MK2-HP). The HP units increase the range of detection between 45 percent and 80 percent over the standard EM61MK2. There are two main tow fish types—the **deep-tow TEMA-MK3**, which can be operated in 3 to 100 m of water, and the **TEMA-Lite**, which can be floated and pushed or towed in extremely shallow water to approximately 40-m depth.

The TEMA-MK3 employs a custom telemetry system. All data from the three EM sensors as well as all the ancillary sensors are multiplexed up a single twisted pair of wires or one single-mode fiber optic cable. With the use of the fiber optic multiplexer (MUX), the TEMA is capable of streaming two full 1080-p high-definition video streams, simultaneous with multiple standard definition streams, live to the surface during data collection, as well as the data from the three EM units, two altimeters, heading and tilt sensor, and the USBL responder trigger signal. The fiber optic MUX also allows for real-time control and uploads of still photos from Tetra Tech's custom underwater digital single-lens reflex (DSLR) camera housing.

Tetra Tech's TEMA Underwater Metal Detection Capability

Our in-house proprietary metal detection systems were developed based on several decades of MEC/UXO detection and remediation for the U.S. Navy, U.S. Army Corps of Engineers, and commercial clients. Differentiators include:

- TEMA platform detects ferrous (magnetic) and non-ferrous metals (e.g., aluminum).
Benefit: requires only one system, one pass for full detection capability.
- The TEMA's detectors are focused; thus are insensitive to nearby piers, bulkheads, etc.
Benefit: allows surveys in areas where magnetometers cannot operate due to interference.
- Equipped with 1080p HD video/still cameras and underwater lighting.
Benefit: provides real-time visual data informing operators on detects (e.g., an anchor vs. a bomb).
- Data from all devices, multiple EM sensors, altimeters, attitude sensors, video/photos, are multiplexed and streamed real-time to the surface via a single fiber optic cable.
Benefit: eliminates multiple cables and multiple cable operators, reducing both cost and time.

Tetra Tech is a leading provider of consulting, engineering, program management, construction, and technical services addressing the resource management and infrastructure markets. The Company supports government and commercial clients by providing innovative solutions focused on water, the environment, and energy. With more than 14,000 employees worldwide, Tetra Tech's capabilities span the entire project life cycle.

Innovation through Design

The TEMA-Lite can be configured as a surface-floated array or bottom-towed sled. The TEMA-Lite can be pushed, surface towed, or dragged as a sled behind a small boat, or pushed



Shallow water hovercraft deployment

while rigidly attached to a boat or Tetra Tech's custom hovercraft.

The use of a hovercraft allows for data collection over extremely shallow areas that contain sensitive habitat, such as coral reefs, tundra and intertidal

zones. The TEMA-Lite can be outfitted with HD cameras, altimeter, RTK-GPS, and USBL transponder.



Offshore geophysical survey operations

The Marine Gradiometer System (MGA)

The MGA is a scalable 4-m-wide 3-D gradiometer array. It consists of 10 Overhauser magnetometers that measure the 3 gradient components of the magnetic field that are used to calculate the true measured analytic signal. The analytic signal is unaffected by diurnal variation and is less sensitive to geologic influence, while being more sensitive to magnetic targets of interest. Tetra Tech demonstrated the MGA during the Environmental Security Technology Certification



Tetra Tech's MGA is readily deployable from large and small vessels

Program (ESTCP), MM-0808, Wide Area Assessment for Marine UXO. This system can be configured in same deep-tow or shallow-water configurations as the TEMA. With a 300-m depth rating the MGA can reach depths that other systems cannot.



The 4-sensor MGA being deployed for a cable route survey

Autonomy for ROVs and Munitions Disposal Services

Once targets have been selected, reacquisition, identification and disposal can be performed. To this end, Tetra Tech's ROV services include autonomously reacquiring targets with EM or magnetometer, flying at a fixed altitude and station holding during inspection. The ROV can also be installed into a towbody—the Tetra Tech Towed ROV (T³ROV)—and towed behind a survey vessel, increasing the system's capability and efficiency, with the ability to add up to 100K lumens of lighting, HD cameras, DSLR, CTDs, etc., while reducing operating costs. Our systems capture true georeferenced video/stills (not merely a display overlay) allowing for review of imagery at a location by simply clicking on a map. We have ex-Navy EOD divers on staff and have recovered thousands of MPPEH from underwater sites, including chemical munitions.

About Tetra Tech's Marine Mapping Group

The group comprises professional geophysicists, geologists, hydrographers, and USCG licensed captains and marine professionals who deploy worldwide to complete challenging projects with innovative systems and solutions. We specialize in all types of marine geophysical and geotechnical surveys. The ability to draw capable staff and resources from Tetra Tech offices throughout North and South America translates to rapid deployment virtually anywhere. Our team has practical approaches to detecting and locating unexploded ordnance and munitions debris, as well as cable and pipeline routing, and debris surveys from nearshore to deep-water environments.