

## **Deep B.V.**

Deep BV Amsterdam is an internationally operating engineering bureau, specialized in hydrography and geophysics. Deep charts everything on, around and in the underwater bottom three-dimensionally by means of advanced technology, both on land and on sea. Deep works with a close team of hydrographic engineers, geologists, geophysicists and engineer geologists. A good collaboration between these various specialties within multidisciplinary projects is a prerequisite for reaching high-tech solutions. Deep carries out projects for the dredging and offshore industry, contractors, governmental organizations and engineering bureaus. According to Deeps' vision a good collaboration with and openness towards the client will eventually lead to the best possible result.

Deep uses the following techniques, among others:

Multi beam, single beam, side scan sonar, magnetometer, sub-bottom profiling, ground penetrating radar (GPR), radio detection, resistance measurements, EM-methods, DGPS positioning, under-water video and positioning, wave and tidal measurements, vibro coring etc.

## **Tracing of Conventional Explosives**

The Dutch soil still contains many conventional explosives from the Second World War that have not yet exploded. They vary from airplane bombs, grenades, mines and other types of ammunition to whole airplane wrecks and can be dangerous to the surrounding environment due to time and weather influences and changes in the condition of the soil. The whole process from historical pre-investigation to the detection, approaching and rendering harmless of these explosives must be carried out by a company that is certified according to BRL-OCE.

Deep BV is specialized in detecting conventional explosives, both on land and on sea. By collaborating with a certified company one can go through the whole process of tracing the explosives. An often used geophysical measuring technique is the detection of explosives by means of a magnetometer. This piece of equipment detects ferro- or iron-containing material because this causes a local disturbance of the natural earth-magnetic field. By carrying out measurements in a pattern of survey lines and linking them directly to a coordinate by means of GPS equipment, a terrain can be charted without causing destruction. By processing and plotting the data with specialized software, a list of suspected locations can be produced which can then be used for the further process of approaching the explosives and rendering them harmless.

## **Tracing of conventional explosives**

Hydrography is the science that focuses on the physical properties and processes of the Earth. Hydrographic engineers reconstruct what takes place in the sub-soil, by means of physical methods and techniques. In the case of near-surface geophysical investigation, non-

destructive measuring techniques are used. By measuring for instance the earth magnetic field, electrical resistance, differences in the gravitational field and sound velocities, one can get a picture of the sub-soil.

These techniques can be used for example for charting the geology of the soil, environmental and hydrological investigations, the tracing of conventional explosives, archeological investigations, detection of cables and measurements of asphalt thickness. By combining these techniques, Deep can accomplish a complete picture and therefore an optimum result of its investigation.

### **The Twenthe Channel**

An example of a Deep project is the charting of unexploded conventional explosives in part of the Twenthe Channel near the village of Lochem. Approximately 13 kilometers of the channel has been measured with a magnometer. Found objects have been classified and delivered in the form of a map and a list of coordinates. Thereafter, the objects have been approached and removed so that the safety of future dredging activities can be guaranteed.