

## GROUND PENETRATING RADAR / STRUCTURAL RADAR DETECTION OF NETWORK, CAVITY, FRAMEWORK, STRUCTURAL DEFECT

Ground penetrating radar is a subsoil and structure investigation tool. It uses reflectometry of electromagnetic pulses within radar frequencies. The wave is emitted and received by a measuring antenna moving over the investigated ground or structure. Reflection on interfaces, networks, and objects present in the investigated ground create a picture on the control screen as the antenna moves. The most frequent uses of GPR concern detections of objects, structures or defects buried in ground, concrete or masonry:

Cartography of underground networks (water, gas, electricity, communication, sewage, various fluids...);

Search for caves, galleries, ducts, void, underground quarries...;

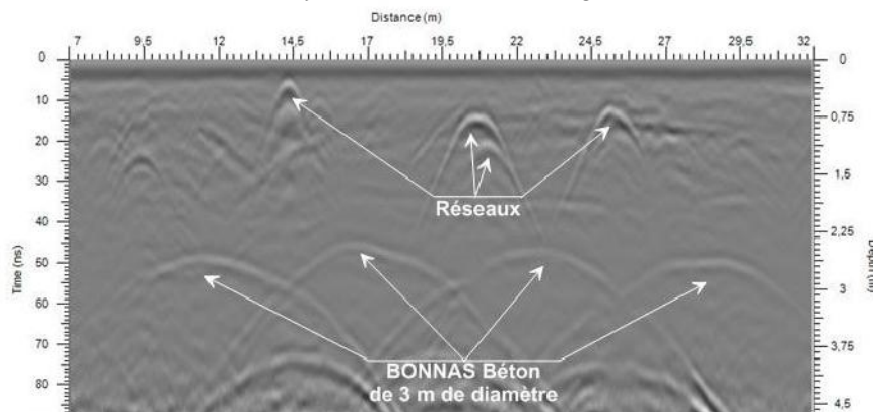
Man-entry pipes : investigation of concrete, masonry, extrados...;

Search for tank, metal drum, ammunition... as part of environmental studies;

Search for reinforcements in concrete;

Investigation of pavement and subgrades (road, runway, train ballast...)

Search for old concrete or masonry foundations, archeological search...



Radar technology provides high-definition images and allows for investigation rates of several kilometers a day. The figure above, called radargram, represents a GPR acquisition along a straight profile. We can notice several anomalies, some characteristic of pipe presence.

Depth penetration of GPR, which depends on the frequency of the antenna used, varies between a few decimeters with high-frequency antennas (900 à 2600 GHz) and a few meters with low-frequency antennas (100 à 600 MHz). Some materials, like clay, moist soil or steel, have high mitigation capacities and limit still penetration depth of GPR waves. The measuring chain consists of an acquisition unit and an antenna. It is usually placed on a trolley, facilitating movement. Data is processed with the help of softwares, like RADAN. These softwares process data and create 2D and 3D radargrams.



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