

UTILITY SURVEYS - METHOD AND LIMITATIONS

GREENHATCH GROUP LIMITED

It is industry standard to undertake Underground Utility Surveys using two main pieces of equipment, Electromagnetic location equipment and Ground Penetrating Radar.

The RD8000 precision locator we use works on electromagnetic principles and the Mala Easy Locator or the IDS Detector Duo are both Ground Penetrating Radar systems. The RD8000 is predominantly used for locating cables, metallic pipes and other metallic services. The Ground Penetrating Radar system is used for locating non-metallic services such as Polyethylene water and gas pipes and other buried features such as fuel tanks and other voids within the ground that may be of interest. With both pieces of equipment and their methods of operation there are technical and physical limitations to what can be achieved and what services can be successfully traced on site and reasons for any limitations.

The RD8000 can be used for locating services using three main methods of operation; a 'passive' method, an 'induction' method and a 'direct connection' method. When using the 'passive' frequencies, the signal picked up by the RD8000 receiver at the surface is from the utility giving off its own background signal naturally. An electric cable or a telecoms cable will emit its own power or radio signal which if strong enough can be traced at the surface. If the utility is dead, cut off and buried in-situ, they do not give off this 'passive' signal because they are effectively 'turned off' and therefore no natural signal is emitted and therefore it cannot be detected via the passive method. Some live cables can still be problematic such as some HV cables which can be the 'balanced' type which are designed specifically not to give out any 'passive' signal whatsoever. It makes no difference whether they are 11Kv or 33Kv if they are designed that way there is no way they can be detected via the passive method. Some ductile iron pipes can also be very difficult to locate, a signal may be present along some length of the pipe however some pipes do have a rubber seal at the end of each pipe segment which effectively breaks the conductivity of the trace signal. Therefore only small sections of the pipe may be traceable.

When the site has been surveyed using the passive frequencies and no further signals are obtained, the 'induction' method is employed, the signal generator part of the RD8000 equipment is used to try and induce a 'generated' signal onto the target utility with the aim of tracing this particular generated signal at the surface. The generator is generally placed on the ground and a signal is emitted into the ground from the generator with the intention that the signal will be 'attached' to a buried service and then travel down its length thus allowing the route to be traced at the surface with the receiver in 'induction' mode.

In certain cases, passive and induction sweeps do not gain signals on utilities and the only other way to locate these using the Electromagnetic methods is by direct application of a trace signal at source. This is where the signal generator is directly connected to the utility via a clamp or clip leads. To do this direct access to the service is required; this is normally via a stop valve, inspection chamber, cable riser or plant room. Sometimes, a point for direct connection does not appear in the survey area or is behind locked doors / gates. Whilst surveyors will extend the survey area to look for such access points there is a cut-off point otherwise the survey area becomes too large. This is one reason why we suggest having historical record drawings or statutory undertaking drawings – these will give a better indication of where access points are likely to be. The topographical survey will show the position of certain access points however these tend to be confined to the survey areas alone.

Once the Electromagnetic methods have been exhausted Ground Penetrating Radar can be used to further investigate the site services. GPR does not physically locate buried services but looks for differences in the ground density to indicate the possibility of buried services.

The GPR unit is mounted on a trolley based system which is then pushed over the site area. Naturally, if the site is overgrown, stepped or uneven it is difficult or near impossible to push the GPR unit over the site area. The actual radar unit needs to be in close proximity with the ground otherwise the unit does not operate. Unfortunately GPR has its limitations as well, if services are buried in heavy, wet or clay soils or in lots of rubble, backfilled or disturbed material, the return signal is either too weak (dispersed due to the water) or too jumbled (too many peaks and troughs because of disturbed ground) to allow interpretation and the chances of finding utilities from results gained are very slim. The GPR unit tends to work best on flat virgin ground where a break in the natural strata can be seen where a trench has been cut to lay the service in. The GPR unit is never used as a standalone survey method / tool but is used to complement the electromagnetic locator. It is not generally used to locate cables; this is the wrong application for this equipment.

Record information for all sites is essential, whether they are historic records or statutory records the more information surveyors have when attending site helps them evaluate the site and investigate all possibilities. Attending site with no record information can make surveying particular sites problematic. If we are unable to locate a particular service, the record information enables us to add and annotate any additional information we haven't been able to trace. If there are no access points, no marker posts, no signal and the service is buried out of sight then there is no way of knowing it is there. Record information can help identify any services that could possibly be there.

There is no guarantee that despite using the two main methods of location and all available techniques, along with examining record drawings, that all utilities are going to be found. Due to their buried nature it is impossible to provide a 100% guarantee that all services will be positively found. We will however use industry recognised equipment, employ industry recognised techniques and use experienced staff at all times to provide the best possible service.