Plowman Craven

Creswick, Welwyn Garden City
2D Underground Services Survey

Site address:

Chequers Lane, Welwyn Garden City, AL7 4SJ

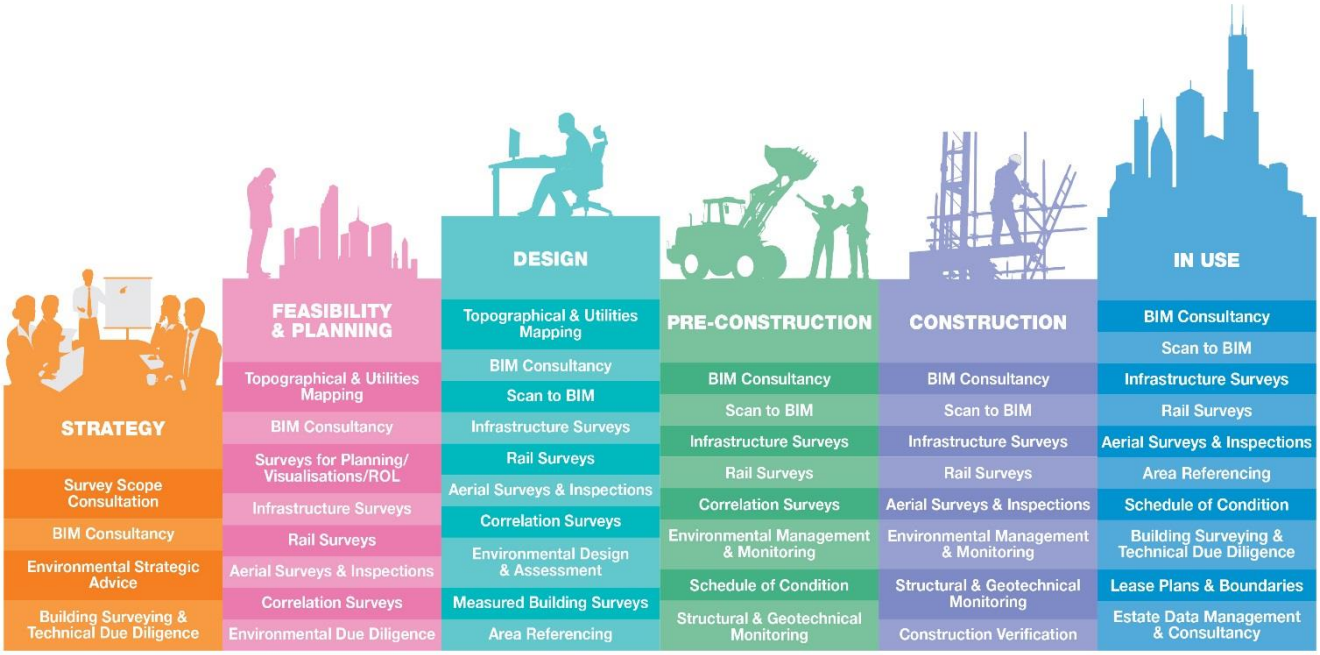
Prepared for:

Hilson Moran Partnership

One Discovery Place
Columbus Drive Farnborough
Hampshire
GU14 0NZ

Job Number: 48454

Revision: 1
Issue Date: 13/06/2023



Project Particulars

Plowman Craven were employed to carry out a full underground asset location survey, in line with PAS128 2022 (Publicly Available Specification for underground utility detection, verification and location) Data is available in line with BS EN ISO 19115-1:2014+A2:2020.

The main objective for this project is to detect, record and map all the underground assets within the agreed site boundary.

Plowman Craven attempted to locate the depth and position for all the underground services including plastic pipes and ducts, concrete sewers, fibre optics, communication cables and other below surface anomalies to a depth of circa 2.0M. Where possible services have been traced to a greater depth.

Site Works Commenced on **03/06/2023**

Weather During Works **Sunny**

Delivery of Outputs **13/06/2023**

Project Resource

Site Team: **Andrew Mitson & Jack Powell**
Responsible for data collection

Project Manager: **Nicky Berg**
Overall Management and planning of project, Authorising person for all outputs.

Project Lead: **Andrew Mitson**
Responsible for key skill sets required on site and Technical advisory.

Report Prepared by:

Jack Powell **Date: 04/06/2023**

Approved by:

Oliver New **Date: 13/06/2023**

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Underground Survey Results

General

A full desktop utilities pack was obtained, and the received drawings have been used to supplement the electronically traced information. Plowman Craven cannot however guarantee that all subsurface assets have been found, and service types have been determined by association with the feature from which it was traced, or, by correlating the traced asset with service records.

There was no confined space access attempted or allowed for on this site visit and as such all measurements have been taken from the surface only.

This project did not include for laser scanning of chambers and as such the extents modelled represent the measurements available to the surveyor at the time of survey.

Survey Equipment used:

Electro-Magnetic Locators:	RD8200
Ground Penetrating Radar:	Stream UP
GNSS System:	Leica GS16

Drainage

Detection Method: EML/GPR

All manhole covers were lifted where possible, with pipe sizes and invert depths recorded, and connections proved to source or destination by resonance or dye testing. Main outlet invert levels have been calculated based on a subtraction of the measured invert depth from the stated cover level. Where possible, a transmitting probe was inserted into the pipe and the route traced electronically. Chambers have been plotted to scale where significantly larger than the cover.

One cover was unable to be opened due to it being seized/rusted.

The Sonde / Flexi Trace will not give true line of sewer nor will it give an accurate depth. Outfalls in to main laterals will not be surveyed from standard techniques, CCTV surveys or slip trenches are recommended.

Drainage, unless specified otherwise is surveyed from the surface. Designation (SW, FW, CW) is determined from visual inspection alone. CCTV is recommended to determine any connectivity and the correct authorisation must be obtained from the Asset owner prior to installing or designing new connections.

The Invert Depths are provided at the Manhole for any connections visible and the Depth associated to the line is represented on the drawing as the depth to the located sonde/Flexi, this will not be a true invert or crown depth unless stated otherwise.

No confined space access was attempted or allowed for on this site visit

Electricity

Detection Method: EML/GPR

Electricity cables have been traced from access points such as cable risers, cable pits and other electrical features such as lamp posts. The identification of electricity cables is made by association with the feature it was traced from or taken by correlating the traced services with the record drawing and often, remote, visual inspection alone is insufficient means to determine the voltage of a cable.

British Telecom

Detection Method: EML/GPR

Inspection covers were lifted with details recorded and duct routes traced where possible.

COLT

Detection Method: EML/GPR

Inspection covers were lifted with details recorded and duct routes traced where possible. Flexi-trace techniques were used to trace these services as they are non-conductive fibre cables.

GPR

Detection Method: Stream UP

All GPR anomalies must be deemed as a live asset until proven otherwise. All depths displayed on the associated drawing are shown from ground level.

Baselines were established on site and the survey area was covered in line with PAS128 2022 M2p spacings, features may be the result of services which are running through the site, abandoned services, natural geological features or land drains amongst other things.

Records

See below for Desktop Utility Information.

Service routes added from records supplement the information gathered whilst on site but do not guarantee their presence. Anything added from records should be deemed as a live asset until proven otherwise.

Cautionary Notes

Radio frequency location and ground penetrating radar techniques have been used in the location of underground services. The results are not infallible and trial excavations must be carried out to confirm service identification, positions and particularly depths. Although all reasonable effort has been made in searching available record drawings, the completeness of the underground services information cannot be guaranteed.

Please refer to PAS 128:2022 Underground utility detection, verification, and location – Specification which can be obtained from the BSI website. The information provided within this documentation advises on survey methodologies and technologies in a lot more detail.

Plowman Craven take a consultative approach to our work and therefore we will attempt to provide a suitable scope of works associated to your needs, in line with PAS128 2022.

Desktop Utility Information

Utilities Identified:

Utility Name	Utility Type	Affected	Not Affected	No Response Received	Comments
UKPN	Electric	31/05/2023			
Utility Assets	Electric		09/06/2023		
Cadent	Gas	31/05/2023			
Energy Assets	Multi		31/05/2023		
Equans (Engie)	Multi		31/05/2023		
Leep Utilities	Multi		01/06/2023		
GTC	Multi		02/06/2023		
Eclipse Power	Multi		02/06/2023		
Last Mile (Energetics)	Multi		31/05/2023		
Affinity Water	Water	02/06/2023			
Thames Water	Sewerage	31/05/2023			
BT	Telecoms	02/06/2023			
Vodafone (C&W, Energis, Thus)	Telecoms		01/06/2023		
Virgin Media	Telecoms	31/05/2023			
Cityfibre	Telecoms		02/06/2023		
Colt (CA Telecom)	Telecoms	02/06/2023			
EUNetworks	Telecoms		31/05/2023		
Lumen Technologies	Telecoms		01/06/2023		
Kcom	Telecoms		01/06/2023		
MBNL	Telecoms		01/06/2023		
Sky	Telecoms		01/06/2023		
Sota	Telecoms		31/05/2023		
Arelion (Telent)	Telecoms		31/05/2023		
Verizon	Telecoms		31/05/2023		
Zayo	Telecoms	31/05/2023			
Linesearch	Linesearch	31/05/2023			
Mast Data	Telecoms		02/06/2023		
Coal Authority	Mining		02/06/2023		
Network Rail	Infrastructure		31/05/2023		

Please note this is cautionary information, for those assets identified within the survey area, they have been shown to exist if not able to be traced. Plowman Craven are not responsible for the completeness of said record drawings or the inaccuracies associated with them.

Although every effort is made to obtain Statutory record drawings and attend site within a 90-day window, we cannot guarantee the drawings last revision date.

Site Obstructions

Fig 1: MH not lifted due to seized frame and cracked/damaged cover.

Site Aerial/Survey Boundary

Fig 2: Site extents.

Plowman Craven

PAS128 2022 Survey Type/Quality Levels

Survey Type Establish with client prior to survey		Quality Level (Practioner to determine post survey)	Post Processing GPR Data (GPR Data Analysis)	Location Accuracy		Supporting Data
				Horizontal (A)	Vertical (B)	
D	Desk top Utility Record Search	QL-D	-	Undefined	Undefined	Copy of utility asset record only.
C	Site Recconaisance	QL-C	-	Undefined	Undefined	A segment of utility whose location is demonstrated by visual reference to street furniture, topographical features or evidence of previous street works (reinstatement scar)
B	Detection (C)	QL-B4	No	Undefined	Undefined	A utility segment which is suspected to exist (either on QL-D or QL-C records) but has not been detected and is QL-B4P Yes therefore shown as an assumed route.
		QL-B4p	Yes			
		QL-B3	No	±500mm	Undefined (No reliable depth measurement possible)	Horizontal location only of the utility detected by one of the geophysical techniques used. EML field unable to estimate depth and horizontal accuracies within B2 tolerances with confidence. Features present within the GPR data that indicate the presence of a utility but do not directly correlate to its position (e.g. trench sides or fill detected by GPR without positive identification of utility).
		QL-B3p	Yes			
		QL-B2	No	±250mm Refer to Annex C for accuracy achievable at what depth.	±40% of detected depth	Horizontal and vertical location of the utility detected by one of the geophysical techniques used.(D) Symmetrical field achieved resulting in peak and null measurements within B2 tolerance and/or present in GPR data where both depth estimates and horizontal location can be confidently established to the required accuracies.
		QL-B2p	Yes			
		QL-B1	No	±150 mm Refer to Annex C for accuracy achievable at what depth.	±15% of detected depth	Horizontal and vertical location of the utility detected by one of the geophysical techniques used. (D, E) Symmetrical field achieved resulting in peak and null measurements within B1 tolerance and/or present in GPR data where both depth estimates and horizontal location can be confidently established to the required accuracies.
		QL-B1p	Yes			
A		QL-A	-	±50mm	±50mm	Horizontal and vertical location of the top, bottom or centreline of the utility (to be indicated on drawings).

A) Horizontal location is to the centreline of the utility.
B) Vertical location is to the top of the utility. Depths determined to the centre of the utility should be indicated as such by exception.
C) For detection, it is a requirement that a minimum of GPR and EML techniques are used (see 9.2.1.1.2).
D) Electronic location readings from EML equipment should be obtained by using the signal generator and receiver together. Locations obtained by the EML receiver alone and not confirmed by GPR shall be categorized as a B3.
E) If only detected by one technique, the practitioner should be prepared to make available to the client clear evidence for the accuracy achieved to be classified as a QL-B1 or QL-B1P.

Survey Methodology

EML Methodology:

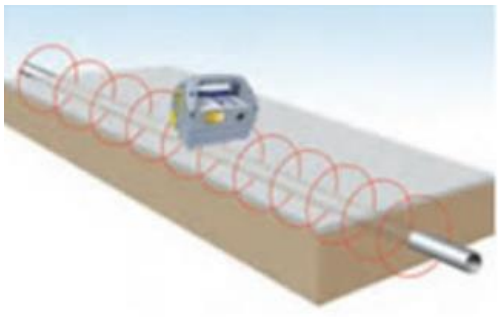
RD8000/RD8100 receivers and transmitters, which uses very low electromagnetic frequencies to detect the services are used with varying approaches:

Direct Connection – This technique incorporates the use of a signal generator which is capable of generating sine waves at very low frequencies, typically 8 kHz or 33 kHz which can be applied to a metallic service. The service acts like an aerial and conducts the transmitted signal, which can then be detected on the surface using the receiver.

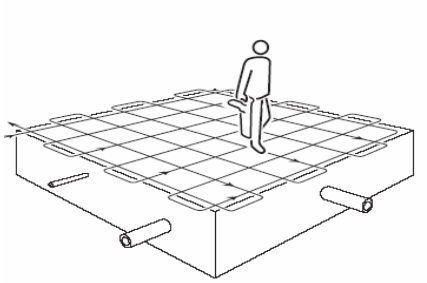
This is the most accurate method of locating a buried service and is applied in the first instance where access to pipes and cables is possible.

Signal Clamp – The signal clamp will be used to trace buried LV and HV cables. The signal will be applied via a clamp which is placed around the cable at a point the service enters or exits the ground.

Induction – Where a direct signal cannot be applied, the transmitter is used to radiate an indirect signal actively. The transmitter has a built-in aerial, which is capable of transmitting an electromagnetic field into the ground which conducts along the pipe or cable and can be detected on the surface using a receiver**.**



Passive – In Passive mode, the receiver is used without the transmitter to detect signals, which are generated by power cables or from distant radio transmitters, which constantly induce a signal into metallic services.



This method should only be used once both Direct Connection and Induction methods have been exhausted.

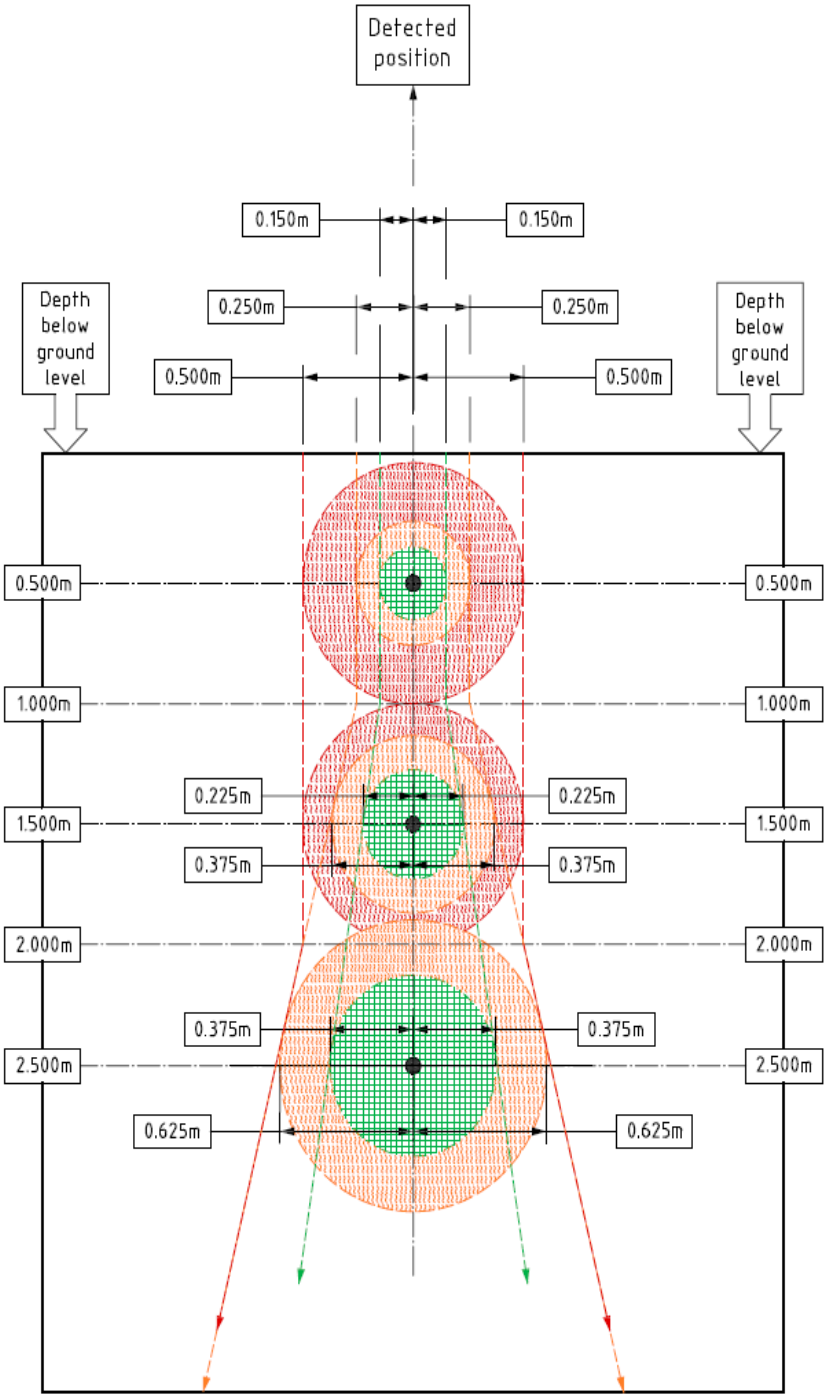
Maximum Depth Approx.:	Line: 20' / 6m
	Sonde: 50' / 15m
Depth Accuracy:	Line: ± 5% tolerance 4" / 0.1m to 10' / 3m
	Sonde: ± 5% tolerance 4" / 0.1m to 23' / 7m
Locate Accuracy:	± 5% of depth

Figure below illustrates the horizontal and vertical accuracies for QL-B1, QL-B1P, QL-2, QL-B2P, QL-B3 and QL-B3P and how these are affected by depth.

Each cone in the chart shows the envelope of expected accuracy. QL-B4 represents routes where detection was attempted but unsuccessful. Hence QL-B4 describes assumed routes and cannot be represented within the chart. The three sets of circles show examples of expected accuracies of detected utilities at 0.50m, 1.50m and 2.50m in depth.

Each cone in the chart represents the envelope of expected accuracy for Quality Levels B1, B2 and B3. Quality Level B4 (where detection was attempted but unsuccessful, i.e. assumed routes) are not attributed any accuracy.

Horizontal and vertical accuracy



Key

- QL-B1 ±15% of depth or 0.150 m (whichever is greater)
- QL-B2 ±25% of depth or 0.250 m (whichever is greater)
- QL-B3 detection successful but no depth, horizontal ±0.500 m

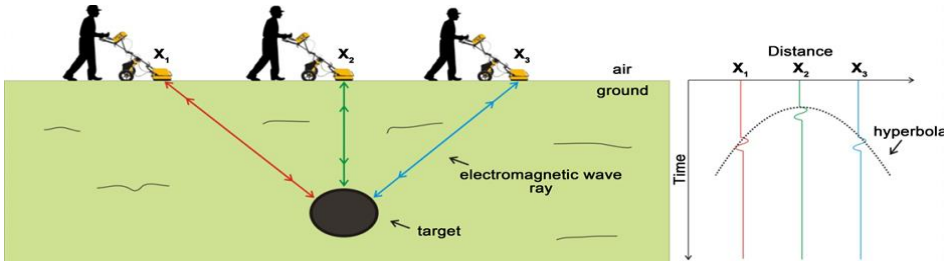
NOTE The accuracy decreases beyond a depth of 2.000 m.

- Detected utility position

GPR Methodology:

Ground Penetrating Radar is a geophysical technique that produces ultra-high frequency (UHF) electromagnetic waves that allow interfaces between materials with differing dielectric constants to be mapped.

The GPR system consists of two antennas, a transmitter and a profiling recorder. The transmitter generates a very short pulse which is emitted into the ground. Energy backscattered by any targets such as a pipe, cable or structure is then captured by the receiving antenna, which is fixed to the transmitting antenna so they move together.



To achieve best results the radar must always be in contact with the ground, the collection of data across heavily rutted or overgrown sites does not give the best results. Where the radar encounters reinforcing bars these can mask any features below, severely limiting its capability to locate services under. It is therefore unreasonable to expect services in these areas to be traced.

All Equipment used was calibrated and tested in line with manufacturer guidelines. Calibration certificates can be provided on request.

Please note Depths are provided to the centre of the utility for those detected using EML on a cable and to the crown for those detected using GPR.

Please note: The type of soil or material being investigated, and the electrical properties it possesses, are important factors within a survey, but there are also other practical considerations. A purely ground-coupled GPR antenna requires good ground contact to perform well. If less energy is transmitted into the ground, then depth penetration is reduced.

Three factors that influence the actual depth penetration achieved on any site are the relative dielectric permittivity (RDP) of any material, its conductivity and its moisture content (which can also impact on the conductivity).

The RDP of a material is related to the density of any bound charges, and how easily these bonds can be displaced by an electromagnetic wave. A material with a high RDP has a high density of bound charges. An EM wave travels more slowly through a material with a high RDP value than through one with a low RDP value.

References:

It is the client's responsibility to understand the works requested and instructed. Additional guidance and reference material to aid in this understanding can be found within the PAS128 2022 (Publicly Available Specification for underground utility detection, verification and location)

- Annex B (informative) Client guide to using PAS 128 and utility survey
- Annex D (informative) Technical considerations when using utility detection methods (EML and GPR)
- Annex E (informative) Example project workflow

Throughout this report, information has been extracted directly from the PAS128 2022 revision and has been used as supporting information.

Notes:

It is the client's sole responsibility that this report is read in conjunction with the provided drawing, it must be accompanied with the drawing at all times. If the drawing is being used for digging purposes it is all so the clients responsibility that safe digging practices are followed in line with HSG47 "Avoiding danger from underground services", Plowman Craven will not be held responsible for any negligence associated to safe working. Further information on the capabilities of the equipment and associated technical restrictions can be found within the PAS128 2022 document as well as our supporting proposal documents.