Title	**Demonstrate knowledge of ground penetrating radar for underground utility locating**		
Level	**3**	**Credits**	**5**

Purpose	People credited with this unit standard are able to demonstrate knowledge of ground penetrating radar (GPR) for underground utility locating.

Classification	Infrastructure Works > Generic Infrastructure Works

Available grade	Achieved

Guidance Information

1 Evidence presented for assessment against this unit standard must be consistent with safe working practices and be in accordance with industry requirements.

2 Legislation and guidelines relevant to this unit standard include:
- Health and Safety at Work Act 2015;
- *Excavation Safety Good Practice Guidelines;*
- *Guide for Safety with Underground Services:* available from www.worksafe.govt.nz and any subsequent amendments and replacements.

3 Definitions
Attenuation refers to (natural absorption) as a transmitted electromagnetic signal moves through a material.
Industry requirements may refer to but are not limited to relevant policies, processes, methodologies, industry codes of practice, site specific health and safety plans, standard operating procedures, site safety plans, quality plans, work plans, traffic management plans, contract work programmes, job safety analysis, safe work method statements, job instructions, manufacturer's requirements, contract specifications, manuals, procedural documents.
Utility locating refers to any application aimed at position or depth determination of man-made objects embedded within the earth. This includes target location of electrical, water, and gas lines. The principal objectives are target identification and accurate measurement of its position and depth.

Outcomes and performance criteria

Outcome 1

Demonstrate knowledge of GPR for underground utility locating.

Performance criteria

1.1 The purpose, capabilities, and limitations of GPR technology are explained in terms of the visual interpretation of a radargram.

1.2 GPR technology is explained in terms of factors that contribute to how it works, data it collects, and interpreting results.

Range factors include – the electromagnetic signal, electrical conductivity, the signal transmission and behaviour of radio waves, time it takes to reflect back, relation to an asset and where it should be, low and high frequency, wave behaviour, resolution, filters.

1.3 Di-electric contrast and the reflection co-efficient are explained in terms of the detection of different materials.

Range soil composition – dry sand, wet sand, clay, rock.
asset composition – asbestos, cement, polyvinyl chloride (PVC), high density polyethylene (HDPE), steel.

1.4 Hyperbolas are explained in terms of strong and weak responses and the type of material a reflection comes from.

Range materials include – pipes, structures, fibre optic cable, non-metallic water line in wet soil, non-metallic gas line in dry soil, PVC pipes, depth of a utility.

1.5 Attenuation and the electrical conductivity of soil or rock are described in terms of hard-to-find utilities.

1.6 GPR is explained in terms of detecting sloping and horizontal lines.

1.7 GPR is explained in terms of the data it produces and the importance of collecting data in several directions.

Range 90 degrees to feature, 45 degrees to feature, parallel to feature.

1.8 GPR is explained in terms of factors that impact on data interpretation.

Range factors include – masking weaker reflections, air reflections, height of antennae from the ground, and the use of background subtraction filters to emphasise hyperbolas.

1.9 Common radargram patterns are described in terms of what they represent.

Range radargram patterns include – trenchlines, ringing, buried manhole covers or pit, ducting, rebar, concrete, sumps, chambers, underground storage tanks, voids.

1.10 The importance of looking at GPR data in context is described in terms of how it is interpreted.

Range contexts include – map location, photos, as built drawings, google images, field sketches, in the city, a rural area, changing ground surface, radio frequency noise, electromagnetic locating (EML).

Planned review date	31 December 2027

Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	2 March 2023	N/A

Consent and Moderation Requirements (CMR) reference	0101

This CMR can be accessed at http://www.nzqa.govt.nz/framework/search/index.do.

Comments on this unit standard

Please contact Waihanga Ara Rau Construction and Infrastructure Workforce Development Council at qualifications@WaihangaAraRau.nz if you wish to suggest changes to the content of this unit standard.