

GEOPHYSICS

Supporting Investigation, Design & Construction.



WHAT WE'RE LOOKING TO ACHIEVE

Our goal is to provide a comprehensive geophysics service that helps clients better understand subsurface conditions before and during investigation and design. By combining advanced geophysical techniques with geotechnical expertise, we can identify ground conditions earlier, reduce uncertainty, optimise intrusive investigations, and deliver more informed, cost-effective project outcomes.



OUR SERVICES

BOREHOLE / DOWNHOLE TOOLS

Geophysical measurements collected within a borehole using specialised logging tools.

Wireline

- ATV – Acoustic Televierer
- OTV – Optical Televierer
- Mechanical Calliper Logging
- Natural Gamma Logging

Downhole Shear Wave Velocity

- Downhole VSP (Vertical Seismic Profiling)
- Seismic Cone Penetration Test (sCPT)
- Seismic Dilatometer Test (sDMT)

360° Downhole Camera

SURFACE GEOPHYSICAL METHODS

Non-invasive techniques that investigate subsurface conditions from the ground surface.

Surface Seismic

- MASW (Multichannel Analysis of Surface Waves)
- MAM (Microtremor Array Method)
- HVSr (Horizontal-to-Vertical Spectral Ratio)
- SRT (Seismic Refraction Tomography)

ERT (Electrical Resistivity Tomography)

VES (Vertical Electrical Sounding)

GPR (Ground Penetrating Radar)

DOWNHOLE SEISMIC/sCPT/sDMT

Intrusive shear wave velocity techniques

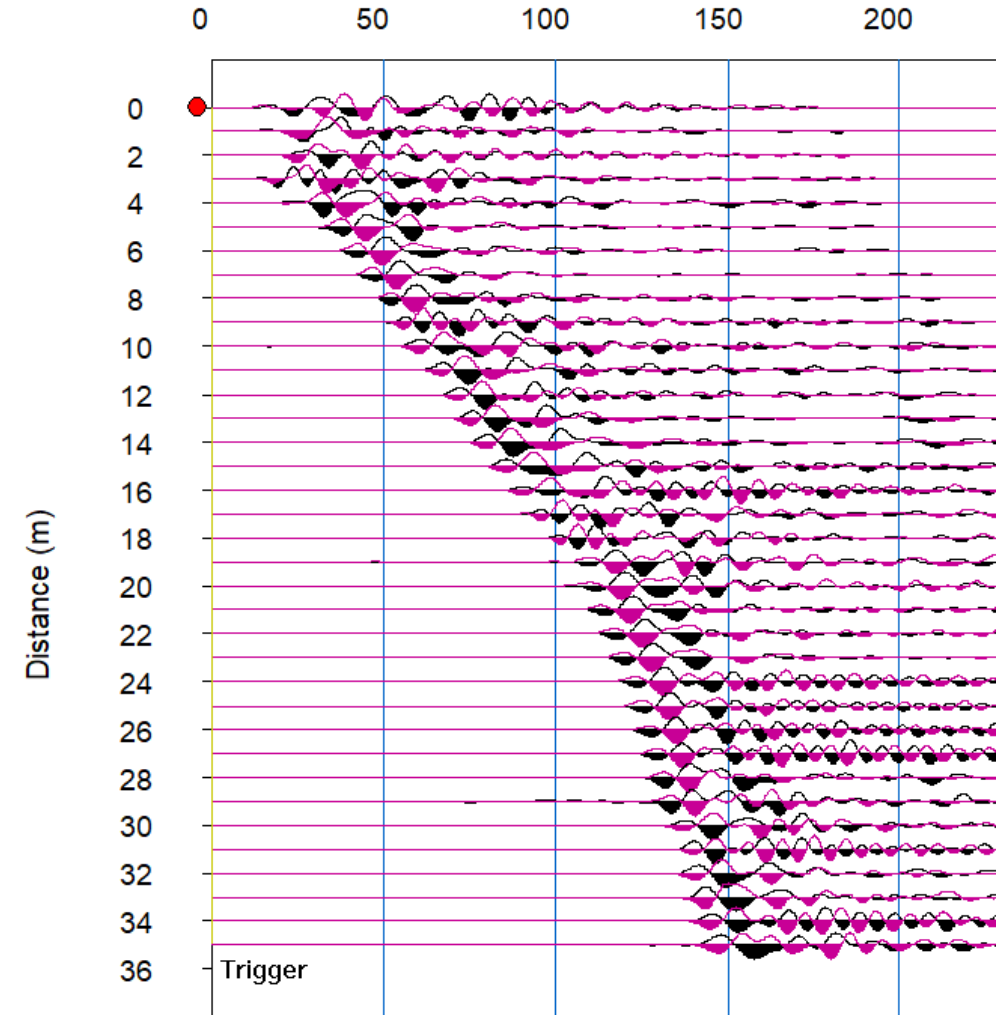
WHAT IT IS

Downhole Seismic testing is a method of recording shear wave (V_s) and compressional wave (V_p) velocities in drillholes. A loaded beam (weighted by a vehicle, rig or IBC) is used to create shear waves at surface by being struck by a sledgehammer. The travel time of the seismic waves are recorded by a clamped geophone that is lowered at intervals downhole. From this the velocity of the subsurface materials can be calculated.

Similar techniques for measuring shear wave velocities include Seismic Cone Penetration Testing and Seismic Dilatometer Testing.

WHY WE USE IT

- Site Subsoil Class Assessments under TS1170.5 and NZS1170.5
- Calculating V_{s30}
- Assessing small strain elastic moduli such as shear modulus
- Informing PSHA's



WIRELINE – DEFECT SCANNING & ORIENTATION

WHAT IT IS

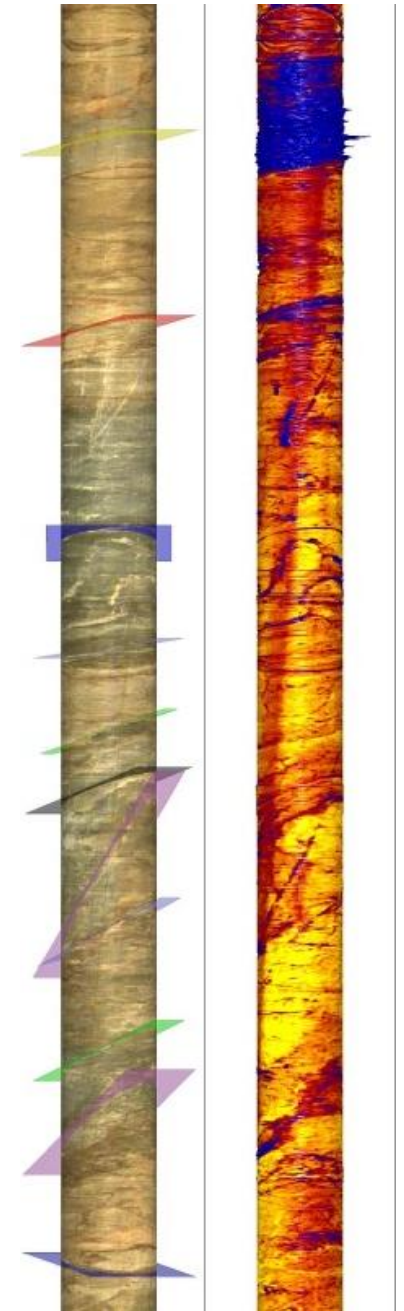
Telev viewers are downhole tools that are deployed into drillholes. They scan the drillhole walls and produce 3D images of the hole.

Acoustic Telev viewers (ATV's) use an ultrasonic signal that accurately measures the drillhole size and a measure of the surface roughness which is affected by the geology/defects. It works below the waterline and is not affected by cloudy water.

Optical Telev viewers (OTV's) use a 360° fisheye camera to record a continuous image of the drillhole. The tool can work above and below the waterline but typically complements the ATV above the waterline.

WHY WE USE IT

- Measuring true dip and azimuth of geological defects (joints/faults/bedding planes).
- Providing a continuous image of the drillhole wall without effects of core loss.
- Independent assessment of RQD.
- Drillhole deviation of uncased holes.



SURFACE SEISMIC – SHEAR WAVE VELOCITY

WHAT IT IS

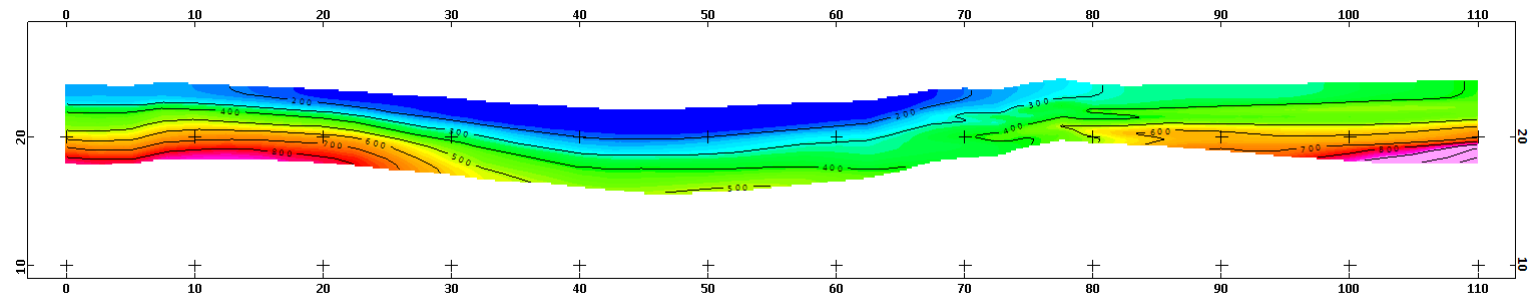
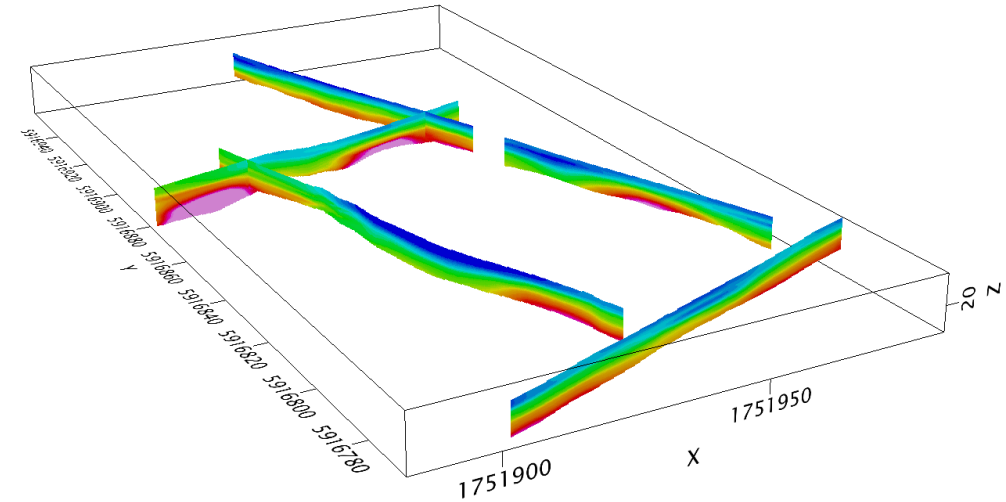
Multi-channel Analysis of Surface Waves (MASW) – An active source surface seismic method optimised for measuring shear wave velocity in 1D and quasi-2D in the top 20 m.

Microtremor Array Measurements (MAM) – A passive seismic method optimised for measuring shear wave velocity in 1D at depths greater than 20 m.

HVSR/Nakamura Ratios – A passive seismic method optimised for measuring the period of a site to bedrock and other high impedance layers.

WHY WE USE IT

- Assessing Vs30
- Mapping geological changes based on stiffness
- Site Subsoil Class Assessments under TS1170.5 and NZS1170.5
- Assessing construction variation in structures such as stop banks



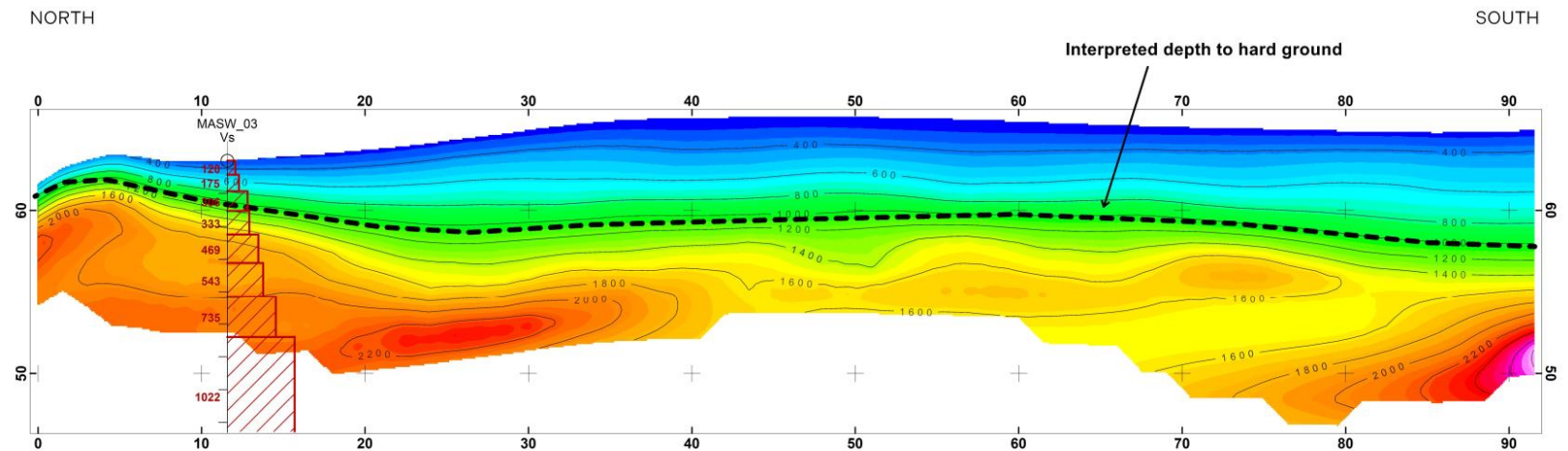
SURFACE SEISMIC – SEISMIC REFRACTION TOMOGRAPHY

WHAT IT IS

A surface seismic technique optimised for measure compressional wave velocity (V_p). The technique involves deploying geophones in linear arrays and undertaking shots along the array.

WHY WE USE IT

- Measuring depth to bedrock/hard
- Assessing rippability
- Measuring depth to saturated materials
- Fault mapping



ELECTRICAL RESISTIVITY TOMOGRAPHY

WHAT IT IS

Electrical Resistivity Tomography (ERT)

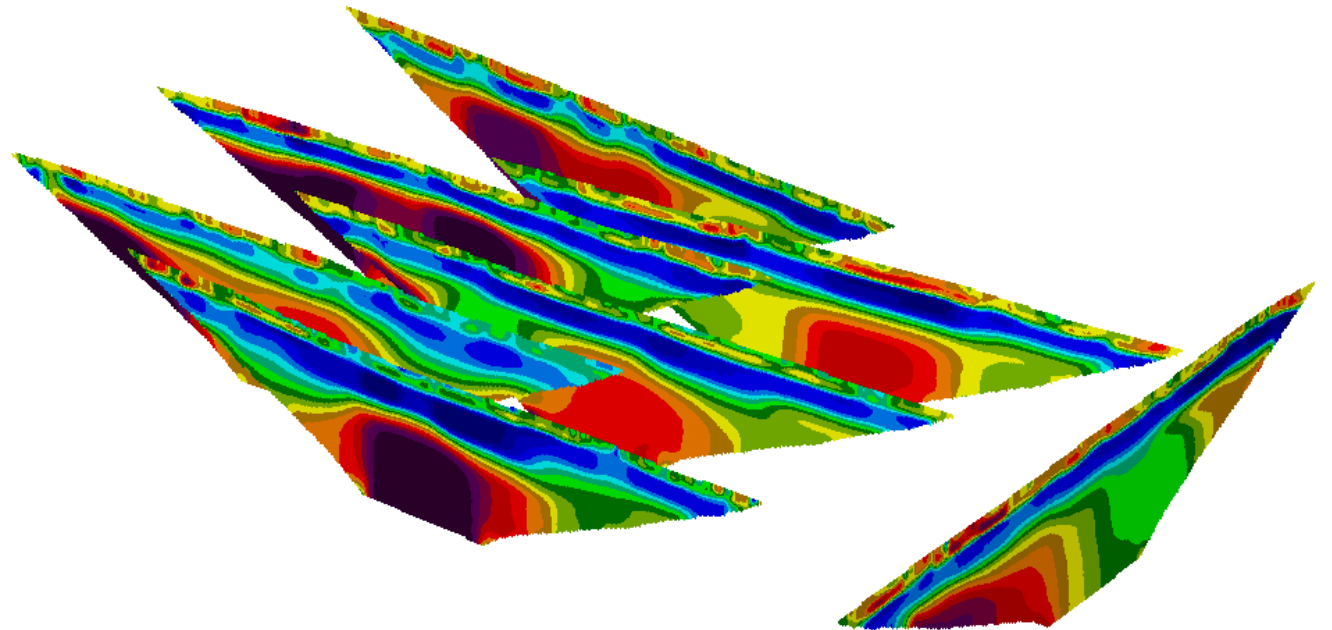
An electrical technique where an array of electrodes are inserted into the ground and a 2D measurement of subsurface electrical resistivity is developed. Electrical resistivity is controlled by geology, porosity, ground water and ground water chemistry.

Vertical Electrical Sounding (VES)

A simpler but related technique to ERT often used to measure apparent resistivity in 1D.

WHY WE USE IT

- Fault mapping.
- Groundwater assessments including saline intrusion.
- Geological mapping.
- Void identification.
- Contaminant assessment.
- Earthing and electrical design (VES).



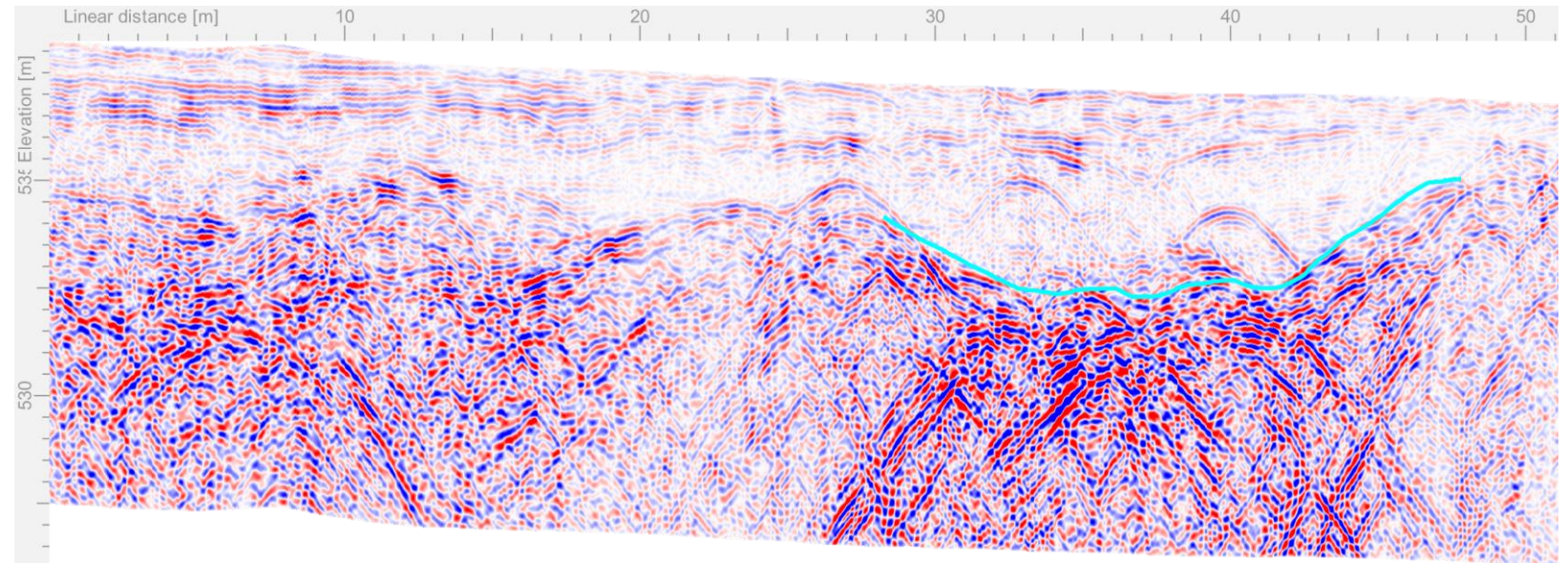
GROUND PENETRATING RADAR

WHAT IT IS

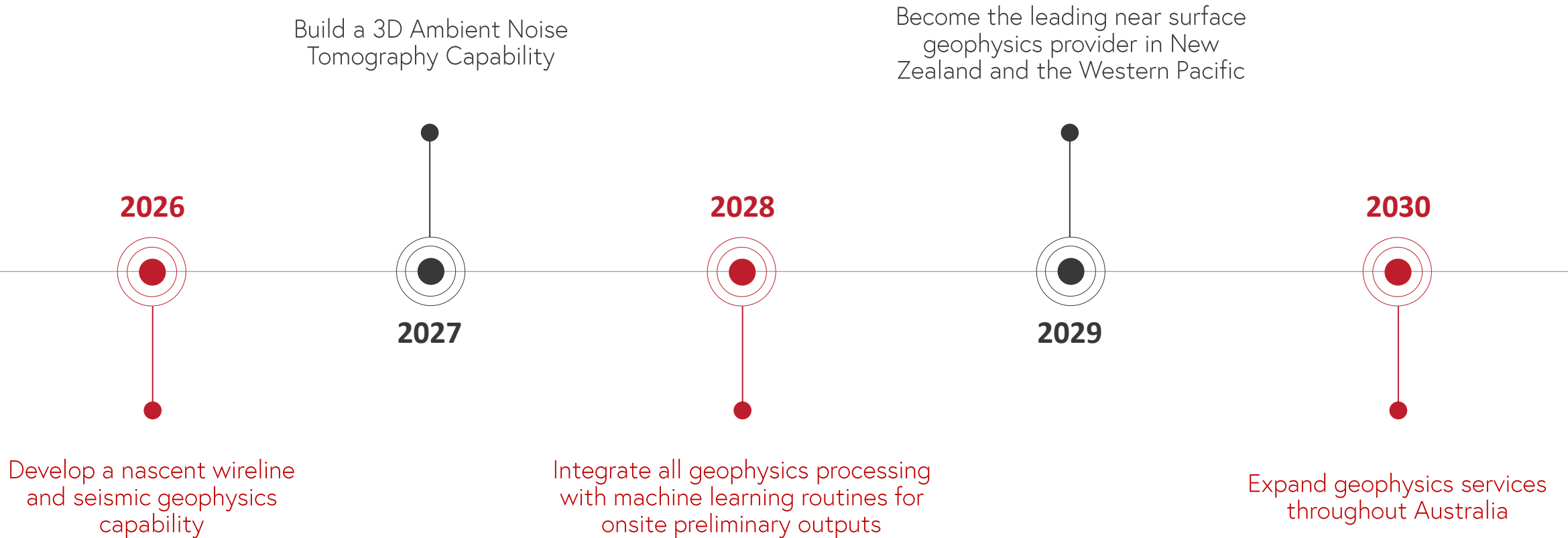
Ground Penetrating Radar (GPR) measures the amplitude and travel time of electromagnetic radar pulses. The pulses are varied by the dielectric permittivity, moisture content, electrical conductivity and consistency of the media it is propagating through.

WHY WE USE IT

- Depth to bedrock.
- Voids.
- Buried storage tanks (UST's).
- Graves.



PLAN MOVING FORWARD





We're all about creating and sustaining a better world through the excellence of our work, and the values we promote in our everyday lives.



ABOUT US

Geotechnics has over 65 years' experience as New Zealand's leading civil engineering testing company.

We operate at an international level, serving the geotechnical, environmental and civil engineering industries with a suite of testing and monitoring services, conducted both onsite and in our laboratories. In addition, we also supply, hire, service, calibrate and repair civil engineering testing equipment.

Our capability is delivered through a nationwide network of laboratories and field teams, supporting projects from early investigation through to construction and asset monitoring, and providing reliable, decision-ready data at each stage.

Using advanced technology and established methodologies, we ensure accuracy and consistency across a wide range of projects, including the Waterview Connection and Kaikōura earthquake recovery.

Health, Safety and Wellbeing is core to our operations, supported by our ISO 45001-certified management system. Our teams bring extensive technical experience and a practical, site-focused approach to project delivery.

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