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WE ARE DESIGNING THE FUTURE ON SOLID FOUNDATIONS

WHAT IS THE CHALLENGE YOU ARE TRYING TO OVERCOME TODAY?

SEISMIC
RESISTIVITY
GPR
BOREHOLE GEOPHYSICS

To achieve the ideal solution, please review our catalog and contact us.

Discover Our Geophysical Methods

We value the diverse needs of our domestic and international customers, and we actively listen to your requests in order to draw fresh inspiration from those who lead the way every day. We are committed to providing you with the most optimal solutions.

SEISMIC

We determine subsurface parameters, from shallow near-surface layers both on land and at sea to deep geological structures.

RESISTIVITY

We provide modular and technologically advanced solutions, ranging from traditional Vertical Electrical Sounding (VES) to high-resolution electrical tomography.

GROUND PENETRATING RADAR

Since the ground-penetrating radar (GPR) method is a fast, precise, and non-contact technology, we offer practical solutions for a wide range of applications.

BOREHOLE GEOPHYSICS

Borehole imaging is performed using in-hole methods applied within the drilling well. These data are correlated with drilling data to obtain precise ground parameters.

The primary factor that draws us to geotechnics should be the prominence of risk in this field. Let us not forget that in any situation dominated by risk, the necessity of overcoming challenges takes precedence. After all, we are dealing with soil, a natural material. As engineers responsible for the foundations of civil engineering structures resting on or embedded within the ground, as well as for the design and implementation of soil reinforcement structures, we must simultaneously consider various engineering risks while ensuring both safety and economic feasibility.

Since the rules of the game are "overcoming challenges" and "creating differentiation," we must base our expertise on solid foundations.

Prof. Dr. H. Turan DURGUNOĞLU

SECTORAL APPLICATIONS SUCCESSFULLY COMPLETED LOCALLY AND ABROAD

35+ YEARS OF EXPERIENCE

Zemin Etüd Ve Tasarım A.Ş. has been a pioneer in the industry, operating with over 35 years of experience. Both in Turkey and internationally, Zemin Etüd Ve Tasarım A.Ş. actively participates in geotechnical design, modeling, quality control, consultancy, soil investigation (drilling, field testing, geophysical surveys), and laboratory services, playing a key role in first-class projects. Additionally, we provide structural health monitoring services for many critical structures, ensuring the instrumental observation of structural performance both during construction and throughout the service life of the structures, along with the evaluation of the results. Our projects are executed by experienced engineers and technicians. Led by Prof. Dr. H. Turan DURGUNOĞLU (Ph.D., UC Berkeley, CA, 1972), our team comprises over 25 highly experienced engineers with master's and doctoral degrees in geology, geophysics, and geotechnical engineering. We also have laboratory technicians specializing in soil mechanics, along with more than 40 operators, technical personnel, and field workers conducting on-site investigations.

VISION

To uphold the principles of integrity, quality, and customer satisfaction in soil investigation and engineering solutions while fulfilling our environmental sustainability and social responsibilities. By leveraging technology and innovation, we aim to provide innovative, reliable, and cost-effective services in the industry. We are committed to supporting the continuous development of our employees and ensuring the highest standards in occupational health and safety, information security, and risk management. Our goal is to achieve industry leadership, establish a strong presence in global markets, and maintain continuous growth.

MISSION

To deliver reliable and innovative engineering services by providing high-quality, cost-effective, and sustainable solutions within the framework of value engineering. By integrating technology with engineering expertise, we strive to be a trusted partner in the industry

OUR VALUES

Reliability
Ethical Approach
Quality
Innovation
Sustainability
Customer Orientation
Environmental and Social Responsibility
Occupational Health and Safety
Teamwork
Expertise
Continuous Improvement in Business Processes
Employee Development
Merit and Equality
Employee Engagement and Commitment

ZEMINAS;
• Chamber of Geological Engineers (JMO)
• Chamber of Geophysical Engineers (JFMO)
• Chamber of Civil Engineers (IMO)
• Soil Mechanics and Geotechnical Engineering Association (ZMGM)
• Foundation Contractors Association (TMD)
Active members of associations and chambers.

Our company is IAS accredited;
- 9.24.7877.10930. I ISO 9001:2015 (Quality Management System)
- 14.24.7877.20462. I ISO 14001: 2015 (Environmental Management System)
- 45.24.7877.30441. I ISO 45001: 2018 (Occupational Health and Safety Management System)
- 27.24.7877.60157. I ISO 27001: 2022 (Information Security Management System)

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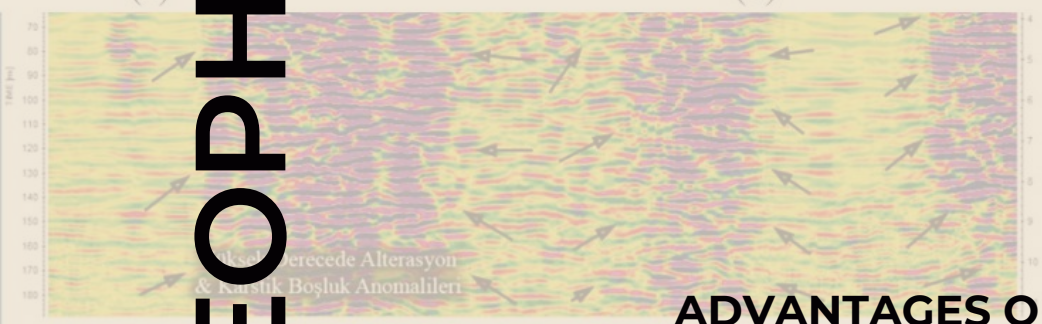
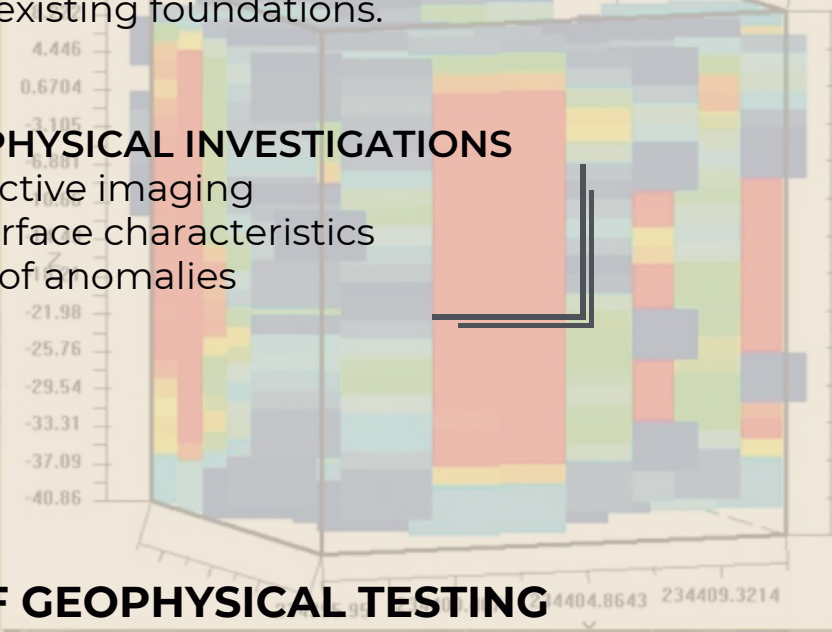
WHY GEOPHYSICS?

Geophysical methods are typically used as part of the initial site investigation phase of a project or to complement additional information obtained through widely spaced observations (e.g., boreholes, test pits, etc.). These methods can be applied to determine subsurface stratification, soil parameters, bedrock surface profile, groundwater depth, soil unit boundaries, fractures within rock or dense soil, cavities, buried pipes, and the depths of existing foundations.

KEY FEATURES OF GEOPHYSICAL INVESTIGATIONS

Non-destructive imaging
Mapping of subsurface characteristics
Detection of anomalies





ADVANTAGES OF GEOPHYSICAL TESTING

Many geophysical tests do not require drilling. As a result, they provide significant advantages in situations where traditional drilling, testing, and sampling methods are challenging (e.g., in gravel and rubble beds) or in areas where potentially contaminated soils may be present underground. Generally, geophysical tests cover relatively large areas, allowing the characterization of large regions with a small number of measurements. They are particularly suitable for projects with extensive profiles, where the lateral extent is much larger than the vertical (e.g., new highway construction). Geophysical measurements provide information about the true elastic properties by evaluating the characteristics of soil and rock under very small stresses, often on the order of 0.001%. In terms of acquiring subsurface information, geophysical methods are cost-effective because they allow for the study of large areas.

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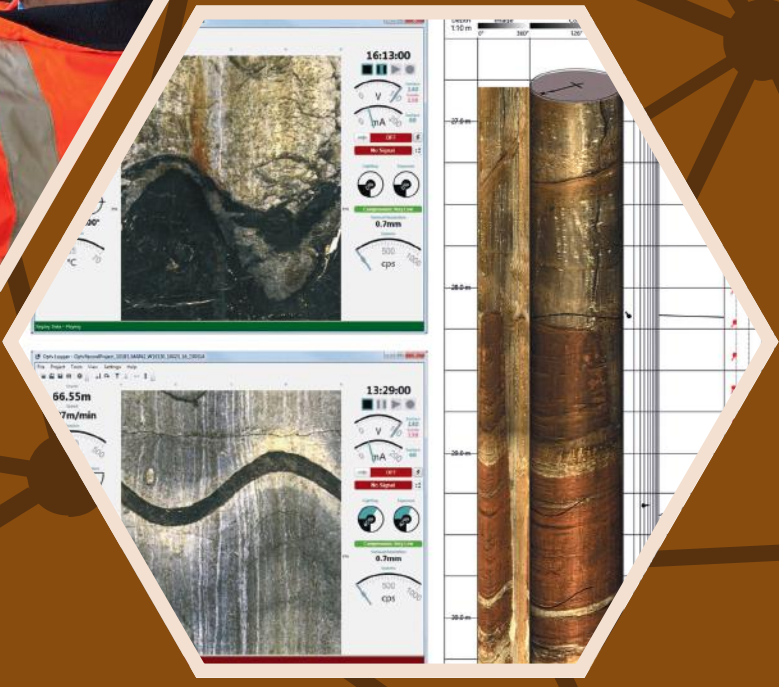
GEOPHYSICAL METHODS



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SURFACE GEOPHYSICS

Seismic Methods

Seismic Refraction
Seismic Reflection
Active Multi-Channel Surface Wave Method (MASW)
Multi-Channel Surface Wave Method Passive ReMi and SPAC
Microtremor Method

Electrical Methods

Vertical Electrical Sounding (VES) Measurement
Electrical Resistivity Tomography (ERT) Measurement
Natural Voltage (SP) Method
Artificial Probabilisation (IP) Method

Electromagnetic Method

Ground Penetrating Radar (GPR) Measurements

DOWNHOLE GEOPHYSICS

Seismic Measurements

Downhole
Crosshole Tomographs
PS Logging
Marchetti Seismic Dilatometers

Well Imaging Measurements

Acoustic Televiewer (Atv)
Optical Televiewer (Otv)
Natural Gamma

Auxiliary Measurements

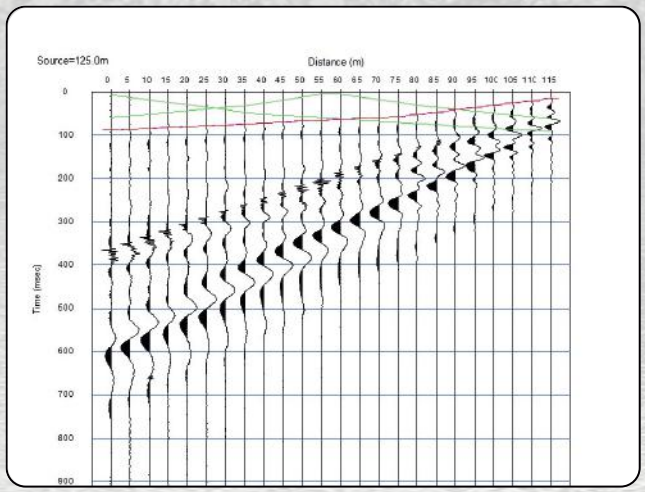
Geotracker Multishot Inclinometer
Flow Logging

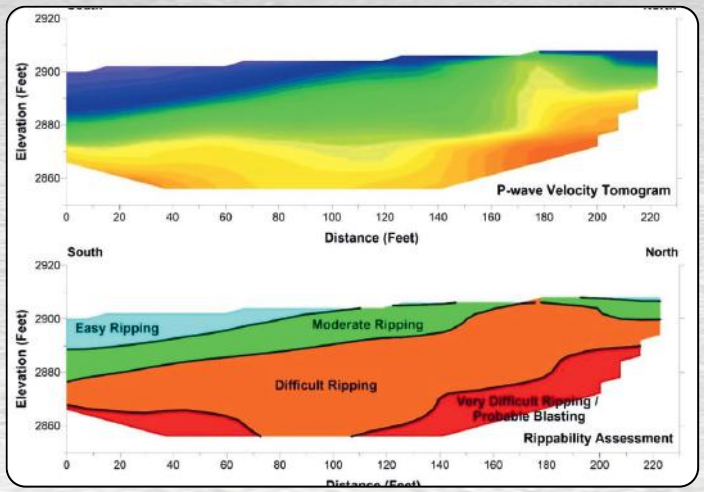
SURFACE GEOPHYSICS

Seismic Methods

Seismic Refraction

In engineering studies, it is used to determine the elastic parameters of soils, to investigate the thickness of the cover layer and the depth of the bedrock, to classify the soils and to evaluate their removability. Geometrics Geode Exploration Seismograph is used in our seismic refraction measurements.





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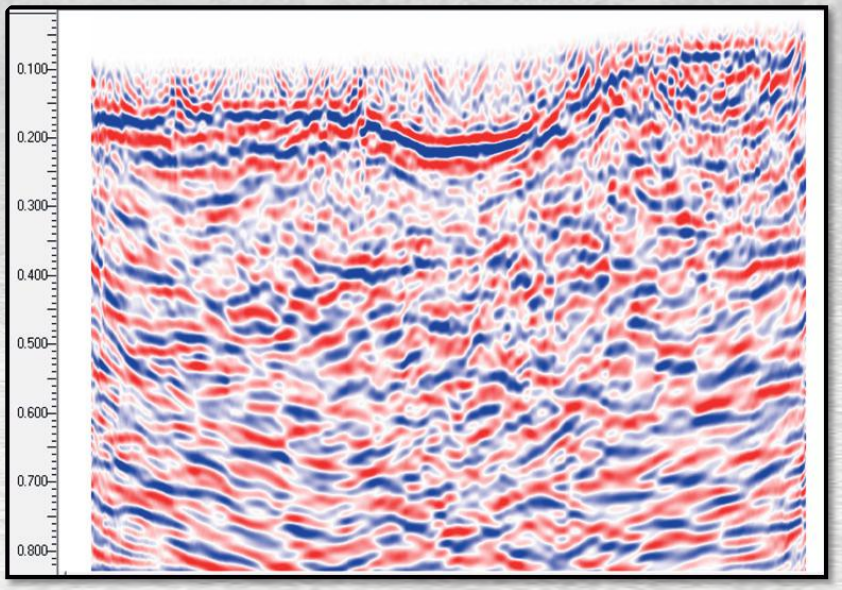
SURFACE GEOPHYSICS

Seismic Methods

Seismic Reflection

In the field of engineering, it is used in the determination of coastal facilities, crack and fracture structures, submarine soils and sediment stack conditions, and in the solution of basic rock problems of harbours, highways, dams and large structures.



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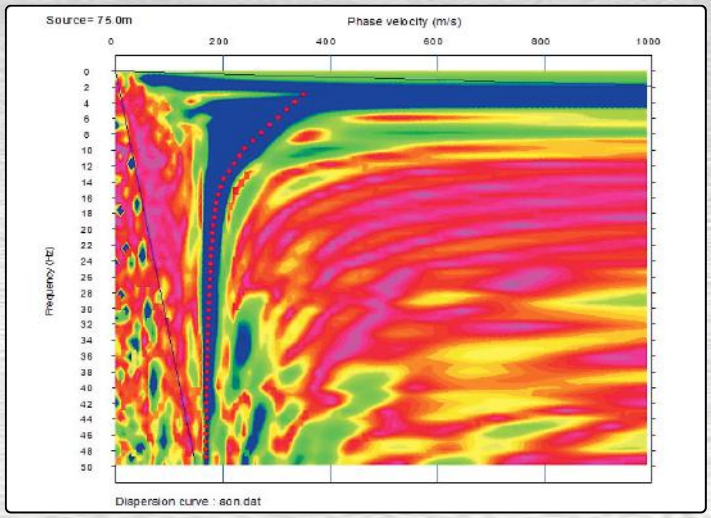
SURFACE GEOPHYSICS

Seismic Methods

Method of Multichannel Surface Wave (MASW) - Active

MASW method is an environmentally friendly and easily applicable method developed to determine the variation of shear wave velocities with depth. It can also be used to investigate liquefaction potential in gravelly soils in areas where methods such as standard penetration test or cone penetration test are not suitable. Geometrics Geode Exploration Seismograph is used in our MASW measurements.



SURFACE GEOPHYSICS

Seismic Methods
ReMi and SPAC - Passive

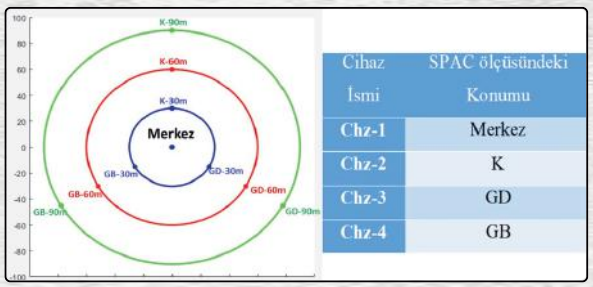
In ReMi and SPAC methods, the data source is environmental noise rather than an active seismic source. Vehicle and human movements, wind and other atmospheric events are the main components of these noises. These methods are widely used because they do not require an active source, the equipment is easily transportable and can be applied in urban areas. One of the advantages of these methods is that the depth of investigation increases depending on the measurement time and geometry.

ReMi Method

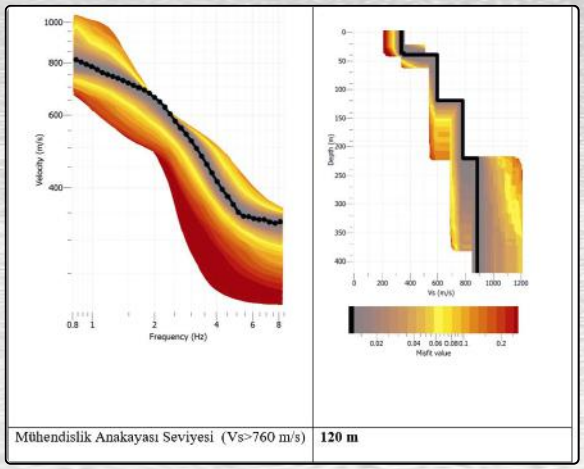
The ReMi method is used to determine the variation of S-wave velocities with depth using the inverse solution method by utilising the dispersion curve.

SPAC Method

The SPAC method is a technique developed by Aki (1957, 1965) that works with circular array measurements. It determines the velocity structure of the subsurface using microtremor recordings and collects data with at least four seismometers. The depth of impact can reach up to about four times the triangular array edge length. This method is widely used to determine the seismic velocities and thicknesses of deep layers.



Cihaz İsmi	SPAC ölçüsündeki Konumu
Chz-1	Merkez
Chz-2	K
Chz-3	GD
Chz-4	GB



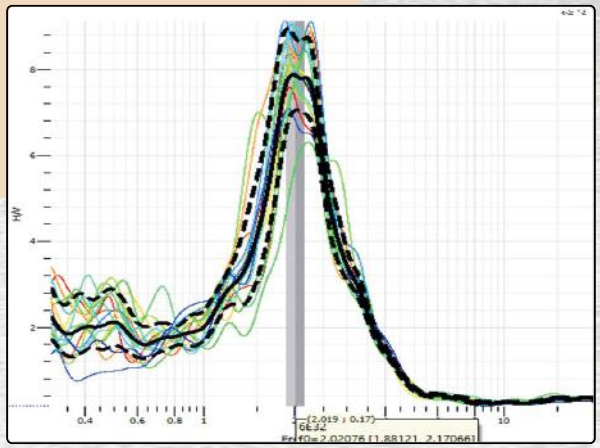
SURFACE GEOPHYSICS

Seismic Methods
Microtremor Method

Weak and low amplitude vibrations that can be recorded on the ground surface are called microtremor. By using seismometers, the ‘sound of nature’ is listened to and the ground parameters below the measurement point are determined.

Microtremor method is preferred due to its advantages in terms of applicability, low cost and signal-to-noise ratio compared to conventional seismic methods. Ground dominant period, shear wave velocity (Vs) and ground magnification values can be determined by this method. These measurement results are used as the main input for numerical ground magnification analyses with microtremor results.

Guralp System CMG-6TD accelerometer system is used in our microtremor measurement studies.



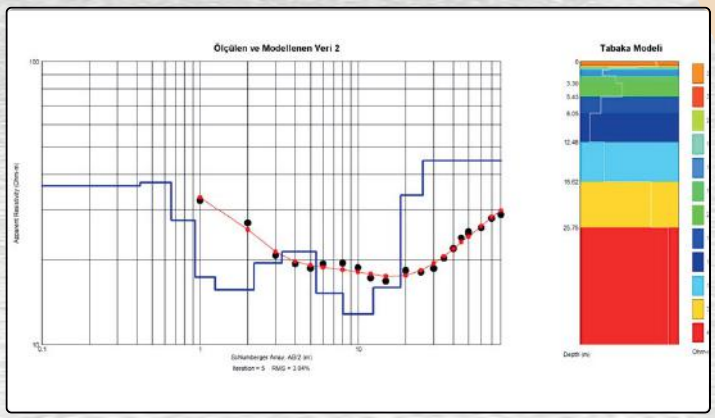
SURFACE GEOPHYSICS

Electrical Methods

We perform our measurements with the AGI SuperSting R8 (SuperSting R8/IP/SP+56). This device has a system with 8 channels and 56 electrodes. The eight-channel SuperSting has eight receivers, so that the electrical voltage between the eight electrodes can be measured simultaneously each time a current is applied. This significantly reduces the total measurement time.

Vertical Electrical Sounding (VES) Measurement

The main purpose of this method is to map the geological structure of the subsurface according to its electrical properties (resistivity). DES method is widely used in mineral, geothermal energy resources and petroleum exploration, hydrogeological and engineering geological problems. Different measurement techniques have been developed depending on the array geometry. The purpose of the survey, field conditions and geological features are taken into account when determining the measurement technique.



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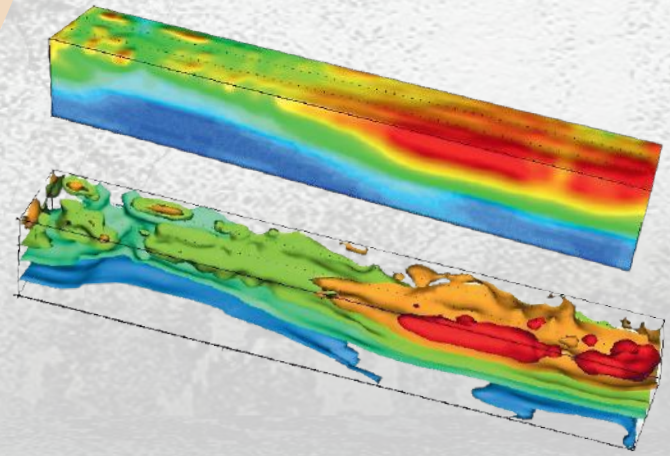
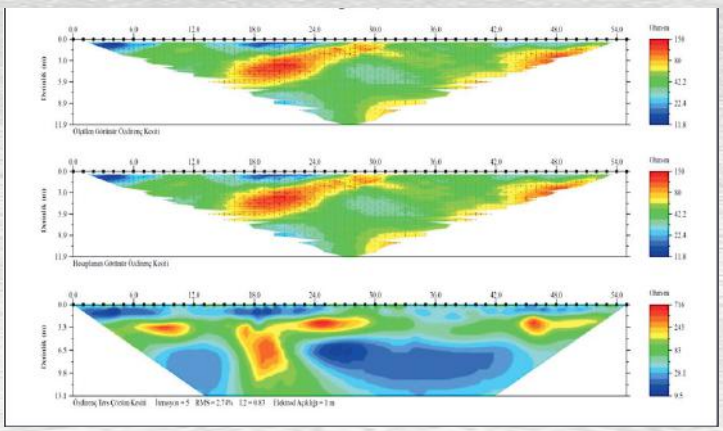
SURFACE GEOPHYSICS

Electrical Methods

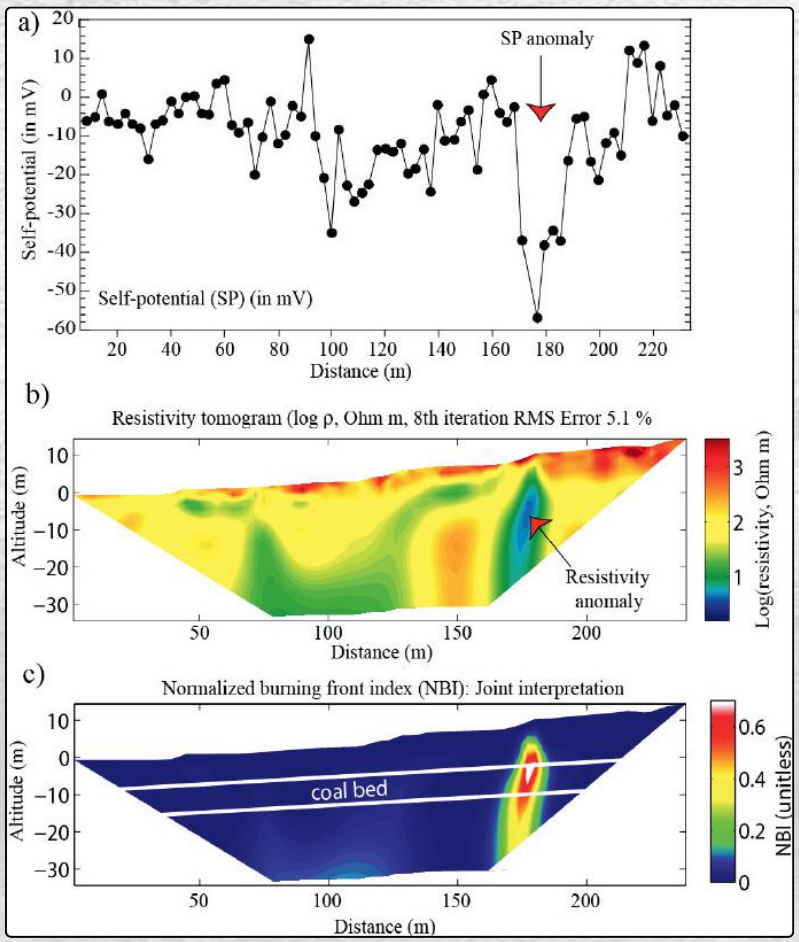
Electrical Resistivity Tomography (ERT)

This method is used for hydrological investigations such as mapping of lithological, structural and stratigraphic features, determination of fracture and fracture systems, determination of water table and aquifer depth, determination of groundwater salinity. It is also applied for the detection of groundwater contaminants. As a result of the measurements, 2D and 3D images of the underground can be obtained.





SURFACE GEOPHYSICS



Electrical Methods

Self-Potential (SP) Method

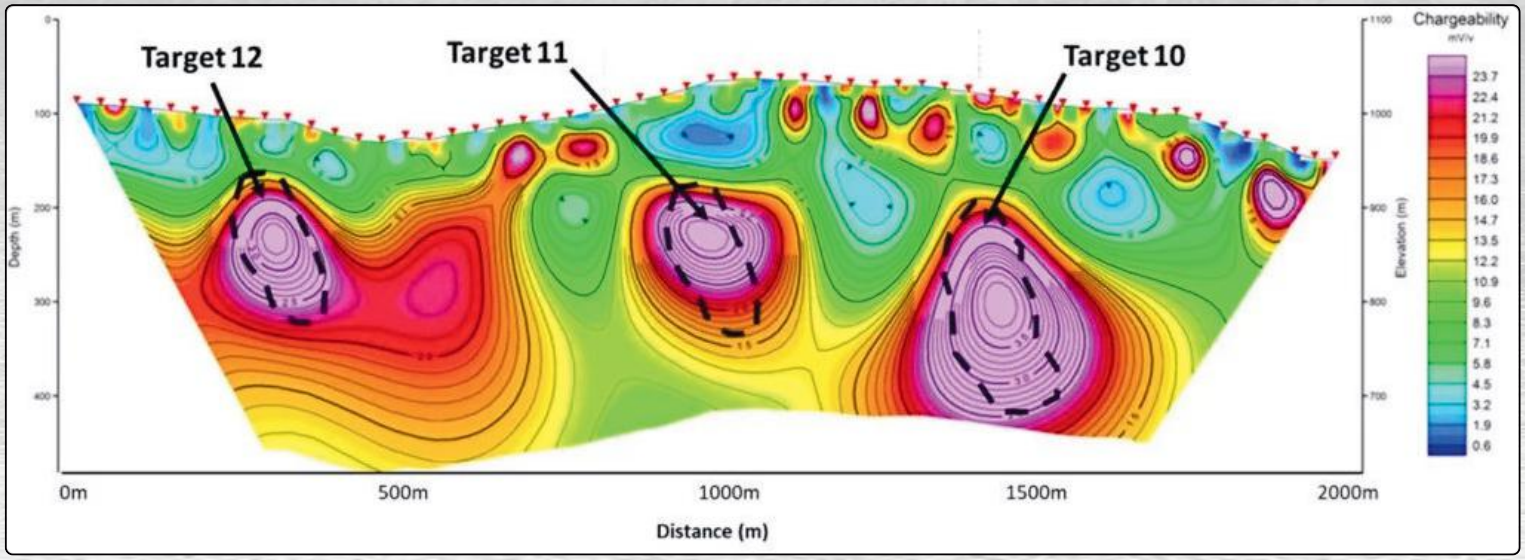
This method is based on the principle of measuring the natural potential differences of the earth without using artificial current sources. Natural voltage differences are caused by various factors such as climate changes, topography and geological conditions. Geothermal surveys are used in environmental studies and engineering applications, especially for the determination of thermal fluids and groundwater. It also has a special application area in the detection of water seepage in dam base reservoirs.

SURFACE GEOPHYSICS

Electrical Methods

Induction Polarisation (IP) Method

IP method is an intensively used technique in metallic mineral exploration. These applications, which are made by considering the time and frequency changes of the electrical properties of the rocks, are especially preferred for sulphide ore, graphite, oil, natural gas and industrial raw material exploration.



SURFACE GEOPHYSICS

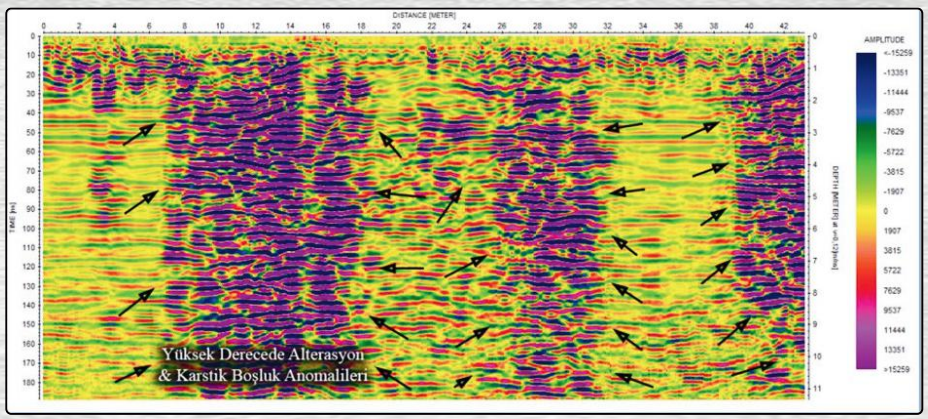
Electromagnetic Method

Ground Penetrating Radar (GPR) Measurements

Ground penetrating radar is an electromagnetic reflection technique using a transmitting antenna that sends electromagnetic signals underground and a receiving antenna that records the reflection of these signals from interfaces with dielectric contrast.

It offers high resolution data quality thanks to high frequency signals and stands out as a fast and reliable method for the detection of buried underground structures (infrastructure lines, foundation systems, pipe/cable ducts, tunnels, historical structures, karstic cavities, etc.).

By using antennas with different frequencies, imaging can be performed at different depths.



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DOWNHOLE GEOPHYSICAL MEASUREMENTS

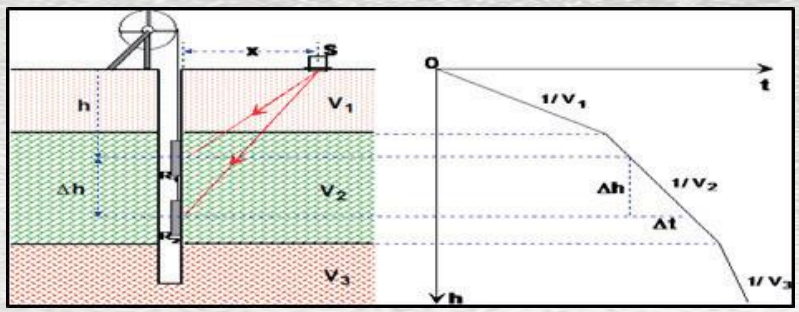
Seismic Measurements

Downhole Seismic Method

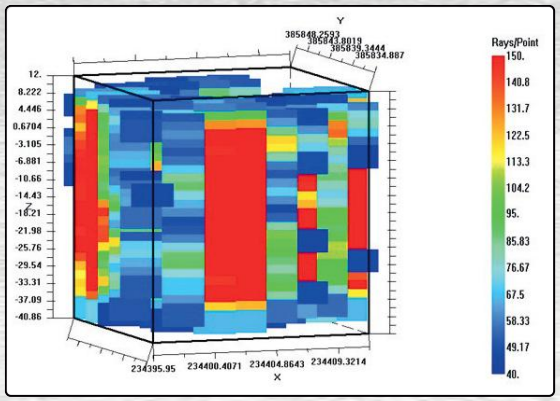
This method is applied for the detection of low velocity zones that cannot be determined by conventional surface seismics. P-wave (pressure) and S-wave (shear) measurements are used to determine the dynamic moduli of the soil.

The measurements are carried out inside the borehole. The wave source (e.g. sledgehammer) is used at the surface and the travelling time of the seismic waves is measured by moving a series of receiver systems inside the borehole. These measurements can be made both above and below the subsurface water table.

For the application, a casing with a diameter of 3 to 6 inches is placed in the well (e.g. PVC) and fixed by grouting to make the well suitable for the measurements.



DOWNHOLE GEOPHYSICAL MEASUREMENTS



Seismic Measurements

Crosshole - Crosshole Tomographs

This method is based on measuring the travelling time of seismic waves between boreholes to determine the elastic properties of the soil.

1. One borehole is used as a source (energy generator) and the other boreholes are used as receivers.
2. P-wave (pressure) and S-wave (shear) data are obtained and important engineering parameters such as Poisson's ratio are calculated.

Basic parameters that can be obtained with the crosshole method:

- Stratigraphic structure and velocity profile of the ground,
- Mapping of bedrock, weathered layers and weak units,
- Depth of the underground water table,
- Structural features (fractures, faults),
- Geotechnical risk anomalies (e.g. dissolution voids).

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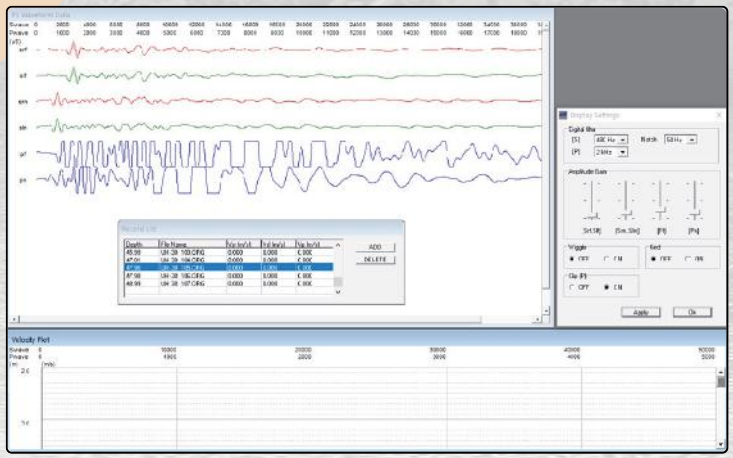
DOWNHOLE GEOPHYSICAL MEASUREMENTS

Seismic Measurements
PS Logging

PS Logging method is applied for the detection of low velocity zones that cannot be determined by classical surface seismics. P-wave and S-wave measurements are used to determine the dynamic moduli of the ground.

This method

- It is one of the most suitable methods for measuring very deep soils and seabed soils.
- It offers fast measurements and allows a high resolution profile to be obtained with small measurement intervals.



DOWNHOLE GEOPHYSICAL MEASUREMENTS

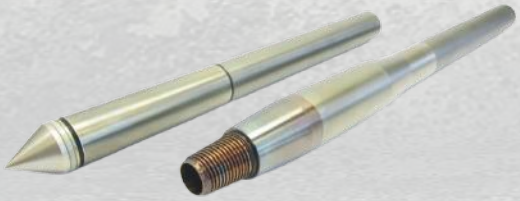
Seismic Measurements

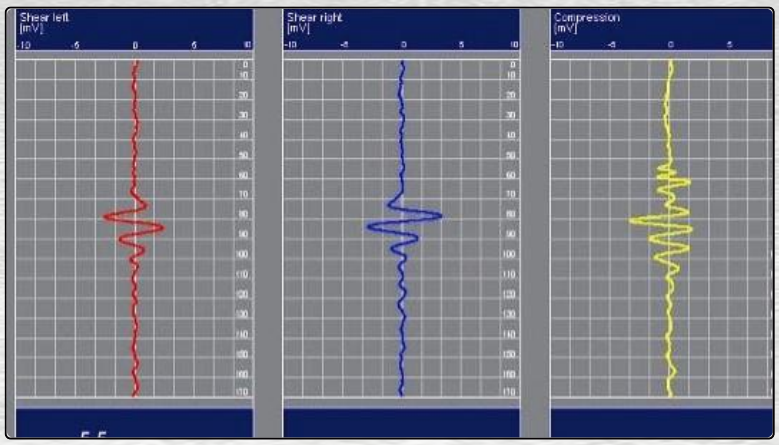
Seismic CPT (Seismic Cone Penetration Test – SCPT)

This method is a seismic measurement system that allows in-situ and precise measurement of shear wave velocities (Vs).

- Measurements are made with a three-axis (x, y, z) geophone system placed in a seismic cone.
- Shear wave velocity (Vs) and pressure wave velocity (Vp) are determined at the desired depths to identify the soil layers.
- These data are used in the evaluation of bearing and settlement properties and in foundation engineering design parameters.

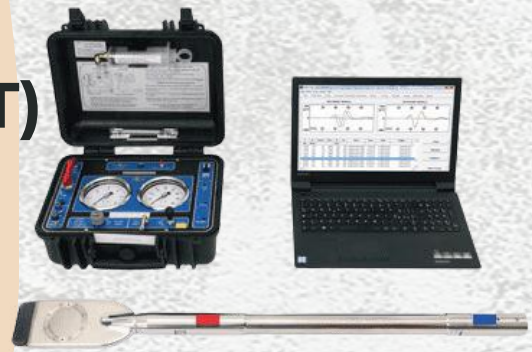
The CPT equipment, manufactured by A.P. van den BERG in the Netherlands, features its own integrated electronic data acquisition system.





DOWNHOLE GEOPHYSICAL MEASUREMENTS

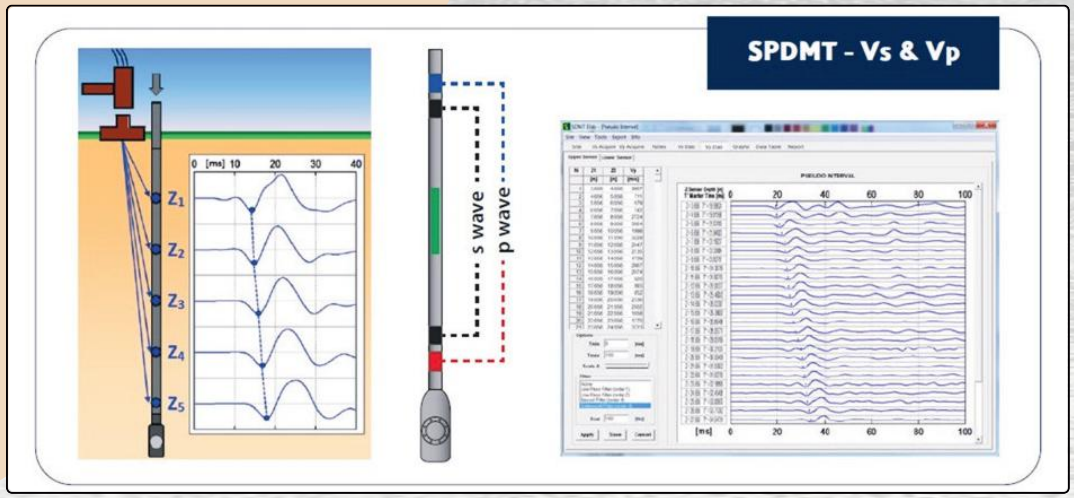
Seismic Measurements
Marchetti Seismic Dilatometer (SDMT)



A seismic dilatometer is an add-on module that can be combined with a dilatometer or CPT to measure shear wave velocity (Vs) and pressure wave velocity (Vp).

- The SDMT is a system containing a seismic geophone and detects acoustic waves through sensors placed between the blade and the rods.
- The data is transferred to a computer and analysed by the Seismic-DMT system connected to the control unit.
- The measurements provide the shear wave velocity (Vs) of the ground layers at the specified depths.

This method was developed by Italian engineer Giorgio Marchetti in 1980 and is widely used in soil engineering studies.

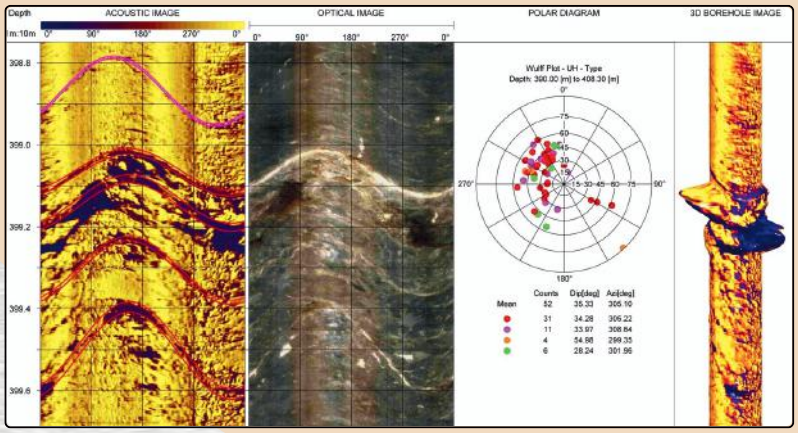


DOWNHOLE GEOPHYSICAL MEASUREMENTS

Well Imaging Measurements Acoustic Televiewer (ATV)

The HRAT Acoustic Televiewer is a high-resolution ultrasound device and an advanced system for continuous and uninterrupted imaging of the well wall.

- It allows analysing structural geology by recording the amplitudes of the ultrasonic signals reflected from the well wall.
- It performs precise measurements, especially on fractures and discontinuities, and logs the data as sinusoidal traces.
- It offers significant advantages for structural interpretation by providing real-time directional information.
- Correlation measurements can be made by adding a natural gamma detector to the probe.



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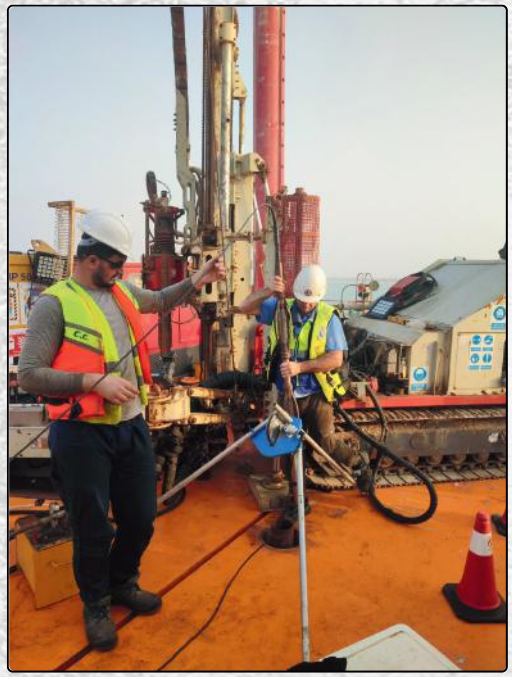
DOWNHOLE GEOPHYSICAL MEASUREMENTS

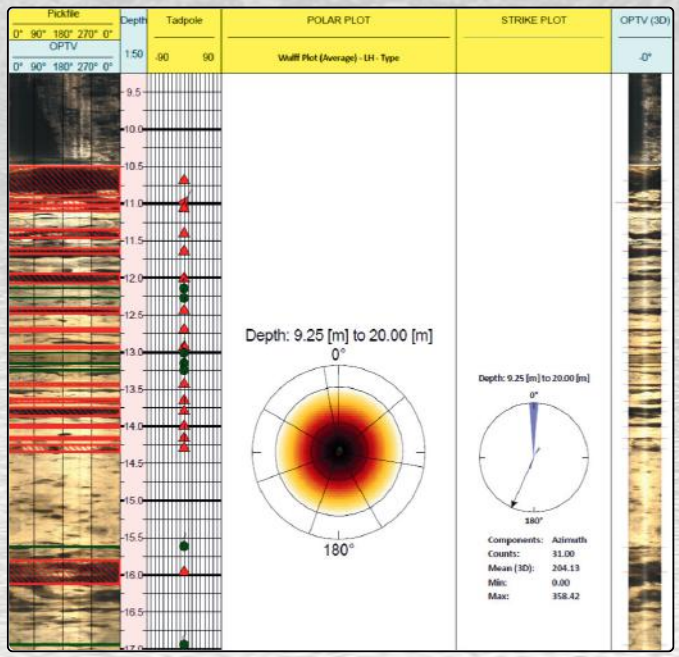
Well Imaging Measurements

Optical Televiewer (OTV)

The Hi-OTV Optical Televiewer is a high-resolution optical device capable of continuous 360-degree imaging of the well wall.

- It provides higher resolution imaging than the Acoustic Televiewer and can record the true colours of the well wall.
- However, it is not suitable for operation in muddy and turbid environments.
- It is one of the most suitable imaging methods especially for dry and clean wells.
- Correlation measurements can be made by adding a natural gamma detector to the probe.

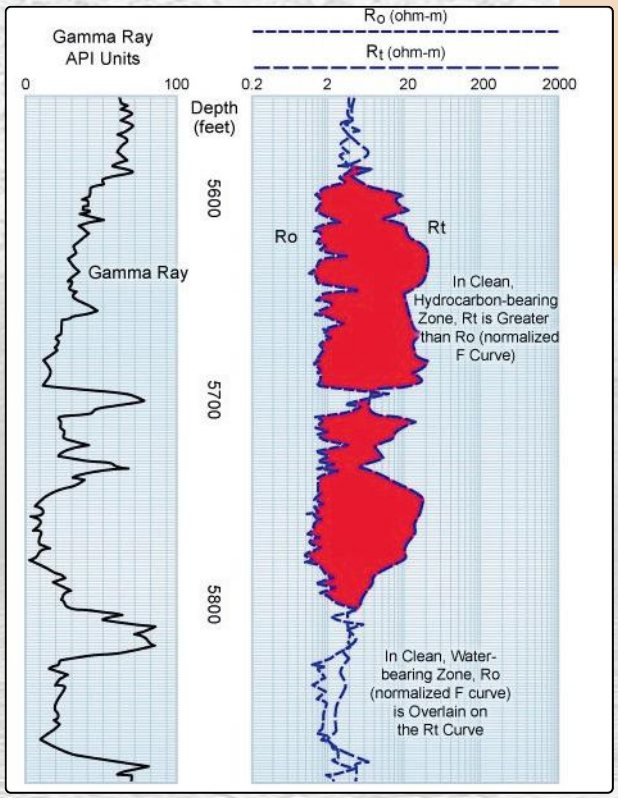




DOWNHOLE GEOPHYSICAL MEASUREMENTS

Well Imaging Measurements

Natural Gamma (Natural Gamma Log)



The Natural Gamma method measures natural gamma radiation levels within the wellbore using scintillation gamma detectors.

- It detects gamma rays emitted from decay products of radioactive elements such as potassium, uranium and thorium.
- Widely used for lithology determination and stratigraphic correlation.
- It is an important tool for depth correction and calibrating other drilling logs.
- Thanks to the spectral gamma log, the chemical composition of certain radioactive sources can be estimated.

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DOWNHOLE GEOPHYSICAL MEASUREMENTS

Auxiliary Measurements
Geotracker Multishot Inclinometer Device

Accurate determination of drilling routes is a critical parameter for reserve estimation and operational planning of underground resources. For this purpose, inclination and direction measuring devices can be used to precisely determine the route of the borehole underground.

- It is an important tool for accurate detection of geological strata, fault fractures, mineral, oil and natural gas formations.
- The system consists of a measuring probe and a handheld terminal:
  a. The probe has sensors that measure direction and inclination.
  b. The handheld terminal allows data to be displayed and analysed.

Thanks to this system, drilling guidance and geological modelling processes become more reliable.

DOWNHOLE GEOPHYSICAL MEASUREMENTS

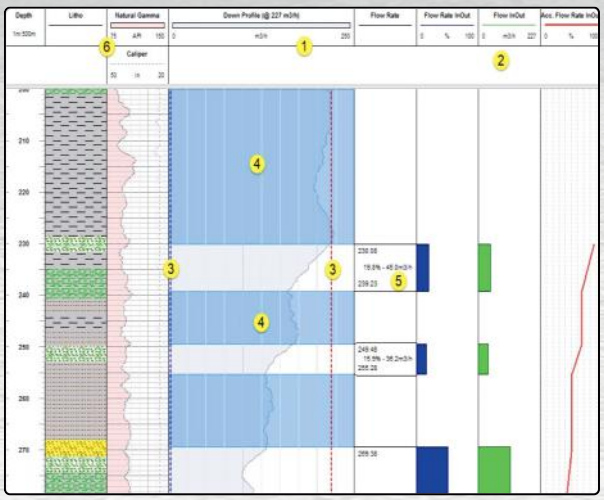
Auxiliary Measurements

Flow Logging Measurements

A vertical flow meter logger is a device that measures the vertical movement of groundwater in a borehole.

- In groundwater investigations, it provides critical data for the correct design and interpretation of hydraulic tests and chemical sampling.
- The data obtained helps to improve field conceptual models.
- It can be used for monitoring water chemistry and preventing contamination.
- Tests can be performed in fractured rock aquifers and unconsolidated sand-gravel aquifer wells.

Flow logging is an important measurement technique for hydrogeological modelling and water management studies.



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COMMERCIAL - HOUSING PROJECTS

INDUSTRIAL STRUCTURES

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