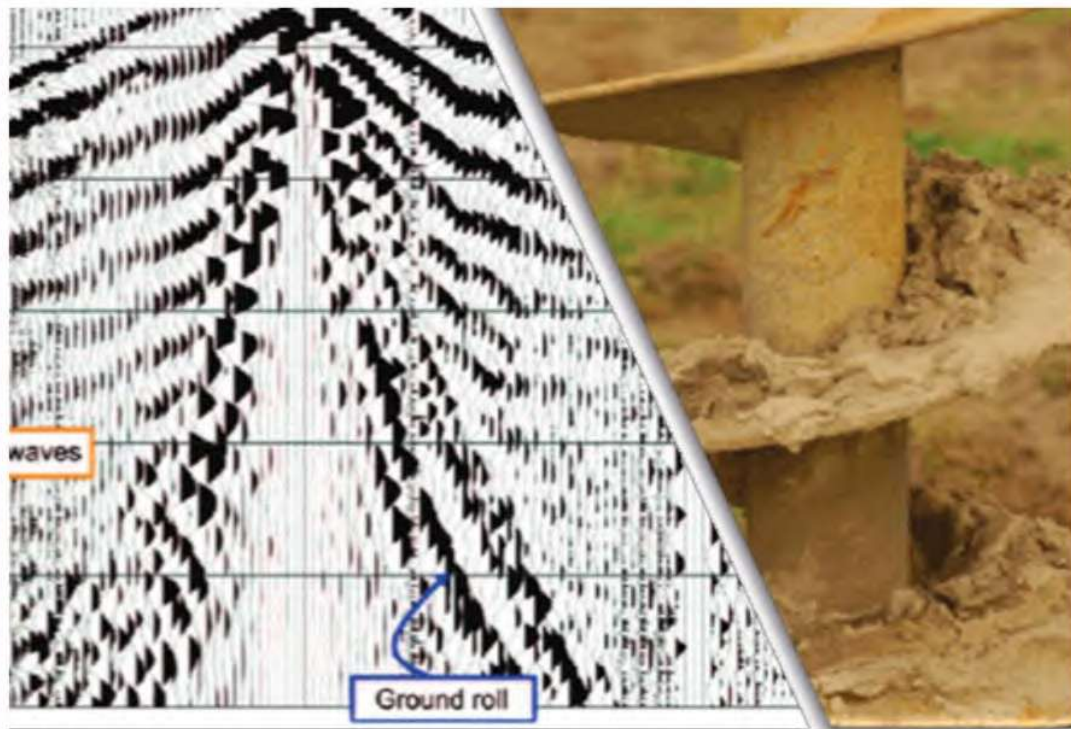




M.A.R GEOTECHNICAL AND GEOPHYSICAL LABORATORIES CO. LTD.

EXPLORE OUR DIVERSE SERVICES
AND IMPRESSIVE PROFILE.



- Geotechnical Services
- Structural Analysis
- Topographic Surveys
- Geophysical Services
- Materials Testing
- Drone Surveys

Website : geotech.marprojects.net

Email: geotech@marprojects.net

Tel: +966 11 810 3676

Mob: +966 50 1985 222

TABLE OF CONTENTS

Introduction	3-4
Our Business	5
Geophysical Services	6-9
Exploration Geophysics	6
Ground Water Exploration	6
Minerals Exploration	6
Engineering Geophysics	7
Cavity Detection	7
Bedrock Profiling	7
Fracture Mapping	7
Artificial Ground	7
In-Situ Elastic Properties	8
Soil & Rock Properties	8
Engineering Geophysics	9
Underground Utility Mapping	9
Leakage Detection	9
Structural (Concrete) Assessment & Evaluation	9
Geophysical Techniques	10-20
Electrical Techniques	11
Seismic Techniques	12
Electromagnetic Techniques	14
Gravity Techniques	16
Magnetic Techniques	17
Ground Penetration Radar (GPR)	18
Marine Survey Techniques	19
Geotechnical Services	21-25
Ground Investigation	21
Borehole Sampling & Testing	21
Geotechnical Geophysics	22
Engineering Geology	23
Fractures & Joints	23
Drilling Service	24
Land Survey Services	26-29
Topographic Survey Services	26
As-Built Survey Services	27
3D Laser Scanning Services	28
Environmental Services	30-31
Environmental Assessment	30
Environmental Study	30
Environmental Management	30

INTRODUCTION

M.A.R GEOTECHNICAL & GEOPHYSICAL LABORATORIES CO. LTD. delivers a state-of-the-art complete and optimized solution of specialized services, which include advanced Geophysical and Geotechnical & Surveying Services.

M.A.R GEOTECHNICAL & GEOPHYSICAL LABORATORIES CO. LTD. is a delivering cutting-edge subsurface research and surveying services to a variety of industries, including civil engineering, mineral mining, groundwater exploration, groundwater management, and the environment, is a new growing geoscience services company.

Our skilled & qualified personnel works on all the specific stages of your prestigious project working under stringent quality control methods and adhering to the strictest industry standards & rules. We take the time to collect precise data, then reveal the findings in a way that is helpful to our clients.

M.A.R GEOTECHNICAL & GEOPHYSICAL LABORATORIES CO. LTD. from the beginning phases of developing proposals for scientific and technical studies through the technical implementation and following up to the final stage of project delivery aspires to give its services to the highest degree of competence and excellence control.

OUR QUALITY

To uphold the greatest degree of professionalism in our services by implementing best practices for quality assurance (QA) and quality control (QC) in our operations, while also being economical and abiding by health and safety regulations.

OUR CORE VALUES

Since its inception M.A.R GEOTECHNICAL & GEOPHYSICAL LABORATORIES CO. LTD. have evolved as one of the leading service providers in the field of geophysical and geotechnical engineering in the Kingdom. This has been achieved by:

- Delivering excellence and efficiency to our clients
- Providing its services at the highest level of professionalism and quality control starting from the initial stages of the development of proposals for scientific studies and passing through the stages of follow-up and technical implementation up to the final phase of the project's delivery
Highly qualified and experienced staff.

OUR STRENGTH

"YOUR BUSINESS IS OUR SUPREME PRIORITY" Professionalism, superior equipment with a focus on growth and development, and affordable pricing continue to be our primary objectives.

OUR WORK ENVIRONMENT

With the aid of the most recent equipment, cutting-edge software, communication, and display devices, we have been able to attract the top technical professionals in the industry and have gained our client's trust. For the effective completion of the projects, project-specific facilities are established on or close to the site and run in collaboration with the head office.

OUR PEOPLE

MAR Company has range of employees that are specialized and very much entrusted to different organization specializing in various disciplines of Geoscience. Some of these are stated below:



SAFETY AND HEALTH

In M.A.R GEOTECHNICAL & GEOPHYSICAL LABORATORIES CO. LTD., health, safety and environment are considered as firsts for any job. Our HSE practices conform to M.A.R GEOTECHNICAL & GEOPHYSICAL LABORATORIES CO. LTD. as well as the client's HSE policies.

- Understanding our customer requirements and customizing solution accordingly.
- Taking firm decision as per customer requirements with – think out of the box approach.
- Maintaining the highest standards of quality.
- Adopting the safest means of work execution by adopting M.A.R GEOTECHNICAL & GEOPHYSICAL LABORATORIES CO. LTD. HSE policy.
- Possession of latest hardware and the software.
- Maintaining and upgrading resources to keep a pace with latest developments in the methodology, instruments and approach.
- Regular Trainings of our staff.



OUR BUSINESS

Our operations carry out studies in the field of exploration, infrastructure projects, water & environmental projects using geophysical and geotechnical studies.

We concentrate on the exploration of groundwater and minerals in exploratory projects. Our products assist infrastructure projects identify and reduce subsurface risk. Water management, aquifer recharge and recovery, hydrology, and hydrogeology are all topics covered by our water business area. Our environmental business identifies maps and forecasts potentially dangerous ground conditions, mostly brought on by human activity. The essence of what we do is meeting the needs of our customers by assisting them in resolving their complex process difficulties and improving their operational sustainability to ensure maximum efficiency in their projects. Our company model is centred on serving the requirements of our customers, and we provide value by doing so.

OUR SERVICES

Geophysics

Exploration Geophysics

- Water Exploration
- Mineral Exploration
- Geothermal Exploration

Engineering Geophysics

- Subsurface Void, Cavity &
- Tunnels detection
- Bedrock Depth & Sediment Thickness
- Landfill Delineation
- Seismic Hazards Assessment
- Lithology & Geological Structure
- Non-Destructive Testing
- Engineering Parameters
- Structural & Concrete Condition Assessment &
- Evaluation

Underground Utility

- Utility Mapping (Pipes, Drums, Cables, etc.)
- Locating Underground Storage Tanks (UST)
- Concrete Structures, Foundations, Piles
- Water Leak Detection & Piping Inspection

Geotechnical

Geotechnical Studies

- Onshore & Offshore Site Investigations
- Geotechnical Borehole Drilling & Sampling
- In-situ Properties of Soil & Rock
- Imaging Between & Below Boreholes
- Geotechnical Lab Testing
- Geotechnical Geophysics
- Engineering Geology

Surveying

Land Surveys

- Topographic Survey
- As-Built Surveys
- Boundary Surveys
- Above Ground Utilities
- Pipeline Route Surveys
- Road & Rail Surveys
- 3D Laser Scanning

Hydrographic Surveys

- Hydrographic Surveys
- Bathymetric Surveys
- Port & Coastal Surveys
- Sub-Bottom Surveys
- Side Scan Sonar Surveys

UAS/Drone/Aerial Surveys

- Aerial Photogrammetry
- LiDAR Surveying
- Digital Elevation
- Contour Maps
- Geographic Information Systems (GIS)
- Remote Sensing

Geodesy Surveys

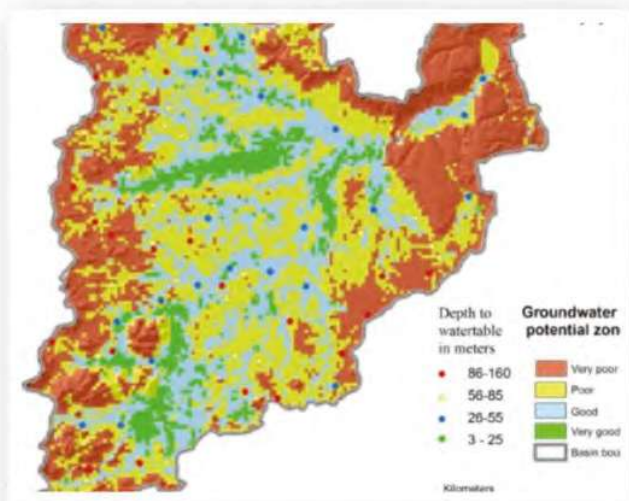
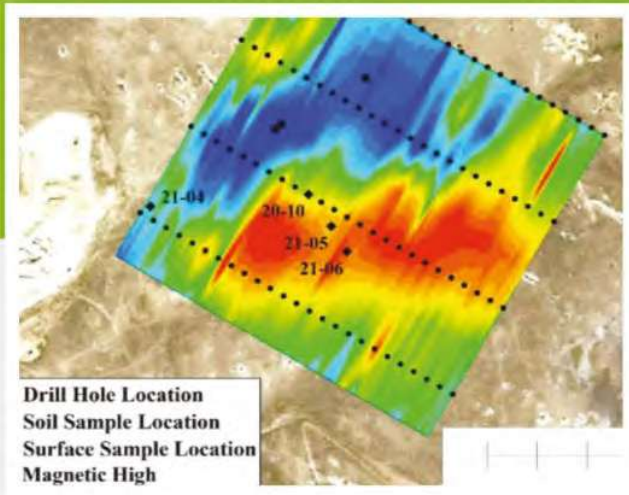
- GPS & Geodetic Control Network Design
- Field Surveying & Attribution
- Establishment of Geoidal Horizontal & Vertical Datum
- Gravity Survey & Geoid Modeling
- Geodetic Transformation.

Geophysical Equipment Rental

- Ground Penetrating Radar (GPR)
- Radio Detection Unit (RD8000)
- Electromagnetic Survey (EM31)
- Electrical Resistivity (ERT)
- Borehole Logging equipment and Borehole Cameras.

GEOPHYSICAL SERVICES

EXPLORATION GEOPHYSICS

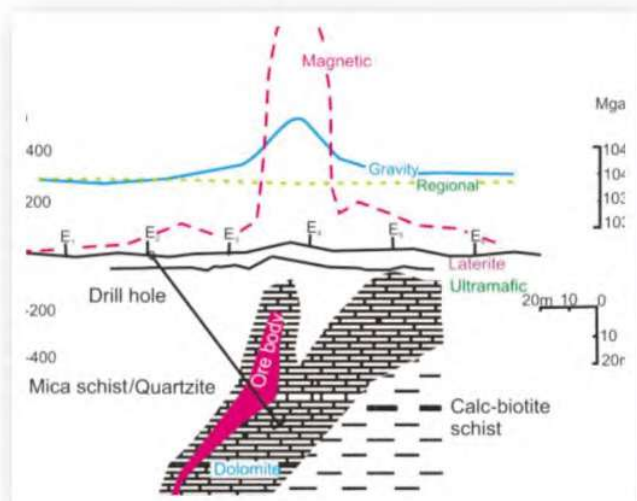


Ground Water Exploration

Water management, aquifer recharge and recovery, hydrology, and hydrogeology are all topics covered by our water business area. Our environmental business identifies maps and forecasts potentially dangerous ground conditions, mostly brought on by human activity. The essence of what we do is meeting the needs of our customers by assisting them in resolving their complex process difficulties and improving their operational sustainability to ensure maximum efficiency in their projects. Our company model is centered on serving the requirements of our customers, and we provide value by doing so.

Minerals Exploration

We are engaged in mineral prospecting activities actively. We offer consulting services that begin with desk research to identify the best locations for reconnaissance investigations (pre-feasibility studies), surface geophysical surveys that assist in identifying the target zones, and follow-up drilling and logging services to determine the size, shape, and depth of the ore bodies.



GEOPHYSICAL SERVICES

ENGINEERING GEOPHYSICS

Cavity Detection

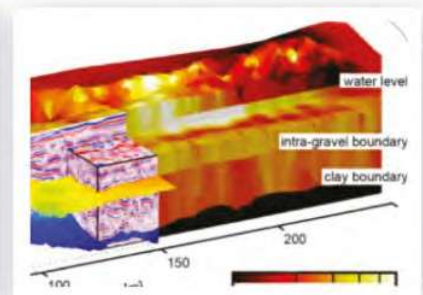
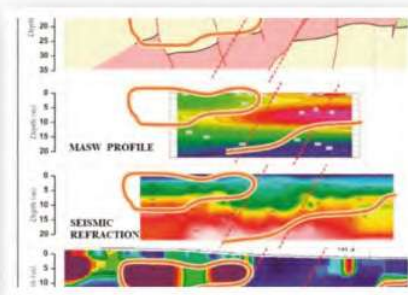
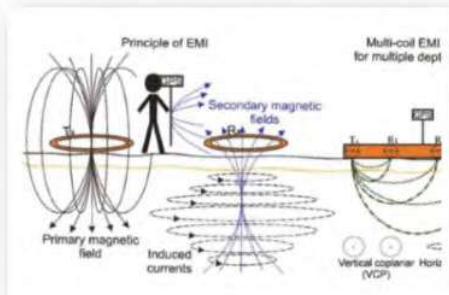
For the community and the infrastructure, subsurface cavities, sinkholes, karstic solutions, and subsidence zones are dangerous. We evaluate such risky environments using a wide range of geophysical techniques, which then inspire concepts for improving the ground and reducing risk to prevent ground failure.

Bedrock Profiling

Determining bedrock depth, variations in bedrock topography, and strength are important prerequisites for foundation design; fortunately, we've got that covered thanks to a variety of geophysical applications that can quickly and affordably give us specific properties of the subsurface layers.

Fracture Mapping

Mapping of fracture, fault, and fissure structures is helpful for locating elements that could be infiltration zones or have an impact on prospective groundwater channels. Fracture mapping is also used to identify drainage channels for problems that are difficult to characterize or monitor using conventional techniques like drilling and groundwater sampling.



Method	Measured data	Estimated property
Seismic	Travel time refracted/reflected seismic wave	Density and elastic moduli
Gravity	Gravitational field of the Earth in space and time	Density
Magnetic	Geo magnetic field in space and time	magnetic susceptibility
Nuclear magnetic resonance	Relaxation electromagnetic field	Fluid content and relaxation constants
Geo-electric	Earth resistance	Electrical resistivity
Induced polarization	Voltage decay	Electrical chargeability
Self potential	Electric potential	Electrical resistivity
Electromagnetic	Response to electromagnetic pulses	Electrical resistivity
Radar	Travel time of reflected Radar	Dielectric constant

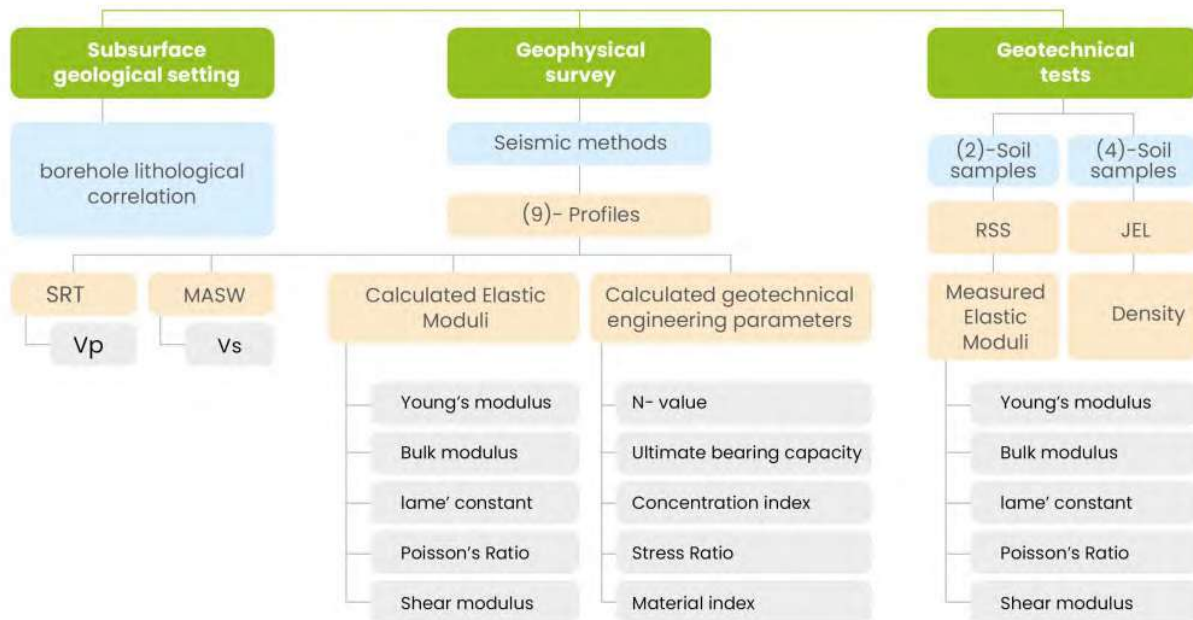
Near Surface Ground

Areas where human activity has dramatically altered the earth surface. Since the near-surface ground conditions are crucial for ongoing development of the sites, artificial or man-made ground is an important part of our understanding of the ground, along with bedrock and superficial deposits.

In-Situ Elastic Properties

In order to optimise the foundation design properties, geotechnical site investigations, geophysical techniques can supply the properties of the ground to the engineer. These properties include:

- Shear Modulus
- Bulk Modulus
- Poisson's Ratio
- Young's Modulus
- Damping Ratios
- Rippability.



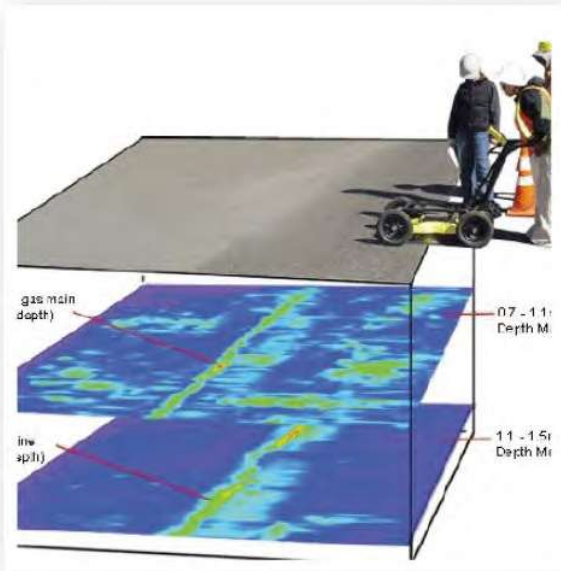
Soil & Rock Properties

The physical characteristics of soil and rock have geological significance; for instance, resistivity is influenced by porosity, moisture content, clay content, and chemical composition. Seismic velocities and rock strength are connected. The most trustworthy method of determining these qualities is geophysical testing.



GEOPHYSICAL SERVICES

ENGINEERING GEOPHYSICS



Underground Utility Mapping

An underground cable and pipe network's location and identification can be seen on a utility map. Sewers, electric cables, telephone cables, gas mains and water mains are among the items that must be found during the operation. You will receive a complete, thorough map of anything that is hidden underneath or directly related to any above-ground elements if you combine this mapping method with a topographical survey. When breaking ground, utility maps are crucial because they accurately depict the locations of the hidden utilities you will discover. Additionally, it helps to avoid harming or destroying any utilities that could endanger people, facilities, or property. You will receive thorough maps of subsurface infrastructure thanks to our knowledge, skill, and capacity to use a variety of geophysical techniques.

Leakage Detection

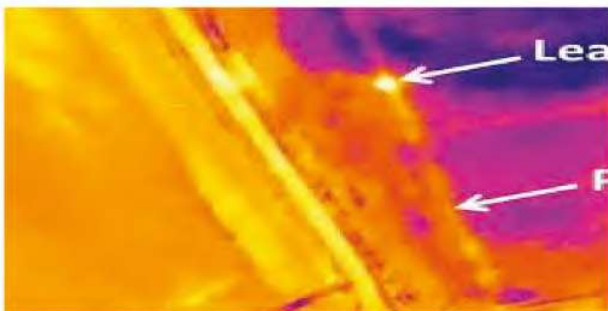
In systems that contain liquids and gases, pipeline leak detection is used to pinpoint the location of a leak. Examples of detection techniques:

- Helium Leak Detector
- Nitrogen Leak Detection
- Thermal Cameras
- Acoustic Microphones
- Infrared Radiometric

Structural (Concrete) Assessment & Evaluation

The structural surface drilling can be done in safer regions due to structural assessment and concrete scanning. Several uses for concrete scanning are shown below:

- Concrete Assessment & Deterioration
- Structural Investigation
- Electrical Wiring in Structures
- Services & Voids in Structures
- Detection of Reinforcing Steel



GEOPHYSICAL TECHNIQUES

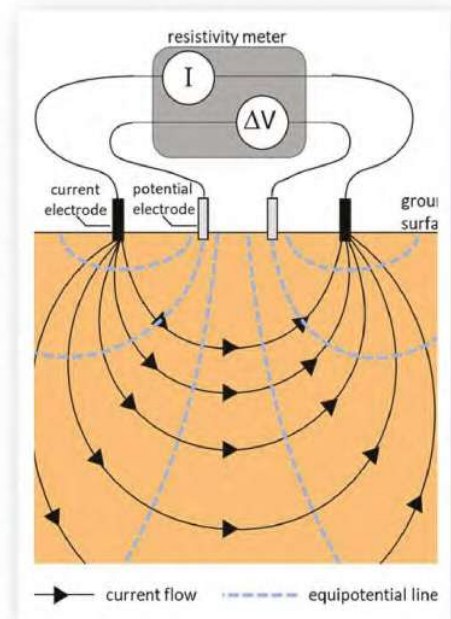
ELECTRICAL METHODS

Basic Theory

The ground material, the presence and saturation level of fluids, and the presence of buried objects all affect the electrical characteristics of the subsurface. The distribution of these qualities as a function of depth and horizontal distance is described using electrical approaches.

Two metal stakes are used to conduct an electric current into the ground to measure ground resistance. Voltage is the unit of measurement for the electrical potential difference between two extra electrodes (potential electrodes). This voltage can be transformed into a resistance measurement for the ground between the two potential electrodes by applying Ohm's law.

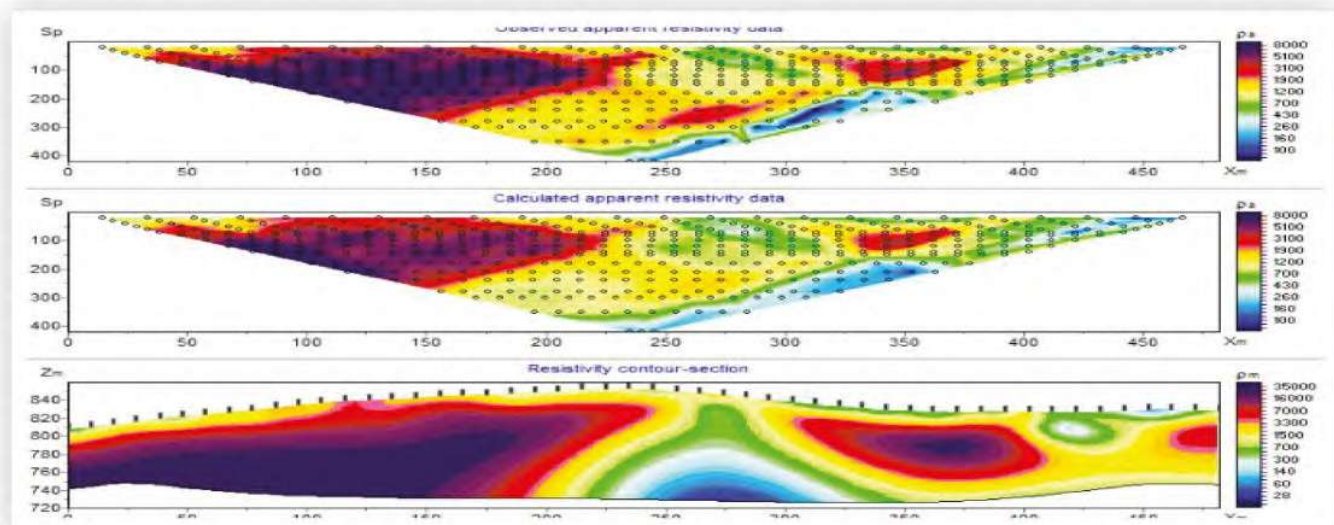
When the electrode spacing is close, the field between the electrodes is only distributed on the surface; however, when the electrode spacing is wider, the electrical flux runs deeper. An electrical profile model of the subsurface can be created using the data set provided by the potential at the surface, which will reflect these path differences.



Applications

- | | |
|---|--|
| ■ Ground water and mineral exploration | ■ Geological and Stratigraphic mapping |
| ■ Locating Cavities, voids, Tunnels and solution features | ■ Determination of depth to bedrock |
| ■ Buried foundation mapping | ■ Landfill waste mass Investigation |
| ■ Mapping and monitoring of groundwater pollution | |

Data Example

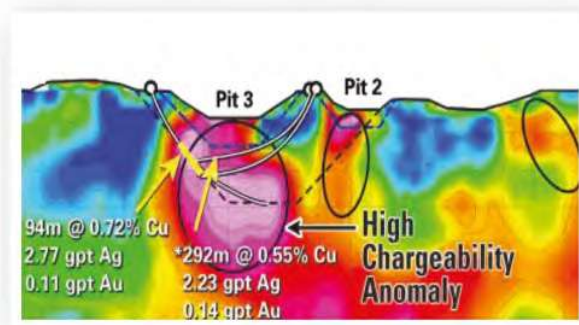
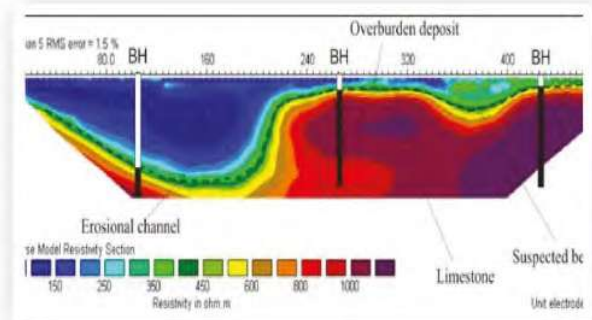


GEOPHYSICAL TECHNIQUES

ELECTRICAL TECHNIQUES

Electrical Resistivity Tomography (ERT)

Direct current is used in the geophysical technique known as electrical resistivity tomography (ERT) to measure the earth's resistivity. Steel electrodes buried in the ground are used to inject current into the subsurface, and a profile or area's apparent resistivity distribution is measured. A two- or three-dimensional resistivity model of the subsurface can be created using data processing and inverse modelling.

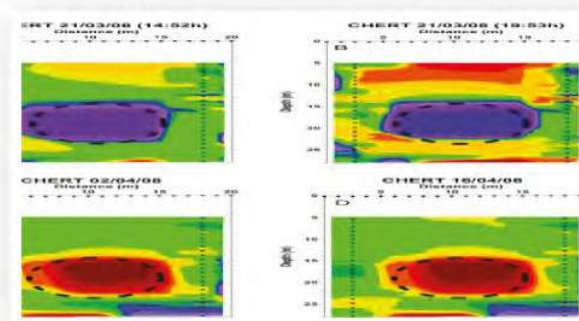
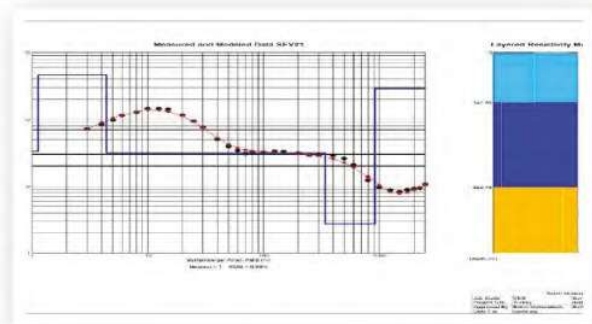


Induced Polarization (IP)

Some minerals exhibit Induced Polarization (IP). When currents are turned on and off, it is analogous to the charge-discharge behavior of capacitors. When the current pulse is turned off, a decline curve can be seen at the receiving electrodes if IP effects are present. This deterioration is measured by the chargeability.

1D Vertical Resistivity Sounding (VES)

The Schlumberger or Wenner electrode arrays are typically used in the electrical resistivity approach known as VES. These resistivity survey setups typically consist of four electrodes and increase in electrode spacing. Longer electrode spacing measures deeper into the subsurface while shorter electrode spacing measures the resistivity distribution in the shallow subsurface.



Cross-Hole Resistivity Tomography (CRT)

Cross-hole Resistivity Tomography The capacity to do cross-hole surveys is called tomography. Using a conventional surface system, this is operated with the addition of specialized down-hole cables. For the majority of applications, the typical depth restrictions are between 150 and 300 m. Both surface-to-borehole and borehole-to-surface surveys are options. Cross-hole data and surface array data can be merged to enhance the image quality.

GEOPHYSICAL TECHNIQUES

SEISMIC METHODS

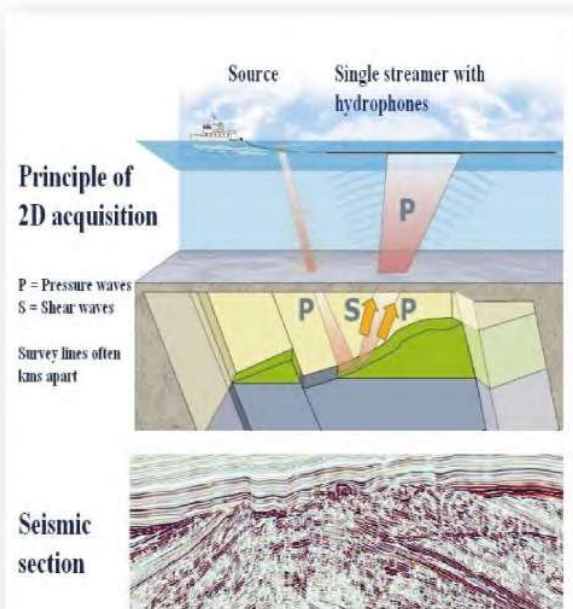
Basic Theory

A source starts a mechanical vibration, which then moves to the vibration's destination. These waves are earthquake vibrations. Simply said, the vibration is a change in stress level brought on by a disturbance. All displacement-supporting directions are affected by the vibration. The vibration easily transfers between different media, from solids to liquids or gases, and vice versa. While electromagnetic waves can pass through a vacuum, mechanical vibratory vibrations cannot. The term "ray," "ray vector," or "ray path" refers to the direction of travel. The location of the first disturbances will create a spherical shell or wave front in a uniform material since a source generates motion in all directions.

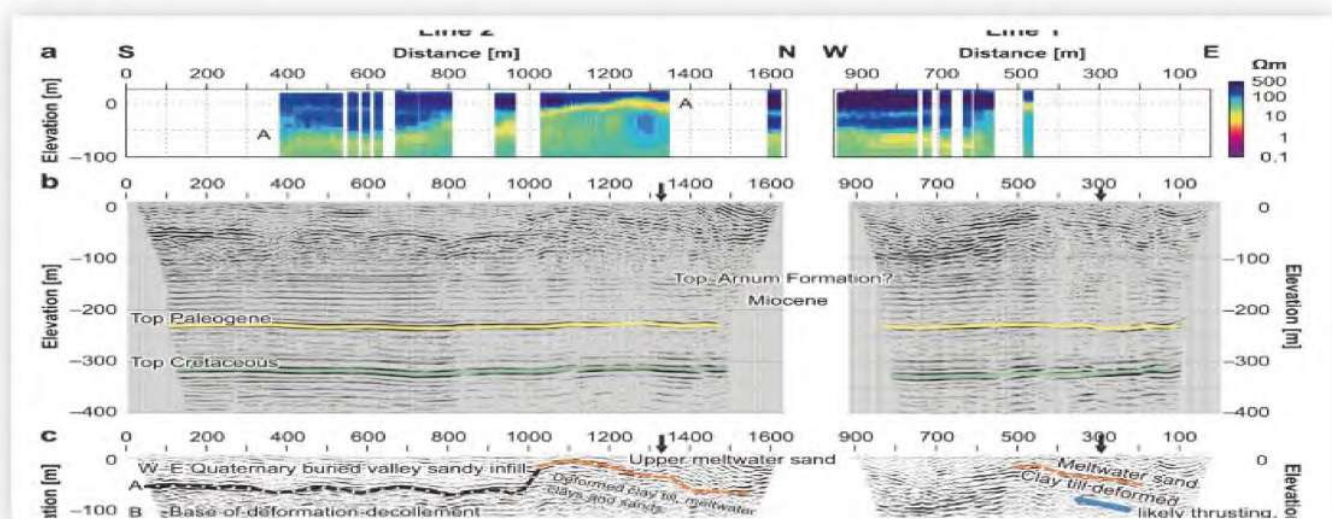
Seismic waves can be divided into two main categories: surface waves, which only occur near boundaries, and body waves, which travel through the entire volume of a material.

Applications

- Bedrock profiling - Engineering Rock head
- Estimation of depth to water table
- Rock rippability and quality
- Engineering parameters:
 - Poisson Ratio
 - Shear Modulus
 - Bulk modulus
 - Young modulus
 - P and S wave velocity
- Mining and subsurface structure delineation
- General geologic structure and Geologic layering
- Locating sinkholes and Buried channels



Data Example



GEOPHYSICAL TECHNIQUES

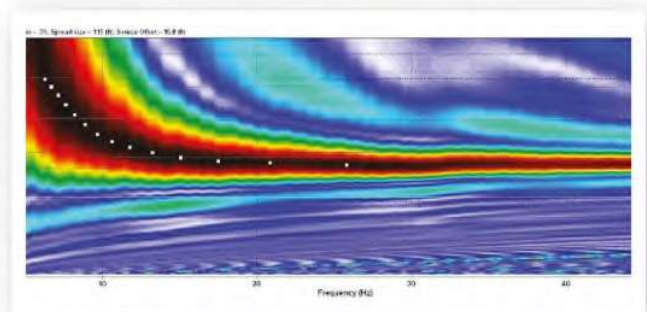
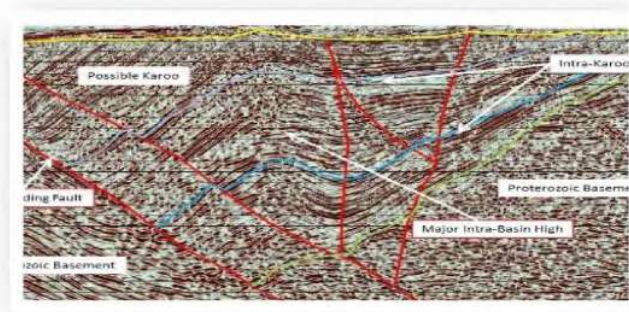
SEISMIC TECHNIQUES

Seismic Reflection Surveys

Seismological concepts are applied in the geophysical exploration technique known as seismic reflection to determine the characteristics of the Earth's subsurface from reflected seismic waves. A controlled seismic energy source is needed for the technique, such as dynamite, a specialized air pistol, or a seismic vibrator, also known by the brand name Vibroseis. It is possible to determine the depth of a feature by noting the amount of time it takes for a reflection to reach a receiver.

Multi-Channel Analysis of Surface Waves (MASW)

The seismic technique known as multi-channel analysis of surface waves (MASW) is used to characterize the shear wave velocity of the subsurface. The MASW method induces a sound wave into the subsurface and records it along a traverse line that has a variety of sensors, similar to seismic refraction. To ascertain how the shear wave velocity varies with depth, MASW uses the dispersive characteristics of Rayleigh-type surface waves.



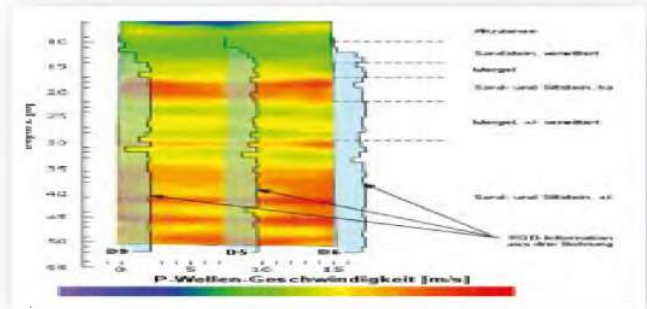
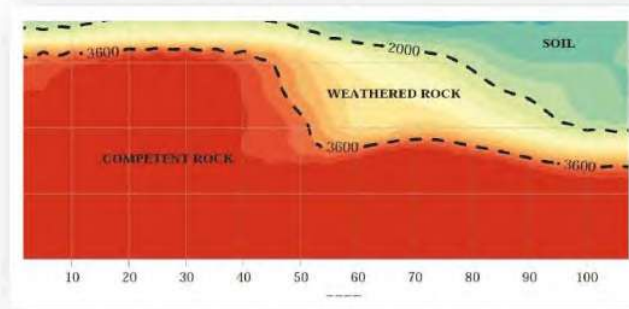
Seismic Refraction Surveys

The seismic refraction method is based on the measurement of the time it takes for seismic waves to flow through soil and rock at the interfaces between subsurface layers moving at various speeds. This characteristic often corresponds well with changes in lithology, degree of fracturing, and weathering. It also typically correlates well with rock hardness and density. Under most circumstances, seismic refraction continues to be the best technique for precisely mapping the depth to competent bedrock.

Borehole Seismic Surveys (Down-hole & Cross-hole)

One borehole is all that is needed for down-hole. At a predetermined distance from the top of the borehole, seismic energy is created on the surface. At regular intervals down the hole, the first-arrival seismic wave travel times are monitored.

Cross-hole measurement entails timing the transfer of seismic energy between two boreholes. While the other hole is utilized to track the arrival of the seismic energy, one hole is used to deploy the source.

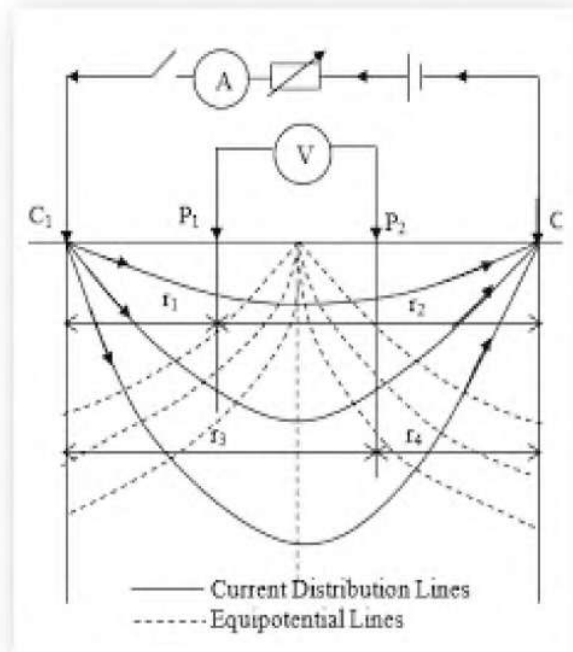


GEOPHYSICAL TECHNIQUES

ELECTROMAGNETIC METHODS

Basic Theory

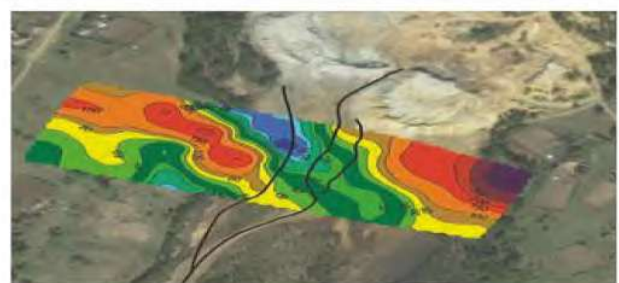
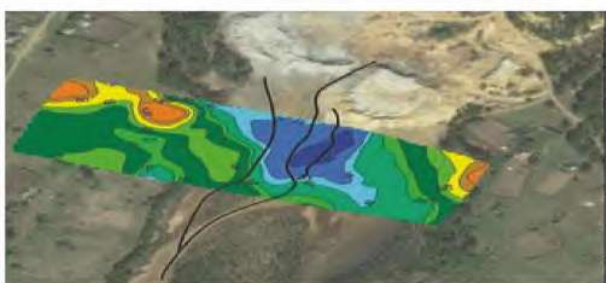
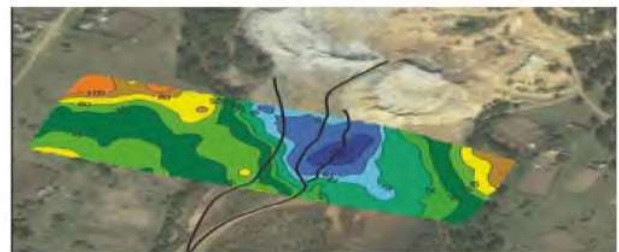
The electrical conductivity of the ground is measured in electromagnetic (EM) surveying as a function of depth and horizontal distance. The electrical conductivity of different rocks varies in value. The electromagnetic approach relies on the magnetic component of electromagnetic waves that are produced at the surface to induce electric currents in the ground. A wire coil (a transmitter coil) is subjected to an alternating current with changeable frequency. Through this method, an alternating primary magnetic field is created, which causes very small eddy currents to form in the earth. The size of these currents is directly correlated with the ground conductivity around the coil. The secondary magnetic field produced by these eddy currents is subsequently partially absorbed by a receiving coil. The voltage produced by the receiver coil's interaction with the primary and secondary magnetic flux is correlated with the subsurface electrical conductivity.



Applications

- | | |
|--|---------------------------------|
| ■ Geological and hydrogeological studies | ■ Contaminant plumes |
| ■ Cavities, voids, weathering and solution feature mapping | ■ Utility detection and mapping |
| ■ Bedrock and stratigraphy mapping | ■ Buried structures |
| ■ Ground water and mineral exploration | |

Data Example



GEOFYSICAL TECHNIQUES

ELECTROMAGNETIC TECHNIQUES

Time Domain **Electromagnetic (TDEM)**

In TDEM, transient pulses of electric current are used to create electric and magnetic fields, and the response's subsequent decay is measured. The primary electrical field is sent using coils on the ground, while the secondary magnetic field is received using coils on the ground. The size of the transmitting coil on the ground, the strength of the current, and the conductivity of the layers all affect how deep the probe goes.

Frequency Domain **Electromagnetic (FDEM)**

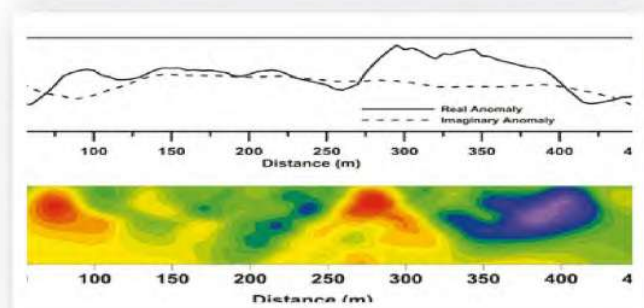
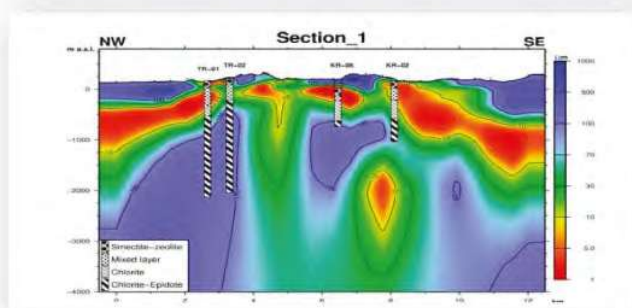
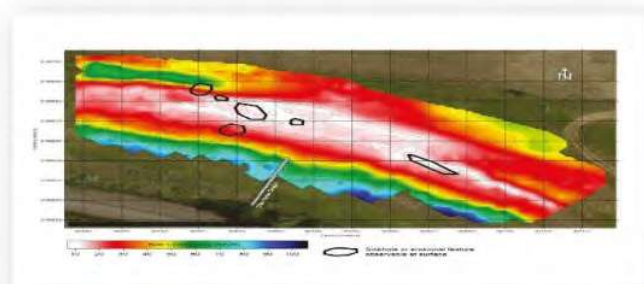
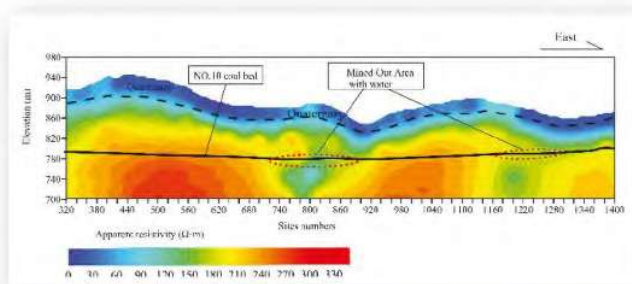
Frequency Domain Electro Magnetic (FDEM) induction involves producing electromagnetic fields that cause currents to flow through the ground, which then trigger secondary magnetic fields to form beneath the surface. Subsurface characteristics and features can be determined by detecting the magnetic fields. The electrical conductivity of the subsurface is connected to the size and phase of the induced currents, which are measured using this technique.

Magnetotellurics **(MT AND AMT)**

Using passive energy sources such as lightning storms and naturally occurring ionospheric current sheets, the electro-magnetic survey and imaging techniques known as magnetotellurics (MT) and audio-frequency MT (AMT) may map geologic features to depths of 500 metres or more. The MT geophysical survey method incorporates measurements of the earth's magnetic and electric fields across a broad frequency range.

Very Low-Frequency **Electromagnetic (VLF)**

Low-frequency transmissions are used as the source in the continuous-wave (frequency domain) electromagnetic technique known as very-low-frequency (VLF) surveys. Measurements of this field's orientation are done during VLF surveys. The technique has been effectively utilized in engineering and groundwater surveys to find conductive fault zones and other sub-vertical conductors, while it is mostly used in mineral exploration operations.

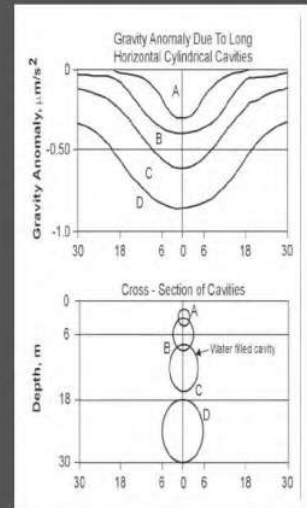


GEOFYSICAL TECHNIQUES

GRAVITY METHODS

Basic Theory

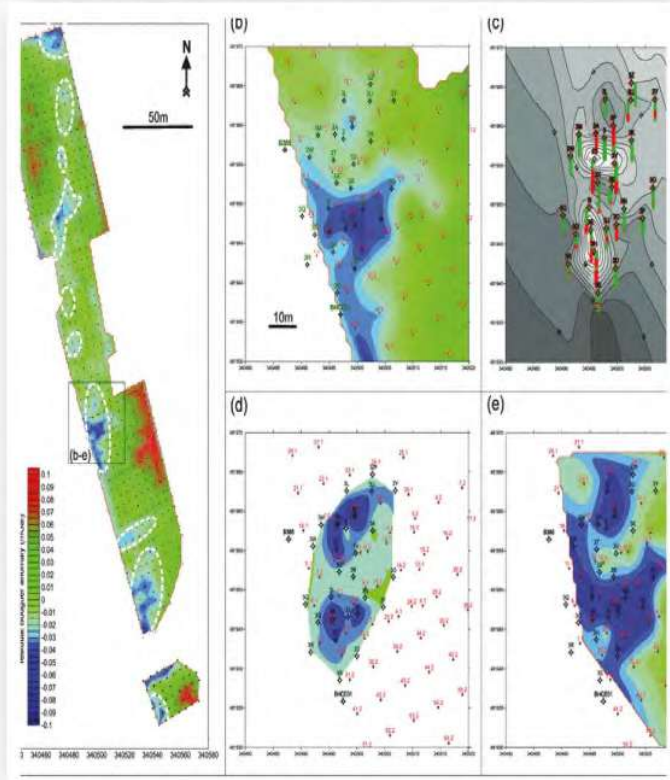
The localized variations in the gravitational attraction at the surface are detected using the gravity method. These variances are related to the densities, weathering, and competence of the rocks as well as the presence of underlying voids and cavities. The observed gravitational field experiences localized highs and lows due to anomalous high- or low-density bodies. The gravity method relies on detecting small-scale variations in the Earth's gravitational field that are brought on by substances with various densities. A localized high (or low) anomaly in the observed gravitational field results from the presence of an anomalously high (or low) density body in the subsurface. Although the stated gravitational effects are very minute, sophisticated instrumentation and data processing methods allow for the detection of both natural and man-made structures and voids.



Applications

- Regional subsurface structures and bedrock litholog
- Mineral Exploration
- Detection of voids, caves, mines,basement
- Ground water inventories
- Detection of buried structures,foundations and storage tanks
- Fault problems Basin Studies

Data Example



Gravity Techniques

Gravity Survey for Regional Structures

On the surface of the Earth, the gravity field is not constant everywhere. It changes depending on how the mass materials underneath are distributed. It is possible to quantify and understand this lateral change in terms of the likely underlying geology. A gravity survey is an indirect (surface) method of figuring out a substance's density. The density of the rock below increases with increasing gravity values.

Microgravity Survey

Bulk densities of different subsurface materials vary. By gathering surface measurements of the Earth's gravitational field, microgravity surveys aim to find regions of contrasting or anomalous density. A localized high (or low) anomaly in the observed gravitational field results from the presence of an anomalously high or low density body in the subsoil.

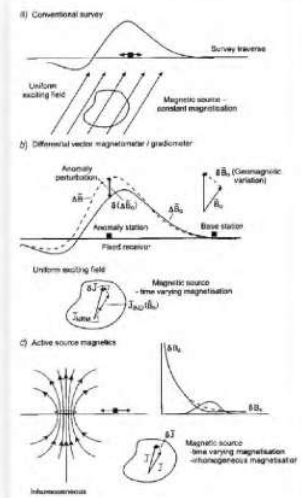
GEOPHYSICAL TECHNIQUES

MAGNETIC METHODS

Basic Theory

In ferrous materials, the magnetic field of the earth creates a secondary magnetic field. While all materials to some level exhibit this vulnerability, iron and steel materials typically have an effect that is quite easy to measure. Geologic components that contain ferrous minerals, most commonly magnetite, are ideal targets. Measurements of the magnetic field are frequently used to look for manufactured iron and steel objects like tanks and barrels. The targeted geologic feature or man-made object must be the proper size and orientation to the earth's field for the magnetic geophysical survey approach to be effective in order to discover the aberrant field.

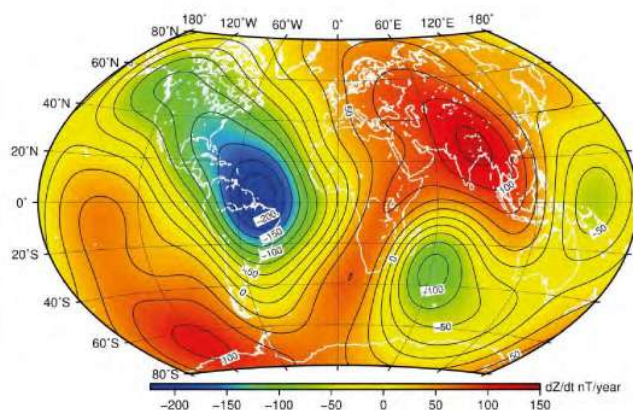
Interference in the near-surface can be caused by structures and their foundations, fences, automobiles, buried storage tanks (known or unknown), utilities, and landfill waste. Note that anyone of these items may also be the target.



Applications

- Locate buried tanks and pipes
- Detect buried unexploded ordnance (UXO)
- Map old waste sites and landfill boundaries
- Map basement faults and geology
- Mineral exploration
- Locating landfills
- Archaeological studies

Data Example



Magnetic Techniques

Total Magnetic Field Intensity (TMI)

In this kind of study, the entire earth's magnetic field is measured using just one magnetometer. The geomagnetic field's strength varies from around 65000 nanoTesla (nT) at the magnetic poles to about 25000 nT in the magnetic equator. Ferromagnetic materials or objects cause localised changes to be superimposed on the broader regional field. Mineral exploration, geothermal and hydrocarbon exploration, lithology, structural geology mapping, and the study of igneous dikes all use total magnetic field surveys.

Magnetic Gradiometry

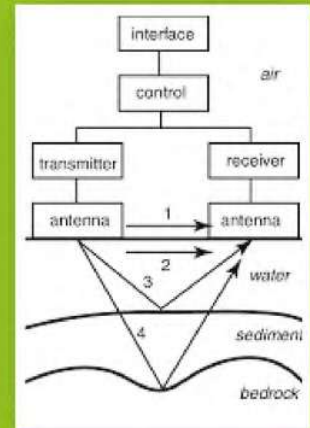
Both the overall magnetic field and its vertical gradient are measured using conventional magnetic equipment. The gradient, which is the quantity recorded by magnetic locators used in land surveying, is particularly helpful for finding things buried at shallow depths. These surveys are frequently used to locate pipes, cables, metallic items, metal drums holding poisonous or contaminated waste, unexploded ordnance, and archaeological artefacts.

GEOPHYSICAL TECHNIQUES

GROUND PENETRATION RADAR (GPR)

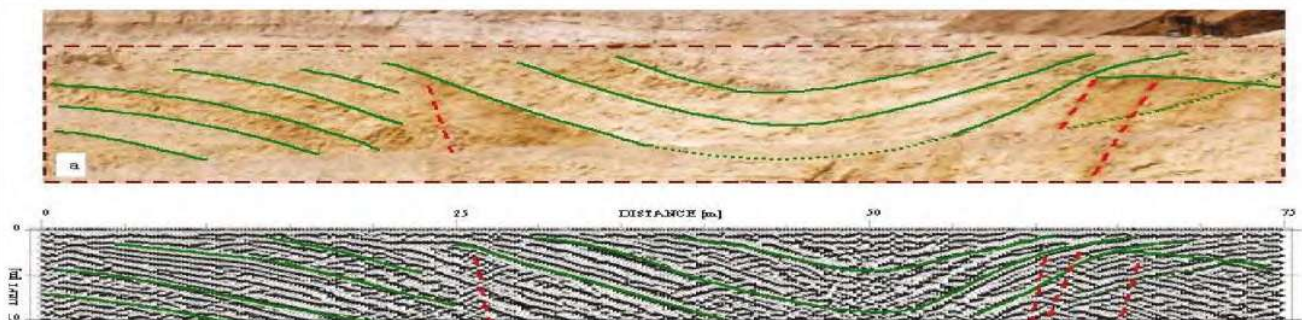
Basic Theory

GPR works by delivering a very small energy pulse into a substance and measuring the power and the amount of time it takes for any reflected signals to return. A scan is defined as a sequence of pulses over a specific area. Every time an energy pulse enters a medium with differing electrical conductivity or dielectric permittivity than the material it left, reflections are created. The contrast between the two materials' dielectric constants and conductivities determines the strength, or amplitude, of the reflection. As a result, a pulse going from dry to wet sand will result in a very strong reflection, but a pulse moving from dry to limestone will result in a reflection that is rather faint. The characteristics of the material that the pulse is going through affect the rate of signal attenuation, which varies greatly.

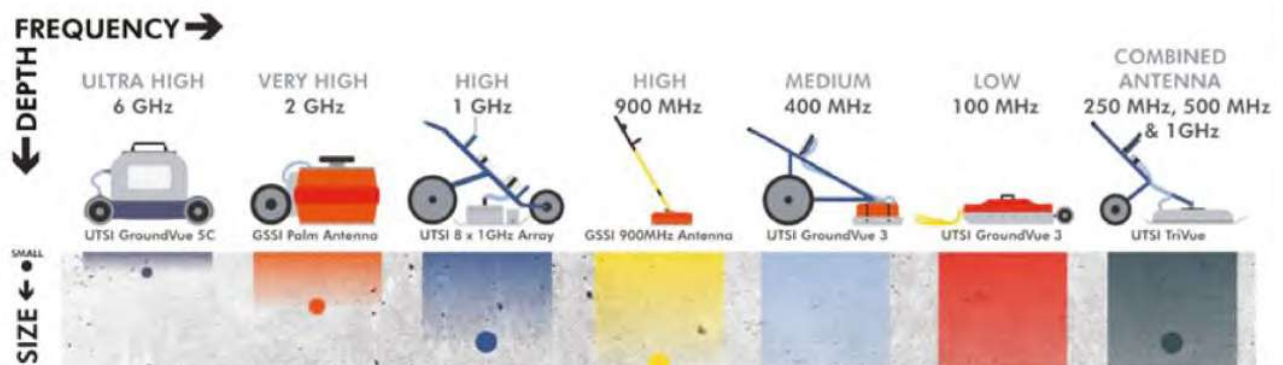


- Detection of voids, caves and mines
- Depth to bedrock, water table and geological Mapping
- Utility Locating and Concrete Inspection
- Detecting buried pipes and Mapping buried Foundations
- Mineral Exploration
- Mapping archaeological features
- Road Inspection and Railway Evaluation
- Contamination and landfill extent mapping

Data Example



Antenna Frequency, Approximate Depth Penetration And Appropriate Application:

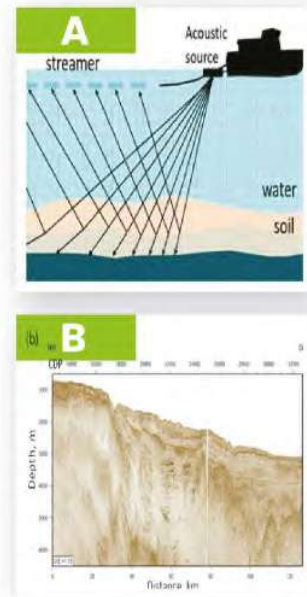


GEOPHYSICAL TECHNIQUES

MARINE SURVEY

Basic Theory

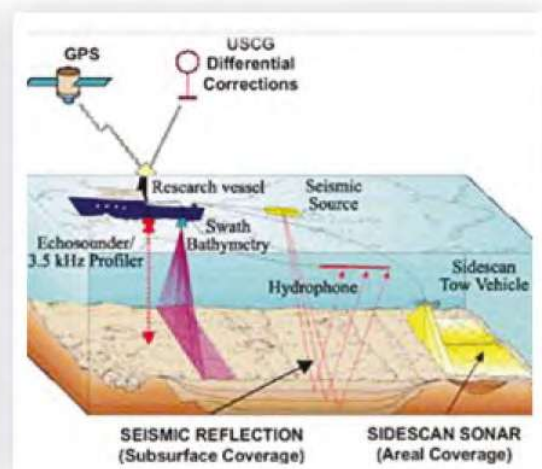
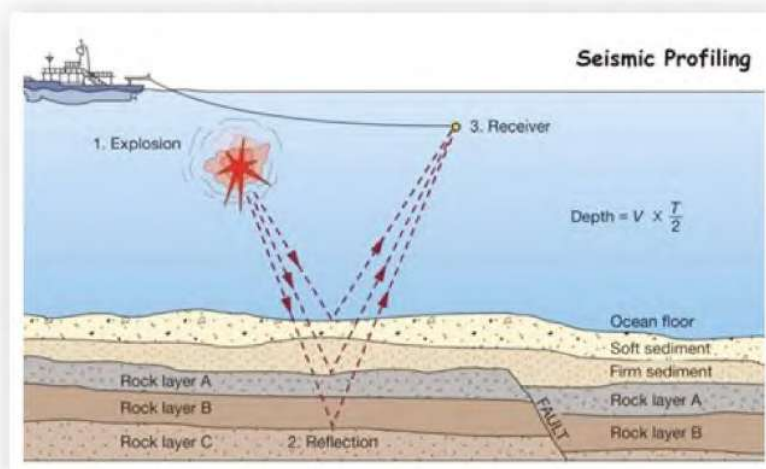
Marine survey is the process of creating maps or charts of the seafloor and the underlying geological structure. Several instruments are used for this mapping, all of which are operated from coastal vessels. The identification of underlying structural elements, geological layers, buried detritus, infrastructure, and utilities is frequently accomplished using marine geophysical techniques. A result of decades of infrastructure construction, deconstruction, and abandonment along metropolitan waterfronts, there are still buildings and utilities close to vital facilities that need to be upgraded or rehabilitated. In many cases, historical plans for these facilities lack precise as-built information to pinpoint the precise placement of remaining undersea subsurface features. Project stakeholders may benefit from marine geophysical surveys to determine subsurface conditions. To detect water depth and subsequently the topography or bathymetry of the seabed, echo sounders are utilized. Additionally, a range of geophysical tools are used to investigate the features of the seabed and the sediments and rocks that lie beneath it. Grabs and coring tools are used to collect seabed samples.



Applications

- | | |
|---|----------------------------------|
| ■ Geological and Geotechnical for Construction Projects | ■ Offshore Wind-farm surveys |
| ■ Bottom & Sub-bottom Mapping | ■ Mining and Mineral Exploration |
| ■ Pipeline and cable route surveys | ■ Marine Environmental Projects |

Data Example



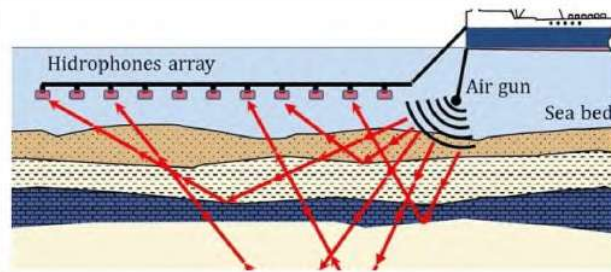
GEOPHYSICAL TECHNIQUES

MARINE SURVEY TECHNIQUES



Marine Electrical Resistivity

The water body's bottom is covered with a marine multi-electrode cable that was specially made for the purpose. There are 25 electrodes in the cable. To calculate electrical resistivity as a function of depth along the electrode array, a control unit applies current, measures the potential from various pairs of electrodes, and applies the appropriate voltage. A programme for two-dimensional inversion is used to process the data. The programme uses a nonlinear least-squares optimization method to find the best fit for the data automatically. Applications include detecting sediment types (clay vs. sand), pinpointing groundwater discharge zones beneath the ocean, mapping geologic structures, and figuring out the geologic conditions below the mudline.



Marine Seismic Techniques

Based on the propagation of seismic waves, marine seismic techniques are geophysical tools for studying the sub-bottom geology. For geotechnical and geological engineering projects where the depth to reliable bedrock and knowledge of fracture or shear zones is crucial, marine seismic refraction data are often gathered. A seismic wave is induced into the seafloor using the seismic reflection technique, and the waves that are reflected from the subsurface strata are then recorded. Geology can be mapped using seismic reflection at depths greater than (50 m).

Marine MASW method, through the measurement of the dispersion characteristics of the surface waves, the Multi-channel measurement of Surface Waves (MASW) seismic method determines the shear-wave velocities of the subsurface materials.



Sub-Bottom Profiling

In this context, the term "sub-bottom profiling" (SBP) refers to the high-resolution characterization of rock and sediments beneath bodies of water. We can identify and map the interfaces between different sedimentary layers or the overburden/bedrock contact beneath a body of water using marine geological profiling. The method is based on seismic reflection theory, which involves sending a seismic wave into the ground and receiving the energy it reflects off of various interfaces..



Side Scan Sonar Surveys

Side scan: A picture or image of the ocean floor is produced by sonar. It creates a picture by measuring the strength of how "loud" the return echo is. In comparison to softer parts like sand, the sea floor's hard surfaces, like rocks, reflect more sound and provide a stronger or louder return signal. Darker than quieter locations are those with loud echoes. Shadows are also produced in the sonar image where no sound was detected by objects or features that rise above the ocean floor. One can estimate the size of the feature by the size of the shadow.

GEOTECHNICAL SERVICES

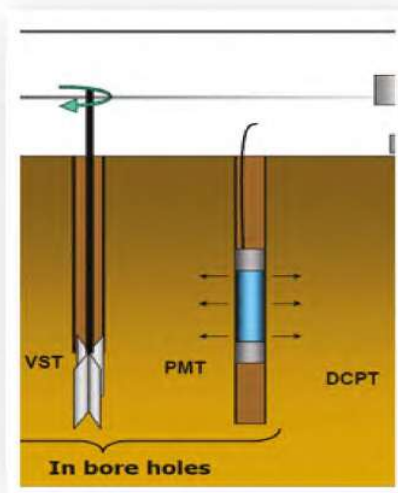
Ground Investigation

The planning of a safe, affordable, and sustainable future use of that site, whether it be for commercial development, residential additions, or public sector projects, requires an investigation into the geology and previous use of a site to learn about its engineering, environmental, and contamination characteristics. Additionally, we perform post-failure analysis and design remediation.



Soil & Rock Samples

Our geotechnical engineering team has a wealth of experience in laboratory and field testing, sampling, and monitoring of soil conditions. We can offer complete geotechnical services to our clients because of our proficiency in laboratory testing and field work. Additionally, we have geotechnical field sampling capabilities, which allow us to do in-situ testing and data collecting as well as swiftly collect high-quality samples for laboratory testing. Our geotechnical engineers and geologists have years of experience conducting field investigations, including geologic mapping and data collection using site reconnaissance and downhole logging, monitoring slope movement with inclinometers, checking groundwater levels, and performing in-situ strength and permeability tests.



In-situ Testing

The capacity to gauge the geographical variability of the deposits and evaluate the geologic materials in their native habitat can both be accomplished by in-situ testing. In order to investigate the soil, we offer a comprehensive and integrated variety of services. The data is gathered utilizing a range of techniques, devices, and sensors, including:

- Cone penetration tests - (CPT)
- Seismic cone penetration tests - (SCPT)
- Plate Loading Test - (PLT)
- Piezocone penetration tests - (CPT-u)
- Dilatometer Marchetti test - (DMT)
- Vane Shear Test - (VST)
- Standard penetration test - (SPT)
- Pressuremeter Test - (PMT)
- Suspension Logging (SL)

Laboratory Testing

We can provide the following services at our lab:

- Soil classification tests
- Soil chemical tests
- Modified Proctor Test
- CBR Tests
- Soil compaction and density tests
- Soil strength and consolidation tests
- Foreign material testing
- Rock Testing



GEOTECHNICAL SERVICES

GEOTECHNICAL GEOPHYSICS

What Is Geotechnical Geophysics

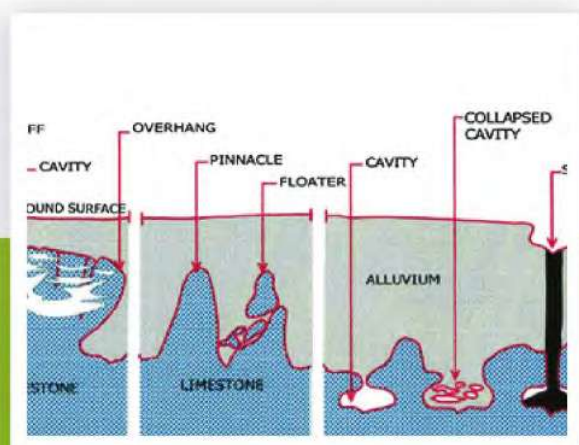
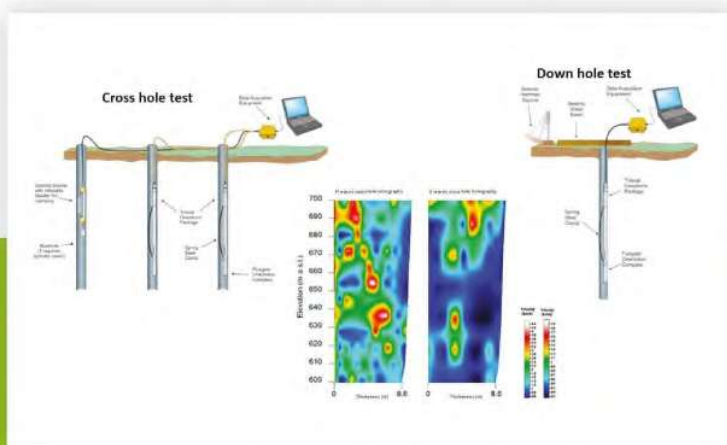
The use of geophysics to problems in geotechnical engineering is known as geotechnical geophysics. For vast study regions, a geotechnical geophysical survey is the most efficient way to gather subsurface data. Geotechnical geophysics can be used to choose the placement of a borehole and can offer trustworthy details about the subsurface's nature and variability between existing boreholes. A successful geophysical survey could identify the presence of the pinnacle and map its height and aerial extent while a normal drilling program might miss an isolated geologic formation like a accessibility. Geophysical equipment can frequently be used in places that drill rigs might find difficult to access, including beneath bridges and power lines, in cities, on steeply sloping terrain, in swampy areas, on pavement or rock, and in other urban settings.

Why Use Geotechnical Geophysics

Any geotechnical study can be optimized by using geotechnical geophysics, which is both affordable and trustworthy as:

Imaging is necessary to identify characteristics such as voids, cavities, cracks, water infiltration, water channels, etc. between and below boreholes where simply geotechnical approaches may be ineffective.

- Providing information on the in-situ characteristics of rock and soil
- Reconnaissance geotechnical geophysics has the potential to greatly reduce the overall number of boreholes necessary, resulting in a cost-efficient, quick, and thorough site research plan.
- Latitudinal and vertical variations provided by geotechnical geophysics can provide information on the dip and strike of the subsurface rocks.
- In geotechnical geophysics, the data can be analysed both qualitatively and quantitatively, and maps of the site's overall bearing capacity and shear velocities can be produced.
- Geotechnical geophysics provides crucial assistance in estimating fault position, geometry, and activity.

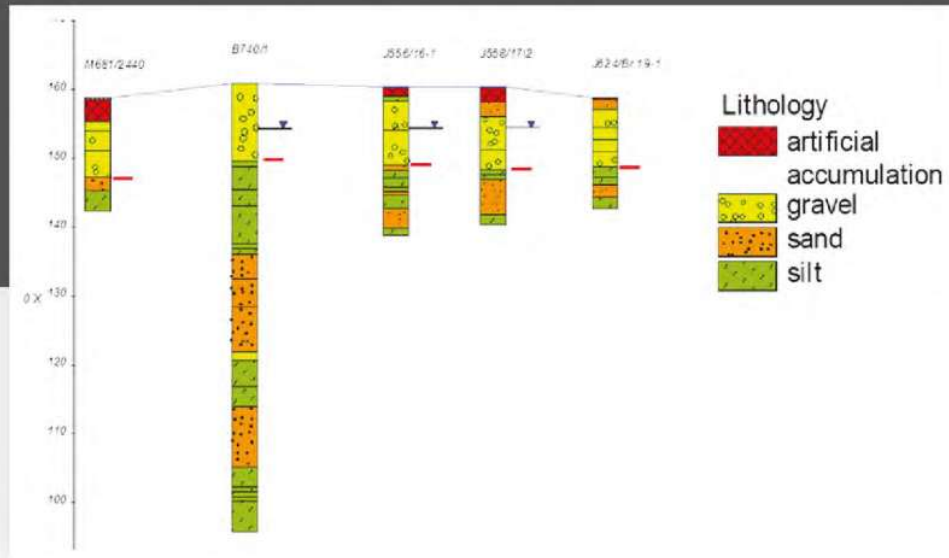


GEOTECHNICAL SERVICES

ENGINEERING GEOLOGY

Recommendations, analysis, and design are provided by engineering geology in relation to human development and many types of constructions.

Engineering geology focuses primarily on the interactions between the earth and its structures, or the study of how the earth's processes affect man-made buildings and human activities.



Fractures & Joints

The result of brittle deformation, fractures and joints characterize the strength of rock material and reveal details about its tectonic history.

They serve as crucial fluid channels and give room for minerals to develop. Engineering geology and resource exploration need to understand how fracture orientations result from stress.



GEOTECHNICAL SERVICES

DRILLING SERVICES

Exploration Drilling

In the mineral mining industry, exploration drilling is used to investigate known ore deposits' contents or to scout out possible geological and commercially valuable sites. Geologists can recover and analyze sample core profiles at the surface using exploration drilling at a lesser cost and with less of an impact on the environment. RGS has all the necessary equipment for projects involving the exploration of minerals.

Rotary Drill Rigs (Geotechnical Works)

Auger, mud rotary, air rotary, and diamond core drilling are just a few of the rotary-based drilling techniques that RSC's equipment is capable of completing. The Mud Bay fleet's rotary drill rigs are configured to carry out a variety of various tasks, giving your project more adaptability while only requiring a single piece of equipment.

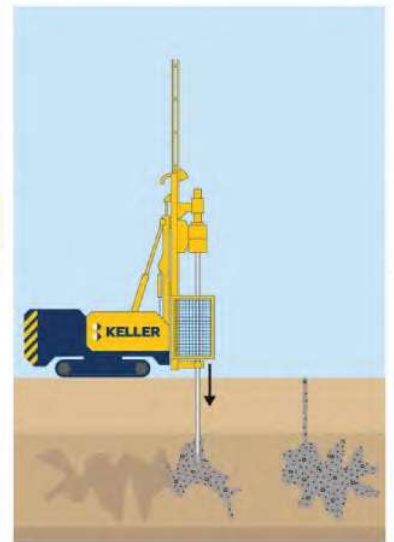
Auger Drills

RGS has a number of auger drill rigs that have been tried and true in the industry and are able to run solid and hollow stem augers with varying diameters up to 12 inches. These rigs are also fully prepared for CPT and other in-situ experiments, whether they are being performed for geotechnical or environmental reasons.

Cavity Probing And Grouting

Cavities and karst features are typical features found in carbonate rocks. Our services include carrying out, supervising, and documenting the cavity probing and grouting work necessary under and around the project site's foundation. To do the probing from the excavated level, we have air percussion drilling rigs.

To ascertain whether there are any voids in the rock formations supporting the proposed structures, cavity probing will be carried out. Measures are taken to ensure that structures placed on top of sub-surface formations will be secure and free from any structural damage caused by settlement or collapse of the sub-surface formations, including determining the nature and extent of any cavities that may be present. After probing, the plan calls for filling cracks in the rock formations with a grout mix that contains sand, water, and bentonite chemicals as well as sand and small pebbles in place of aggregate.



Probe Drilling

Drill, maintain, and keep an eye on probe holes in the tunnel and shaft excavations to look for groundwater inputs.

Pre-Excavation Grouting

Cementation injection To stop water from entering the excavation, grout through holes that were previously dug.

Shot-Crete

Shot-Crete is a method of pouring concrete that produces a product with greater strength, less permeability, and greater durability than typical pumped concrete.

Shot-Crete works well for retaining walls, concrete rehabilitation and repair, new construction, architectural building involving free form designs requiring intricate formwork, and the challenging mining environment.

Spraying is used to apply concrete. Portland cement and aggregate are combined to make Shot-Crete, which is then delivered by compressed air to the spray gun's nozzle along with water. After being sprayed in position, the wet mixture can almost immediately be sculpted or troweled. Shot-Crete is typically put over a framework of reinforcing bars and steel mesh for structural reasons. Shot-Crete is used for a range of fancy concrete constructions, including fake rock walls, zoo enclosures, canopy roofs, refractory linings, pools, and dams because it can take any shape, is easily colored, and may be sculpted after application. In order to stop leaks and tunnel fragmentation, it is occasionally employed to connect the tunnel walls.



LAND SURVEY SERVICES

TOPOGRAPHIC SURVEY SERVICES

A topographic survey identifies every surface feature on a piece of property and shows every elevation and natural feature. In essence, it is a three-dimensional map of a three-dimensional space that displays all of the characteristics and enhancements, both natural and man-made. It displays their precise location, dimensions, height, and any elevation changes.

In-depth attention to detail is necessary when conducting surveys along roadways and major thoroughfares. Along with our standard survey considerations, there are frequently additional factors to take into account, such as traffic and personal safety, particularly when extensive time is needed on the road due to the need for additional detail, such as white lines, yellow lines, lane information, and central reservation information. Although customers occasionally request, with the agreement of property owners, information on building locations of trees and other essential detail when constructing huge 'above road' constructions, roads are often surveyed to the extents of the highway boundary.



Major Sectors of requirement a Topographic Survey

Topographic surveys, commonly referred to as contour surveys, may be needed for pipeline networks, civil engineering design and construction projects, and real estate transactions:

- New construction
- Road or bridge design or improvements
- Remodeling projects to existing structures
- Grading or drainage projects
- Utility design

To identify the current conditions and elevations of a place, many local governmental entities and business developers require topographic surveys. Topographic surveys are used by architects and engineers along with a boundary survey to develop precise and suitable designs based on current conditions.

Data usage of Topographic Surveys

Either an electronic EDM device or a GPS unit of surveying quality are used to take measurements for topographic surveys. The contour lines on a site map that represent the topographic survey's findings are improved by computer tools to offer interactive perspectives. Our CAD experts can use this information to estimate how planned upgrades would affect the topography.

The natural landscape can serve as the inspiration for such changes, and clients can employ topographic surveys to assess and plan elements like drainage ditches, grading, or other features. Prior to a real estate sale or the start of a construction project, hiring a professional surveyor to undertake a topographic survey will guarantee that the land's attributes are appropriate for the use for which it is intended. A topographic survey can also give important information on how a site's past or present use has impacted the land, allowing for better planning for future use. For usage with AutoCAD, digital data is provided in the DWG/DXF and PDF formats.

LAND SURVEY SERVICES

AS-BUILT SURVEY SERVICES

Construction As-Built surveys are used to depict the work's final state as it was actually built and accepted. A common and significant requirement of construction contracts is the as-built documentation, and the procedure mandates that any modification to the original design be included by drafting the change on one set of contract documents designated specifically for that purpose.



As-built surveys are used in the middle of a construction project, in contrast to typical land surveys, which are carried out either before buildings or other improvements are added to the site or after these additions are finished. As-built depictions of the land's improvements as they looked at a specific period were requested by numerous sectors. As built surveys can be applied to both residential and commercial properties. From the planning stage through actual building and future maintenance, surveys are essential tools in the construction business. A site plan or plot plan, which outlines the project's whole course of action, is the first step in any building project. Any restrictions already in place at a specific location are included in this plan.

Several as-built surveys are carried out over the course of a construction project. The number of surveys conducted and their frequency are determined by the size of the construction project. An as-built survey is used to confirm to local and state boards that the authorized construction work was finished in accordance with the same standards established during the planning stage and displayed in the site plan.

The as-built survey is most frequently used to demonstrate to the building inspector that a project is compliant with zoning requirements. For almost every form of land project, from creating new roads and trails to upgrading existing utilities, as-built surveys may be necessary.

As-built accuracy is crucial for more reasons than just administrative efficiency. A important tool for altering the timeline of a significant construction project is an as-built survey, which details precisely what has been finished up to this point. An essential tool for managing the building both during construction and after it is finished is an as-built survey. As a result, they might be required by the project manager or other people with a stake in the project's success. They could be used, for instance, to calculate payments to contractors or keep track of what needs to be finished by a certain date. They are frequently used to check utility and cable plans, floor layouts, evacuation plans and other later building stages.

Many types of construction surveys, including some as-built surveys, are regarded as civil engineering, necessitating extra degrees in addition to land surveyor certification. There are various survey kinds used for very particular goals in the as-built survey field. For instance, a foundation survey verifies that the foundation has been erected according to the site plan's specifications and in the proper place on the property. A Deformation Survey can establish if a project is changing shape or moving over time while it is being built or after it has been completed by creating a three-dimensional photograph of the structure at two separate periods in time.

For all parties to a building contract, accurate existing condition documentation provides unintended advantages. As-built can provide checks and balances against unbilled work or uncredited deletions if changes are properly documented and referenced.

LAND SURVEY SERVICES

3D LASER SCANNING SERVICES

Consider employing 3D laser scanning technology when planning your next construction project if you want to reduce labor costs, increase material cost estimates, and save time. The newest BIM technique, laser scanning, provides a precise, economical, and highly integrated way to virtually model construction, retrofitting, and restoration projects. This article delves deeper into laser scanning technology, how it may be used in building projects, and the costs and advantages of this cutting-edge new technique.



Contextualizing 3D Laser Scanning

The most precise technique for building information modelling is laser scanning. A point cloud survey, often known as LIDAR (a combination of the words "light" and "radar"), is a method in which a laser scanner quickly and accurately measures the distance between densely scanned points over an item. Companies employ a tripod-mounted high-speed laser with an integrated camera. Each time a light ray strikes a surface in the surroundings, the system generates a data point that represents the distance between the laser scanner and that surface. The laser releases light beams at a very rapid pace.

Laser scanners can scan approximately a million different spots per second at a radius of up to 300 meters. For every 100 meters between the scanner and the target surface, the normal error range for a laser scanner is plus or minus two millimeters, resulting in readings that are not only quick but also incredibly accurate.

Traditional surveying techniques that rely on physical measurement and mapping are being increasingly replaced by laser scans. Although useful, these techniques need a lot more man hours to complete successfully and may not be as accurate as laser scanners.

Practical Methods and Integration for 3D Laser Scanning

Any significant construction project should include 3D laser scanning in its budget, and the top companies are constantly developing cutting-edge solutions to achieve the greatest outcomes at the lowest possible price. Companies are mounting laser scanners onto helicopters and drones in addition to the standard laser, camera, and tripod setup to create an even more precise 3D mapping of massive structures.

Up till recently, the construction sectors of renovation and restoration have seen the most success using 3D laser scanning. Laser scanning is one of the best ways to map the area and figure out how to best complete the necessary work without disturbing or harming any other part of the building structure when the job site is a National Heritage Building and you need to upgrade the HVAC and fire protection infrastructure.

In order to plan building projects, engineers and architects employ other software that combines perfectly with laser scanning technologies. All of the major makers of CAD, modelling, and BIM software have created compatibility add-ons that enable the uploading of point cloud data produced by laser scanners into the system, creating 3D images that are excellent for project planning or enabling architects to design building upgrades on top of an image of the existing structure.

Laser scanning users exhibit a retention rate of approximately 100%, indicating that they are unlikely ever to return to conventional survey techniques for their BIM or CAD requirements. However, laser companies aren't just interested in the building industry; they're also employing laser technology to assist police enforcement in developing all-terrain exploratory robots that use thermal imaging to find hazards in their surroundings. survey methods for their BIM or CAD needs.

By comparing the anticipated end state to a point cloud map of the present development, laser scanners and 3D printing could be utilized to quickly produce and replace building components or as a way to assess progress on a specific construction project.

How can we precisely map our work sites to optimize productivity, planning, and coordination? This is a very basic and evident problem that construction firms encounter every day. Laser scanning technology provides a solution. Previously, surveyors might provide the general layout, and architects were left to produce scale drawings or their own visual representations of the location.

Today, we can rapidly and easily create extremely accurate images of job sites using laser scanning. We can then use these images for planning, predicting our material needs, and increasing the productivity and profitability of any construction project.

Key areas for application include:

- | | |
|---|---|
| ■ Creation up to date as-built documentation | ■ Complete 3D CAD models from point cloud |
| ■ 3D semi-automated modeling | ■ Aid in inspection |
| ■ Clash/Interference checking | ■ Deformation analysis and weld peaking reports |
| ■ Condition and damage assessment | ■ Tank/vessel volumetric information |
| ■ Data exchange with many CAD platforms 2D plan | |

KEY BENEFITS OF 3D LASER SCANNING

Speed, Accuracy, and Consistency

With the use of 3D laser scanning, it is possible to quickly and precisely gather millions of quantifiable data points in order to deliver consistent pinpoint accuracy.

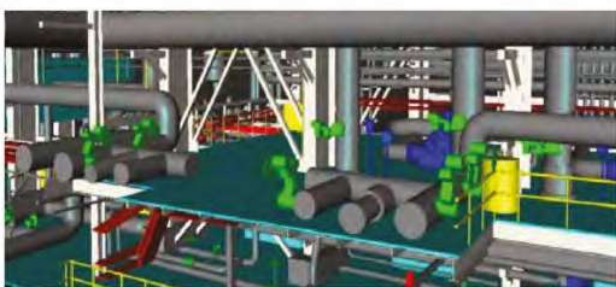
Valuable Data for Design

Datasets are dimensionally precise, measurable, and shareable, so you can do away with all speculation at work.

Works on Retrofits and New Builds

You require a high degree of accuracy for intricate MEP installations. If your project is complicated, requires retrofits, or needs renovation, you can collect accurate data across the whole measurement range.

- | | |
|--|---------------------------------------|
| ■ Mitigation of risk | ■ Reduction of installation man-hours |
| ■ Minimizing shutdown periods | ■ Maximizing field productivity |
| ■ Minimizing offshore fabrication activities | ■ Minimizing field hot-work. |
| ■ Eliminate re-work and reduce the cost of retrospective engineering | |



ENVIRONMENTAL SERVICES

ENVIRONMENTAL ASSESSMENT

ENVIRONMENTAL-PLANNING

Strategic Environmental Assessment (SEA) is an environmental planning tool applied at the policy, plan, and program level to integrate sustainability into early decision-making. It incorporates environmental and social considerations, evaluates cumulative and long-term impacts, compares development alternatives, supports master planning, and enhances transparency through stakeholder participation. Key deliverables include baseline environmental and socio-economic profiles, strategic alternatives analysis, impact and mitigation frameworks, sustainability indicators with monitoring systems, and a regulatory-compliant SEA report.



1. ASSESSMENT

ENVIRONMENTAL BASELINE-STUDIES

Environmental Baseline Studies assess and document the existing environmental conditions of a project area prior to development, providing a reference for predicting and evaluating project impacts. The studies cover air quality and meteorological monitoring, noise level assessment, soil and geological investigations, and surface and groundwater quality analysis, including hydrogeological characteristics. The findings are compiled into detailed baseline monitoring reports and supported by GIS-based environmental maps to aid planning, impact assessment, and decision-making.



2. ENGAGEMENT

Environmental Permitting

We provide end-to-end support to secure all required environmental approvals from authorities.

ESIA – Environmental & Social Impact Assessment

Comprehensive assessment of environmental and social impacts

Stakeholder engagement and public consultation

Social baseline, livelihood impacts, and resettlement considerations

Development of Environmental & Social Management Plans (ESMPs)

Compliance with national regulations and international standards (IFC, World Bank)



3. CONSTRUCTION (PPC)

AIR QUALITY



NOISE

WATER QUALITY SECTION (SURFACE & GROUNDWATER)



SOIL & GEOLOGY



NOISE



OUTPUTS



ENVIRONMENTAL SERVICES

ENVIRONMENTAL STUDIES

ENVIRONMENTAL MONITORING

Environmental monitoring programs involve the systematic and continuous observation of environmental parameters to ensure compliance with regulations and track the performance of mitigation measures. These programs help detect deviations early, guide corrective actions, and support sustainable management throughout the project lifecycle. Continuous monitoring also provides data for reporting to authorities and stakeholders.

EFFLUENT DISCHARGE

Effluent discharge monitoring involves sampling and analyzing industrial or domestic wastewater to ensure that discharges meet regulatory standards. It includes testing physical, chemical, and biological parameters of wastewater, comparing results with permit limits, and maintaining records for compliance. Trend analysis of effluent quality allows identification of recurring issues and supports timely corrective actions to prevent environmental harm.

BIODIVERSITY STUDY

Biodiversity and ecological monitoring evaluates the health and status of flora, fauna, and their habitats within the project area. It includes regular surveys, habitat condition assessments, and the tracking of sensitive or endangered species. Programs often incorporate conservation measures and long-term ecological performance indicators to ensure ecosystem protection and support sustainable development practices.

EMISSION MONITORING

Emissions monitoring focuses on measuring pollutants released from industrial stacks or other sources to ensure adherence to air quality standards. Techniques include periodic stack emissions testing as well as real-time monitoring using Continuous Emission Monitoring Systems (CEMS). Data from emissions monitoring helps identify non-compliance, optimize processes, and implement emission reduction measures effectively.



ENVIRONMENTAL SERVICES

ENVIRONMENTAL MANAGEMENT

Environmental Audits & Compliance Reviews

Independent assessment of environmental performance.
Internal compliance checks against permit conditions
Regulatory gap analysis versus national and international standards
Operational risk identification
Corrective Action Plans (CAPs)
Audit reports aligned with ISO 14001 and regulatory frameworks



Waste Management Planning

Integrated waste strategies aligned with sustainability goals.
Hazardous waste identification and classification
Storage, handling, and transportation procedures
Treatment and disposal pathways
Regulatory compliance planning
Recycling programs and material recovery
Circular economy solutions
Waste minimization and segregation systems
Outcomes:
Reduced environmental footprint
Lower operational costs
Improved regulatory compliance
Enhanced corporate sustainability performance

Environmental Due Diligence (EDD)

Supports investment, acquisition, and financing decisions.
Phase I Site Assessment
Desktop review and site inspection
Historical land-use analysis
Risk screening
Phase II Site Assessment
Soil, groundwater, and material sampling
Laboratory testing
Contamination delineation
Liability risk evaluation
Cost estimates for remediation
Transaction support for lenders and investors



Environmental Management Plans (EMPs)

Structured frameworks to manage impacts throughout the project lifecycle.
Components:
Mitigation measures for all identified impacts
Construction and operational controls
Monitoring plans and KPIs
Roles, responsibilities, and training needs
Incident response and emergency preparedness
Reporting and documentation frameworks

LIST OF MAJOR PROJECTS

By
M.A.R Geotechnical and Geophysical Laboratories Co.



A. GEOTECHNICAL STUDIES



No.	PROJECT DESCRIPTION	LOCATION	CLIENT
01	Geotechnical Investigation for Al Jouf Agricultural & Infrastructure Development	Al Jouf, KSA	Private / Confidential
02	Geotechnical Investigation for Sports Club Jeddah for ITTEHAD Club Company (ICC)	Jeddah, KSA	ITTEHAD Club Company (ICC)
03	Geotechnical Investigation for Solar PV IPP Project, Al Hanakiyah	Al Hanakiyah, KSA	ASSYSTEM RADICON
04	Geotechnical Investigation for Warehouse Projects in Sudair Industrial City	Sudair, KSA	Private / Confidential
05	Geotechnical Investigation for SPPC-1, Samha Wind Power Park, Al Qassim Area	Al Qassim, KSA	SPPC
06	Geotechnical and Hydro-Geological Studies in Abha for Ardara – SAPL	Abha, KSA	SAPL
07	Geotechnical Investigation and Toposurvey for ROSHN National Guard Master Planning and Infrastructure Phase-1	Riyadh, KSA	Saudi Arabian Parsons Limited
08	Geotechnical Investigation for HEJAZ GreenShose Project – NEOM	NEOM, KSA	NEOM
09	Geotechnical Investigation for MAGNA Infrastructure Phase-02 – NEOM	NEOM, KSA	NEOM
10	Geotechnical and Structural Studies for Almarai Staff Buildings in Tabuk	Tabuk, KSA	Almarai Company
11	Geotechnical Investigation for Updated Concept Masterplan and Infrastructure Designs (Area-A) – Modon-AlKharj	Al Kharj, KSA	Saudi Arabian Parsons Limited (MODON)
12	Geotechnical Investigation for Updated Concept Masterplan and Infrastructure Designs (Area-B) – Modon-AlKharj	Al Kharj, KSA	Saudi Arabian Parsons Limited (MODON)
13	Geotechnical Investigation for Batterjee Medical College in Al Qassim	Al Qassim, KSA	Batterjee Medical College
14	Geotechnical Investigation for Almarai Warehouse Al Kharj	Al Kharj, KSA	Almarai Company
15	Geotechnical Investigation for King Salman Road Tower, Riyadh	Riyadh, KSA	Private / Confidential
16	A11 Hub1 Al Ula Project – Al Ula for Dar Al Handasah (S&P)	Al Ula, KSA	Dar Al Handasah (S&P)
17	GCC Olayan – 3S Centre – GCC Olayan	Riyadh, KSA	GCC Olayan
18	Geotechnical Investigation for the Development of Khamis Compound – For Naber Real Estate	Riyadh, KSA	Naber Real Estate
19	Geotechnical Investigation Project – Yanbu Refinery	Yanbu, KSA	Private / Confidential
20	Geotechnical Investigation for Wind Power Project in Shaqra Area, Riyadh	Shaqra, Riyadh, KSA	Private / Confidential



Delivering reliable subsurface solutions and geoscience excellence that support the success of critical infrastructure and development projects.

MAR
GEOSCIENCES & ENVIRONMENT

LIST OF MAJOR PROJECTS

By
M.A.R Geotechnical and Geophysical Laboratories Co.

MAR
projects



B. GEOPHYSICAL SURVEYS



No.	PROJECT DESCRIPTION	LOCATION	CLIENT
01	Underground Utilities Mapping Survey using GPR & RD for AIUla Language Institute Parking Plaza Enhancement	Al Ula, KSA	RCU
02	Underground Utilities Mapping and Manhole Survey for Wadi Laban Hanging Bridge Extension Project	Riyadh, KSA	RCRC
03	Geophysical Surveys for cavities exploration & weak zone identifications studies for sewerage network extension project in Mina, Makkah City	Mina, Makkah, KSA	Al Mabna Al Mutakamil Co.
04	Geophysical Surveys for Underground Utilities detection & underground tanks investigations using GPR, EM, RD techniques at KKIA Riyadh	Riyadh (KKIA), KSA	Al Arabia Company
05	Geophysical Surveys for Underground Utilities detection & underground tanks investigations using GPR, EM, RD techniques at Al Medina City	Al Medina, KSA	Al Arabia Company
06	Geophysical Surveys for Underground Utilities detection & underground tanks investigations using GPR, EM, RD techniques at Shoaiba SWA Industrial Area, Jeddah	Shoaiba, Jeddah, KSA	SAWAED & SDN JV
07	Geophysical Surveys for deliveration of settlement & ground improvement works in Water park site Qiddiya Riyadh	Qiddiya, Riyadh, KSA	Uretek Saudi Arabia
08	MASW (Multi-channel Analysis of Surface Waves) for shear wave velocity profiling and site classification studies for various projects	Various Locations, KSA	FACCO
09	GPR Surveys for subsurface profiling, voids & cavities detection for road and infrastructure projects	Various Locations, KSA	Al Mabna Al Mutakamil Co.
10	GPR Surveys for concrete thickness, rebar mapping and subsurface investigation for building & structural projects	Various Locations, KSA	CGL Jeddah
11	Electrical Resistivity Tomography (ERT) surveys for groundwater assessment and subsurface characterization studies	Various Locations, KSA	Private / Confidential
12	EM (Electromagnetic) & RD (Radiodetection) surveys for underground utilities mapping and routing	Various Locations, KSA	ASTRA Construction
13	Combination Geophysical Surveys (GPR + EM + RD) for integrated underground utilities detection and site investigations	Various Locations, KSA	Private / Confidential



Delivering reliable subsurface solutions and geoscience excellence that support the success of critical infrastructure and development projects.

MAR
GEOSCIENCES & ENVIRONMENT



المركز السعودي للاعتماد
Saudi Accreditation Center



شهادة اعتماد

ACCREDITATION CERTIFICATE

Saudi Accreditation Center (SAAC) Declare that

M A R GEOTECHNICAL AND GEOPHYSICAL LABORATORIES CO

Address: Riyadh

Scope : **Construction**

Has met the requirements of Saudi Accreditation Center and has been accredited in compliance with the following standard :

ISO/IEC 17025:2017

General Requirements for the competence of testing and calibration laboratories
المتطلبات العامة لكفاءة مختبرات الفحص والمعايرة

N-T-00528



Issue Date : 02/01/2026

Expire Date : 01/31/2029



Stamp

يشهد الاعتماد السعودي بأن :

شركة ام ايه ار الجيوتقنية والجيوفيزياء للمختبرات

العنوان : الرياض

المجال : **التشييد والبناء**

قد حقق متطلبات المركز السعودي للاعتماد وتم اعتماده وفقاً لمتطلبات المواصفات القياسية التالية :

تاريخ الإصدار : 02/01/2026

تاريخ الانتهاء : 01/31/2029



Saudi Aramco E-Reference No. 0016800

Registration Approval Letter

February 07, 2026

Attention : M.A.R GEOTECHNICAL AND GEOPHYSICAL LABORATORIES CO

CR Number : 1010913449

Supplier Type: Service Provider Only

Country : Saudi Arabia

We are pleased to inform you that M.A.R GEOTECHNICAL AND GEOPHYSICAL LABORATORIES CO is now registered in the Saudi Aramco Supplier Management System under Vendor Code No. 10118484, provided your company continues to meet all relevant Saudi Arabian and Saudi Aramco standards.

This registration, however, should not be construed as a commitment by Saudi Aramco to procure from you. Being registered as a supplier only grants your company the opportunity, along with other registered sources, to respond to requests for submitting proposals in accordance with Saudi Aramco's established policies and procedures. All procurement instruments including but not limited to service contracts, purchase agreements, or purchase orders will be issued based on the name and address included in your commercial registration (CR), as stated in your Supplier Registration.

Saudi Aramco wishes to remind you that being recognized as a supplier carries with it serious obligations and responsibilities to act in a legal and ethical manner. We wish to remind you of the Saudi Aramco Supplier Code of Conduct (SCOC) which you acknowledged. Failure to abide by the principles set forth in the SCOC can result in adverse actions being taken by Saudi Aramco against you including suspension of you as a supplier. Saudi Aramco also expects each of its suppliers to satisfy each of the requirements of any procurement instrument which might be placed and to act responsibly and reliably as a supply chain supplier.

Material Suppliers should apply for Saudi Aramco Supplier Portal access by forwarding a request to portal-registration@aramco.com. The Supplier Portal is the main electronic business tool used between Saudi Aramco and its suppliers and serves to improve the flow and accuracy of key supply chain information.

For further information or assistance please contact the Saudi Aramco Supplier Help Desk by forwarding a request to SupplierHelpDesk@aramco.com or via the unified call center 800-116-1168 for In-Kingdom suppliers or +966 (11) 290-8950 for Out-of-Kingdom suppliers.

Abdalhadi Shahadh Alshammari, Supervisor
Supplier Registration Unit
Supplier Relationship Management Div

It is the responsibility of the supplier to update Saudi Aramco Supplier Registration Profile through Ariba for the following:

1. Change of Name / Commercial Registration Number / Address / Owner(s)
2. Any change of the supplier location
3. Discontinue supply of approved commodities (9COMs and 9CATS)

This is an electronically generated letter by Saudi Aramco. To verify Supplier approval status, please contact Supplier Help Desk at supplierhelpdesk@aramco.com



Certificate of Registration

Awarded to

M.A.R Geotechnical & Geophysical Laboratories Co.

2495, Arafat Branch Road, Dar Al Baida Area, 8304, Riyadh, Kingdom of Saudi Arabia.

Operates a Quality Management System which complies with the requirements of

ISO 9001:2015

for the following scope:

Laboratories for Construction and Building Materials.

IAF CODE: 34 NACE 7120

Certificate Number: 47790010073

Original Issue Date: 11/06/2026

Current Issue Date: 11/06/2026

Expiry Date: 10/06/2029

Sharmin Mahmud, MBA, PhD
General Manager Risk and Compliance



MSCB-339



Registered by:

Global Registrar of Systems Pty Ltd. trading as GRS Certification

Head Office: Suite 34, Benson House, 2 Benson Street, Toowong, QLD 4066, Australia

Phone: (+61) 1300 007 477 | Email: certification@grscertification.com | Web: www.grscertification.com

Expiry is subject to regular surveillance audits and applied Terms & Conditions of GRS.

This certificate cannot be treated as a legal document and must be returned to GRS upon request.



Certificate of Registration

Awarded to

M.A.R Geotechnical & Geophysical Laboratories Co.

2495, Arafat Branch Road, Dar Al Baida Area, 8304, Riyadh, Kingdom of Saudi Arabia.

Operates an Environmental Management System which complies with the requirements of

ISO 14001:2015

for the following scope:

Laboratories for Construction and Building Materials.

IAF CODE: 34 NACE 7120

Certificate Number: 477140010073

Original Issue Date: 11/06/2026

Current Issue Date: 11/06/2026

Expiry Date: 10/06/2029

Sharmin Mahmud, MBA, PhD
General Manager Risk and Compliance



Registered by:

Global Registrar of Systems Pty Ltd. trading as GRS Certification

Head Office: Suite 34, Benson House, 2 Benson Street, Toowong, QLD 4066, Australia

Phone: (+61) 1300 007 477 | Email: certification@grscertification.com | Web: www.grscertification.com

Expiry is subject to regular surveillance audits and applied Terms & Conditions of GRS.

This certificate cannot be treated as a legal document and must be returned to GRS upon request.

MSCB-339



Certificate of Registration

Awarded to

M.A.R Geotechnical & Geophysical Laboratories Co.

2495, Arafat Branch Road, Dar Al Baida Area, 8304, Riyadh, Kingdom of Saudi Arabia.

Operates an Occupational Health & Safety Management System which complies with the requirements of

ISO 45001:2018

for the following scope:

Laboratories for Construction and Building Materials.

IAF CODE: 34 NACE 7120

Certificate Number: 477450010073

Original Issue Date: 11/06/2026

Current Issue Date: 11/06/2026

Expiry Date: 10/06/2029

Sharmin Mahmud, MBA, PhD
General Manager Risk and Compliance

Registered by:

Global Registrar of Systems Pty Ltd. trading as GRS Certification

Head Office: Suite 34, Benson House, 2 Benson Street, Toowong, QLD 4066, Australia

Phone: (+61) 1300 007 477 | Email: certification@grscertification.com | Web: www.grscertification.com

Expiry is subject to regular surveillance audits and applied Terms & Conditions of GRS.

This certificate cannot be treated as a legal document and must be returned to GRS upon request.



MSCB-339





EQUIPMENT DETAILS



www.geotech.marprojects.net

Category	Equipment Description	Brand / Model	Capacity / Specification	Year	Qty
1. GEOTECHNICAL EQUIPMENT					
1	Mobile Drill Rig B53	Mobile Drill B53	Rotary Core Drilling up to 200 m	2023	3
2	Mobile Drill Rig B54	Mobile Drill B54	Rotary Core Drilling up to 300 m	2023	1
3	Mobile Drill Rig B61	Mobile Drill B61	Rotary Core Drilling up to 400 m	2015	1
4	Crawler Drill Rig	JDL280	Rotary Core Drilling up to 250 m	2024	2
5	Hydraulic Crawler Drilling Rig	Hydraulic Rig	Drilling Unit	2020	1
6	RC Drilling Rig	RC Rig	Reverse Circulation Drilling	2018	2
7	Air Percussion / DTH Rig	DTH Rig	Pneumatic Drilling	2021	1
8	Water Level Indicator (Dip Meter)	Solinst / Equivalent	100 m	2024-2025	8
9	Grout Pump P13	Putzmeister P13	20 m³/hr	2024	1
10	Grout Pump SP11	Putzmeister SP11	11 m³/hr	2025	1
11	Flow Meter	Digital Flow Meter	Lugeon & Pumping Tests	2024	4
12	Lugeon / Pressure Testing Equipment	Double Packer System	Hydrogeological Testing	2026	6
13	SPT Equipment	Automatic Hammer Set	ASTM D1586	Available	As Required
14	Shelby Tube Sampler	Standard Set	Undisturbed Sampling	Available	As Required
15	Core Barrels	Single & Double Tube	Core Recovery	Available	As Required
16	Sample Extruder	Laboratory Unit	Soil Sample Extraction	Available	As Required
17	Air Compressors	Atlas Copco / Equivalent	Drilling Support	Available	As Required
18	Mud Pumps	Various	High Pressure	Available	As Required
19	Field Testing Kits	Various	Soil Testing	Available	As Required
20	Generators	Various	Field Power Supply	Available	As Required
21	Tripod & Winch	Various	Drilling Support	Available	As Required
22	Air Compressor (Portable)	Various	Portable Unit	Available	As Required
23	Casing Pipes	Various	Drilling Casing	Available	As Required
24	Drilling Accessories (Bits, Rods, etc.)	Various	Drilling Support	Available	As Required
2. GEOPHYSICAL EQUIPMENT					
25	Ground Penetrating Radar (GPR)	GSSI SIR-4000	400/900 MHz Antennas	2023	1
26	Electrical Resistivity Meter	IRIS Syscal Pro	72-96 Electrodes	2024	1
27	Magnetometer	Geophysical Unit	Magnetic Survey	2022	1
28	EM Conductivity Meter	Geonics EM-31	Conductivity Survey	2022	1
29	Seismograph	Geometrics / Equivalent	24 Channel	Available	As Required
30	Geophones	4.5 Hz Geophones	Seismic Survey	Available	As Required
31	Electrodes & Cables	Resistivity Set	ERT Survey	Available	As Required
32	GPS Receiver	Trimble / Garmin	RTK Compatible	Available	As Required
33	Data Logger	Geode / Equivalent	Multi-channel	Available	As Required
34	Power Supply Unit	Various	Field Power Supply	Available	As Required
35	Geophones Accessories	Various	Cables, Stakes, etc.	Available	As Required
36	Seismic Accessories	Various	Hammers, Plates, etc.	Available	As Required
3. TOPOGRAPHIC SURVEY EQUIPMENT					
37	Total Station	Leica / Topcon	Surveying	Available	As Required
38	RTK GPS / GNSS System	Leica / Topcon	Survey Grade	Available	As Required
39	Auto Level	Leica / Equivalent	Surveying	Available	As Required
40	Digital Level	Leica / Equivalent	Precision Survey	Available	As Required
41	Survey Prism & Poles	Various	Survey Accessories	Available	As Required
42	Measuring Tape	Various	50 m / 100 m	Available	As Required
43	Handheld GPS	Garmin	Mapping	Available	As Required
44	Tripods	Various	Instrument Support	Available	As Required
45	UAV / Drone	DJI	Aerial Survey	Available	As Required
46	Laser Scanner	Leica / Equivalent	3D Mapping	Available	As Required
47	Survey Stakes & Markers	Various	Survey Marking	Available	As Required
48	Field Notebooks & Accessories	Various	Field Recording	Available	As Required
4. HYDROGEOLOGY EQUIPMENT					
49	Flow Meters	Various	Lugeon & Pumping Tests	Available	As Required
50	Water Level Loggers	Solinst / Equivalent	Groundwater Monitoring	Available	As Required
51	Piezometers	Various	Monitoring System	Available	As Required
52	Automatic Water Samplers	ISCO / Equivalent	Portable Unit	Available	As Required
53	Rain Gauges	Various	Rainfall Monitoring	Available	As Required
54	Observation Wells & Boreholes	Various	Monitoring Network	Available	As Required
55	Water Sampling Pumps	Grundfos / Equivalent	Portable Unit	Available	As Required
56	Permeameters	Various	Soil Permeability Tests	Available	As Required
57	Slug Test Equipment	Various	Hydrogeological Testing	Available	As Required
58	Conductivity Meters	Hach / Horiba	Water Quality	Available	As Required
5. ENVIRONMENTAL EQUIPMENT					
59	Water Quality Sensors	YSI / Horiba	Multi-parameter	Available	As Required
60	Soil Sampling Kits	Various	Sampling	Available	As Required
61	Air Quality Monitors	TSI / Aeroqual	Air Monitoring	Available	As Required
62	Noise Level Meters	Larson Davis / Rion	Type 1 / Type 2	Available	As Required
63	Temperature & Humidity Loggers	HOBO / Testo	Data Logging	Available	As Required
64	pH Meters	Hach / Hanna	Water / Soil Testing	Available	As Required
65	Turbidity Meters	Hach / LaMotte	Water Testing	Available	As Required
66	Environmental Data Loggers	Campbell / HOBO	Environmental Monitoring	Available	As Required
67	Environmental Sampling Bags & Bottles	Various	Sample Collection	Available	As Required
68	Personal Gas Detectors	Honeywell / BW	Gas Monitoring (Multi-gas)	Available	As Required
69	Safety & Monitoring Accessories	Various	PPE & Field Safety	Available	As Required



Truck Mounted Drilling Rig -01



Truck Mounted Drilling Rig -02



Truck Mounted Drilling Rig -03



Geomil CPT Equipment - Crawler)



Truck Mounted Drilling Rig-04



Truck Mounted Drilling Rig-05



Track Mounted Drilling Machine



Mineral Samples



Hydrology Survey - Abaha



Hydrology Survey - Abaha



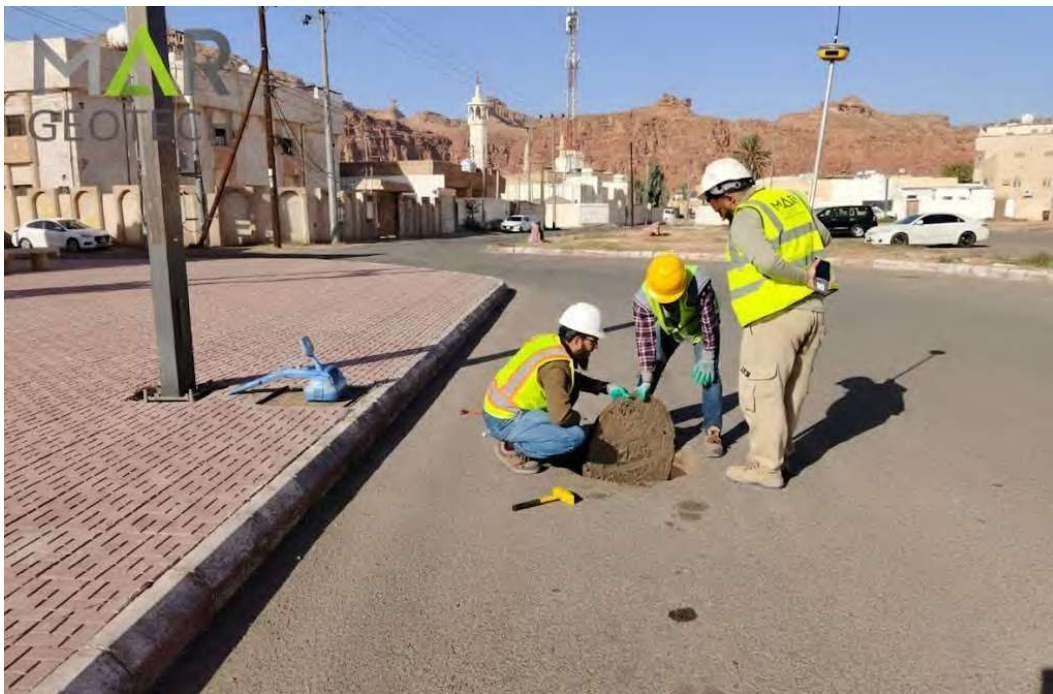
GPR Survey – 400 MHz



GPR Survey – 100 MHz



Manhole Inverted Level



Manhole Inspection



RD Survey



MASW Survey



Contact Us

- **Website:** geotech.marprojects.net
- **Mail:** geotech@marprojects.net
- **Mob:** +966 50 1985 222
- **Tel:** +966 11 810 3676
- **ADDRESS:** Salahuddin Al Ayoubi Road, Al Malaz,
PB No-376373, Riyadh- 11335, Saudi Arabia