



ENGINEERING AND MINING GEOLOGY



GDP-GEOMIN srl
engineering & mining
geology

RELIABLE AND SMART SOLUTIONS FOR MINING

GDP-GEOMIN is an independent consulting group providing focused advice and expert solutions for the mining industry. With more than 30 years experience in this sector, our team includes leading experts in services ranging from exploration, mining, geomechanics, hydrogeology, tailings, environmental planning, operational assistance, remediation and mine closure.

GDP-GEOMIN is made up of professional engineering geologists, hydrogeologists, geotechnical engineers, and land management experts with a long-standing international experience both in underground and in open-pit mining.

Our services are oriented to develop cost-effective solutions, whose design is based on a thorough understanding of the system, a careful evaluation of the potential hazard factors and continuous communication with the customer.

ENGINEERING SERVICES

GEOLOGY



**GEOMECHANICS
GEOTECHNICS**



**HYDROGEOLOGY
GEOTHERMICS**



GEMORPHOLOGY



“Engineering geology is about performing robust interpretations based on solid data”

GEOLOGY

A reliable geological model requires the direct knowledge of the existing context. Therefore, we invest in the scientific collection of large amounts of data by means of field and site surveys.

- geological and structural field mapping
- ore mapping and prospecting
- fault and fracture analysis
- 3D ore body reconstruction
- borehole planning and logging
- resources quantification
- GIS-based and 3D geological modelling
- applied petrography and mineralogy
- remote sensing
- interpretation of geochemical analyses
- spatial analysis of geological data
- natural asbestos risk assessment

GEOMECHANICS AND GEOTECHNICS

We model the behaviour of soils and rock masses by planning and interpreting field and underground surveys, in-situ and laboratory tests, and by synergistically integrating the results in a sound geological model.

- investigations planning
- rock mass geomechanical classification
- intact-rock and rock-mass parametrization
- 2D/3D numerical modelling of underground and surface excavations
- interpretation of monitoring data series
- support to the Work Method Statement
- analysis of support and reinforcement solutions
- assistance to excavation in difficult conditions
- vibrometric monitoring of blasting operations
- project management for D&B, TBM, microtunnel
- soil characterization

HYDROGEOLOGY AND GEOTHERMICS

Groundwater management must rely on a sound knowledge of developments in quantitative hydrogeology. Therefore, our conceptual models are based on the most updated analytical and digital methods

- physical characterisation of aquifers
- hydrogeological mapping
- assessment of tunnel inflows and impacts
- reservoir yield assessment
- interpretation of hydrochemical analyses
- design of drainage systems
- supervision and interpretation of well tests
- monitoring and sampling
- execution and interpretation of tracer tests
- geoth. exploration planning
- 2D/3D numeric fluid and thermal-flow models
- geoth. pump systems design

GEOMORPHOLOGY

Our long-term knowledge of natural hazards in the Alps, one of the most geologically active regions in the world, allows us to provide our clients with effective solutions for any land management issue

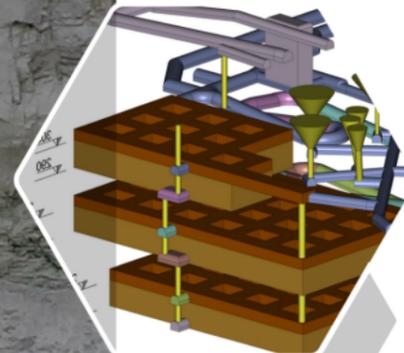
- geomorphological field mapping
- interpretation of interferometric radar data
- rock cliff hazard assessment
- analysis/interpretation of monitoring data
- ballistic rock-fall analysis
- debris flow hazard analysis
- GIS-based spatial analysis on photo-lineaments
- analysis of watersheds and catchments
- risks, costs, intervention, and tender analysis
- design of slope and rock cliff monitoring systems
- 2D/3D slope stability numerical modelling

ENGINEERING SERVICES

EXPLORATION



MINE DESIGN



ENVIRONMENTAL ASSESSMENT



OPERATIONAL ASSISTANCE



From approval and permitting to design and construction management services, helping your project become successful

EXPLORATION geology and geomechanics

Our exploration services include geological, structural, geomechanical petrographical and geochemical analyses, investigation planning, exploration management, economic assessments, and project evaluations.

- exploration management
- geological and structural analysis
- rock mechanics assessment
- drill planning and management
- geophysical investigation planning
- remote sensing
- interpretation of geophysical data
- 3D ore body reconstruction
- applied petrography and mineralogy
- groundwater assessment and modelling
- resources quantification
- investment risk assessment

MINE DESIGN open-pit and underground mining

We hold a long-standing experience in open-pit and underground mine design. We focus on producing mine designs and optimized schedules that make the most effective use of the mine capital. Among our projects are some of the biggest open stopes in Europe.

- mining method selection and investigation planning
- definition of mining strategies
- slope stability and rockfall risk assessment
- design of foundations and embankments
- 2D/3D numerical geomechanical modelling
- design of underground reinforcement solutions
- equipment selection
- drill and blast design
- ventilation system design
- dewatering scheme design
- due diligence and financial evaluation

ENVIRONMENTAL ASSESSMENT Permitting and risk management

Our experience with a wide range of mining projects assures the identification of environmental and groundwater management solutions fundamental for a venture's success, accomplishing regulatory permitting and finding regulatory compliant solutions.

- site characterization and GIS-based analysis
- environmental impact assessment
- support in environmental audits
- waste rock and tailing characterization
- design of recovery systems
- support in permitting and licensing
- groundwater numerical modelling
- risk assessment of water resources
- assessment of metal contamination
- geochemical analyses interpretation
- design of water treatment systems
- mine waste engineering

OPERATIONAL ASSISTANCE Supervision and expert advice

Our long site-based experience on different mine contexts allows us to provide operational assistance and work supervision with the capability of quick responses and effective solutions for various issues that can be faced during mining operations

- assistance to excavation in difficult conditions
- work supervision and investigation assistance
- technical expert advice
- support to drill-and-blast operations
- geomechanical and groundwater monitoring
- technical audits and expert witnesses
- supervision and interpretation of well tests
- noise, air pollution, vibration monitoring
- tailored training of client personnel
- execution and interpretation of tracer tests
- stakeholder involvement and consultation

MINING SERVICES

MARKET SECTORS

TRANSPORT
INFRASTRUCTURES



HYDRAULIC
INFRASTRUCTURES



GROUNDWATER
AND GEOTHERMICS



LAND
MANAGEMENT



MINING AND
QUARRYING



“Geology deals with complexity.
We make it clear for practical design needs”



PROJECTS

GDP strives to account for all geological, hydrogeological, and geomechanical issues involved in the lifetime of a project, from feasibility to its final delivery. Our primary goal resides in communicating with designers, contractors, and investors, on a basis of clarity, reliability, and cost-effectiveness. GDP has a core team that is qualified for the most demanding projects, and particularly capable of dealing with difficult geological conditions and severe geological risks, such as, for instance, underground works in fault zones, heavy water inflows, poor geomechanical conditions, asbestos-bearing rocks.

- Roads and highways
- Tunnels, shafts, penstocks, powerhouses
- Railways and stations
- Bridges and viaducts
- Project management
- Risk assessment and tendering
- Work Method Statement
- Claims and arbitrations

EINSTEIN TELESCOPE - UNDERGROUND GRAVITATIONAL WAVE DETECTOR (Sardinia, Italy) Preliminary study for the development of the technical and economic feasibility project

Client: INFN
Period: 2024-2026
Works total spend: ~2 BE

Sardinia is a candidate to host this major underground infrastructure. The study evaluated a T and L-shape with two 16-km-per-side tunnels built up to 500 m deep, ensuring low-noise for one of Europe's key research projects with global impact.

- Drafting investigation plan
- Geological-structural survey
- Interpretation of investigation results (5'000 m-long boreholes, seismic data, well-logs, laboratory tests)
- Geomechanical characterization
- Thin section analyses
- 3D geological model with LEAPFROG
- 3D flow model with FEFLOW

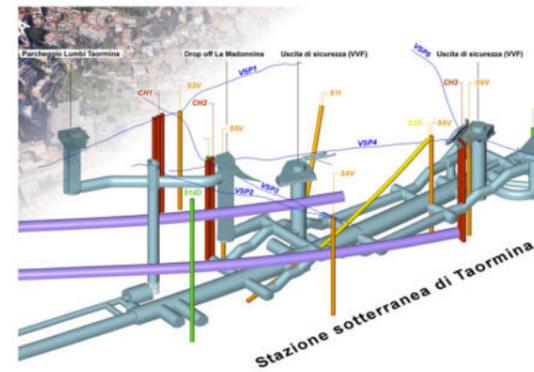


MESSINA-CATANIA HIGH-SPEED RAILWAY: Lot 1-2 GIAMPILIERI-FIUMEFREDDO (Italy) Final Design: geology and hydrogeology, investigation planning,

Client: Proger (on behalf of RFI)
Period: 2021-2023
Works total spend: 1.8 BE

The project deals with the doubling of the Giampilieri-Fiumefreddo line. The total length is about 42 km, of which 35 km are underground (9 tunnels). It comprises the Taormina underground station and viaducts (more than 2 km).

- Geological surveys
- Geognostic investigation planning
- Geomechanical characterization
- Hydrogeological interpretation
- Landslide hazard assessment
- Assessment of the tunnel drainage impact on groundwater
- 3D geological model of the Taormina railway station



TRANSPORT INFRASTRUCTURES

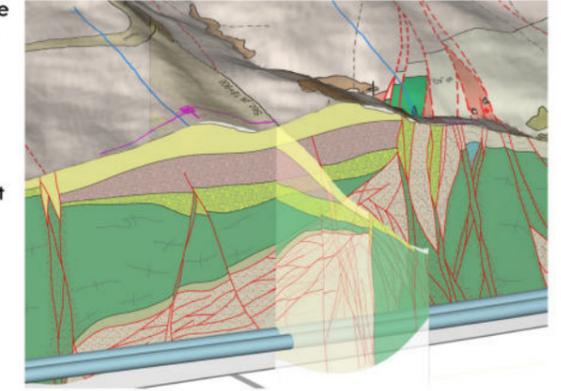
MILAN-GENOA HIGH-SPEED RAILWAY LINE (Italy)

Final Design and Construction-phase update: geology, hydrogeology, asbestos and gas risk assessment, 3D modelling

Client: Rocksoil S.p.A. (on behalf of COCIV)
Period: 2012-2026
Works total spend: 6 BE

This 53 km long section crosses the Northern Apennine chain with a 39 km long twin tunnel, and includes the design of 4 access tunnels, a cut-and-fill section in the Po alluvial plain, service roads, and muck dumps.

- Geological-Hydrogeological Reference Model and Construction-phase update
- Field surveys, borehole interpretation, hydrogeochemistry, risk analysis
- 3D hydrogeological modelling: tunnel inflows and resource impact assessment
- Study on the distribution of asbestos analysis and methane risk analysis
- Detailed investigation survey and support to the management of a TBM block in a complex zone



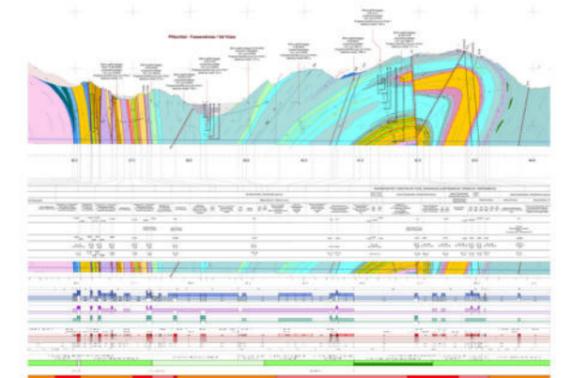
MUNICH-VERONA HIGH-SPEED RAILWAY: BRENNER BASE TUNNEL (Bozen, Italy)

Italian section, Detailed Design and Final Design: geological and hydrogeological studies
Austrian section, Detailed Design: hydrogeological studies

Client: Brenner Basistunnel BBT-SE
Period: 2009-2023

Works total spend: 8 BE
With more than 230 km of tunnels locally reaching a depth of 1800 m, and a complex geology, including tectonised granites and evaporites, this Alpine railway connection is one of the most relevant European projects.

- Reconstruction of the geological and hydrogeological reference model of the Italian section
- Reconstruction of the hydrogeological reference model, Austrian section
- Evaluation of the tunnel inflows by means of 3D numerical models
- Springs and wells impact assessment
- Support to the environmental impact assessment



4^{EME} ROCADE D'ALGER HIGHWAY, Lot 1 (Algeria) Detailed Design: geology, geotechnics, and investigations planning

Client: ITALFERR (on behalf of Società Italiana Condotte d'Acqua, Rome)
Period: 2014-2016

Works total spend: 350 ME
The 61 km-long highway section project between Khemis Miliana and Berrouaghia includes viaducts, trenches, embankments, and ring roads.

- Geological field surveys
- Geotechnical characterisation
- Hydrogeological reference model
- Planning and supervision of geotechnical investigations and laboratory tests
- Earthworks balance
- Support to engineering issues





PROJECTS

Alpine hydropower plants are among the most challenging engineering projects, involving topics related to both underground conditions and surface instability processes (e.g. landslides, debris flows, avalanches). The extreme complexity of the Alpine geology also implies a thorough scientific approach, to account for high geological and hydrogeological risks, with a particular focus on large, deep-seated slope deformations.

Thanks to an established, long-standing experience in this field of activity, we export our skills and knowledge worldwide, facing the most diverse geological settings, design and construction issues.

- Surface and underground hydropower plants, dams, reservoirs
- Large-scale water supply projects, aqueducts and sewers
- Support to the design of minimum-risk solutions and excavation methods
- Analysis of instability, convergence, and settlement issues
- Catchment and resources analysis, impact assessment
- Support to tendering

PRÉ SAINT DIDIER - MORGEX HYDROPOWER PLANT (Valle d'Aosta, western Italian Alps)

Technical and Financial Feasibility Project

Client: Compagnia Valdostana Acque CVA S.p.A.

Period: 2022-2026

Works total spend: 55 M€

A new hydropower plant consisting of a ~3 km-long pressure diversion tunnel, and underground power plant, access and tailrace tunnels is being planned on the Dora Baltea river. The definitive design is in progress.

- Geological field survey and implementation of the reference model
- Geotechnical and geomechanical model
- Analysis and comparison of alternative design solutions
- Hydrogeological risk assessment for springs
- Definitive Design investigations planning and redaction of technical-financial specifications



LANZADA HYDROPOWER PLANT (Sondrio, central Italian Alps)

New underground penstock: feasibility study and Preliminary Design
Upper valve chamber: Detailed Design and works supervision

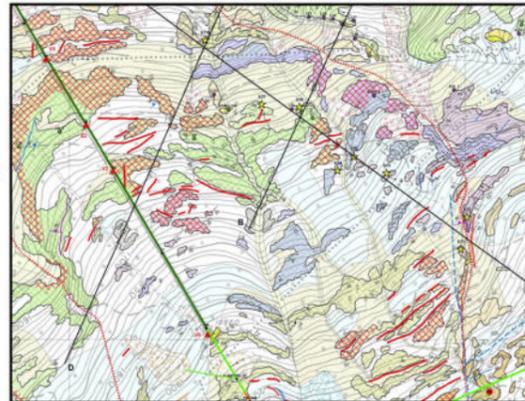
Client: ENEL (National Electricity Board)

Period: 2010-2017

Works total spend: 90 M€

A new underground penstock is being planned to underpass an active deep-seated slope deformation. After completion of a first tranche of works, studies, monitoring, and design are in progress.

- Detailed geological, structural, and geomorphological mapping
- 3D geological reference model
- Deep-borehole and seismic surveys planning, supervision and interpretation
- Hydrogeological reference model, tracing tests, and monitoring
- Natural asbestos risk assessment
- Mechanized tunnelling methods statement
- Underground works supervision



HYDRAULIC INFRASTRUCTURES

ITARE DAM WATER SUPPLY PROJECT (Nakuru, Kenya)

Detailed Design: geology, hydrogeology, and geomechanics

Client: CMC Ravenna, Kenya branch

Period: 2016-2017

Works total spend: 350 M€

The project aims to supply the expanding city of Nakuru with water from the Itare dam, some 80 km east of it. A 15 km-long TBM-driven hydraulic tunnel is excavated in the volcanic units of the western flank of the African Rift Valley.

- Detailed geological field surveys, tunnel section, portals, and dam area
- Geological and hydrogeological reference models
- Borehole and seismic surveys planning and supervision, borehole logs analysis
- Laboratory tests interpretation, geomechanical reference model
- Supervision and interpretation of well tests
- Risk assessment for mechanised tunnelling in weak rock units



LA PUNILLA DAM ON THE RIO NUBLE (Bío-Bío Region, Chilean Andes)

Detailed Design: geology, geotechnics, and investigations plan

Client: Lombardi SA (on behalf of ASTALDI Chile)

Period: 2016-2018

Works total spend: 500 M€

The project aims to improve irrigation over a 60,000 ha region, and provide hydropower generation of 470 GWh/y. It also includes the restoration of the N31 National Road and the creation of a new road network in a mountain region.

- Detailed field surveys
- Updating of the design geological reference model of the main roads and dam site
- Analysis of the geomorphological hazards: rock-falls, debris-flows, and fluvial erosion
- Borehole planning and interpretation
- Interpretation of laboratory tests
- Geotechnical and geomechanical design



MASJED-E-SOLEYMAN UNDERGROUND POWERHOUSE (Khuzestan, western Iran)

Design of the powerhouse cavern restoration and reinforcement

Client: STP-Sadd Tunnel Pars (on behalf of Iran Water And Power Resources Development Co.)

Period: 2016-2017

Works total spend: 10 M€

With a height of 177 m, Masjed-e-Soleyman is one of the highest rock-fill dams in the world. Recent deformations of the powerhouse cavern vault demanded urgent stabilization interventions.

- Critical overview of the geological, hydrogeological, and geotechnical reference model
- Geomechanical modelling
- Interpretation of monitoring data, rainfall series, borehole and on-site tests
- Expert advice on anomalous convergence phenomena
- Support of the design of reinforcement measures and safety procedures





PROJECTS

Groundwater represents a precious resource, all the more vulnerable if we consider the growing impact of human activities on the environment. At the same time, it represents a serious challenge for all underground works, as unpredicted water inflows can seriously threaten the achievement of a project. These two topics are often combined.

Over time, we developed a method that merges an utterly solid geological approach and the quantitative modelling of groundwater and/or heat flow, using the most advanced software. Our well-known skills in this sector have led us to deal with some of the most important projects in the world.

- Aquifer management, protection, monitoring, and remediation
- Well design, construction, and testing; dewatering schemes
- Watershed potential, rainfall vs. groundwater balance
- 3D analysis and modelling of natural flow and heat systems
- 3D analysis and modelling of natural flow and heat systems
- Geothermal exploration and design of geothermal heat systems
- Impact of tunnelling on groundwater and surface waters
- Tunnel inflow prediction and quantitative modelling

SUSTAINABLE GROUNDWATER MANAGEMENT IN GEOTHERMAL AREAS (Travale, Italy)

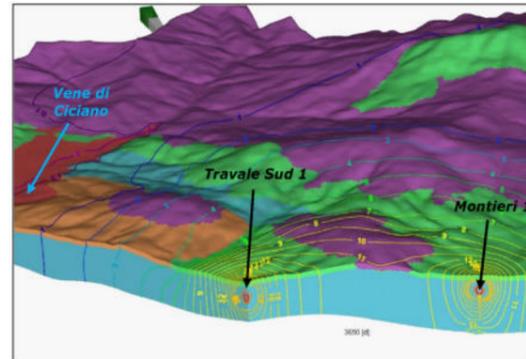
Hydrogeological modeling of the Calcare Cavernoso: evaluating well withdrawal effects on groundwater resources

Client: ENEL GP

Period: 2024-2025

The project involves water extraction from the shallow Calcare Cavernoso aquifer and reinjection into the deep geothermal reservoir to ensure pressurization. The study assessed potential impacts on water resources, such as the Vene di Ciciano springs.

- Geological and stratigraphic survey of the Travale-Montieri geothermal area
- Monitoring and logging of physical parameters for local rivers and springs
- Water balance analysis based on hydrometric and climatic data
- 3D geological modeling of deep geological bodies (LEAPFROG)
- 3D numerical flow simulations to quantify withdrawal effects (FEFLOW)



DEWATERING OF THE MELITO LANDSLIDE (Irpinia, south-Italy)

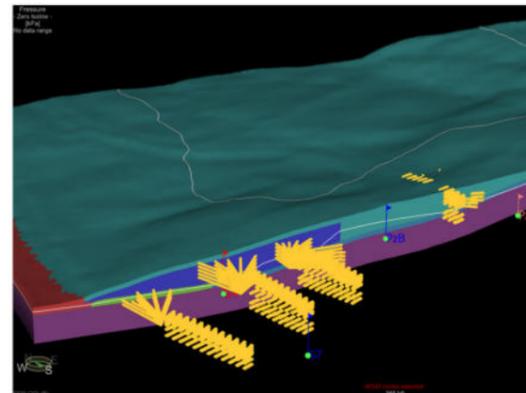
Design of dewatering schemes aimed at stabilizing the Melito landslide

Client: Rocksoil/NET/Alpina

Period: 2022-2023

One tunnel portal of the Apice-Hirpinia Lot belonging to the Naples-Bari High Speed/High Capacity railway line sits on a large landslide detaching at 20 m-depth. Design of solutions for the landslide stabilization have been based on pervasive slope dewatering.

- Conceptual reconstruction of the hydrogeological reference model
- Implementation of a 3D numerical model (FEFLOW)
- Numeric modelling of different dewatering schemes
- Comparison of quantitative predictions
- Drawdown maps
- Reporting



GROUNDWATER & GEOTHERMICS

GROUNDWATER AND SURFACE WATERS MONITORING (Susa Valley, northern Italy)

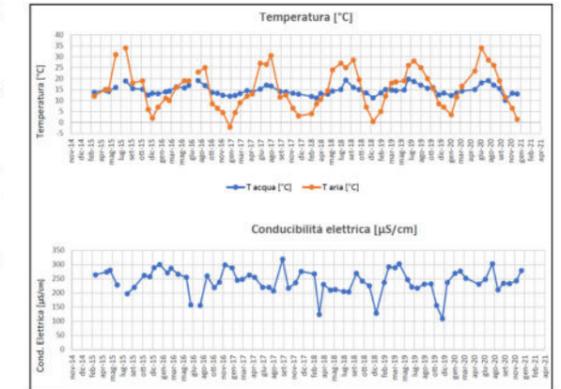
Monitoring of a huge set of springs, wells, piezometers and rivers in the frame of the Lyon-Turin railway project

Client: TELT sas

Period: 2018-2020

The project concerned 3 years of groundwater and surface waters monitoring of resources located in the Susa valley, next to the future Lyon-Turin tunnel line project. About 110 groundwater points and 35 surface water resources have been constantly monitored and chemically analyzed.

- Monthly monitoring of groundwaters (flow, level, T, El. Con., pH, Eh, %O₂)
- Monthly monitoring of surface waters (flow, level, T, El. Con., pH, Eh, %O₂)
- Sampling and assessment of the benthic macroinvertebrates in waterbodies
- Sampling and chemical analyses of all waters (major and minor elements, O18, Deuterium, Tritium, radioactive isotopes, organic compounds)
- Database implementation



C.NA PECORARA AND C.NA ROMANELLOTTA DUMP SITES

Impact assessment of Heavy Metals derived by muck leaching through aquifer

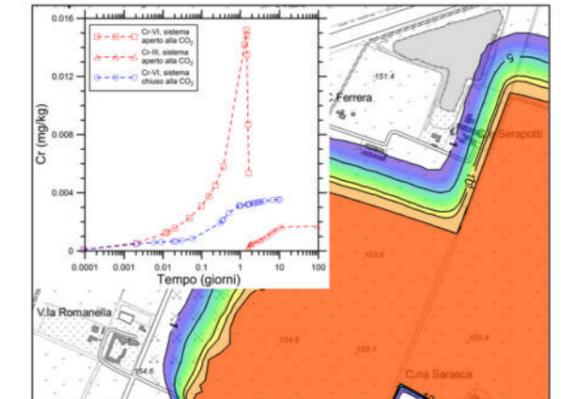
Client: COCIV Consortium

Period: 2018-2020

Works total spend: -

The C.na Pecorara and C.na Romanellotta dump sites host the muck material derived from the excavation of the Main Tunnel Line of the Terzo-Valico high-capacity railway. The interaction of Cr-Ni-Co-bearing materials with the groundwater has been the focus of the study.

- Updating and validation of the preliminary hydrogeological reference model
- Survey of the groundwater wells
- Hydrochemical study and chemical kinetic modelling of Cr-Ni-Co leachates
- Numerical modelling of the fluid flow across the vadose and saturated zone
- Assessment of the plume propagation of leachates through the aquifer



GRETA PROJECT - NEAR-SURFACE GEOTHERMAL ENERGY IN THE ALPINE SPACE

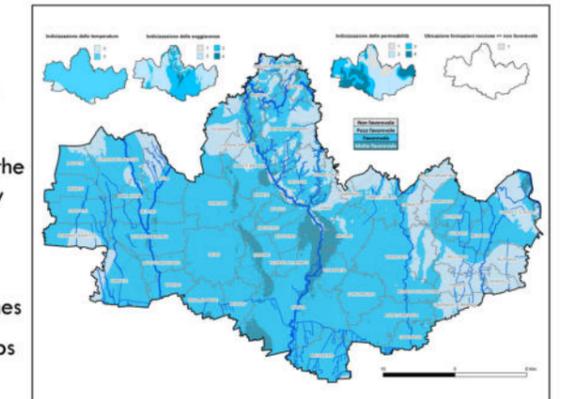
2014-2020 International Cooperation Program: technical consulting on the development of geothermal systems

Client: Valle d'Aosta regional agency for the environment/ Regione Lombardia

Period: 2016-2018

The GRETA project aimed at supporting the local governments of the transnational Alpine area (Italy, Switzerland, Germany, Austria, Slovenia, and France) in developing sustainable and renewable energy sources.

- Assessment of different geothermal mapping methods
- Definition of criteria for the design of geothermal heat pump systems
- Assessment of criteria for integrating the geothermal energy in regional energy plans
- Proposals for harmonized regulations
- Editing of legal and technical guidelines
- Editing of a geothermal potential maps for the Monza Province





PROJECTS

Our professional history led us to deal with some of the most awesome natural events threatening human activities: floods, debris flows, rock falls, landslides, and deep-seated slope deformations. These processes constantly force designers, site managers, and government agencies to face the task of minimising the risks, as effectively as possible.

We have extensive knowledge and worldwide experience in hazard and risk assessment, risk management strategies, stability analyses, and design of interventions for both slope and fluvial dynamics. When specialists are needed, we have a team of geologists qualified for abseiling inspection of cliffs and with specific expertise in geomechanics and slope engineering.

- Hazard and risk zoning studies
- Slope stability analysis and modelling
- Design of landslide repair and stabilization
- Roped cliff surveys
- Rock-fall risk assessment and management
- Kinematic, ballistic, and wedge stability analysis
- Design of rock-fall protection
- Works supervision
- Flood and debris-flow hazard analysis
- Avalanche and glacier-retreat hazard analysis
- Design of avalanche barrier systems for ski resorts
- Hydraulic and forestry works

PROTECTION OF A CONSTRUCTION SITE IN TAORMINA AGAINST ROCK FALLS (south Italy)

Hazard and risk analysis, 3D modeling, support to intervention design and monitoring

Client: Proger (on behalf of WeBuild)

Period: 2022-2025

Two blocks with a bulk volume of more than 2'000 m³ and other unstable masses hang above a construction site in Taormina. The activity comprised a complex multi-phase study for the assessment of rockfall hazard and the design of steel mesh panels and barriers.

- Structural and geomechanical survey
- Definition of the volume and kinematics of the unstable blocks
- 2D and 3D modelling of trajectories of falling rocks
- Support to the design of rockfall barriers and steel mesh panels
- Support to the monitoring system planning
- Support to the client during the monitoring phase and demolition preparation



THE DEEP-SEATED SLOPE DEFORMATION OF SARRE (western Italian Alps)

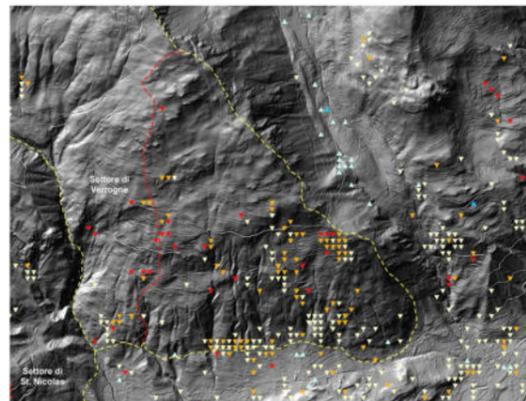
Hazard zoning for the protection of residential areas

Client: Valle d'Aosta Geological Survey

Period: 2011

This post-ice Age, senescent and structure-controlled phenomenon shows a marked hazard zoning: almost completely stabilized in its upper sectors, it turns to a source of risk in the lower part, triggering rock falls and threatening the residential areas at the base of the slope.

- Detailed geomorphological and structural field surveys
- Spatial analysis of 3D LIDAR data
- Radar interferometry: data processing and analysis
- Reconstruction of the evolutionary model of the slope deformation zone
- Rock fall hazard and risk assessment



PROJECTS

In 2017 GDP Consultants acquired GEOMIN Srl, a consulting company active since 1994 in the mining and quarrying sector.

Mining represents a core business of our consulting and we are committed in serving clients across a range of needs from authorisation, through resource estimation and mine planning, to mine decommissioning.

Our primary goal is the delivery of services based on our clients' real needs, with an eye to the most advanced technological solutions and to the use of modern design tools, and a special bias for the environmental sustainability of each project.

- Surface and underground mines and quarries
- Authorisation procedures
- Resource exploration and modelling
- Mine design, ventilation, industrial process planning
- Environmental impact assessment
- Slope stability and monitoring, rock engineering, geomechanics
- Tailings, waste disposal, and environmental monitoring
- Water and groundwater drainage and protection
- Decommissioning and reclamation

"CHÂBLE DU MIDI" SURFACE AND UNDERGROUND QUARRY (Villeneuve, Swiss Alps)

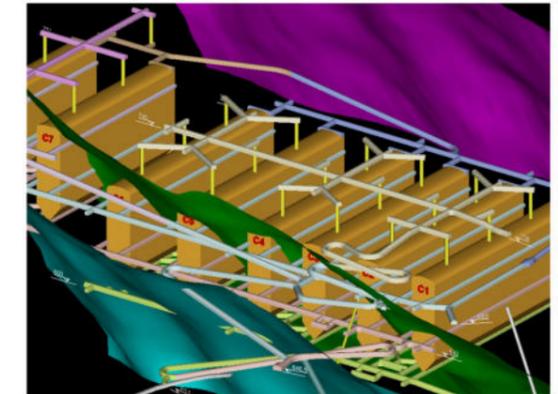
Resource estimation, mine design, works supervision and management, industrial process planning

Client: Carrières d'Arvel SA

Period: 2016-2023

This large aggregate quarry facing Lake Geneva is presently being exploited at the surface through a newly shaft and conveyor tunnel. During 2022 the excavation of the underground works began and will end with 10 sublevel stopping chambers, each sized 90x30x180 m, with 20 km of service tunnels, ramps, and shafts.

- Geological field surveys
- Resource evaluation and 3D geological/structural reconstruction
- Sublevel stopping mine design
- Tunnel design, rock engineering, surface and underground stability analyses
- Equipment and ventilation design
- Rock blasting design
- Industrial equipment (conveyors, crusher) foundation and anchoring design



"COSTIOLO" UNDERGROUND QUARRY (Bergamo, central Italian Alps)

Mine design and environmental impact assessment

Client: Unicalce SpA

Period: 2013-2023

The "Costiolo" industrial limestone quarry is one of the largest underground openings all over Europe. The expansion project includes a sublevel stopping sector and a room-and-pillar sector. The most relevant environmental issue concerns the interference with the groundwater.

- First-phase feasibility study for the underground expansion plan
- 3D hydrogeological modeling
- Environmental impact assessment and consulting for the approval procedure
- Sublevel stopping and room-and-pillar mine design
- Rock engineering, rock mass geomechanical modelling, and stability analyses
- Equipment and ventilation design



UNDERGROUND QUARRIES

MARMORINO QUARRY - HIGH PURITY CALCIUM CARBONATE (Sacile, eastern Italian Alps)

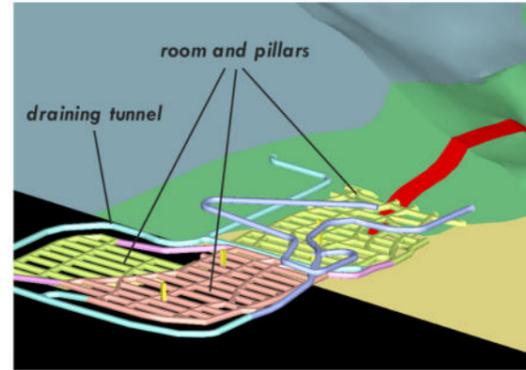
Feasibility and Final Project, sustainability assessment of excavations under the groundwater level

Client: Mineraria Sacilese S.p.a.

Period: 2018-2026

The room and pillars "Valmadonna" quarry exploits the "Marmorino" limestone, used in high-quality industrial processes. A new underground mining design is currently in progress as the surface-exposed deposit is approaching exhaustion.

- Geological field surveys and geomechanical characterization
- Quantification of the reserves and mining extension planning, 3D geological modelling (Leapfrog)
- Groundwater well testing and 3D fluid-flow numerical model (FeFlow)
- Hydrochemical study of the springs and drought impact risk assessment
- VIA (Environmental Impact Assessment)



GOLA DELLA ROSSA QUARRY (Serra S. Quirico - Ancona, Central Apennines, Italy)

Geological and geomechanical study, sub-level stoping design optimization

Client: GDR-M

Period: 2021-2025

The Gola della Rossa quarry extracts high purity CaCo_3 (>98%) which is used for a variety of industrial processes (micronized powders, cement-based premixes). The extraction is currently carried out underground by sub-level stoping.

- Investigation planning
- Geological and structural survey
- Geomechanical characterization
- Resource evaluation and 3D geological and structural modeling
- Sub-level stoping stability modelling and mine design
- Final variant Design for the underground expansion plan
- Equipment and ventilation system design



CAVA MARTINA (Casazza - Bergamo, Italy)

Sub-level stoping mine design

Client: Nicem (Holcim)

Period: 2017-2026

The Martina quarry is a limestone extraction site producing high-quality limestone and aggregates used in cement, concrete and other construction products. Operations include drilling, blasting, excavation, crushing and processing.

- Geological field surveys
- Final variant Design for the underground plan
- Sublevel stoping mine design
- Three-dimensional finite element analysis (FEA) for the evaluation of in situ stress distribution
- Equipment and ventilation system design



OPEN-PIT QUARRIES

SAN CARLO LIMESTONE QUARRY (Rosignano, Livorno, Italy)

Open-pit mine design, stability analyses, studies of processing plants & machinery

Client: Solvay Chimica Italia Spa

Period: 2020-2026

The San Carlo Quarry is a long-established limestone quarry supplying high-quality limestone for industrial use, particularly for the Rosignano Solvay soda ash plant. The site plays a strategic role in the local mineral supply chain.

- Geological survey
- Open-pit mine design
- Rock engineering and stability analyses
- Studies of processing plants & Machinery
- Production cycles
- Capital investments
- Environmental Impact Assessment (EIA)



SNIVE QUARRY (Western Italian Alps)

Multi-stage mine design, environmental impact assessment

Client: Sibelco Italia Spa

Period: 1997-2025

The Snive Quarry extracts quartzites used for the glass industry. It is the biggest quarry of Sibelco Spa in Italy having a production of about 1 million of tons of raw material per year.

- Geological and geomechanical survey and resource assessment
- 3D geological modelling with complex structural features
- Mine design
- Environmental impact assessment
- Water resource management
- Permitting and licensing
- Technical support in legal procedures



LIMESTONE QUARRY OF SAINT-ANDRÉ (Nice, France)

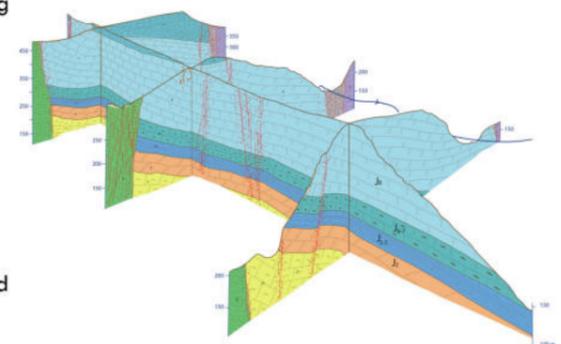
Feasibility Project: quantification of the reserves and mining extension planning

Client: SEC - Société d'Exploitation de Carrières

Period: 2017-2018

Extraction is currently carried out through opencast mining. The study consisted in the feasibility assessment of the mining activity shifting from the surface to the underground by developing sub-level stoping exploitation schemes.

- Geological field surveys and modelling
- Geomechanical and hydrogeological characterisation
- Comparative analysis of extraction schemes
- Preliminary planning of the production cycle
- Preliminary solutions for ventilation and mineral transportation
- Economic analysis and scheduling



OPEN-PIT QUARRIES

GÖKIRMAK COPPER MINE (Hanönü district, Kastamonu Province, Turkey)

Expert advice on open-pit slope stability

Client: Acacia

Period: 2025-2026

The Gökirmak Copper Mine is an important copper mining operation within the country's base-metal sector. The deposit is primarily characterized by copper mineralization associated with sulfide ores hosted in volcanic and sedimentary formations.

- Monitoring execution support
- Monitoring data interpretation
- System improvement and reporting
- Tailing storage facility and waste rock dam



CREUSA DOLOMITE QUARRY (Bernezzo, Cuneo, Italy)

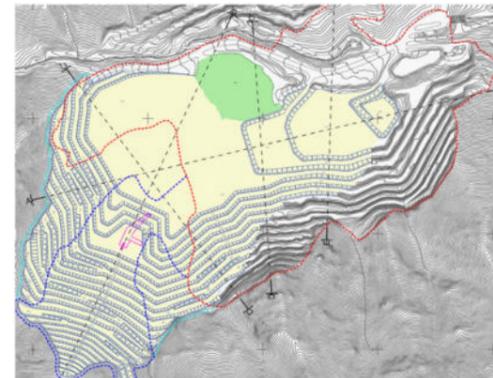
Final Design - Open-pit mining area expansion project

Client: Unicalce SpA

Period: 2017-2020

The Cava Creusa quarry in Bernezzo (Cuneo) is a key extraction site operated by Unicalce. The quarry exploits high-quality dolomite resources, which are central to the production of dolomitic lime and related industrial product.

- Geological survey and resource assessment
- Laboratory-based microscopic and petrographic analyses
- Investigation planning
- Geomechanical study and slope stability
- Mine design of the open-pit and subsurface crushing and hauling system



GIUNCHETTO QUARRY (Genoa, Italy)

Environmental impact assessment and restoration

Client: Unicalce S.p.a.

Period: 2017-2019

The Giunchetto dolomite quarry extracts an average of 400'000 tons per year. The open quarry is located in Genova town with critical production with drill and blast method.

- Open-pit mine design
- Environmental impact assessment
- Landscape compatibility assessment
- Waste management plan
- Water resource management
- Restoration plan and stabilization of
- Application of environmental engineering techniques



With you in your civil engineering and mining challenges



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