GeoConsult

for Civil Construction, Ground Water and Environment

Introduction

GeoConsult is active in Geotechnical Engineering, Engineering Geology, Geohydrology and Environmental Engineering.

The company was set up in 1993 and is based in Haarlem, The Netherlands. Since then projects have been carried out for various clients from industry, government and private parties.

GeoConsult provides a variety of services, such as consulting, participation in projects, research and advice on legal disputes. Where field- or laboratory data are required, third parties may conduct site investigations in order to provide the necessary data.

GeoConsult has completed many multidisciplinary projects in co-operation with larger and smaller companies.

Our completed projects vary widely and include geotechnical design, dewatering design, feasibility studies, tender research, claim research, construction support and regional research for land subsidence. GeoConsult has been contributing to large infrastructure projects, such as High Speed Rail Link between Amsterdam and Brussels (HSL-Zuid), the Cargo Rail Link between Rotterdam and the German Ruhr area (Betuwe Line) and the North-South Metro link in Amsterdam.

Research projects in the field of environmental engineering have been conducted in order to study the effects of land subsidence, resulting from the extraction of natural gas and the lowering of surface water levels in the polders in the northern provinces of Groningen and Friesland.

GeoConsult's main clients include:

- Royal Volker Wessels Stevin Group
- BoreTunnelCombination
- Ballast Nedam
- Royal BAM Group
- Boskalis Dredging
- Ballast HAM Dredging
- Holland Railconsult
- Ministry of Transport, Public Works and Water Management
- Netherlands Oil Company (NAM; partly a subsidiary of Shell Group)
- TotalFinaElf E&P The Netherlands
- Chevron Inc., The Netherlands Branch

Company Philosophy

For construction on or within the underground properties of the soil or rock have to be acquired and judged. With the obtained data calculations are performed for chosen foundation methods, with the aim to ascertain, that no failure of the ground or excessive settlements will occur during the construction or during the life of the object. Data about the depositional and deformational history of geological layers have to be related to geotechnical parameters, as established in the field and in the laboratory, according to engineering geology practice.

The developed geotechnical parameter models form the basis for calculations, simulating the interaction between soil or rock and the construction, using methods from geotechnics: soil and rock mechanics and geohydrology.
GeoConsult puts much emphasis on the engineering geological basis for the parameter models and this is possible as a result of fundamental knowledge of the relationships between geology and soil behaviour. These data are largely obtained through research that is conducted in-house.

Design calculations have to be applied in every day construction practice. By designing interactively with construction preparation, GeoConsult achieves the optimal and safe construction of foundations and other geotechnical structures.

Subsidence of the ground surface may occur where minerals or fluids are extracted from the subsurface for energy or water supply purposes or for the dewatering of building sites. This may cause damage to buildings, hydraulic structures or the natural environment.

GeoConsult attaches great value to the preservation of the human and natural environment and takes these aspects into account in its work.

Innovation is progress through renewal. This principle does not only apply to the improvement of products and processes such as foundation methods, tunnel design or excavation techniques, but also to the models that are used to calculate and predict soil behaviour.

GeoConsult actively pursues renewal in its various working processes.

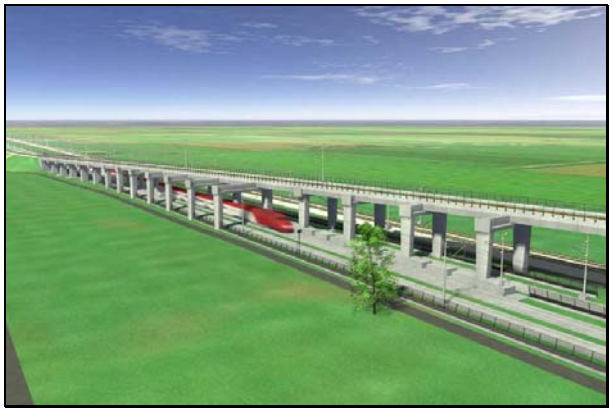
Areas of activity

Infrastructure
Foundations
Dewatering
Underground Construction
Dredging
Legal and Contractual

Environment

Land Subsidence
Soil and Ground Water Pollution

Infrastructure



Large infrastructure projects, such as roads and rail roads, generally consist of a wide range of civil engineering constructions: earth embankments, settlement free slabs, fly-overs, underpasses, noise protection screens, culverts and technical buildings.

These constructions require specific site investigations, foundation design, geotechnical and dewatering design. Where roads and railroads are incorporated into existing constructions, as well as in existing cables and pipes systems, specific technical solutions are required, both during the construction phase and during the life time of these structures.

GeoConsult has been involved in the construction of the High Speed Rail Link connecting Amsterdam via Antwerp to Brussels. GeoConsult carried out the geotechnical design for the connection to the existing rail infrastructure (Contract HSL7) from the conceptual stage right through to the construction stage.

This design & construct contract involved: near Schiphol Airport: two fly-overs and connecting earth embankments; between Moerdijk and Breda: a fly-over and connecting earth embankments and the railway bridge over the river Mark and in the city of Breda: two underpasses and a fly-over with connecting earth embankments.

Foundations

The choice of type of foundation and its design will vary according to the soil conditions and the characteristics of the superstructure. The conditions during construction such as available space, ground water and adjacent structures, will have to be assessed in order to establish feasible construction methods.

GeoConsult made the designs for the foundations for a variety of projects which include town houses, buildings, industrial constructions as well as large civil engineering constructions, such as large underpasses, fly-overs and bridges.

GeoConsult applies generally used solutions for pad or strip and pile foundations but we also have experience with specialized foundation techniques such as diaphragm walls, large diameter piles, grout anchors, jet-grouting and the application of geotextiles.

Dewatering

For many foundation solutions the ground water level has to be lowered temporarily. Assessments will have to be made as to the required capacity of a dewatering system, the type and depth of wells to be applied and what effects pumping will have on its surroundings.

Other considerations are the quality of the water (for example the possibilty of mobilization of hazardous chemical constituents) and the possible return of water into the ground (infiltration).

(Geo)hydrological models of the subsoil are often essential in order to assess the feasibility of various dewatering system, this also with a view to possible construction methods.

GeoConsult has been involved in the design of several large projects for the dewatering of construction pits. These projects consisted of the design and supervision of site investigations, pumping tests and ground water flow modelling which eventually resulted in the presentation of reports to obtain dewatering permits.

Underground Construction

In the construction of underground spaces, such as tunnels, underground stations and parking garages, the geotechnical properties of the soil, the ground water and the workability of the soil are boundary conditions for the design and for the choice of construction methods.

Until recently no bored tunnels were driven in The Netherlands. In the early nineties this changed with the construction of the second Heinenoord tunnel under the river Meuse. GeoConsult made the geotechnical models in the pre-design stage for this tunnel.

More bored tunnels followed: the tunnel under the Westerschelde, the sea entrance of Antwerp, the Botlek railway tunnel, the tunnel which is part of the High Speed Rail link Amsterdam-Brussels, and the North-South Metrolink in Amsterdam which has recently been started. GeoConsult made a variety of contributions: site investigation design, geotechnical models, research of borefront stability, application of foam, gradations of bored materials, swelling behaviour of clays and the characteristics of bored materials in over consolidated clays.

One of the innovative constructions in The Netherlands is a circular shaped parking garage built in the city of Groningen. This construction is made in glacially over- consolidated clays. The circular wall is self supporting as a result of arching and is constructed as a diaphragm wall. GeoConsult provided the advice on the horizontal, anisotropic, soil pressures and conducted the research on the clay and the swell and floor heave of the open base of the garage.

Dredging

Models of geological and geotechnical conditions are essential for the cost calculation of dredging projects. Productions have to be estimated and the suction or the cutting of materials has to be assessed, as well as the workability and wear on the dredging equipment. Settlement and stability calculations are also required for the geotechnical design of land reclamation where dredged materials are deposited near shore.

GeoConsult has carried out a variety of dredging projects for land reclamation in the Middle East and Southeast Asia.

The feasibility of the dredging of rock mainly depends on factors such as the strength of the rock, the occurrence of discontinuities and the hardness of specific layers.

In Lake Nasser, Egypt, GeoConsult did research for rock dredging at 45 m water depths for the water intake of an irrigation canal. This canal is designed to irrigate the southern desert in the New Valley Project.

Legal and Contractual

Many disputes that arise during the realisation of construction contracts relate to the characteristics of the subsoil.

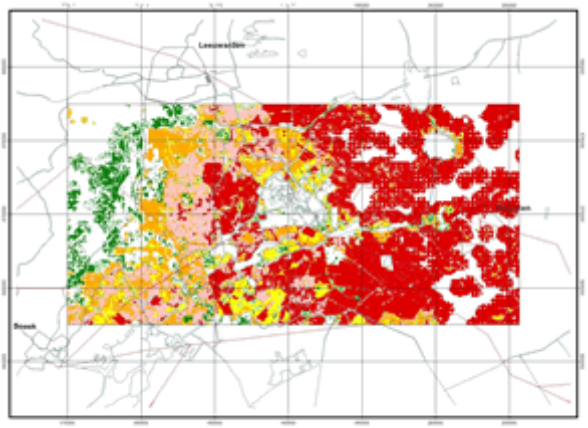
Pre-contract research is often limited due to cost reductions in the early stages of a project as this may introduce undesired queries. More extensive examination however does not necessarily mean that unexpected situations do not occur. Adaptations may be required in design or construction methods, and these changes may develop into disputes over the costs involved. Eventually these disputes may lead to legal proceedings. There may be the need for arbitration or investigation by an engineering gelolgical or geotechnical specialist .

GeoConsult has successfully provided advice on disputes about engineering geological, geotechnical or contractual matters in association with legal advisors.

Land Subsidence

As a result of the extraction of natural gas in the north of The Netherlands there is subsidence of the ground in the soft peat and clay layers near the surface. There is also subsidence as a result of the lowering of the surface water in the polders. It may be difficult to establish the cause of damage to houses and other constructions when both phenomena occur at the same time .

GeoConsult has carried out a number of research projects for the government, oil companies and third parties on the effects of land subsidence and possible damage, also in association with geotechnical and architectural consultants.



Bodemdaling gerelateerd aan de verlaging van oppervlaktewater peilen

Soil and Ground Water Pollution

In many civil engineering construction projects measures have to be taken to protect the environment. Examples are the research of existing pollution levels and the classification of soils to be excavated. In the latter case the purpose is often the assessment of the soil's possible reuse or the requirement for its sanitization.

For research in the environmental field and for the development of solutions for land sanitization, GeoConsult collaborates with consulting engineers Kuiper & Burger, Zoetermeer, who have an extensive and successful project record in environmental engineering.

Products and Services

- Activities for Civil Engineering Projects
  - Conceptual Research
  - Feasibility Research
  - Pre-Design
  - Final Design
  - Participation in Design Teams
  - Tender Research
  - Design, Preparation and Supervision of Site Investigations
  - Dewatering Design
  - Construction Support: Monitoring Plans, Monitoring, Troubleshooting
  - 2nd Opinion Research
  - Pre-Claim and Claim Research
- Regional Research of Land Subsidence Problems
- Damages Research related to Land Subsidence
- Environmental Research: Exploratory, Extended and Sanitation Research

Projects

Civil Engineering Construction

Bored Tunnels	Clients
Feasibility Study for Bored Tunnel under River Westerscheldt	Public Works, Province of Zeeland
Research of Properties and Possibilities for Deposition of Drilling Debris of overconsolidated Clay of Boom during Boring of Westerscheldt RoadTunnel	Public Works, Province of Zeeland /NV Westerscheldetunnel
Feasibility Study for Bored Tunnel for 2nd Heinenoord Raod Connection under River Meuse	Construction Department Public Works/Bore TunnelCombination
Consulting for overconsolidated Clays for Design of Stations in North-South Metro Link Amsterdam	Projectbureau North-South Metro Line
Geotechnical Consulting for Bored Botlek Railway Tunnel, Betuwe Cargo Rail Link	Bore Tunnel mbination
Research for drilled Materials of bored Sophia Tunnel, Betuwe Cargo Rail Link	Bore Tunnel Combination
Desk Study of Construction Methods for Tunnels in Soil and Rock	Royal Volker Stevin Group
Research for Drilling Mud Mixing and Regeneration Plant	Royal Volker Stevin Group

Underground Construction

Consulting for anisotropic horizontal Soil Pressures at circular Underground Parking Garage, City of Groningen	Ballast Nedam Engineering

Ports, Dredging and Land Reclamation

Tender Research Port Calabar, Nigeria	Stevin Construction
Harbour Development Mina Jebel Ali, Dubai	BalfourBeatty/Ballast Nedam/Stevin Construction
Site Investigation Supervision and Design for Dredging and Land Reclamation Works for Projects near Lagos, Warri and Port Harcourt,Nigeria	NigerianDredging and Marine
Tender Research for Land Reclamations, Singapore	D. Blankevoort InternationalDredging
Tender Research and Site Investigation Supervision for Rock Dredging of Water Intake Channel for Irrigation, 'New Valley Project', Lake Nasser, Egypte	Dredging CompanyBoskalis, HAM, Dredging International

Foundations	**Clients**
Site Investigation Supervision, Foundation Design, and Design of Pile Test, Okrika Jetties, Port Harcourt, Nigeria	NPA/Rendall, Palmer and Tritton/Stevin Construction
Regional Siting Study for Large Diameter Pile Test in glacially overconsolidated Clays, near Delfzijl and Eemshaven	IRO/Fugro McLelland
Site Investigation an in-situ Research during Construction for Caisson Foundation in Sandstone for Road Bridge, St. Catherines, Canada	Ministry of Transportation/Acres Consulting Services
Consulting for Tension Piles in glacially overconsolidated Clays for Foundation of High Voltage Line Pylons between Zwolle and Eemshaven	SEP/KEMA
Design of Pile Foundation, Fly-over West, Hoofddorp	HSLInfraRail
Design of Pile Foundation, Fly-over Oost, Hoofddorp	HSLInfraRail
Consulting for Settlement Problem existing Pile Foundation for Fly-over Oost, Hoofddorp; Jack-up Operation for Limitation of Differential Settlements	HSLInfraRail
Design of Pile Foundation, Fly-over "Den Hoek"	HSLInfraRail
Design of Pile Foundation, Bridge over River Mark	HSLInfraRail
Design of Foundation, Road Under-pass mr Bierensweg, Breda	HSLInfraRail
Design of Pile Foundation, Fly-over NAC Stadion, Breda	HSLInfraRail
Design of Combined Foundation, Road Under-pass Westtangent, Breda	HSLInfraRail
Design of Pile Foundation, Pedestrian Bridge Station Lage Zwaluwe	HSLInfraRail
Design of Foundation for various Technical Buildings, Contract HSL 7	HSLInfraRail
Construction Pits and Dewatering	
Tender Research for temporary Sheet Pile Cofferdams, Open Construction Pit and Dewatering for Water Regulation Dam, Senegal	Stevin Construction
Construction Supervision of Earthen and Sheet Pile Coffer Dams for dewatering of Construction Pit for Hydro Power Station, Sault Ste.Marie Hydroelectric Development, North-Ontario, Canada	Great Lakes Power/Acres Consulting Services
Dewatering for Motorway A4 Enlargement at Railway Fly-over, Leidschendam	VanHattum en Blankevoort

Tender Research for and Consulting during Construction and Dewatering of Construction Pits for Aqueduct "De Gaag"	Van Hattum en Blankevoort
Dewatering Consult for Construction Pit for Road Under-pass mr Bierensweg, Breda	HSLRailInfra
Dewatering Consult for Construction Pit for Road Under-pass Westtangent, Breda	HSLRailInfra
Tunnels and Underground Constructions in Rock	**Clients**
Consult on Stability of Existing Water Transport Tunnel, Sault Ste. Marie Hydroelectric Development, North-Ontario, Canada	Great Lakes Power/ Acres Consulting Services
Stability Research and Restoration Consult for Underground Rooms from Pharaoic Period, Middle-Egypt	Leiden University, Penn State University Boston Institute of Fine Arts
Rock Excavations	
Construction Supervision of Excavation for Tail- and Headrace Channel for Hydro Power Station, Sault Ste. Marie Hydroelectric Development, North-Ontario, Canada	Great Lakes Power / Acres Consulting Services
Dams	
Site Investigation and Redesign of Existing Dam, Atikokan Power Station, North-Ontario, Canada	Ontario Hydro / Acres Consulting Services
Construction Supervision Earth Dams with Clay Core and Grouting Operation in Sandstone Foundation, Sault Ste. Marie Hydroelectric Development, North-Ontario, Canada	Great Lakes Power / Acres Consulting Services
Construction Materials	
Site Research of Possible Locations for Quarry's for Concrete Aggregate and Dimension Stone, Nigeria	Royal Volker Stevin Group
Research, Planning and Exploitation of Clay Quarry for Core of Earth Dams, Sault Ste. Marie Hydroelectric Development, North-Ontario, Canada	Great Lakes Power / Acres Consulting Services
Legal and Contractual	
Research of Pile Integrity Vibrocom Piles, Aquaduct "De Gaag"	Van Hattum en Blankevoort
Research Fissuring in Cellar Floors and Walls, Generali Insurance Group, Diemen	Generali Insurance Group
Research of Damage during Installation and Extraction of Sheet and Combiwall Piles for Construction of Botlek Rail Tunnel	Bore Tunnel Combination

Projects

Environment

Land Subsidence	Clients
Modelling of Land Subsidence related to Ground Water Level Lowering in the Phreatic Zone for the Compilation of Settlement Maps	Provinces of Gelderland and Friesland
Research of Peat Oxidation in Province of Friesland and Modelling for the Prediction of Future Land Subsidence	Province of Friesland
Research of Shallow Land Subsidence (related to Surface Water Level Lowering) and Deep Land Subsidence (related to Natural Gas Extraction) in NE of Province of Friesland	Netherlands Oil Company (subsidiary of Shell and Texaco)
Research of Shallow Land Subsidence (related to Surface Water Level Lowering) and Deep Land Subsidence (related to Natural Gas Extraction) in Middle of Province of Friesland	TotalFinaElf / Chevron

Underground Depositories

Feasibility Study for the Construction of Underground Depositories in the Deep Underground in The Netherlands for Chemical and Nuclear Wastes, Hydrocarbons etc.	KIVI-Commission for Tunnelling and Underground Constructions
Research of the Influence of Geological Processes on the Safe Deposition of Nuclear Waste in Salt Domes; Finite Element Modelling of Possible Creep Effects of Salt during Land Ice Cover; co-operation with ECN, Petten	OPLA-CommissionMinistry of Economic Affairs

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