

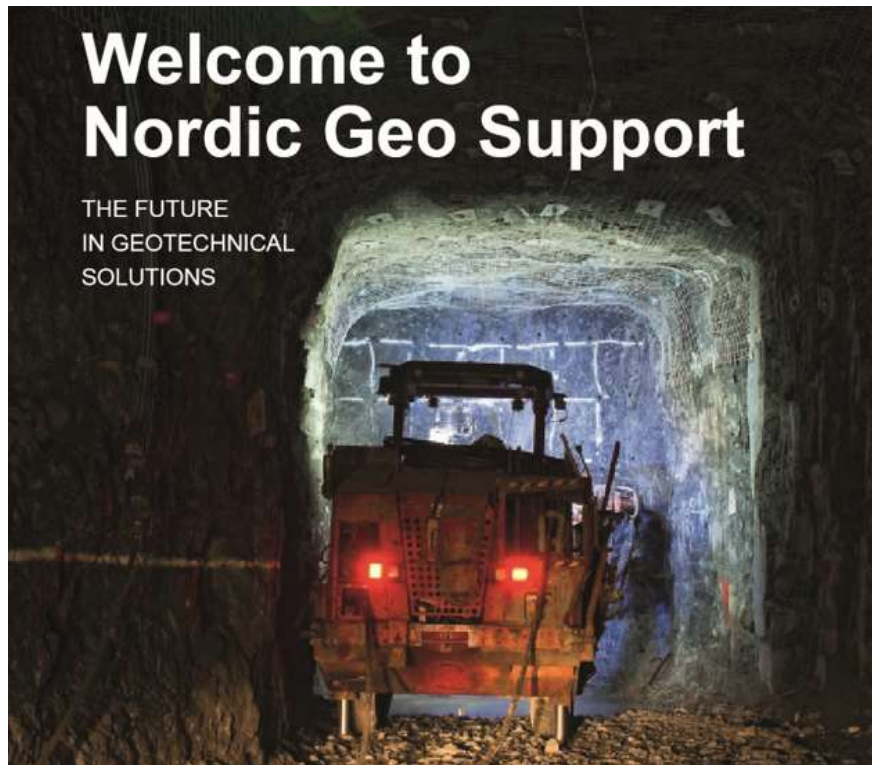


# Nordic Geo Support

Thixotropic Grouting – Case Study

Paris Metro

# About us

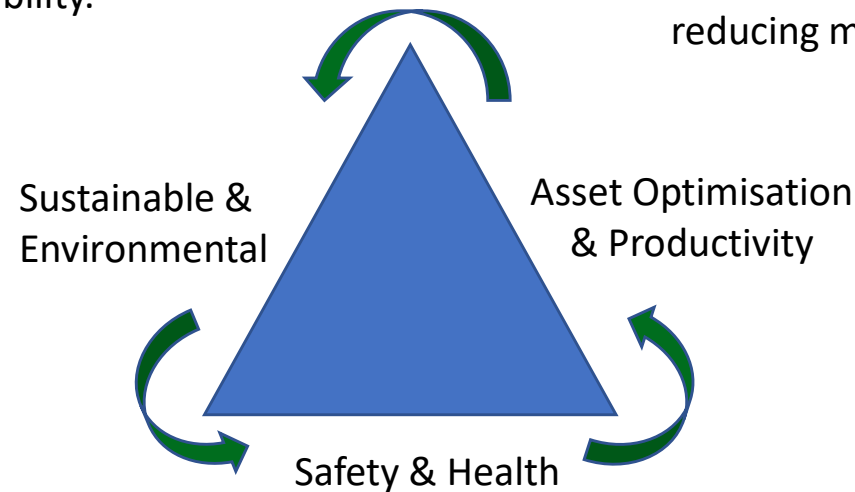


- Originating from the Nordics with leading edge technical solutions for global customers.
- We specialise in innovative products with an emphasis on improving sustainability for mining, tunnelling and construction industries.
- Partnering with leading technology companies globally for improving our world's future.
- Nord Geo Support and its partners are focusing on bringing the production of technology closer to customer, reducing the global CO<sub>2</sub> footprint and reliance on global supply chains.

# Reducing Project Impacts

**Sustainability & Environmental:** Solutions that drastically reduce CO<sub>2</sub> emissions in manufacture and transport and energy usage as well as offering longer life cycles and reusability.

**Asset Optimisation & Productivity:** Solutions that are faster, more efficient, easier to use and reusable, optimising advance rates and ore recovery as well as reducing maintenance costs.



**Safety & Health:** Solutions that remove humans and equipment from unsecured ground, faster ground securing, ensuring stability and consolidation, reduce manual operations and weight in manual handling.

# Product range

## Drilling Consumables

High Performance rock drilling tools and consumables:

- DTH Hammers
- Bits
- Shanks
- Rods
- Drill Pipes
- Adapters
- Augers, Accessories

## Injection Grouts

Leading edge resin injection technology for demanding cases:

- Water Stopping
- Sealing
- Ground Consolidation
- Ground Stabilisation
- Construction and structural repairs

## Anchoring & Bolting Grouts

Grouting technologies offering ease of use, clean and fast setting:

- Capsules
- Cartridges
- Pumpable grouts
- Additives

## Anchoring & Bolting

A broad range of rock bolting and anchoring technologies:

- Double and single coated protected steel
- Steel Self Drilling Anchors
- GFRP bolrs of all types
- Standard bolts and meshes

## Cement-Based Additives

Cement based admixtures and additives:

- Concrete Repair
- Admixtures
- Modifiers
- Waterproofing
- Joint Sealants

## Pumps & Accessories

Cement and resin mixing and pumping technologies:

- Cement Pumps
- Resin Pumps
- Transfer systems
- Dataloggers
- Hoses, lances, packers

## Water control

Waterproofing, drainage and pumping:

- TunnelDrain innovative strip drainage system
- Drainage pipes
- Waterproofing grouts, additives and sealants
- A broad range of dewatering pumps

## Ventilation

Air quality, ventilation and safety solutions:

- Ventilation bags and systems, including Mecanicad's rigid ducts
- Fans & inline coolers
- Water atomisers

## Re-usable Hangers

Developed in the Nordics, fast, easy to use & reuse:

- Services Hooks for ventilation systems, water and pneumatic lines, electrical cables and distribution boards
- Blasting hooks

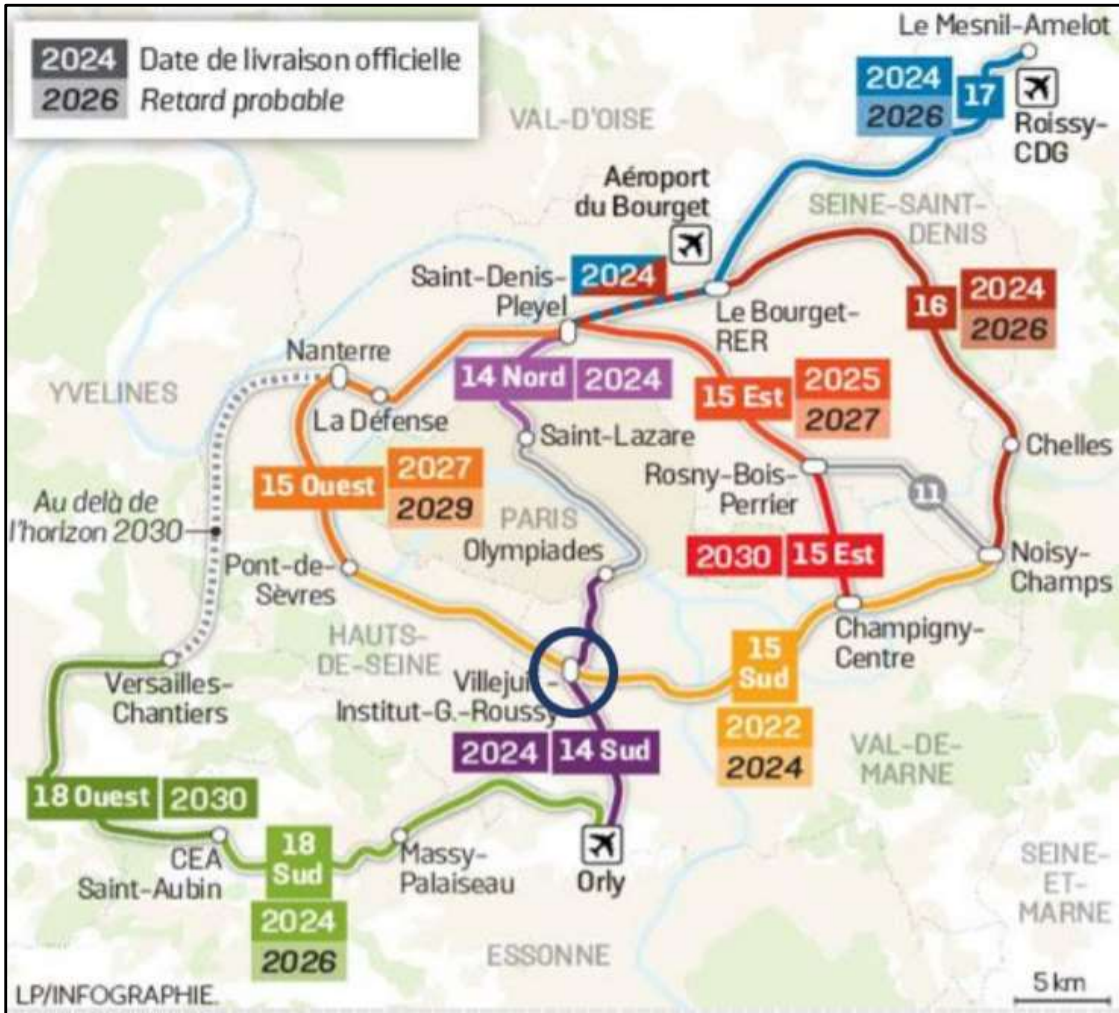
## Other products

A range of other products:

- Coatings & sealants
- Personal protective products
- Mining accessories



# Case - Anchoring



## International Project – Grand Paris Express

- Creation of a metro line system into the suburbs
- Connections with existing Paris Metro system
- Around 20 TBMs in operation

# Anchoring & Sealing

Where: Villejuif (94) – Parisian Suburb

Work to be done :

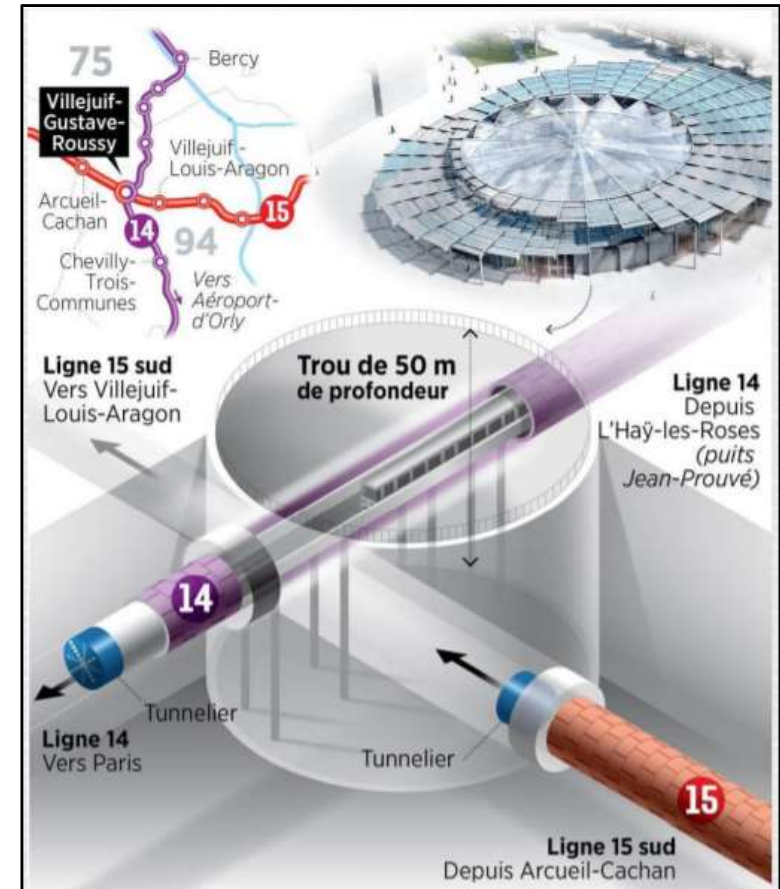
- Construction of underground station
- Gallery leader

End goal :

- Expansion of the Paris metropolitan network

Crossing of lines L14 and L15 with two TBM's  
4 galleries (Amorces) to be created in advance

Main contractor : Vinci Construction France – Spie  
Batignolles



# Anchoring & Sealing



Production of Diaphragm Walls



- 63 meters of diameter
- 50 meters of depth
- Open excavation
- Creation of 4 galleries





# Project Challenges

- Delay in soil studies and access to information
- Delay not acceptable due to incoming 2 TBM's crossing
- Poor result during tensile tests on different anchors (self drilling anchor – fiberglass – rebar bolts...)
- Very bad soil composed of clay loam soil saturated with water (no circulation)
- No or slow reaction with grouting cement to seal
- Loss of grouting cement in the ground
- Poor result with socket anchor





# Technical Solution

Solution: Extend the length of anchors to improve soil penetration with silicate grout

- The design increased the amount of anchors to solve situation
- Grout with Silicate resin Seal

Detail: Drilling hole  $\varnothing$  46 mm on 5 meters length with fully thread bar  $\varnothing$ 25 mm

Hose material polymer PEHD  $\varnothing$ 13 x 2 mm

Grout - Sealing with silicate resin injected via grout pump. Mixing head with static mixer.



# Benefits

## Benefits to project:

- Recovered lost time and avoid losses of material
- Pull the anchor after 1 hour instead of 24h with grouting cement
- High return on advancement
- Ability to move to continuous production in 3 workstations (24h/24h and 7 days/7 days)
- Total Cost savings estimated at 1.2M€



Time	Compressive Strength (N/mm <sup>2</sup> )
15 mins	11
30 mins	16
60 mins	20
120 mins	22
1 day	30
3 days	31

# Thank you!

[www.nordicgeosupport.com](http://www.nordicgeosupport.com)