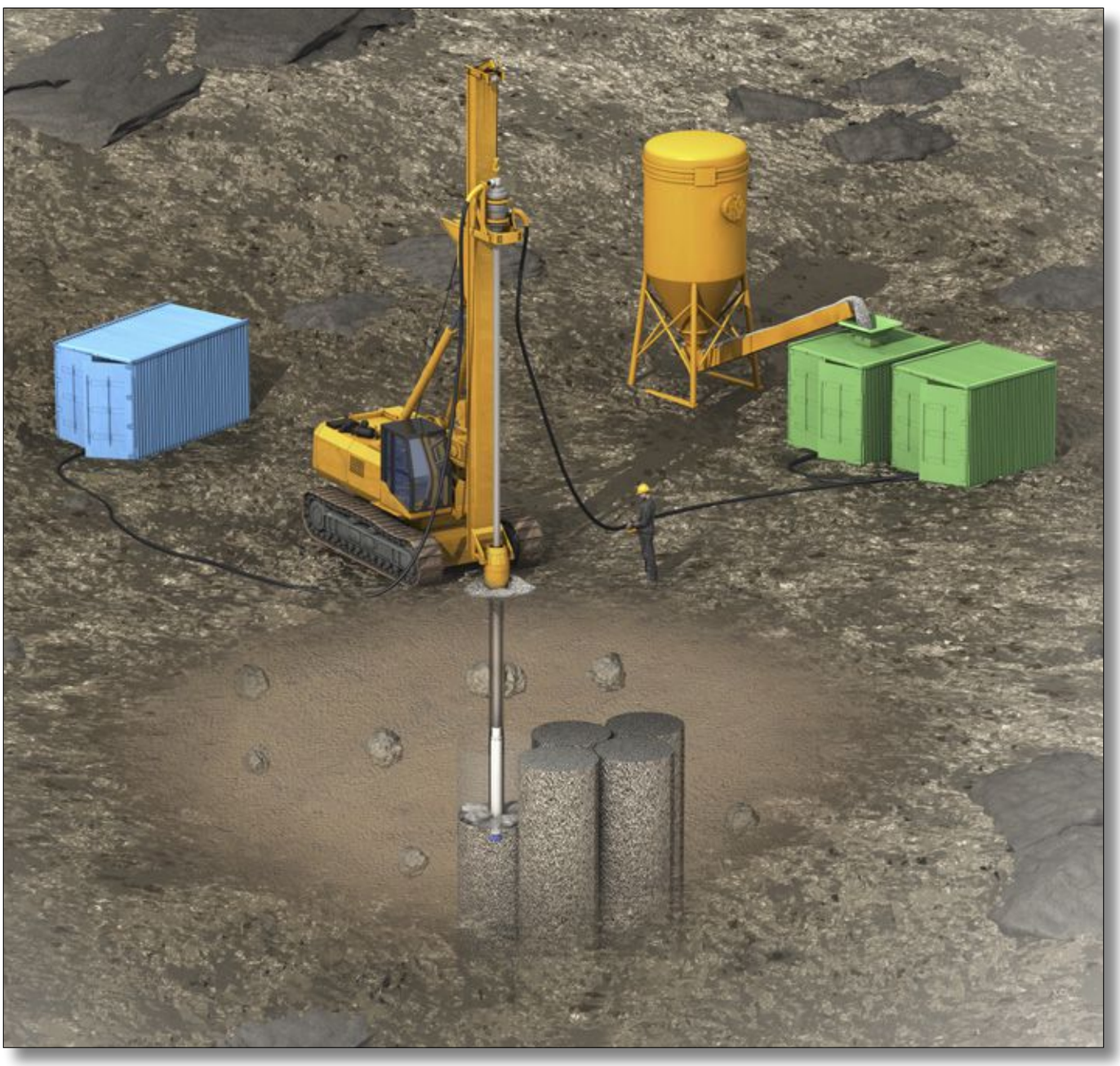
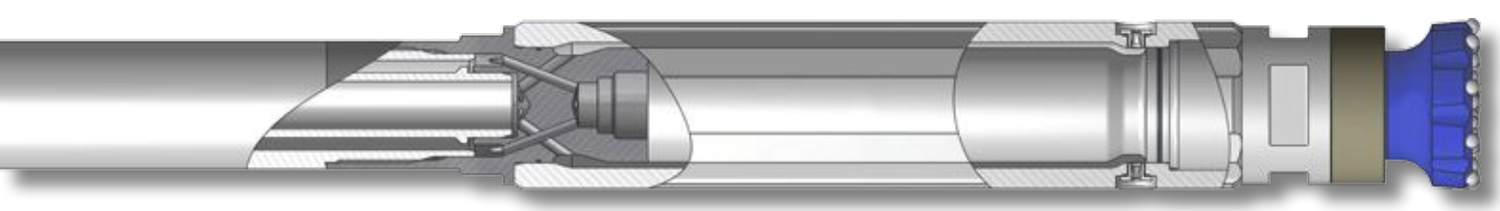
Wassara Jet grouting hammer

- Enabling single fluid jet grouting in difficult formations!





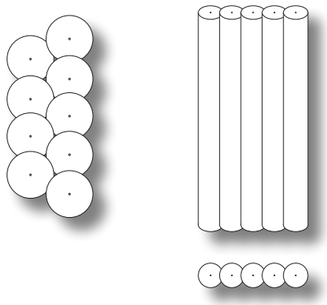
Jet grouting

Jet grouting is a ground stabilization procedure which uses the principle of high velocity injection of cement grout into the ground. Jet grouting is the only type of grouting that is capable of treating all types of soils, from clays to gravel. The technique creates in situ geometries of grouted soil, using a grouting monitor followed by a rotary drill bit, attached to the end of the drill string.

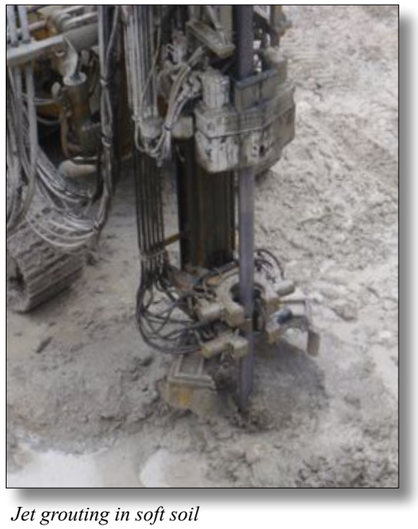
After drilling to desired depth, a grout jet with high velocity is initiated from nozzles mounted in the side of the monitor. The jets erode and mix the in situ soil as the drill string and jet grouting monitor are rotated and raised slowly, forming columns.

Application areas include:

- Underpinning existing foundations
- Retaining walls
- Tunnels in soft soils (horizontal jet grouting)
- Bottom plugs
- Ground improvement, e.g. slope stability
- Cut-off walls
- Dam sealing
- Diaphragm wall gaps / sheet pile walls / secant pile walls
- Jet grouting slabs, sealing the bottom of planned excavations



The jet grouting procedure creates jet grouted columns, either full or partial sizes. Jet grouting is the only soil stabilization technique that would work equally well in plastic clays and granular materials, although compressive strengths and load capacity are typically higher in granular materials.



Jet grouting in soft soil

The result: Jet grouted cement columns

Easy to describe, a bit more complicated to perform

The main principle comprises two parts; (1) Drilling a hole and (2) Jet grouting injection of cement grout. Although easily described, the process can be quite complicated to perform.

Jet grouting is effective across a wide range of soil types, including silts and most clay types. Because it is an erosion-based system, soil erodibility plays a major role in predicting geometry and quality. The majority of the jet grouting sites offers little problem; the drilling can be made by conventional methods and the operation is completed in two simple steps.

Difficult formations

The problems often occur in moraine/till and formations with large amount of stones. Presence of stones, boulders and other obstacles in the soil can cause problem like hole deviation and/or shadow effects, resulting in a leaking cut-off wall, poor drilling performance or even total failure to drill down to desired depth. In such cases, the solution could be to first pre-drill the hole with a percussion hammer and then switch back to the grouting equipment to create the jet grouting element.

Boulders may force the drill string to deviate

leading to deviation of the jet grouted column

Boulders may even lead to a total failure to drill down to desired depth

Hole casing

In some cases, when the formation is even more problematic, you might need to case the hole to prevent it from collapsing when pulling up the drill string from the hole to change equipment.

Drill with a casing tube

Pull up the drill string

Insert a plastic tube

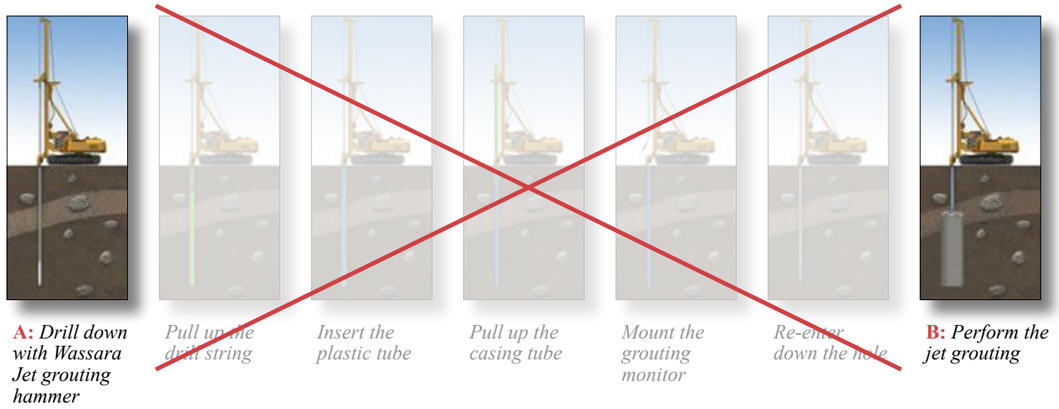
Pull up the casing tube

Mount the grouting monitor

Re-enter down the hole

Perform the jet grouting

Single pass jet grouting with Wassara



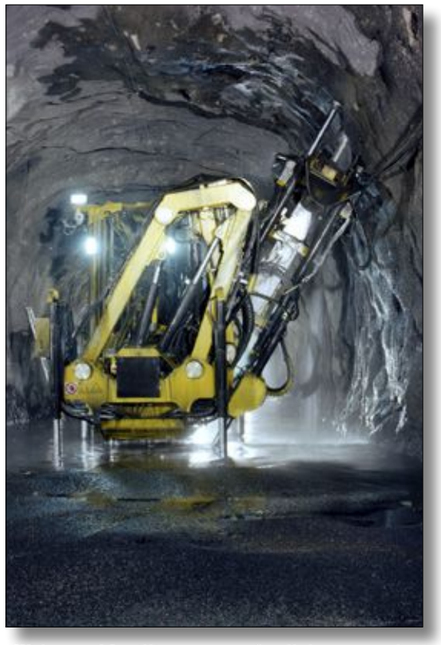
With Wassara Jet grouting hammer, you only need two steps

Where stones, boulders and other obstacles have made jet grouting complicated, the patented Wassara Jet grouting hammer makes it easier. As the drill string is complete with all necessary tools, no changing of equipment is required during the whole operation.

A. When drilling, the water powered hammer makes its way through any stone or boulder present in the formation.

B. During the following jet grouting step, the hammer can easily be restarted if necessary. As the hammer and jet monitor are powered by separate pumps, they can be controlled independent of each other.

Drilling and jet grouting with Wassara Jet grouting hammer



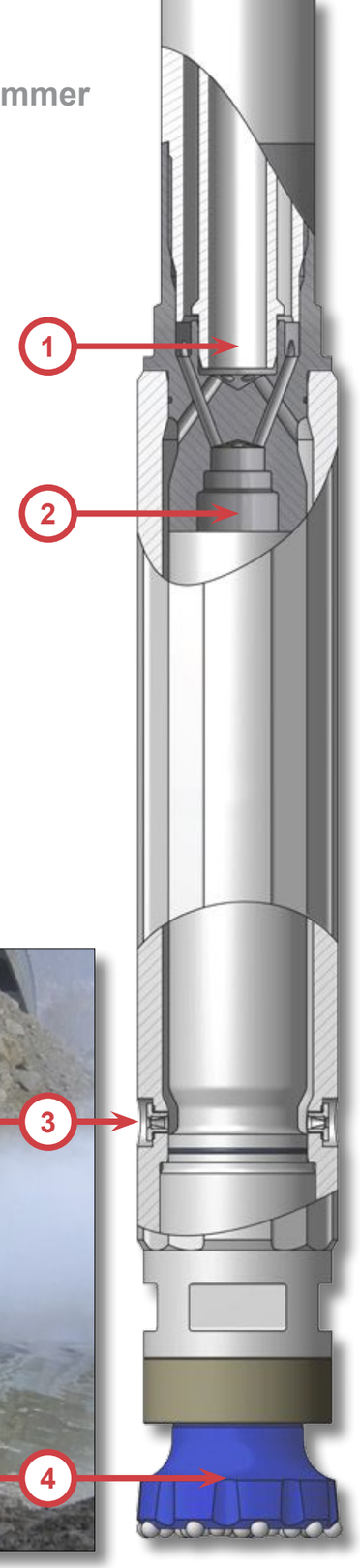
With over 15 million metres of well documented drilled blast holes in LKAB mines, the water powered drilling technology has proven its superiority.

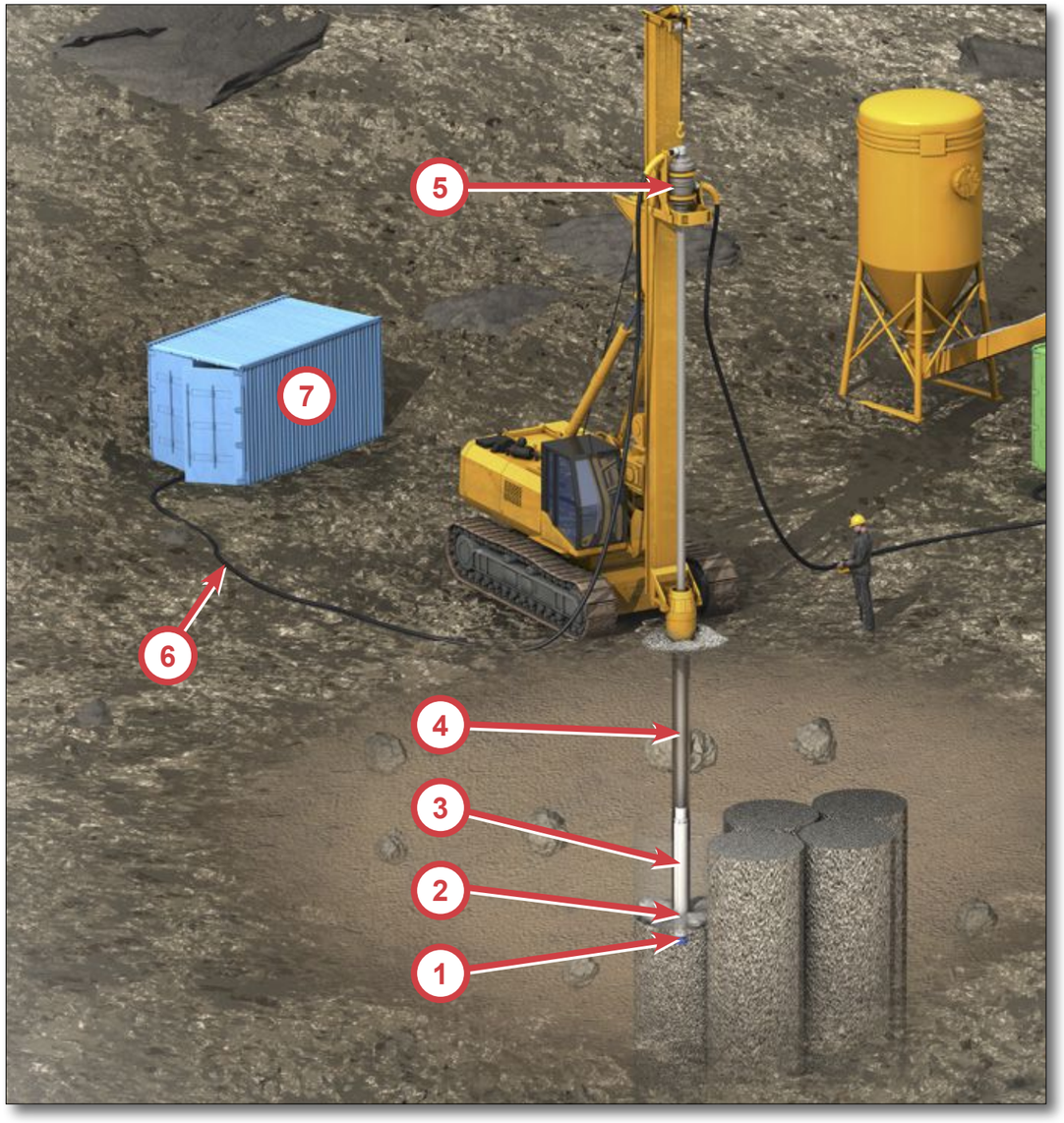
The patented Wassara Jet grouting hammer

The combination of a down-the-hole hammer with an integrated jet monitor enables drilling in difficult formations. The new innovative Wassara Jet grouting hammer provides a solution for single pass jet grouting with single fluid in most formations. Where boulders and other obstacles have made jet grouting complicated, the Wassara Jet grouting hammer makes it easier.

The main parts are:

1. **Channel for the high pressure cement grout**
   During grouting, the cement grout is delivered through this channel.
2. **Channel for the high pressure water**
   The water is powering the hammer while drilling. Normal water pressure is 100-150 bar. During jet grouting, a small amount of water is running to keep the cement grout from entering the hammer.
3. **Wassara nozzle**
   The Wassara Jet grouting hammer has four nozzle sockets for multiple configurations and backup. Nozzle hole sizes range from □ 3.0 to 6.0 mm.
4. **Wassara drill bit**
   This drill bit is particularly designed for use with Wassara water powered hammers.





The Wassara equipment for jet grouting comprises:

1. Wassara drill bit
2. Wassara nozzle
3. Wassara Jet grouting hammer
4. Dual wall drill tube
5. Swivel
6. High pressure water hose
7. High pressure water pump unit

The Wassara equipment

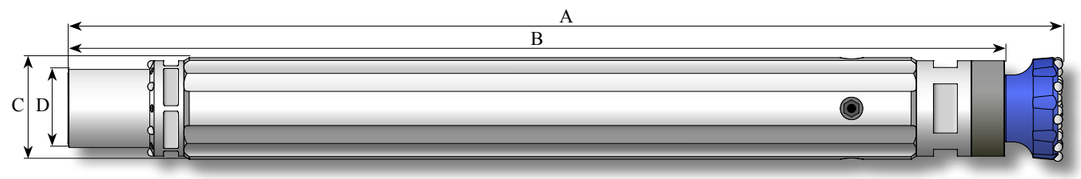
Setting up your equipment for jet grouting with Wassara

The patented Wassara Jet grouting hammer uses dual wall drill tubes and a series of nozzles actually placed in the hammer casing. This enables the grout to be delivered closer to the bit end, leading to an efficient solution.

We strongly recommend you to follow this configuration when setting up your system:

Pos	Detail	Type	Part no	Size
1	Wassara drill bit	Wassara 340	3000105	□ 165 mm (6□□)
			3000093	□ 153 mm (6□)
2	Wassara nozzles	3.0 mm	1500143-3,0	3.0 mm (0.118□)
		3.5 mm	1500143-3,5	3.5 mm (0.138□)
		4.0 mm	1500143-4,0	4.0 mm (0.157□)
		4.5 mm	1500143-4,5	4.5 mm (0.177□)
		5.0 mm	1500143-5,0	5.0 mm (0.197□)
		5.5 mm	1500143-5,5	5.5 mm (0.217□)
		6.0 mm	1500143-6,0	6.0 mm (0.236□)
		Nozzle Blind	1500105	-
3	Wassara Jet grouting hammer	W100 JG	1001454	Ø 149 mm (5 ⅞”)
4	Dual wall drill tube	Duplex □ 114.3 mm (4□□)	4000088	L=1000 mm (3.3 ft)
			4000089	L=2000 mm (6.6 ft)
			4000090	L=3000 mm (9.8 ft)
5	Swivel	Duplex Jet grouting swivel	1002408	□ 114.3 mm (4□□)
6	High pressure water hose	High pressure hose EN 856 4SP	5000002	□ 32 mm, L=20 m (□ 1□□, L=66 ft)
7	High pressure water pump unit	WASP 150 diesel / electrical	-	-

The equipment for preparing and distributing the cement grout to the drill string shall be configured according to the grout pump manufacturer’s recommendations. Specifications can be changed without notice.



Wassara Jet grouting hammer, technical data	
Length A	1457 mm (62.2")
Length B	1372 mm (59.7□)
Width C	Ø 149 mm (5 ⅞”)
Width D	□ 114.3 mm (4□")
Weight (excluding drill bit)	140 kg (308 lbs)
Water consumption (new to worn)	200□350 l/min (52-93 USgpm)
Max operation pressure	150 bar (2175 psi)
Max grout flow	450 l/min (119 USgpm)
Max grout pressure	500 bar (7250 psi)

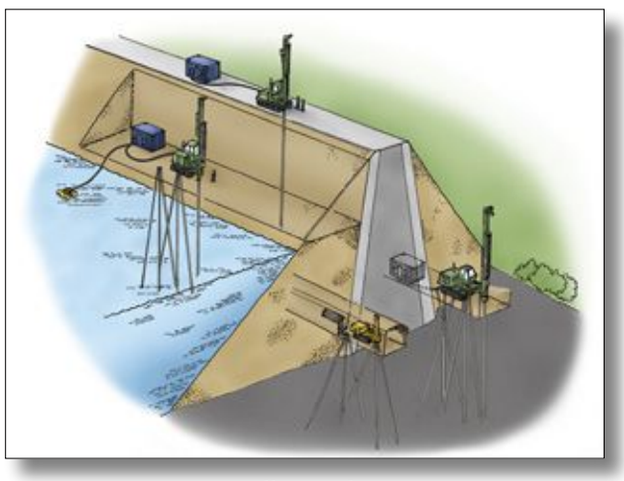
Specifications can be changed without notice.

Drilling with water powered equipment from Wassara gives you:

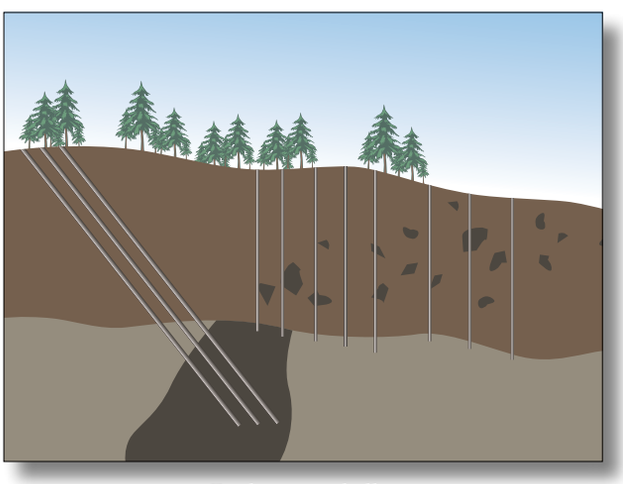
- ✓ Drill hole quality
  - Gives smoother and more stable holes with high accuracy
- ✓ Safer and benign drilling
  - Gives low up-hole velocity of the water and low impact on the formation. Water column keeps the hole stable.
- ✓ High drilling performance
  - Tackles most ground conditions, including water rich formations
- ✓ Economic and environmentally friendly
  - Gives low energy consumption. No injection of air or oil into the formation. No oil mist or dust in the air.

Our focus areas are:

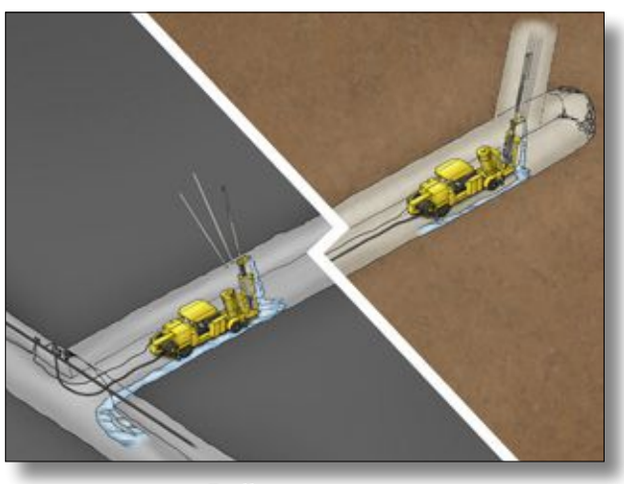
Jet grouting



Drilling in dams



Exploration drilling



Drilling in mines

Wassara
Water Powered Drilling Systems
– a company in the LKAB Group

Wassara AB
Rosenlundsgatan 52
SE-118 63 Stockholm
Phone +46 8 429 34 00
info.wassara@lkab.com
www.wassara.com

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