

Successful projects with Wassara™ Drilling System



Göteborg – Sweden
Foundations in water rich formation.



Ohra Dam, Oberhof – Germany
Drilling of grout holes at the Ohra Dam.



Citybanan, Stockholm – Sweden
Construction of a ground water cut-off wall at the Central Station.



Chikushi tunnel – Japan
Drilling of 200 m long horizontal survey holes.



Södra Länken, Stockholm – Sweden
Ground water infiltration prevention at Södra Länken high-way link.



Wolf Creek Dam, Kentucky – USA
Installation of grout curtain to prevent seepage.



Malmö Citytunnel – Sweden
Ground water screening during the construction of the City Tunnel.



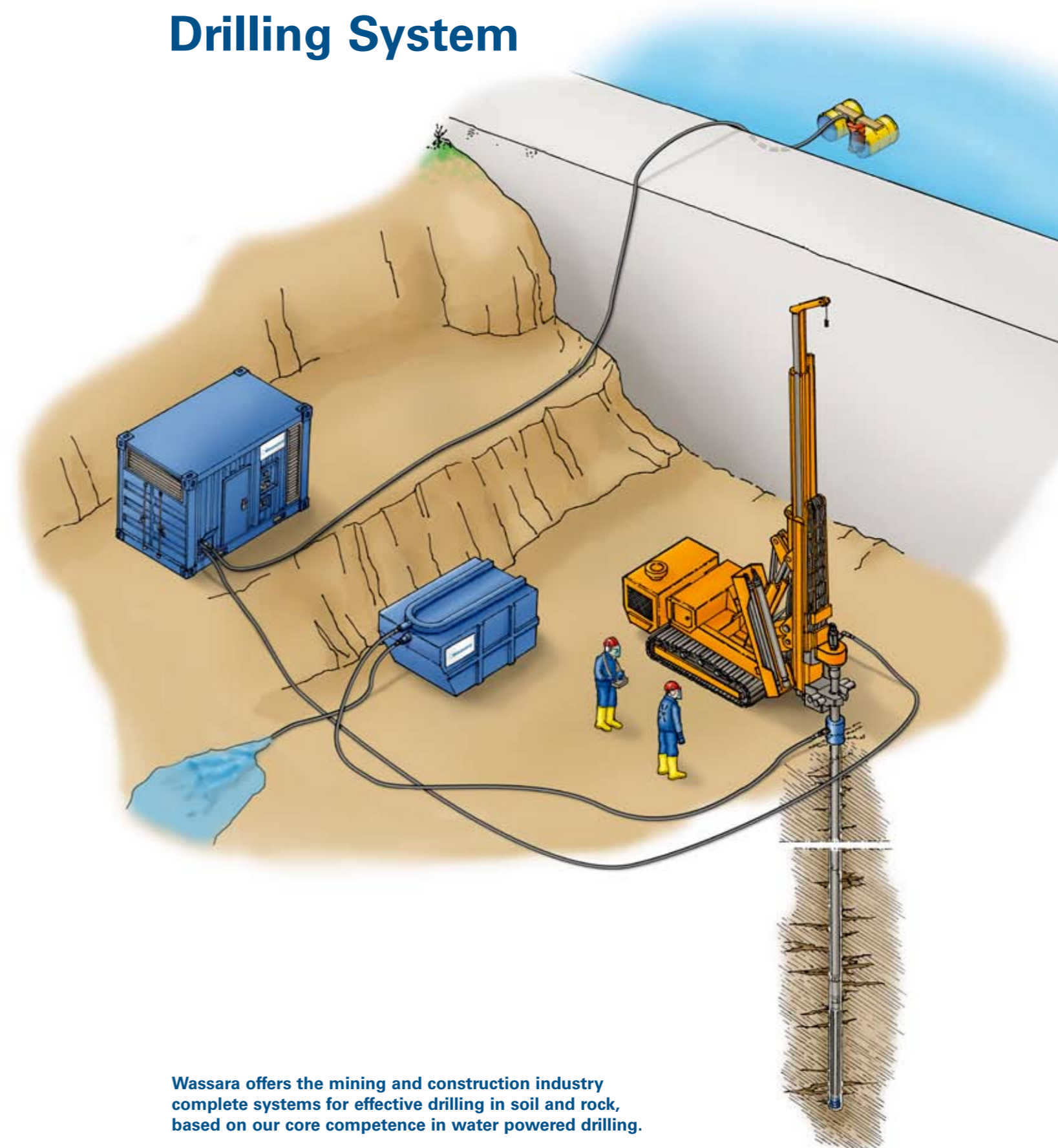
Niagara – Canada
Construction of foundations for an 11 km long turbine tunnel.



Keller – Wales
Grout curtain creation at Marchlyn Mawr-Reservoir, Wales.

Byrd4

Wassara™ Drilling System



Wassara AB, Hornsgatan 103, SE-117 28 Stockholm
Phone +46 8 84 95 50, Fax +46 8 84 02 71
info.wassara@lkab.com
www.wassara.com

Wassara offers the mining and construction industry complete systems for effective drilling in soil and rock, based on our core competence in water powered drilling.

Wassara's water-powered drilling system is cost-effective and environmentally friendly.

Doesn't that sound like a good day on the job?

Wassara's water-powered drilling system offers entirely new possibilities for efficient drilling.

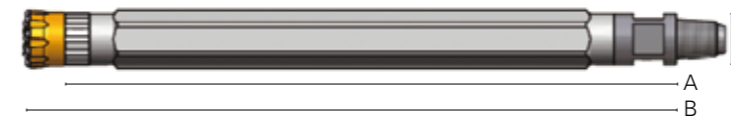
The system demonstrates its superiority most clearly on jobs where the environment is sensitive and has to be handled with care, e.g. when drilling in urban environments or at hydroelectric or water dams.

Wassara's system is also in a class by itself when it comes to projects that are subject to strict hole straightness requirements.

Wassara is a complete water-powered drilling system developed in Sweden. All its components have been optimized for maximum performance as a unit, making the system economical to use.

Yet another advantage is that our technology has lower environmental impact than traditional drilling systems, and it also offers a significantly better work environment in terms of noise and air pollution. **Doesn't that sound like a good day on the job? – Every day.**

CONSTRUCTION



| Wassara™ Hammers. | | | | | | |
|-------------------|---------|---------|-----------|----------------------|---------------------------------|------------------------|
| Hammer model | A mm | B mm | C mm | Weight Kg (Excl Bit) | Water Cons. New to Worn (l/min) | Rec. Oper. Pres. (Bar) |
| W50 | 895 mm | 950 mm | Ø 54–58 | 13.5 | 80–130 | 150 |
| W 80 HD | 977 mm | 1049 mm | Ø 80–92 | 32 | 130–200 | 180 |
| W 100 | 1185 mm | 1270 mm | Ø 102–111 | 56.5 | 200–350 | 180 |
| W 120 | 1495 mm | 1572 mm | Ø 120–128 | 99 | 300–450 | 180 |
| W 150 | 1495 mm | 1605 mm | Ø 140–162 | 165 | 350–500 | 150 |



| WASP – Wassara high pressure water pump units. | | | | |
|--|-----------|--------------|----------------|---------------------|
| Pump model | Max flow | Max pressure | Required power | Diesel engine power |
| WASP 50 Diesel | 137 l/min | 170 bar | 43 kW | 76 kW |
| WASP 80 Diesel | 219 l/min | 200 bar | 80 kW | 110 kW |
| WASP 150 Diesel | 476 l/min | 200 bar | 173 kW | 183 kW |

WASSARA™ DRILLING SYSTEM – CONSTRUCTION

| Hole size | Drill bit | Hammer | Check valve | Drill tube (OD, thickness, length in mm) | Swivel | High pressure hose pump unit to swivel (Standard EN856 4SP) | Pump unit | Sedimentation container | Hose hole to sedimentation container. Max length 15 meter | Submersible drainage pump | Hose submersible pump to pump unit. Max height 15 meter, max length 100 meter |
|-----------|--|---------------------------------------|--|--|-------------------------------|--|-----------------|-------------------------|---|---|---|
| Ø | | | | | | | | | | | |
| 60 mm | Flat Face Semiballistic, No 3000015 | W50S/56/1000321 NC13 API pin | 50 mm, NC 13 API No 2000009 | 48.3x6.3x1000 NC13, No 4000001 | Stenberg 600 | Hydroscand* Deltaflex 4 CO Art nr 1015-14-16, ID 25 mm Parker* 701 Spiral Hose Part No 701-16, ID 1" (25 mm) | WASP 50 Diesel | TBD | ID 32 mm (1 1/4") | Grindex* Minette 3 phase ITT Flygt* 2620 3 phase | OD 50 mm (2") |
| 62 mm | Flat Face Semiballistic, No 3000016 | | | 48.3x6.3x1500 NC13, No 4000002 | | | | | | | |
| 64 mm | Flat Face Semiballistic, No 3000017 | | | 48.3x6.3x2000 NC13, No 4000003 | | | | | | | |
| 95 mm | Flat Face Spherical, No 3000002 Flat Face Spherical + Semiballistic, No 3000006 | W80S/HD/90/1000281 2 3/8" API REG pin | 76 mm, 2 3/8" API REG. PIN/BOX No 1000407 | 76x6.3x1000 2 3/8" API REG, No 4000015 76x6.3x1500 2 3/8" API REG, No 4000014 76x6.3x2000 2 3/8" API REG, No 4000011 76x6.3x3000 2 3/8" API REG, No 4000005 | Stenberg 600 or 2 3/8 API REG | Hydroscand* Deltaflex 4 CO Art nr 1015-14-20, ID 32 mm Parker* 701 Spiral Hose Part No 701-20, ID 1-1/4" (32 mm) | WASP 80 Diesel | TBD | ID 45 mm (1 3/4") | Grindex* Minette 3 phase ITT Flygt* 2620 3 phase | OD 75 mm (3") |
| 115 mm | Flat Face Spherical + Semiballistic, No 3000007 Flat Face Spherical, No 3000008 | W100S/111/1000292 2 3/8" API REG pin | 89 mm, 2 3/8" API REG. PIN/BOX No 1000365 | 89x6.3x2000 2 3/8" API REG, No 4000013 | Stenberg 600 or 2 3/8 API REG | Hydroscand* Deltaflex 4 CO Art nr 1015-14-20, ID 32 mm Parker* 701 Spiral Hose Part No 701-20, ID 1-1/4" (32 mm) | WASP 150 Diesel | TBD | ID 50 mm (2") | Grindex* Minor N 3 phase ITT Flygt 2630 MT 3 phase | OD 75 mm (3") |
| 120 mm | Flat Face Spherical, No 3000009 | | | 89x6.3x3000 2 3/8" API REG, No 4000012 | | | | | | | |
| 130 mm | Flat Face Spherical, No 3000012 Convex Semiballistic, No 3000013 | W120S/125/1001067 3 1/2" API REG pin | 102 mm, 3 1/2" API REG. PIN/BOX No 1000585-102 | 102x8.8x1000 3 1/2" API REG, No 4000007 102x8.8x1500 3 1/2" API REG, No 4000008 102x8.8x2000 3 1/2" API REG, No 4000009 102x8.8x3000 3 1/2" API REG, No 4000010 | Stenberg 600 | Hydroscand* Deltaflex 4 CO Art nr 1015-14-24, ID 38 mm Parker* 701 Spiral Hose Part No 701-24, ID 1-1/2" (40 mm) | WASP 150 Diesel | TBD | ID 63 mm (2 1/2") | Grindex* Minor H 3 phase ITT Flygt* 2630 HT 3 phase | OD 75 mm (3") |
| 165 mm | Flat Face Spherical, No 3000014 | W150S/160/20317 3 1/2" API REG pin | 114 mm, 3 1/2" API REG. PIN/BOX No 1000716-114 | 114x8.8x1000 3 1/2" API REG, No 4000016 114x8.8x1500 3 1/2" API REG, No 4000017 114x8.8x2000 3 1/2" API REG, No 4000018 114x8.8x3000 3 1/2" API REG, No 4000019 | Stenberg 600 | Hydroscand* Deltaflex 4 CO Art nr 1015-14-24, ID 38 mm Parker* 701 Spiral Hose Part No 701-24, ID 1-1/2" (40 mm) | WASP 150 Diesel | TBD | ID 63 mm (2 1/2") | Grindex* Minor H 3 phase ITT Flygt* 2630 HT 3 phase | OD 75 mm (3") |

*Recommended manufacturer