



7 Years of Cutting Edge Technology for the Mining Industry in Canada

Verena Schreiner, BAUER Resources Canada Ltd

The Bauer Group



BAUER *Begeistert für Fortschritt*
passion for progress

Construction **Equipment** **Resources**

The banner features the BAUER logo and slogan at the top. Below is a collage of three images: a construction site with a large blue machine, a yellow drilling rig, and a mining site with a green field. At the bottom, three colored boxes labeled 'Construction', 'Equipment', and 'Resources' are shown.

The Bauer Group



The Bauer Group

Segment Resources

Three Main Competences



Materials

about 24 % of revenues*



- Full-line provider for materials in the field of
 - well construction
 - geothermal energy
- distribution of gas/water/
geothermal energy

Exploration & Mining Services

about 38 % of revenues*



- Production drilling
(for example: water wells)
- Exploration drilling
- Preparative work for the mining
of resources
- Complete solutions in the field
of geothermal energy
- Special solutions for mining
resources

Environment

about 38 % of revenues*



- Disposal of polluted areas
- Cleaning of process water
and effluents
- Processing of drinking water
 - Cleaning of extracted air
 - High purity systems
 - Brewing technology
- High purity water systems

* based on figures FY 2012

Cutting Edge Technology for the Mining Industry

BAUER Resources Canada Ltd.



AHK Workshop
Berlin
December 11-12, 2013

Canadian-German Success Stories
7 Years of Cutting Edge Technology for the Mining Industry in Canada



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PROJECTS

Cutting Edge Technology for the Mining Industry

Cut-off Walls – Difficult Conditions?



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Canadian-German Success Stories
7 Years of Cutting Edge Technology for the Mining Industry in Canada



Cutting Edge Technology for the Mining Industry

Cut-off Walls – Difficult Conditions?



Diavik Diamond Mine:

- A154: 2000-2001:
 - 290,000 m³ Ground Improvement
 - 32,700 m² Cut-off Wall
 - 5,950 m² Jet-Grouting
- A418: 2005-2007:
 - 112,000 m³ Ground Improvement
 - 13,600 m² Cut-off Wall
 - 3,000 m² Jet-Grouting



Red Dog Zinc Mine:

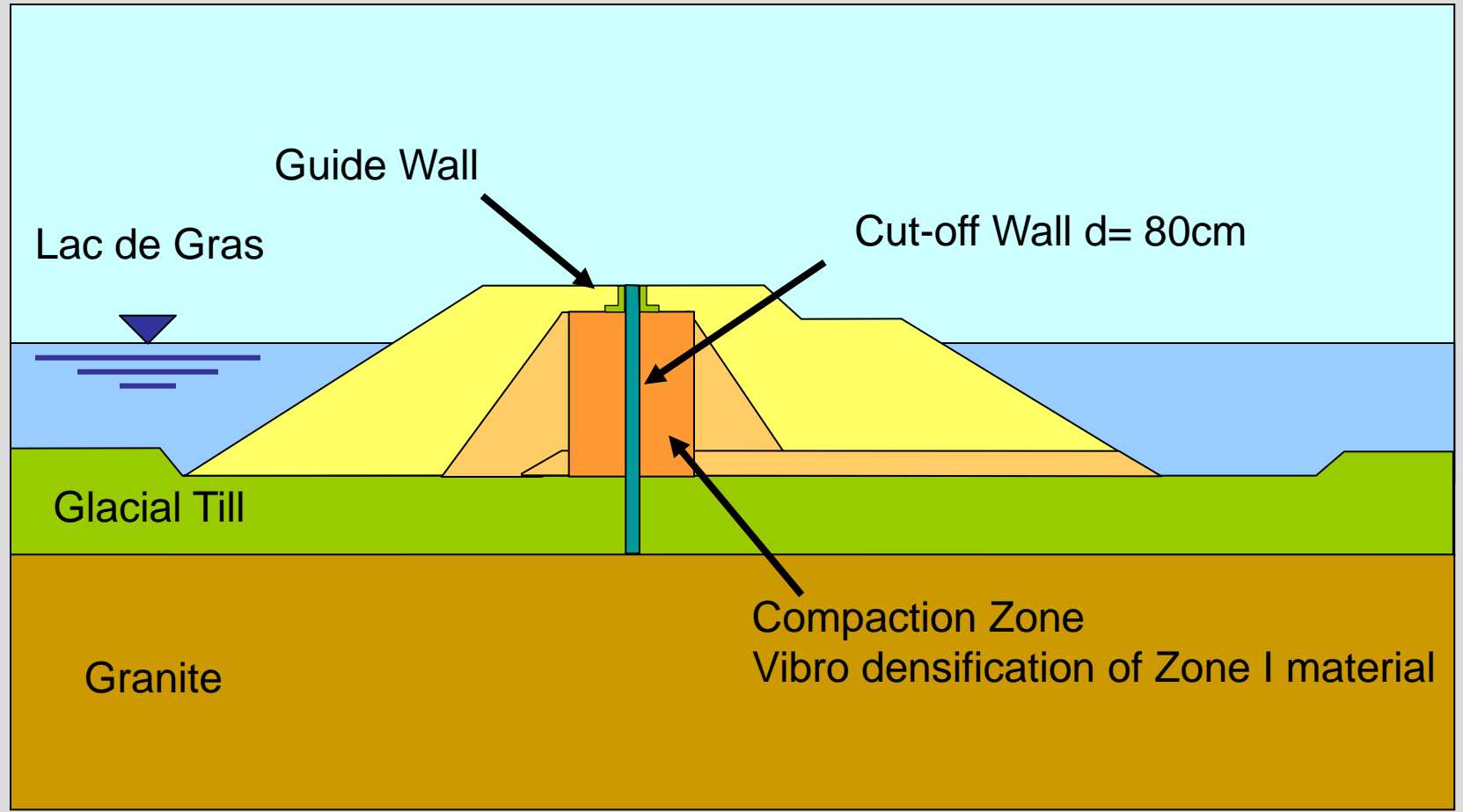
- 2007-2010:
- 53,000 m² Cut-off Wall
- cutting through permafrost

Cutting Edge Technology for the Mining Industry

Cut-off Walls – Difficult Conditions?



Construction Sequence Diavik Cut-off Wall



Cutting Edge Technology for the Mining Industry

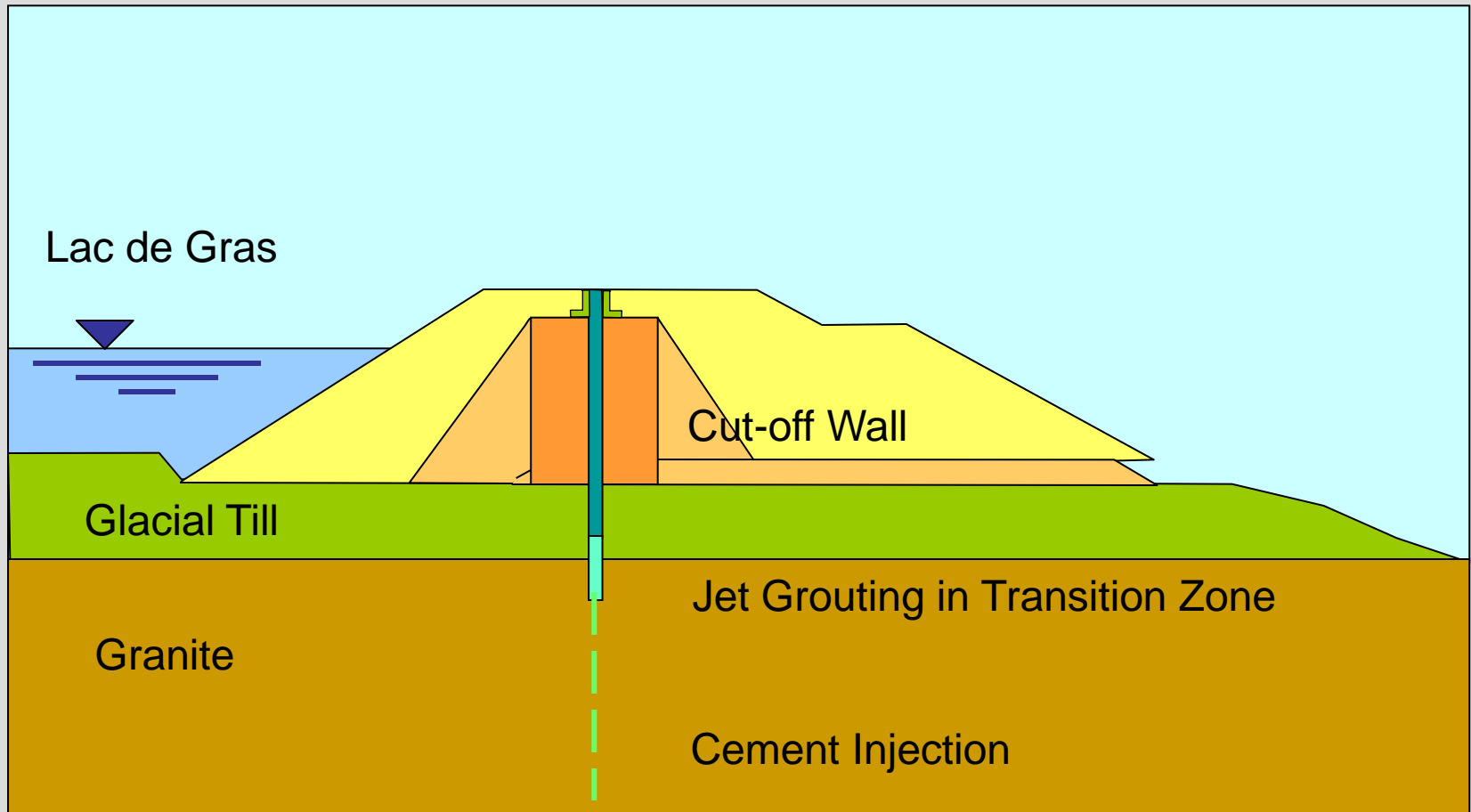
Cut-off Walls – Difficult Conditions?



RESOURCES
CANADA



Construction Sequence Diavik Cut-off Wall



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Cut-off Walls – Difficult Conditions?



Part of the BAUER Fleet



Cutting Edge Technology for the Mining Industry

Cut-off Walls – Difficult Conditions?



Challenges



Cutting Edge Technology for the Mining Industry

Large Diameter R/C Drilling



Cutting Edge Technology for the Mining Industry

Large Diameter R/C Drilling



Shore Gold Kimberlite Bulk Sampling

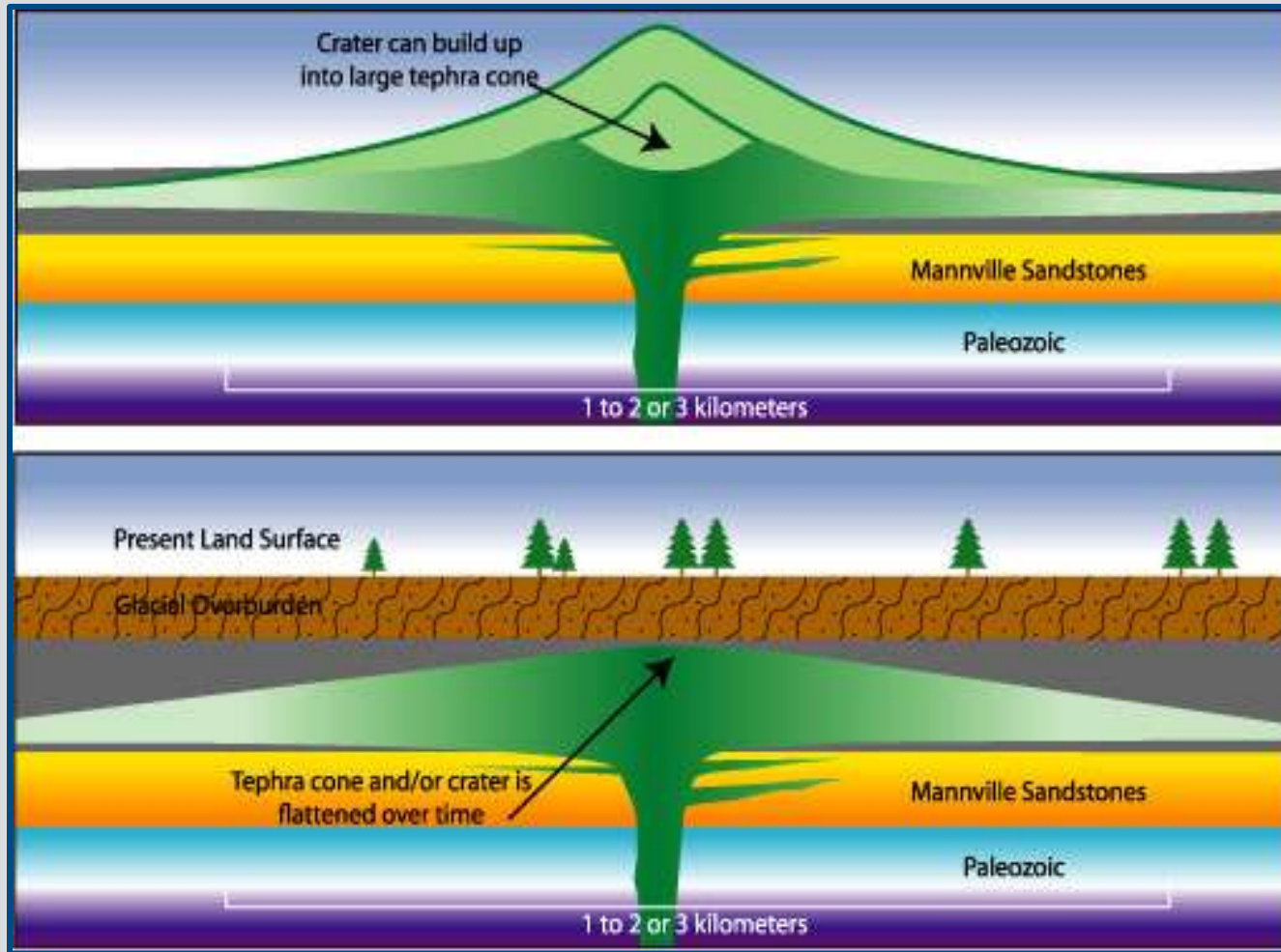


Cutting Edge Technology for the Mining Industry

Large Diameter R/C Drilling



Geology

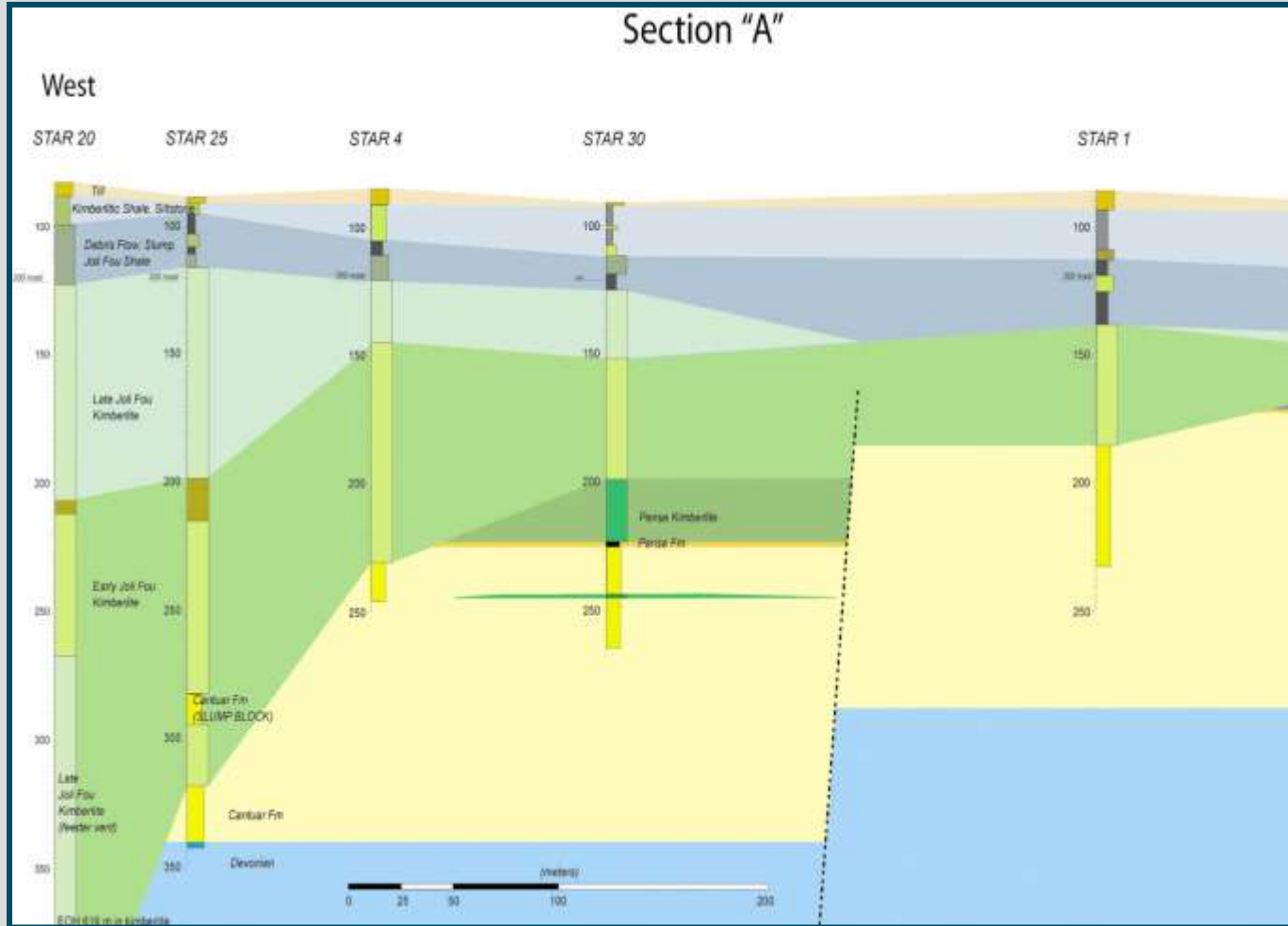


Cutting Edge Technology for the Mining Industry

Large Diameter R/C Drilling



Cross-section of Kimberlite Pipe



Cutting Edge Technology for the Mining Industry

Large Diameter R/C Drilling



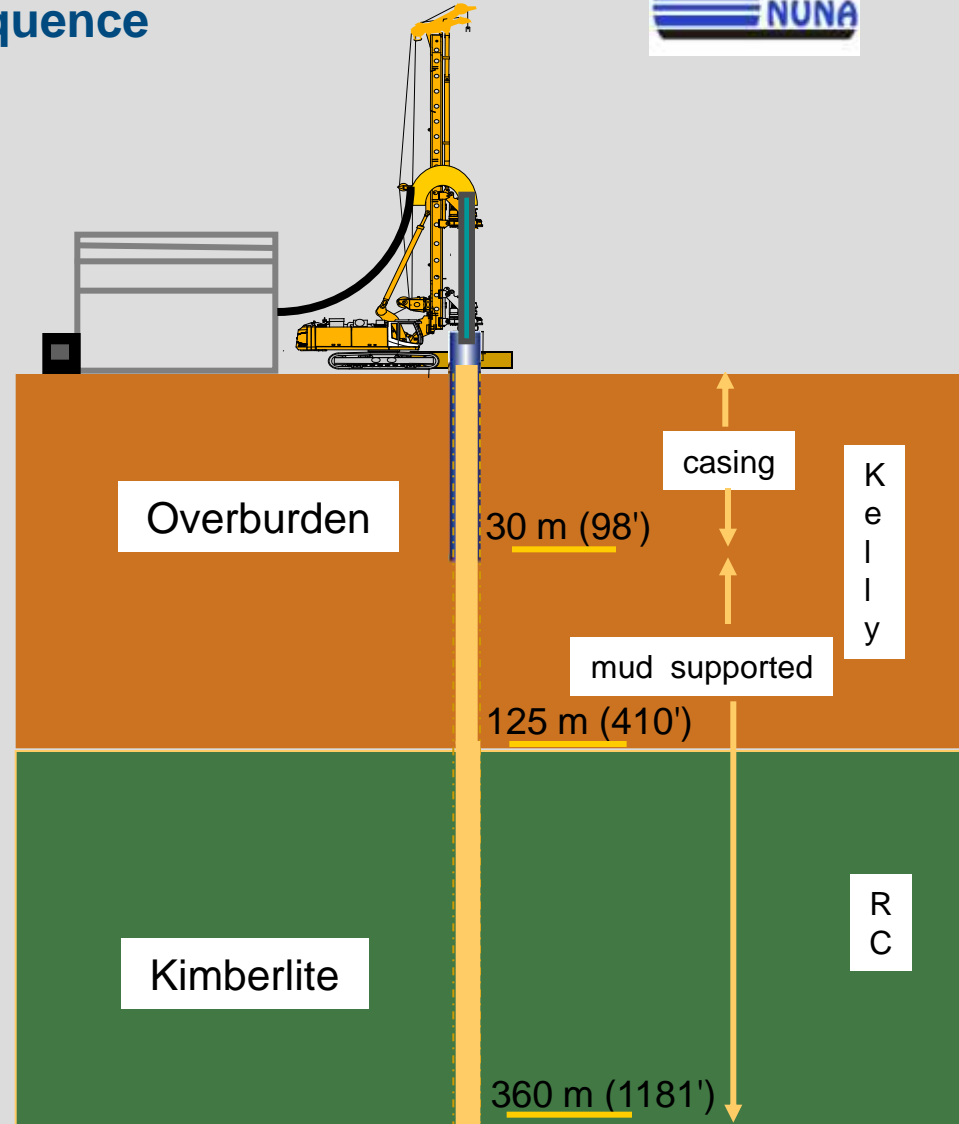
Work Sequence

Installation of casing and pre-excitation of overburden (till) with BG 36 and oscillator BV 1320 to approx. 30 m (98') depth

Auger, bucket (core barrel) drilling diameter 1200 mm (47") (mud supported) up to 85 m (279'), using kelly extensions up to 125 m (410')

Conversion into RC mode

RC drilling up to 360 m (1181') through kimberlites



Cutting Edge Technology for the Mining Industry

Large Diameter R/C Drilling



Assembly of Rig in FALC

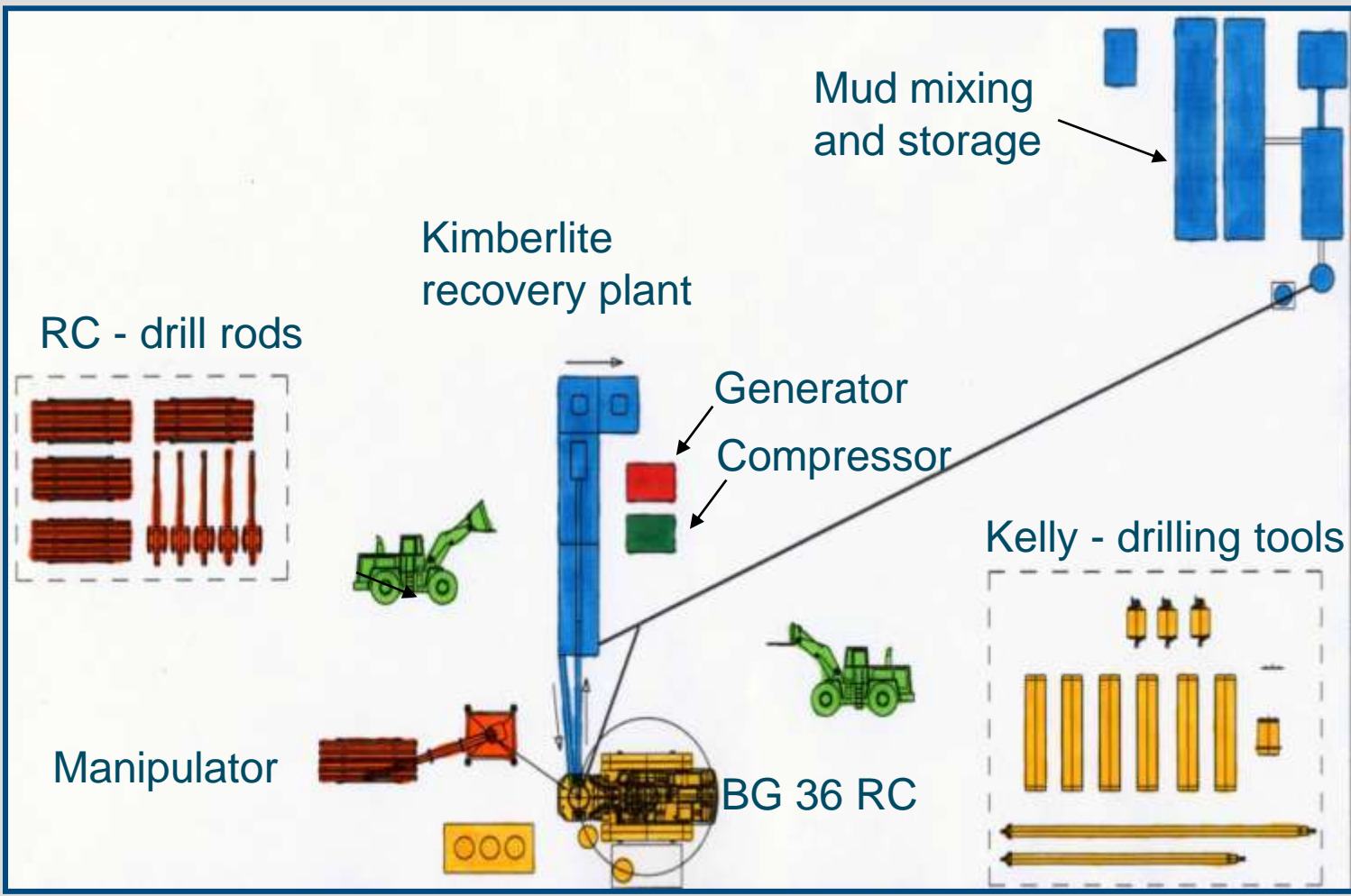


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Large Diameter R/C Drilling



BG 36 Drill Site Layout



Cutting Edge Technology for the Mining Industry

Large Diameter R/C Drilling



Challenges



Cutting Edge Technology for the Mining Industry

Large Diameter Drilling – Passive Vertical Drains



Cutting Edge Technology for the Mining Industry

Large Diameter Drilling – Passive Vertical Drains



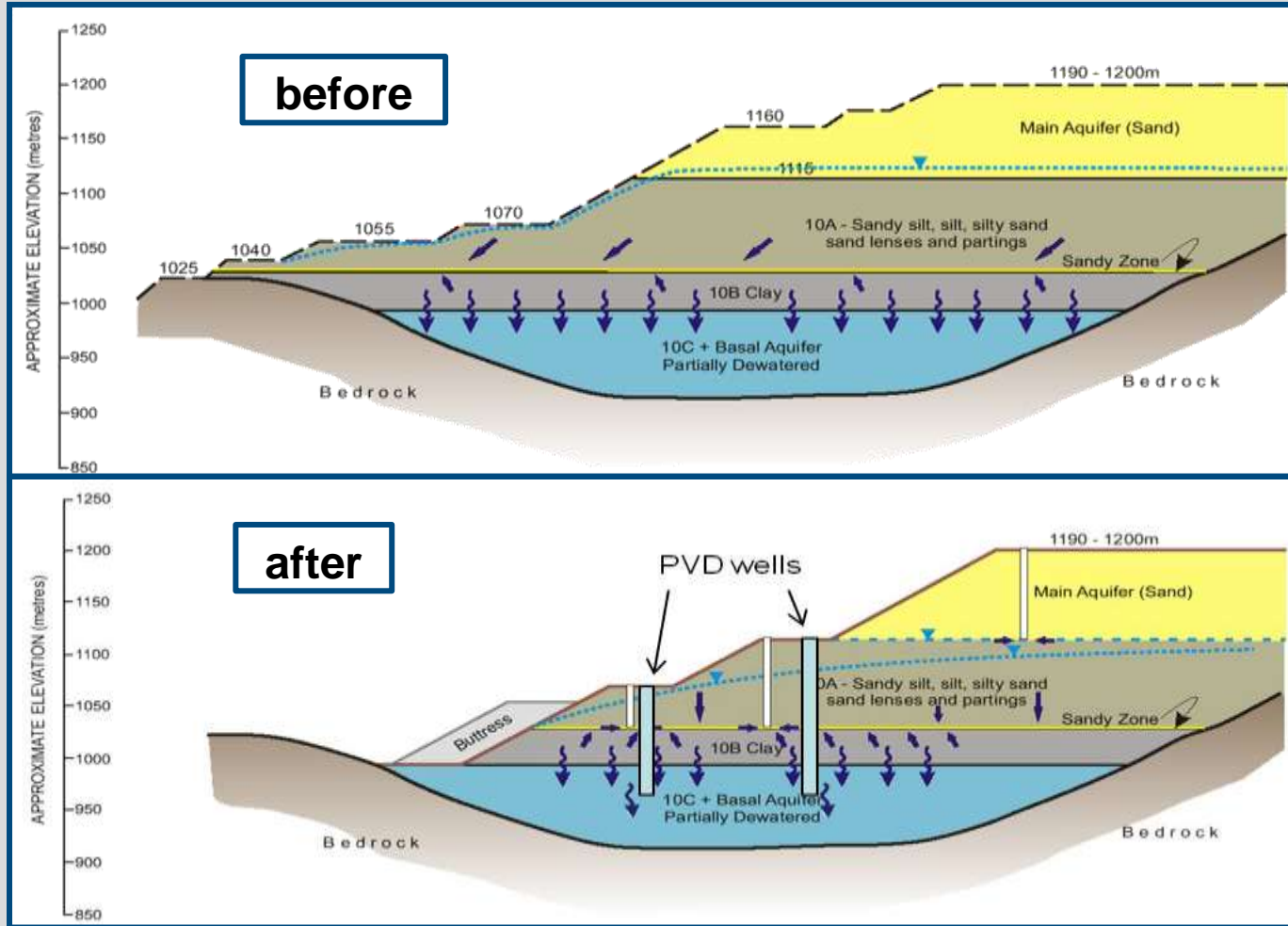
2010: 34 PVD Wells



Valley Pit, 2010

Cutting Edge Technology for the Mining Industry

Large Diameter Drilling – Passive Vertical Drains

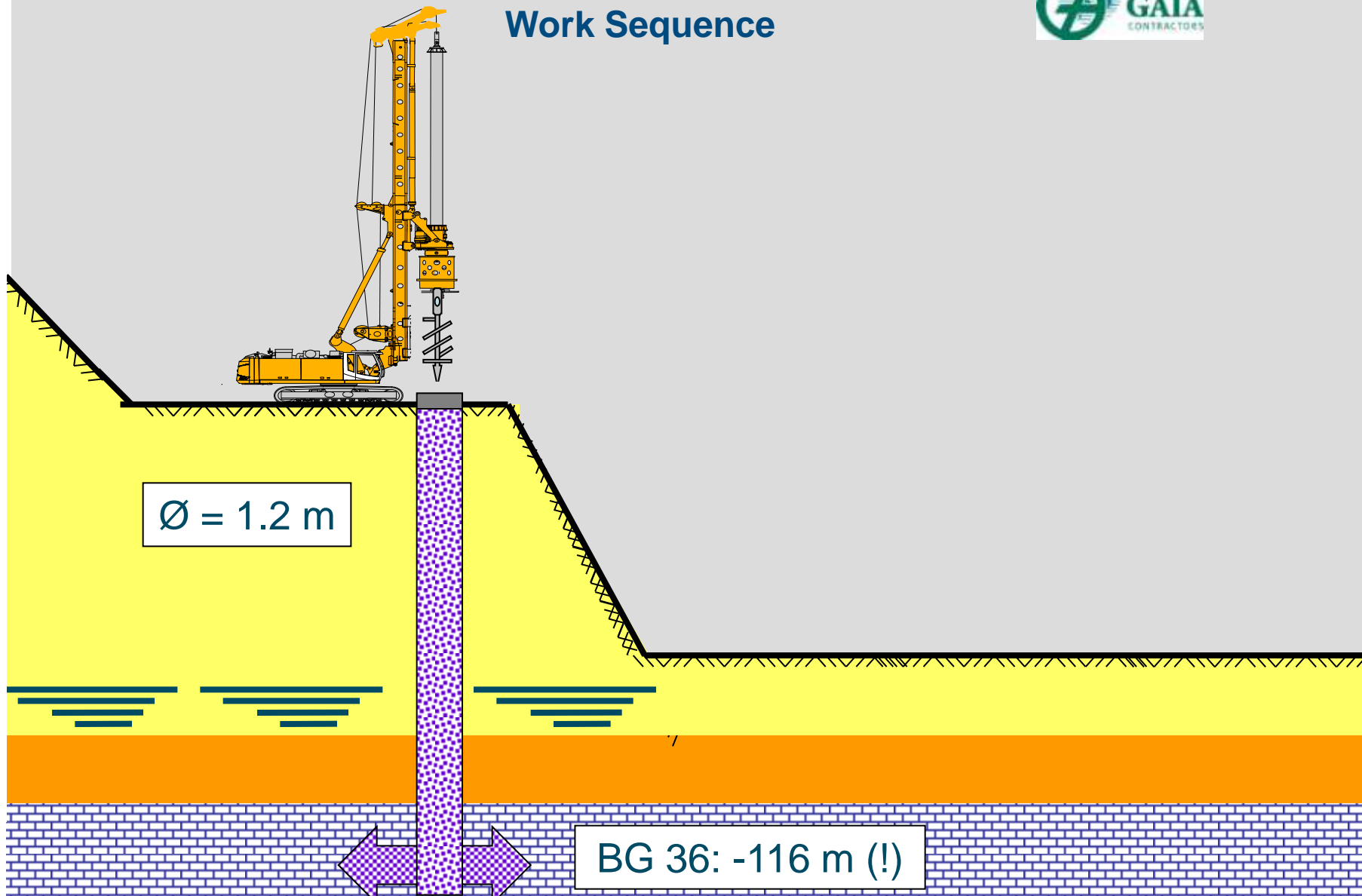


Cutting Edge Technology for the Mining Industry

Large Diameter Drilling – Passive Vertical Drains



Work Sequence

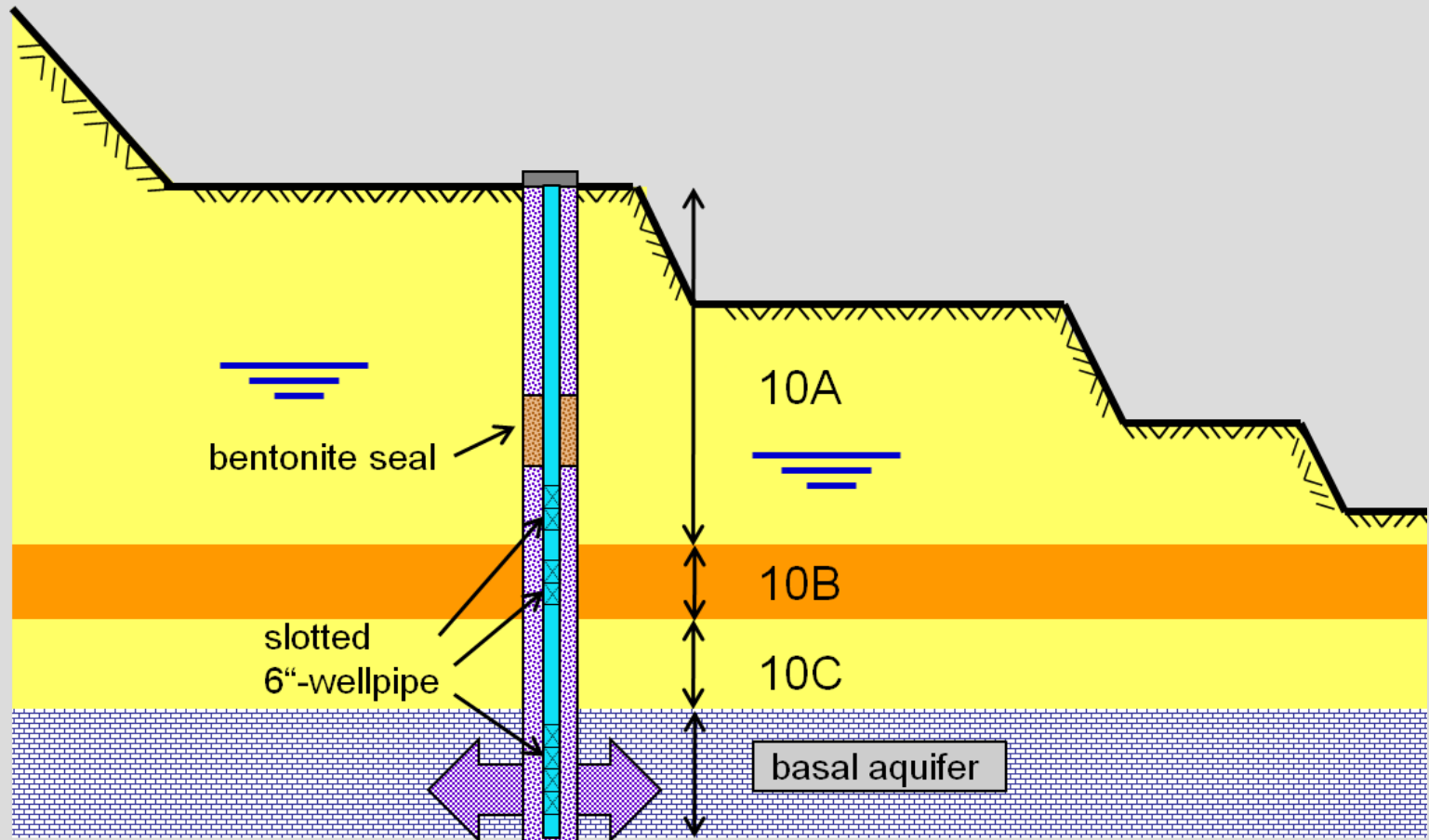


Cutting Edge Technology for the Mining Industry

Large Diameter Drilling – Passive Vertical Drains



Completed Passive Vertical Drain



Cutting Edge Technology for the Mining Industry

Large Diameter Drilling – Passive Vertical Drains



Challenges



Cutting Edge Technology for the Mining Industry

New Method for Uranium Mining

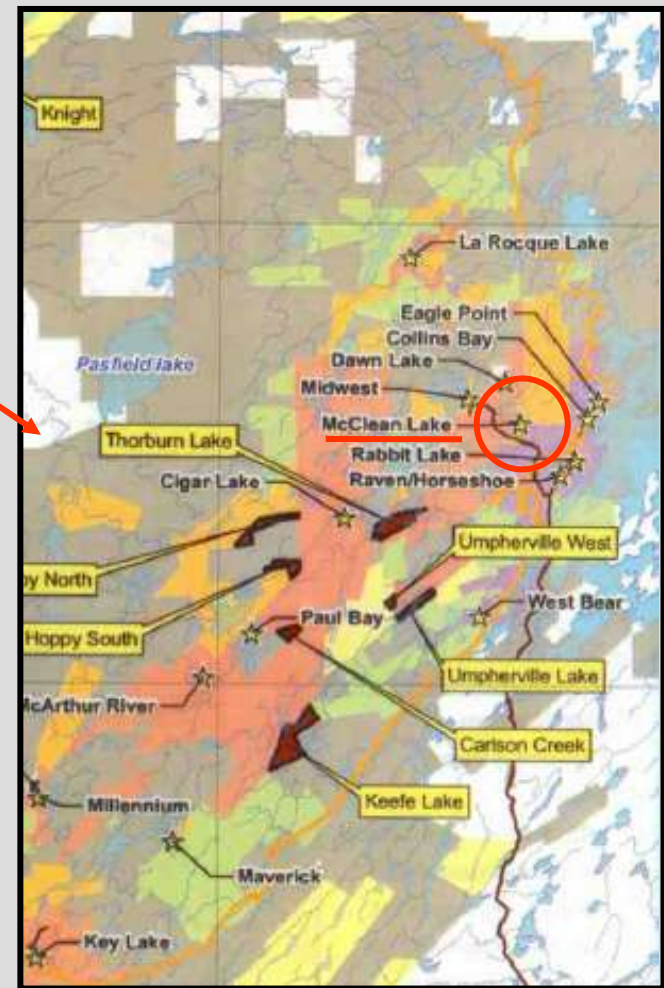


Cutting Edge Technology for the Mining Industry

New Method for Uranium Mining



McClean Lake Operation

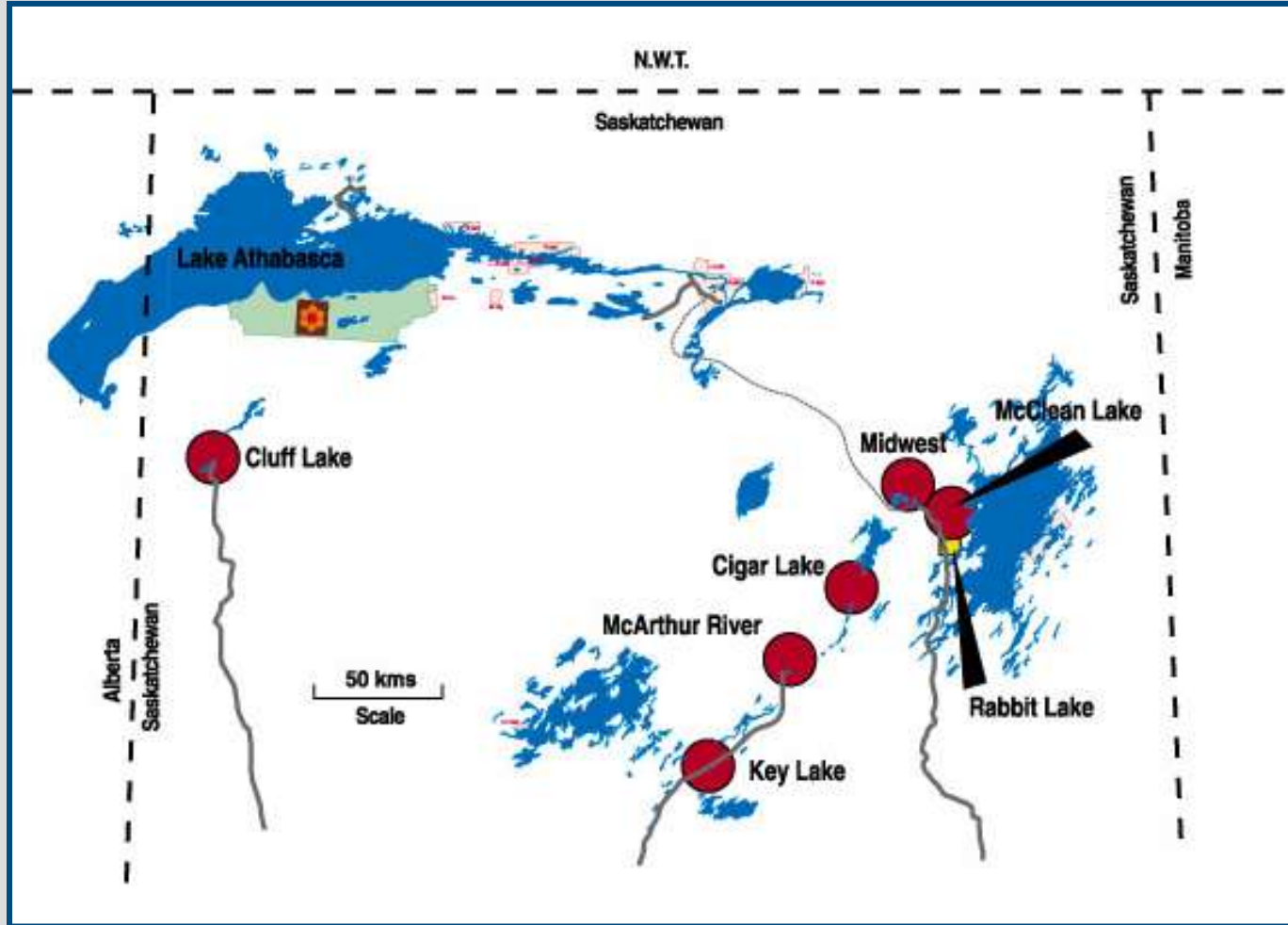


Cutting Edge Technology for the Mining Industry

New Method for Uranium Mining



McClellan Lake Operation

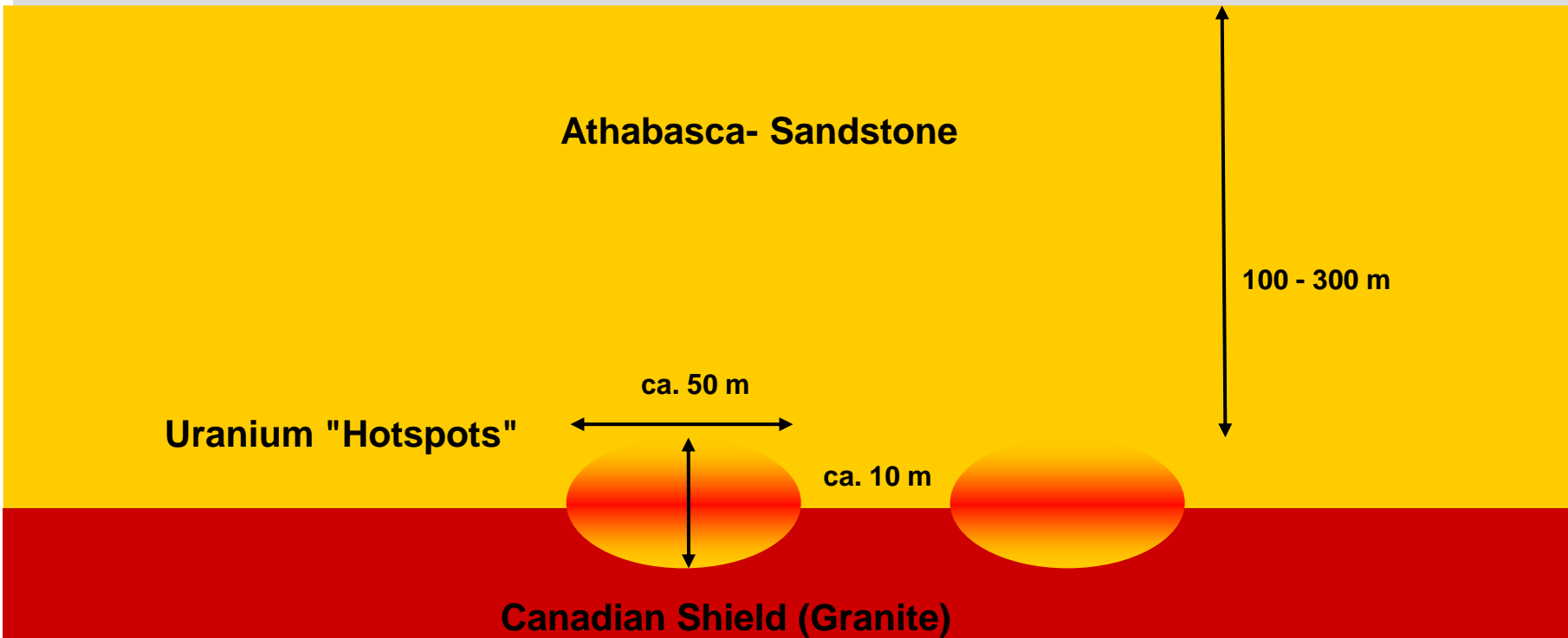


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New Method for Uranium Mining



Uranium Deposits in Athabasca Sandstone



Cutting Edge Technology for the Mining Industry

New Method for Uranium Mining



Uranium Mining Open Pit



Cutting Edge Technology for the Mining Industry

New Method for Uranium Mining

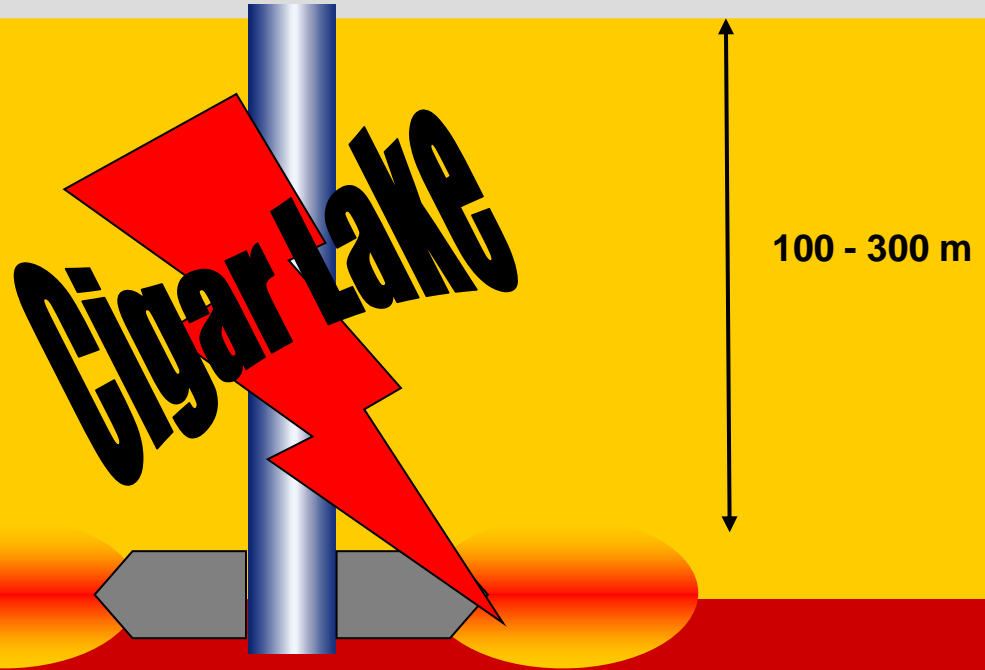


Underground Mine

Athabasca- Sandstone

Uranium "Hotspots"

Canadian Shield (Granite)

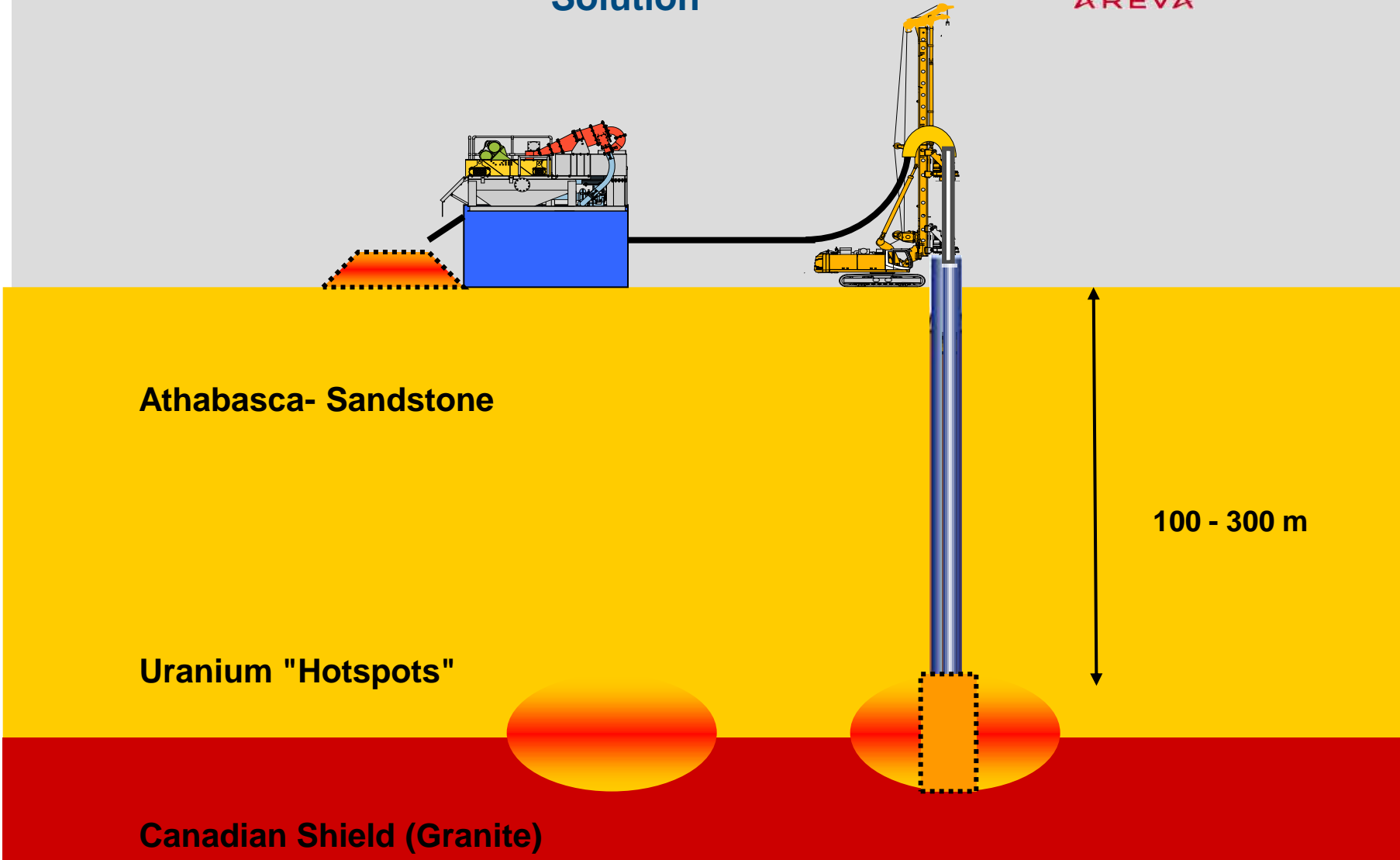


Cutting Edge Technology for the Mining Industry

New Method for Uranium Mining



Solution



Athabasca- Sandstone

Uranium "Hotspots"

Canadian Shield (Granite)

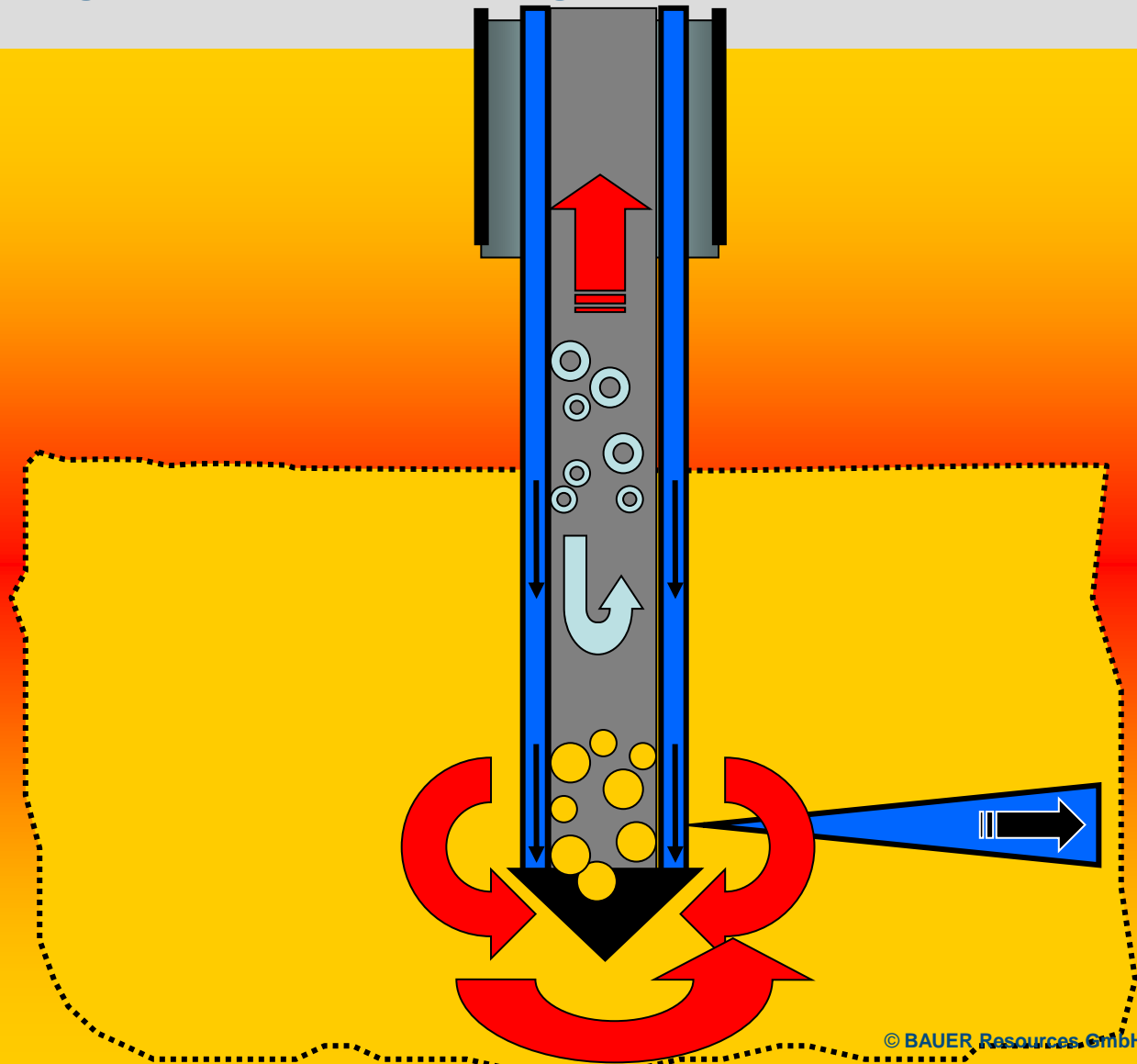
100 - 300 m

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New Method for Uranium Mining



High Pressure Wet Mining (HPRC) Principle



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New Method for Uranium Mining



Top Drive

- swivels:
 - high pressure water swivel
 - high pressure air swivel
 - air swivel for the RC-production
 - flushing swivel
 - return swivel
- rotary head
- clamping head
- sledge as attachment to drilling rig

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New Method for Uranium Mining



Field Application of the HPRC Mining System



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New Method for Uranium Mining



Field Application of the HPRC Mining System



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New Method for Uranium Mining



Results:
High grade uranium ore



Goals:

- New engineering phase in 2014 to improve the existing system
- Test the new system
- Production

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New Method for Uranium Mining



Perfect example for international teamwork



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IDEAS

Cutting Edge Technology for the Mining Industry

Vertical Cutter Mining



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Vertical Cutter Mining



Application:

- Smaller kimberlite pipes
- Remaining tooth of kimberlites exploited with an open pit mine

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Vertical Cutter Mining



BAUER BC50 Trench Cutter

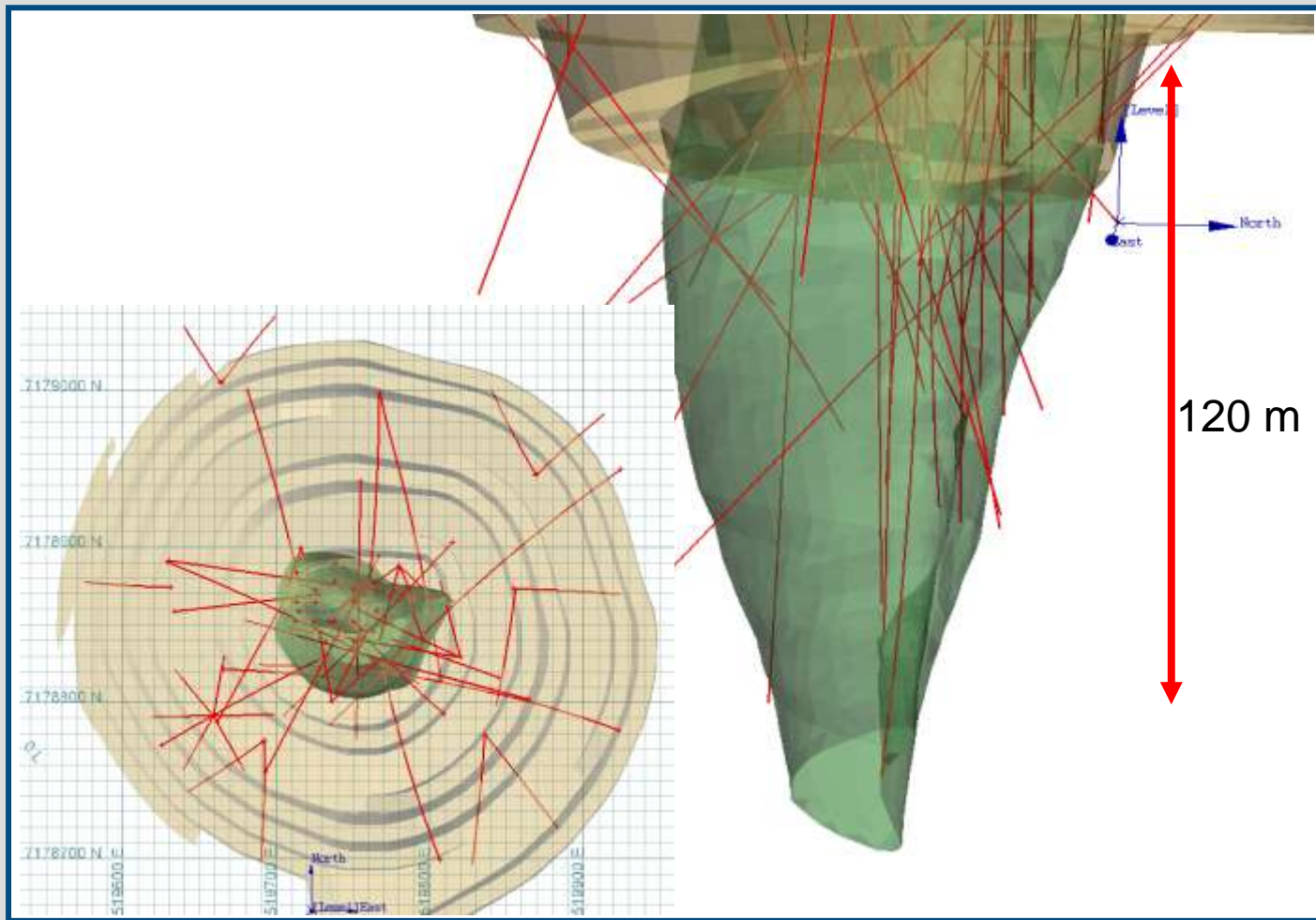
- Max. cutting depth: 150m or 500'
 - Footprint up to 2.800mm x 3.200mm
 - Two main pumps
- the ideal machine for Vertical Cutter Mining

Cutting Edge Technology for the Mining Industry

Vertical Cutter Mining



Small kimberlite pipe



Cutting Edge Technology for the Mining Industry

Vertical Cutter Mining



VCM test at Ekati Mine



Cutting Edge Technology for the Mining Industry

Vertical Cutter Mining



VCM test at Ekati Mine

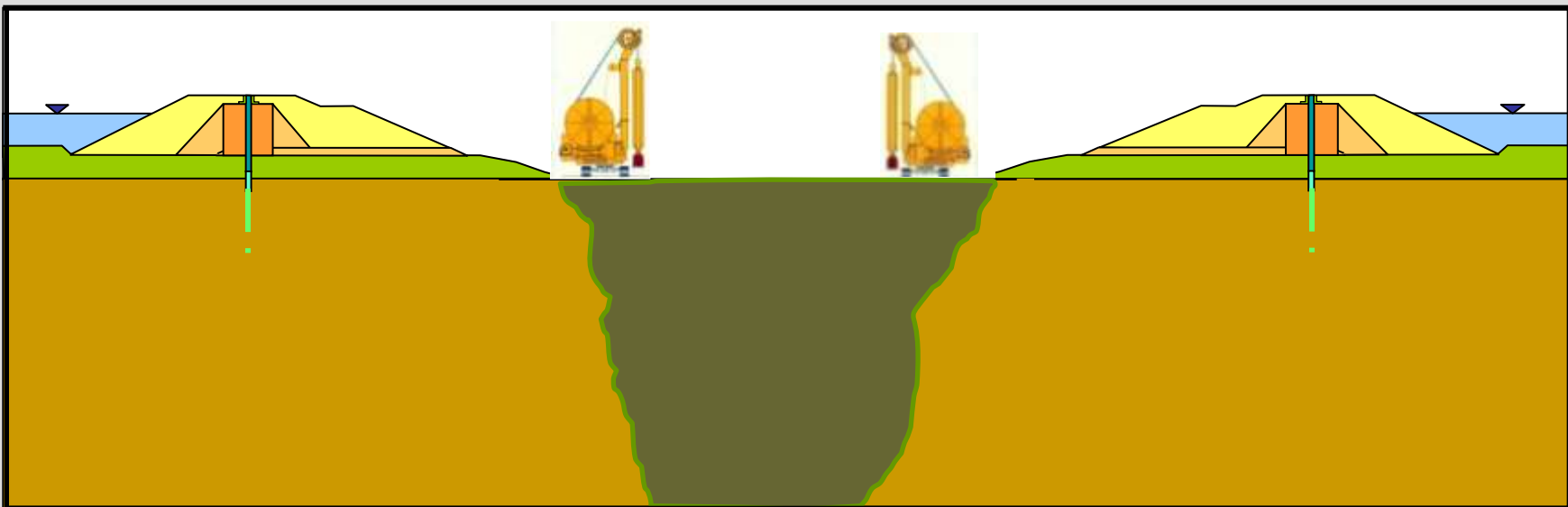


Granite intrusions

Excavated test trench in
Kimberlite at the Ekati Mine

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Vertical Cutter Mining



Land based operation

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Coal Mining with BAUER



Cutting Edge Technology for the Mining Industry

Coal Mining with BAUER

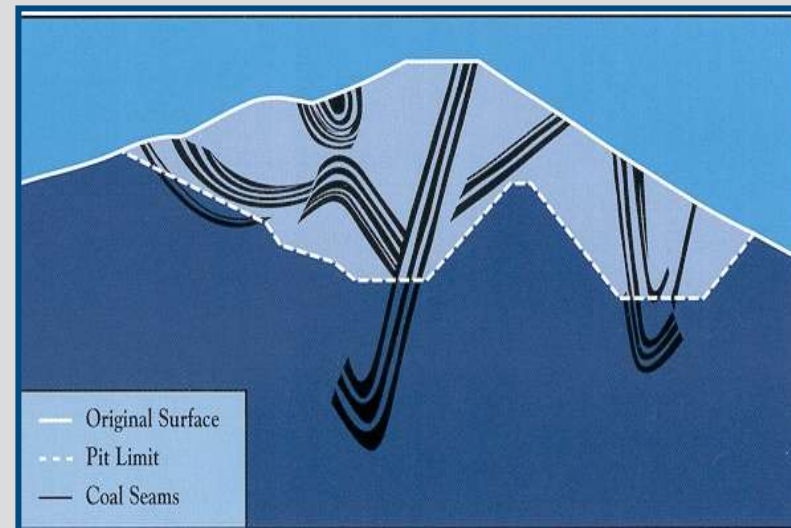
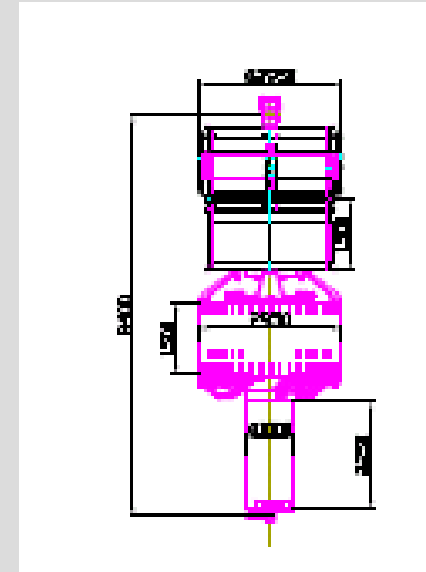
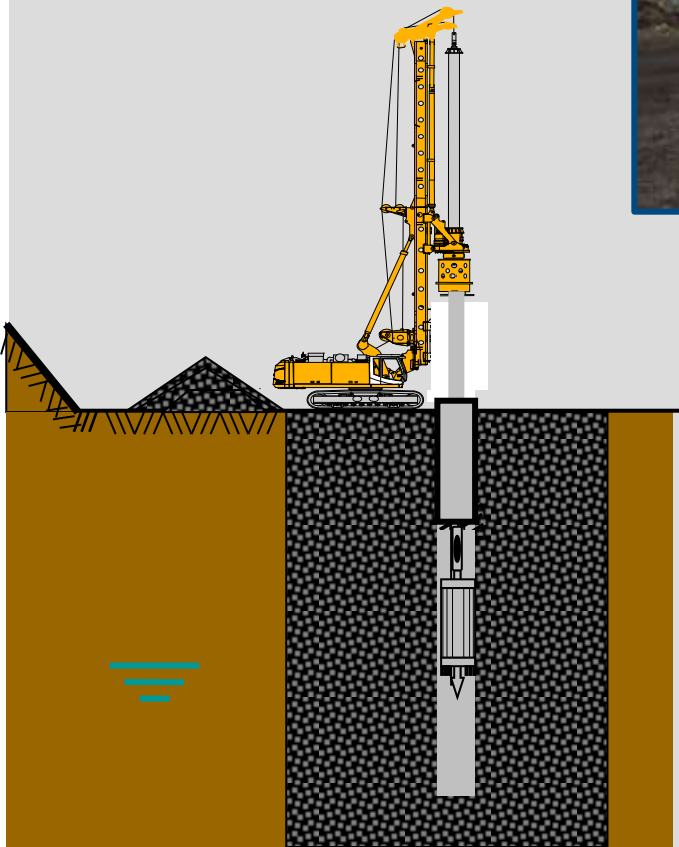


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Coal Mining with BAUER



Exploitation of vertical coal seams



Cutting Edge Technology for the Mining Industry Success story?!?



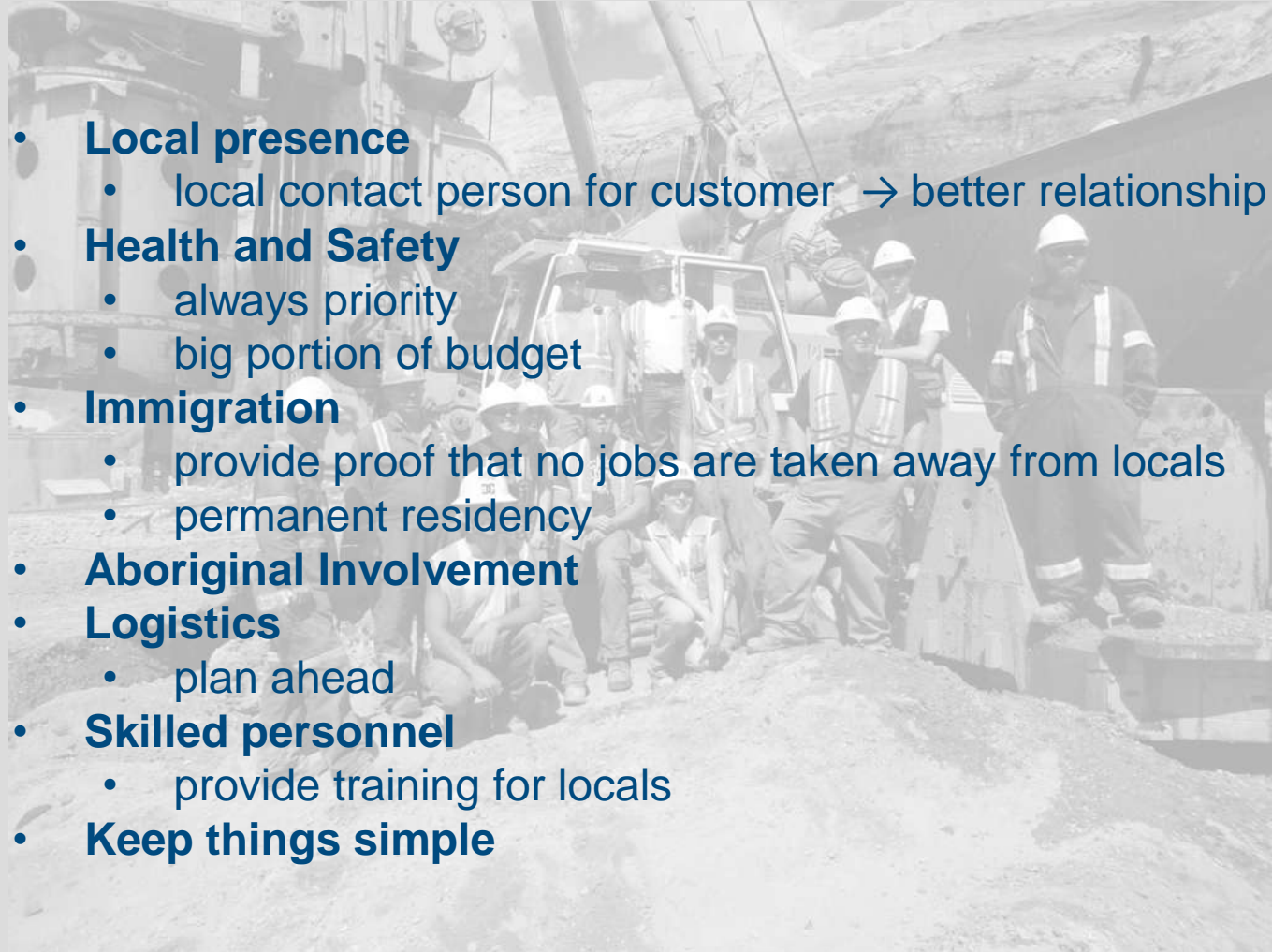
Know-How &
Experience



Local Expertise

Teamwork

Cutting Edge Technology for the Mining Industry Our Experience



- **Local presence**
 - local contact person for customer → better relationship
- **Health and Safety**
 - always priority
 - big portion of budget
- **Immigration**
 - provide proof that no jobs are taken away from locals
 - permanent residency
- **Aboriginal Involvement**
- **Logistics**
 - plan ahead
- **Skilled personnel**
 - provide training for locals
- **Keep things simple**

Cutting Edge Technology for the Mining Industry

Thank you!



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