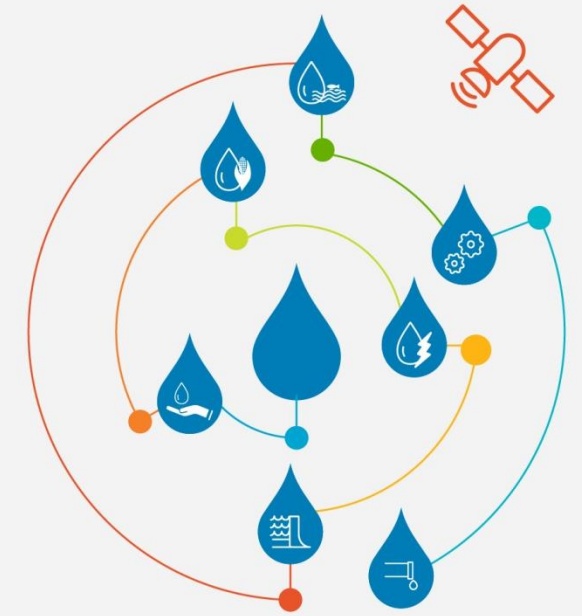


Trenchless technologies: efficient, sustainable and essential solutions for water network laying



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ADB

Why mechanized trenchless technologies?

	Open trench Method	Trenchless works
Feasibility	Not possible to cross obstacles Depth Limited Not all geological conditions	Crossing of all kind of obstacles Deep projects All geological conditions, high hydrostatic pressure
Traffic	Road closure, traffic jam	No traffic disruption
Sustainability	Excavated volume important Visual and noise pollution Large Surface layout	Volume excavated very limited No Dewatering Surface layout only around shaft, Pollution limited



Different technologies



Microtunneling:
 Φ from 500 to
3500mm

Tunneling:
 $\Phi > 2500$ mm



Auger drilling:
 Φ from 250 to
1500 mm

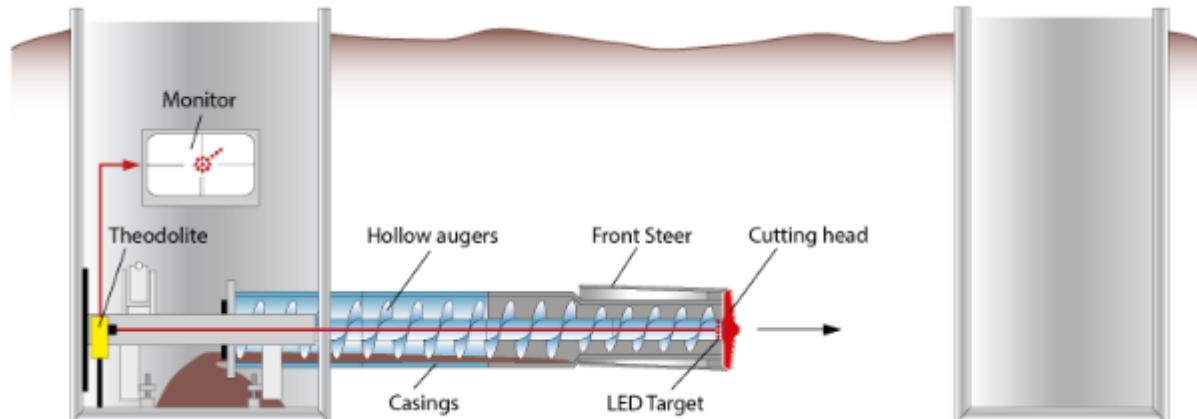


Horizontal Directional Drilling:
 Φ from 40 to 1200mm

Different technologies

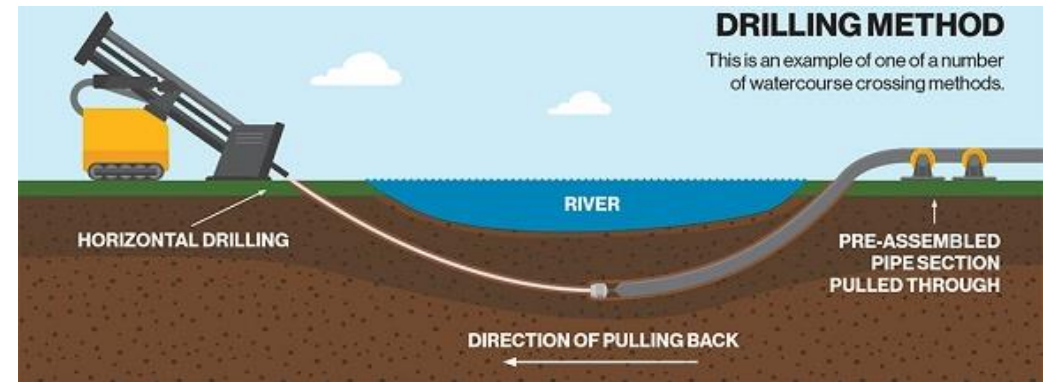
Auger drilling:

- Φ from 250 to 1500 mm
- Maximum Length: around 100 m
- Hydrostatic pressure: <3m
- Lining: plastic, concrete, iron, steel...
- Process: Excavation with a front steer equipped with an auger and pipe jacking
- Useful in urban context



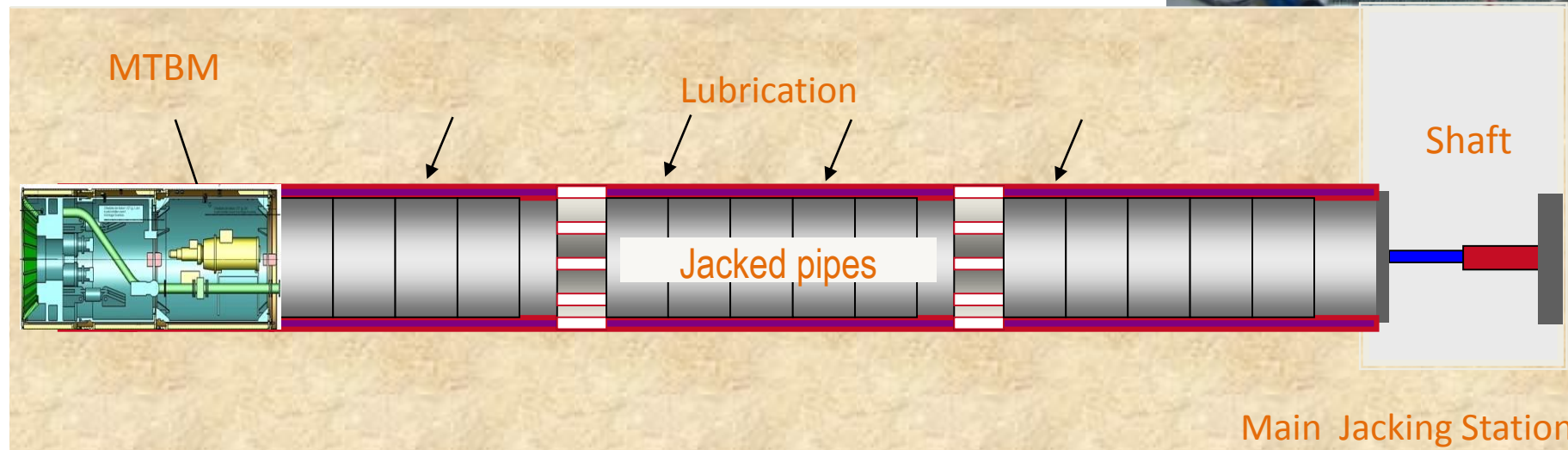
Horizontal Directional Drilling:

- Φ from 40 to 1200 mm
- Length up to 1.5/2 km
- Not in all geological conditions
- Process: pilot hole, then enlarging the hole and pipeline pulling
- Lining: PE, HDPE, iron, steel
- Useful for river/road crossing...



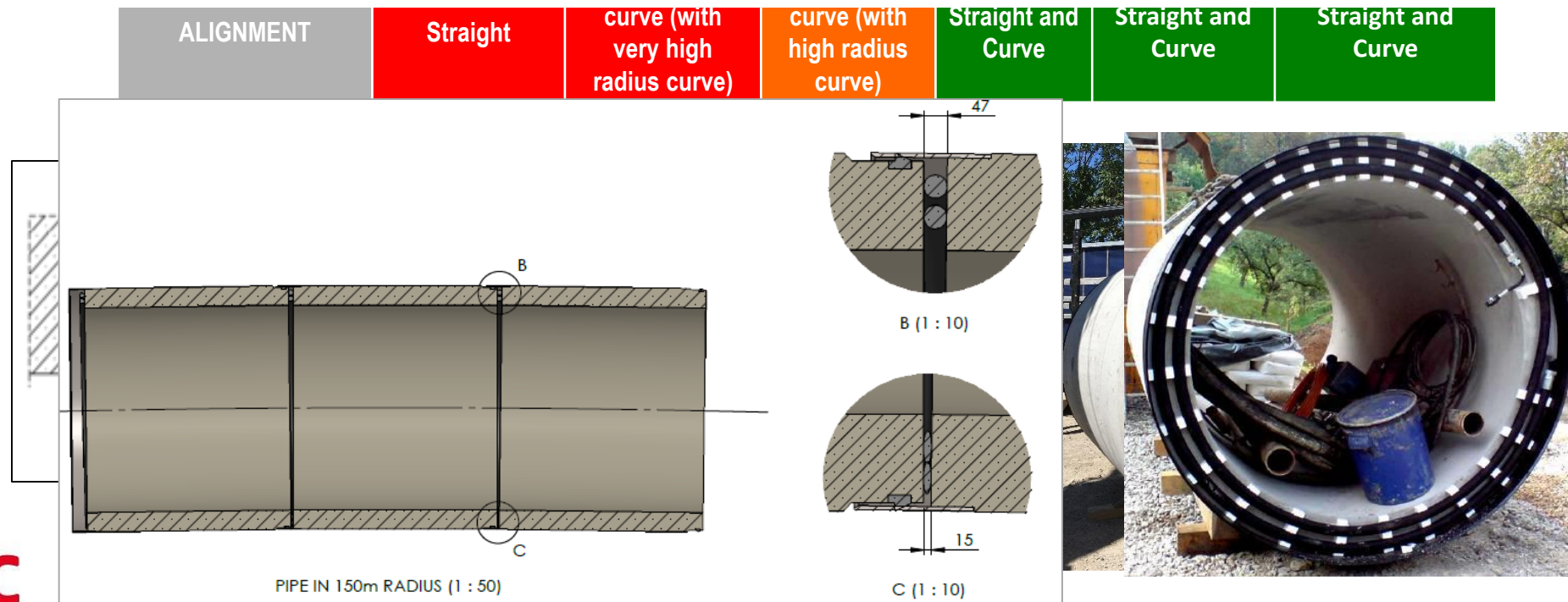
Microtunneling: Principle

- Limited drive length
- Lining is made of RC or GRP pipes
- Machine is controlled from the surface
- Principle is to jack the pipes from a launching shaft



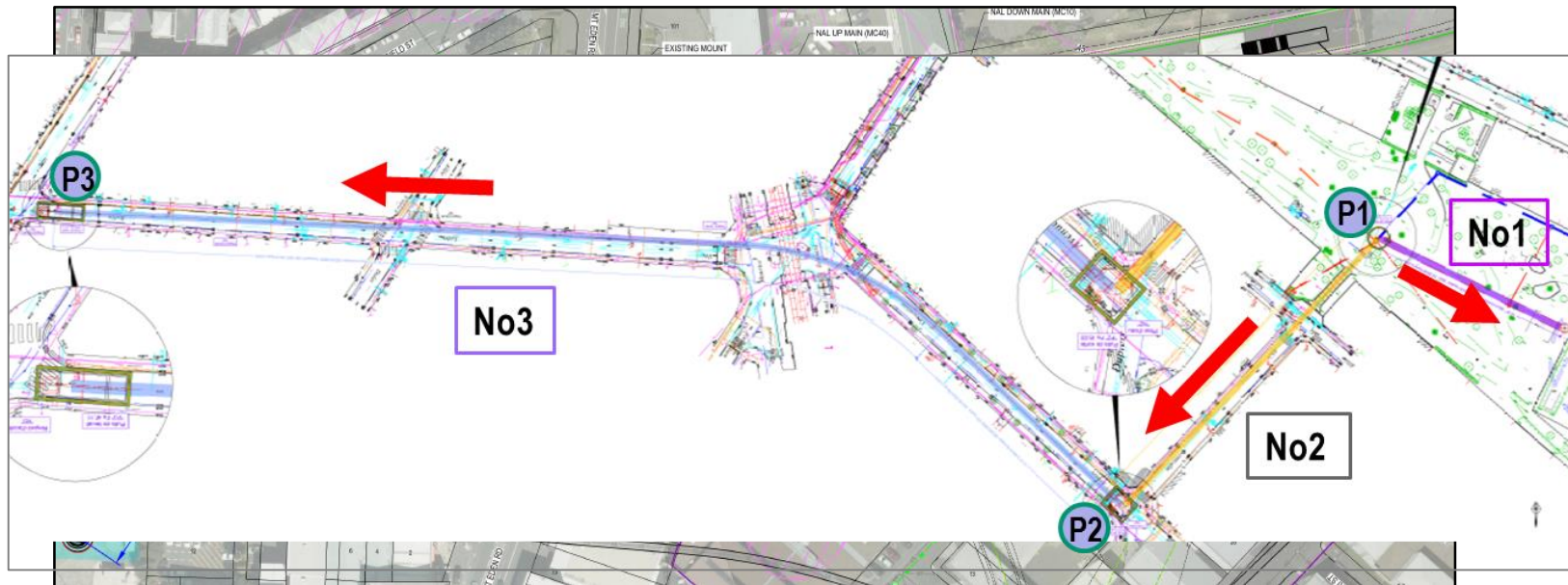
Microtunneling: Innovative Solutions

- Innovative configuration for **tight curves** :
 - Implementation of hydraulic joints between each pipes
 - Pressure and elongation real-time monitoring
 - Main advantages: cost & time effective, less disturbances



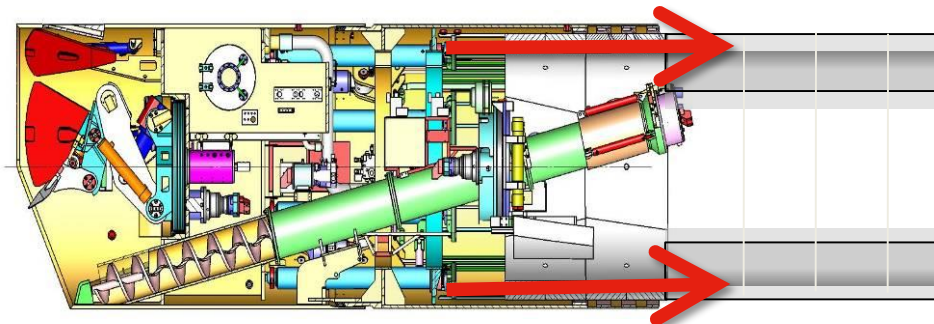
Microtunneling: Innovative Solutions

- ~~Stover Water Treatment Plant~~ Paris (6.47 km, d 226 m): 1BA DuracUS™ curve with a radius of 150 m

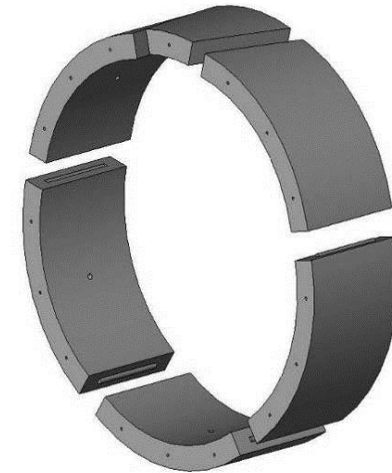


Tunneling: Principle

- “Unlimited” drive length
- Lining is made of RC precast segments
- Machine is controlled from inside the tunnel
- Principle is to place in advance the precast ring behind the machine as it progresses



LAUNCHING
SHAFT



Tunneling: Innovative Solution

- Solution: increase the quality and the durability of the lining by a secondary lining



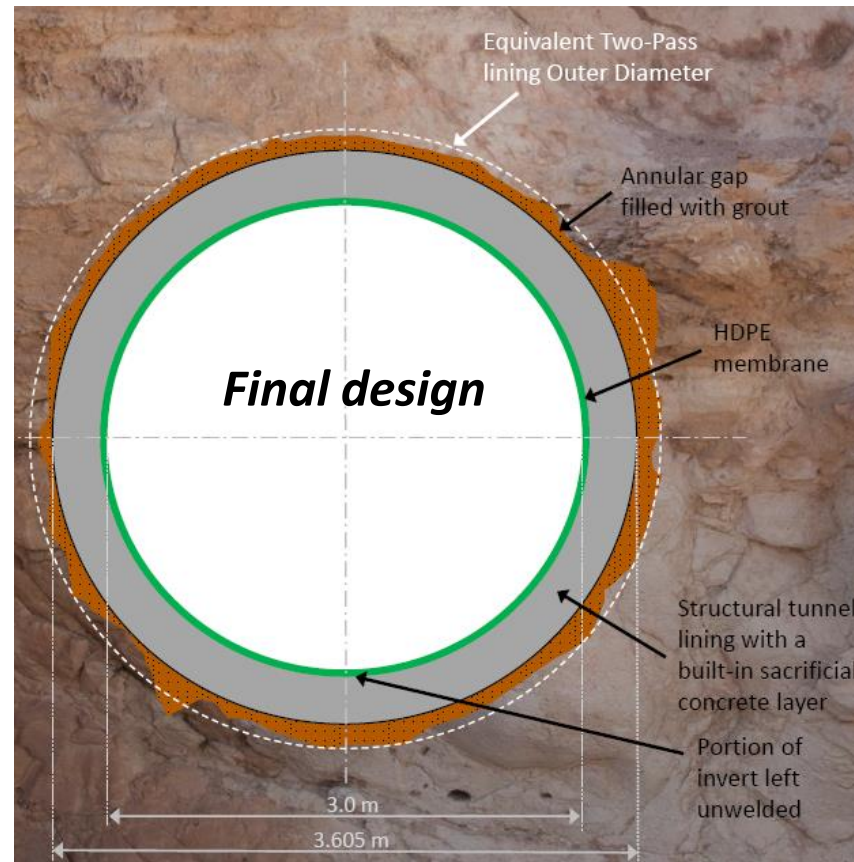
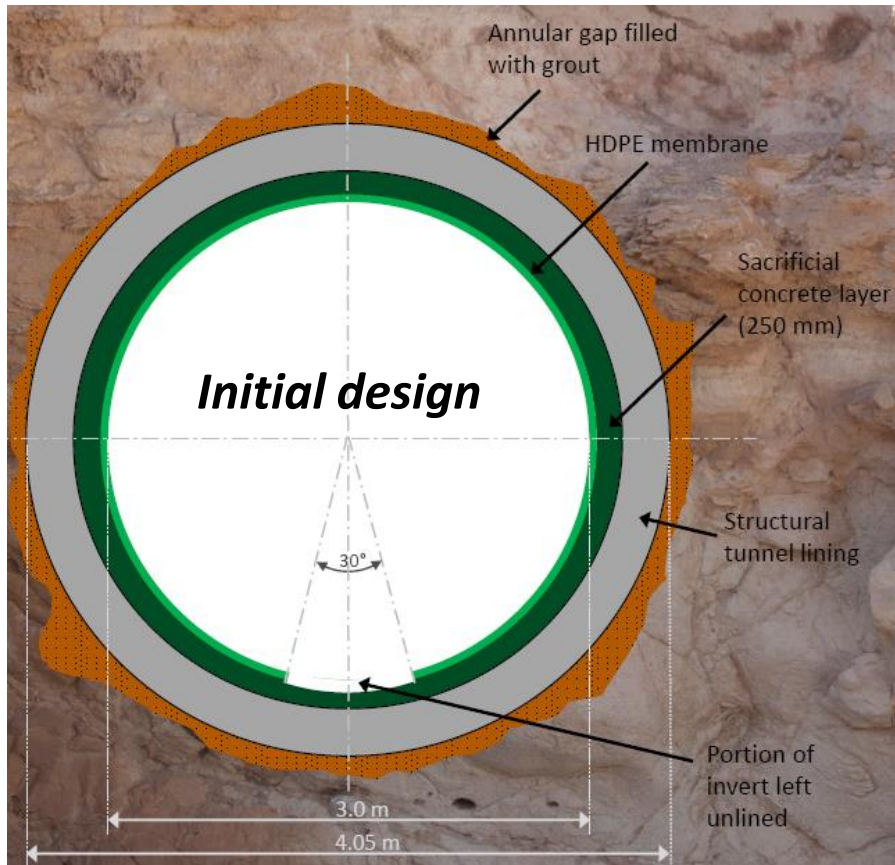
Norris Cut Tunnel, 1.8 km Φ 2.5 m (Miami, USA)

- 1) Construction of the RC segments tunnel with TBM
- 2) Installation of the second lining (GRP lining) inside the tunnel
- 3) Grouting of the annular space between the two linings

=> Lot of time and expensive solution

Tunneling: Innovative Solution

RC segments with HDPE membrane in only one-pass lining



IDRISS MTS01, 16 km Φ 3 m (Doha, Qatar)

Main Advantages:

- Same level of quality, 100 years design life
- Reduction of the excavated diameter
- Reduction of TBM numbers
- Reduction of the risks
- Time and Cost savings



Tunneling: Innovative Solution

RC segments with HDPE membrane in only one-pass lining



Thank You



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