Celtic Interconnector

The first HDVC interconnection between Ireland and continental Europe

Nicolas Blanc (RTE)
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OPTIMUM

Le réseau de transport d'électricité


Le réseau
de transport

EirGrid

Rte Le réseau de transport d'électricité

2 project promoters
EirGrid and Réseau de Transport d'Électricité

575 km total length
500 km subsea

700 MW of exchange capacity in total
the equivalent of supplying power to around 450,000 homes

The Celtic Interconnector Project

The Celtic Interconnector

- Joint development by EirGrid and RTE - CIDAC
- Project of Common Interest (PCI) Status from the European Union since 2013
- Part funded through the EU CEF
- Construction underway
- Connects Ireland's electricity market to the French electricity market
  - Enhances security of supply
  - Reinforces European energy solidarity
  - Essential to Irish and French climate action ambitions

EirGrid Rte

Celtic Interconnector

La liaison électrique entre la France et l'Irlande

Connecting the electricity grids of Ireland and France

Co-financed by the Connecting Europe Facility of the European Union

Trenchless crossings in France

Large-scale HDDs

Microtunnel

Small-scale HDDs

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Large-scale HDDs – Landfall (FR)

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Landfall – Design engineering

- Constraints & geology
  - Hard, abrasive, resistant granite
  - Need to exit at -12m LAT
- Landfall site choice
  - 4 potential sites near Port Neuf : OPTIMUM selected **Kéradennec**
    - Drill path up to 300m shorter than other potential sites
    - Directly next to the sea (no bay to cross)
    - Less resistant rock
    - Less sediment
    - Easier site access

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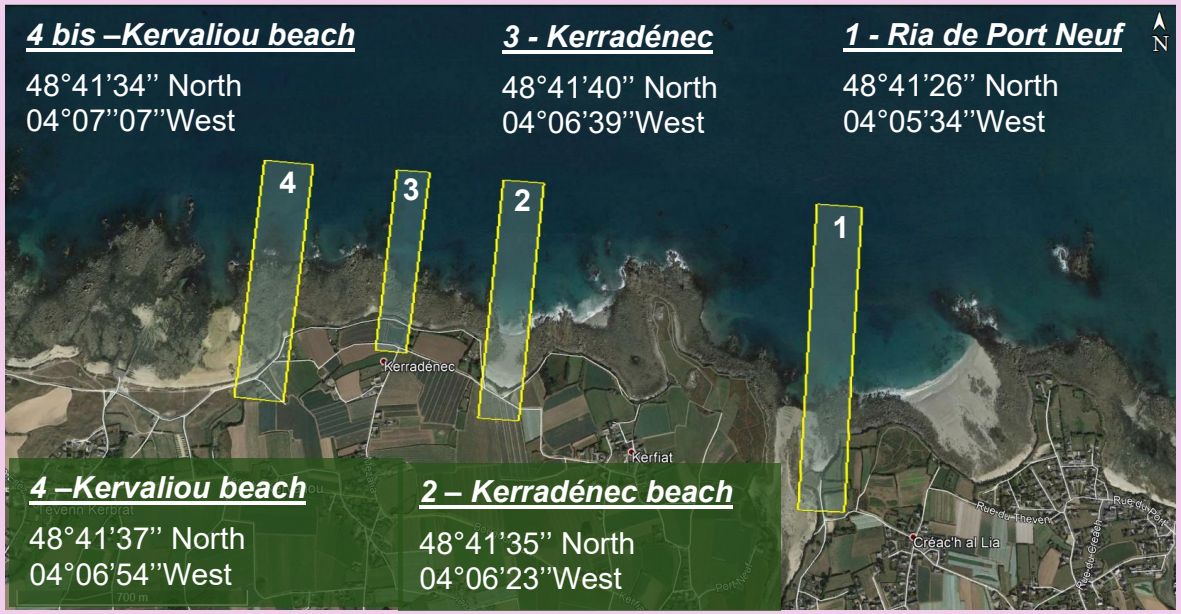
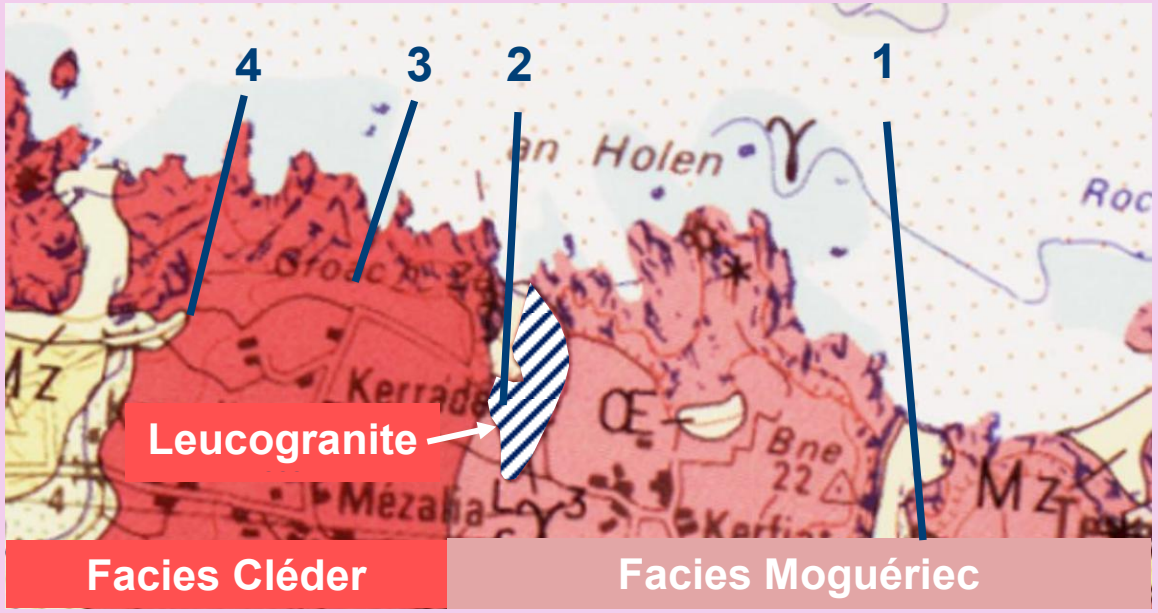
Landfall – Potential sites





The less you drill in granite, the better !

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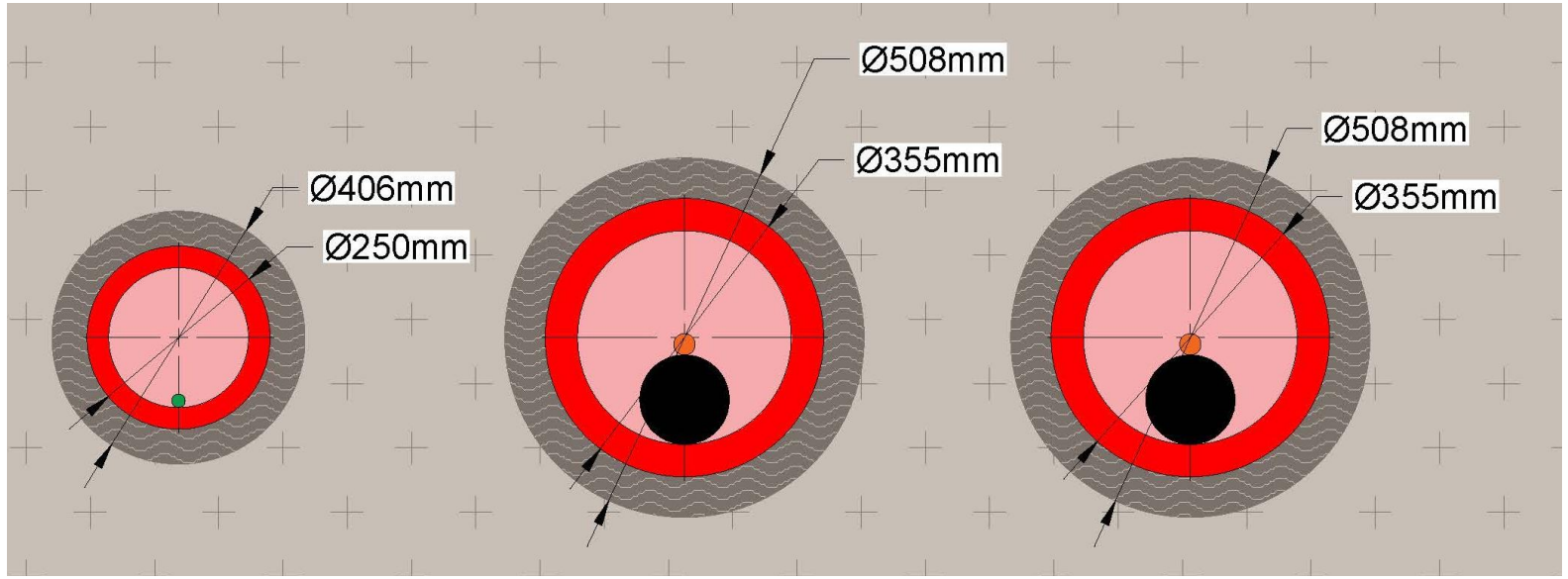
Landfall – Design engineering

- Crossings : 3 parallel 440m HDDs



Landfall – Works phase

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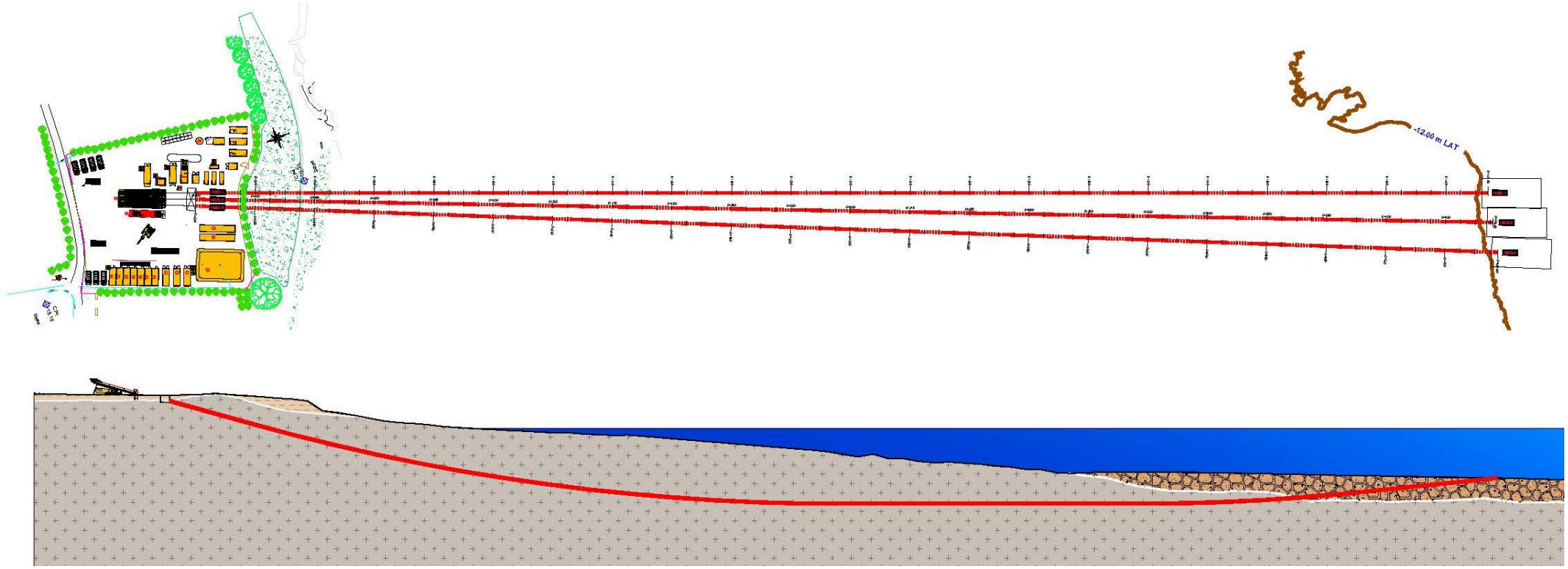
Landfall – Works phase



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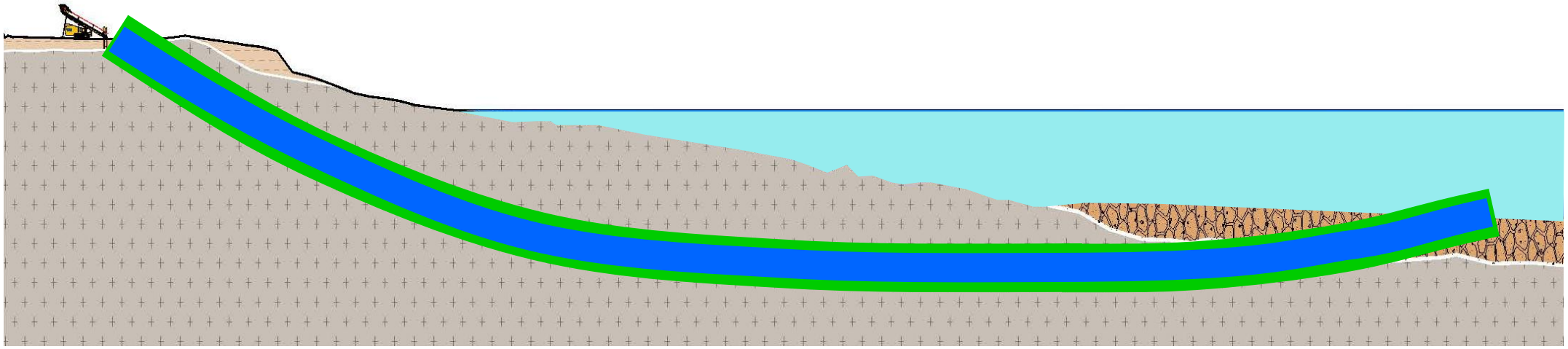
Landfall – Works phase

- Hard and abrasive granite rocks > Risk of tool damage / loss
  - Solution ?
    - 9 ⅞” rock bit on 6 ¾” mud motor
    - 16” and 20” rock reamers
    - Spares on site at all times
    - Programmed, regular tool renewals
    - Continuous monitoring of drilling parameters
      - Unexpected deviation > check drilling tools and reamer cones

Landfall – Works phase



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Landfall – Schedule : 8½ months

Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun

Installation
2 months

Permits
2 months

Pilot holes & reaming
4 months

Bad weather
2 months

Pullback
2 weeks

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Microtunnel - Rail + river crossing

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Rail + river crossing – Design engineering

- After study, HDD was rejected in favour of microtunnelling
  - Ground investigations highlighted sandy gravel above shale formations
  - Site conditions made microtunnelling the best option

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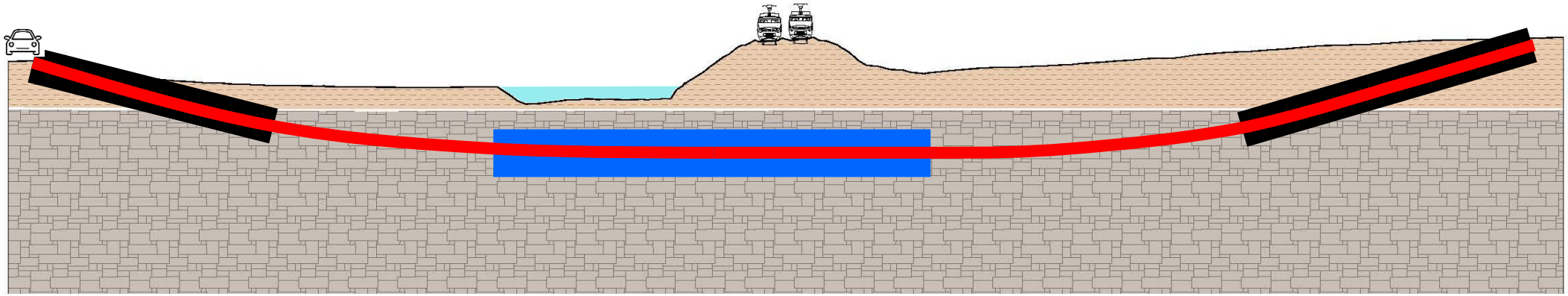
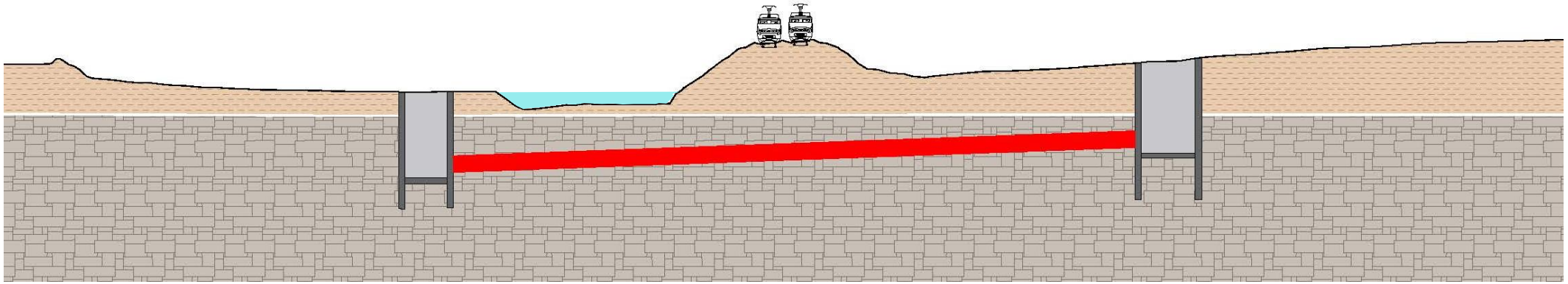
Rail + river crossing – Design engineering

- With HDD
  - Both casings and an intersect would be necessary
  - Nearby road and cliff made this impossible



Rail + river crossing – Design engineering

- With microtunnelling
  - Vertical secant pile shaft down to shale formation
  - Tunnelling in a straight line through the shale



Small-scale HDDs – River crossing

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River crossing – Design engineering

- Crossing constraints
  - Entry and exit on narrow country road, exit on a sharp bend
  - Limited access to and space around the jobsite
  - Wetland area with protected woodland and housing nearby
  - Sands and fractured granite rock : high permeability and instability in both layers

River crossing – Design engineering

- Technique selection
  - HDD given the crossing length and drill path depth (below water table)
- Crossing profile
  - Initial design (2022) : 3 parallel drills with reduced hole diameter (325mm each) given anticipated instability and thermal duct constraints
  - Mode op modified (2024) : 2 parallel drills (550mm and 600mm), as drilling teams believed ground stability would be better

River crossing – Works phase

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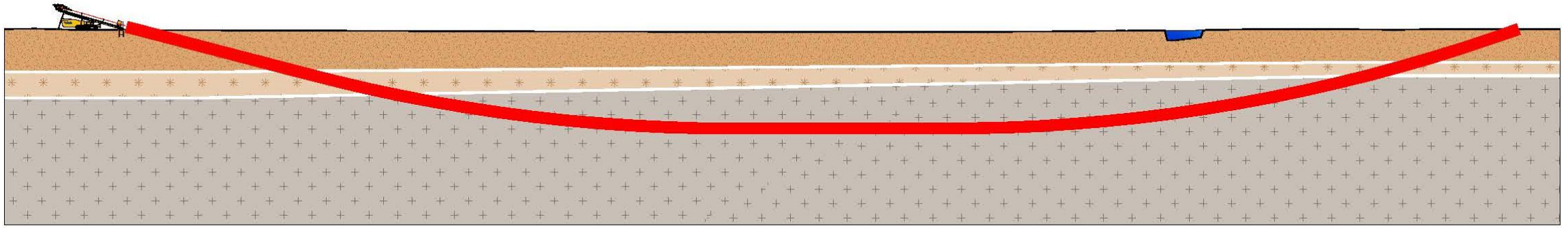
River crossing – Works phase

- Crossing in hard granite
- Less than 2km from the landfall site



River crossing – Works phase

- Challenging drilling works
  - Neat timber didn't make for easier drilling !
  - Lost hole on cleaning pass, possible ground collapse
    - Consequence ? Another rig needed to re-open the tunnel from the exit point
  - Reamer tools mobilised were not appropriate (pre-used)
  - No spare reamers were mobilised onsite
    - Consequence ? Downtime

River crossing – Works phase

- Mode op modified onsite to 1 single drill to avoid serious road collapse
- Lessons :
  - Ensure drill pipe continuity - always add a drill pipe behind the reamer !
  - Use new tools in granite - no matter how short the crossing !
  - Do not underestimate the potential impact of the surrounding ground on pit conditions (sand, fluctuating water table, …)
  - Make sure the pit lining takes account of the **details** of the drilling operations

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River crossing schedule : 1¾ months

February	March	April

Installation
8 days

Pilot hole
6 days

Reaming
19 days

Pullback
2 days

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Conclusions

- Landfall
  - Site choice was crucial **!**
  - Trenchless engineering expertise from the outset was key to project success
  - Big projects need big focus on paperwork (HSE, permits, insurance) !
  - Don’t underestimate the impact of nature : planning and cost
- River crossing
  - A shorter crossing isn’t always easier !
  - There is no such thing as an easy crossing in granite !
  - Take the same precautions, anticipate risks, devote the necessary resources (planning, new tools, spares, expertise, …)
  - Details are everything !
- An experienced driller is priceless !

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