



# Delivering the Bank Station Capacity Upgrade Project

## Innovation through Collaboration

Cate Anthony  
(Dr. Sauer & Partners)  
and  
John Comins  
(Dragados)



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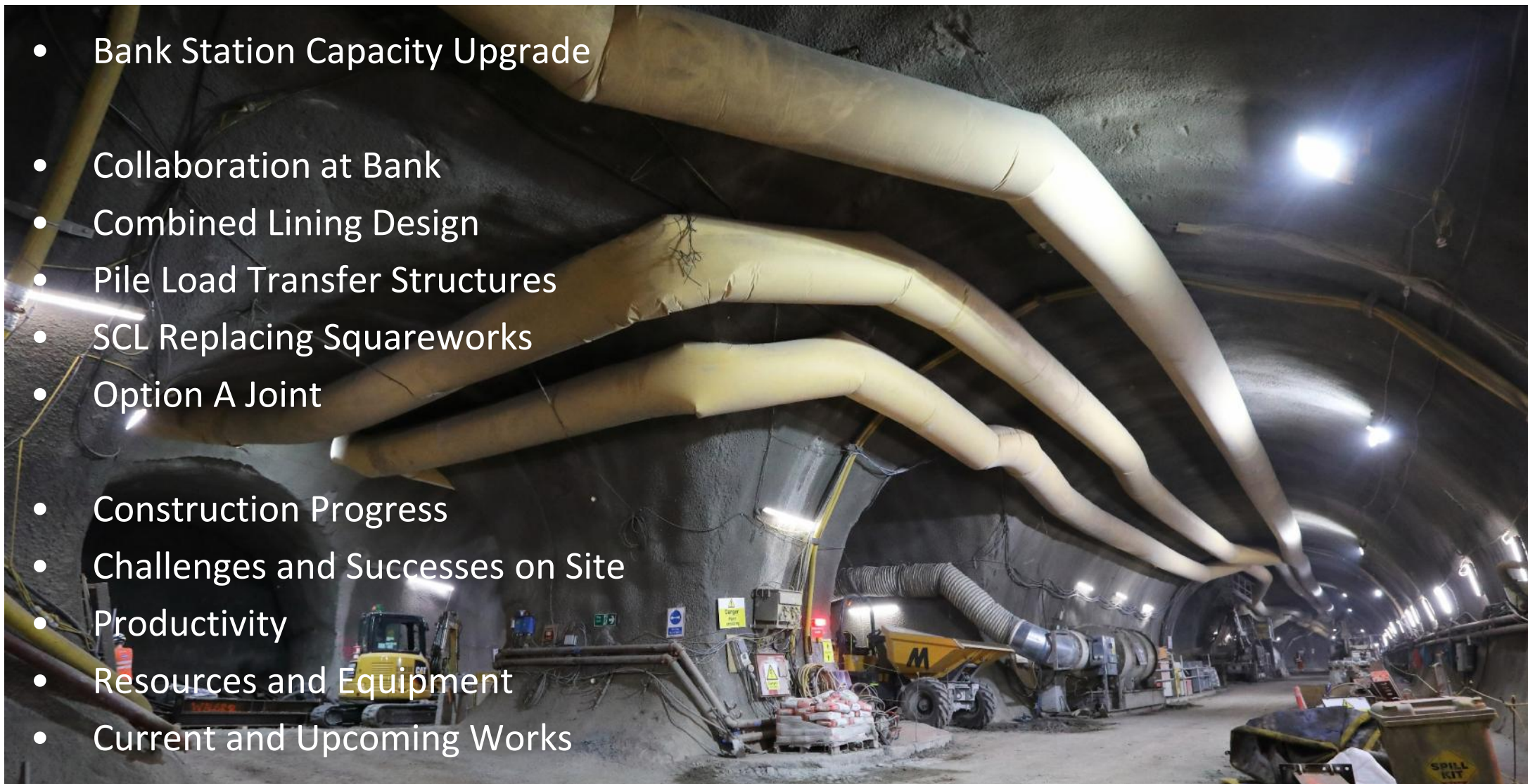
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# Agenda

- Bank Station Capacity Upgrade
- Collaboration at Bank
- Combined Lining Design
- Pile Load Transfer Structures
- SCL Replacing Squareworks
- Option A Joint
- Construction Progress
- Challenges and Successes on Site
- Productivity
- Resources and Equipment
- Current and Upcoming Works



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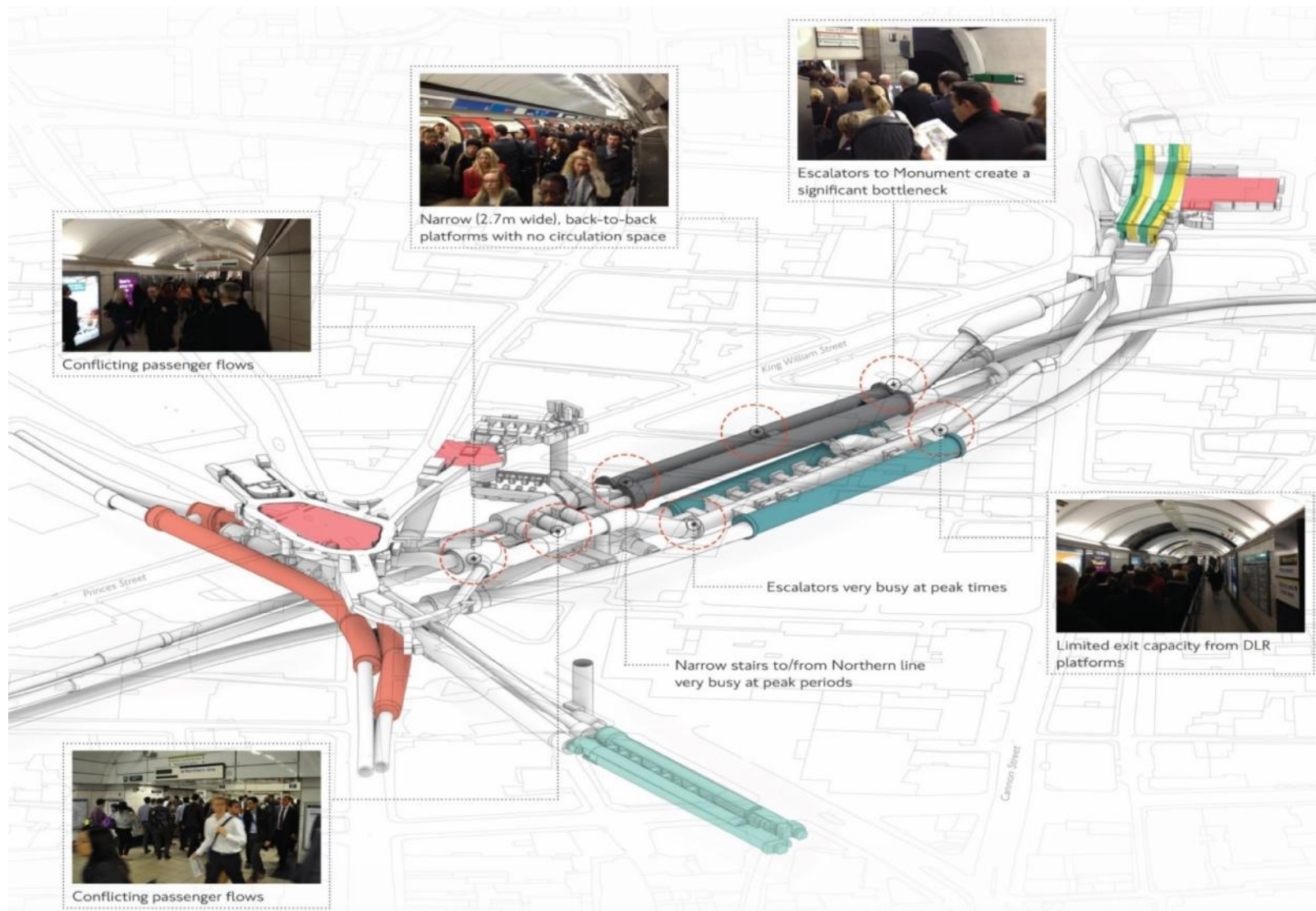


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Bank Station Capacity Upgrade



# Bank Station Capacity Upgrade



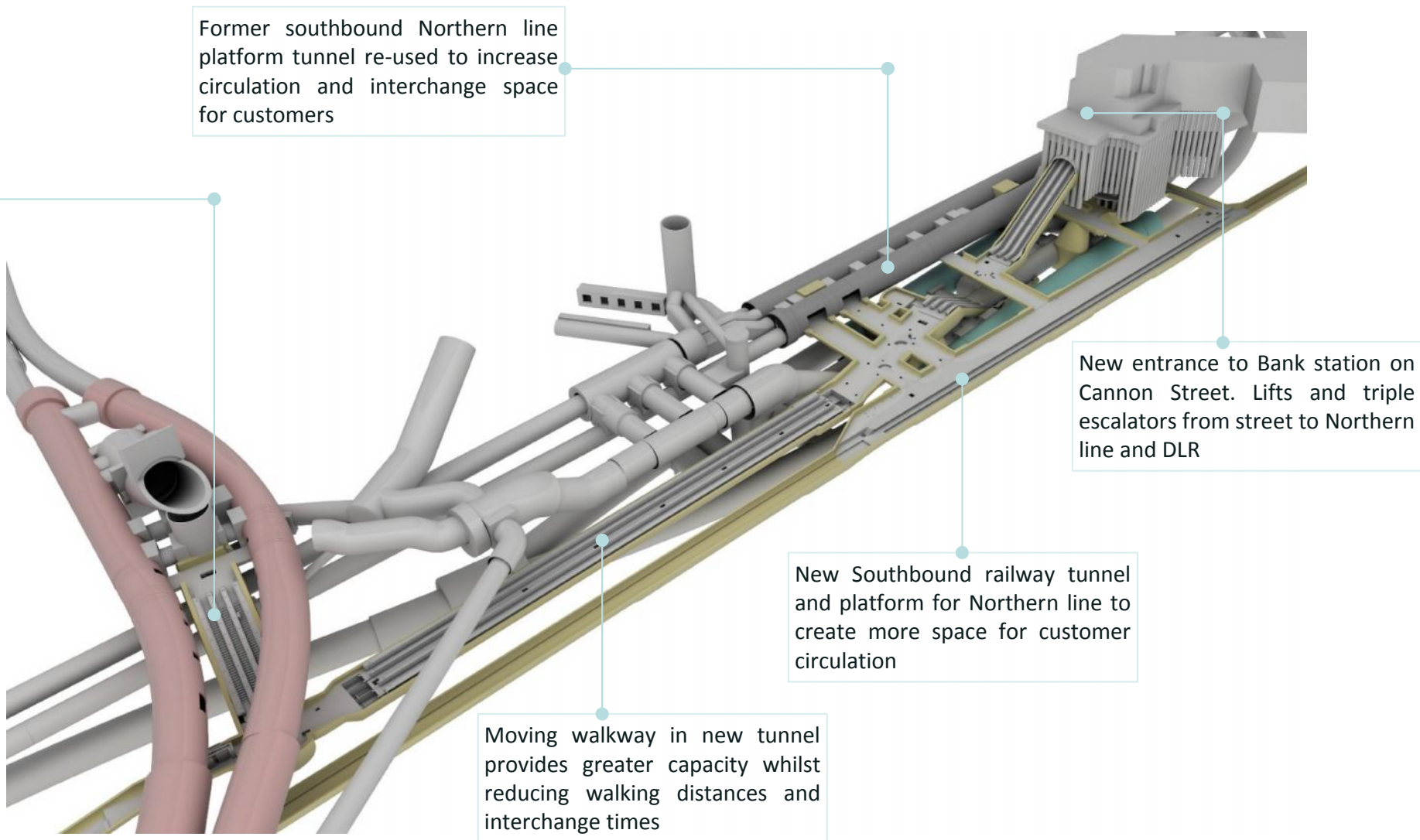
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# Bank Station Capacity Upgrade



UNDERGROUND



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# Design Philosophy – Tier 2 Engagement

## SCL DETAILED DESIGN

Sketch   Draft Design   Final Design   IDC   Compliance Submission   IFC

TIER 2  
ENGAGEMENT

TIER 2  
ENGAGEMENT

FINAL CONSTRUCTABILITY  
REVIEW

TIER 2  
ENGAGEMENT

LU REVIEW

Dragados  
Tier 1

London  
Underground

Joseph Gallagher  
Tier 2  
Tunnels

Dr Sauer  
Tunnel Designer



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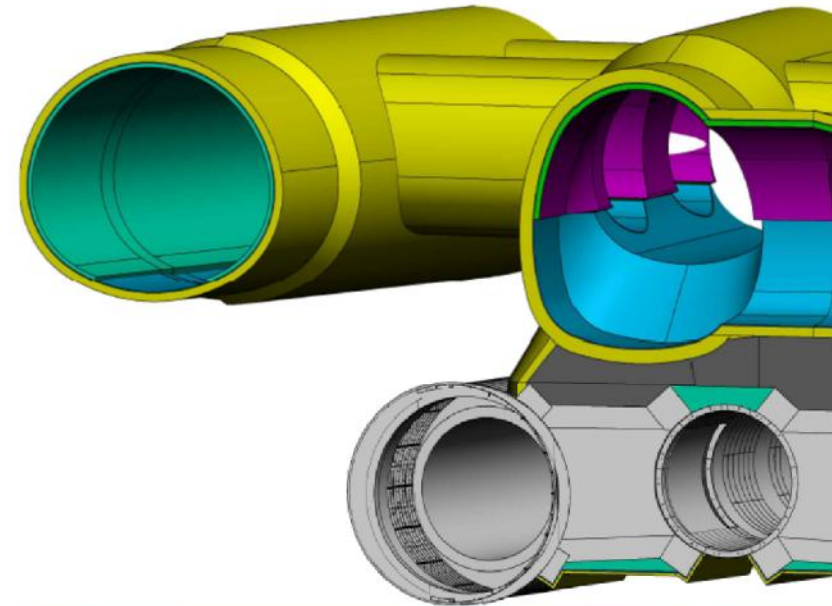
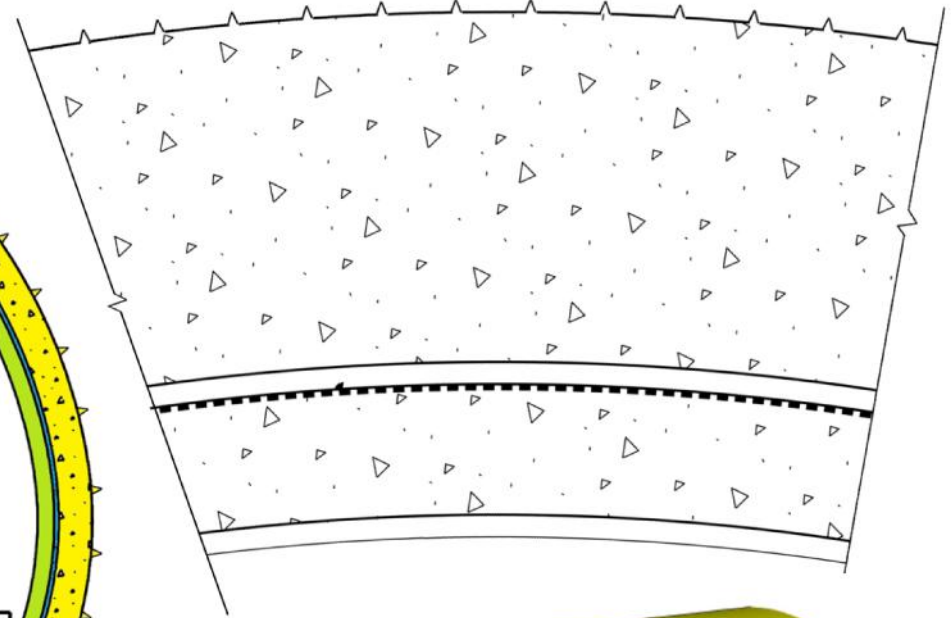
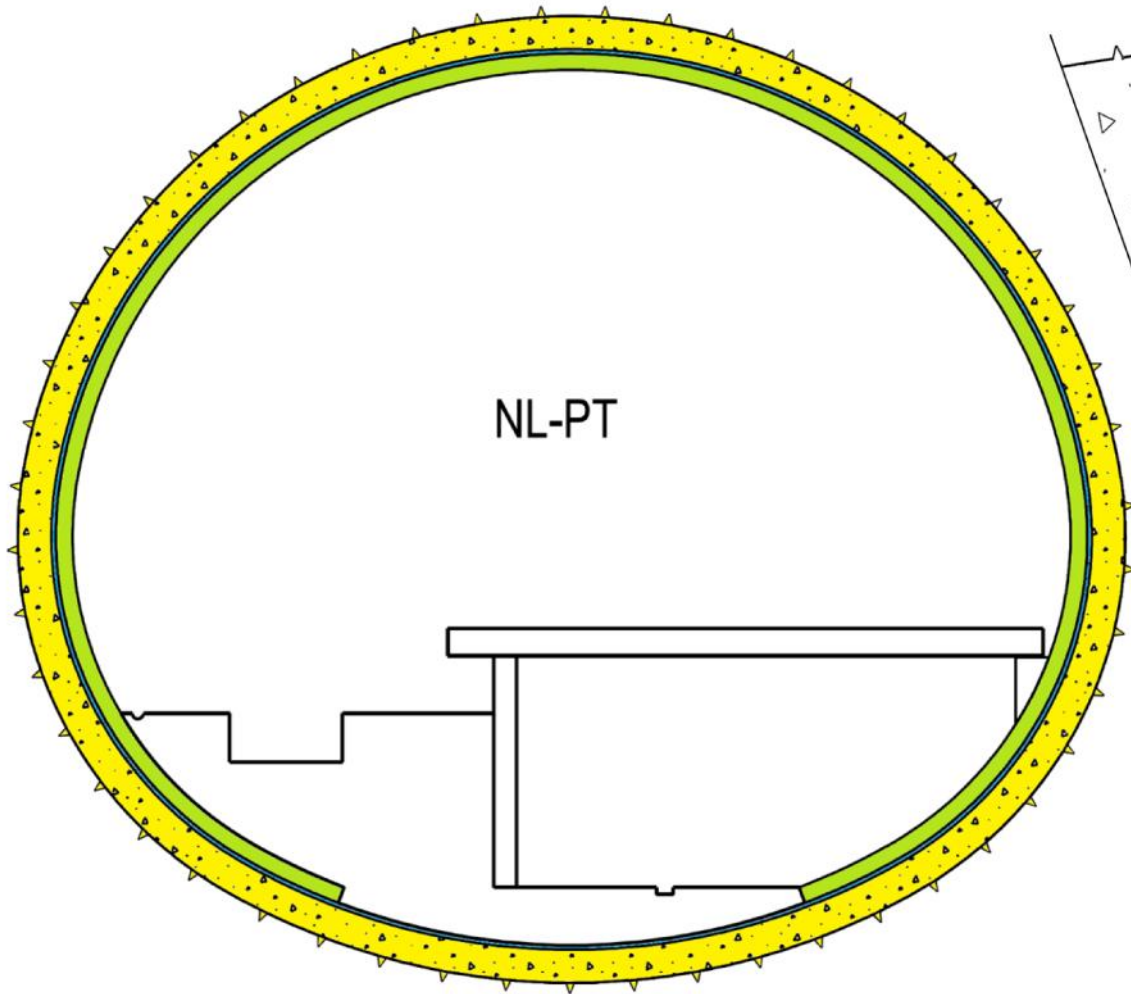


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# Combined Lining Design



- Approximately 15% saving in lining thickness



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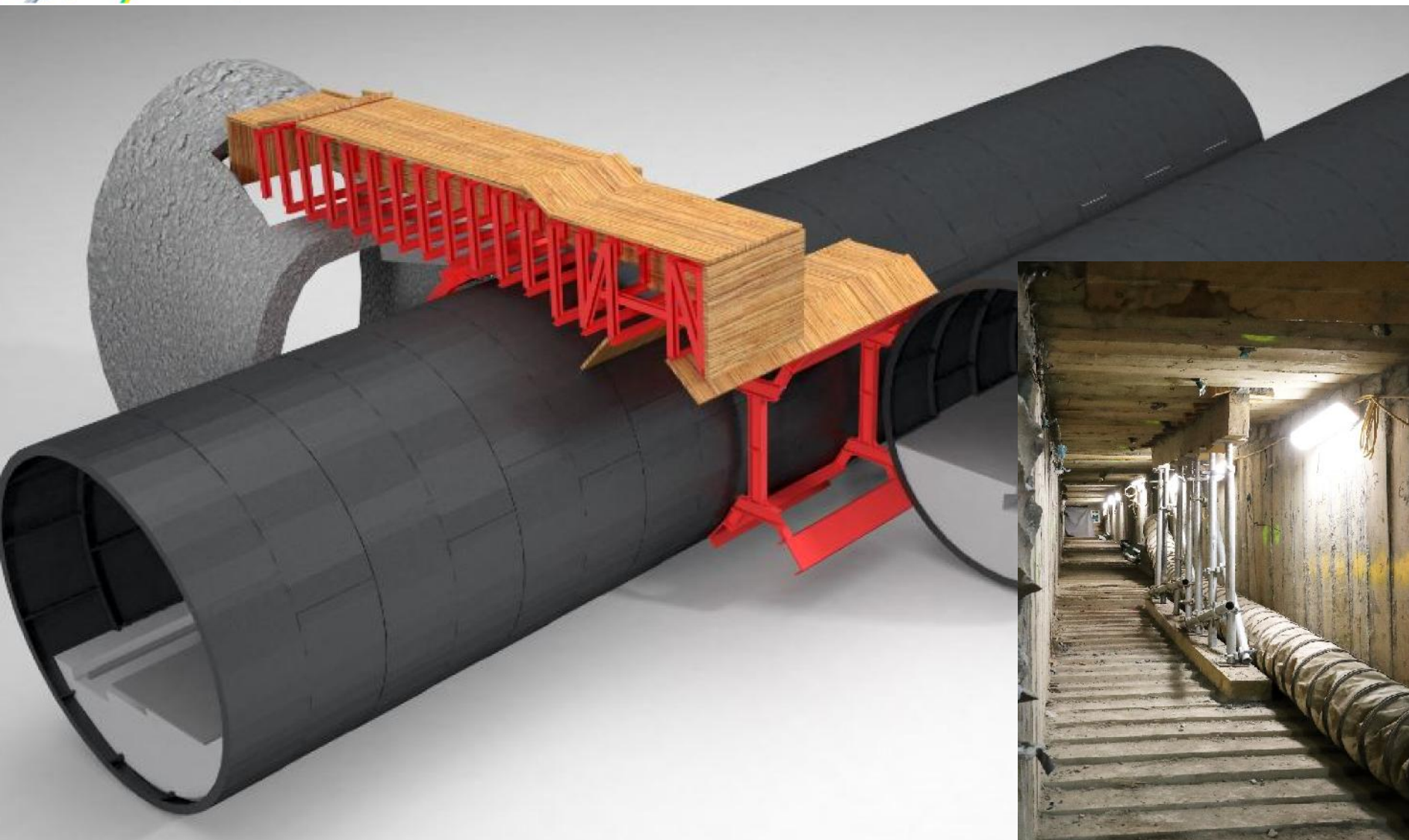


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# SCL Replacing Squareworks



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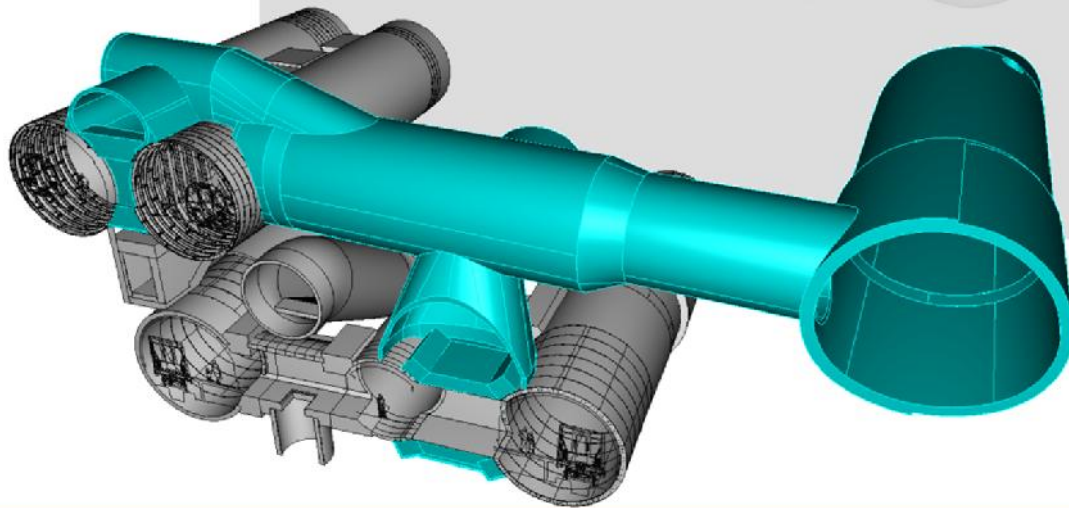
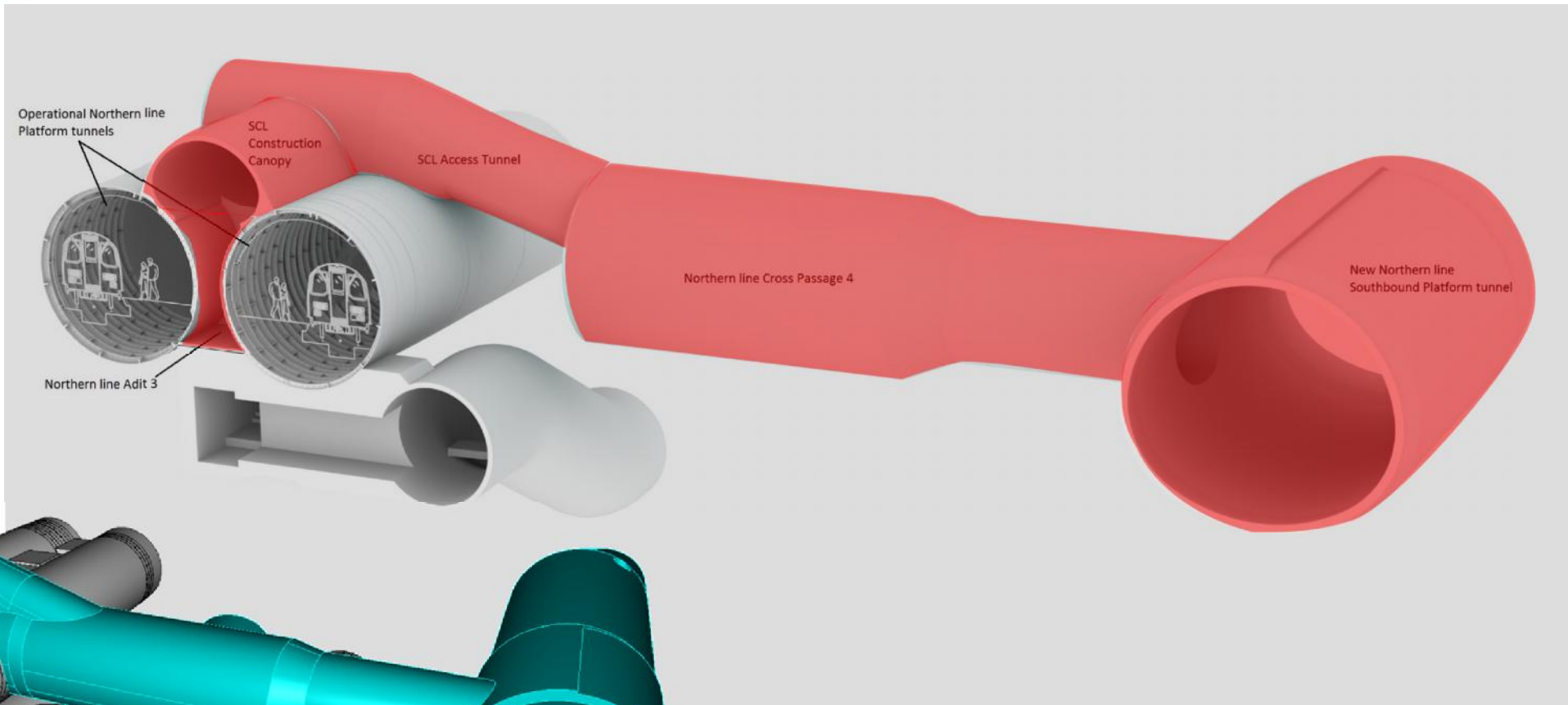


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# SCL Replacing Squareworks



- Existing assets
- New SCL tunnels
- Construction sequence



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# SCL Replacing Squareworks

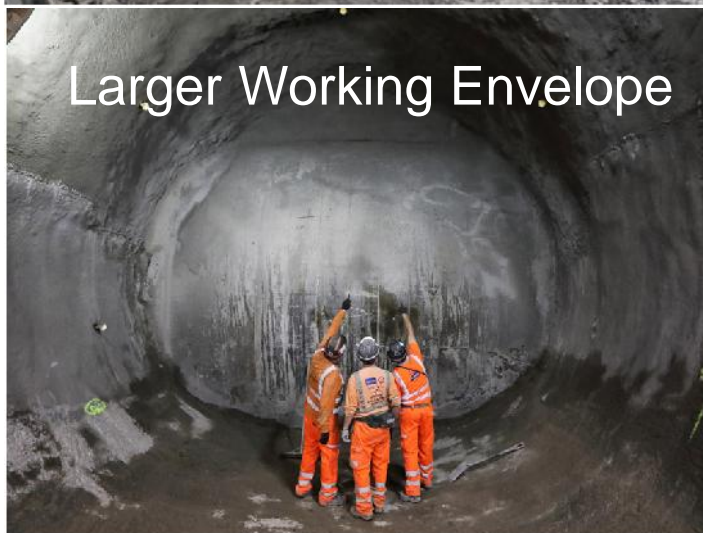
Faster and Safer



Mechanised Excavation and Support



Larger Working Envelope



Improved Waterproofing



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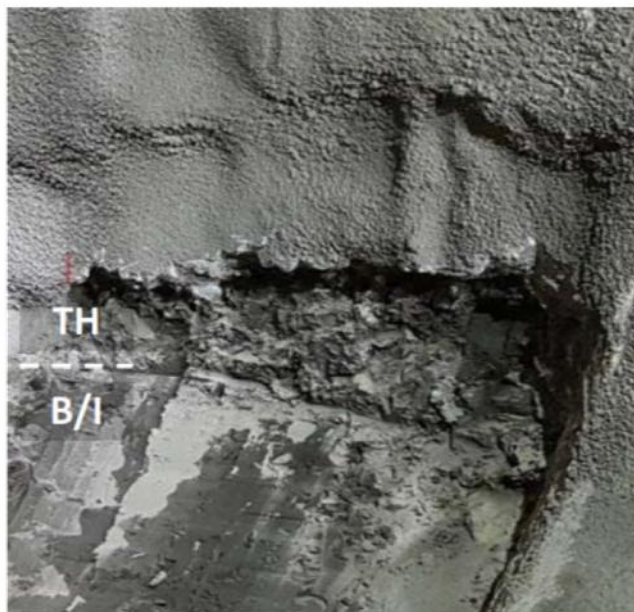


# Option A Joint

Step 1: Primary SCL at stepped joint



Step 2: Toe break-off



Step 3: Primary lining to full thickness



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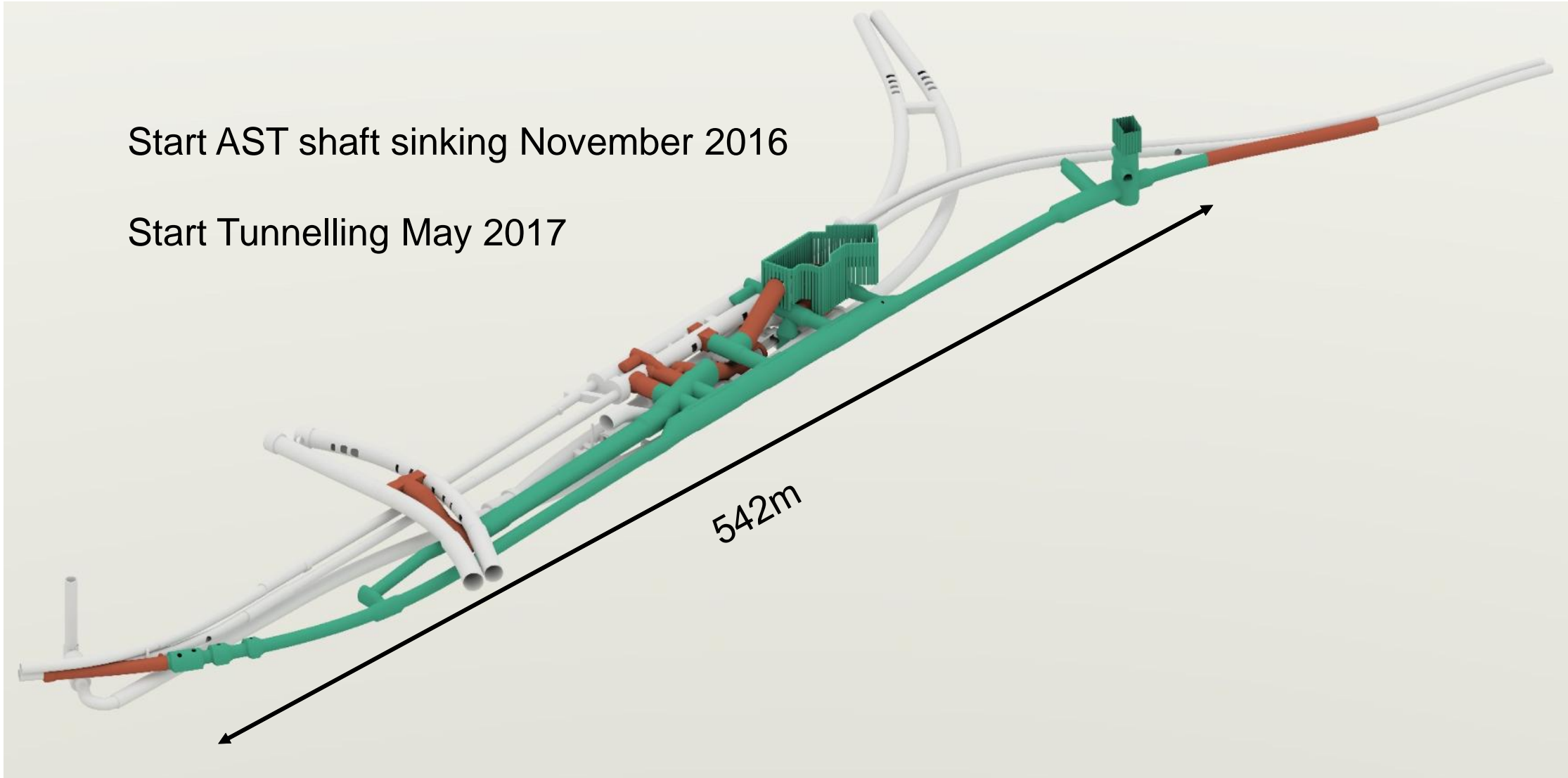
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# Construction Progress so far

Start AST shaft sinking November 2016

Start Tunnelling May 2017



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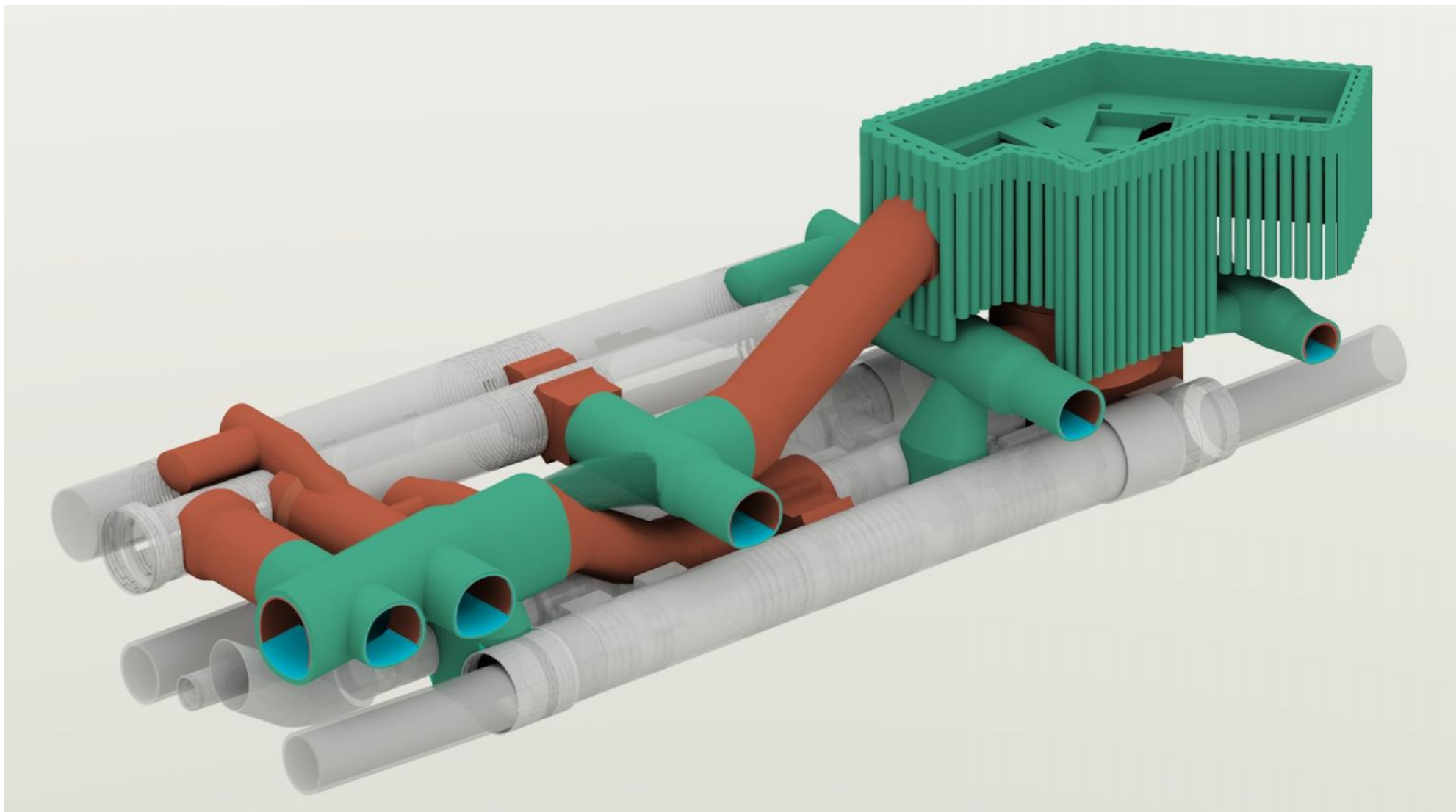


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# Construction Progress so far – Central & WBS



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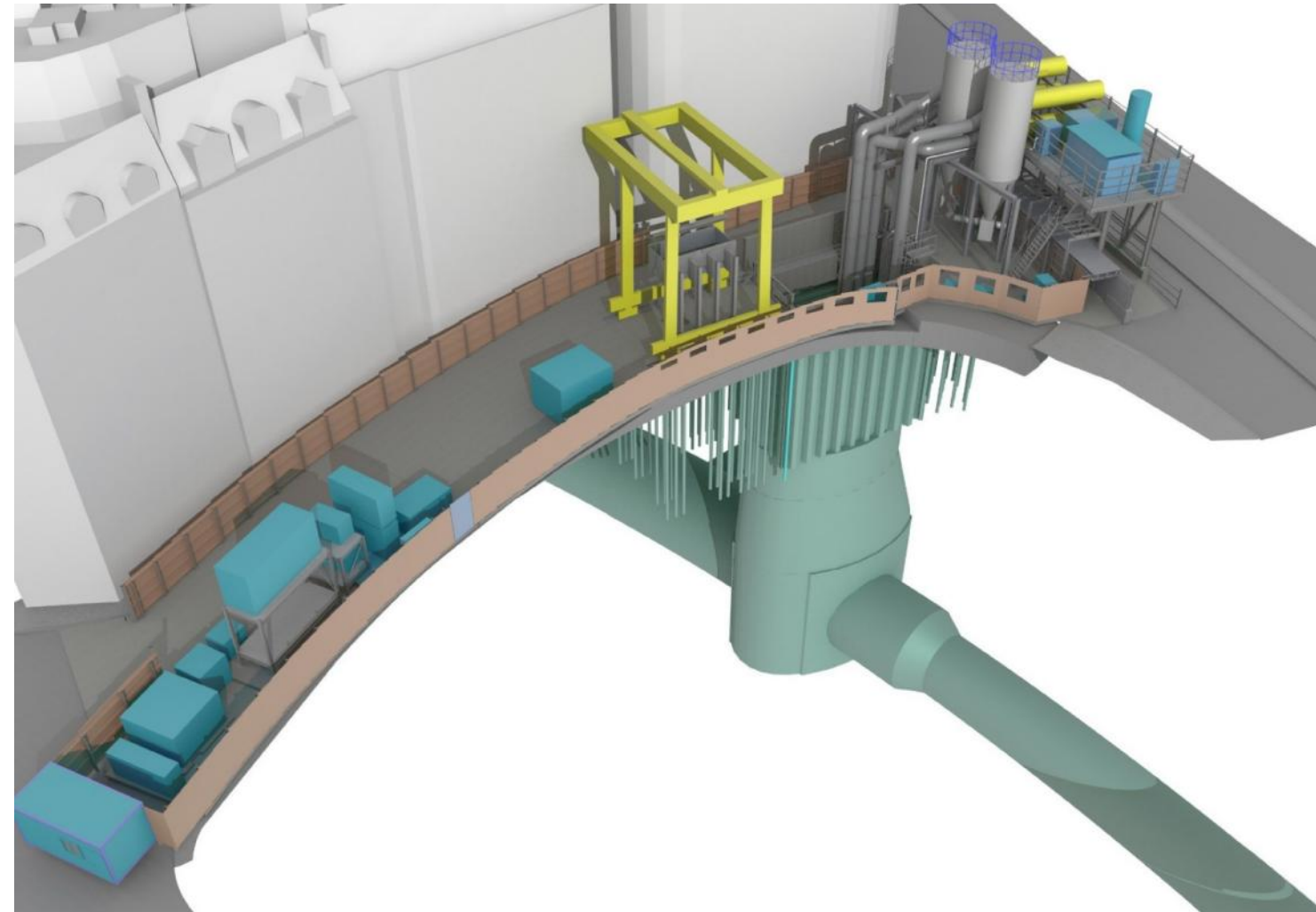
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# Challenges and Successes – Site Establishment



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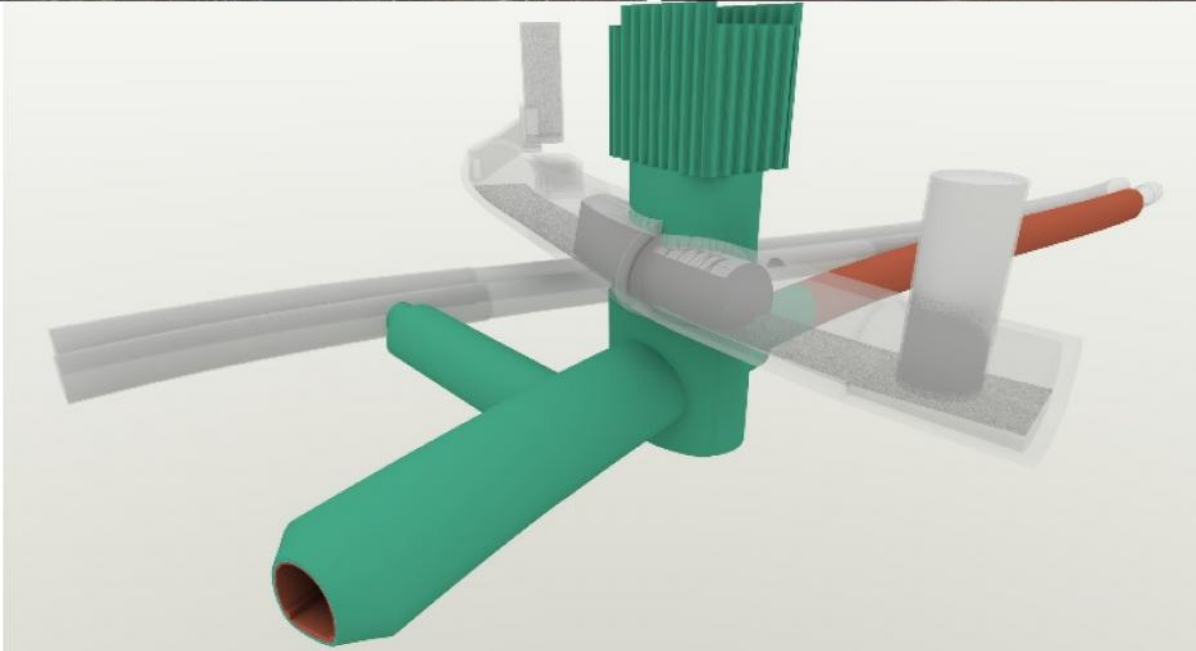
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# Challenges and Successes – AST Shaft Sinking



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# Resources and Equipment - Excavation



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# Resources and Equipment – Concrete Supply



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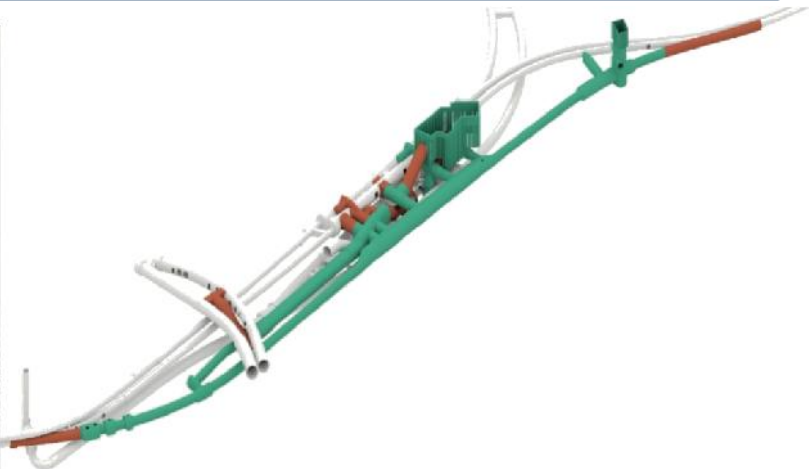


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# Resources and Equipment – Dust & Ventilation



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2018

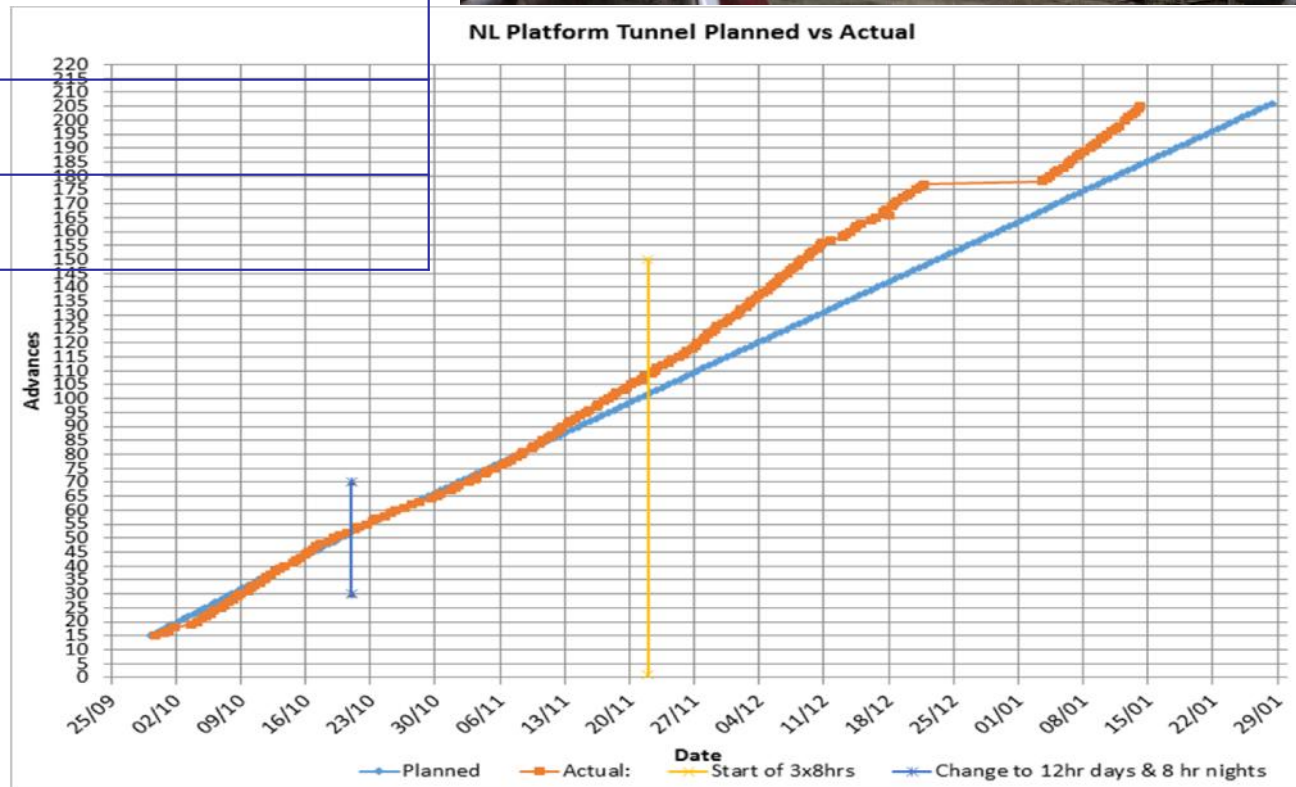
# Productivity



Tunnel	Dia	Shift	m/day (ave.)		Comment
NL RT & pilot	4.9m	12hr	2.0	Full Face	Including initial plant chamber
		8hr	2.7		
NL Platform	9.8m	12hr	1.2	TH - INV	Enlargement from pilot
		8hr	1.5		
CP3	8.2m		1.3	TH - INV	
CL-MW	7.7m		1.8	TH - INV	



NL Platform Tunnel Planned vs Actual



5 Oct 2017 10:59:00



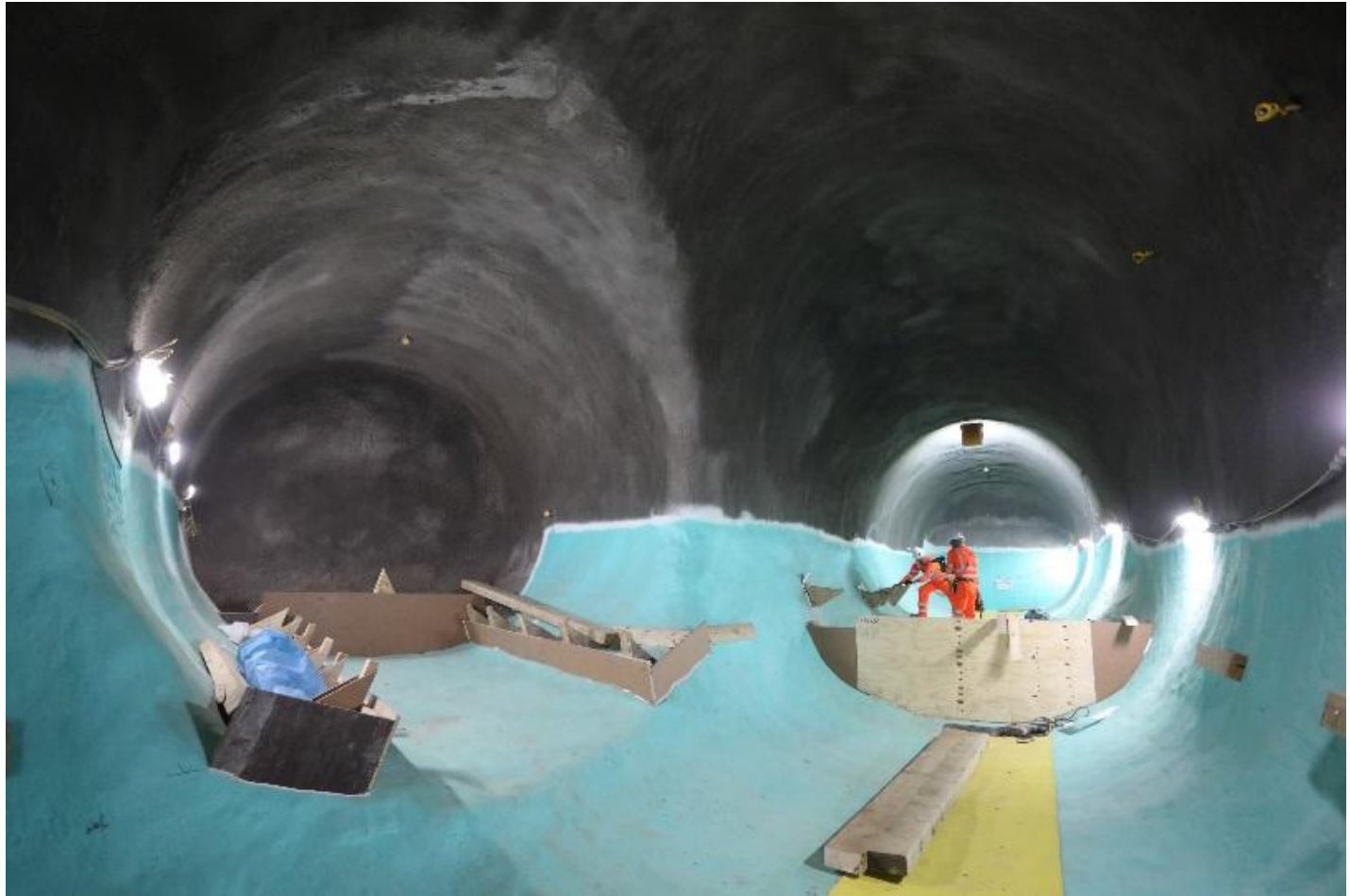
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# Current Works – Waterproofing



- PVC and Mapelastic spray membranes
- 2 layer system
- Mapelastic is water based, supplied premixed and dust free
- Waste is minimised and it is simple to spray



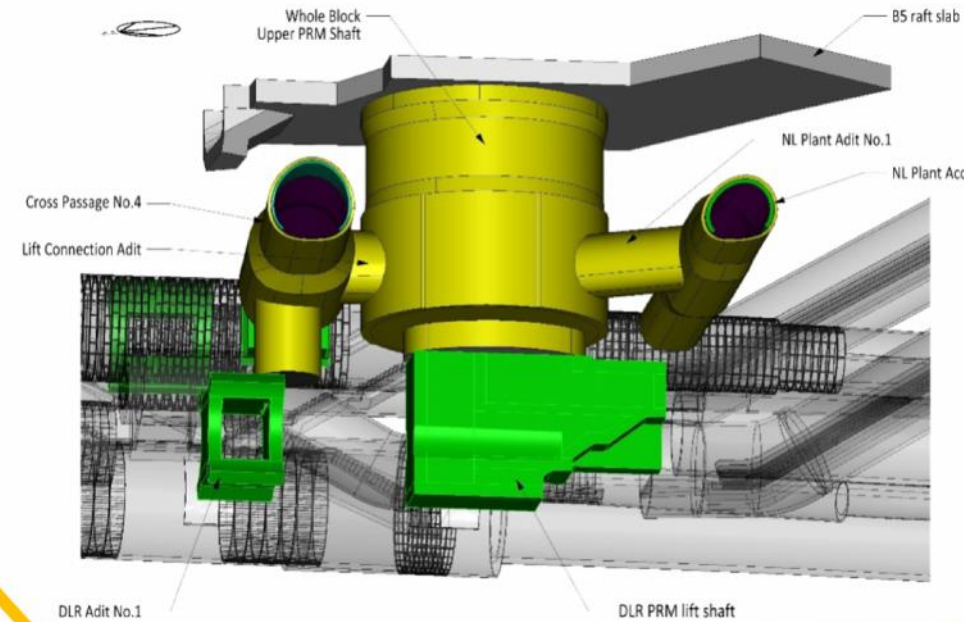
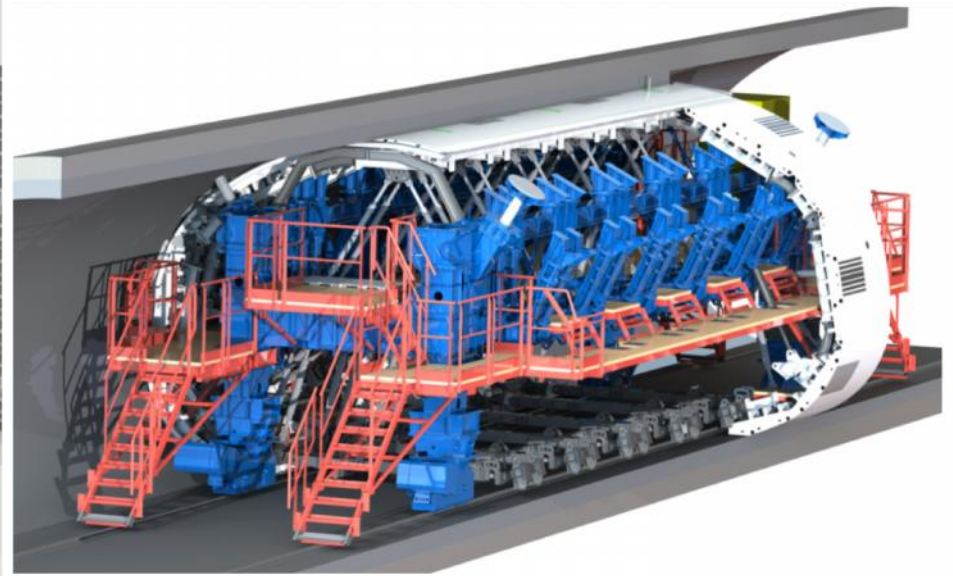
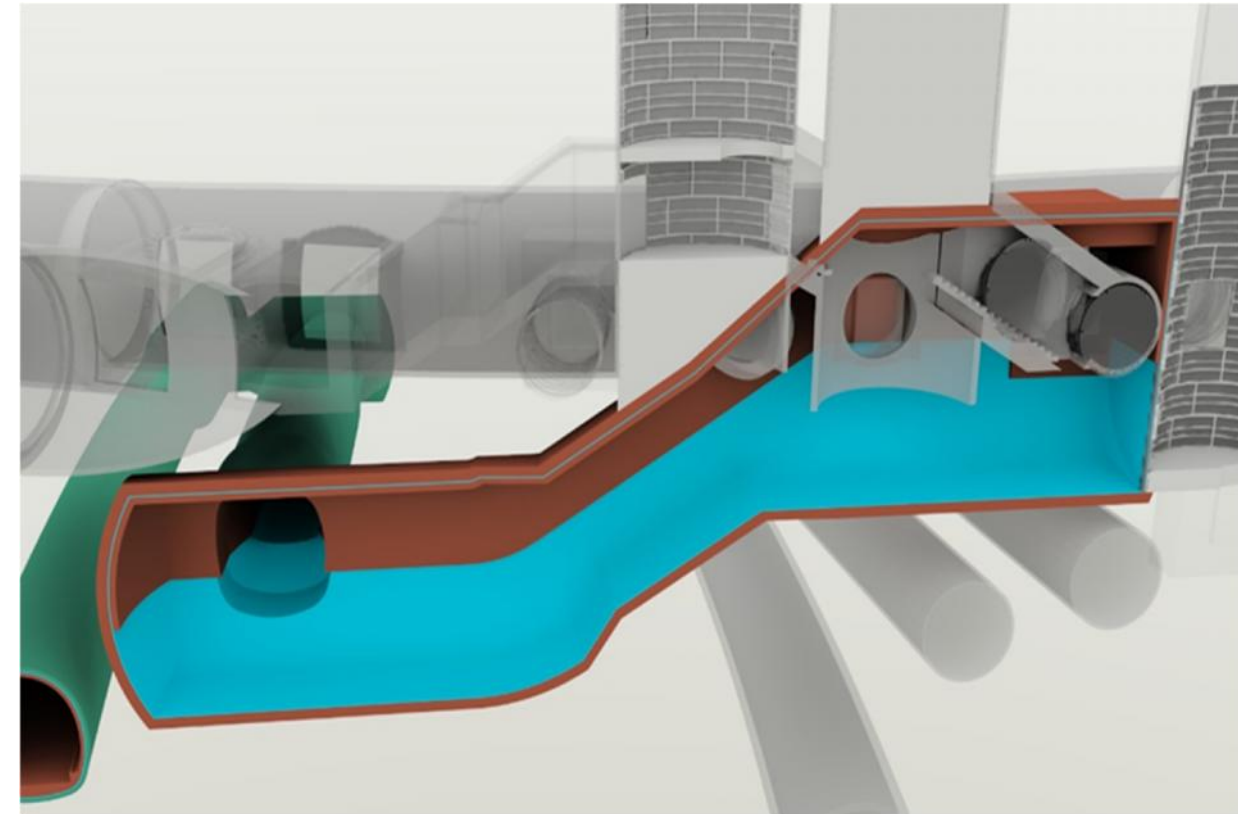
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# Upcoming works



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# Thank you for your attention



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