World Tunnel Congress & Exhibition

WTC 2019

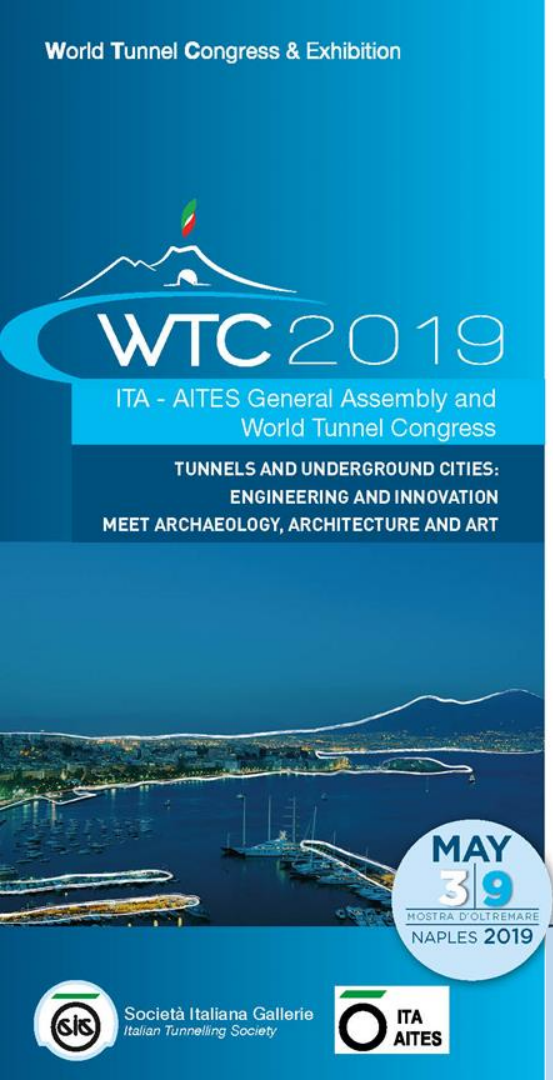
ITA - AITES General Assembly and World Tunnel Congress

MAY 3 | 9
MOSTRA D'OLTREMARE
NAPLES 2019

TUNNELS AND UNDERGROUND CITIES: ENGINEERING AND INNOVATION MEET ARCHAEOLOGY, ARCHITECTURE AND ART

Società Italiana Gallerie
Italian Tunnelling Society

ITA AITES



Technical Visit

date: 09.05.19

LINE C: the new Underground in Rome

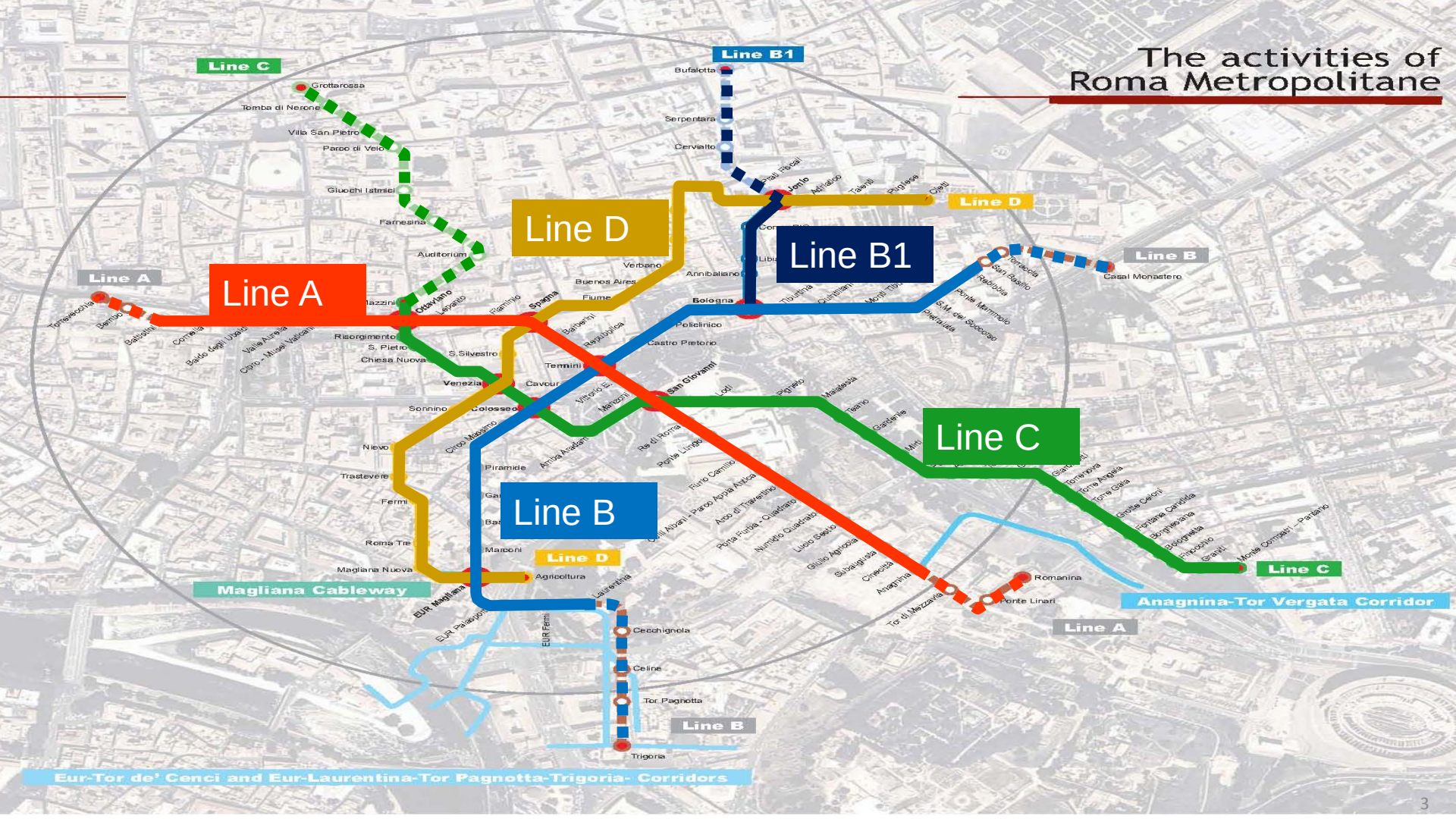
Andrea Sciotti

(Roma Metropolitane s.r.l.)

ROMA METROPOLITANE

METRO C

The activities of Roma Metropolitane



ROMA

Client

ROMA METROPOLITANE

atac ROMA

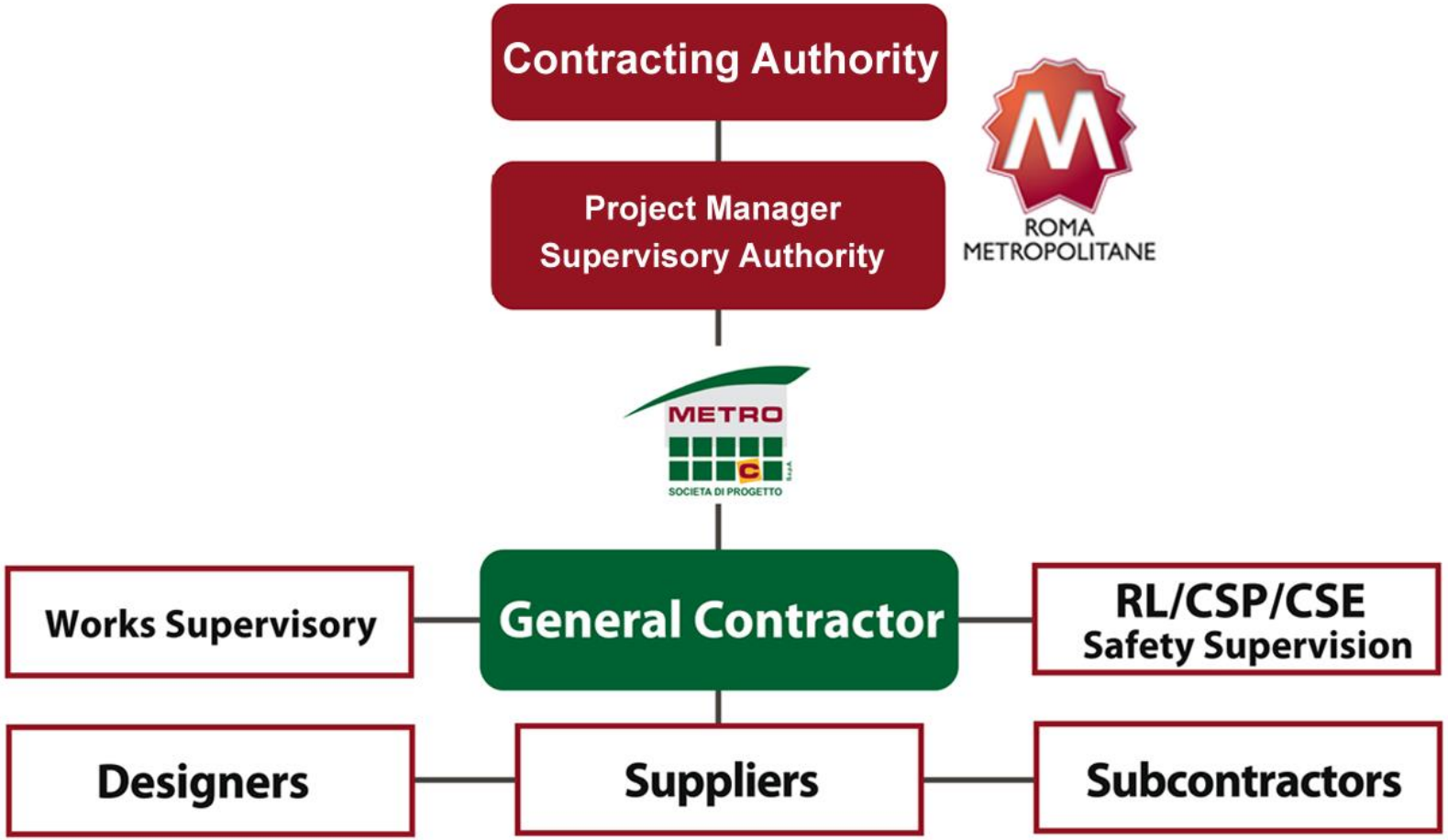
Contracting Authority

Service Operator

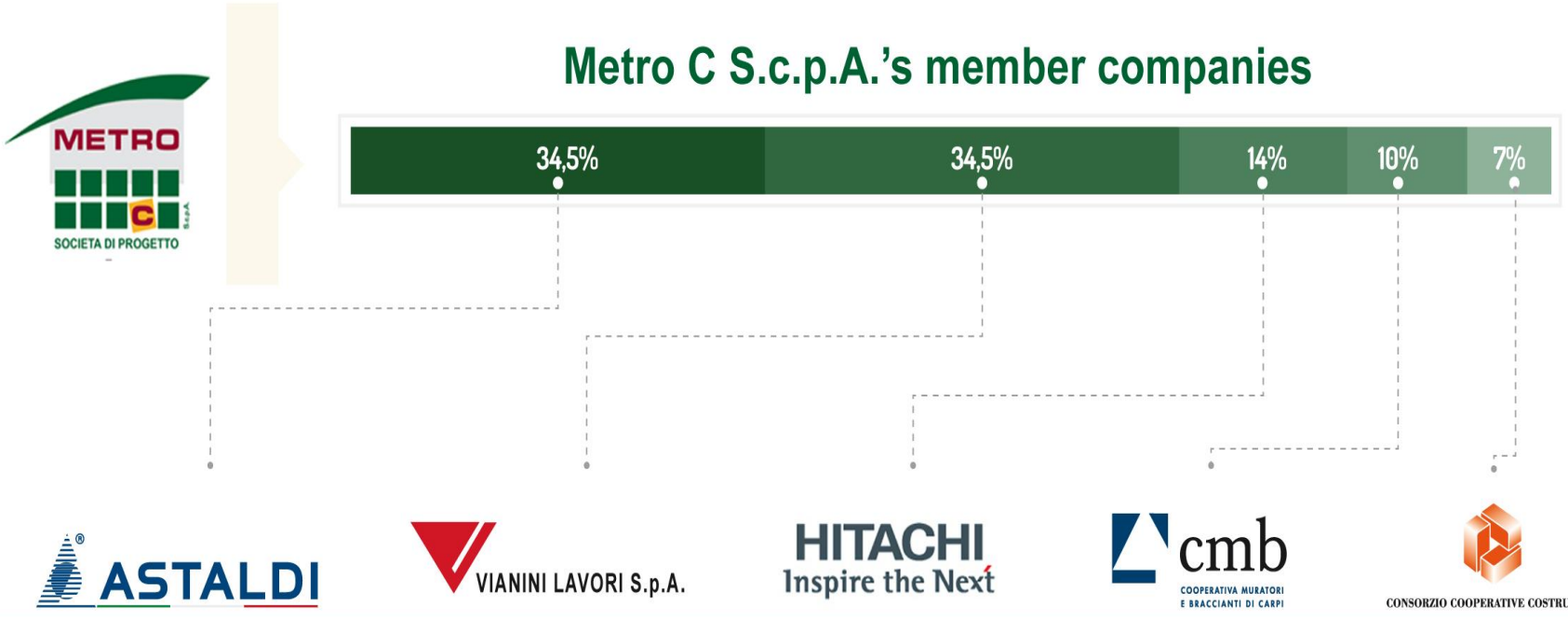
Work in progress (until now ……)

	2004	2018
	A+B	A+B **+B1** **+C** (partially)
Metro Lines (Km)	**36,5**	**59**
Stations (n.) **(of which in the historic City centre)**	**49** (15)	**75** (15)

Line C: General Contractor



Line C: General Contractor



Line C: Main System features

Rome Line C is a mass transit railway, with high capacity and low headway, based on standard rail and **completely driverless** (without driver on board).

Line C is both on viaduct and subway.

Operation management is carry-on from the Graniti Depot operating control room (OCC).

Operation management is based on the presence of stewards who assist the passengers and overwatch the stations, with knowledge of the Train and capable of driving it in degraded mode (if necessary).

Station platforms and guideway will be physically separated by Platform Screen Door System, fully automated and syncronized with the train's doors.

Line C: Main System features

Line Length: **25.5 km**
Number of Stations: **30**
19 subway and 11 open air

Contractual Service
Availability granted 98.5%
Commercial Speed 35.7 km/h

Max Speed: **80 km/h**
Acceptace range for
station stopping +/- 30cm

Fleet: **30 trains** of
1,200 passengers each
(6 pass/m^2)

Minimun headway: **180 seconds**
System capacity at 180 sec
24,000 pphpd
Lowest headway: capable 90 seconds

Depot: Main System Features

Full Heavy maintenance for the trains
Trains start-up and testing
Spare-part management

Train recover area for the
non-operating hours
Full light maintenance on site
for every sub-system provided

Line C: Main sub-Systems

The **Automatic Train Control (ATC)** is the system which ensures the safe and reliable movement of trains and their supervision from a remote location.

Platform Screen Door System: provides a physical separation and segregation between stations platforms and guideway, and, moreover, a safe access to the train.

Train: 30 new generation trains with 6 cars and 204 seats; 80 km/h max speed reachable

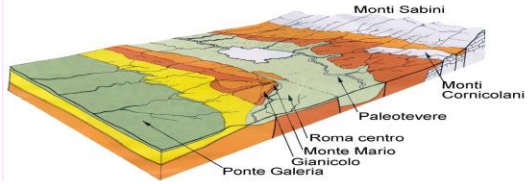
Power Supply system: ensures collection of power from outside line (main city supplier) and distributes it to every sub-system of the metro.

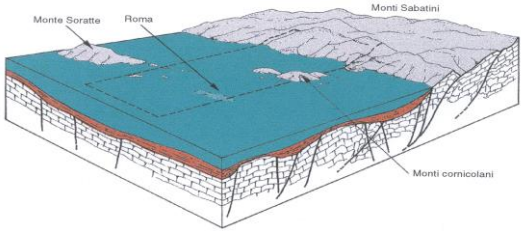
TLC: shared TLC infrastructure ensures full reliability between TLC sub-systems and enforces future extentions options. Optical fiber Gigabit Ethernet with double ring grants full redundancy and high availability for every sub-systems.

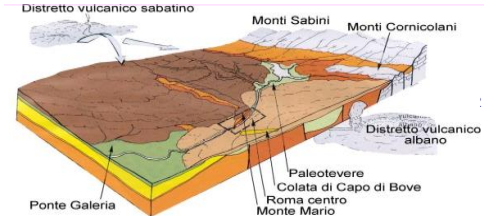
Scada: allows the OCC operators to control and command every device remotly. SCADA IT is for controlling and commanding everything related to civil works (for example escalators, lights, elevators, etc). SCADA IE is for controlling and commanding everything related to main power supply (HV and traction).

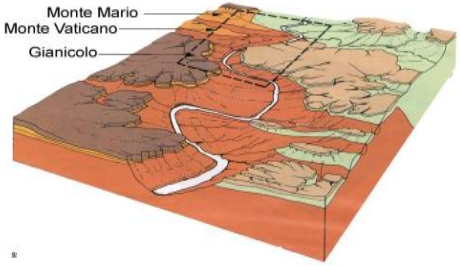
Depot-OCC: the OCC is the place where everything is remotely managed, both automatically and manually.

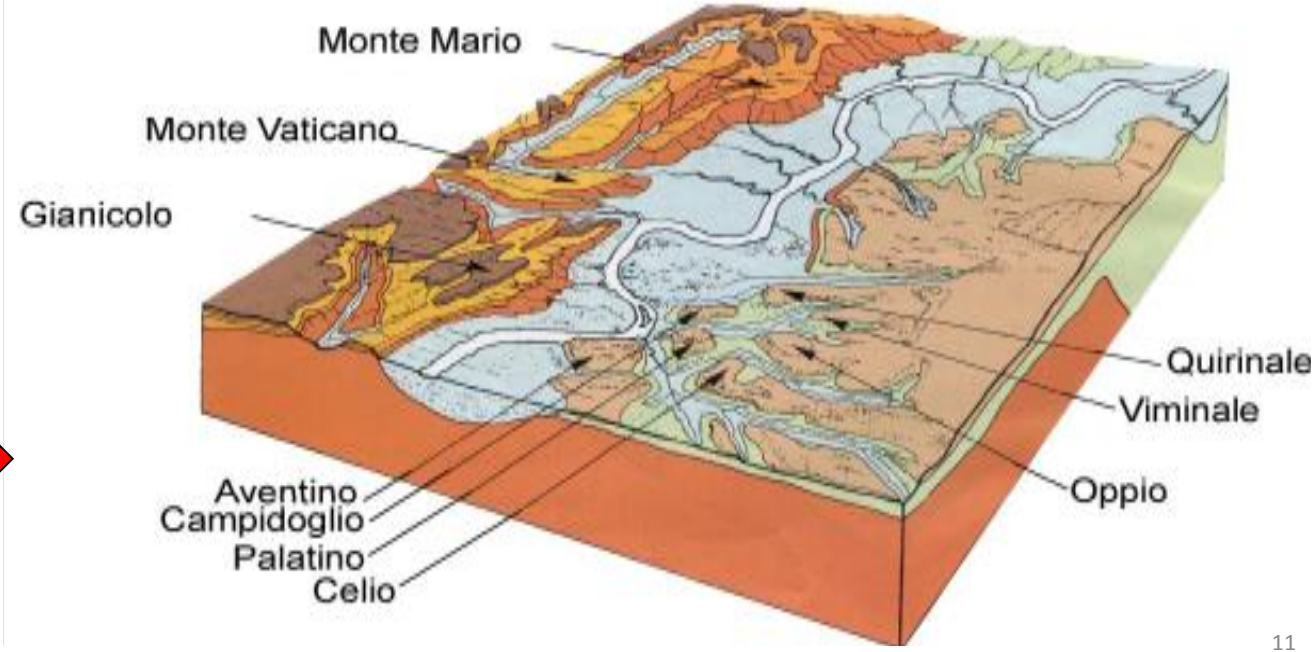
City of Rome – Geological constraints











City of Rome – Historical constraints

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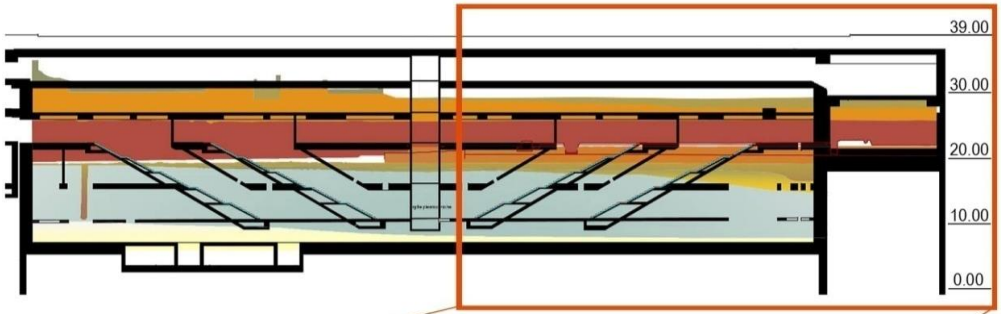
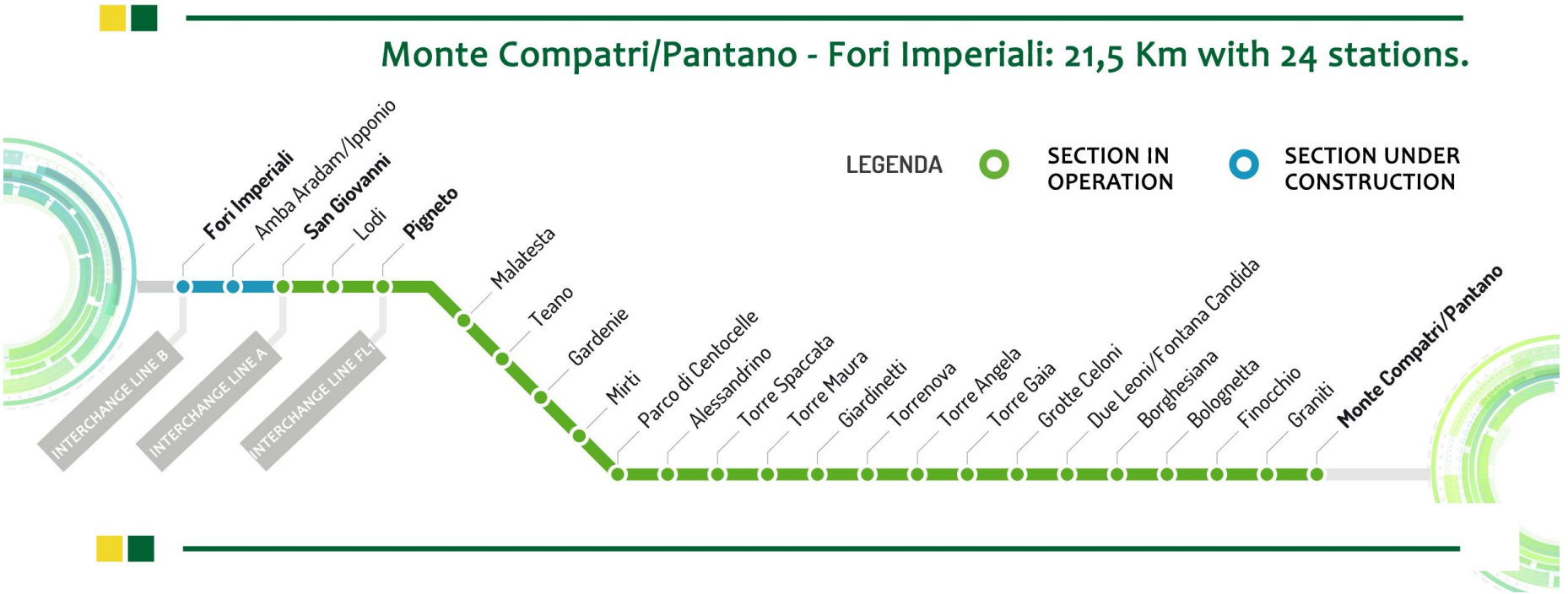


San Giovanni Station - Line C

39,00 asl			
MODERN AND CONTEMPORARY PERIOD (XVIII-XXI a.C.)	FASE 21	b	Rasature e livellamenti per la realizzazione del quartiere contemporaneo
		a	Interri su Via dei Cannetì, messa in opera degli ambienti 9, 10 e nuovi interventi edili negli ambienti 4-5
	FASE 20		Ambienti 4, 5, 7, 8
	FASE 19	b	Viadotto e nuovi interventi edili nell'amb. 3
		a	Selciato dell'Appia e condotti idrici
32,00 asl			
EARLY MODERN PERIOD (XV-XVII a.C.)	FASE 18		Irreggimentazione del fosso, vasche per la calce ed i battuti della via Appia. I primi battuti di via dei Cannetì e gli ambienti 2-3
	FASE 17		Interventi di rasatura della stratigrafia e delle strutture, livellamenti e primi battuti su via dei Cannetì
30,50 asl			
MIDDLE AGES (VII-XIV a.C).	FASE 16		Realizzazione dell'ambiente 1=11
	FASE 15		Resti di strutture medievali
			Depositi naturali, accrescimento lento tra VI secolo d.C. e medioevo
29,00 asl			
LATE IMPERIAL PERIOD (IV-VI a.C)	FASE 14		Sepolture e riporti tardo-antichi
	FASE 13		Agricolo
25,50 asl			
MIDDLE IMPERIAL PERIOD (III a.C.)	FASE 12		Bonifiche ad anfore e canali drenaggio
	FASE 11		Riporti legati a bonifiche e canali di drenaggio
			Interfaccia di distruzione delle strutture idrauliche e livellamento a quota m 22.70 slm
			Spoliazioni ed interro della vasca
20,00 asl			
EARLY IMPERIAL PERIOD (I-II a.C.)	FASE 10		Fase di uso della vasca e della noria, sistemazione del giardino
	FASE 9		Realizzazione della vasca
			Le strutture idrauliche del Corpo 3 ed i condotti con tubuli fittili
			Realizzazione canale principale NW/SE, corpo 3
			Realizzazione del muro in opera reticolata
	FASE 8		Abbandono della canaletta in cappellaccio e della chiusa
			Seconda fase di utilizzo della canaletta in cappellaccio e realizzazione della chiusa
19,50 asl			
REPUBLICAN PERIOD (V-I b.C.)	FASE 7		Messa in opera della canaletta in cappellaccio e sistemazione del bacino idrico nel settore nord
	FASE 6		Realizzazione del muro ad *emplecton* con cortine in blocchi di cappellaccio
	FASE 5		Depositi alluvio-colluviali con materiali antropici
19,00 asl			
ARCHAIC PERIOD (VII-VI b.C.)	FASE 4		Occupazione agricola dell'area con reticolo di canali ed una struttura con scapoli di tufo
	FASE 3		Canalizzazione con argine artificiale in blocchi di cappellaccio
15,50 asl			
PROTOHISTORIC PERIOD	FASE 2		Alluvioni con materiali antropici
14,00 asl			
PLEISTOCENE FORMATIONS	FASE 1		Limi
			Sabbie e ghiaie

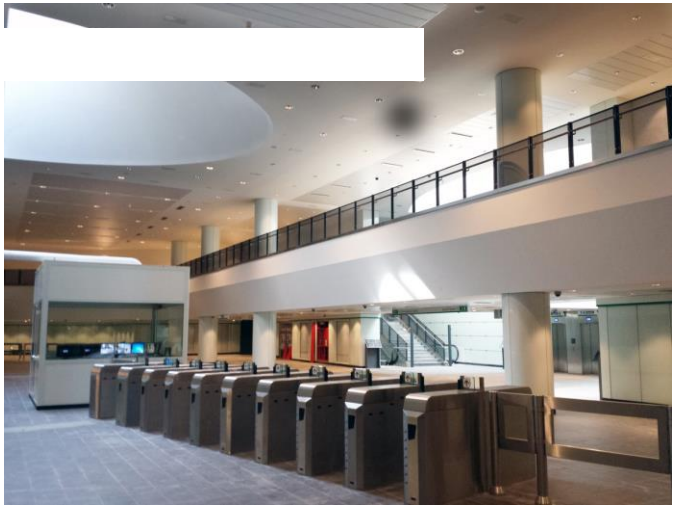
what we did .....



..... 18,5 km realized and 22 new Stations in operation

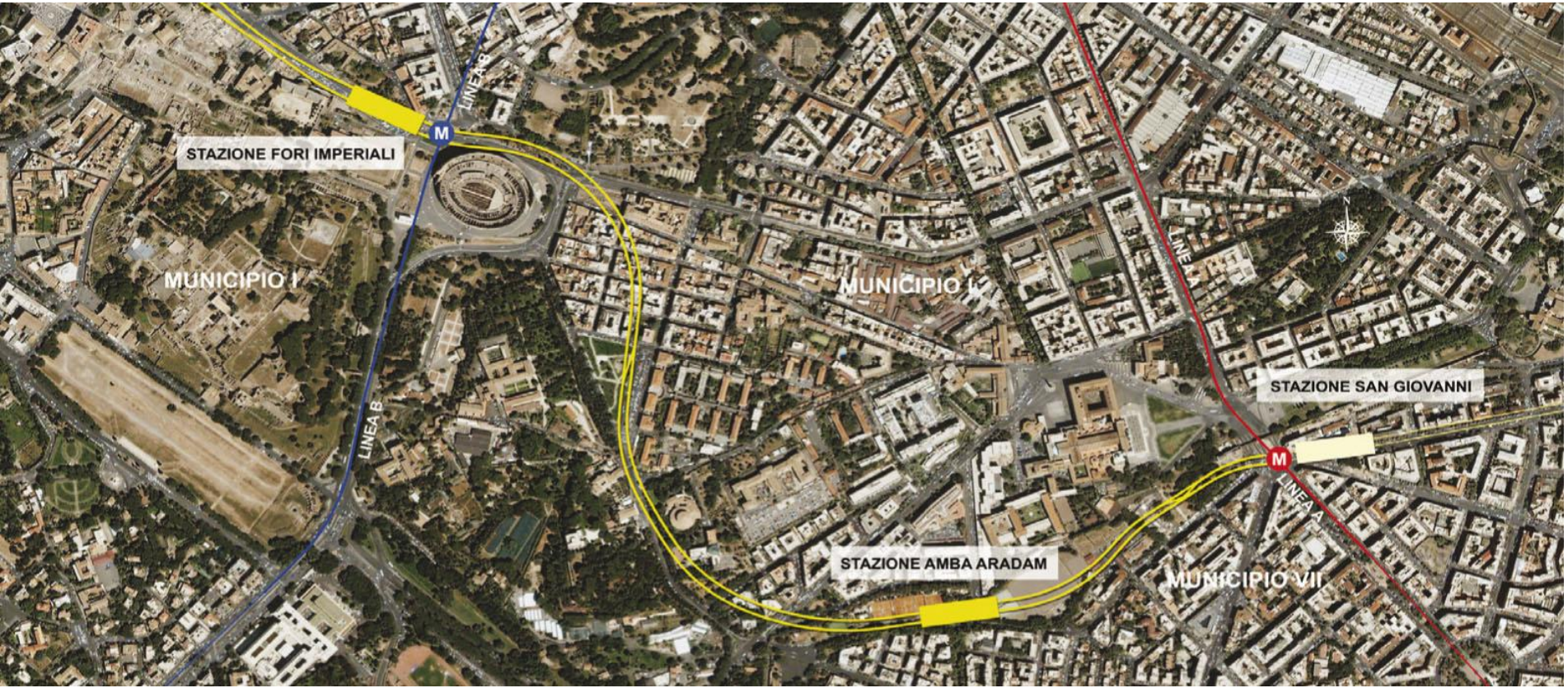
what we did .....

what we did .....

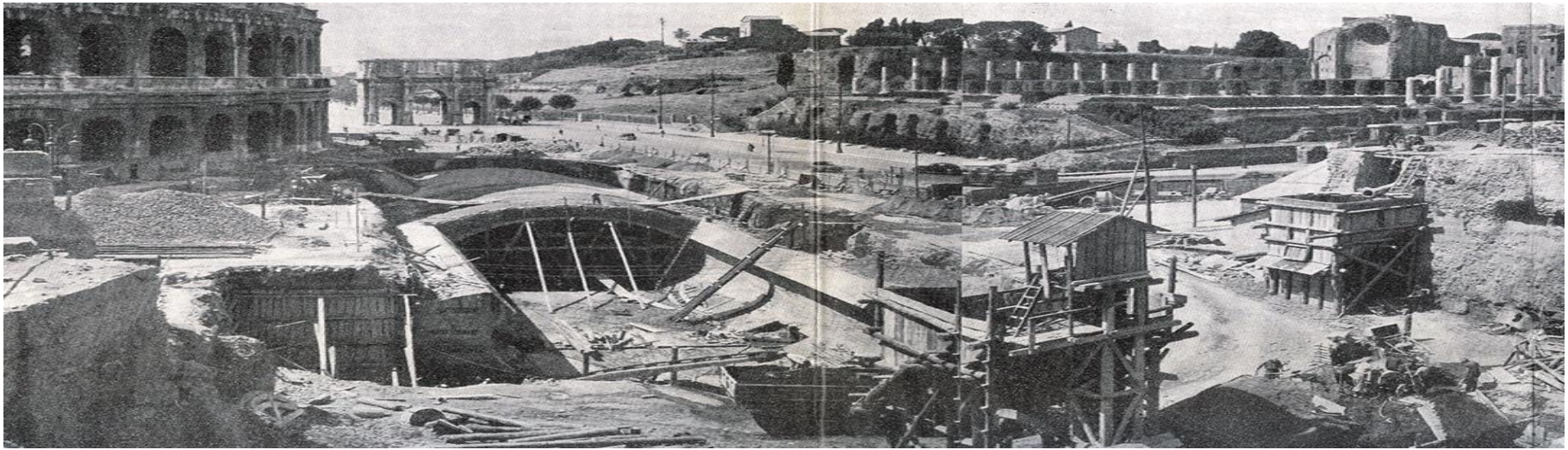


what we did .....

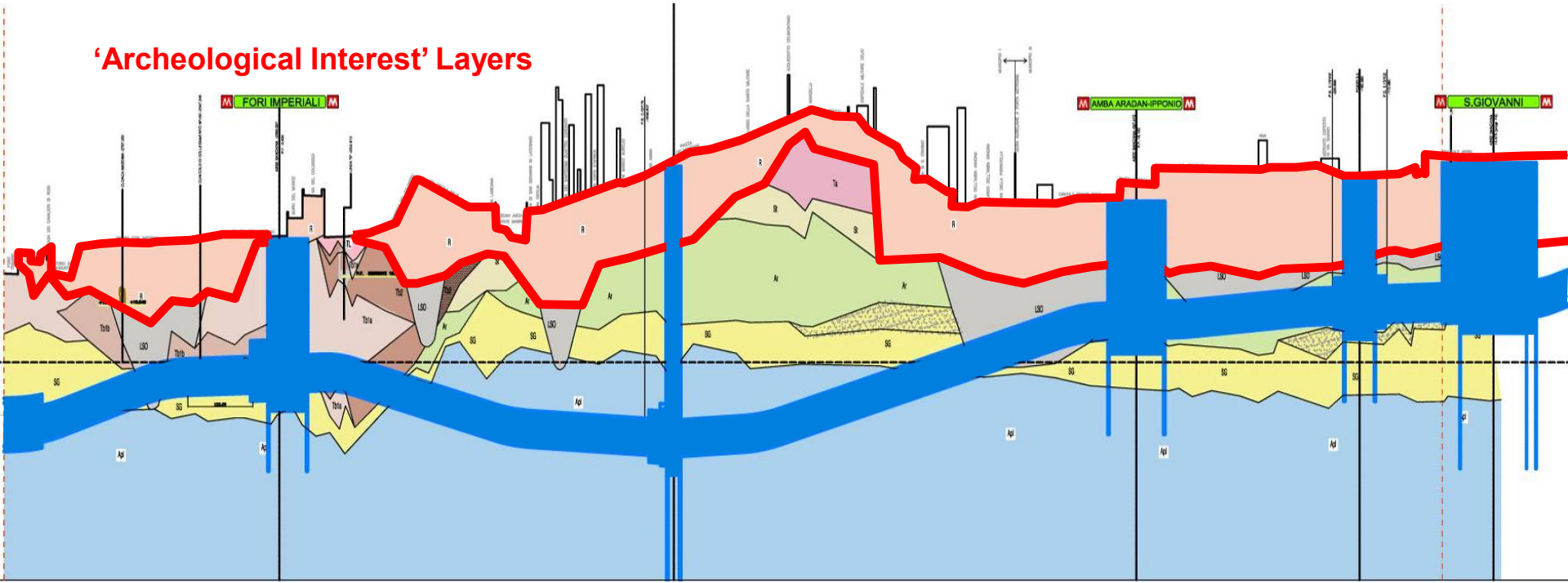
what we are doing ……



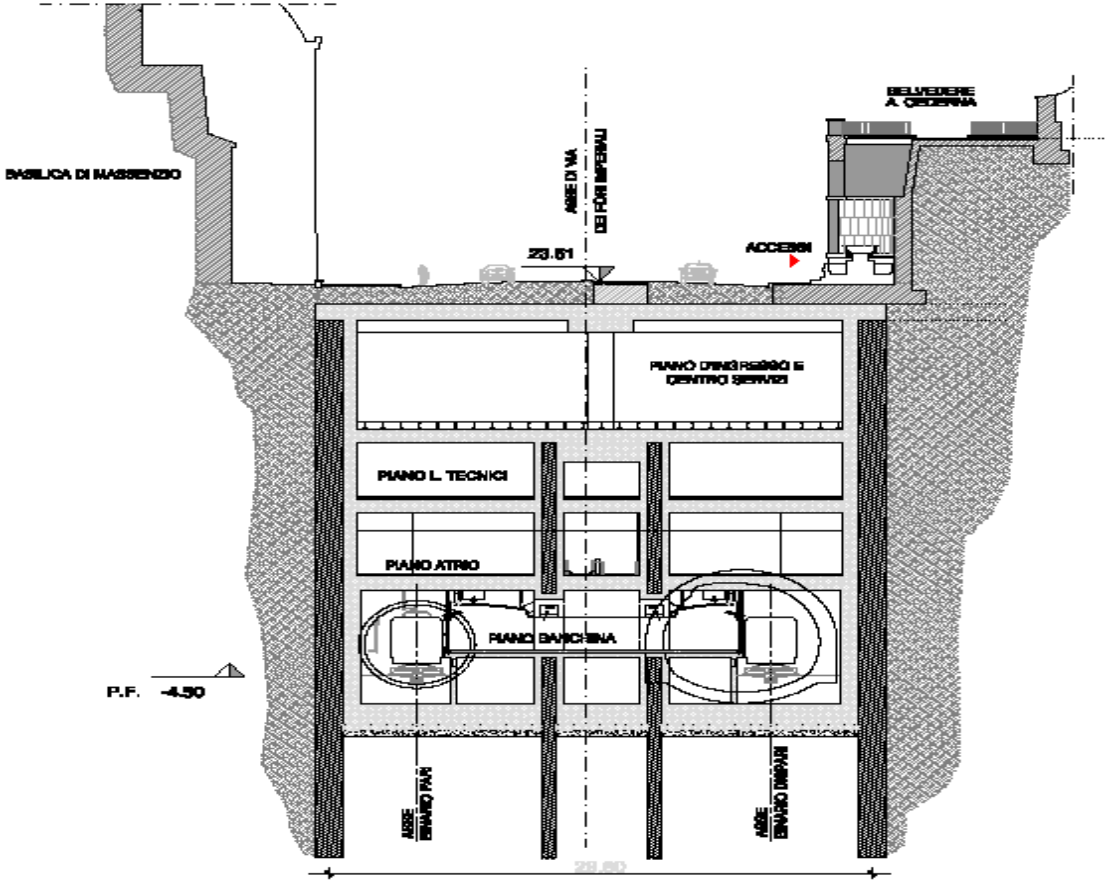
Construction methods in the ‘50s (Line B near the Colosseo)

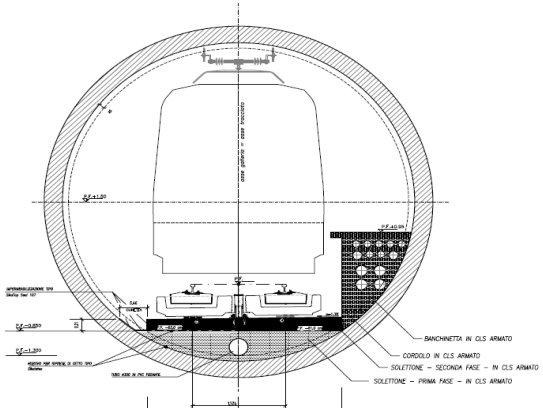


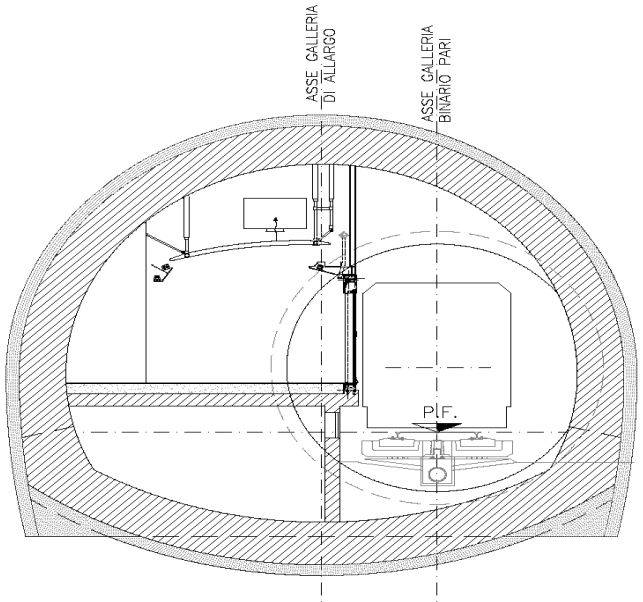
what we are doing ……



Line C – Construction Solutions



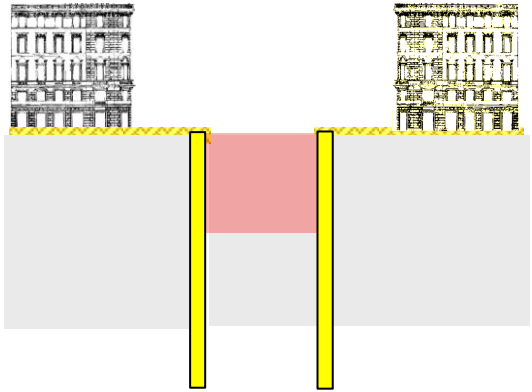




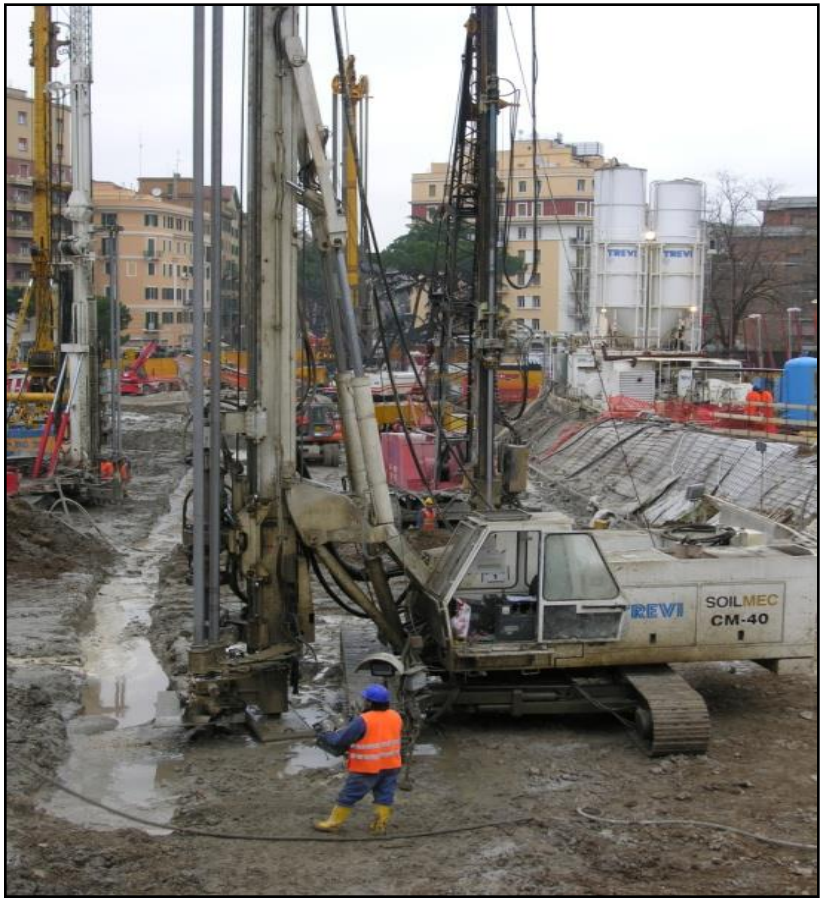
Executive technologies: Tunnel Boring Machine

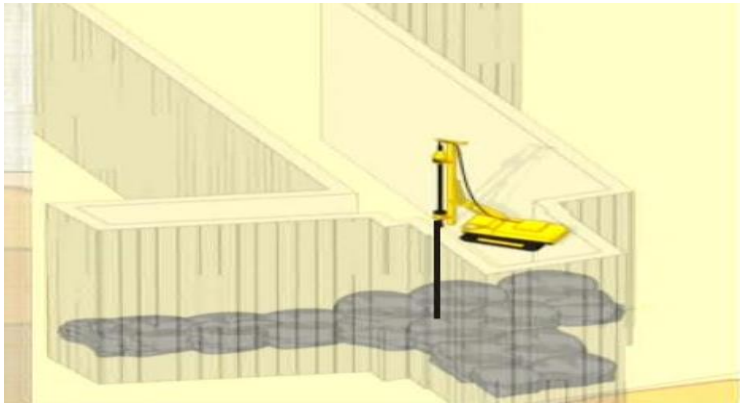
Executive technologies: Diaphragm walls – Trench cutter

Executive technologies: “Archeological method” of excavation

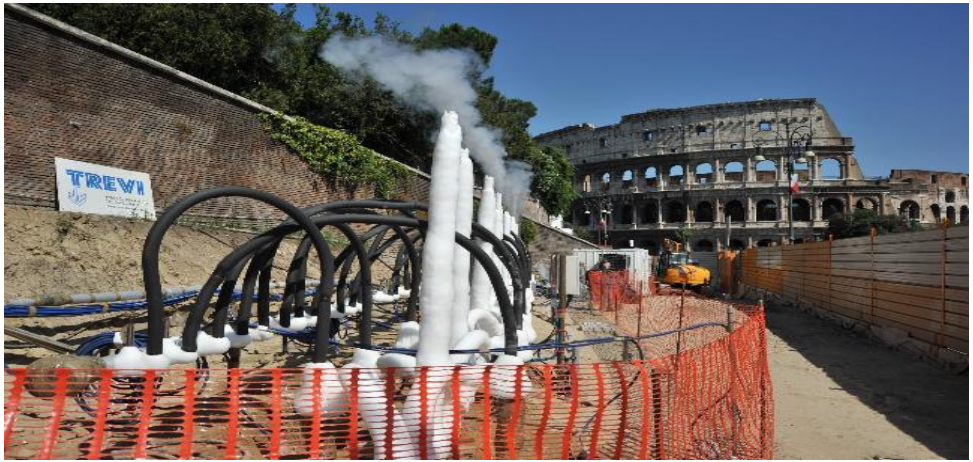


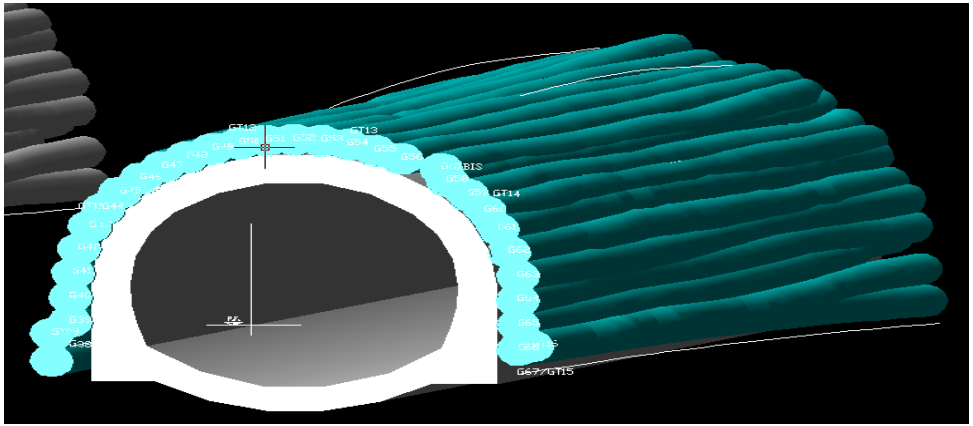
Executive technologies: Soil improvement and building preservation – jet grouting



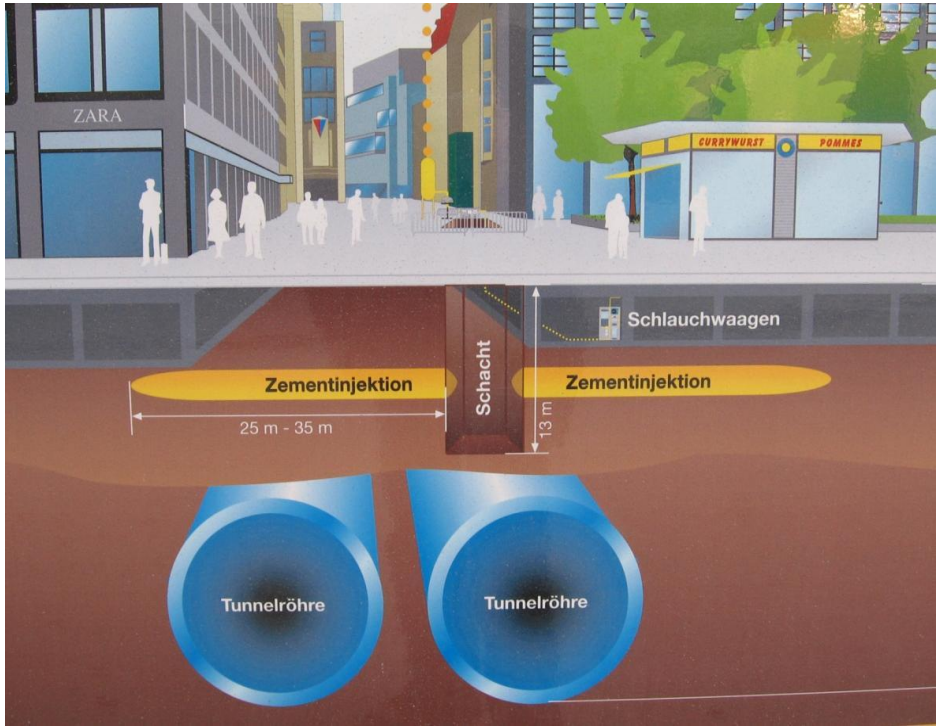


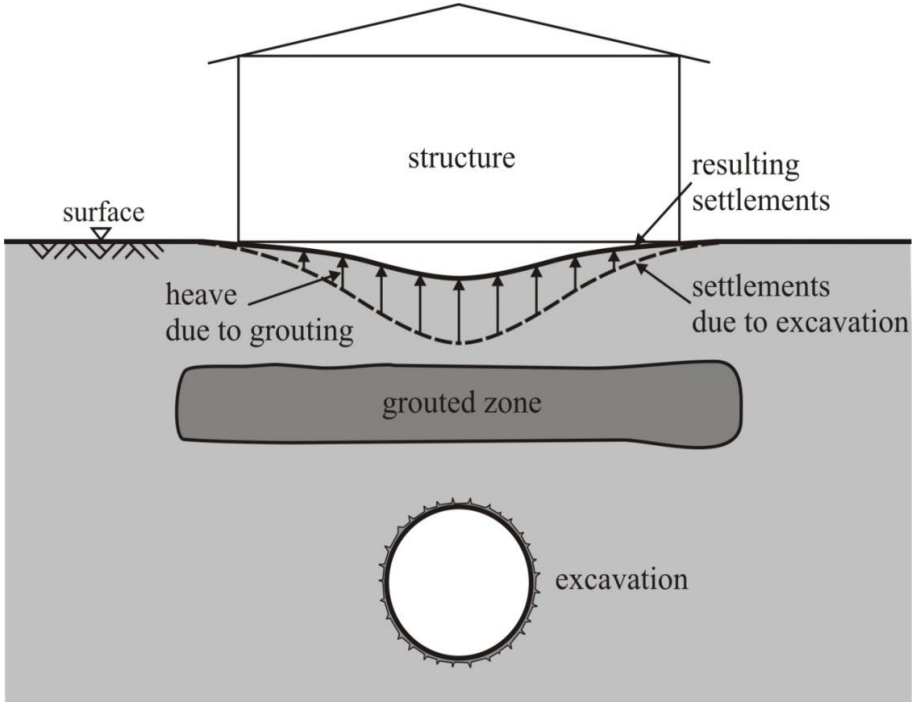
Executive technologies: Soil improvement – ground freezing





Executive technologies: Building preservation – compensation grouting





Line C – T3 (central stretch): work in progress

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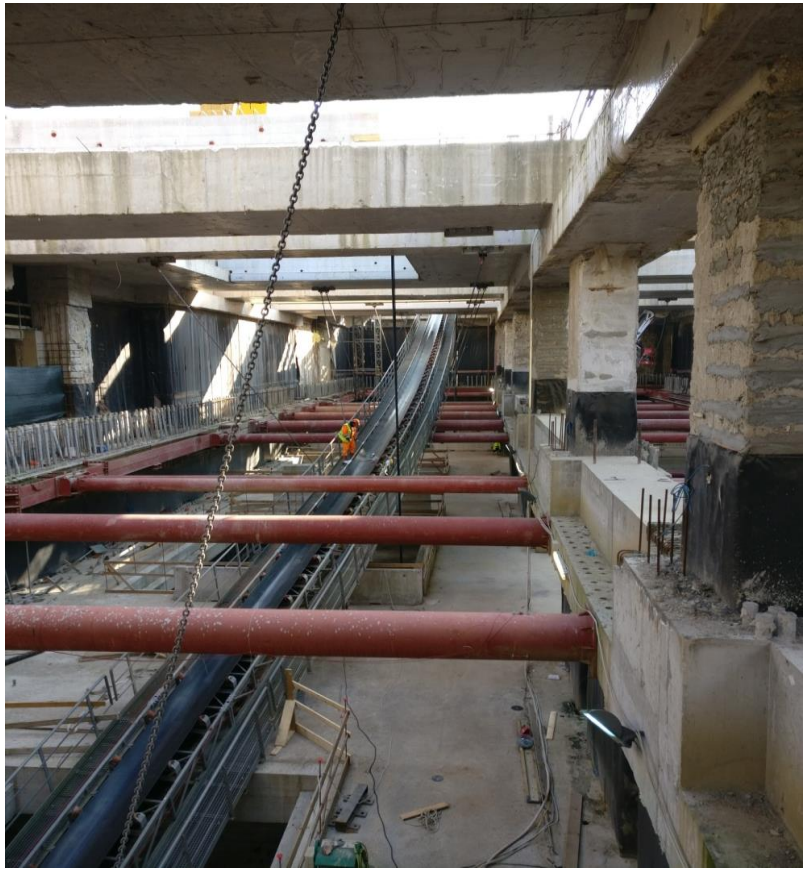
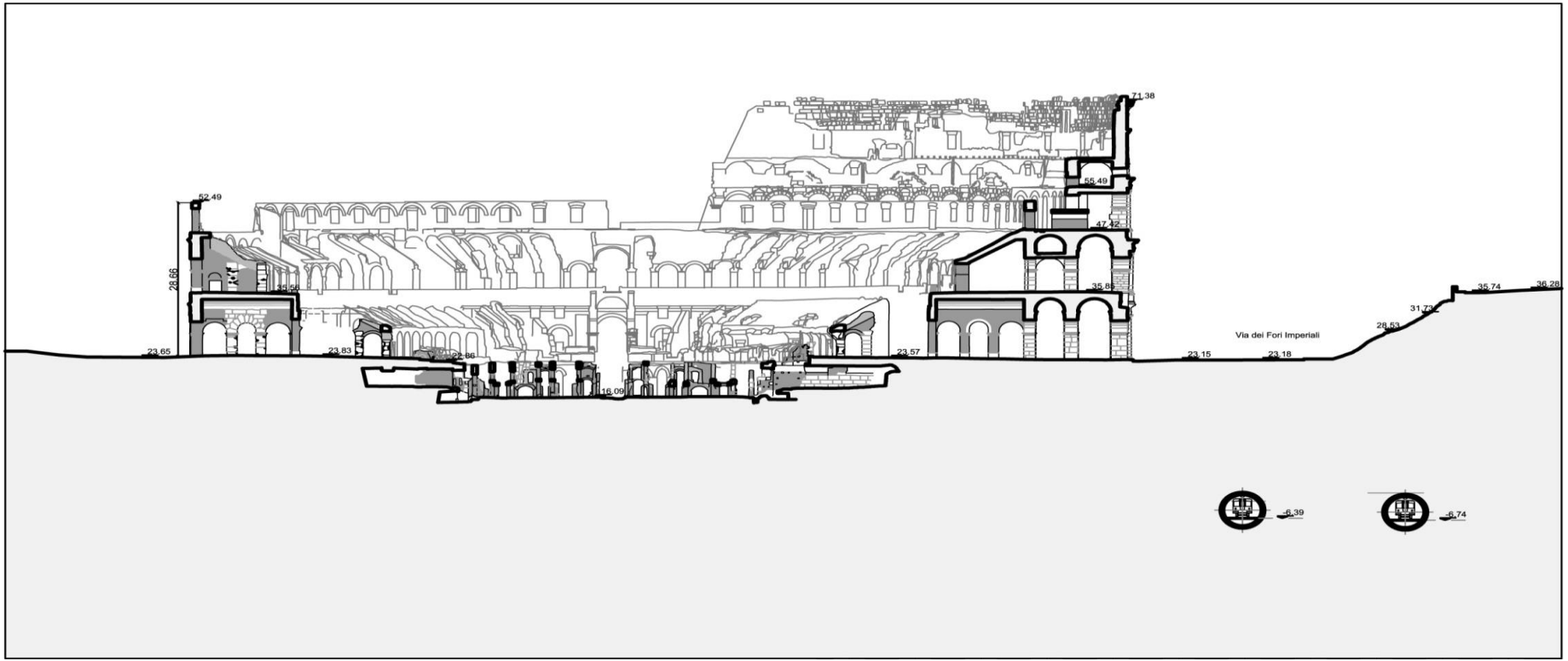


Line C – T3 (central stretch): work in progress

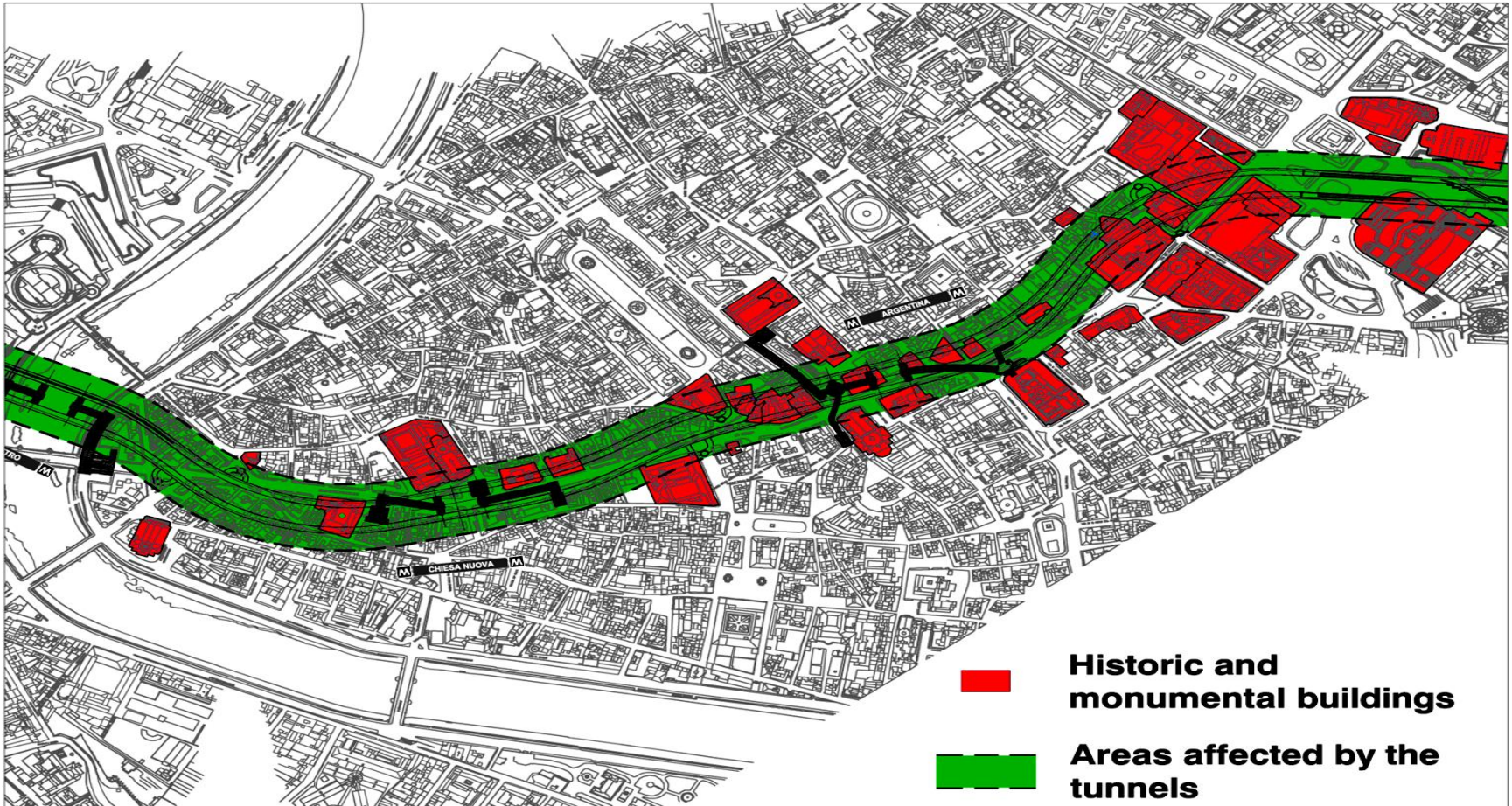
Line C – T3 (central stretch): work in progress

what we have to do .....



what we have to do .....

what we will have to do .....



what we will have to do ……

what we will have to do ……

what we will have to do ……