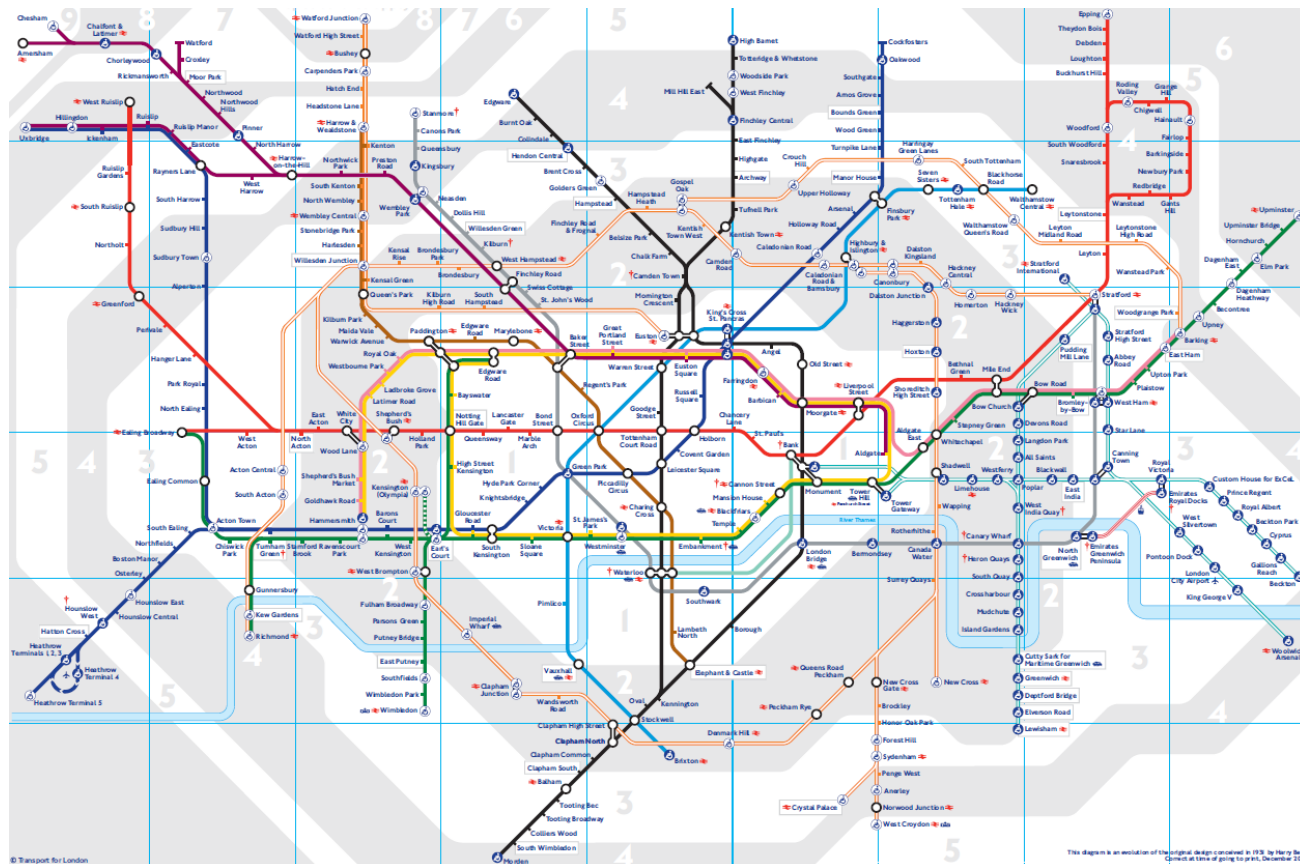


An Introduction to London's Underground Railways and Land-Use Development

Presented by: Nathan Darroch,
Land & Vesting Engineer.

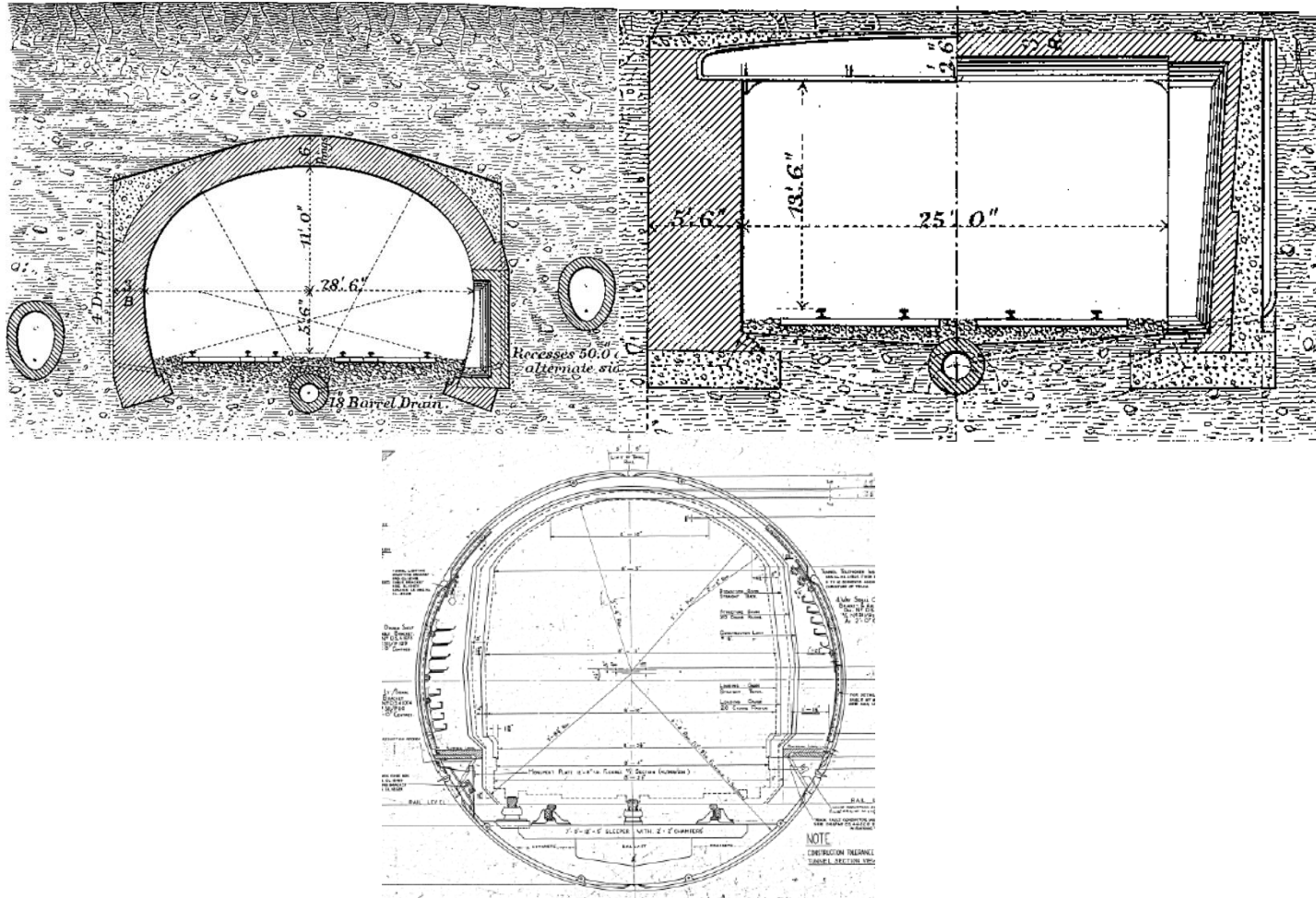
November, 2014



Tunnels:

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- Only 45% of the network's 11 lines are actually in tunnel, these are mostly, but not exclusively, in the central zone



Retaining walls:

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- Some of the earlier sections in the central zone are also in cutting

Fig: 7.

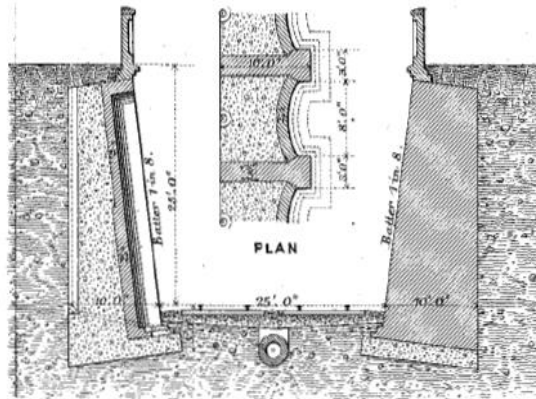
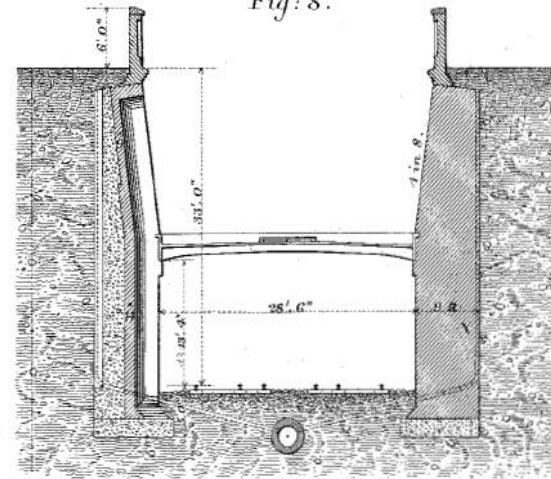


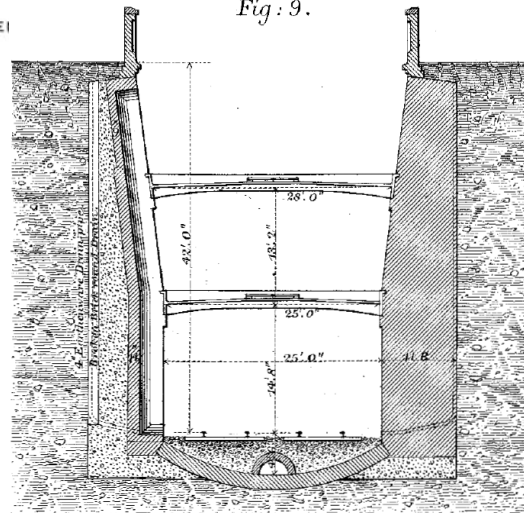
Fig: 8.



CROSS SECTION OF OPEN

Fig: 9.

CUTTING WITH SINGLE STRUT.

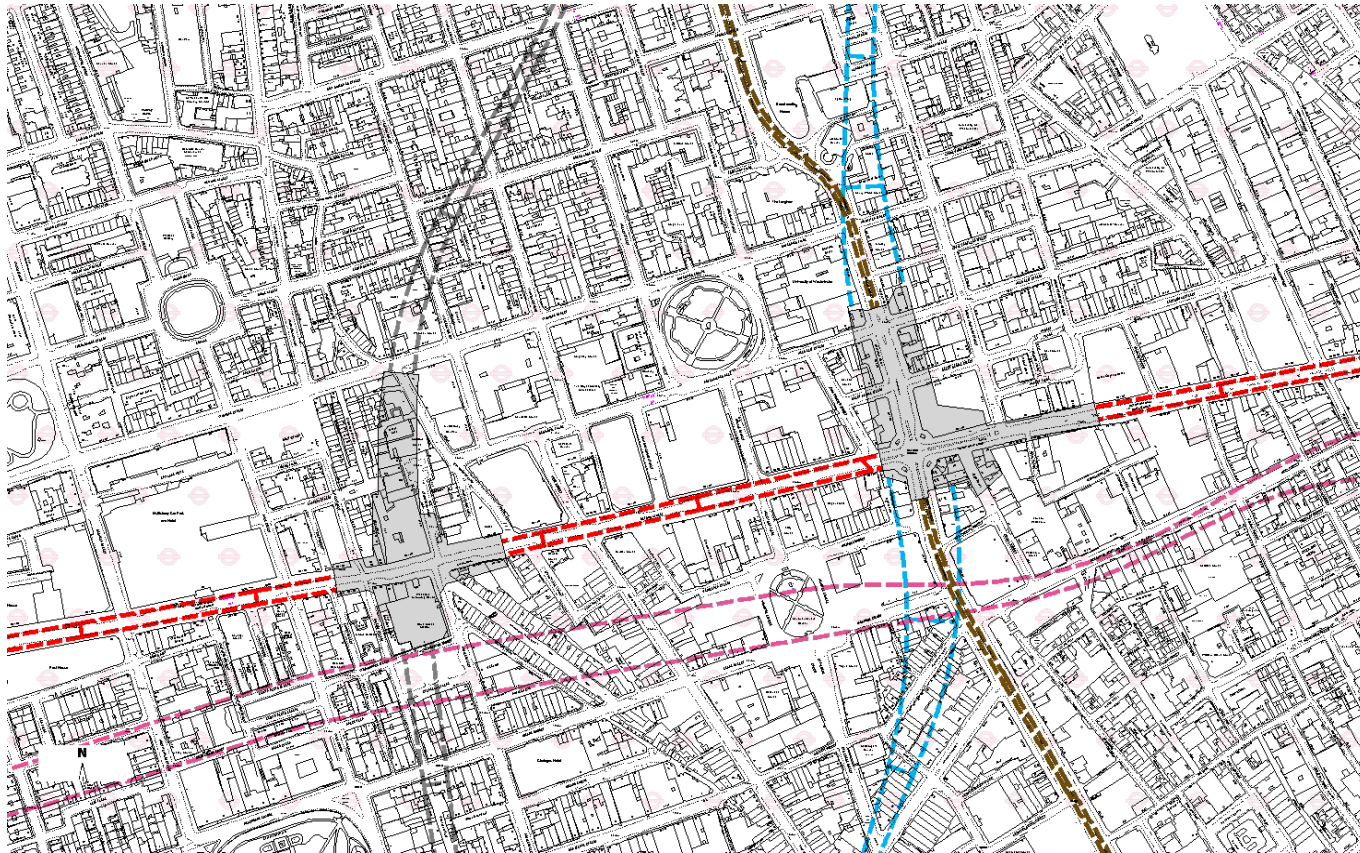


OPEN CUTTING WITH TWO ROWS OF STRUTS.

Interfaces:

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- There are hundreds of thousands of interfaces between the railway and other parties, including:
 - Utilities companies
 - Highway authorities
 - Railway companies and Train Operating Companies
 - Land and property owners

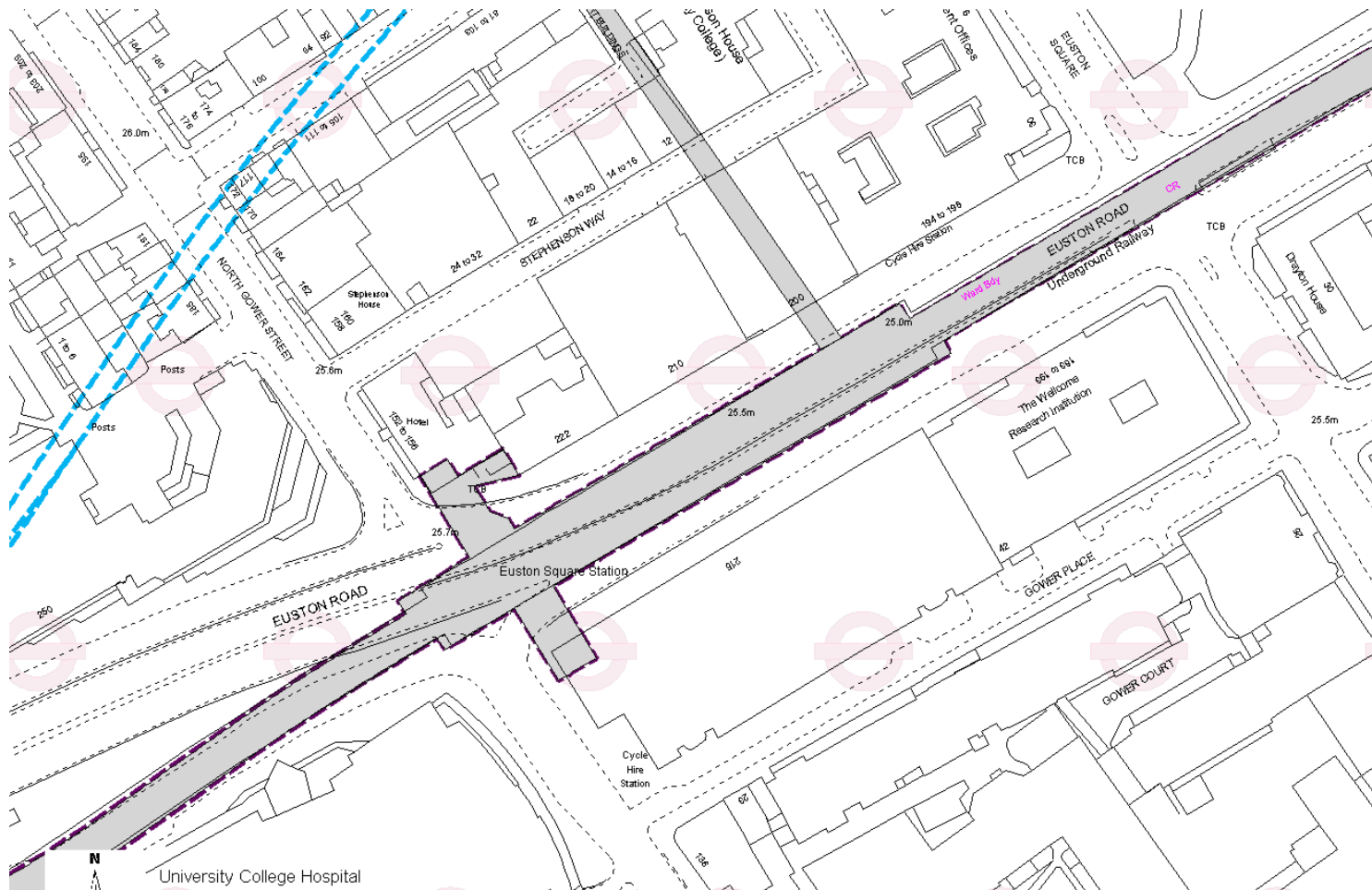


- The sub-surface lines had statutory rights and obligations to acquire land by:
 - right of passage through the subsoil under a road
 - compulsorily purchase of the whole or part of land
 - requirement to purchase the whole of buildings
 - an easement to pass under private land and property
- This has long term effects on the railway environment from both the property ownership, rights and responsibilities and engineering perspectives
 - these perspectives inseparable from one another

Effect of the railway 1863 - present:

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- While the railway is under the road, it still has an interface, whether with adjoining property or with the road itself



Effect of the railway 1863 - present:

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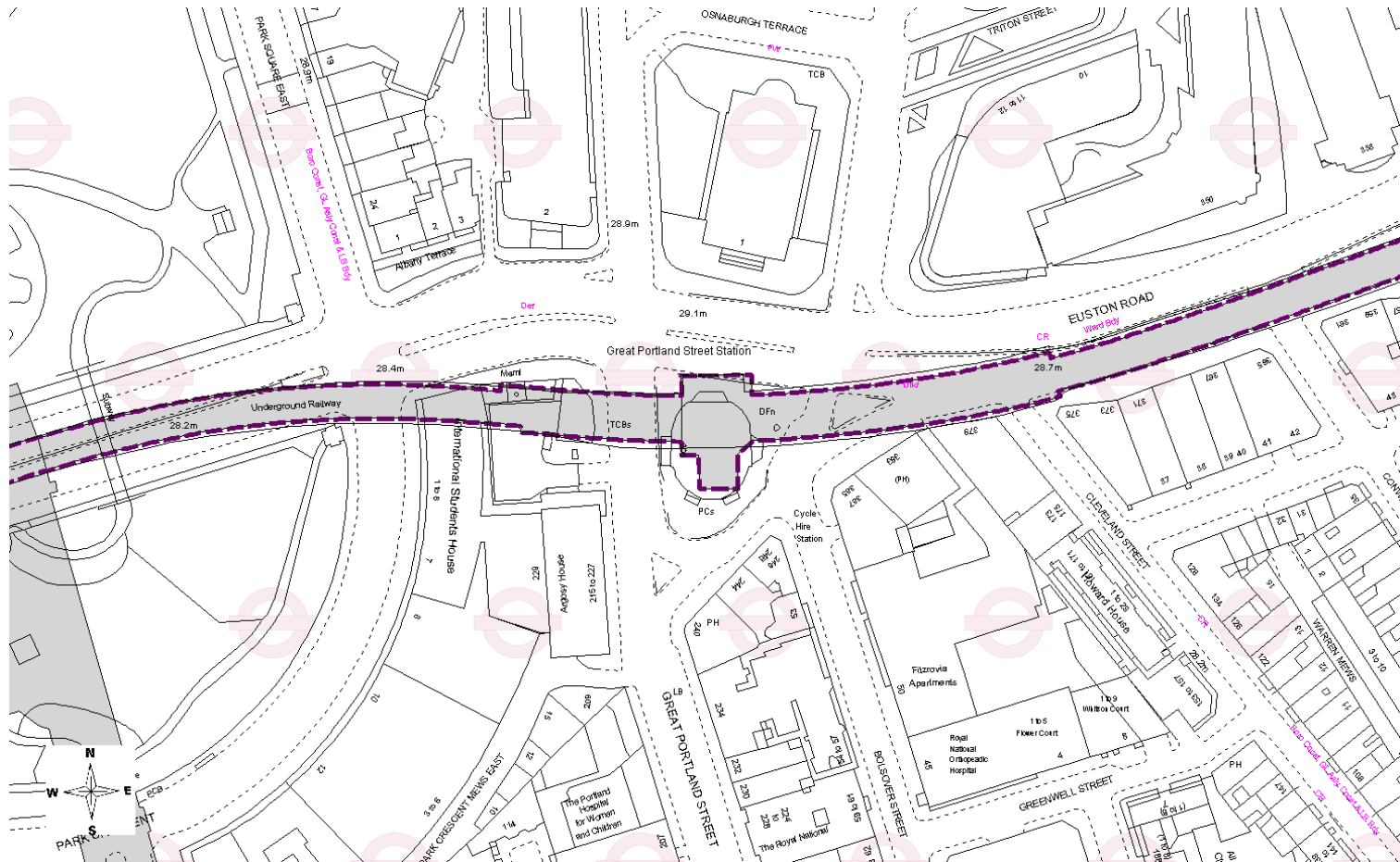
- More land may have been compulsorily purchased than may at first be appreciated



Effect of the railway 1863 - present:

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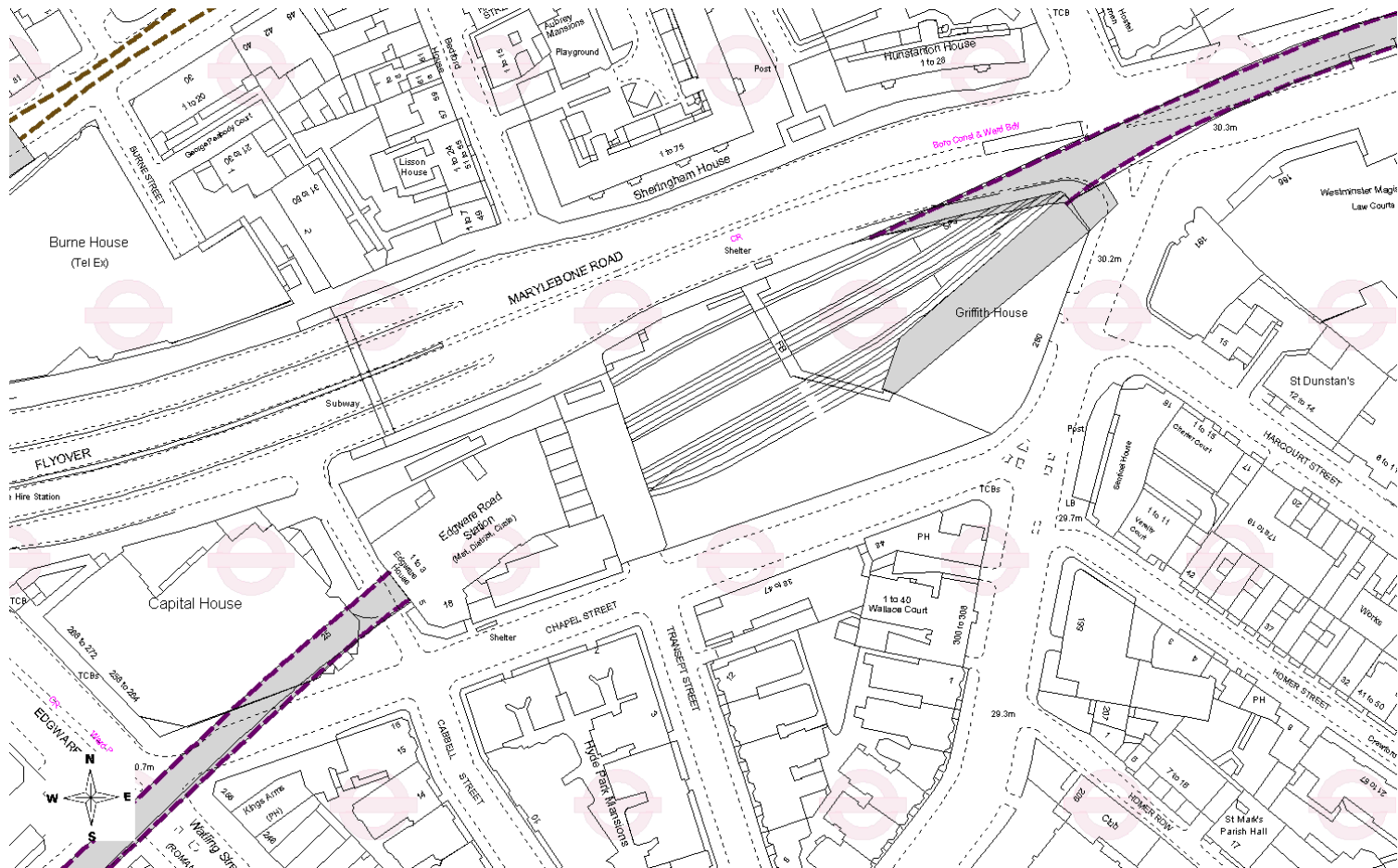
- The railway's construction could be under existing property



Effect of the railway 1863 - present:

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- The railway's construction could see demolition of existing property



Effect of the railway 1863 - present:

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- These factors have long term property and engineering effects that must be understood to ensure protection of the railway, LUs rights and responsibilities

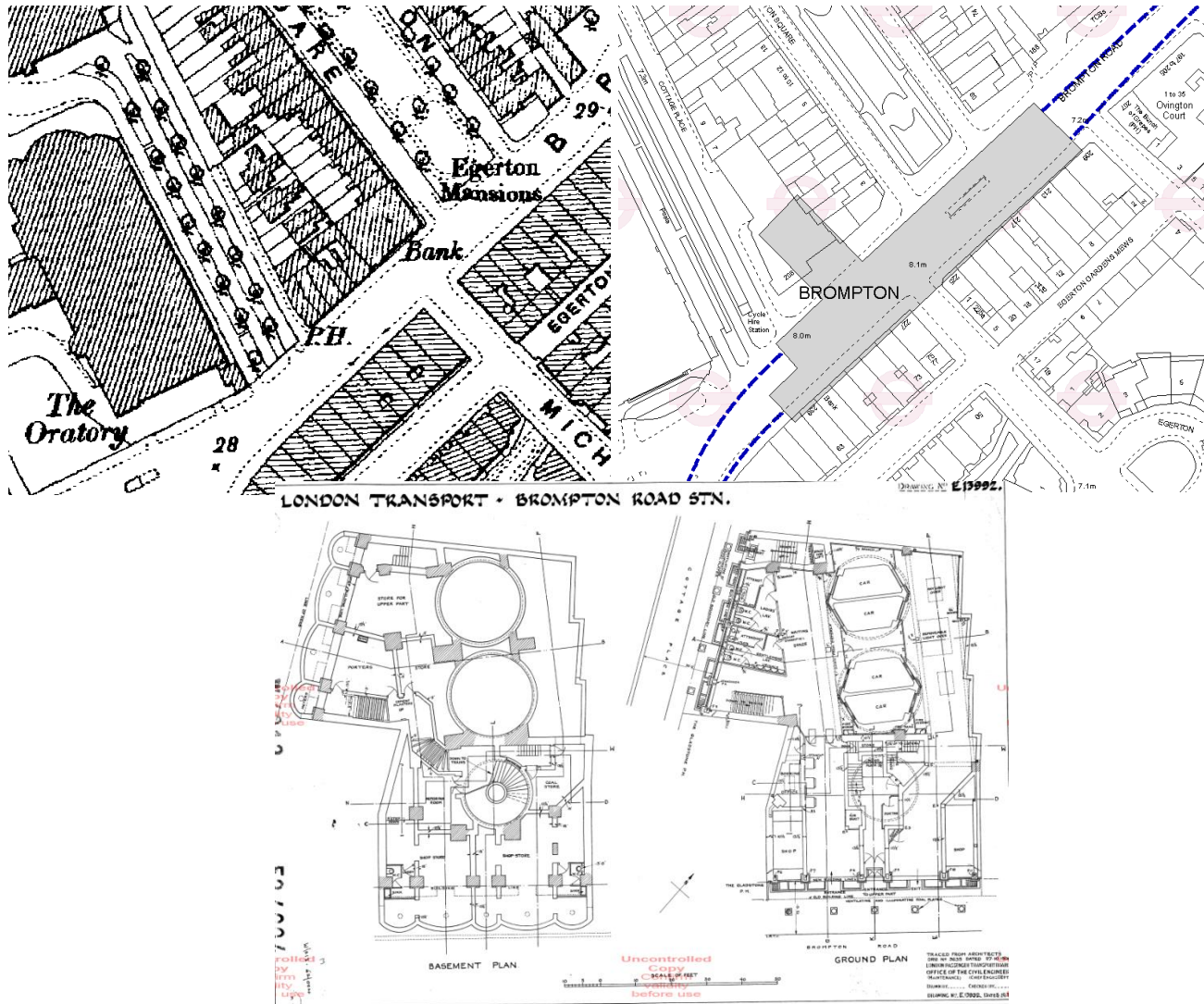


- Construction of the tube railways between 1890 and 1954 saw land acquirement by:
 - compulsory purchase of land for station sites
 - buying easements under private property
 - right of use of the subsoil under the public highway
- The last two did not confer any property ownership to the railway company, but:
 - they did grant rights for the railway's presence
 - they imposed indirect responsibilities on property owners

Effect of the railway 1890 – present:

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- The tubes needed minimal surface land for their railway's



Effect of the railway 1890 - present:

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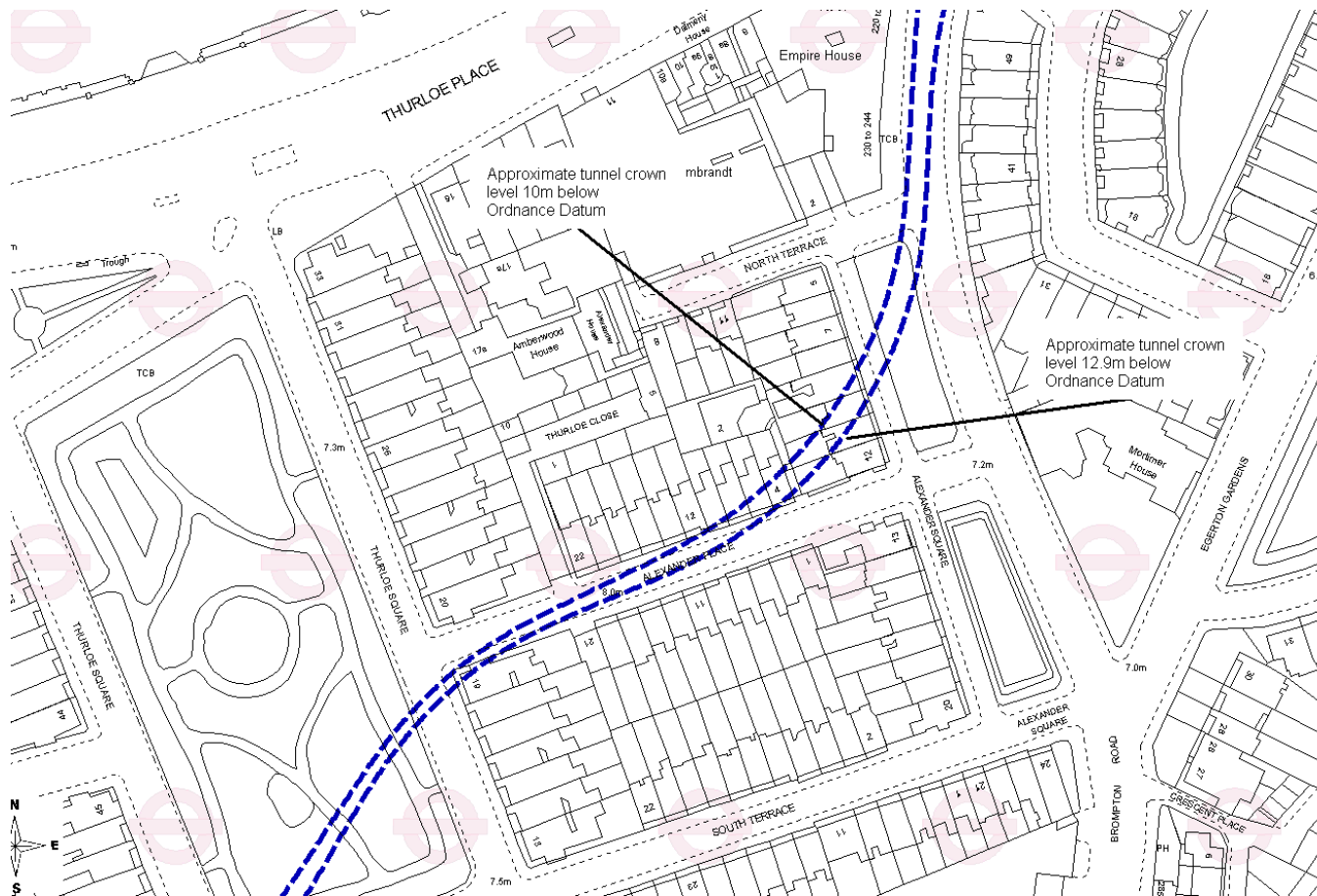
- It was cheaper for the tube railways to accommodate private property interests
 - this saw them run *predominantly* below the public highway



Effect of the railway 1890 - present:

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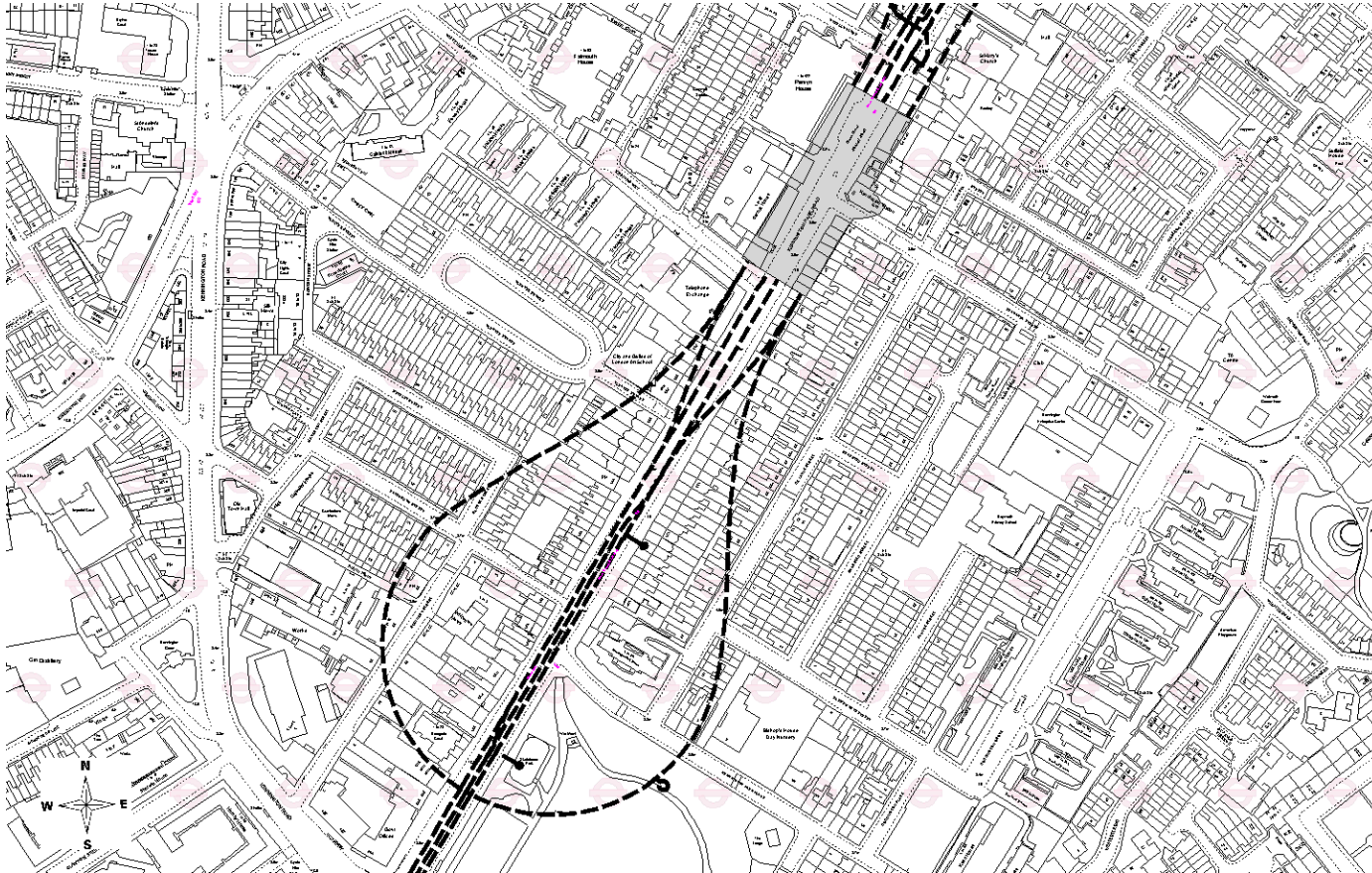
- There were places where the railway did pass under property
 - the right to do so gained through easements through agreement or compulsorily



Effect of the railway 1920 - present:

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- From the 1920s it became common for the extension to pass under property
 - this increased the relationship between the railway and private property, but not necessarily from an engineering perspective
 - again this was through easement



- Tube railways since 1955 have acquired land by:
 - compulsorily '*taking*' that land required on the surface
 - compulsorily '*taking*' the sub-soil required for the tunnels
 - paying compensation for loss of land or sub-soil
- The process of 'taking' is not purchase
 - the sub-soil was considered worthless to the majority of property owners and had no use
 - only those with proposals to use subsoil before a specific date gained compensation

Effect of the railway 1955 - present:

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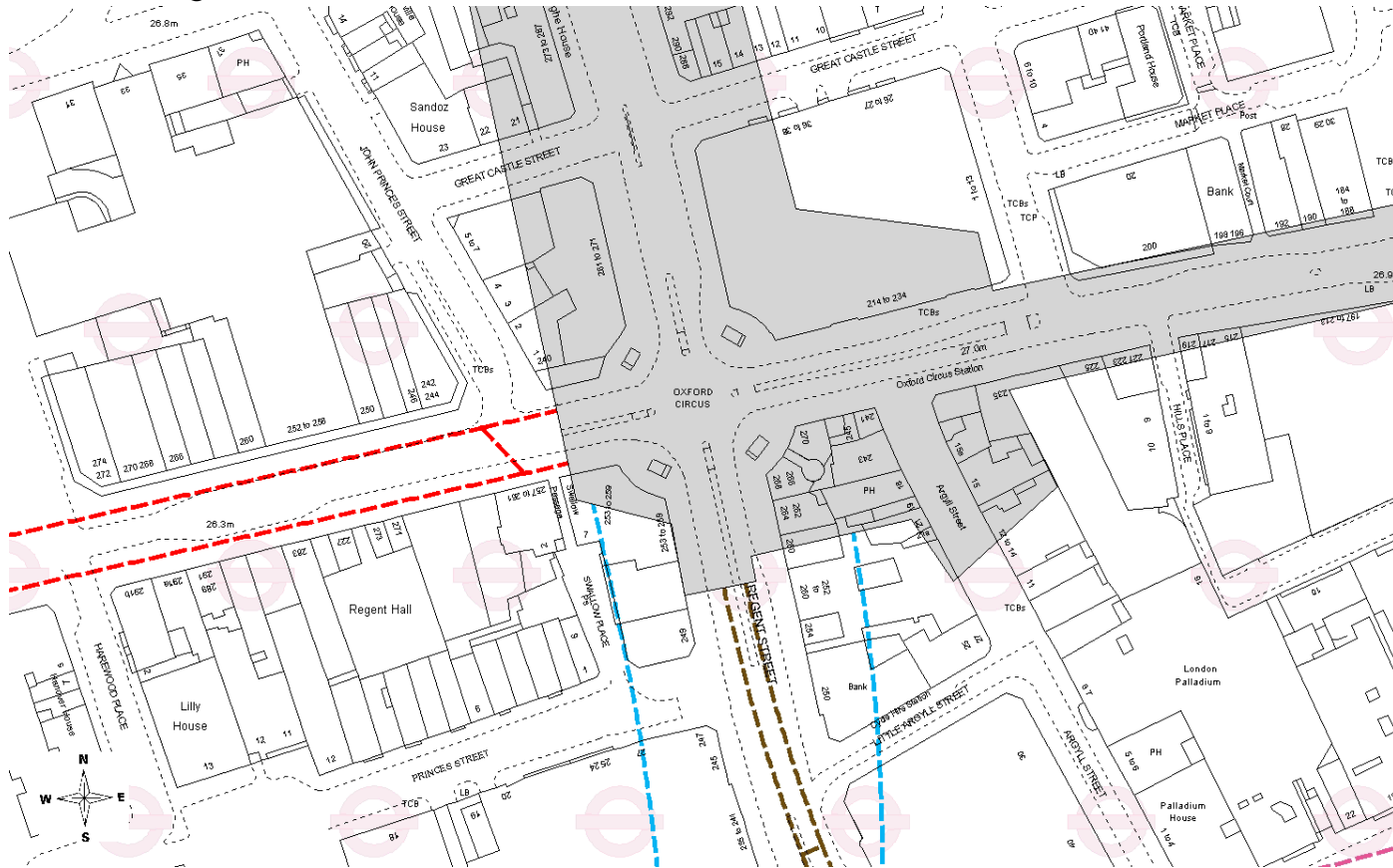
- This saw the Victoria line passing for considerable distances across the street pattern
 - this had little effect on property development due to the low height and depth of buildings at that time



Effect of the railway 1955 - present:

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- The main effect of the new railway was at station sites where existing stations were increased in size and capacity below ground
 - this could affect the presence of existing buildings
 - as well as the property and engineering interface between the railway and those buildings



Effect of the railway 1955 - present:

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- By the 1960s, mass redevelopment of areas in London saw higher buildings with deeper foundations constructed
 - such designs now posed a potential risk to those tubes constructed under property

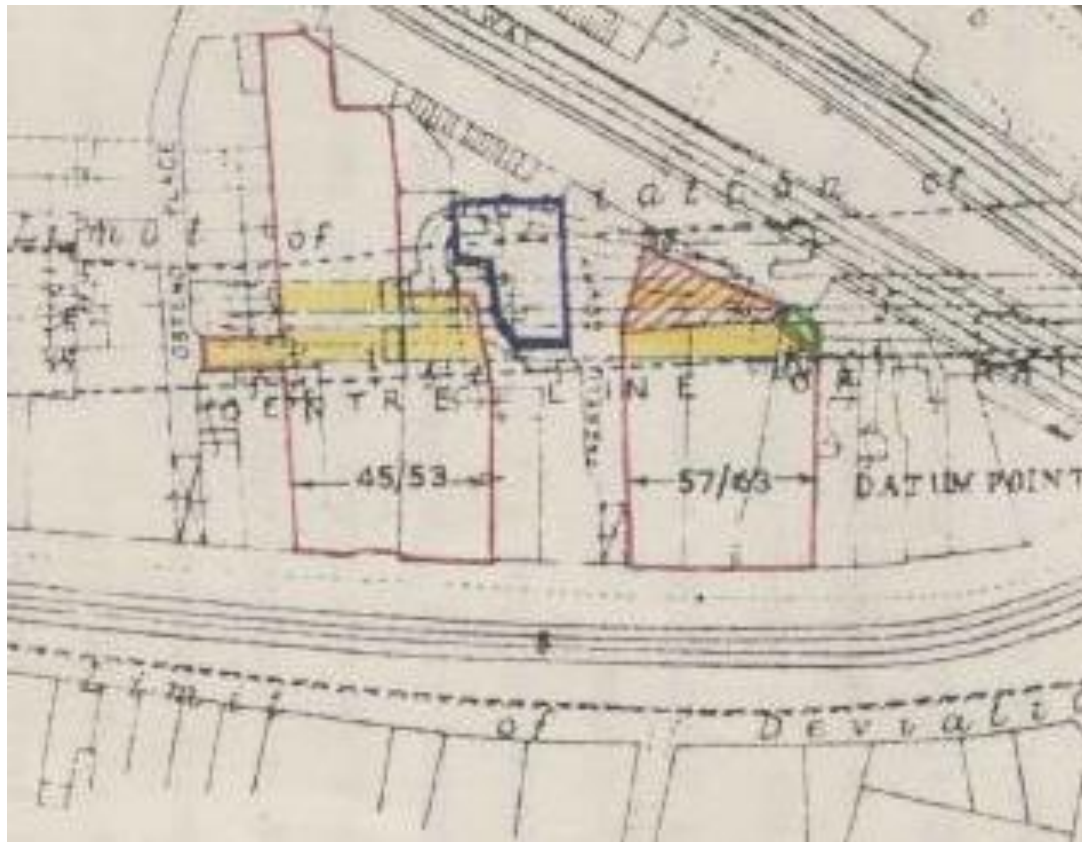


- Tube railways since 1955 had acquired land by:
 - compulsorily taking that land required on the surface
 - compulsorily taking the sub-soil required for the tunnels
 - paying compensation for loss of the land or sub-soil
- By 1965 they could also ‘take’ additional land or subsoil for the protection of the railway, in the form of a 3 metre sleeve
 - this could minimise the effect of foundations on the tunnels

Effect of the railway 1955 - present:

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- Another factor from this period was the:
 - introduction of agreed areas of protection where the London County Council were planning mass redevelopment, agreement for protective measures on land near or above the railway was made
 - this protection is still applicable today



Effect of the railway 1863 - present:

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- It is not just the underground station or railway that have an effect on the property/engineering interface of the railway on land use development
 - the presence of other railway infrastructure also has an effect
 - whether directly or indirectly



Effect of the railway 1920s - present:

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- Ventilation plays an essential part of the railway
 - facilities must therefore be provided



Effect of the railway 1906 - present:

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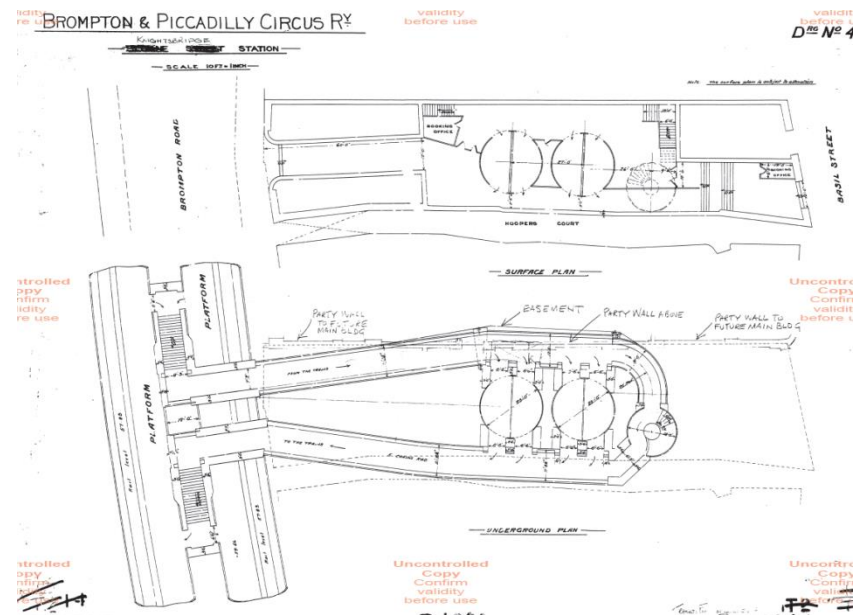
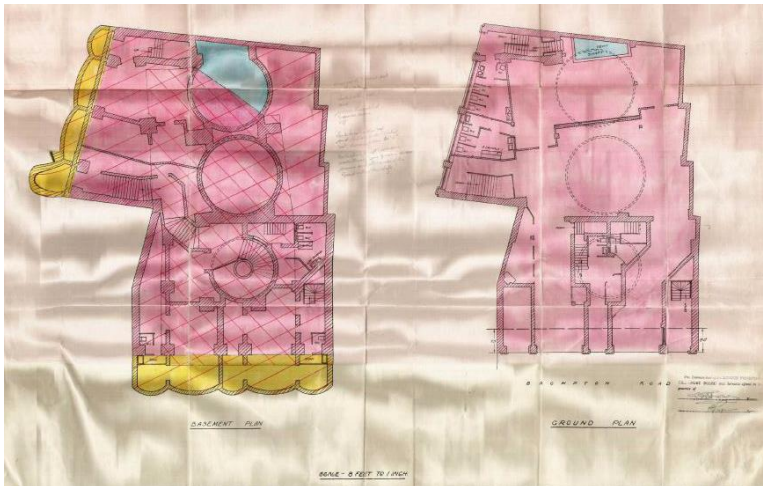
- Even stations have an effect on the interface
 - those using surface buildings able to accommodate development above
 - or be replaced with new development



Effect of the railway 1863 - present:

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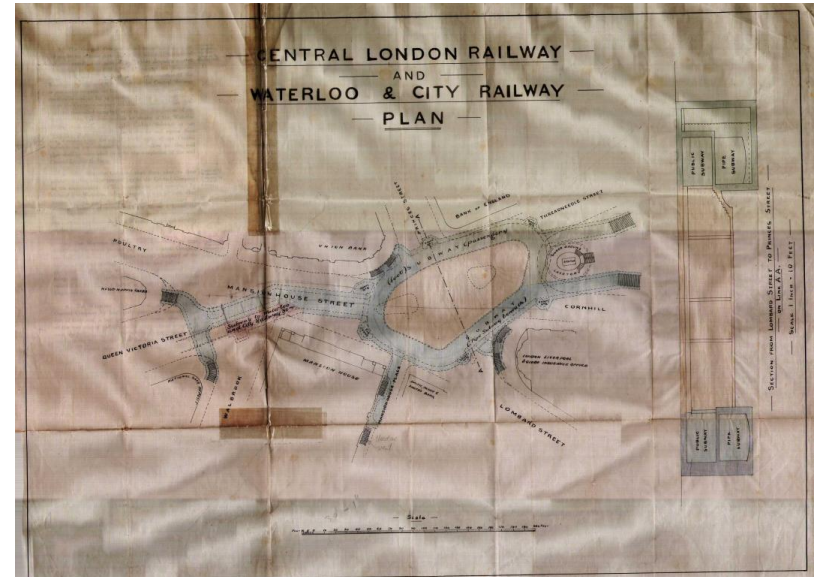
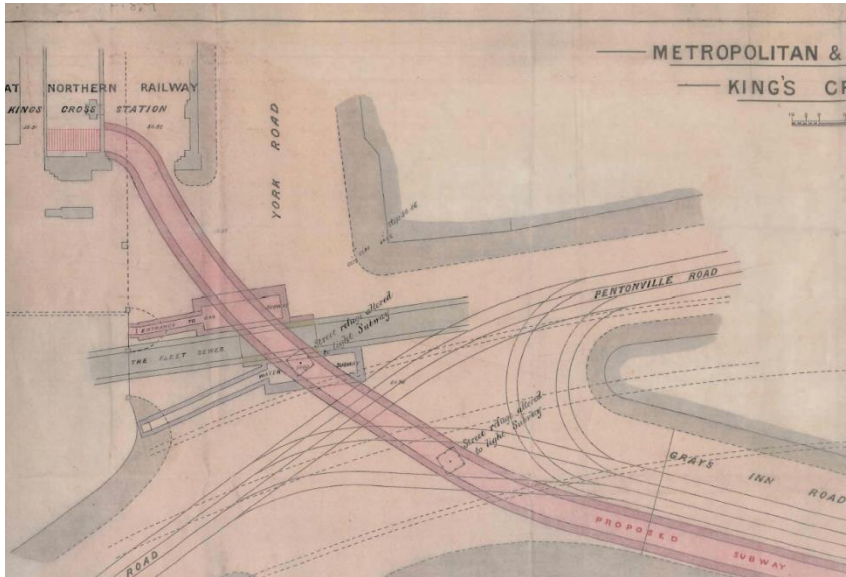
- Where station sites have been disposed of:
 - the presence of our assets and rights must be accommodated
 - as must those of other people



Effect of the railway 1863 - present:

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- There are instances where ownership, rights and responsibilities may not be apparent
 - these require further research



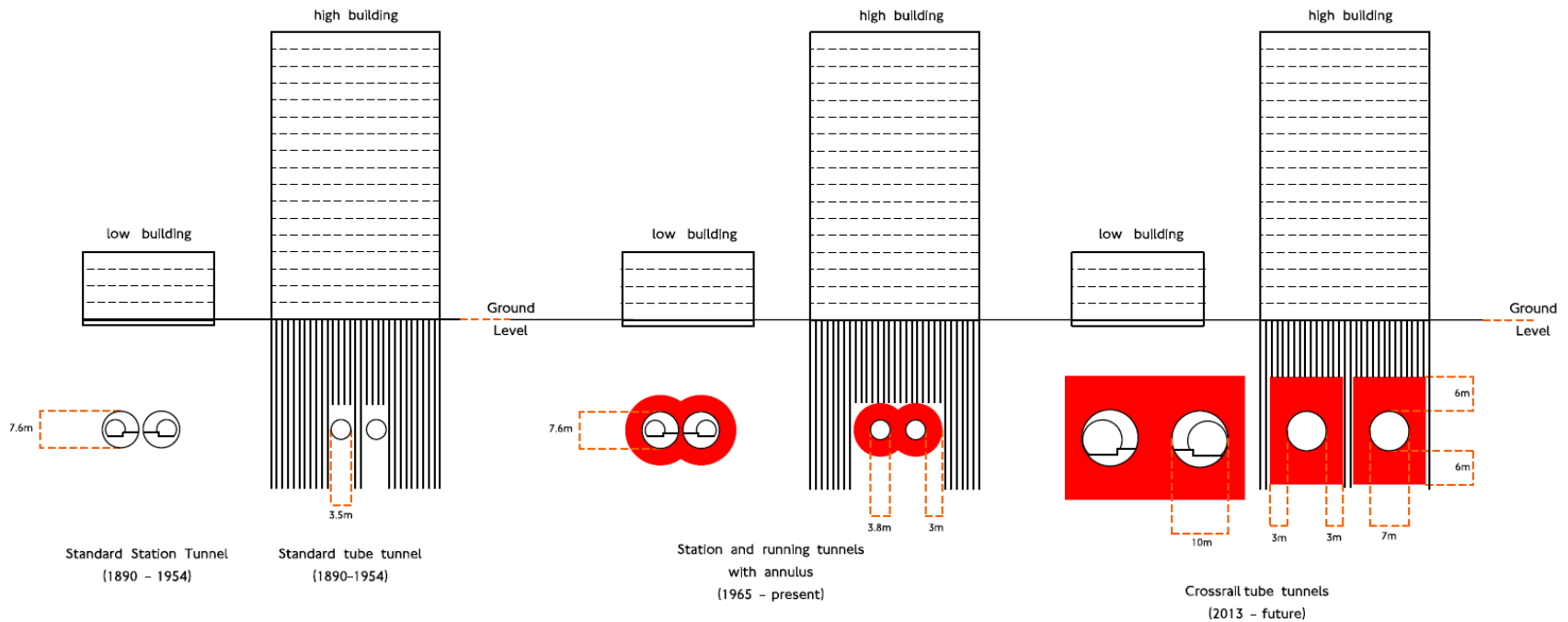
- In general underground railways between:
 - 1863 and 1892 had to buy all that land required or easements under property
 - where they bought land they could retain it or
 - sell portions off with protective provisions
 - 1890 and 1955, they could acquire subsoil via easements and land via compulsory purchase
 - where land was acquired through easement they had no ownership of that subsoil and therefore could not impose protective provisions
 - 1955 to 1975 subsoil and land could be taken for the purposes of the railway with compensation only paid where there were firm plans to use that subsoil by the land owner
 - From 1965, this included taking additional lands for protective measures

- Today, new extensions to lines and new lines such as Crossrail are increasing their interface with private property
 - this is not only through the presence of the protective area
 - but also because of the size of the tunnels and related infrastructure
- We as a company need to be aware of this and to plan this in to our own work, and that of others, to ensure the safe presence of the railway, our property, rights and responsibilities

The Railway Land Use and Property Interface:

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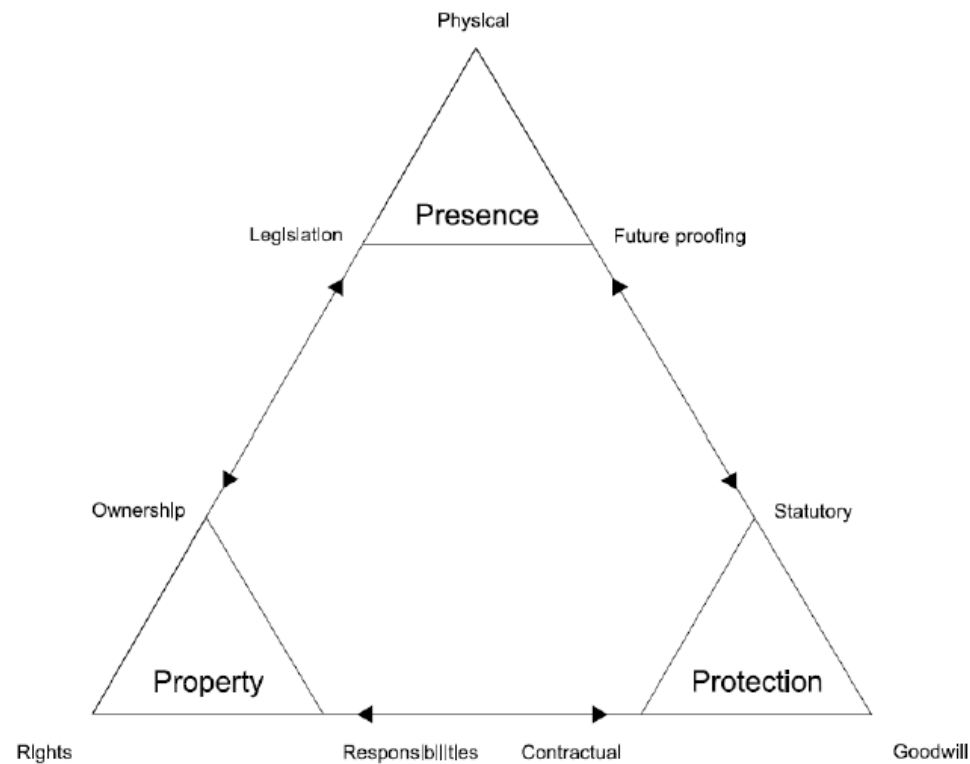
- This diagram shows an example of the presence of the tunnels on private property since 1890



The Railway Land Use and Property Interface:

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- A 'Conceptual Framework' showing the complexity of the interface between underground railways and land use development potentially looks like:



- Presentation overview:
 - the inter-relationship between the presence of the railway and land use development is complicated
 - it involves property and engineering aspects
 - these are not always obvious or fully understood
- We have only considered the railways in the central area
 - out of the urban zone things can be just as complicated
 - LU has more rights and responsibilities that need analysis and consideration

Any questions?

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