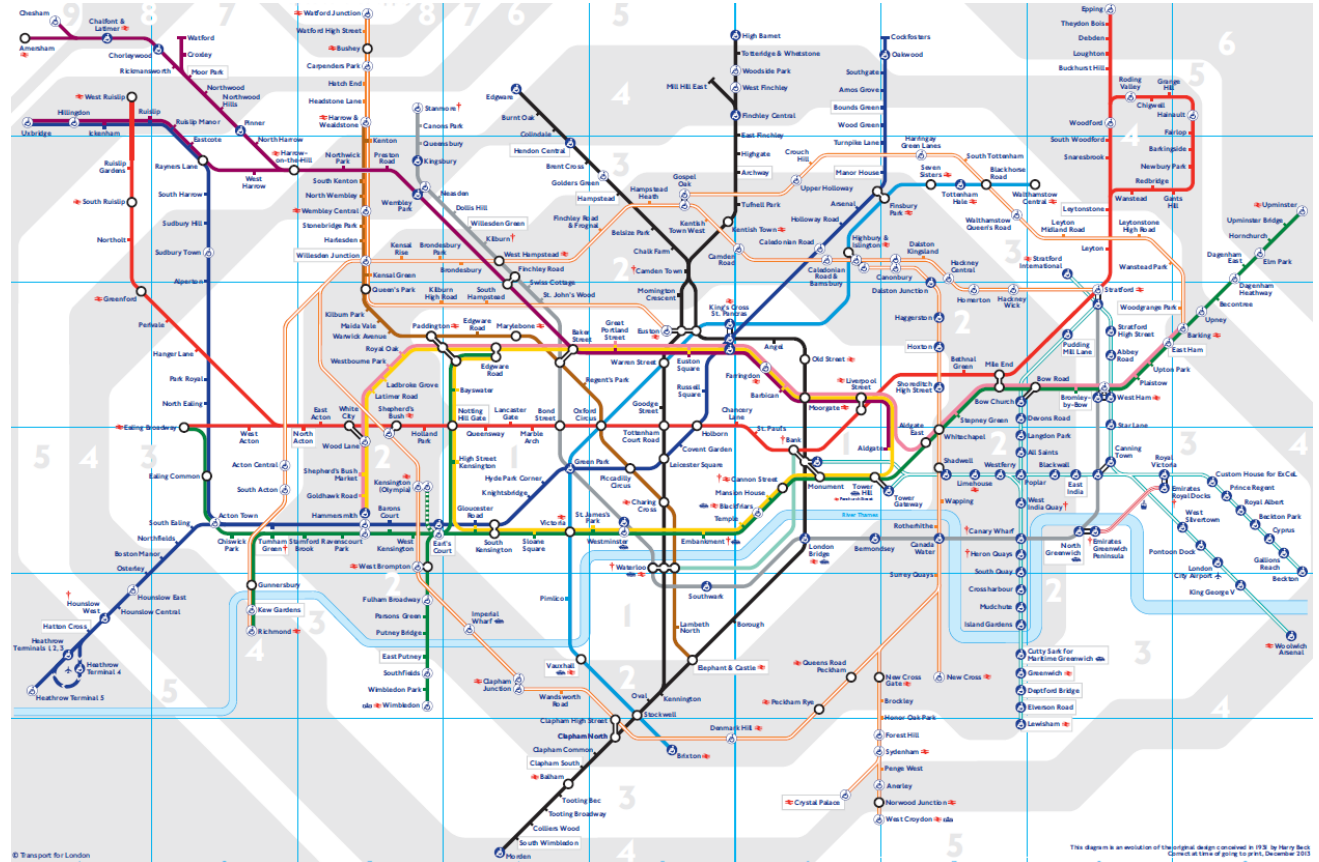


Protecting London Underground's Infrastructure

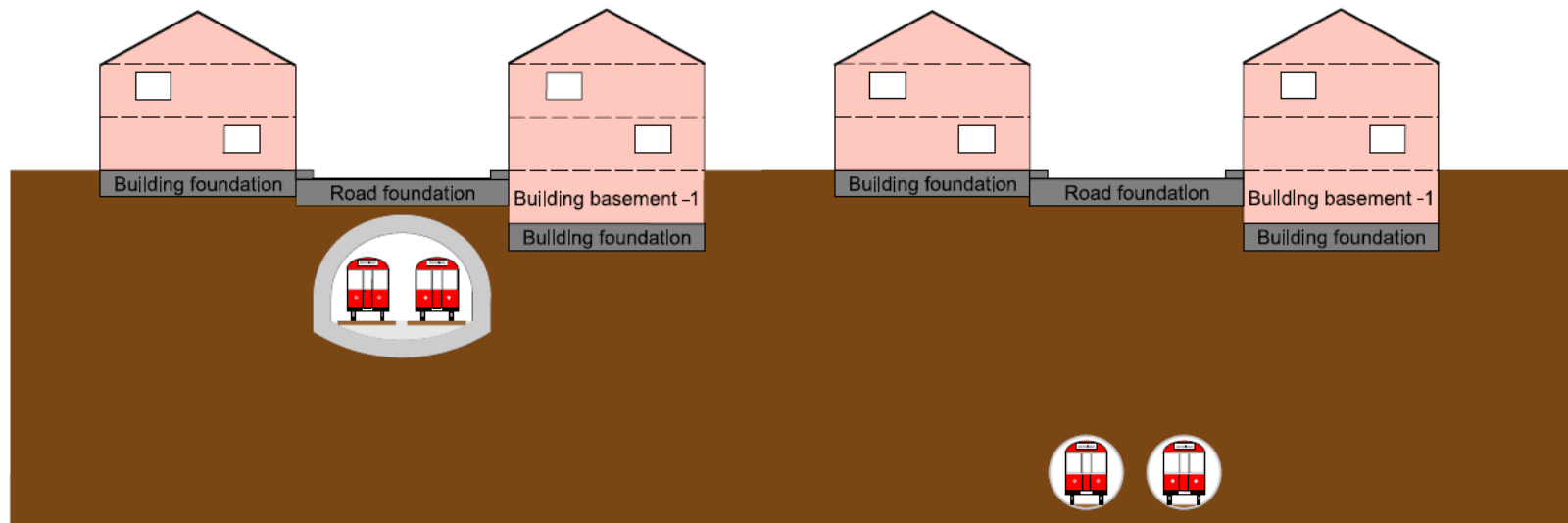
Presented by: Nathan
Darroch,
Land & Vesting Engineer,
at the Railway Division
Young Members Christmas
Technical Forum:
*Engineering Challenges
Posed by Infrastructure
Upgrades,*
5 December 2016



Introduction to London's underground railways:

- London Underground is a rapid transit metro system
- It uses trains, rails, bridges, earth works and tunnels to carry passengers above and below ground
- It was the first such system in the world
- It led and still leads development in changes to technology to improve passenger transit, working with other metro systems globally
- It affects and is affected by its environment
- Its operation requires engineering, legal, financial, people, and many other skills, to be effective

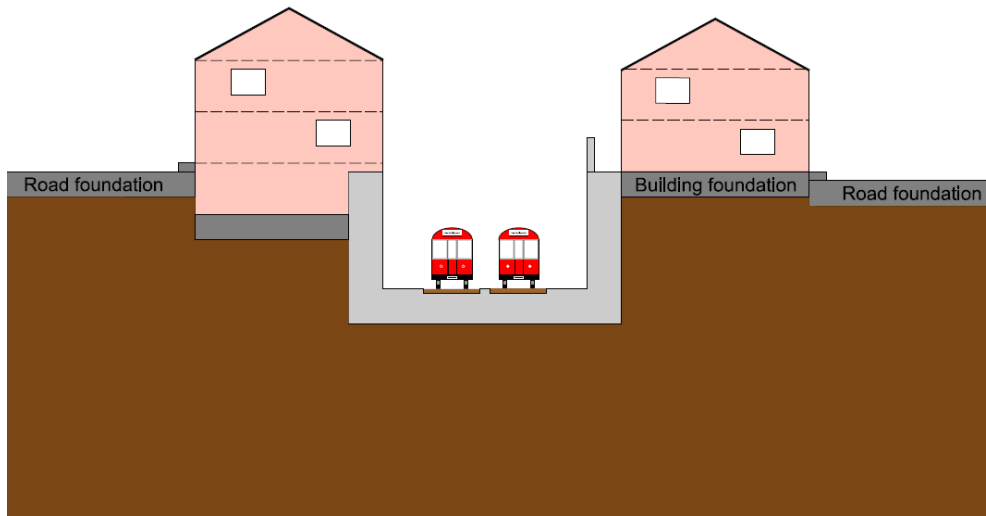
Only 45% of the network is actually in tunnel; most, but not all, are in the central zone...



Sub-surface tunnel below highway
with buildings either side
(0.2m to 7m below ground level)

Tube tunnels below highway
with buildings either side
(2m to 30m below ground level)

...some of the earlier sections in the central zone are also in cutting...

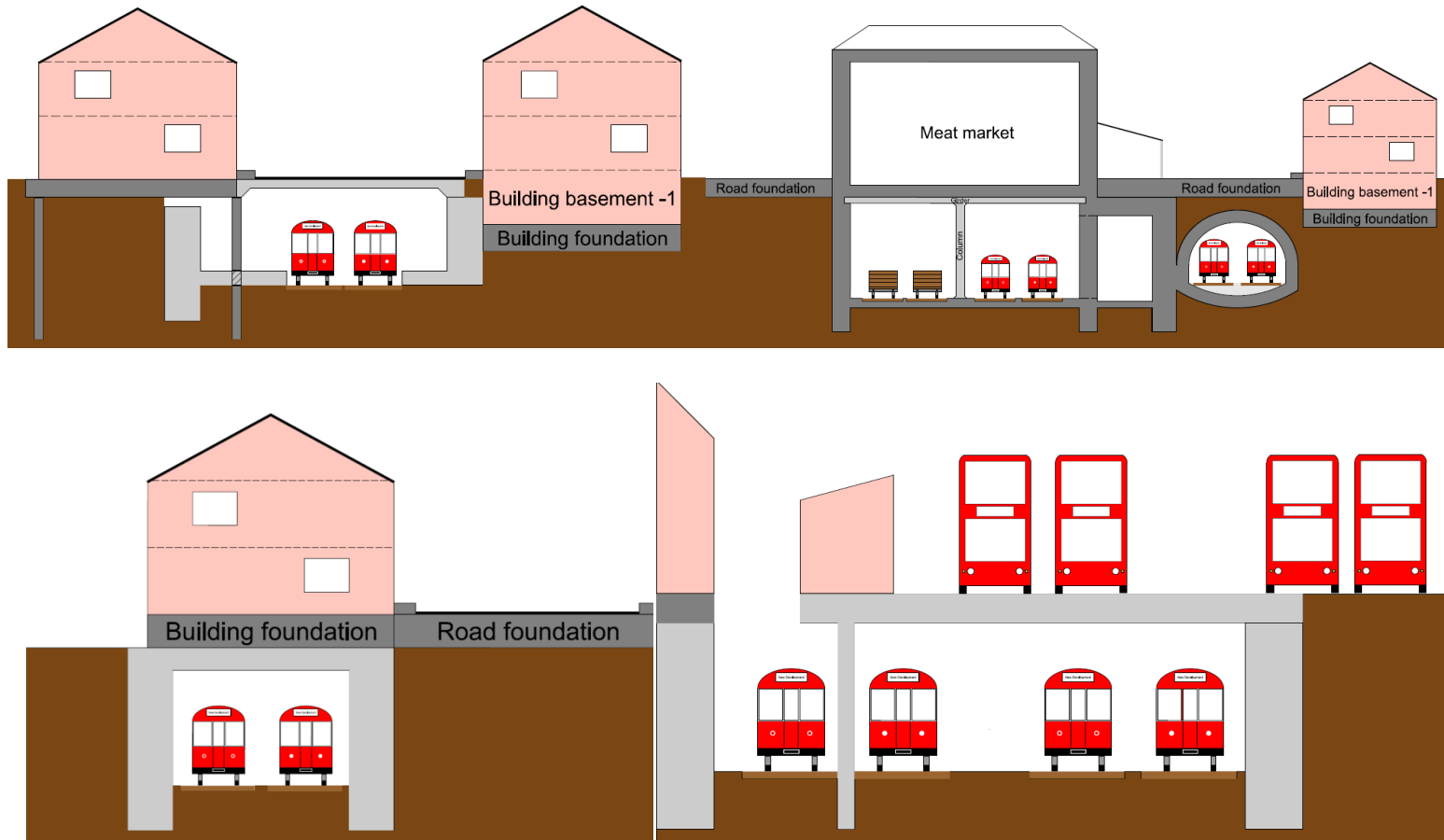


Typical cutting with building over cutting retaining wall, and building offset from top of retaining wall



Image showing railway cutting to the rear of Leinster Gardens, Bayswater

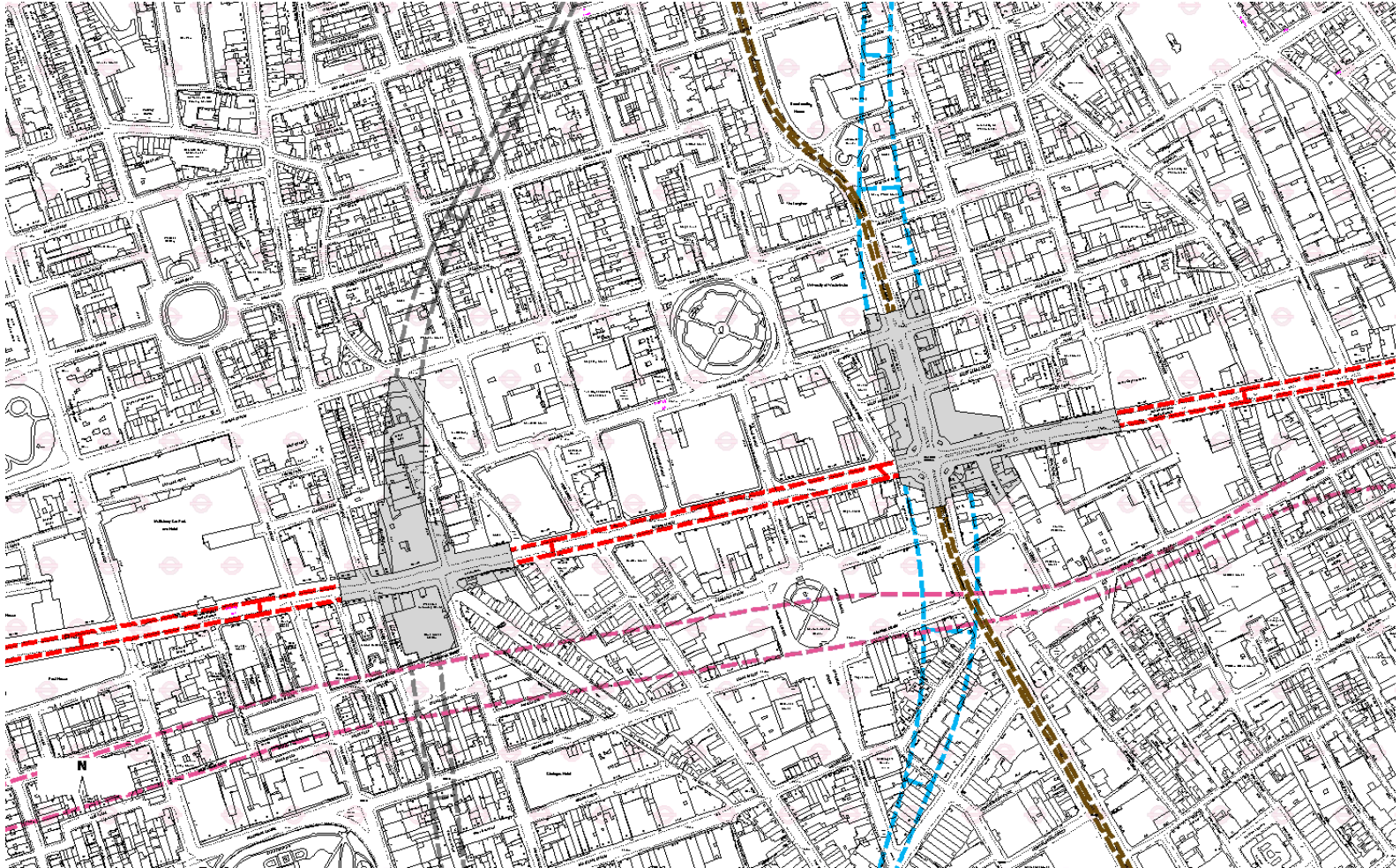
...it has direct and indirect relationships with buildings and structures in its vicinity...



...the remainder is on, just below, or above the surface, but it still has an effect on its environment...



...it therefore has hundreds of thousands of interfaces that can affect it,
and it can affect...



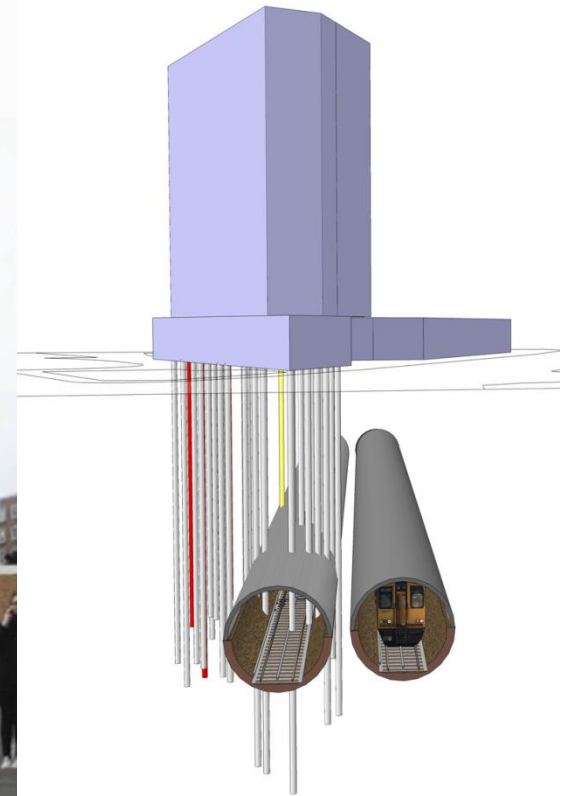
...the London Underground Infrastructure Protection team therefore works to ensure these interfaces are effectively managed...

The team undertaking, among other things:

- provision of plans showing locations of LU infrastructure to ensure third party developers or utilities owners know where LU assets are
- consultation on planning applications
- consultation with third party developers on their proposals, from design to completion
- consultation with utilities companies to ensure their works do not adversely affect the *physical* railway infrastructure
- advising hauliers of safe routes through London, to avoid passing over weight restricted structures
- consultation and clarification of property interfaces with third party land owners, utility companies, and other railway operators

East Road Incident, 2014

...this enables a reduction in *potential* and *real* risk to London Underground's assets, and increases the safe presence and operation of the railway...



...if these interfaces are not managed effectively, there is a serious risk to the safe operation of the railway, its passengers and staff.



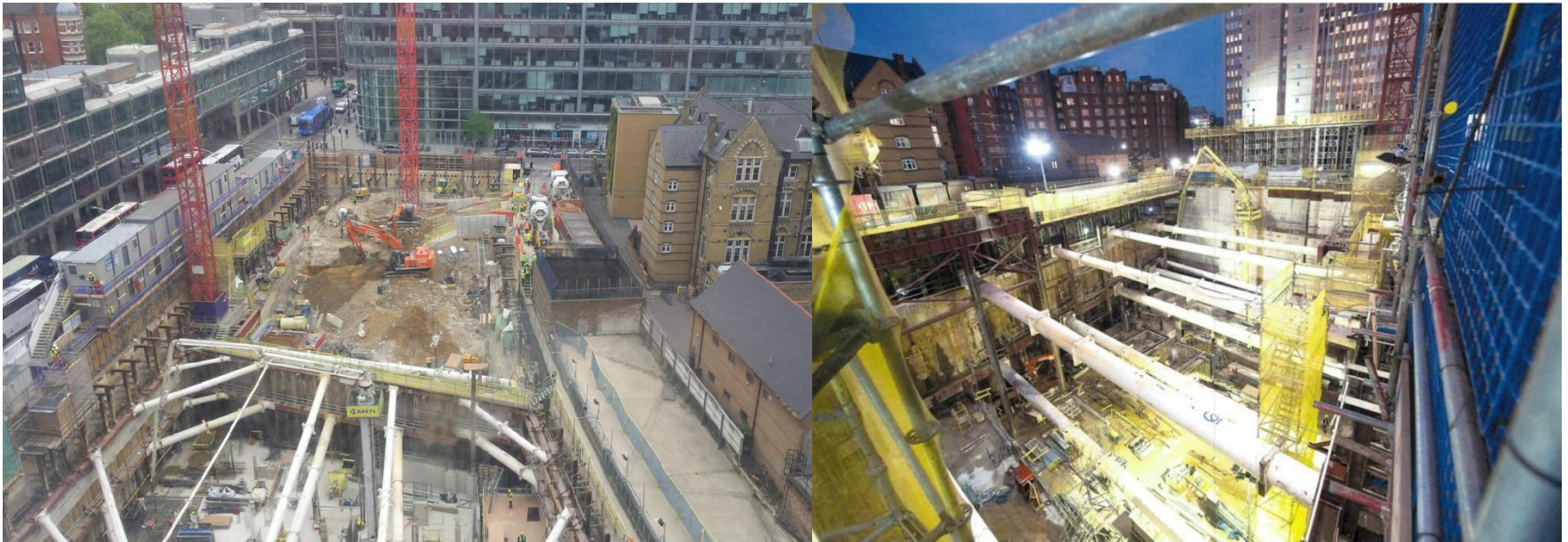
Kingsgate House development, London...

- located on Victoria Street, Westminster
- directly adjacent to the District and Circle lines
- The original building was demolished...



...the new development saw excavation and construction of new buildings:

- 8 storeys below ground level, at its lowest point
- and up to 14 storeys above ground level
- 22 storeys in total
- all with a railway directly adjacent



...*without* London Underground's input:

- the risks to the *engineered assets* forming the railway would be high
- there would be a serious risk to the safe *operation* of the railway
- *passengers and staff* would be put at risk
- there would be severe *service disruption* or *service suspension...*

...with London Underground's input:

- this is what was achieved, with no disruption to the railway, its assets, services or passengers.



Effective understanding of the presence *and* need to protect underground railway infrastructure allows...

- interfaces between London Underground's assets and its hundreds of thousands of neighbours to be managed
- the railway to be safe from the re-development activities of our neighbours
- London Underground's neighbours to undertake their property re-development safely

and ultimately:

- for London Underground to work collaboratively with its neighbours to ensure its passengers and staff are safe and they have a rapid transit service to be proud of.

Further information

If you would like to know more please see...

The London Underground Infrastructure Protection Video:

<https://youtu.be/0hGoJMTBOEg>

Journal Article, 'A brief introduction to London's underground railways and land use', 2014: <https://www.jtlu.org/index.php/jtlu/article/view/411>

Journal Article, 'A conceptual framework for land use and metro infrastructure', 2016: <http://www.icevirtuallibrary.com/toc/jinam/0/0>

RAIB report, 'Penetration of a tunnel at Old Street 2014':

<https://www.gov.uk/raib-reports/penetration-and-obstruction-of-a-tunnel-between-old-street-and-essex-road-stations-london>

Or contact us:

Email: LULCEDIP@TfL.gov.uk

Tel: 0203 054 1298