

Enhancing London Tube Passengers' Travel Experience

LONDON UNDERGROUND STATION
UPGRADE PROGRAMME

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LUL STATION UPGRADE PROGRAMME

- London Underground Limited
- Station Upgrades Programme
- How We Do it !
- An Example

LUL vision:

- **A world-class Tube for a world-class city**
 - Run the best service we can every day; reliable, and with high standards of customer care
 - Deliver new assets and introduce technology on time and to budget, minimising the disruption to customers and changing the way we work to get the most from the new equipment
 - This is what world class means: world class service; world class delivery; world class people; and world class efficiency, and therefore value.

LUL - KEY FACTS

- London Underground was the world's first underground railway and opened in 1863
- More than one billion passenger journeys are made each year
- There are 11 lines covering 402km and serving 270 stations; 45% of the network is in tunnels
- In the peak hours, more than 500 trains are in operation
- Every train travels around 76,800 miles/123,600km each year – more than three times the circumference of the earth
- There are 500 escalators and 163 lifts to keep passengers moving throughout the system
- Waterloo station has the most escalators, with 23 plus two passenger conveyors
- During the three-hour morning peak, London's busiest Tube station is Waterloo, with 51,000 people entering. The busiest station in terms of passengers each year is Victoria with 78 million
- Average train speed is 33km per hour (20.5mph)
- In Central London trains cannot reach speeds of more than 30 – 40mph because of the short distance between stations
- Metropolitan line, trains can reach over 60mph because stations are wider apart

LUL STATION UPGRADE PROGRAMME OBJECTIVES

- Deliver major station upgrades
- Upgrade, install and enhance station assets
- Manage contracts that give best value to London Underground and its customers
- Work in collaboration with our LU, and external partners
- Ensure a safe, working environment for all

Station Upgrades – The Plan

- Green Park Step Free Access
- Station Refurbishments
- Station Developments
- Olympics (Stratford)
- Victoria Station Upgrade
- Stations Lifts and Escalators
- Tottenham Court Road
- Bond Street
- Paddington
- Bank Walbrook Square Development
- Bank Northern Line Congestion Relief and Step Free Access

How we do it !

- PPP
 - TLL
 - METRONET
- NEC3

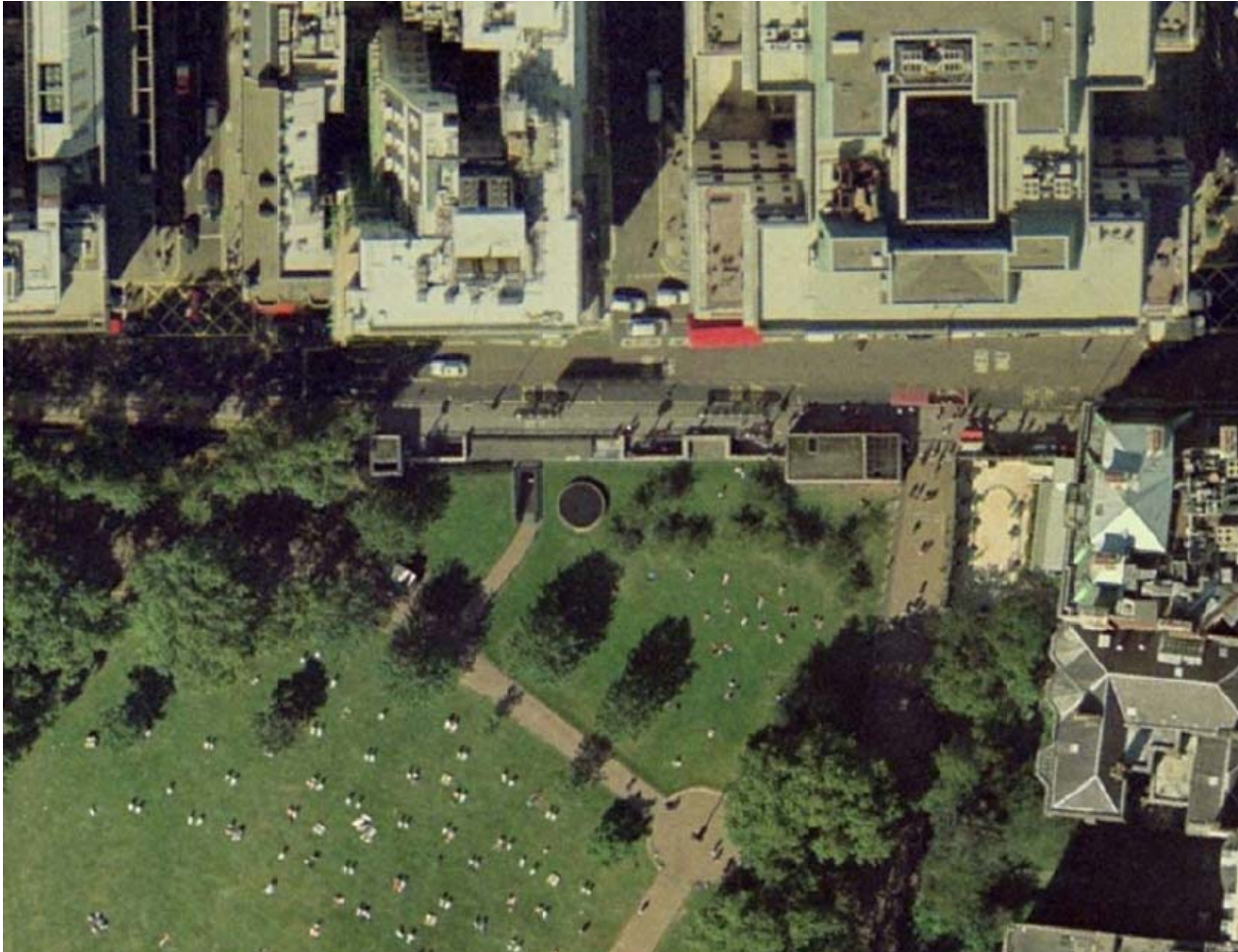
An Example Stations Upgrade Project

With Thanks to my colleagues
Fred Green and Matt Down

Green Park Station

8th busiest station on the network used by over 56 million customers per annum

Served by the Victoria, Jubilee and Piccadilly Lines



Piccadilly

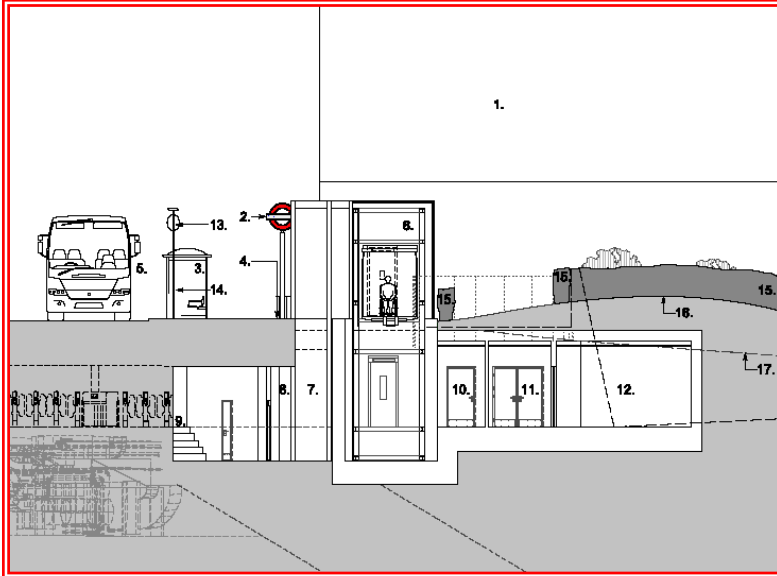
Ritz

Green Park

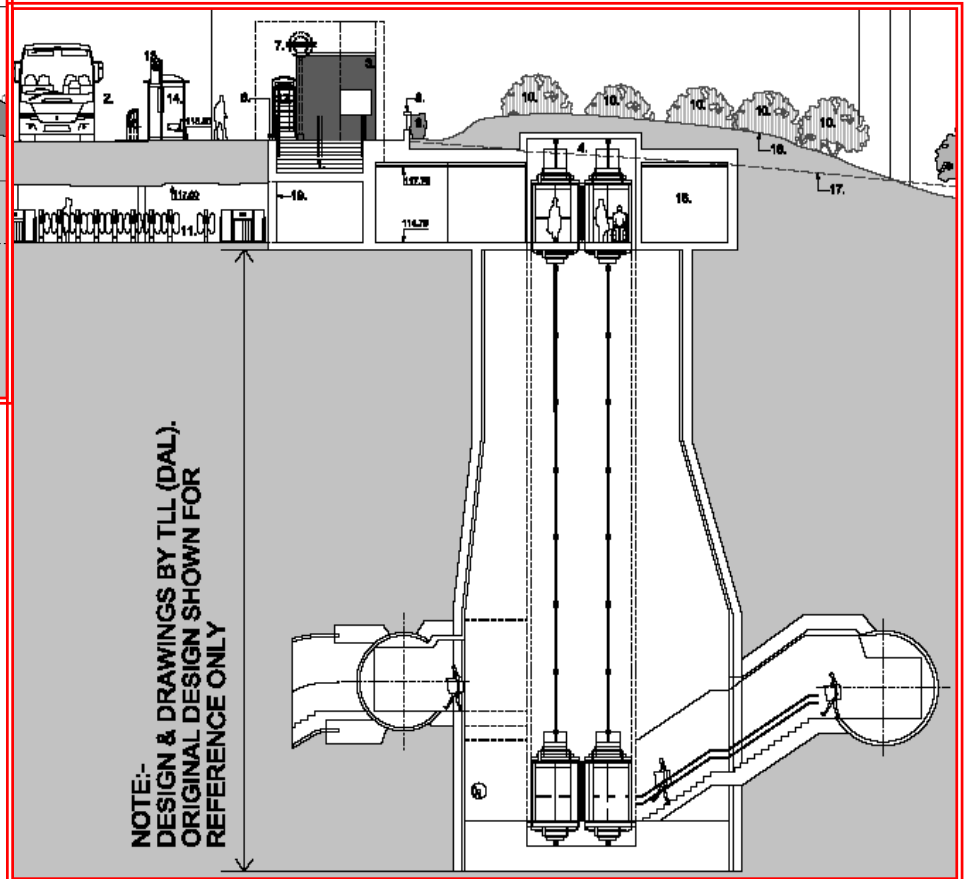
Objective

To make Green Park Station step free from street to platform in time for the Olympics/Paralympics

Two x 19 Person Duplex lifts from ticket hall to Victoria line platform level and Pic/Jub Interchange



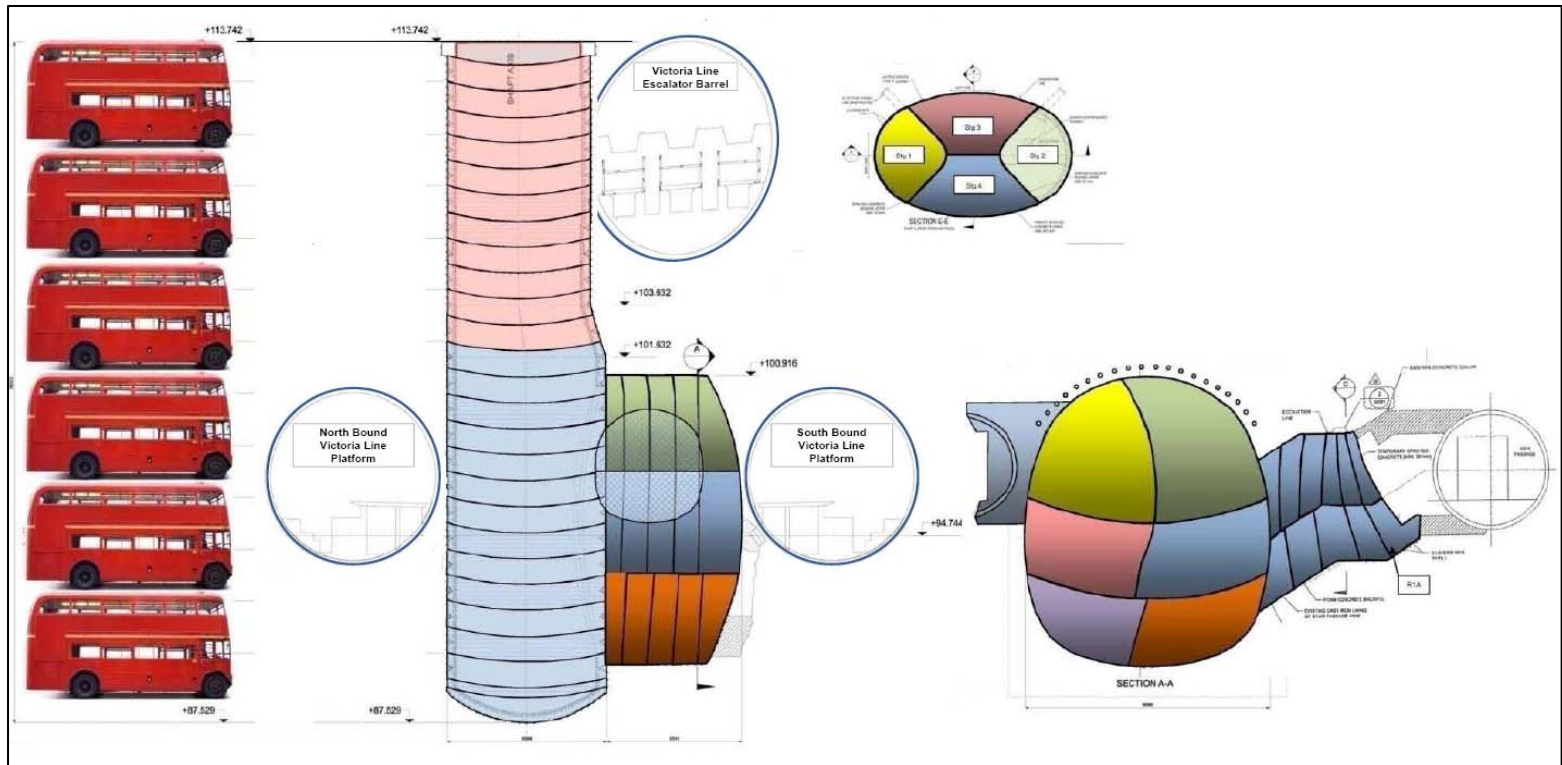
**25 Person lift
from street to
ticket hall**



Lift 5 & 6 Shaft

Shaft construction

- 26m deep lift shaft next to and below the Victoria line escalator shaft and platform tunnels
- 2000m³ of spoil excavated



GREEN PARK was awarded best project AT THE NCE INTERNATIONAL TUNNELLING AWARDS CEREMONY in December 2010 – for project under £10M.

Shaft

**Setting out of shaft ring
beam (13.10.09)**

Main shaft started 13.01.10



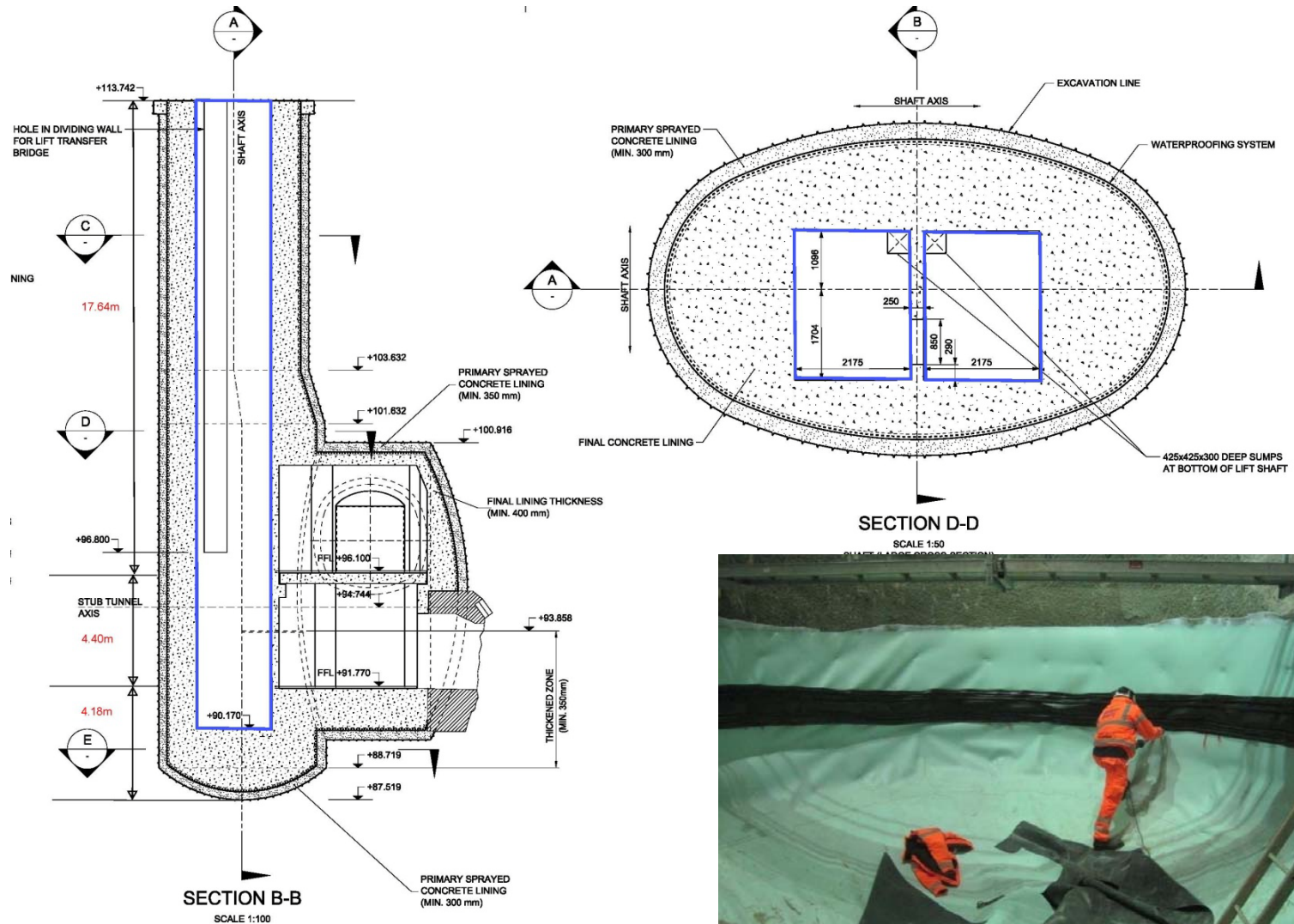
**Start of excavation out from shaft
under escalators**

Shaft

‘Bottoming Out’ ceremony for the completion of Shaft/Tunnel (15.04.2010)



Lift shaft



Waterproof in preparation for filling most of shaft with concrete

Interchange level connection



Interchange passage level

New stair and passageway built to new alignment and connected into existing structures

Existing stair and passageway filled with foam concrete and new structure excavated through it

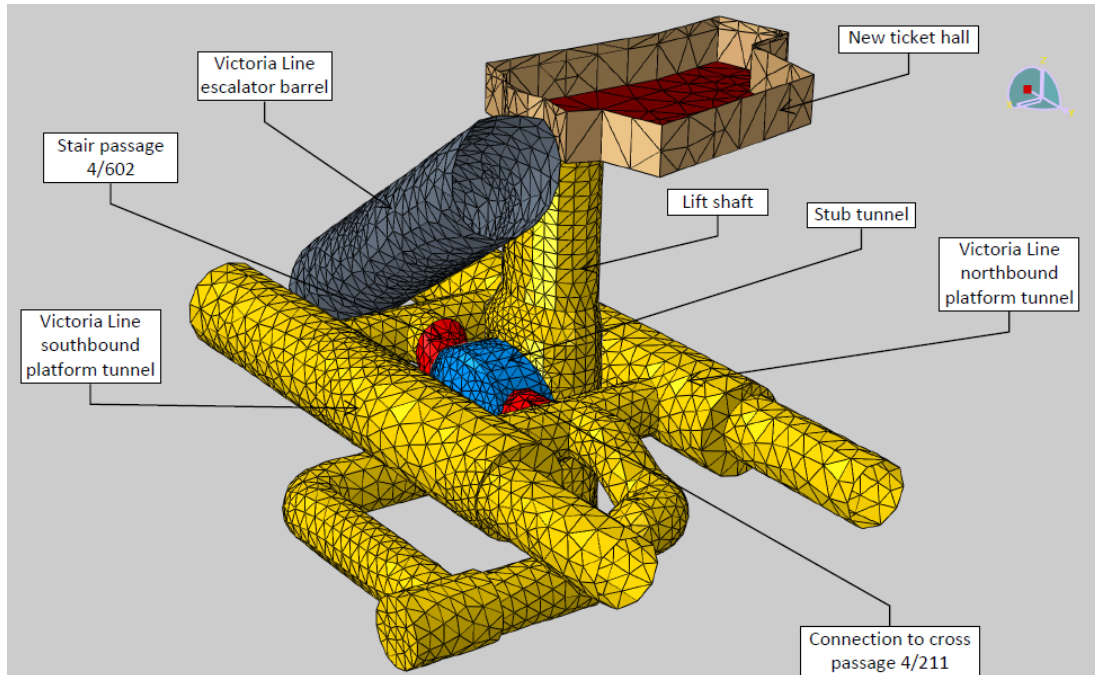
Issues, risks and mitigation

- Tunnelling/Movement
- Neighbours/Access/Noise
- Asbestos
- Existing Services

Issue: Tunnelling/Movement

Risk Causes failure of Victoria line escalators

Pre-existing and proposed structures represented in the 3D FEA



Victoria Line Escalator Barrel Movements:

Phase 2 prediction: 7.3mm

Phase 3 prediction: 8mm.

Contractor prediction: 3mm.

Actual: 4mm.

Recommended replacing the 3 Vic line escalators

Recommended jacking all 3 Vic line escalators

Mitigation

- FE modelling
- PED route modelling
- Operational trials
- Installation of jacks

Issue - Neighbours/Access/Noise

Risk – Works could not progress as planned i.e. 24 hour shaft construction and regular site access

View from Ritz before works start



Mitigation:

- Consult with neighbours
- Agree access plan
- Take measures to prevent disturbing neighbours, e.g. noise, light, dust

Issue - Neighbours/Access/Noise



Cleaning Queen's Walk with road sweeper



Spoil removal vehicle being marshalled along Queen's Walk

Issue - Neighbours/Access/Noise



Issue: Asbestos

Risk:

- Project delays for removal & additional costs
- No allowances within the programme for removal – tunnel rings only element on critical path leading to minimal impact on schedule

Mitigation

- Where possible survey work areas in advance.
- Prioritise construction works/sequencing to focus on high risk areas first
- Commence works early to allow float for identification and treatment of asbestos – include time risk allowance in programme
- Have available well resourced HazMat team to remove asbestos quickly

Common asbestos locations:

**Asbestos
encapsulation /
Breakout works
complete at 4/211**



**Corrugated sheets
containing asbestos found in
passage**

Asbestos

Not so common asbestos locations:

Slide 1 of 2

**Removal of
asbestos debris
from ducts in
Ticket Hall
extension**



**Removal of asbestos ducts in
Cross Passage**



**Excavation for Ticket Hall extension –
Some spoil noted containing asbestos**

Asbestos

Not so common asbestos locations:

Slide 2 of 2

Coring through EHH concrete roof beams above asbestos zone



Concrete slab breakout with attendance by Forest Environmental to remove embedded asbestos pipe



Saw cutting WHH upper concrete beam above asbestos zone

Street Level July 2009



Street Level December 2009



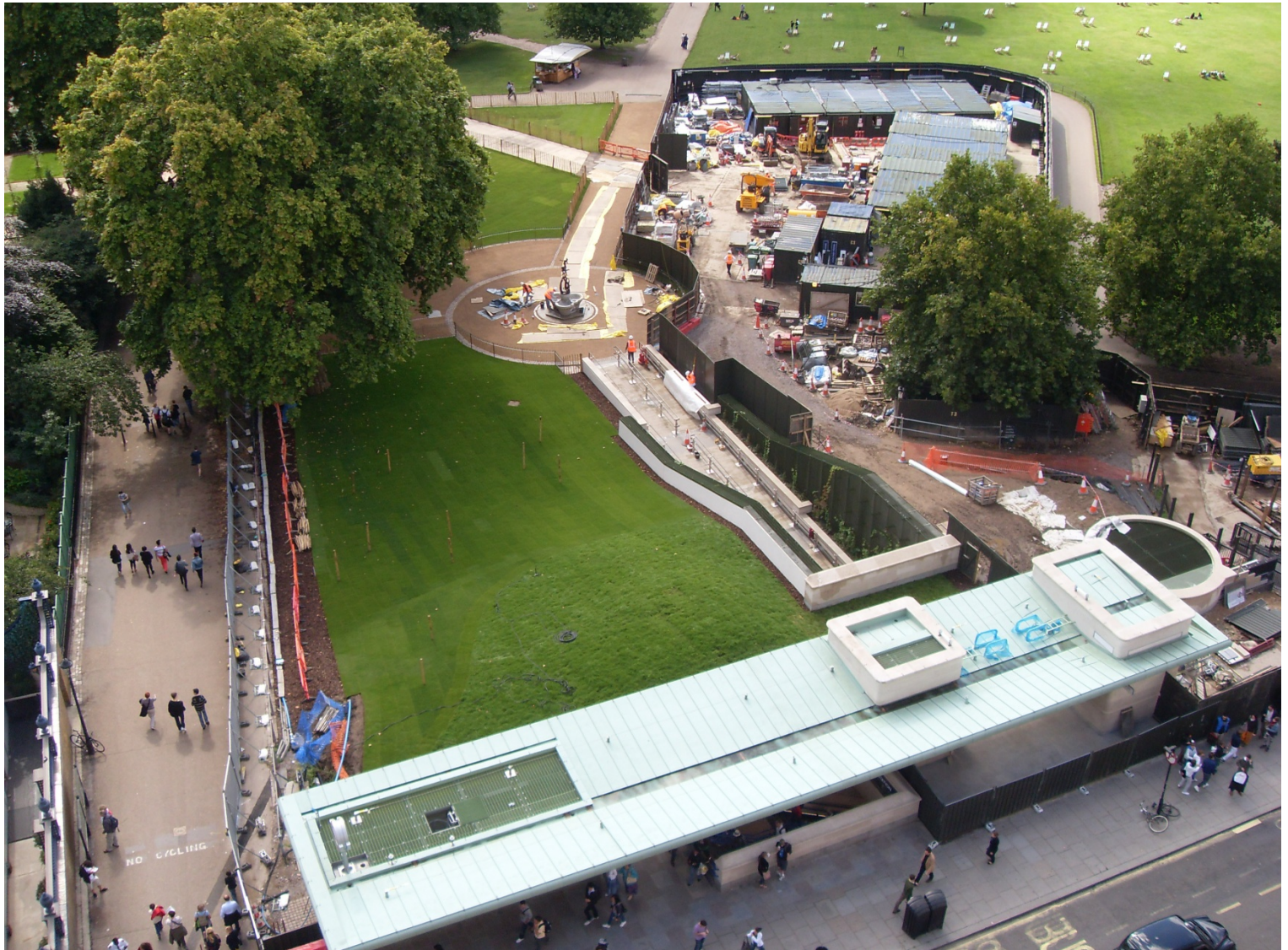
Street Level Aug 2010



Street Level December 2010



Street Level August 2011



29 August 2011
First station inside Circle Line to be step free



January 2012
Site to be demobilised and landscaping completed



THANK YOU