Understanding people on the move in London

Charles Buckingham

Impacts Monitoring Manager

(with thanks to….,.)

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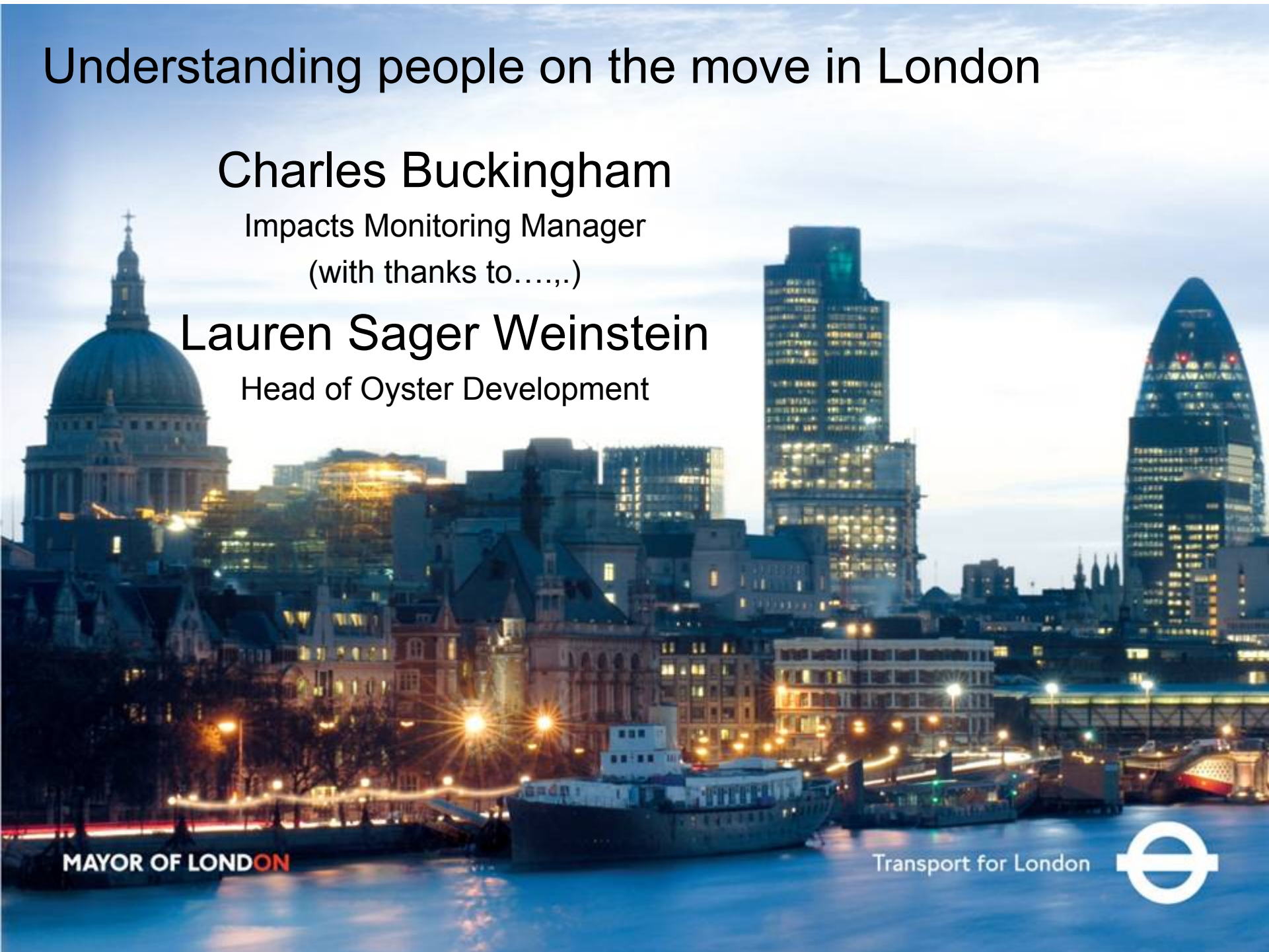

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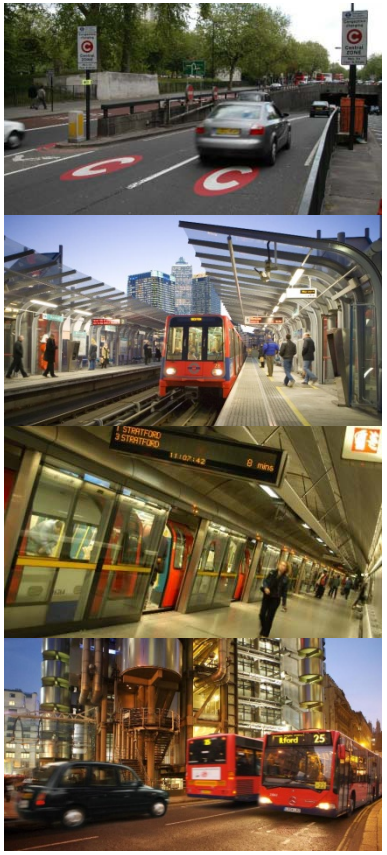
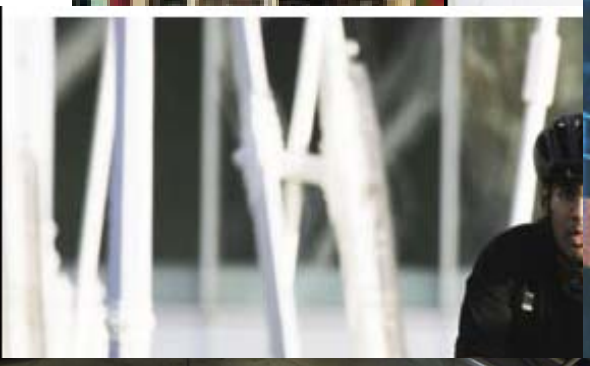
- TfL's responsibilities
- About Oyster
- Using Oyster to understand people on the move
- Congestion Charging – some examples

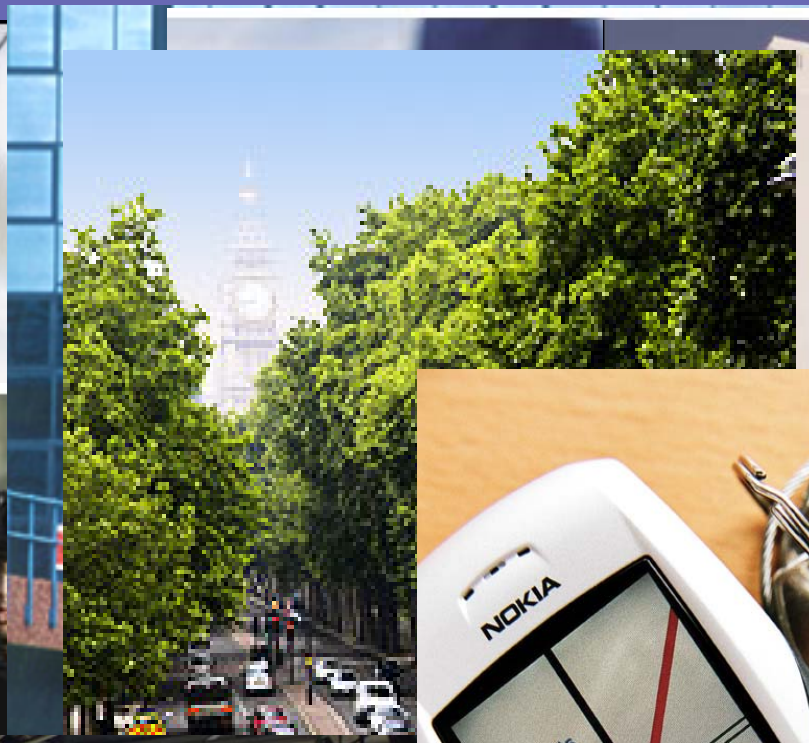
About TfL



- Mayor of London's transport authority
- Finances/procures/operates/maintains public transportation
  - London Underground
  - Buses
  - Docklands Light Railway
  - Croydon Tram
  - TfL Road Network – 580km of arterial roads
  - Congestion Charging

TfL's resp






NOKIA
St Paul's
Bank
Monument
Street
FIND
ZOOM OUT


New Cross
CANADA WATER
378 000

TfL travel facts

Every weekday in Greater London:

6 million journeys are made on London's buses

3.4 million on the Tube

11 million car / motorcycle trips

155k + passengers on DLR

9.5 million walking or cycling trips

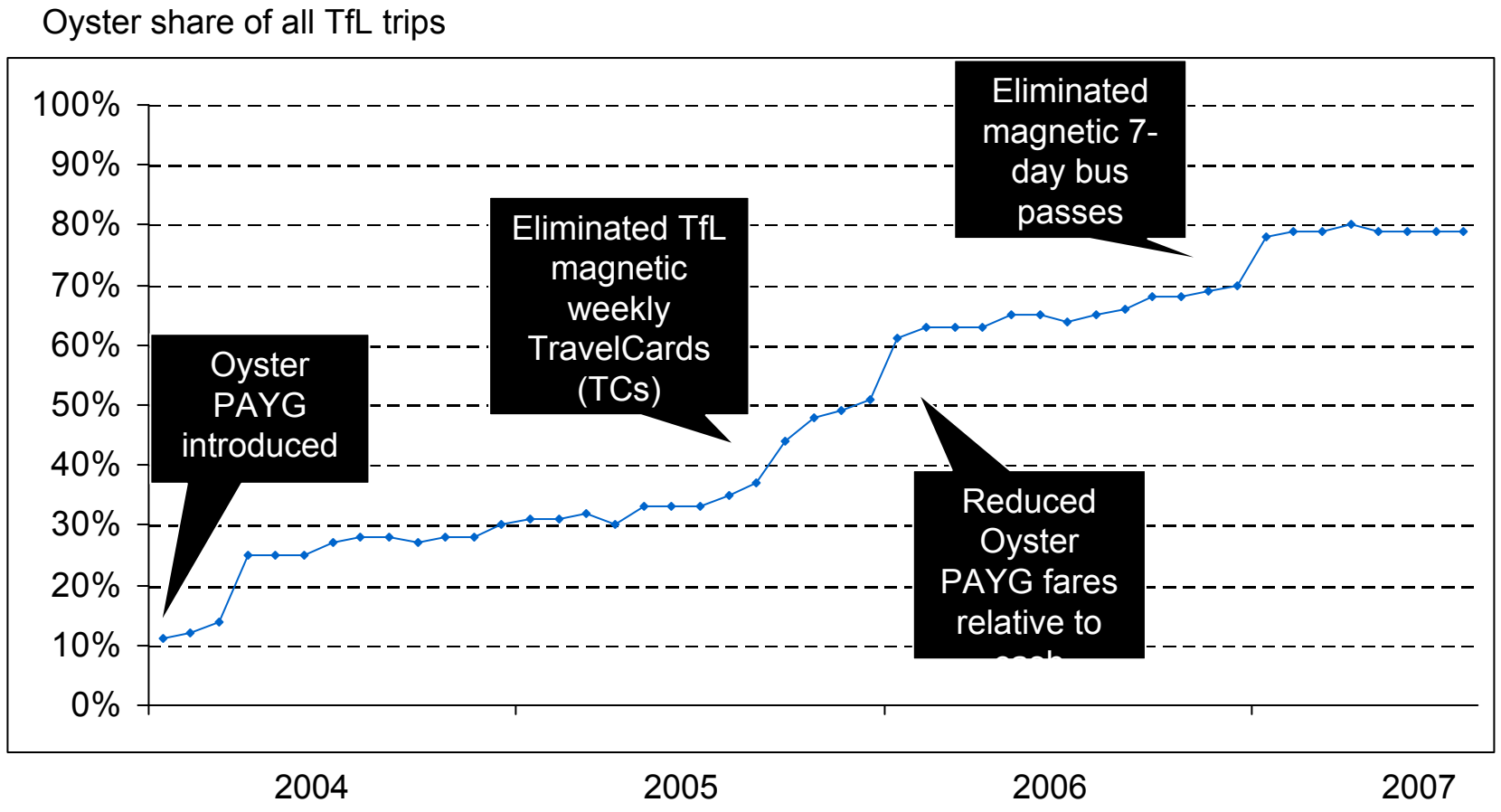
70% of National Rail journeys begin or end in London

About Oyster

Source: TfL Fares & Ticketing Directorate

- TfL's multi-modal smartcard
  - National rail
  - London Underground
  - Buses
  - Tram
  - DLR
- Contactless: 0.2s read/write at the reader
- 3 x tickets + £90 PAYG with daily capping
- Distributed to customers free with a period travel product or a £3 returnable deposit: >16m issued to date
- Concession & discount variants
  - Freedom Pass for over-60s
  - Various child & student schemes
  - Bus & tram adult discount card

Penetration of Oyster



Source: TfL Fares & Ticketing Directorate

Key Oyster Benefits

Change in customer behaviour

Old: purchase a ticket and then travel

New: streamlined travel for customer

Reduces queues

Minimises cash handling

Tackles fraud

Speeds customers through gate

Source: TfL Fares & Ticketing Directorate

Using Oyster to Understand travelling behaviour

Key Oyster statistics

- As of January 2008, 17m + Oyster cards issued
- 5.6m cards were in use during the previous 4 week period

- During the week of 25 November -1 December 2007, on an average weekday there were:
  - 3.1 million Oyster journeys a day on the Tube and DLR
  - 5.4 million Oyster journeys a day on buses and trams

- In November 2007, Oyster card journeys represented around 74% of bus and Tube journeys.

Oyster Card Personal Data

- Oyster cards can be registered or unregistered
- Registered cards can be protected if lost or stolen
- Mandatory registration on monthly and annual tickets
- Detailed journey history kept for 8 weeks for customer service purposes (eg refunds)
- After 8 weeks, personal data is anonymised

Understanding travel patterns using anonymised Oyster data

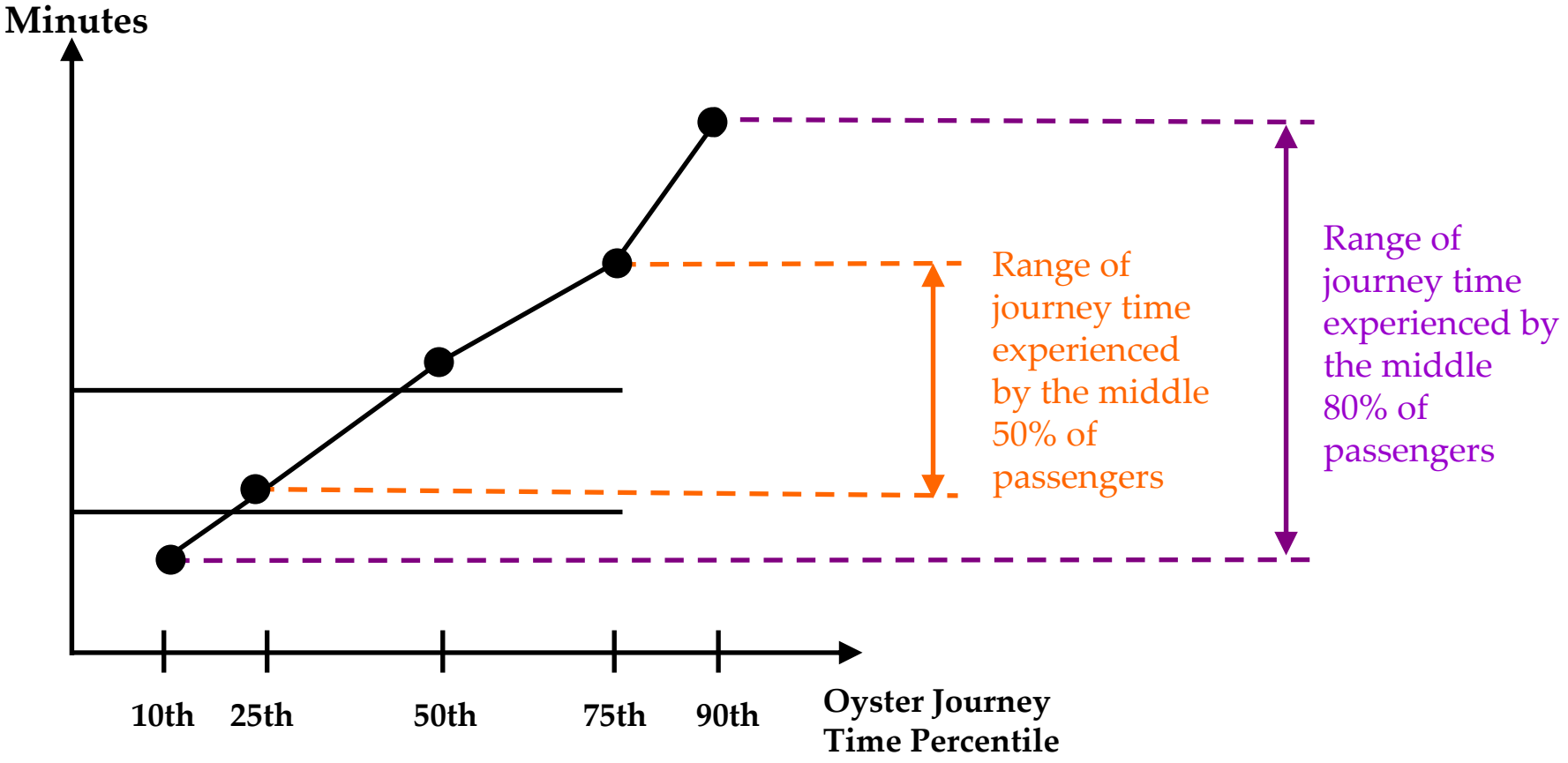
Analysis work supported through TfL partnership with MIT, with TfL guidance on crafting research questions

Sample research

Using Oyster to measure Variation of OD Journey Time

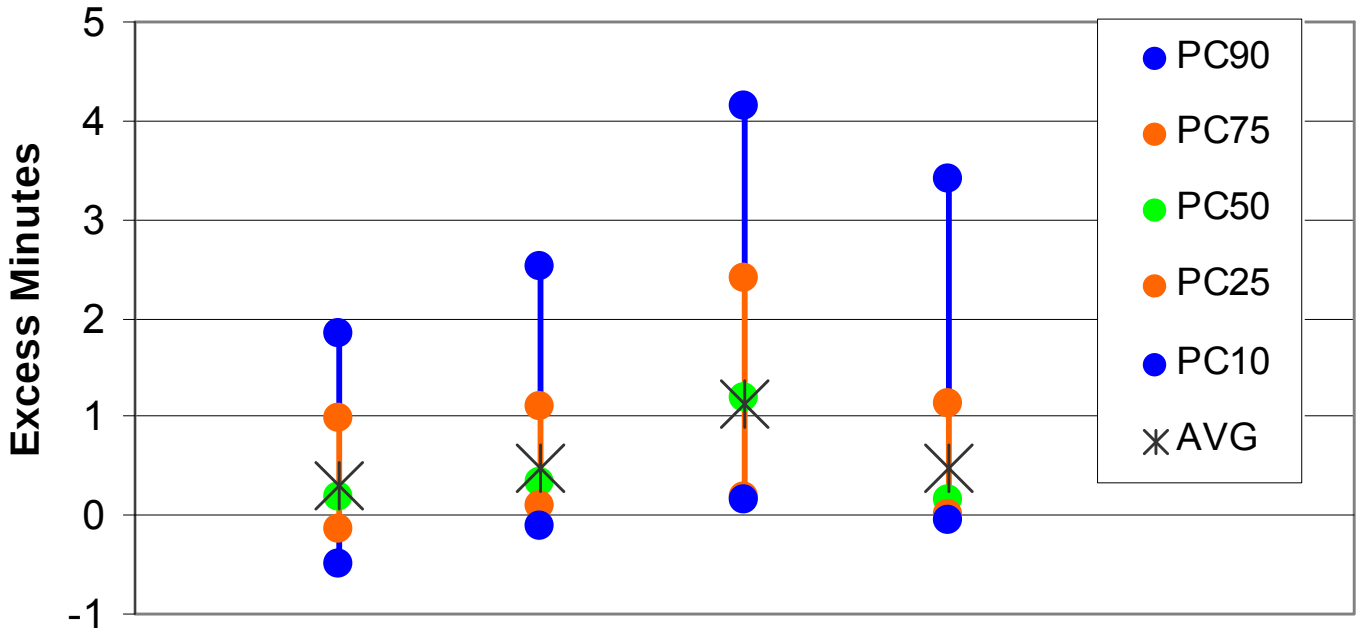
Can we use Oyster data to measure variability of journeys between stations?

Research by Joanne Chan, MIT MST 2007



- **Example ranges only**

Results – Victoria Line (AM Peak Northbound)



- Skewed distribution
- Victoria, the only Zone 1 station in the graph
  - Largest average excess minutes
  - Largest variation in excess minutes

Research by Joanne Chan, MIT MST 2007

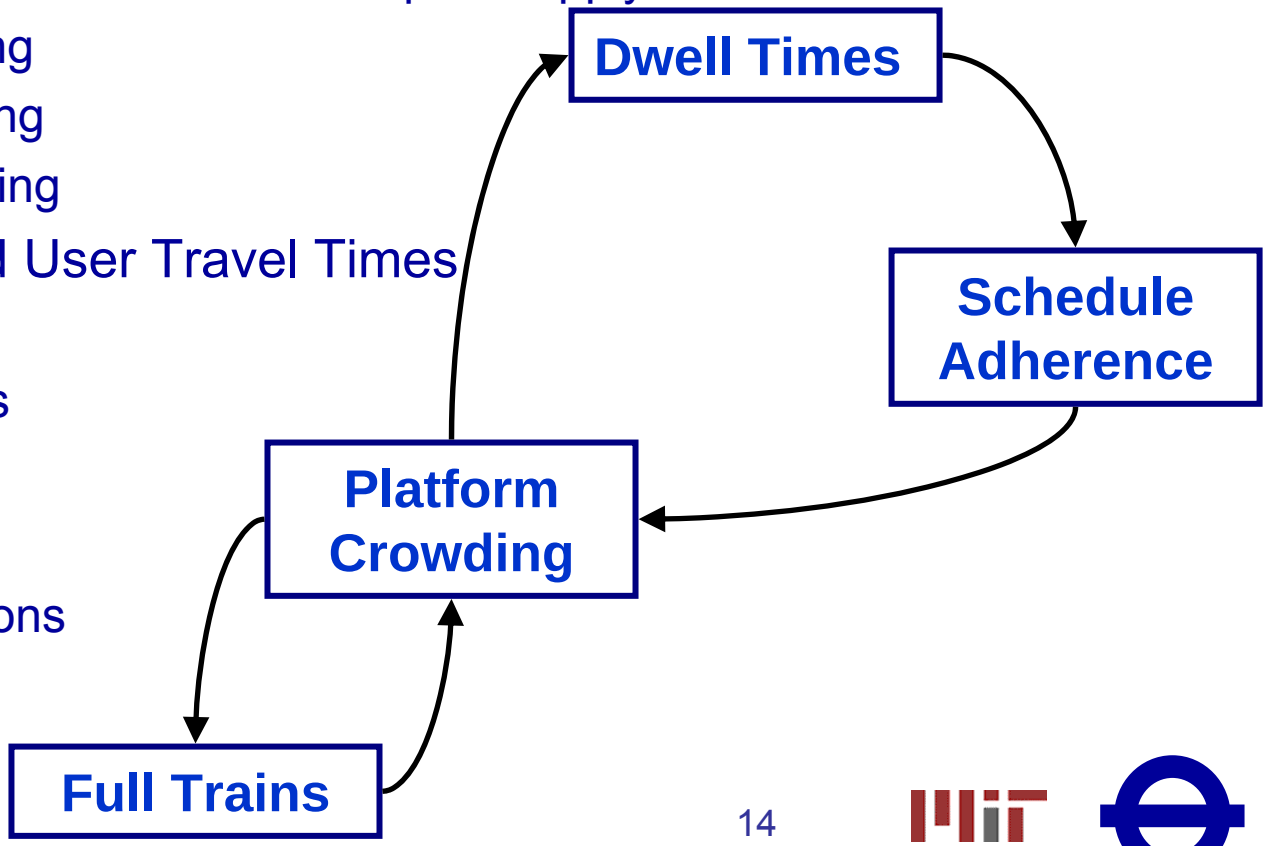
Using Oyster to Measure Crowding

Can we use Oyster data to capture effects of crowding?

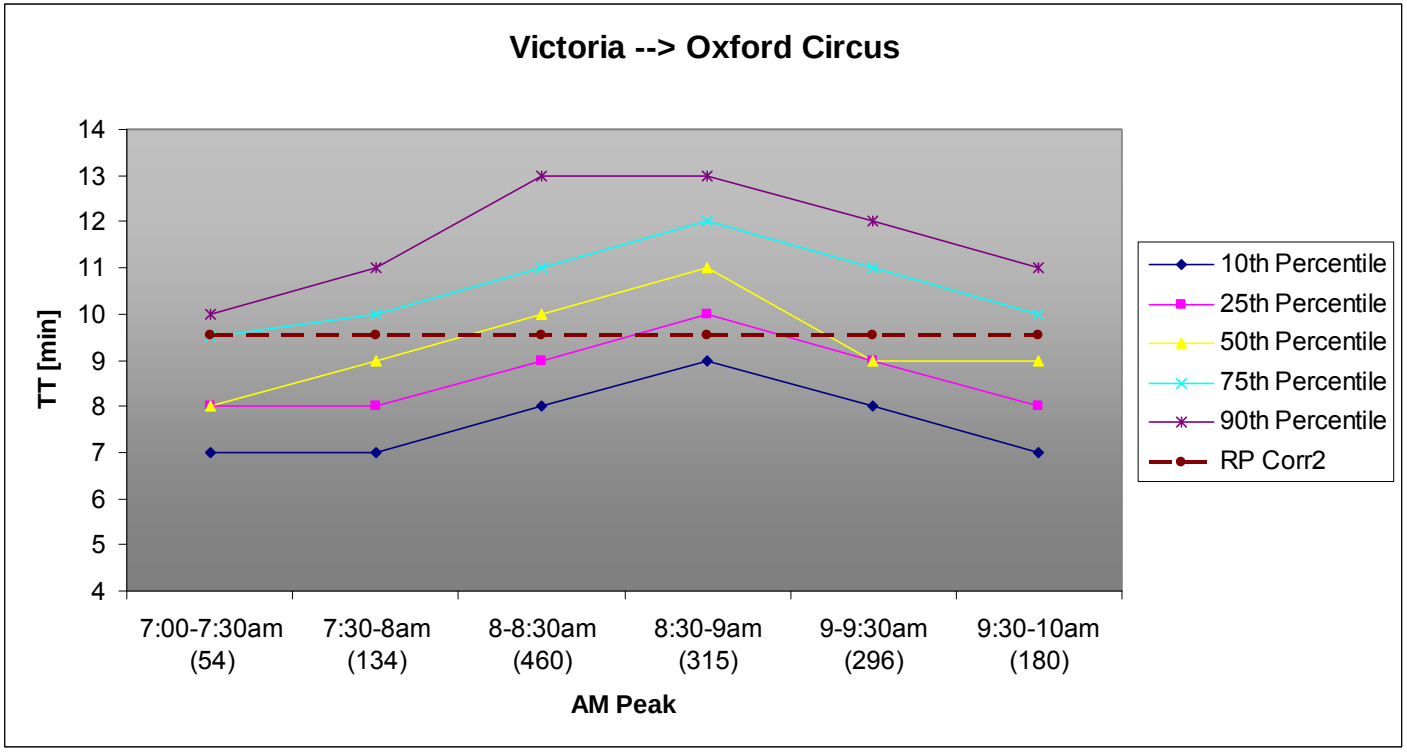
Research by David Uniman, MST candidate 2008

The theoretical model:

- Imbalance b/w Travel Demand ↔ Transport Supply
  - Platform Crowding
  - On-Train Crowding
  - In-Station Crowding
- Leads to Increased User Travel Times
  - ↑ Wait Times
  - ↑ On-Train Times
- Through…
  - Full Trains
  - Headway Variations



Analysis: 30-min AM Peak Oyster



RP Corr2 = TfL rail plan modelling tool, corrected to take into account Oyster journeys are gateline to gateline

David Uniman, MST Candidate MIT 2008

Travel time increases at the peak; after the peak many journeys are still longer than early morning

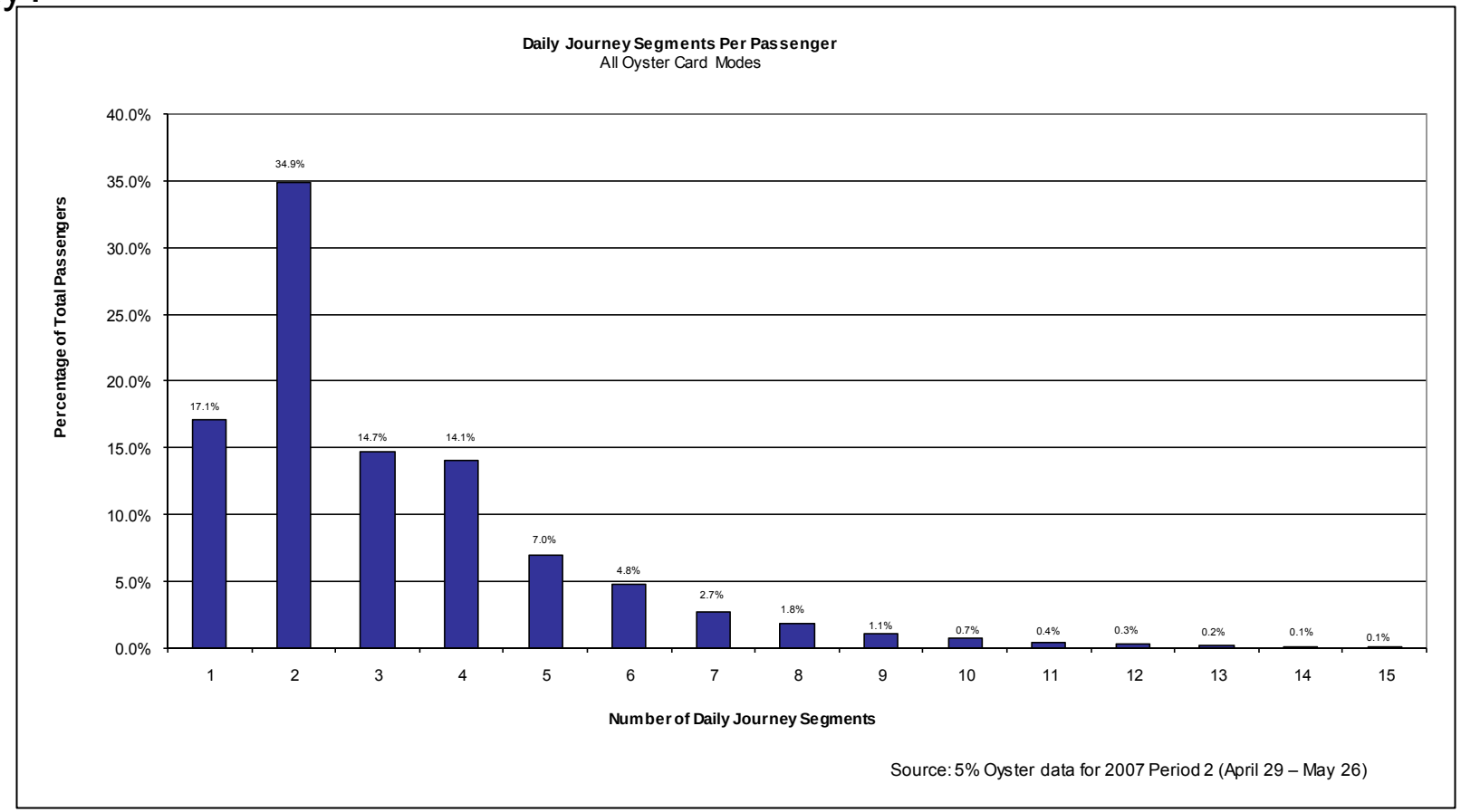
Research Question

- **By focusing on bus passenger interchange behaviour, can Oyster data be used to help improve the public transport network in London?**
- **Key contribution:**
  - **Methodology for describing passenger interchange behaviour in London using Oyster card data**

Catherine Seaborn, MIT MST candidate 2008

Journey Segments Per Passenger

• Question: how many journey segments do Oyster customers take on a given day?



Weekday Journey Segment Patterns

Mode 1	Mode 2	Mode 3	Mode 4	Mode 5	Mode 6	Passengers	Share	Cumulative Share
U	U					416,082	16.3%	16.3%
B	B					401,356	15.7%	32.0%
B						266,561	10.4%	42.4%
B	B	B				150,781	5.9%	48.3%
B	B	B	B			144,275	5.6%	54.0%
U						125,528	4.9%	58.9%
B	U	U	B			77,353	3.0%	61.9%
B	B	B	B	B		72,943	2.9%	64.8%
U	U	U				65,190	2.6%	67.3%
B	B	B	B	B	B	50,485	2.0%	69.3%

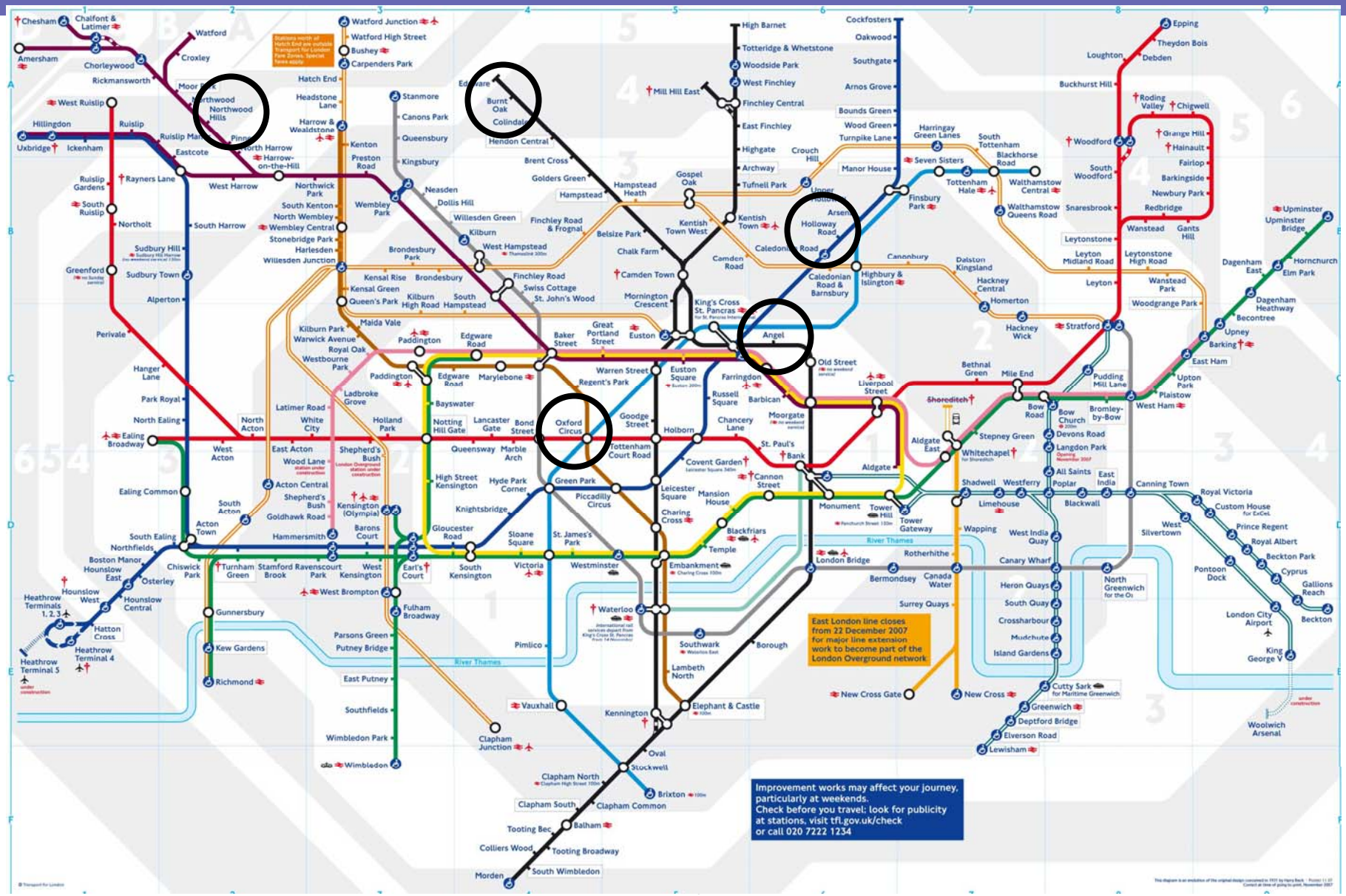
Source: 100% Oyster data for Wednesday, November 14, 2007

- What are the modes for these journey segments?
- Top 10 shown
- Total patterns: 15,802

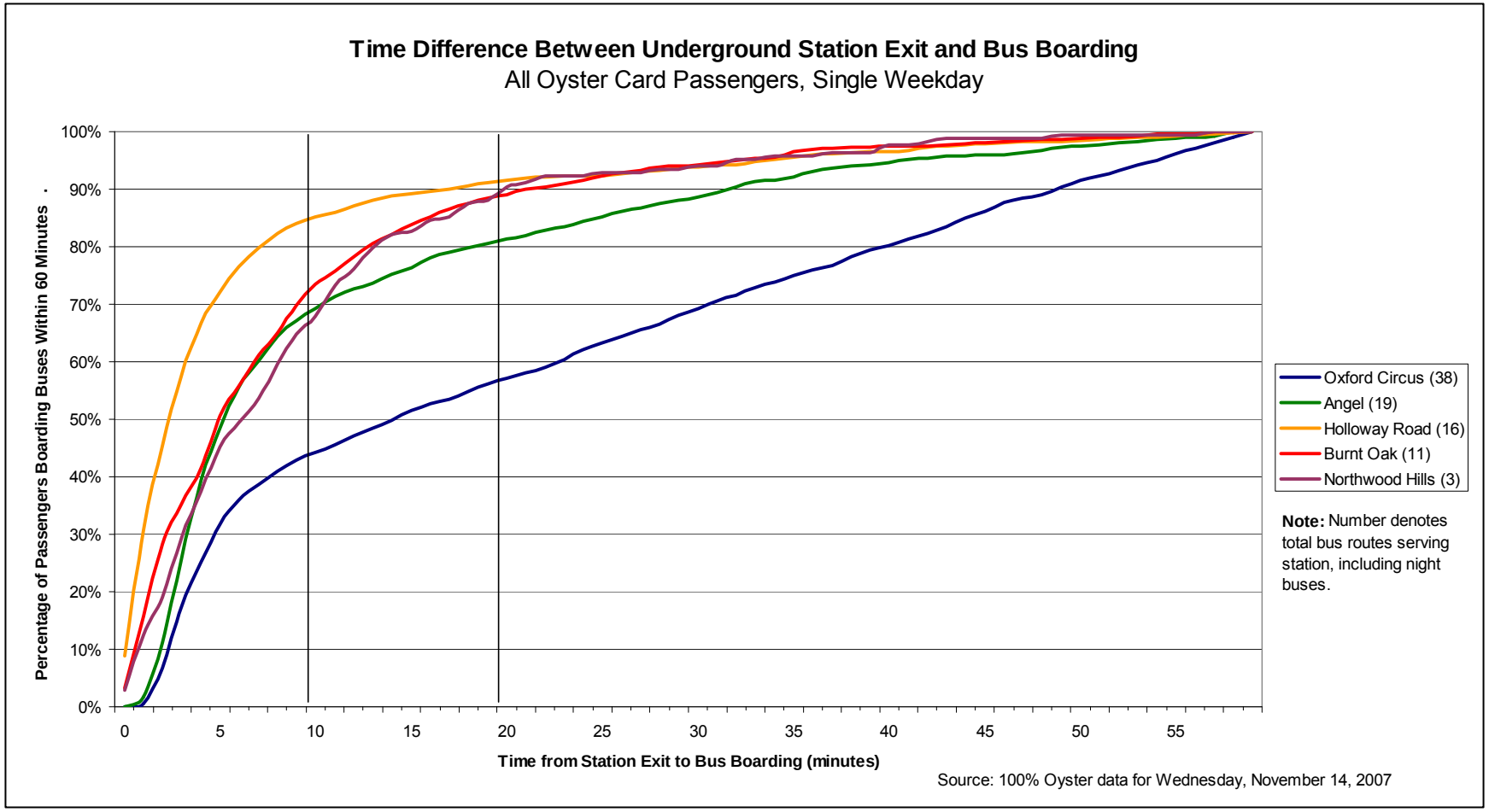
Research Question

- **What are the characteristics of interchanges to bus at London Underground/bus interchange locations?**
  - **How long does it take for passengers to transfer between modes?**
  - **Function of walk time, frequency of service, reliability**

Example Interchange Stations

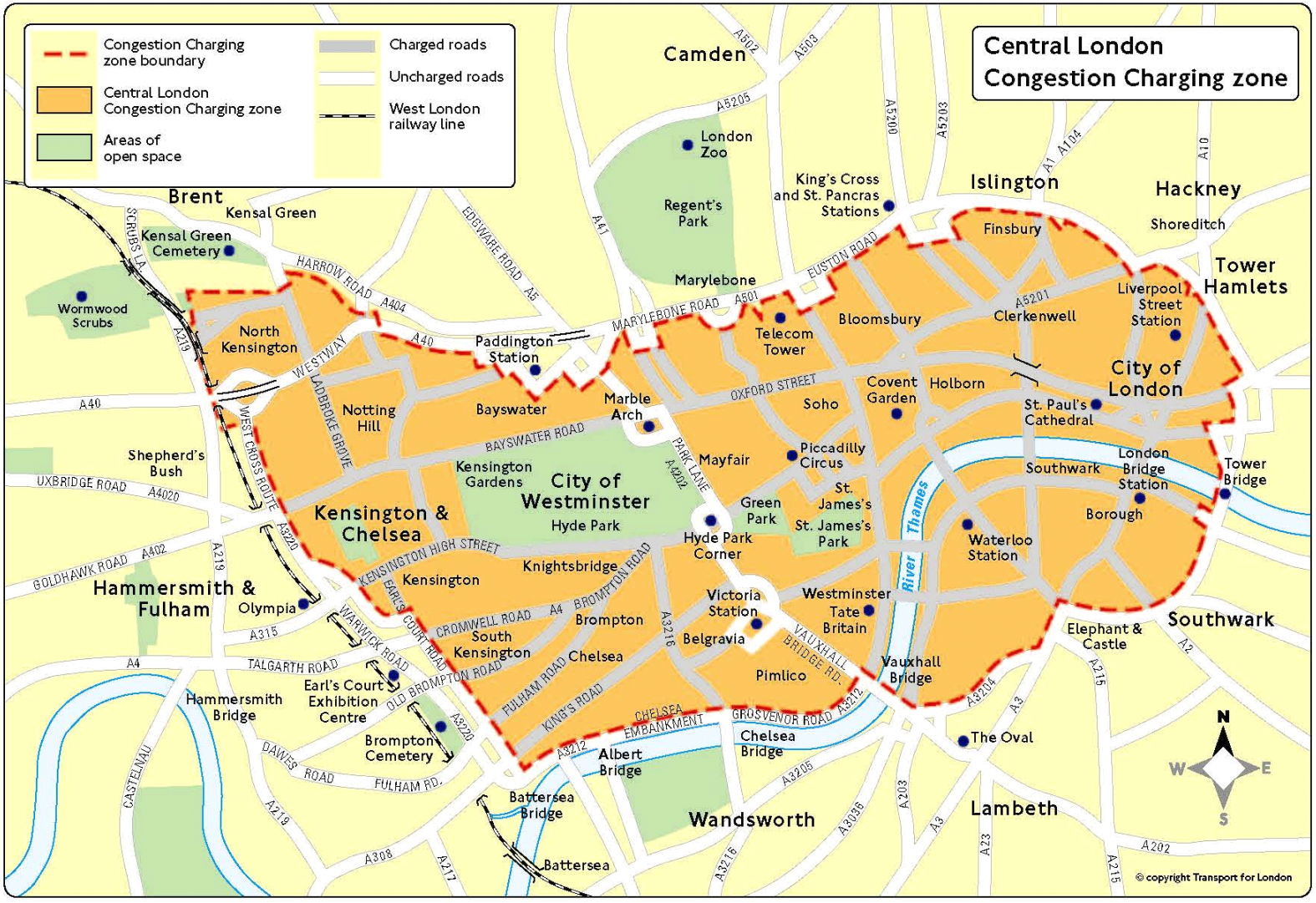


Potential Interchange Time: Underground-Bus



Congestion charging in central London

Extended Central London charging zone



A transport success

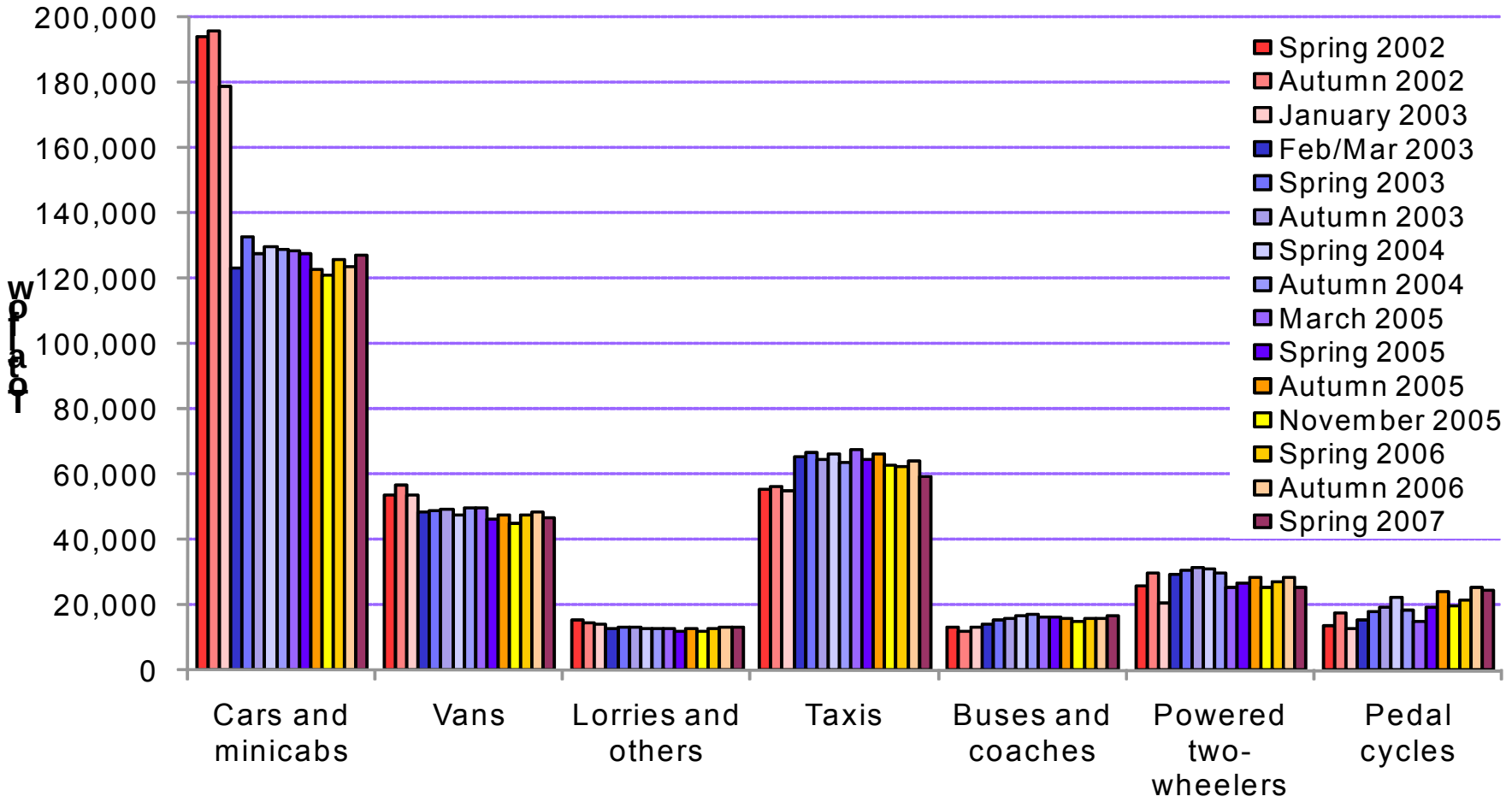
- Traffic entering charging zone: (4+ wheels) Down 21%
- Chargeable vehicles: Down 31%
- Initial impact on congestion high: 30% decline (first yr)

  Averaging 21% over scheme lifetime
- Nitrogen oxides (NO_x) emissions: Down 13%

  8% due to Congestion Charging
- Particulate matter (PM_{10}) emissions: Down 16%

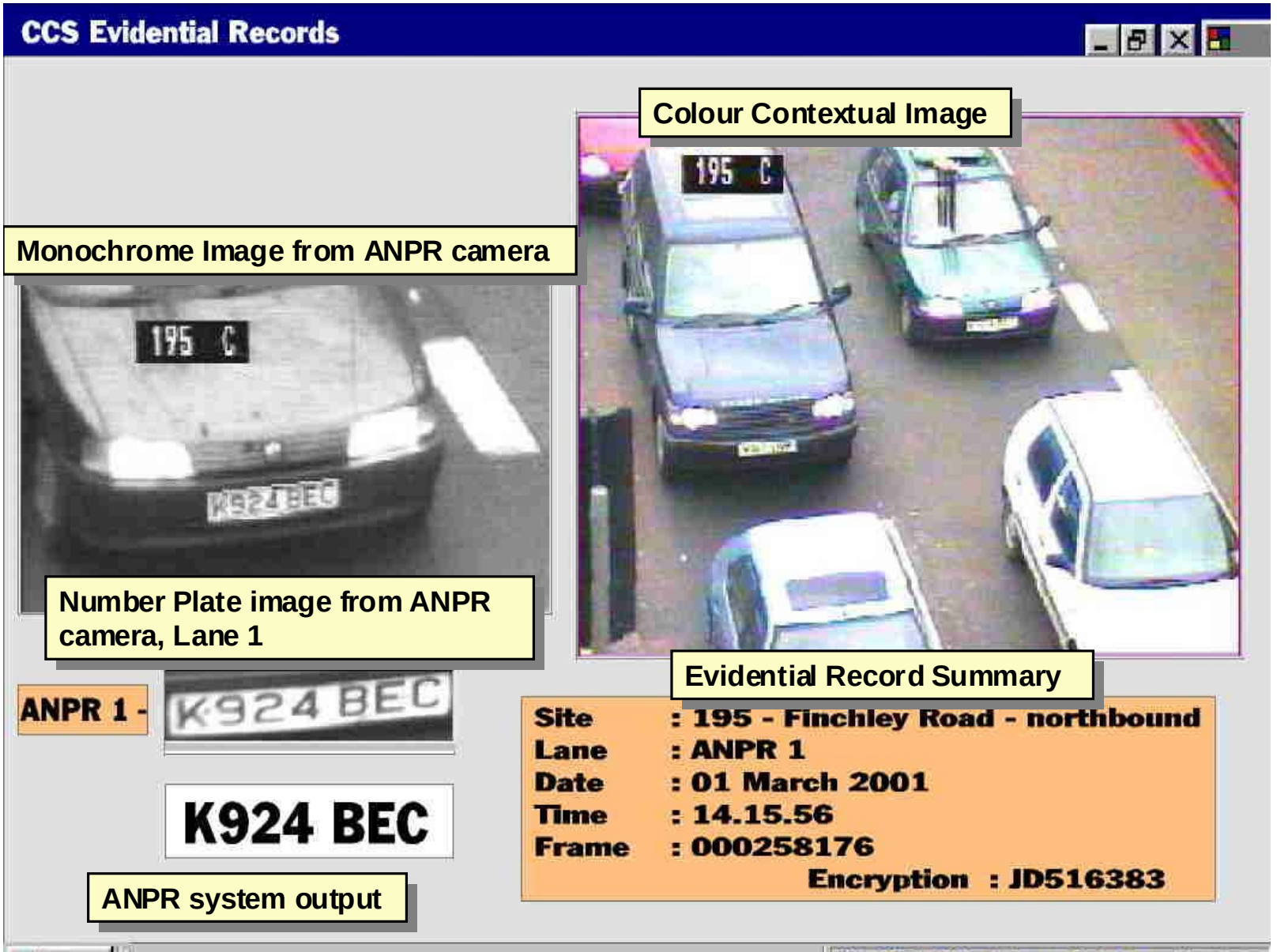
  6% due to Congestion Charging
- Carbon Dioxide (CO_2) emissions: Down 16%

Substantial traffic change



Camera-based enforcement (1)

Camera-based enforcement (2)



Unique opportunity to study traffic characteristics and behavioural change

Potent data source:

- Vehicle population profiles
- Frequency of travel etc.
- Some routeing/journey time information (congestion)
- Match with licensing data – vehicles registered not same as vehicles ‘in the zone’

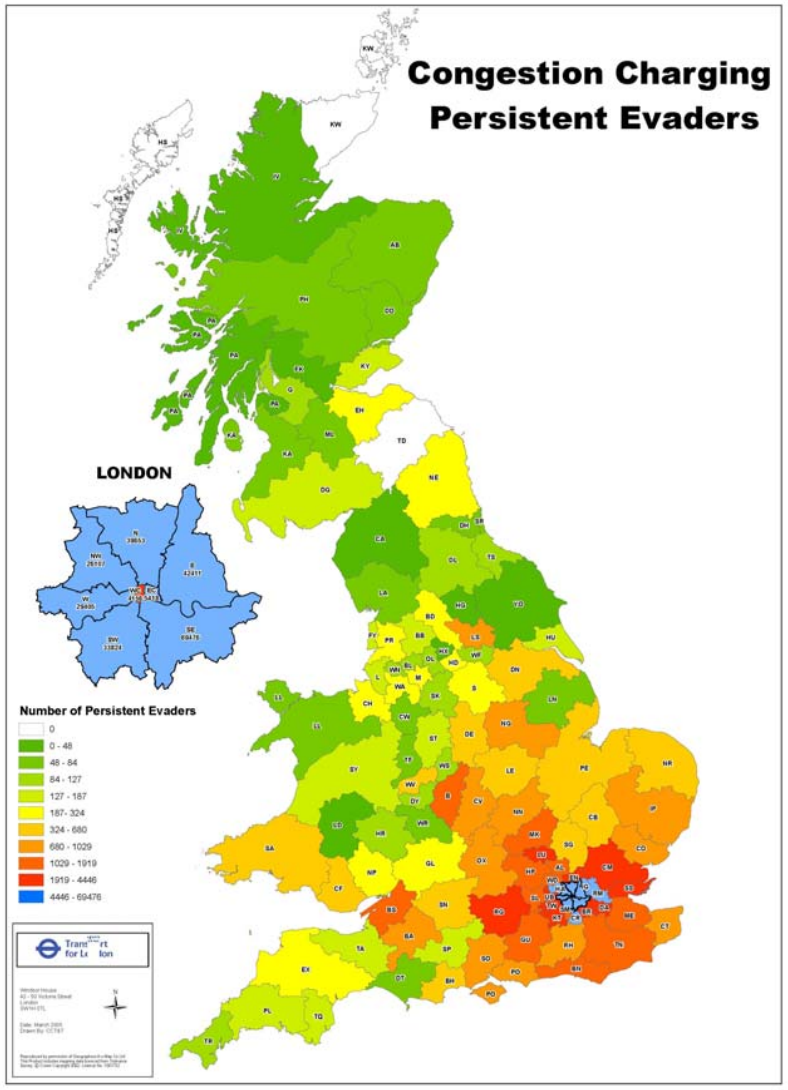
BUT:

- Cameras capture vehicles NOT people
- Only captures vehicles ‘there’ – not those who have gone away
- Do not capture whole trip
- Data Protection imposes some (necessary) limitations
- Can’t really use as sample frame for follow-on surveys
- Cameras optimised for enforcement NOT research
- Tend to be defeated by ‘easier’ things like data processing

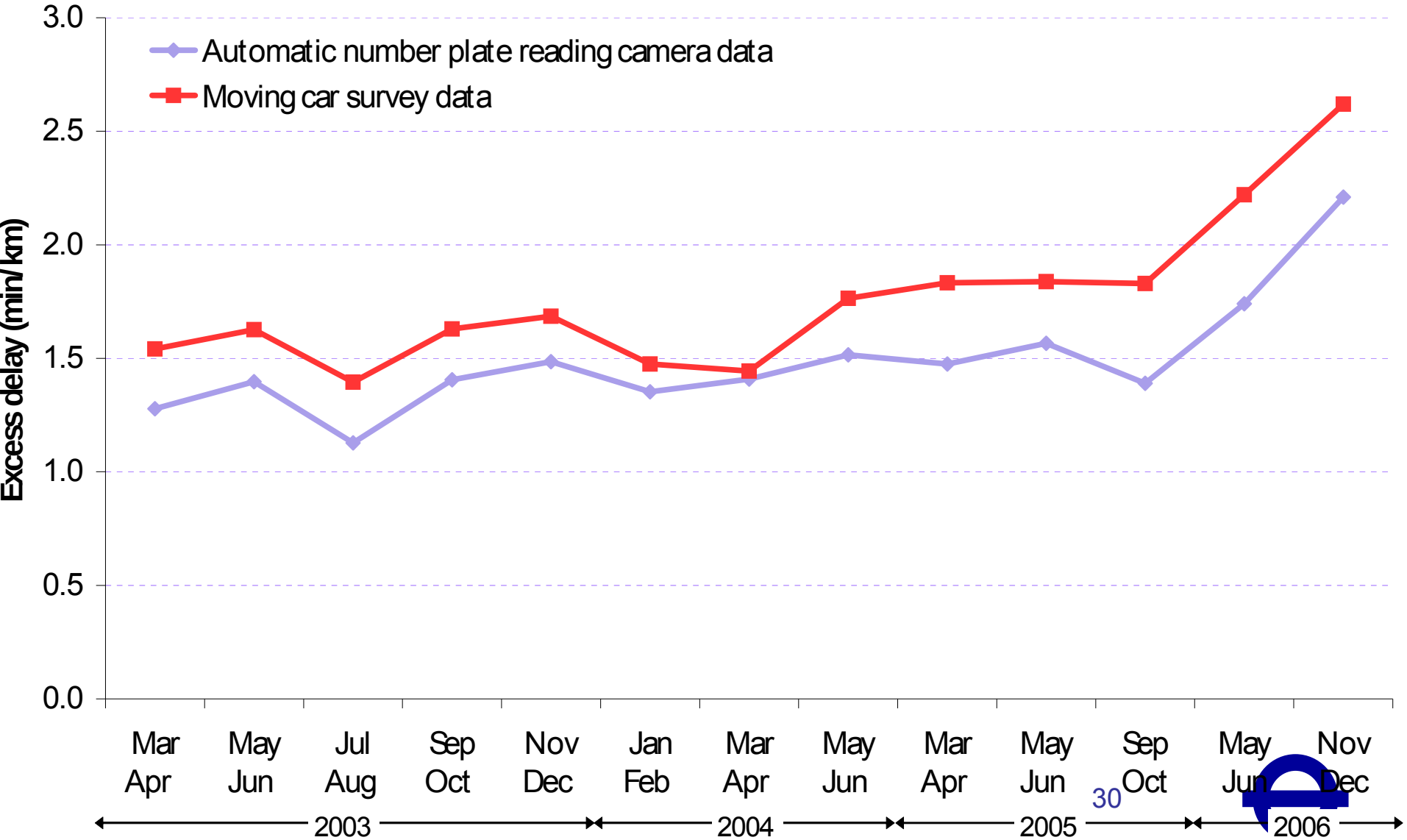
So:

- Potential only partially fulfilled

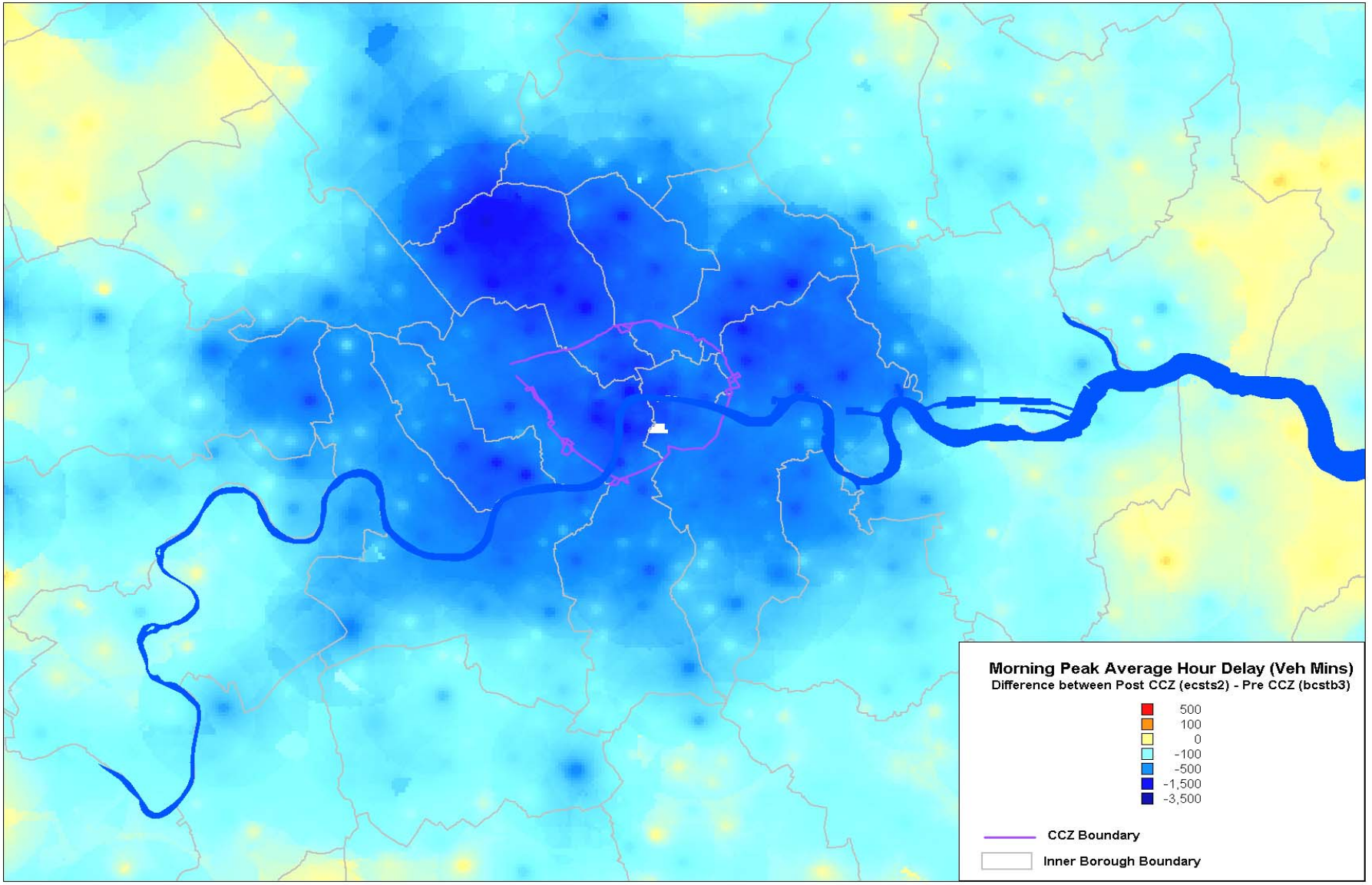
Understanding our chargepayers



Measuring congestion



Understanding the effects of charging



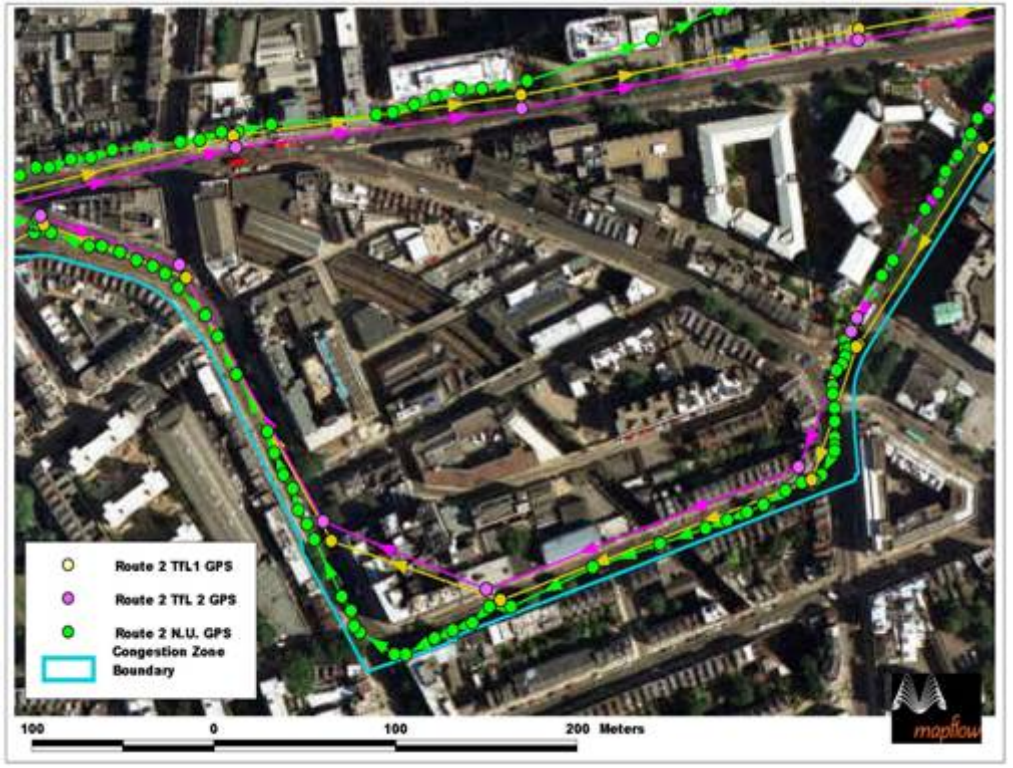
Potential future developments - Tag & Beacon

Tag and beacon technology is already providing high capture rates for schemes where charges vary across the day, for example cordon charging varying by time of day

Stockholm 2006

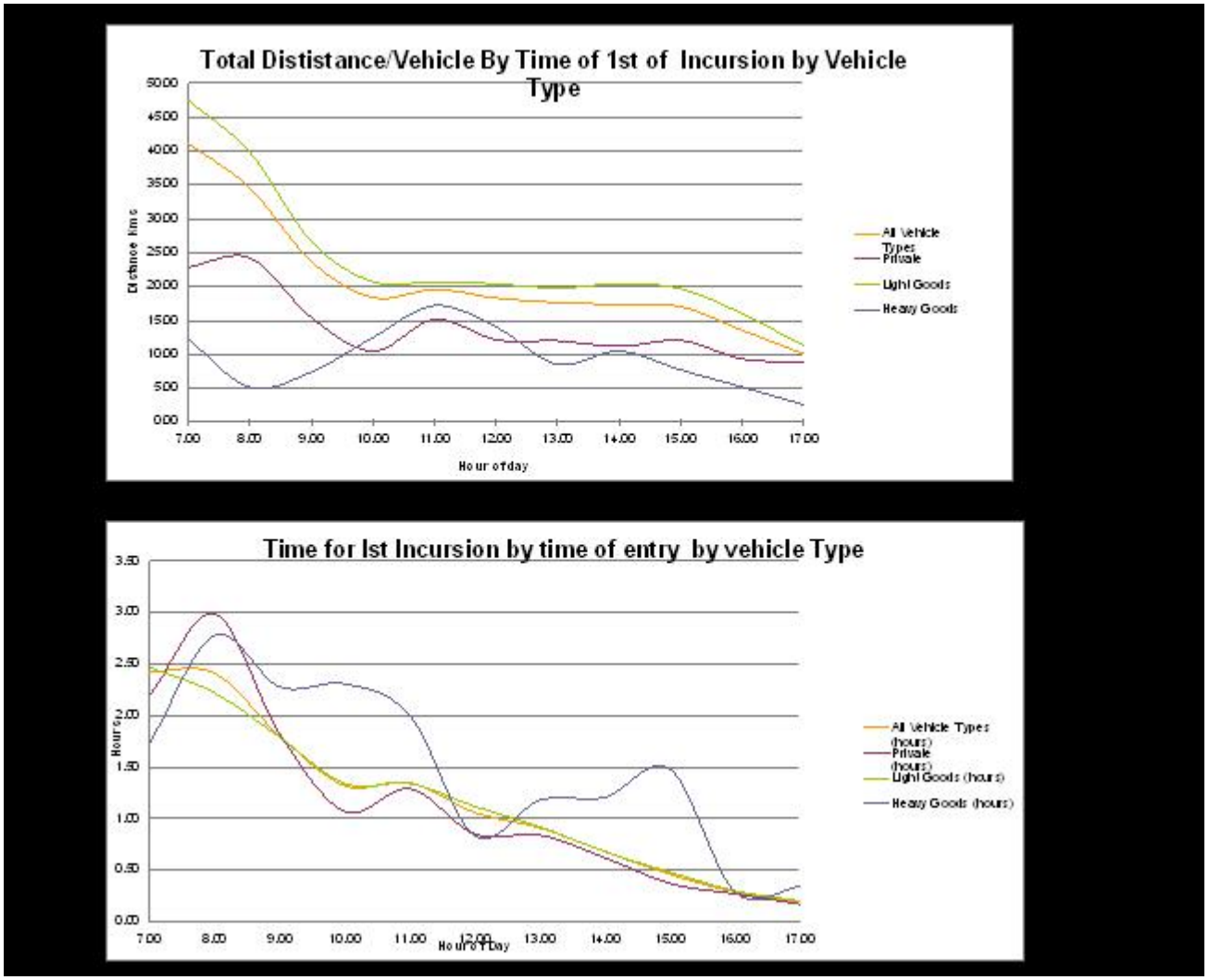
The future?
Satellite/mobile positioning systems

Satellite and mobile phone location systems for distance-based charging need further development for affordable use in urban areas



Example position reports from multiple different GPS and GSM mobile devices

Example from GPS trials - ‘use’ of zone varies by time of first entry



Thank You !

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