Written submissions received for the Transport Committee's investigation into the State of the London Underground

This document contains written submissions received for the Transport Committee's investigation into the state of the Underground.

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Transport for London
London Underground

9 June 2011

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Dear Caroline

I am writing in response to your letter of 13 May 2011, requesting information in advance of my attendance at the Transport Committee meeting on 14 June.

Spreadsheets containing the information you have requested are attached to the electronic copy of this letter (which has also been sent to Laura Warren).

It is worth noting of course that much of this information is already publicly available either as part of the ongoing performance data published on our website or in regularly published reports also held on the website.

I have also attached some illustrations of the longer term trends, which I hope the Committee will find useful.

All of this information highlights a number of key features:

- a long term trend of improving performance
- record numbers of passengers using the Tube – last year there were 1.1bn passenger journeys, up 17% since 2003/04 - and record levels of customer satisfaction
- the volume of train service operated has increased while its reliability has also improved - since 2003/04, excess journey time has fallen by 12% and delays have fallen by over 35%

MAYOR OF LONDON

- the work to upgrade the Tube and the necessary weekend closures have impacted on the number of train kilometres operated in recent years but these still remain near their highest ever level
- there was an acknowledged dip in performance in the autumn and winter, attributable to a number of factors including strikes
- there have also been some initial difficulties with new systems introduced on the Jubilee and Victoria lines, reflecting similar experience with other new systems around the world
- however, performance has now returned to the levels seen before last year's dip.

The underlying long-term trend of improving performance has been achieved despite the ever-increasing passenger numbers and a need to close parts of lines more often at weekends in order to undertake upgrade work. The latter will of course deliver a step-change in performance in the long term, as well as 30% more capacity across the network.

The improvement in performance in recent years has been achieved in two key ways. Firstly, through a continuous and progressive process of making best use of the Tube's assets. The age and condition of many of the assets is a limiting factor to some extent, but by carefully analysing and reviewing, then developing and improving both our timetables and our maintenance regimes, we have been able to make very significant progress.

Secondly, we have also recognised and focused on the absolutely core role that our staff play in daily service delivery. So, over the past six years, we have invested heavily in engagement and training programmes that have played a crucial role in ensuring staff are well equipped to deal with the demands of the record passenger numbers mentioned above. This process is ongoing.

Perhaps the best example of how those two strands have combined to deliver tangible changes to our customers' experiences is on the Northern line, which went from so-called 'misery line' to award-winning industry leader in the space of three years. Across the network, the focus on improving performance is reflected in sustained record levels of customer satisfaction.

I am very aware of the impact that any incident of disruption can have on our customers' experiences. My commitment is that we have learnt from such problems, and taken action to address them. We are now once again seeing a return to the underlying strong positive trend in performance, and we continue to develop our short and longer term plans to deliver a continually improving relable service across all of our lines. The Tube continues to play a fundamental role in supporting major events in London on a regular basis, including of course the recent Royal wedding, and our plans for the Olympic and Paralympic Games are well advanced.

I look forward to exploring all of these issues further with the Committee next week.

Please do not hesitate to contact Melanie Couldrey, Senior Corporate Communications Manager, on 020 7918 3904 or melanie.couldrey@tube.tfl.gov.uk if you need any further information or clarification at this stage.

Yours sincerely

Mike Brown

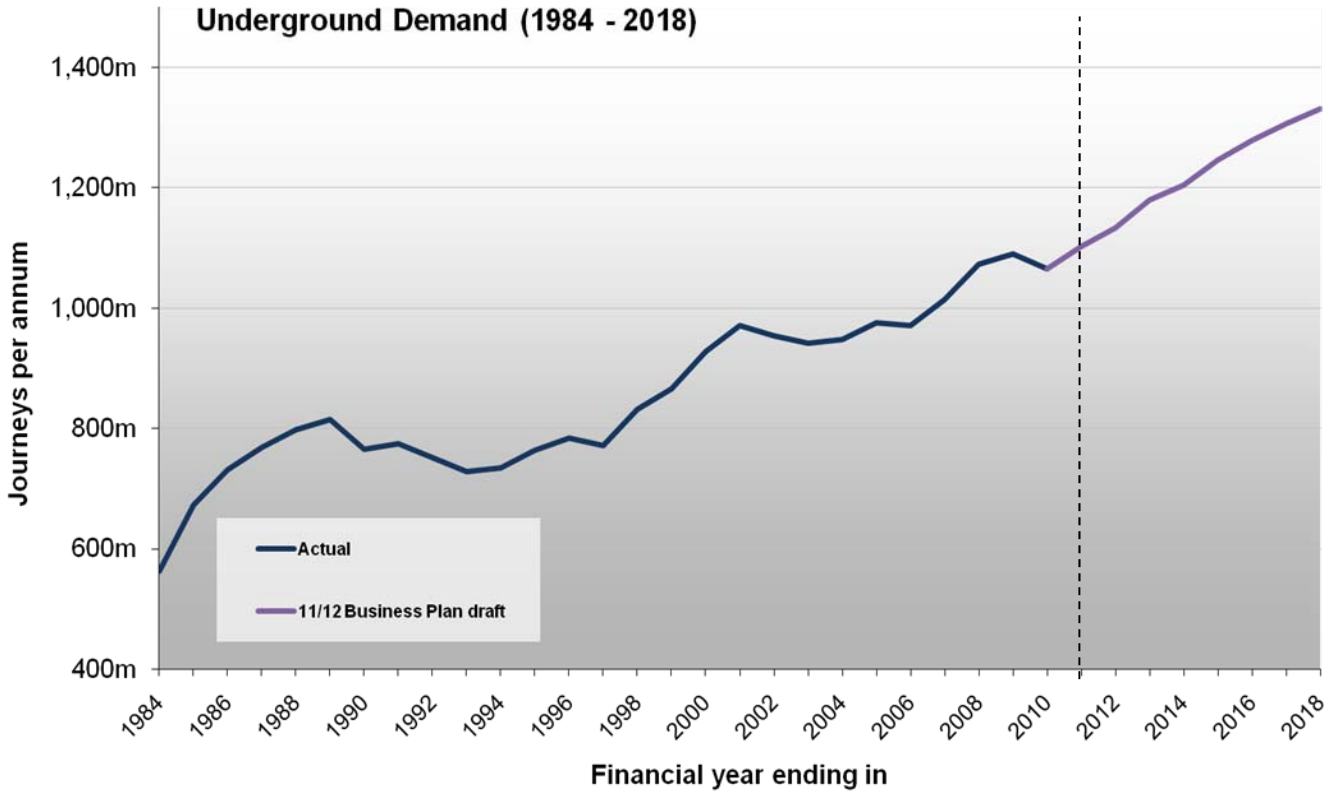
LU reliability - summary

- **Long-term trend of improving performance on the Tube**
- **Passenger numbers at highest ever level (1.1bn journeys in 10/11)**
- **Customer satisfaction (independent survey) also at highest ever level - increased from 76 points to 79 points in five years, with scores of 80 in two quarters of last year**
- **While the volume of train service operated has risen (by around a quarter over 15 years), trains excess journey time has fallen (by over a third over 10 years).**
- **The last three years has seen the best ever performance but the increased level of weekend closures for upgrade work has reduced kilometres operated slightly**
- **Dip in performance last autumn / winter but we have recovered in recent months and are seeing a return to previous performance levels**

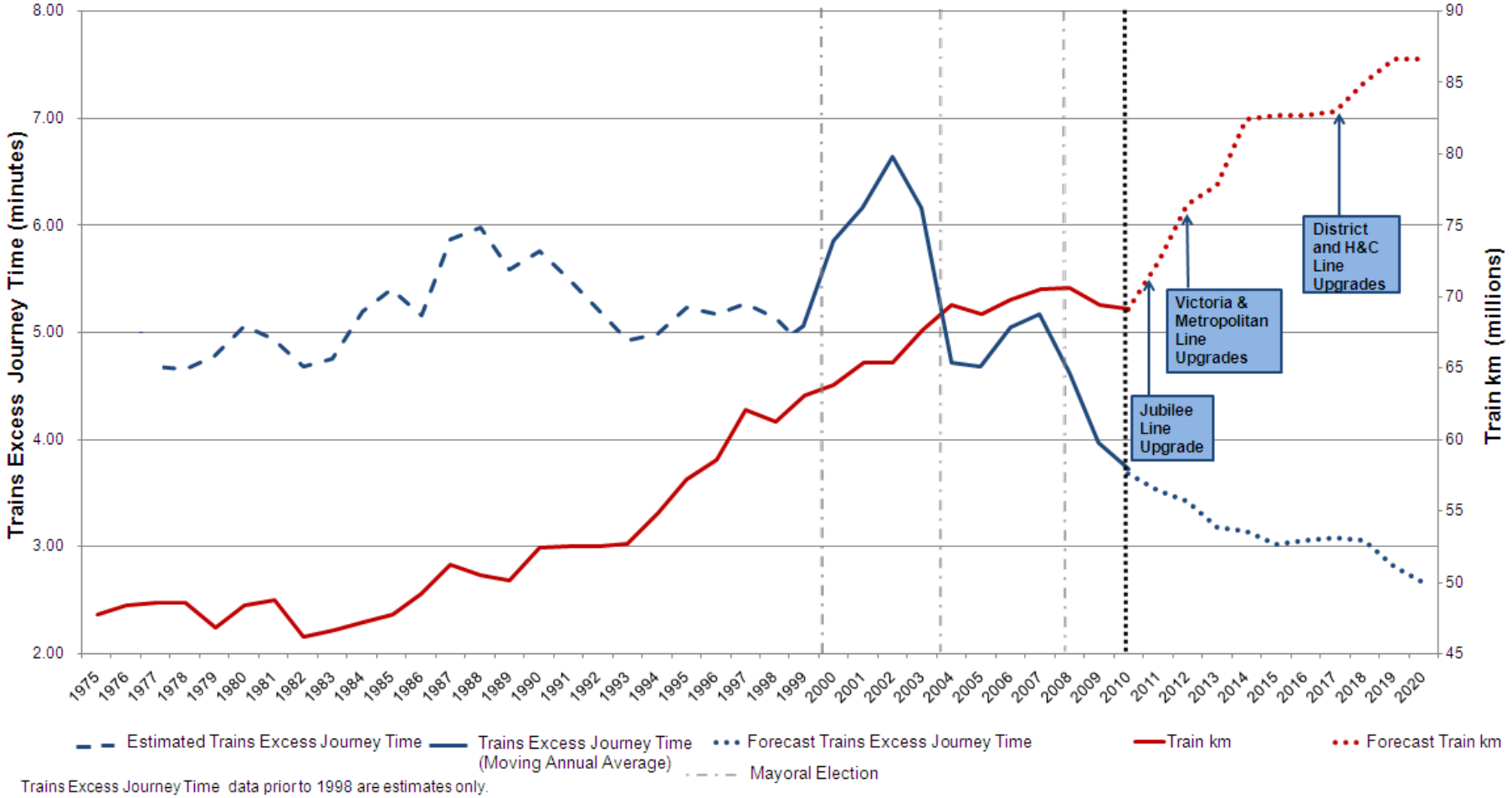
UNDERGROUND

Rising demand

LU demand has seen a rising trend over time, which is projected to continue

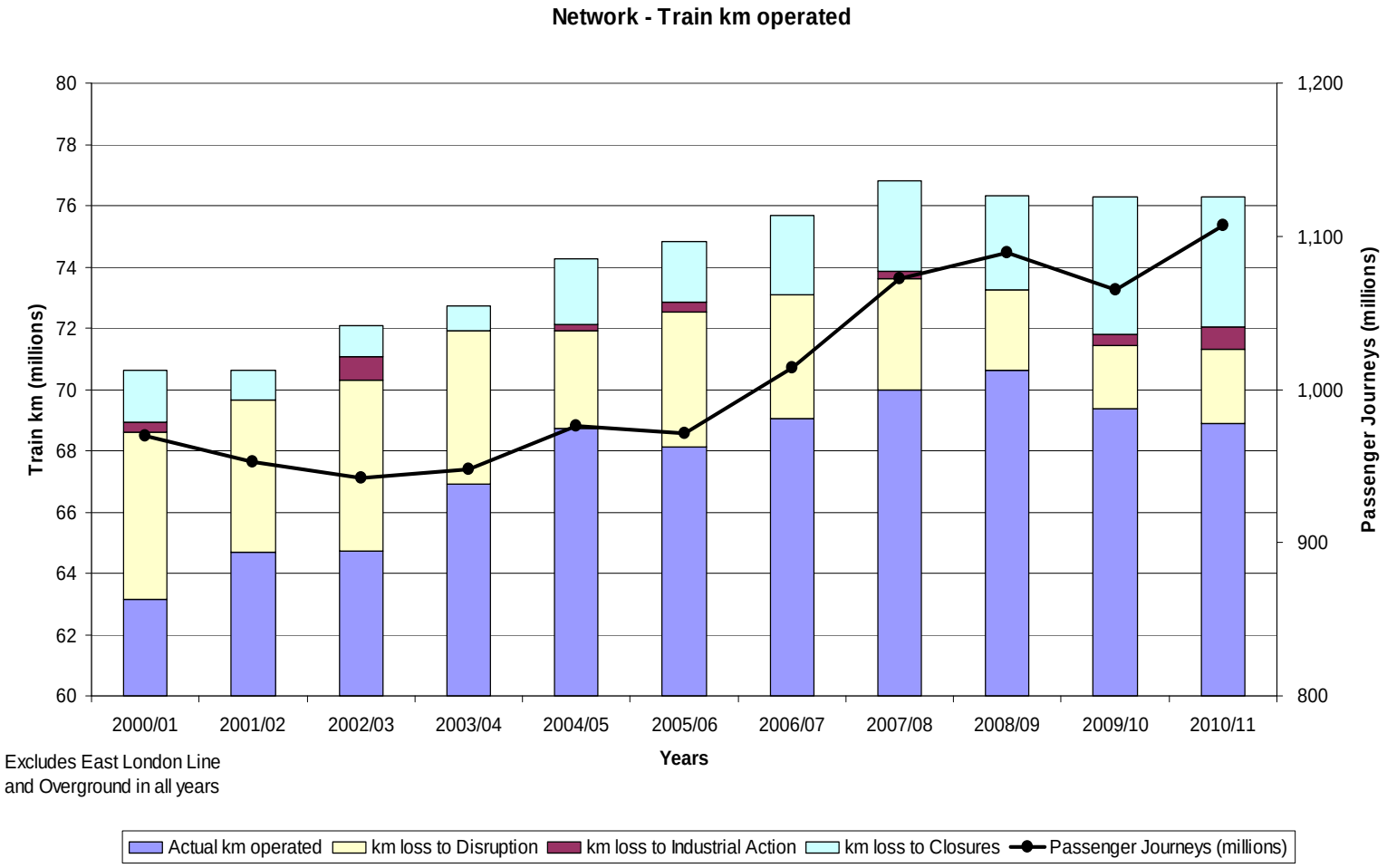


LU Performance



Trains Excess Journey Time data prior to 1998 are estimates only.

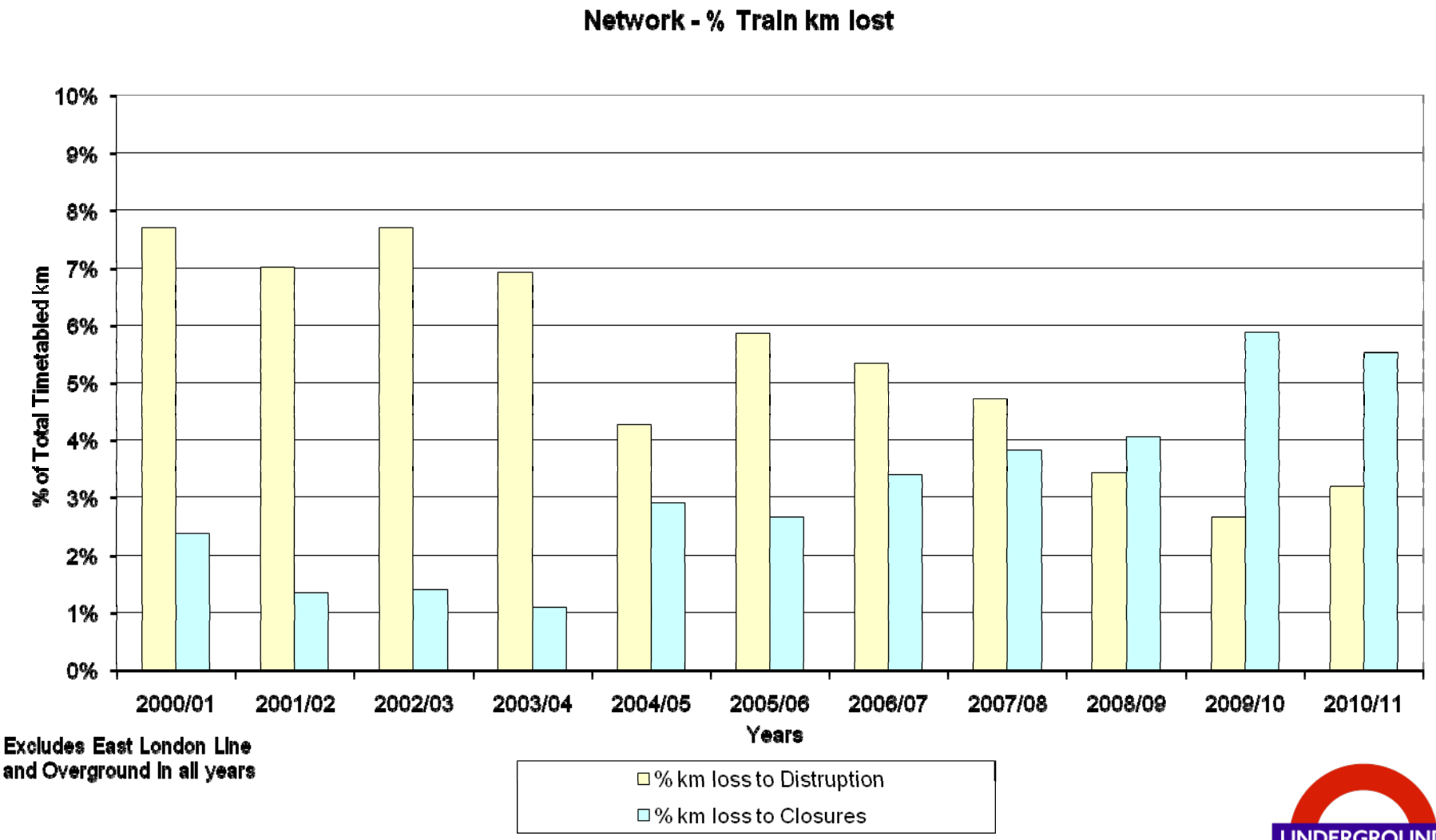
LU Performance



Excludes East London Line and Overground in all years

Over the last ten years the impact of planned closures on the train km run has increased, whilst the impact of service disruption has fallen

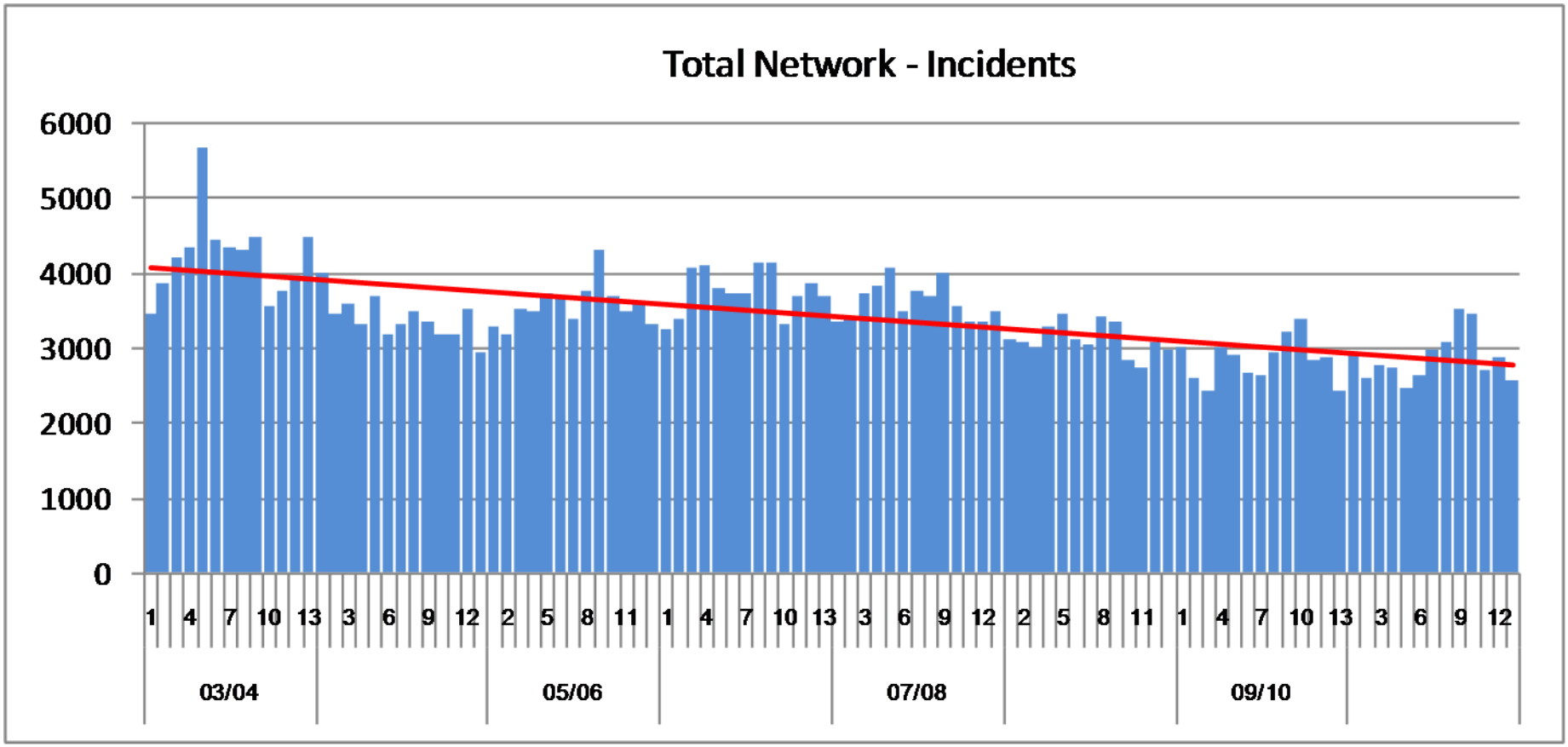
LU Performance



Excludes East London Line and Overground in all years

Service disruption has halved, whilst closures have increased

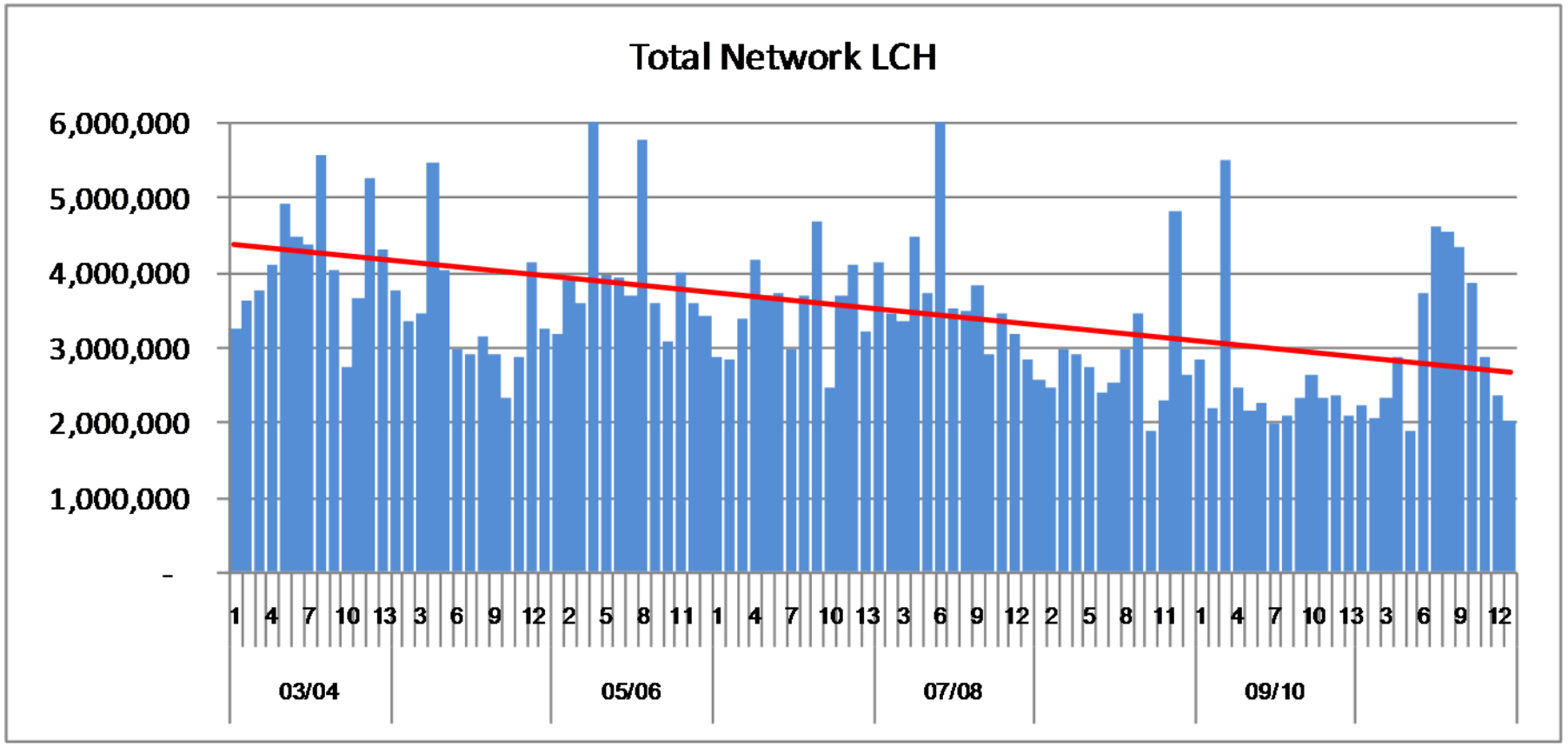
LU Performance



The number of incidents has reduced by over 30% since 2003/04

UNDERGROUND

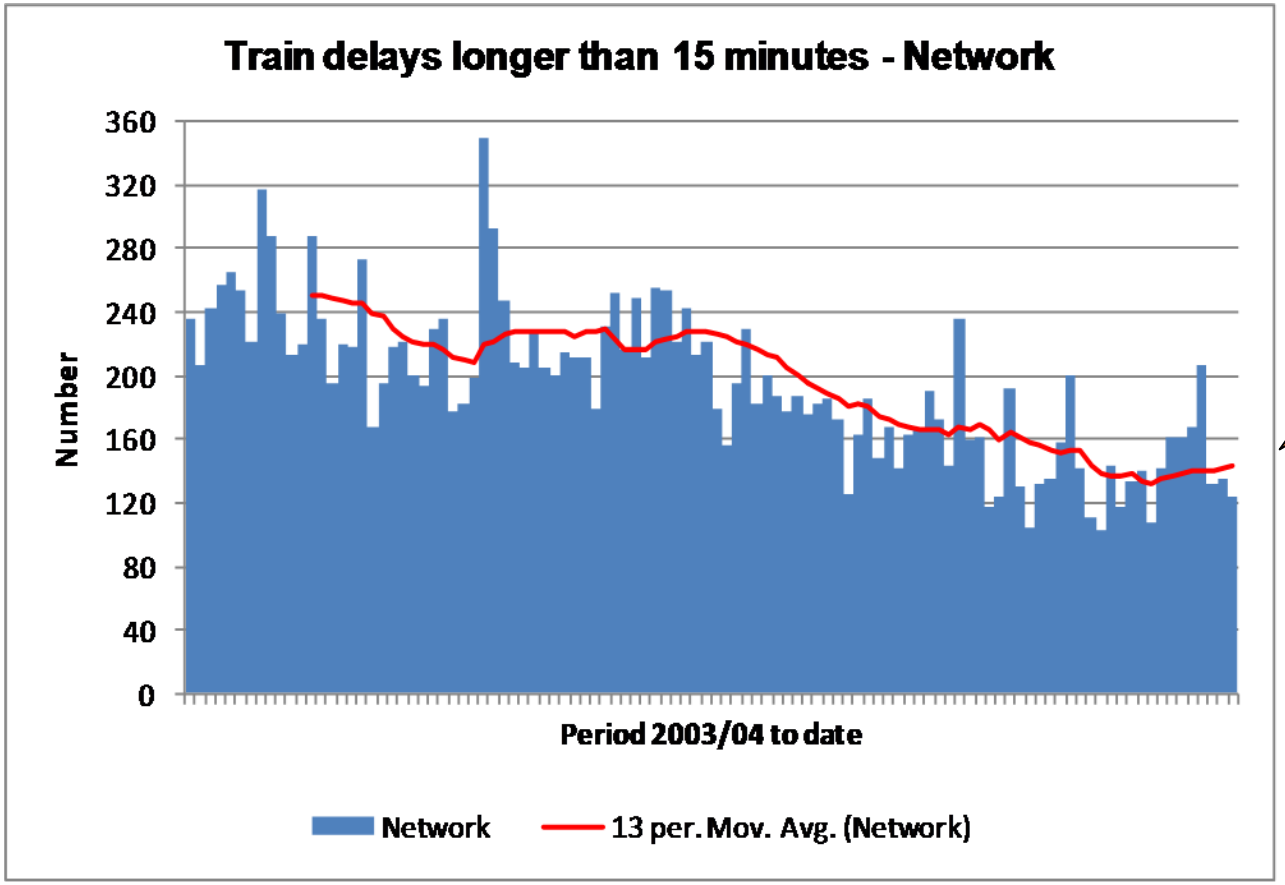
LU Performance



Lost Customer Hours have decreased 26% since 2003/04

UNDERGROUND

LU Performance

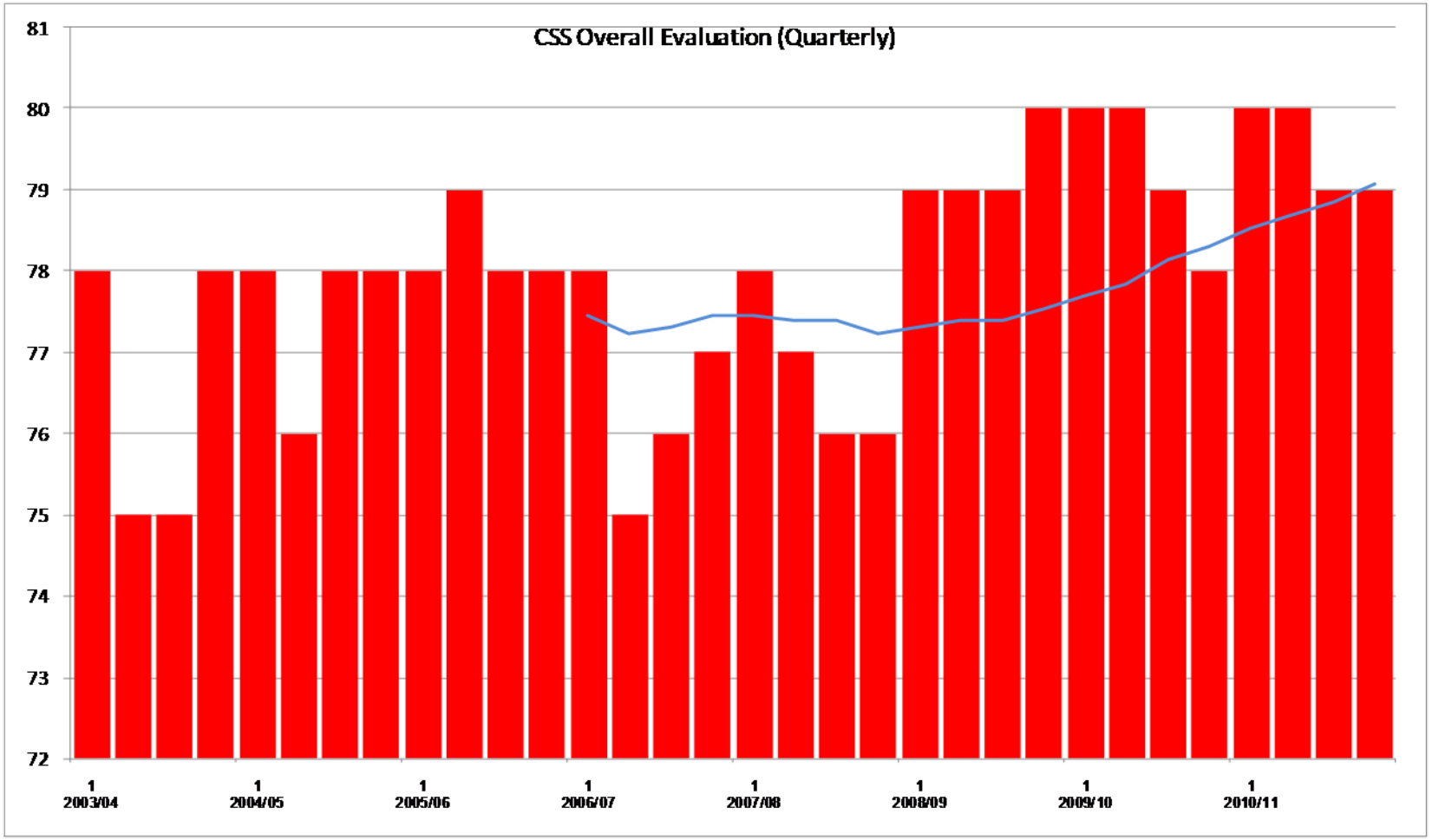


36% decrease since 2003/04

15 minute delays have fallen by over a third since 2003/04

UNDERGROUND

LU Performance



Customer Satisfaction Survey overall evaluation has increased by 3 points (76 to 79) since 2003/04

UNDERGROUND

LU upgrade programme – risk and mitigation

The Transport Committee requested, as part of their investigation into recent LU performance, an analysis of the high level risks to the upgrade programme. A summary of risk by upgrade is set out below, along with mitigation activity.

Risk 1:	**An unexpected delay materialises to the upgrade programme, hindering successful delivery** *This risk applies to all upgrades being delivered by LU.*

Overall Mitigation:

This risk is mitigated across all upgrade programmes through:

- Regular internal reviews of the delivery programme, including representatives from Sponsor and Deliverer areas of LU, including mandatory programme boards, which have director level attendees.
- Close scrutiny of all project activity at director level (through periodic reporting processes)
- Establishment of close working relationships with contractors to ensure that any potential issues are identified and dealt with in a timely manner
- Weekly upgrade planning meetings, and the use of action trackers to monitor and take corrective action as necessary
- Following an established process for accessing the network for works and making the most effective use of available closures (with any issues arising during closures/engineering hours escalated to Senior Management)

Risk 2:	**Upgraded assets fail to meet long term expectations on enhanced capability.** *This risk applies to all upgrades being delivered by LU, with mitigations in place on a line by line basis.*

Capability is assessed within LU by the Journey Time Capability metric, an output measure which can be delivered through a combination of rolling stock capacity, their speed, and the frequency of the service made possible by the signalling. Each line upgrade will deliver additional capability for LU, the benefits of which will be realised incrementally by LU through the phased introduction of new timetables. A phased introduction is employed to reduce service reliability risks.

Victoria Line Upgrade (VLU)

The successful realisation of the capability benefits of the upgrade is dependent on the introduction of the new signalling system, and the on time delivery of all 09 stock into service.

This will enable a 21% capacity increase realised on Victoria Line as full fleet of new trains is run entirely on the new signalling system.

Sub- Surface Upgrades (SUP)

The successful realisation of the capability benefits of the upgrade is being tracked through a series of specific milestones:

- On time train delivery and introduction of all S stock into service by 2016.
- Full migration to the new ATC signalling system by 2018.
- Asset delivery (upgraded power, trains and signalling systems) enabling capacity increase across the sub-surface lines by 2018

Jubilee Line Upgrade (JLU)

Capability testing has already taken place on the sections of the line already under control of the new signalling system. LU will progressively introduce the JTC benefits of the upgrade, with further JTC testing and flexing of the new signalling system planned once all sections of the line are controlled through the TBTC system.

Northern Line Upgrade (NLU)

The successful realisation of the capability benefits will be ensured by:

- An early assessment by Thales of the potential capability improvement (Autumn 2011)
- Early analysis of future timetable requirements and train frequency to ensure potential issues are identified quickly

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Risk 3:	**Upgraded assets fail to meet expectations on improved reliability and availability in the short term..** *This risk applies to all upgrades being delivered by LU, with specific risks and mitigations tracked on a line by line basis.*

Victoria Line Upgrade (VLU)

Specific risks to the reliability of the upgraded line are:

Risk 3a:	The 09 stock are not as reliable as originally expected (with reliability growth and availability below planned levels) leading to additional cost and programme delay
Risk 3b:	The reliability of the new signalling system fails to meet the level needed to support the service level planned for the upgrade line

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Mitigation:

The key mitigation is to establish integrated working between LU and its contractors, Bombardier Trains UK (BTUK) and Invensys through:

- Continuous VLU staff presence on site.
- Daily email progress updates from BTUK.
- Regular conference calls to address key issues.
- The appointment of a reliability manager

In addition a route map has been requested from Invensys for the asset replacement phase of the signalling programme.

Sub- Surface Upgrades (SUP)

A specific risk to reliability from the upgrade is:

Risk 3c:	The S- stock are not as reliable as originally expected (with reliability growth and availability below planned levels) leading to additional cost and programme delay

Mitigation:

- New trains are required to reach 1,000km of fault-free running at the off-site test track in the Midlands, prior to acceptance from the supplier.
- LU will not accept any further trains onto the network until existing fleet reliability issues have been rectified by the supplier.
- A new team has been formed at Neasden Depot, with specific responsibility for managing the reliability growth of the new trains as they are introduced to the LU network.

Jubilee Line Upgrade (JLU)

The key risk to reliability is that:

Risk 3d:	The new signalling system experiences hardware failure or software issues, resulting in service disruption, the need for additional testing and potential programme delays.

Mitigation:

- 24/7 on-call Thales Support in place to deal with any hardware failures.
- Undertake off-site testing of software to ensure that any issues are identified early (a dedicated test facility exists at Highgate)
- Establish potential patches (quick fix solutions) where possible to address any software issues that may arise to ensure that any delays are minimised

Northern Line Upgrade (NLU)

A specific risk to the reliability of the upgraded line is:

Risk 3e:	The new signalling system experiences hardware failure or software issues, resulting in service disruption, the need for additional testing and potential programme delays.

Mitigation:
The approach to this risk will be based on lessons learned from the Jubilee Line upgrade, with:

- Enhanced off-site/lab based simulation and development of test track at Highgate to test and deliver a robust and trouble free software solution.
- Implementation of an updated monitoring mode to prove that system hardware is fully operational before and during systems testing.
- Maintenance of new assets to be handed over to Tube Lines early (before testing) to improve control, experience and response to faults.

Risk 4:	**Costs increase significantly beyond budget** *This risk applies to all upgrades being delivered by LU, but given that the VLU is now in the final stage of implementation (with the majority of costs certain), the specific mitigations below refer to the NLU, JLU and SUP programmes.*

Sub- Surface Upgrades (SUP)

A specific 'cost risk' is noted for the SUP around the signalling contract:

Risk 4a:	Cost escalation of the competitively priced new (ATC) signalling contract could occur due to contractual compensation events.

Mitigation:

This risk will be mitigated through tight management of LU processes and support systems to minimise compensation events, deliver enhanced cooperative working and minimise changes to the contract specification. This approach has been endorsed by the Mayor's Independent Investment Programme Advisory Group (IIPAG), with progress monitored through internal Programme Boards.

Jubilee Line Upgrade (JLU)

Northern Line Upgrade (NLU)

Both of these upgrades are being managed by Tube Lines, which has identified a specific risk around the use of 3rd party contractors:

Risk 4b:	Potential claims from Tube Lines' contractors results in a significant increase to costs.

Mitigation:

The mitigation for this risk is encapsulated in Tube Lines' approach to managing its contracts through:

- Establishing effective commercial control, with a recognised change control process
- Putting in place a robust early warning process
- Building effective working relationships with 3rd parties

Risk 5:	**Access to the network is limited, which if not utilised effectively will lead to programme overruns, and inconvenience customers unnecessarily.** *This risk applies to all upgrades being delivered by LU*

Overall Mitigation:

This risk is mitigated across all upgrade programmes through:

- Access to the network being co-ordinated by a dedicated 'Access, Logistics and Operations' team. This team are responsible for scrutinising access requests and ensuring maximum utilisation of approved access, in conjunction with another team who considers the customer impact, or impact on major events, of allowing any access to the network.

Specific actions taken by individual upgrades include:

- *SUP:* lessons are being learnt from the experience of the VLU, and also Madrid upgrade programmes on effective access utilisation. Bidders for the new ATC contract were also incentivised to minimise the number of closures they required.
- *NLU:* LU and Tube Lines are undertaking joint planning to optimise the scheduling and use of access. Also specific process improvement initiatives are underway to increase the productivity rate during closures.

Signalling Upgrades unit rates

Information on the cost per kilometre of signalling for each line upgrade on a basis that is comparable with the figures used by the PPP Arbiter in his 2010 Tube Lines Cost directions.

As can be seen from the information below, although costs under the PPP exceeded the Arbiter's estimate, the current forecast for future projects is in line with the Arbiter's estimate. Indeed, London Underground is confident that the signalling costs for the Sub-Surface Railway (SSR) upgrade – the first which does not reflect the legacy of the PPP - will be lower than the Arbiter's estimate.

The unit rate used in all cases is £m per KM of track

A Arbiter view of core signals upgrades costs () upgrades)

1) Definition

The Arbiter assessed "Core Signalling" costs, i.e. all costs likely to be attributable to the signalling system supplier and the Infraco in managing the supplier.

These costs exclude enabling works, e.g. power, civil works to support the signalling system, control centre communications systems, track enabling works, power upgrades, train fitment costs or systems integration costs.

2) Average of recent projects

Low	High	Average	
2.2	3.2	2.7	2008 constant prices
2.5	**3.6**	**3.0**	2011 constant prices

Source, Halcrow's report to the PPP Arbiter (Halcrow NI Strategy 8Mar10), Table 30.12, page 245.

This average is based on information provided to the Arbiter by other metros including Madrid, Paris and New York. The assessment was prepared for the Arbiter by Halcrow.

The range reflects some uncertainty in the extent of each upgrade (i.e. the length of track to be upgraded) and also some variations in the scope of each upgrade (e.g. the level of development costs and interoperability to be achieved) and contracting arrangements adopted by each metro.

	Low	High	Average	
3) Victoria Line Upgrade	3.0	5.5	4.3	2008 constant prices
Rates included in Halcrow's assessment	**3.4**	**6.2**	**4.8**	2011 constant prices

The Victoria line signals upgrade is provided under a fixed price contract, originally undertaken by Metronet in 2003 under the PPP arrangements, with its shareholder Bombardier. The original price was not subject to review by the PPP Arbiter and was not within the control of LU. The range reflects the alternative treatment of development and overhead costs.

The current forecast costs of the VLU signals upgrade remain in line with those included in Halcrow's assessment above.

4) Estimate for future projects

The Arbiter considered that a lower rate of **£2.0m/km** (in 2008 prices, **£2.3m/km** in 2011 prices) would apply to future projects e.g. Piccadilly line. This reflects the average of recent projects (in 2 above).

B **Jubilee, Northern and SSR upgrades**

	Average	
Forecast at April 2011	**2.4**	2011 constant prices

This average represents the total current forecast for Jubilee, Northern and SSR signalling contracts, in constant prices.

The core signalling costs of the all three upgrades are commercially sensitive and confidential as these are all currently subject to ongoing negotiations with the suppliers.

London First - initial written submission, 11 May 2011

Please see below the following bullets on some of the key issues as London First sees them. London First will submit more detailed written evidence in due course.

- current Tube performance is hugely variable in a way that is not always intelligible. Growing passenger demand, ageing assets, a complex upgrade programme, failures of new assets and industrial action all appear to be having an impact. London business - in common with London as a whole - would like to see continued improvements in the tube's availability and reliability. This requires action from TfL on a number of fronts, as per below.

- the termination of the PPP necessarily required TfL to revisit the upgrade programme, looking both at the overall timetable for line upgrades and also the process by which upgrade work is carried out. The timetable on many of the line upgrades has slipped and TfL should now set out clear milestones and dates for all key elements of the upgrade programme so that users know what to expect and that TfL can be held effectively to account. Clarity is particularly important where line closures are planned as these have a major impact on London businesses (and of course Londoners generally). This has been particularly significant over the past couple of years on the Jubilee line which has suffered major disruption and it is important that TfL is able to demonstrate it has learned the lessons from that experience. We welcome LU's decision to revisit the need for large numbers of closures and to seek efficiencies in the way work is carried out, whether through extending hours for maintenance work or through a much smaller number of longer closures.

- it is extremely difficult to gauge the extent to which the Tube upgrade programme is being run economically and efficiently by TfL. This is particularly so following the winding down of the PPP arbiter who we believe did a good job in enabling detailed comparisons to be made between different elements of the upgrade programme, which in turn can be a great spur to efficiency. We welcome the creation of the Independent Investment Programme Advisory Group (IIPAG) but are concerned about the lack of transparency around its work. We believe that London would be better served by its reports being made public, together with TfL's response.

- industrial relations on the tube continues to be a bane of Londoners' lives. The right to strike is an important one, but we are concerned at the recent incidence (and future prospect) of strike action as this has such a negative ability on the ability of London businesses to get their staff to and from work and to sell their products and services. Businesses in the retail, catering and entertainment sectors are particularly impacted by strikes and can ill afford to lose potential sales revenues in the current economic climate. We welcome the fact that next week's tube strike is now off but neither TfL nor the Unions emerge with any great credit from the current climate around industrial relations on the Tube. We cannot go on like this, particularly as we approach the Olympics next year. The GLA, TfL management and unions need to develop a much more constructive relationship and working culture. We are also concerned that strikes are being used early on as a negotiating tool rather than as a last resort and believe that government should review the thresholds for strike action to ensure that industrial action has clear support of the workforce.

-Looking to the longer term, we anticipate that the governance of the Tube will need to continue to evolve. Last year we published the report of our Infrastructure Commission, which examined London's infrastructure needs. It concluded that the transparency and efficiency of London Underground would be improved by governance reforms to create a Regulated Asset Base model, overseen by an economic regulator – as is currently the case with Network Rail for example. While this would not in itself provide additional funding for the underground, it would set out clearly, for the medium-term, the level of resources required based on independent verification of capital and operating expenses. It would thus provide a solid platform for London to argue its case to the Treasury for investment necessary to keep the system functioning.

Additional information provided by London First following 17th May Committee meeting

Following my appearance before the Committee on 17th May to discuss London Underground you asked whether London First would like to submit any further material.

Given that so much of the discussion focused on the need for greater transparency and clear accountability, the Committee may be interested in reviewing the relevant sections of our Infrastructure Commission Report which we published at the end of last year.

The Report concluded that the transparency and efficiency of LU would be improved by governance reforms which would be overseen by an economic regulator – as is currently the case with Network Rail for example. The report can be accessed via the link below, with the key sections at the beginning of chapter 4 (see pages 49-55 – and 'the right structure for the tube' from page 52 in particular).

http://www.londonfirst.co.uk/documents/London_First_Infrastructure_Commission_report_-_EMBARGOED.pdf

I would emphasise that we are not dogmatic about precisely how transparency and accountability on the tube should be strengthened. We have welcomed the creation of IIPAG, for example – and share the Committee's view that the Mayor should commit to publishing their reports. We would also urge TfL to review the performance information that is currently being collected and how it is used: as a management tool; for capturing what matters most to passengers; and for how changes in performance are communicated to passengers in a way that is comprehensible to them. The PPP provided for large amounts of data to be collected which remains helpful in highlighting differing levels of performance between comparable tube lines. However, the collection, presentation and use of this data needs to be systematised

John Dickie
Director of Strategy & Policy
London First

London TravelWatch's response to the London Assembly Transport Committee investigation into the state of London Underground

May 2011

London TravelWatch is the official body set up by Parliament to provide a voice for London's travelling public.

Our role is to:

- Speak up for transport users in discussions with policy-makers and the media;
- Consult with the transport industry, its regulators and funders on matters affecting users;
- Investigate complaints users have been unable to resolve with service providers, and;
- Monitor trends in service quality.

Our aim is to press in all that we do for a better travel experience all those living, working or visiting London and its surrounding region.

Published by:

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Executive Summary

London TravelWatch welcomes this timely investigation by the London Assembly into the state of London Underground.

London Underground's operational performance has taken a significant downturn in recent quarters, with a number of high profile failures. Passengers are frustrated by this particularly given the amount of resources that have been expended on the upgrade programme and the significant levels of disruption that they have to endure over a significantly long period of time.

Passengers are also frustrated by the current cumbersome methods of compensation paid under the Passengers Charter and would like to move to payment directly either to their Oystercards or the credit/debit cards that they used to buy their ticket.

London TravelWatch recommends that London Underground should :-

set itself more ambitious targets to improve overall customer satisfaction with its services that are seen to be independently monitored and verified.

Make a concerted effort to reduce the need for weekend and evening closures of the network where at all possible.

Improve communications with passengers both on trains and at stations.

Where closures and alterations to passenger access to stations are required that these are accompanied by pre-consultation, extensive passenger communication and provision of information on alternative means of travel.

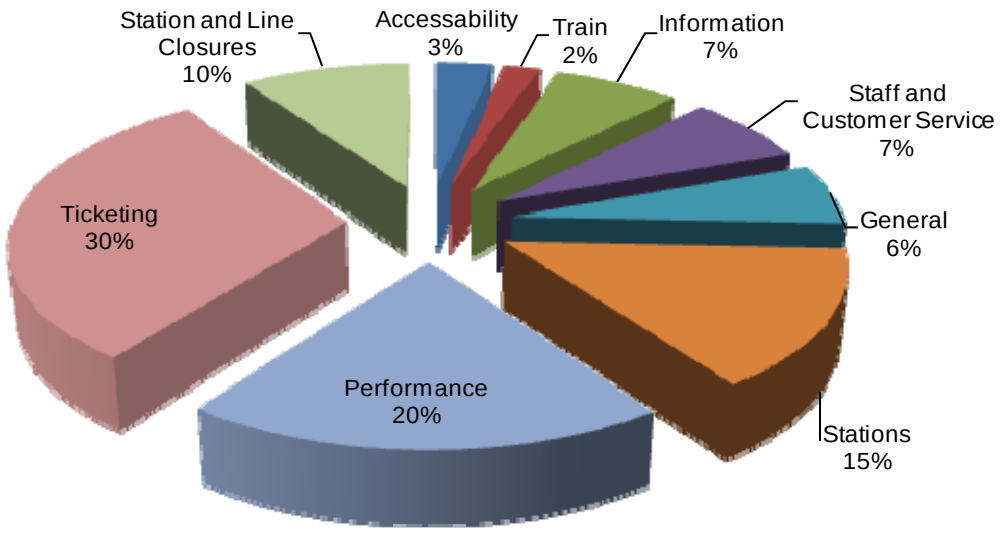
1 Introduction

London TravelWatch is the statutory watchdog representing transport users in London.

The London Underground network serves around 3 million passengers per day, which is equivalent to 1.1billion passenger journeys a year. As such it is a vital component of London's economy and social fabric. A system which is effective and efficient for passengers is therefore a major component of London's economic and social well being.

As the statutory appeals body for complaints about London Underground we received 268 out of 3895 appeals which were related to London Underground from January 2010 to January 2011.

Graph 1 – London TravelWatch London Underground Appeals by Category January 2010 to January 2011



Graph 1 shows the appeals we have received which are related to London Underground from January 2010 to January 2011. The graph evidently shows that the major issues of appeals we receive from passengers are ticketing and performance. This includes issues such as delays, cancellations, compensation etc. Stations were also a significant issue for appellants regarding station specific appeals about the standard of facilities at stations.

London TravelWatch also collates and publishes quarterly performance monitoring reports of all Transport for London modes including London Underground. These are useful in identifying trends in reliability and also in holding operators to account in respect of the quality and quantity of the services they are providing on behalf of passengers.

Please find below the link to our latest Transport for London quarterly performance monitoring report:
http://www.londontravelwatch.org.uk/document/13907/get

In addition London TravelWatch is also consulted by and meets regularly with London Underground on a range of policy and operational matters to represent the interests of passengers.

This submission responds to the questions the Committee has posed in its call for information to the letter of the 19th April 2011 regarding the state of London Underground.

2 London Underground: priorities for passengers

As part of its ongoing passenger engagement work, London TravelWatch invited Howard Collins, Chief Operating Officer from London Underground, to attend its Board meeting on 22 March 2011. Members of the public were invited to put questions to Mr Collins about the operation of the Underground, with questions on the following subjects being representative of those that were submitted:

- The wording of public address announcements on trains and stations, and the use of the phrase 'good service';
- Concern about ongoing weekend closures of the District and Jubilee lines;
- The need for so many weekend closures, across so much track, on several lines at the same time;
- How staff were deployed at stations and whether staff could be moved to more customer-serving roles;
- Why escalator replacement works take so long, compared to other engineering projects;
- How trains were routed at the eastern end of the Central line;
- How passengers could claim refunds;
- Whether train information at Edgware Road station could be improved;
- Whether there could be better communication about problems on other lines at interchange stations.

From this and other correspondence that we receive from our appeals casework, it is clear that there are **three principle strands of concern amongst London Underground passengers** at present on the operation of the network. These are:

- The performance of the network in normal Monday to Friday operation
- The number and need for weekend and evening closures on the network;
- The means and utility of the different streams of communications with users both before they start their journey and during it.

3 London TravelWatch's analysis of London Underground performance

London TravelWatch's Performance Report monitors whether London Underground infrastructure is available for passenger service. This measure includes periods of planned closure as well as unplanned disruption

The measure counts all service disruptions lasting more than two minutes and takes into account the duration, location and time of day of the disruption to estimate the total cost in terms of customer time. This is expressed as 'Lost Customer Hours'. This is shown in Graph 1 below this is taken from the Public Private Partnership report. The 6 period rolling average has increased across all lines in the latest period of the third quarter 2010/11 meaning passengers are facing increased disruption to journeys. Higher availability of the infrastructure means lower levels of disruption to passengers.

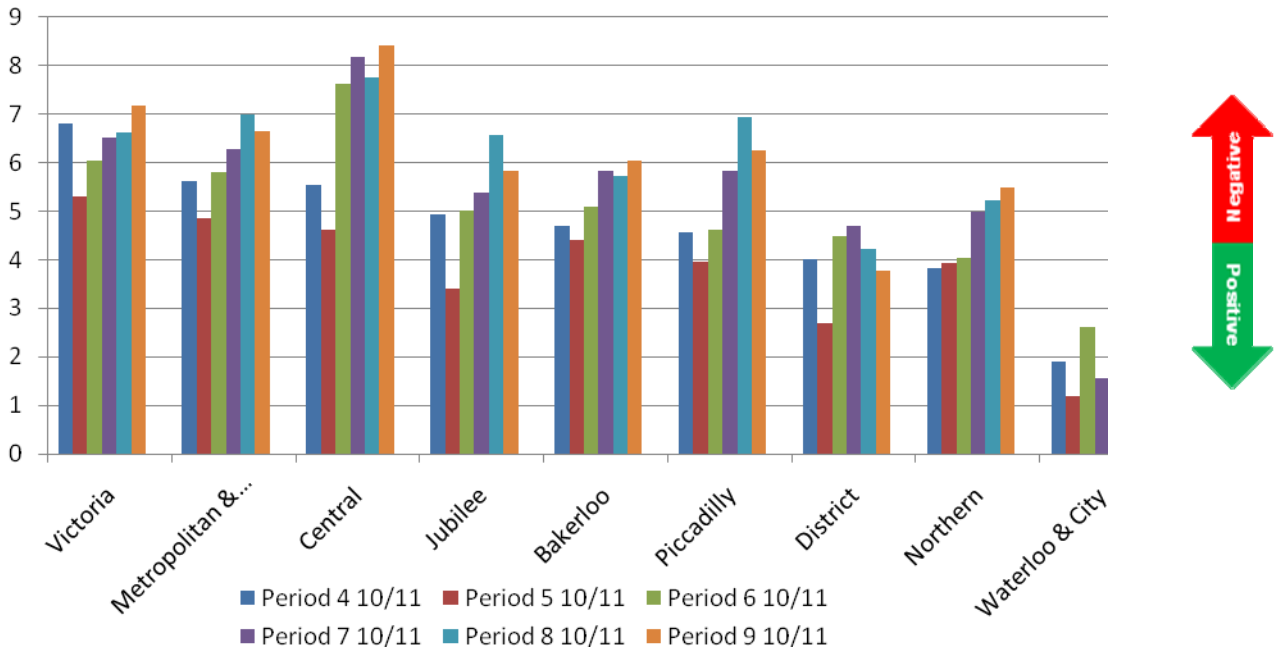
Graph 1 - Availability – P8 2010/11 Lost Customer Hours 6 Period Rolling Average[1]

[1] JNP – Jubilee, Northern, Piccadilly lines, SSL – District, Circle, Hammersmith & City and Metropolitan Lines, BCV – Bakerloo, Central and Victoria lines.

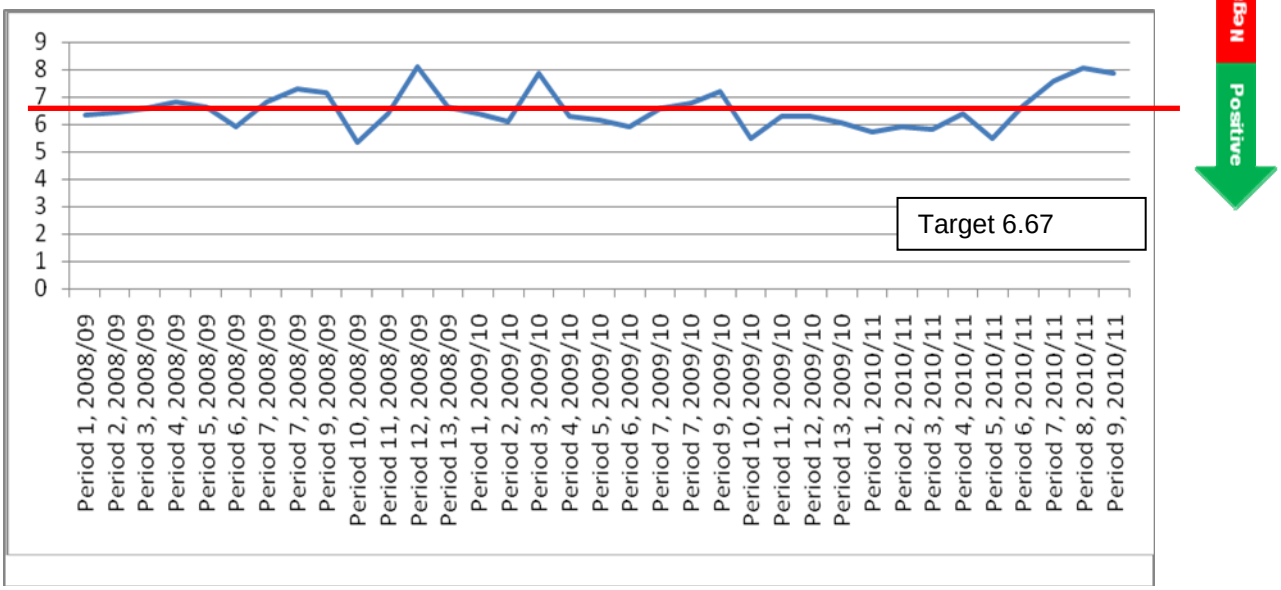
Graph 2 (which is published by Transport for London under London Underground customer metrics) overleaf shows Excess Journey Time (EJT) which measures the number of additional minutes added to a total journey as a result of disruption to the Underground network. This is shown for each line on the Underground network, over the last 6 periods, as well as for the network as a whole which is shown in Graph 3 (extracted by London TravelWatch from London Underground customer metrics). London Underground performed worse than the network target set in the TfL 2010/11 Business Plan. TfL suggests that strike action is the main cause, though record passenger numbers (leading to greater overcrowding at peak times), and asset problems (old equipment failing and new equipment not performing as well as anticipated) contributed to the poor performance.

The network wide score for quarter 3 is poor and is in excess of TfL's business plan target. Although some of the reasons are outside of the control of the Underground passengers have nevertheless been poorly served. London TravelWatch sought reassurance from Underground management that corrective action would be undertaken.

Graph 2 – P4 to 9 2010/11, Excess Journey Time by Line in minutes



Graph 3 – P1 2008/09 to P9 2010/11, Network Excess Journey Time in minutes

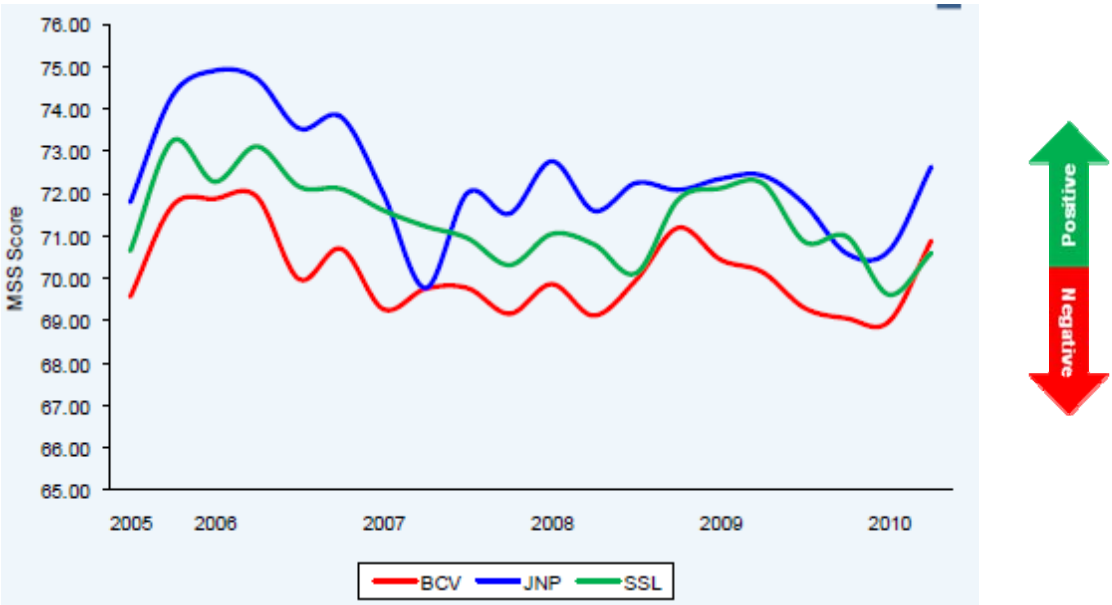


Note: The network wide score is a weighted average that takes account of the fact that 40% of Underground journeys include two wait elements.

Graph 4 shows the ambience measure which reflects the value that passengers place on their travel environment by measuring the quality of the travelling environment on trains and in stations. A quarterly Mystery Shopping Survey (MSS) conducted by an independently-accredited survey organisation assesses various aspects of the service, including the condition of train seats, cleanliness of surfaces and train exteriors and levels of litter and graffiti. This information is published separately in the annual report on the performance of the Public Private Partnership.

Ambience scores have improved on all the LUL ex-PPP contracts in the most recent periods of quarter 3. Only Whitechapel station was below the TfL target.

Graph 4 - Ambience Quarterly Mystery Shopper Survey (MSS) Score P8 2010/11



London TravelWatch has been a regular participant in the work of London Underground advisory panel on closures. This panel comprises representatives of passengers and businesses In London. There is also regular officer contact with regard to forward planning of the closures programme. Two examples of where London TravelWatch has been able to successfully influence this programme were the reduction in the proposed evening and weekend closures of the Northern Line in 2010 and the arrangements for the refurbishment of the Victoria Line escalators at Victoria in 2011.

In the case of the Northern Line, under the prevision Tube Lines arrangements an extensive programme of early evening and long weekend closures had begun in early 2010. This was the cause of significant passenger complaint – particularly where the alternative augmented bus services did not necessarily function as correctly as they should have done. We took this up with London Underground and they then decided that with a revision to the timing of the work being undertaken the length and scale of the closures could be scaled back considerably whilst at the same time achieving the desired upgrade.

At Victoria in early January 2011, London Underground consulted us on its programme to refurbish the escalators at Victoria which link the main ticket hall with the Victoria line. We advised London Underground that as they stood at the time, the plans for this were inadequate because there was an insufficient communications campaign and resource, the total loss of all ticket issuing facilities between 1600 and 2000 Monday to Friday was unacceptable and that by providing advice on alternative routes and modes that passengers could use overcrowding at the station could be avoided. London Underground took up our

suggestions, and the resulting 40% reduction in usage of Victoria underground station was achieved – far exceeding London Underground's expectations. So much so, that within two weeks of the works commencing it proved possible to reopen the District line ticket hall ticket office and vending machines between 1600 and 2000 Monday to Friday. In addition, it proved possible to complete the work of refurbishing the first escalator early in time for the Royal wedding on the 29th April 2011, such that the station was able to operate normally during this event which produced very large crowds over a sustained period of time. We had specifically asked that London Underground should try and achieve this so as to as to minimise disruption on this day.

In both these cases these results would not have been achieved without the intervention of London TravelWatch, both by channelling passenger concerns received through casework, but also because our in depth know ledge and experience of working across modes enabled us to anticipate passenger requirements.

London TravelWatch also monitors London Underground's performance at meeting its own targets, as set out in its business plan. According to the most recent figures London Underground met both targets for customer satisfaction and excess journey time. However, the target for scheduled services operated was missed reflecting, in part, the impact of strike action.

Table 1 – Q3 2010/11 London Underground TfL Business Plan KPIs

KPI	Target 2010/11	Current Performance Level
Customer Satisfaction – Overall	79	79
Excess Journey Time	6.67 minutes	7.8 minutes
% of Scheduled Services Operated	96.3%	93.3%

It is worth noting that whilst London Underground is currently meeting TfL's Customer Satisfaction targets overall, and has done so roughly since 2005/06, and a marginal increase in satisfaction is projected in future (to 81 by 2013/14), the targets themselves have largely remained static. This may be realistic given the amount of work being carried out as part of the upgrade, but given the scale of the upgrade it should also not be beyond the bounds of possibility that general customer satisfaction could be improved by more than a few percentage points.

A more challenging target has been set by TfL in relation to Excess Journey Time which requires a reduction from a target in 2011/12 of 6.2 minutes (and a current performance of 7.8 minutes) to 5.6 minutes by 2013/14.

4 Outcome of recent meetings with London Underground

At the meeting in March 2011 with London TravelWatch it was said that a confluence of small difficulties had combined to cause a much larger set of difficulties. The root causes of these could be attributed variously to:-

- poor drafting and delivery of contracts under the Public Private Partnership arrangements,
- the Rail Maritime and Transport (RMT) workers overtime ban causing delays to inspections to safety critical components,
- some assets being so elderly that despite previous best efforts at life extension failures becoming more common place and record numbers of passengers turning up to travel.

In addition it was noted that the system for making claims for compensation under the Passengers Charter were often seen to be rather cumbersome, and also was often subject to dispute. London TravelWatch asked LUL to reconsider its approach to payment of compensation under the Passenger Charter arrangements. In particular, we believe it would be better for passengers if compensation payments could be made directly to Oystercards or as monetary payments rather than the current system which involves the passenger having to redeem a paper voucher. This is borne out by recent research we have conducted jointly with Passenger Focus on national rail passenger charter compensation which suggests that passengers would prefer these methods rather than the more cumbersome present method.

The Passengers Charter arrangements are taken up by only a proportion of the actual numbers of passengers likely to have been delayed by incidents on the tube network. Therefore, even if significant numbers of claims are received they will not necessarily reflect the full picture of disruption to passengers journeys or passenger dissatisfaction with the network. TfL do also from time to time where very extensive disruption occurs on an unplanned basis, make exceptional refunds of fares paid to Oyster Pay As You Go customers who have touched in or out at stations subject to severe disruption of train services. A recent example was that of the Jubilee line, which was disrupted by signal and power failures.

5 Conclusions

It is noteworthy that London TravelWatch's performance monitoring reports are the only published source where all the monitored indicators are brought together at a single point. Data is otherwise contained in various TfL and Public Private Partnership documents, but which singularly do not make reference to each other.

Publication by an independent body such as London TravelWatch also ensures that TfL and London Underground can be called to account for their performance or practices. As a result changes can be made to the benefit of passengers.

However, London TravelWatch would like to be able to discuss with the Transport Committee at its meeting a number of options for improving analysis and data on passenger satisfaction and priorities for improvement.

Performance has taken a significant downturn in recent quarters on London Underground, with a number of high profile failures. Passengers are frustrated by this particularly given the amount of resources that have been expended on the upgrade programme and the significant levels of disruption that they have to endure over a significantly long period of time.

However, it is noticeable that where extensive communications have been undertaken with users , and where consultation has included significant 'listening and responding' by the operator promoting or implementing the upgrade that passengers have responded in a much more positive way to disruption or the need to change their journeys. An incidental by product of this is that for the operator often projects are delivered in a more efficient and cost effective way.

London TravelWatch recommends therefore that London Underground should :-

1. set itself more ambitious targets to improve overall customer satisfaction with its services. These need to be seen to be independently monitored and verified.

2. Replace the current arrangements for providing compensation under the passengers charter by paying compensations either through Oyster or by directly to passengers credit or debit card accounts.

3. Make a concerted effort to reduce the need for weekend and evening closures of the network where at all possible.

4. Improve communications with passengers both on trains and at stations.

5. Where closures and alterations to passenger access to stations are required that these are accompanied by pre-consultation, extensive passenger communication and provision of information on alternative means of travel.

National Union of Rail, Maritime & Transport Workers

RMT response to the GLA investigation into the state of the Tube

Introduction

The National Union of Rail, Maritime and Transport Workers (RMT) welcomes the opportunity to respond to the GLA investigation into the state of the tube.

The RMT is the largest of the rail unions and also the largest Trade Union on London Underground.

The end of the PPP, public ownership of the Tube and industrial relations

Progress with the Tube upgrades since the end of the PPP and future risks.

Tube upgrades since the end of PPP are proceeding at speed but without any regard for safety. For example, the signalling equipment is being replaced on Victoria line without Train Operators being given the opportunity to see the new equipment before they are expected to use it.

The impact of strikes on the recent performance of the Tube.

As stated in RMT's oral evidence to the Committee, TfL have consistently claimed that industrial action, both action short of a strike and strike action, has had no impact on performance of the Tube.

We note that TfL have since provided the statistical information on the impact of industrial action on performance to the Committee.

RMT welcomes the fact that TfL now acknowledges the significant impact that industrial action has had on the performance of the Tube and will be moving towards working together with the RMT to resolve the industrial relations issues and the relationship between management and the Union through the Independent Review of Industrial Relations on the Tube which has both parties have recently agreed to undertake.

The potential for further strikes in 2011/12 and their likely impact

The potential for further strikes in 2011/12 will be dictated by the circumstances at the time. The RMT hopes that progress will be made through the Independent Review of Industrial Relations on the Tube .

Steps that the Mayor, TfL and unions should take to improve industrial relations

RMT believes that the reestablishment of the London Transport Wages Board and the London Underground Consultative Committee would be positive steps towards stabilising industrial relations on the Tube.

Additionally, as mentioned previously, it is hoped that progress will be made through the Independent Review.

Ongoing disruptions on the Tube

The causes of ongoing disruption across the Tube network.

RMT believes that aging infrastructure and rolling stock, failing drainage and leakages in the tunnels are some of the main causes of ongoing disruption across the Tube network. Our view is that the entire system is in need of significant investment and a coordinated approach to work being undertaken. A coordinated approach requires that all of work be undertaken in-house by a single entity responsible for completing the work across the entire network. This requires Tube Lines to be fully taken back in house and to cease to exist as a separate entity.

Any change in the frequency of service failures across the Tube network.

TfL statistics claim that failures are becoming increasingly infrequent. The fact that the information is not readily available to the Union makes this difficult to verify. However, it does appear that failures whilst possibly less frequent cause significantly more disruption.

The safety of the Tube in light of incidents such as the 'runaway' engineering train on the Northern line in August 2010.

TfL statistics also claim that there are fewer accidents/incidents. Increasing use of contractors and bogus self-employment has led to a reduction in safety culture as staff just get 'bumped' if they raise an issue or refuse to work during or following an incident. LUL safety training has been minimised in an effort to save money, diluting its impact.

Safety and maintenance under the PPP and any changes since June 2010.

There have been proposals and implementation of changes to Maintenance and Track Patrolling Frequencies in the last year, such as increasing the frequency that Tube Lines signals are maintained on which is welcomed by the Union but also cutting depot track patrols across the tube to once a week.

Any steps that could be taken to improve the safety of the Jubilee line.

Patrolling frequencies have been reduced and RMT argue that that may see failure to detect broken rails etc, especially given that the old signalling system could potentially fail in the event of a broken rail (open circuit track failure) and the new system does not thereby potentially allowing a broken rail to go unnoticed. A broken rail could derail a train. Therefore, with the new signalling system track patrols become even more important and critical to the safe running of the Tube.

Performance and progress with upgrades by London Underground line Jubilee line:

Recent disruption on the Jubilee line and its safety after objects fell from trains in April.

The incident regarding the motor cover was in our view as isolated incident. However, regularly a "shoe" falls off due to hitting a traction rail. A shoe is a metal contact block which makes contact with the conductor rail which supplies power to the train.

Heavier and quicker trains are causing huge problems to the track. One consequence of this is voiding, the track dipping in areas, which is occurring more regularly and results is a less smooth journey. This problem is not unique on the Jubilee line but is happening more frequently across the network.

The risk of further slippage with the Jubilee line upgrade and the potential impact of this.

On the 27 June full revenue service began on the Jubilee line. It is the view of RMT that the line is not ready for full revenue service and is destined to fail, which will cause significant further slippage.

The risk of further disruption after the upgrade is completed because of problems with the signalling system at Neasden and the potential impact of this.

The new system has actually worked quite well, and the VCC has been reasonably reliable. In fact, service problems appear to reduce quicker after a problem with the new system as opposed to the old so there has been an improvement.

The lessons to be learned from the Jubilee line upgrade.

There were a number of lessons to be learnt from the Jubilee line upgrade such as issues surrounding the training of staff, ensuring LUL standards are compatible with the Thales system and problems with the short supply of staff with the appropriate skills due to a general skills shortage in the industry.

Additionally, RMT believes that any new upgrade requires Union input from the beginning in order to ensure that the upgrades benefit from the experience of the staff. Any major project such as the tube upgrades would benefit

from end user input, and the Union remains puzzled as to why this was not factored into the planning for a project of this scale.

Victoria line:
The recent performance of the new trains on the Victoria line and if the problems with the doors have been rectified.

On the Victoria line, LUL plan to run a 41 train service across the 32 platforms, and have instructed Train Operators to override safety systems such as sensitive edge in order to keep trains moving. Due to the volume of traffic on the line, any delay would be major. At the time of writing, this issue has not been resolved to the satisfaction of the Union.

The potential for further disruption on the Victoria line when the old signalling system is removed.

RMT has major concerns that should LUL continue to replace signalling systems in the same manner, then Train Operators will again not be familiarised with the new system or specifically trained to use it.

RMT notes that the major fault with the new technology is that failures tend to occur across a larger area. For example, in the older systems a single signal will fail whereas in the newer systems should there be a fault at the central control point of the system an entire line may be without signalling and so cannot function. This occurred on the Victoria line on the week beginning 20th June when a Code Amber lasted for 8 minutes.

Lessons to be learned from the Victoria line upgrade.

Major failings in the Victoria Line upgrade are broadly similar to the Jubilee line upgrade, indicating that there is not a culture of learning lessons from failure.

Training, communication and ensuring staff have the correct skills and understand the needs of maintaining the system following installation are some of the major issues regarding the Victoria line upgrade.

Northern line and sub-surface lines:

The recent poor performance of the sub-surface lines particularly the Metropolitan line.

The Metropolitan Line has a 50 year old signalling system. Problems with the track condition are also major and it is susceptible to rain as the drainage system in certain areas isn't adequate. This causes large areas of signalling track circuits to fail and so requires constant monitoring and adjustments to keep working. Also frequency of service through the City mean minor service delays i.e. 2 minutes of track work, causes a large traffic jam that delays trains for a much longer period of time.

The risk of delays with the Northern line upgrade given it will have the same signalling system as the Jubilee line.

The system on the Northern line is going to be the same as that on the Jubilee line but there is going to be a simplified installation ie same technology, more prefabing.

Again, there were clearly not lessons learnt from the Jubilee line upgrade, and staff remain unfamiliar with the signalling system.

The risk of delays with the sub-surface line upgrades given the complexity of this work.

The Sub-Surface Railway upgrades have had some remedial work undertaken to maintain service as opposed to actually upgrading the system. There is also much confusion as to what signalling system will be used, and concern as to whether or not the best available system will be put in place, or the least expensive.

The ability of TFL to resource and deliver the Northern and sub-surface line upgrades at the same time.

RMT is concerned that maintenance budgets are being cut in order to pay for upgrades. Additionally, the Northern line upgrades will not be completed within the timescale set out in the original plan. The Union also remains sceptical as to whether or not management's claim that the Jubilee and Victoria line can be completed at the same time.

There are also concerns as to whether or not the new rolling stock will be delivered on schedule.

Any action that could be taken to improve the performance of the Northern and sub-surface lines prior to and during the major upgrade work.

RMT notes that some remedial work has already been undertaken but that this work was essentially "fire-fighting" and maintaining the level of service as opposed to preparation for the upgrade work.

Piccadilly, Bakerloo and Central lines:

The implications of the delay in the upgrade of the Piccadilly line.

The signalling system on the Piccadilly line is out of date and life expired, so there will be more failures and increased risk of wrong side faults (ie green signals instead of red) due to aging wiring. This is obviously a serious safety hazard.

The risk that the Piccadilly, Bakerloo and Central line upgrades will not happen.

It has been indicated to RMT representatives that the Piccadilly line upgrades will almost definitely be delayed or postponed. Additionally, a lack of investment has called the timescale for the upgrades on both the Bakerloo and Central line into question.

Any action that could be taken to improve the performance of the Piccadilly, Bakerloo and Central lines prior to the upgrades

RMT believes that with the current level of investment in the tube, and the upgrades that this investment intends to deliver can at best maintain the service as opposed to improving the service in real terms. The assets have been consistently sweated. For example the Piccadilly line is running at capacity and is 40 years old and has seen a reduction in track inspections from every 72 hours to once a week. There has been an increase in the number of areas for inspection, making them smaller. However, there has not been any increase in the number of track inspectors.

Additionally line inspections have been reduced on the central line from 4 annually to 1 annually.

Also the central line, like many other lines, has seen standards slip in recent years and especially since the failed PPP experiment. For example, on the outdoor section between White City and west Ruislip there were 138 track clamps between North Acton and West Ruislip least year, whereas at the beginning of June 2011 there were 98 track clamps between Northolt and Greenford alone.

Planned closures for upgrade and maintenance work

The potential for greater use of block closures to deliver future upgrades and realise savings e.g. on the Northern and sub-surface lines.

RMT has no objection to block closures and recognises that in some instances it may be a more efficient manner in which to get work done.

Realising value for money in running the Tube

TfL's plans for finding savings on the Tube including through changes to: staffing; maintenance practices; and the scope and timescales for upgrades

RMT has consistently opposed the cost cutting measures being imposed on what is an essential public service. As our evidence above makes clear, the Tube is in need of significant and continued investment and not cuts in staffing levels or maintenance practices.

Neither the scope nor the timescales for upgrades have been met, due to managements' preoccupation with imposing unnecessary and in many cases unsafe changes to staffing levels, in addition to changing maintenance practices including reducing some inspections which are undertaken for safety reasons.

It is the opinion of the Union that these cuts are being imposed in order to divert monies into the upgrade programme and to pay for the failure of PPP. They are not being imposed to increase the quality of the service.

For example, in relation to the ticket office cuts RMT believes job cuts of that magnitude damaged the level of customer service afforded to passengers.

The independence of the Independent Investment Programme Advisory Group (IIPAG).

RMT believes that the IIPAG is not genuinely independent. This is clear from the fact that 5 of the 6 members of the group have declared in their declaration of interests current or previous affiliations to engineering firms who currently, or have in the past, held railway contracts.

The areas of cost and performance on the Tube that IIPAG should focus on in its future work.

RMT has consistently argued that the leakage from the industry occurs through contracting out work which in the past was undertaken in-house.

The performance information, including benchmarking information , that IIPAG should publish in future.

RMT argues that due to the use of public funds, all information relating to the performance of the tube should be publically available.

Any other actions that need to be taken in the longer term to improve the performance of the Tube and the delivery of the upgrades.

All maintenance work should immediately be taken fully in-house in order to operate smoothly as a single entity and to prioritise work across the network.

ASLEF's Response to the London Assembly Transport Committee Investigation into the State of the London Underground

1. The Associated Society of Locomotive Engineers and Firemen (ASLEF) is the UK's largest train driver's union representing approximately 18,000 members in train operating companies and freight companies as well as London Overground and Underground and light rail systems.

2. ASLEF welcomes the opportunity to contribute to the London Assembly Transport Committee's Investigation into the State of the London Underground and to highlight some of our concerns regarding the current state of London Underground, particularly the Jubilee Line. Our members who drive Jubilee Line trains have growing concerns around issues of safety.

3. While the investigation is examining the current state of the Underground, the Union takes the view that it is important to examine the historical context. Today's problems on the London Underground cannot be viewed in isolation.

4. It is evident to all staff and passengers on London Underground that the upgrade work on the Jubilee Line has been disastrous, from the number of weekend closures to the delay to the completion date, the project has gone from one crisis to another.

5. ASLEF would point to the report from London Underground to the TfL board regarding the status of the Jubilee Line on 21/07/10 which made clear that there was no prospect of Tube Lines completing the upgrade by 31/12/2009, the original deadline for completion. In addition that report recognised that given the system's "dynamic" nature it was inevitable that when the network was pushed yet further, more and more problematic issues would emerge.

6. We would also highlight the issues with the Control Centre as well as train and general system reliability, not least Trail Operations delays which were running to one thousand minutes per weekend. This poor reliability has had a knock on effect on the amount of drivers who are able to be trained on the TBTC system creating further delays. The Committee will appreciate that drivers cannot be trained on a faulty system.

7. Additionally the multiple delays to the upgrade work and closures required could have been dramatically reduced by Tube Lines if they had used passive system testing combined with extensive investment in off-site simulation using test track. This is used, for example, by the Madrid Metro to great success. Passive testing involves equipment that is installed but not connected to vital operational functions so it can be tested in traffic hours. This helps simulate the "real railway" as far as

possible. While there is, for instance, test track at Highgate, and some simulation did take place such testing has been limited, leading to the closures and delays that have affected millions of passengers.

8. ASLEF believes that the decision not to design the TBTC system in “overlay” mode with the new system overlain on top of the existing one was responsible for significant problems. This means that testing without switching between the two systems could not be done, a consequence of which was that a one hour test required a full day’s closure.

9. Moreover this led to Tube Lines having a reduced ability to provide reliability and it is therefore no surprise that delay minutes for Easter trial operations were 463 compared with a forecast of 22 minutes, and in the May Dank Holiday trial operations the figures were 785 compared with 240 planned.

10. ASLEF would remind the Committee that train reliability has also been affected by the inability to put the TBTC system on the rolling stock with only 20 trains proving sufficiently reliable for passenger service out of the promised 57.

11. The union would also ask the Committee to note the SERCO report to the TfL board in which the company explains that Tube Lines had dramatically underestimated the difficulty in developing the required software for the system, especially considering the complex and safety critical nature of it. Additionally a lack of trials combined with the merging of the upgrade areas has meant that technical difficulties increased significantly.

12. It’s worth remembering that Tube Lines relied on software which attempted to cover as many as 80 faults at a time, a wholly unrealistic amount. This oversight regrettably means that a further period of trial operations will be necessary.

13. At present ASLEF drivers on the Jubilee Line are concerned about the SRS timetabling system particularly its robustness and capability to cope with any service demand, let alone that of Passenger/Revenue Service.

14. Members have highlighted SMC Neasden and the capability of Service Controllers to cope with any formal service, given their outstanding issues of work overload and equipment capacity.

15. ASLEF representatives are have also raised concerns about numerous other questions on the Jubilee Line including user interface issues with incoming Alarms, the suitability of the TOD (Train Operator Display Unit), Train Operator Practical Handling, Bi directional track and its associated implications, Accurate Stop and the inability to get a “zero” reading on the TOD at locations where you would expect to get them.

16. The union would draw attention to the admission of LUL that the SRS, “falls over” every time there are trial operations, a consequence of which is (when it fails) to default a train’s journey to a straight run (for example Stratford to Stanmore), irrespective of planned journey. Therefore, if a driver was undertaking a time tabled reversing move when the SRS failed, the train would be defaulted to a straight run and the signalling would clear the path, for a far greater distance than the anticipated and original move and, give the driver an ‘In Cab’ indication of a

distance to move that was greater, than what was originally required. The inference being, that a train could be moved further than was desirable.

17. ASLEF is of that view that SRS is not robust and that SMC Neasden cannot input too much information into SRS without slowing it up and causing it to crash. In terms of TOD Suitability we would contend that SRS failure may possibly cause the TOD to display a new destination cipher.

18. Despite repeatedly raising this subject with LUL there has been no progress regarding Train Operator Practical Handling. The T/Ops are not yet ready to go live and fail to identify TOD changes and fail (possibly by distraction) to identify the Limit Of Shunt. To date, only 61% of the line's 346 T/Ops have completed a minimum of two trips in TBTC and, 39 T/Ops have yet to even get on to a TBTC train.

19. Many of these issues were encapsulated in an incident on Monday 25th April 2011 when a shoe beam fell off a Jubilee line train. Unfortunately this was the second object to have fallen off a train within two weeks. Moreover what is of great concern to ASLEF is that ALSTOM has said that with trains going faster and breaking harder it's no surprise. ASLEF's members are concerned about their safety.

20. ASLEF's local reps and Train Operators are looking for assurances that all trains have had a full inspection of the shoe beams to ensure there are none with any signs of damage that could result in the shoe beam breaking and that any that have shown damage have been withdrawn from service and will not be re-offered until the faults have been put right and the causes are known.

21. The union would also ask the Committee to seek assurances and confirmation that the increased speed of the trains has in no way contributed to the failing of this or other shoe beams. If this has been a contributory factor then the ASLEF wishes to know what mitigation is to be put in place to ensure the trains operate at a speed where this type of damage will not recur.

Keith Norman
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9th May 2011

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29th June 2011

Dear Ms Warren,

London Assembly Transport Committee investigation into the state of the London Underground

TSSA welcomes the opportunity of making some comments to the Committee's investigation into the state of the Underground. In the time available we have not been able to undertake detailed analysis of the reasons for the recent decline of the Tube's performance that is clearly unsatisfactory. We would, however, broadly agree with the views on various issues expressed to the Committee by our colleagues from ASLEF and RMT on 17th May.

Our comments/opinions on some of the issues that we consider relevant are as follows:

1) Information: We do not have access to information other than that which is publicly available. In general there needs to be clarity in exactly what is being measured for the purpose of early identification of problems so that the cause of the problem is understood for remedial action to be taken to improve performance. Most of the recent (adverse) publicity on performance has been in relation to lost customer hours (LCHs). Whilst this is a fundamental and extremely important measure of performance, there may be other measures that merit more prominence than they presently receive. This may be especially relevant during a period of cost cutting as a result of which staff are being made redundant. For example, according to Travel in London, Report 3 the overall satisfaction of London Underground passengers with all aspects of their journeys in 2009/10 was 79%. This was made up of the following elements:

Station services	Train services	Train crowding	Cleanliness	Station staff helpfulness & availability	Customer safety & security	Train & station information
78%	78%	71%	75%	75%	84%	81%

Many of these aspects of passenger satisfaction depend on staffing levels and we are concerned they will suffer as a result of staff cuts. We are concerned, for example, on how cuts in station staff may result in higher incidence of station closures and how this will be reflected in hard performance measures. Furthermore, we consider that more prominence needs to be given to the views of passengers in terms of value for money in relation to the fares they have to pay.

From the discussions that took place at the Transport Committee on 17th May we are concerned with regard to the apparent lack of openness of the Independent Investment Programme Advisory Group. This approach needs to be challenged and a reminder given that the work the Group undertake is paid for by the public – including presumably the super-remuneration of its members. The Group's reports should as a matter of routine be made public without interested parties having to resort to freedom of information requests.

2) Industrial Relations: It is claimed by London Underground that industrial action taken by RMT and TSSA members contributed to a decline in performance during the periods in question. Bob Crow pointed out to the Committee on 17th May that this contradicted the company's assertions at the time that the industrial action had little effect on services. This point brings into question the reliance that can be placed on LU's interpretation of the underlying reasons for the decline in performance.

It is obvious to us that industrial action however well supported by union members is bound to have an impact on performance. Clearly the increased incidence of such action in recent years suggests that there is scope for improvement. TSSA members do not take industrial action lightly unless they feel there is no real alternative and have to incur significant financial loss in earnings as a result of going on strike – nobody likes losing a day's pay.

In general, we find that it is easy enough to get meetings with senior management at times when industrial action looks inevitable. At other times, however, the company are not so amenable to enter into discussions on issues that can result in industrial unrest and great disruption to tube passengers. The lack of engagement and opportunity to discuss matters of common interest and importance on a regular basis outside the enormously pressurised environment that goes with industrial strife is one problem that could be addressed quite easily. I feel that the restoration of meetings at General Secretary/company Board level perhaps a couples of times a year could really make a contribution to improving matters considerably.

We would also support improvements to the current machinery of negotiations for the introduction of a body similar to the former Wages Board that would in our view result in enormous improvements.

TSSA would be prepared to enter into unconditional, meaningful discussion to examine ways in which industrial relations within LU may be improved.

3) The Mayor for London/Leadership and Responsibility: The Mayor's albeit belated decision to Chair the TfL Board is very welcome. However, it is extremely disappointing that more than three quarters of the way through his term of office he has still not met me or my counterparts from the other trade unions. I would certainly welcome an opportunity to meet the Mayor to discuss the many problems and challenges the Tube faces in delivering improved performance at a time of increasing budgetary constraint.

We would like to get across to the Mayor as the democratically elected politician with ultimate responsibility for delivering better transport in London, that he has a responsibility to engage with all stakeholders, including representatives of the workforce. He appears to be perfectly adept at engaging with the softer media-friendly stuff like the so-called Boris bike and new Route Master project. However, he seems reluctant to move outside this comfort zone to deal with the much harder stuff including performance issues on the Underground. We note it was the Deputy Mayor for Transport and representatives of London Underground who appeared before the Transport Committee on 14th June not the Mayor himself, though it may be the intention to meet him separately?

4) Upgrade Line Closures: In common with all other parties, we have no specific suggestions on how this can be done with least disruption. At best it's probably coming up with the least worst solution – it's certainly not possible to please all of the people all of the time. On the whole, passengers understand that there is bound to be disruption associated with planned upgrade work, including line closures of various kinds. The most important consideration is keeping passengers on board by proper planning involving maximum notice through proper consultation channels e.g. passenger bodies, employer representative organisations, community organisations, LU staff etc. Employers could use internal communications to seek staff views and local authority and local press could also be used more extensively.

There is a real need for TfL to be more honest and transparent in the way in which upgrade closures are reflected in performance to record accurately passengers' experience. In February this year, the BBC Politics Show calculated that if weekend closures were included only 78% of scheduled Jubilee Line services would have run compared with 95% reported by TfL. It is the former figure that accurately reflects the reality for Jubilee Line passengers. For TfL to claim otherwise only serves to undermine public confidence in TfL's official figures giving some credibility to those who may argue that the company is 'cooking the books' or trying to hide something. There is no reason why both figures cannot be officially published accompanied by appropriate explanatory notes.

TSSA is concerned that TfL agreed to scale back the upgrade programme with long overdue work on the Northern and Piccadilly Lines bearing the brunt. We feel that putting such essential work back even further must increase the risk of these lines becoming less reliable that will be reflected in poorer performance and lower levels of passenger satisfaction. This is

unsatisfactory at any time, but even more so during an extended period when passengers are going to have to endure massive inflation plus fare rises.

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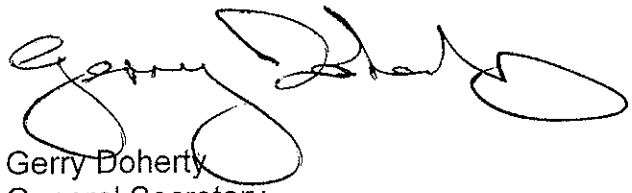
I hope the Committee find the above of some help in its investigation, but please let me know if I can be of further assistance.

Yours sincerely



Gerry Doherty
General Secretary

Comments from Excel Ltd, 11 May 2011

[*Excel Ltd contributed to the Committee's previous investigation into passengers' experiences of the Tube in 2009*]

I do not have much to input this time around. In 2009 we were in the thick of the Jubilee Line closures that were affecting our business severely, however we now seem to be through this period and the impact has been minimized. The few comments I would make are as follows:

- Clearly with the Jubilee Line works overrunning there was further impact beyond the 2009 investigation, however, once the works were finished east of Waterloo the weekend closures that particularly impacted our business came to an end.
- However, as the works have overrun, our customers and visitors are yet to see any benefit from the upgrade works which have been long anticipated by all.
- In 2010 we opened London's International Convention Centre (ICC) and increased the space capacity of ExCeL by 50%. Since opening we have had significant success in attracting more events and therefore visitors to London with the net effect of more incoming people with no enhancement on the Jubilee line leading to increased congestion on the line.
- In addition to our own success, Canary Wharf and the Royal Docks have continued to grow and attract more businesses to the area – as above this had led to further congestion at peaks time on the tube.
- In terms of congestion, future proofing for increased capacities in East London is key. The arrival of Westfield Stratford, The Olympic Park etc. will continue to put increased pressures on LU and particularly Jubilee Line.
- Canning Town station continues to be a significant pinch point at peak times (interchange between Jubilee, DLR and Buses), particularly when we have medium to large events taking place at ExCeL, adding significantly to the already increased background demand.
- There have been some instances of service delays, disruptions and over-running w/e works due to the testing programme.
- On the communication front, since the last review in 2009, this is an area that has improved considerably. We have regular meetings with TfL, regarding the LU and specifically Jubilee line, to run through our event schedules and I would say that our relationship is good.
- On a final note, the ongoing threat of strikes is really disruptive and I would say embarrassing for London. It is very hard to put any contingency plans in place and the cost of doing so is generally prohibitive. Ultimately everyone suffers as a result as it not only has a detrimental financial impact but also is bad for London's international reputation.

James Mark
Excel Ltd

WHat

WEST HAMPSTEAD *amenity and transport*

WHAT submission to Transport committee enquiry into London Underground.

WHAT is transport and amenity campaigning group in West Hampstead. It was established in 1973 and so has been in existence for nearly 40 years.
Our submission focuses on:

- The continuing breakdowns and malfunctioning on the Jubilee line after the upgrade has been completed.
- The difficulty of communication with Tfl.

We have particular concerns about the Jubilee line and its performance after the upgrade.
In West Hampstead we have put up with vast number of closures due to the upgrade of the Jubilee line. We appreciate that this work had to be done, but the work took much longer than predicted with many shutdowns affecting local businesses and residents.

Now, although the work on part of the line has been completed, the situation is almost worse than it was during the upgrade. Virtually every day there are problems. - signal failures, non - communicating trains with problems at Baker Street. There are long delays and even several unplanned closures of the line.
It is has got to the point that one has to build into a planned journey at least 30 extra minutes to avoid being late due to delays.

Given the severe problems recently when trains were stuck in tunnels and doors not able to open, we are very concerned about safety on this line. This is not an acceptable situation.
We have been told that the upgrade means than trains can run more frequently, and therefore make journey times less – our experience is the complete opposite of this with journeys often taking much, much longer than before.

In addition, as a local group concerned about such issues, we have found Transport for London to be an impenetrable organisation. There is an annual transport liaison meeting organised with Tfl by Camden Council . But this is insufficient to develop an ongoing dialogue. Contact with officers is difficult. TfL has tried to improve its information for the public in recent months but we feel it must do more to develop workable systems which genuinely interact with those representing local passenger interests. Recently an approach to Peter Hendy's office resulted in a senior staff member attending a WHAT meeting. This could be built on, with a regular contact point within the organisation. We understand that London Travelwatch(with whom we have liaised) has encountered similar problems.

Virginia Berridge (Chair WHAT)
Mary Tucker (convenor of transport working party)

Office of the PPP Arbiter

Notional Infraco Strategy

8 March 2010

FINAL REPORT

Halcrow Group Ltd

Office of the PPP Arbiter

Notional Infraco Strategy

Contents Amendment Record

This report has been issued and amended as follows:

Issue	Revision	Description	Date	Initials
1.0	FINAL	Final Report issued to OPPPA for consultation with the Parties.	18 September 09	SGB
2.0	FINAL	FINAL Report issued to OPPPA to inform Draft Directions.	16 December 09	SGB
3.0	FINAL	FINAL Report issued to OPPPA to inform Final Directions.	8 March 10	DS

Approved for Issue 8 March 2010

Michael Jamieson,
Director, Rail & Aviation

Disclaimer

This report has been prepared for the Office of the PPP Arbiter by Halcrow Group Limited (Halcrow) under terms of reference agreed with OPPPA. The information contained within this document is intended solely for the use of OPPPA in support of their work on the Tube Lines Periodic Review. Any other persons who use the information contained herein for any purpose other than that which it is intended, do so at their own risk.

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Part D: Line Upgrades

Appendices

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PART A

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PART B

NI Asset Strategies

Current PPP Contract

[excluded]

PART C

NI Asset Strategies

Restated Terms PPP Contract

[excluded]

PART D

Jubilee, Northern and Piccadilly Line Upgrade Project

1. Line Upgrades Overview

The purpose of Part D is to determine the NI strategy for implementing the Jubilee, Northern and Piccadilly Line Upgrade projects.

The following sections describe the NI approach for delivering the Line Upgrades. This considers the:

- Contract Requirements
- Evidence
- Procurement Approach
- Schedule
- Costs
- Access Requirements

It concludes with the population of the DBS.

1.1 Contract Requirements

The Line Upgrades are a key part of the PPP Contract. For each of the Jubilee, Northern and Piccadilly Lines the Contract sets a Journey Time Capability (JTC) target which can be achieved by a number of different technical solutions.

The original Contract (Schedule 3.1 Appendix 5) specifies the Line Upgrade Latest Implementation Date as follows:

	Jubilee	Northern	Piccadilly
Latest Implementation Date	31 December 2009	7 January 2012	11 October 2014

Figure 1.1: Line Upgrade Milestones (PPP Contract, Schedule 3.1 Appendix 5)

These dates are the trigger for changes in Capability payments or abatements for late delivery.

In Restated Terms, the Piccadilly Line Capability payments have been split into two phases with PLU1 due for completion by 11 October 2014 and PLU2 due for completion by 10 October 2015.

1.2 Paragraph 6.5 Guidance

The table below summarises the 6.5 Guidance:

Paper	Summary	Impact on NI Strategy
Paper 14	SCC at Acton	Reflected in NI Enabling Work costs.
Paper 33	Removal of some of the Redundant Equipment moved to RP3.	Reflected in NI Enabling Work costs.
Paper 60	Removal of PESP and SPTs	Reflected in NI Enabling Work costs.
Paper 61	PEDs, floodgate and access	Reflected in NI Enabling Work costs.
Paper 64	Allowance for Train Arrestors	Reflected in NI Enabling Work costs.

Figure 1.2: Summary of 6.5 Guidance Papers

1.3 Evidence

1.3.1 At Transfer

At Transfer there were few TBTC systems which had been implemented on existing railways which would act as comparable benchmarks. The NI would have been faced with suppliers who would be expected to undertake some form development work to deliver a commissioned system. Therefore there was not an extensive evidence base for determining future system costs at Transfer.

1.3.2 Restated Terms

For Restated Terms, a number of reports have subsequently been produced for OPPPA, LUL and TLL:

- **BSL** – International Cost and Performance Benchmarking – Typical Process for Metro Rolling Stock and Signalling Upgrade (July 2008)
- **SERCO** – Piccadilly Line Upgrade – Alternative Upgrade Strategy (February 2009)
- **Booz & Co** – Report on RP2 Signalling Capex Analysis (May 2009)
- **BSL** – International Benchmarking of the Costs and Performance of Maintaining and Renewing Metro Systems (February 2010)
- **Phil Gaffney** – Independent Review of the Jubilee Line Upgrade for the CEO, Tube Lines Ltd (October 2009)
- **CHARTERIS** – Expert Opinion on Aspects of the Restated Terms for the Second Stage of the PPP (November 2009)
- **MTR** – Independent Review of Piccadilly Line Upgrade Signalling Works Estimation Process (November 2009)
- **MTR** – Independent Review of Halcrow's Notional Infraco Strategy and PLU Estimating Methodology (January 2010)

- **Tube Lines** – Jubilee & Northern Line Upgrade Project, Contracting and Procurement Strategy (February 2003)

In addition two visits were undertaken by OPPPA, LUL and TLL to Madrid and Paris metros in November 2009.

1.3.3 BSL – International Cost and Performance Benchmarking (July 2008)

BSL undertook a comparative benchmarking study for the cost of TBTC systems across metro systems during 2008. They identified 32 TBTC signalling projects in the last decade and obtained contract price data and characteristic parameters for 20. To ensure a relevant comparator group, they excluded 11 data sets on the following grounds:

- 9 were in mainland China or India and excluded as atypically low cost.
- The Canarsie Line - New York was excluded as atypically expensive.
- One line in Hong Kong was excluded as atypically short.

There remained a representative population of 9 systems, of which 5 are understood to be Seltrac systems. The costs per route-km for this group are plotted below:

[✂]

Figure 1.3: International Benchmarking of TBTC systems (BSL, 2008)

The BSL study was a desktop exercise collating supplier published 'contract' prices. Therefore these figures only represent what the signalling suppliers perceived to be actual costs for marketing purposes. These costs would not be expected to include enabling works.

Although not evidenced in the graph above, it would be expected that there were economies of scale as the length of the line increased. It would also be expected that there

would be economies of scale from implementing subsequent lines on the same metro with the same team, relationships and direct experiences.

BSL concluded that its benchmark range was between £1.4m and £2m per route km (£0.7m and £1.0m per track km). BSL concluded that there was little correlation between the signalling cost and whether this was installed at new greenfield or existing Metro brownfield sites.

1.3.4 SERCO - Piccadilly Line Upgrade: Alternative Strategy (February 2009)

Serco was commissioned by LUL to review the Piccadilly Line Upgrade with the principle requirement being an independent view of the number of closures required if an alternative strategy were adopted. Serco concluded that:

- No weekend closures were necessary for the construction of SER's and that preparation and enabling works contained within SER's could be carried out during Traffic Hours.
- 39 weekend closures would be necessary to deliver the PLU.
- The design for the maximum loop length could be 2km with a 1.5km average.
- LUL 'Route Secure' operational functionality could be applied to mainline points only.
- Engineering trains could be more efficiently operated by allowing Setting Back and Wrong Road Movements under the 'Engineer's Railway' Rules.
- Activities including P&C work and, cabling between point machines and Signal Equipment Rooms (SER's) were not part of core TBTC installation costs.

1.3.5 Booz & Co – Report on RP2 Signalling Capex Analysis (May 2009)

Booz & Co undertook a review of the BSL 2008 benchmarking report (section 1.3.3). It concluded that:

- Only 9 of the 20 metros reviewed were considered relevant of which only 3 were brownfield sites and they therefore suggest uplifts to reflect the additional costs of upgrading an existing line.
- The effect of Exchange Rates and Purchasing Power Parity (PPP) had not been fully considered and did not reflect the specifics of railways.
- BSL used costs which did not reflect outturn prices and therefore an uplift should be applied.
- There are specific costs associated with the LUL environment

Incorporating their recommended uplifts, Booz and Co suggested a revised Benchmark Range of £1.2m and £4.9m per route km (£0.6m to £2.4m per track km).

Booz and Co identify several themes that contribute to additional costs which arise by:

- working on a brownfield line
- outturn costs versus supplier published (contract award) costs
- miscalculating exchange rates and the time basis of costs
- LUL environment

1.3.6 Phil Gaffney – Independent Review of the Jubilee Line Upgrade for the CEO, Tube Lines Ltd (October 2009)

This report reviewed the current status of the Jubilee Line project and suggested a number of reasons as to why the programme was delayed. The key reasons he identified were:

- **Schedule** - Under-estimation by Thales of the scope and complexity of the LUL environment including existing assets, access, operational functionality and assurance procedures
- **Design** – Thales had not developed software and sub-systems to a high level of maturity
- **Supply** – Delay caused by the replacement of Concentric Cables
- **Management** - Early project delays with TLL project managers failing to adequately manage Thales and specifically the Toronto based project team.
- **Management** - LUL, TLL and Thales not working well together

Phil Gaffney identified some core themes which have caused delay including:

- Poor understanding of initial scope and requirements
- Difficult contract management across multiple sites
- Level of development required after contract award

1.3.7 BSL – International Benchmarking of the Costs and Performance of Maintaining and Renewing Metro Systems (February 2010)

BSL updated its January 2009 benchmarking report reflecting more extensive surveys, albeit with fewer metros. However, only two non JNP metros provided cost information on their signalling upgrades as follows:

- BCV/SSL (VLU) - £8.04m / track km

MTA (New York) - [✂]/ track km (Canarsie)

The figures are significantly higher than in their previous study.

BSL stated that since there was little data available and therefore detailed comparisons of technical characteristics, processes, timelines including delays and access types with unit costs could not be made. Therefore as a result little can be drawn from this report.

1.3.8 CHARTERIS – Carolyn MacDowell – Expert (November 2009)

Charteris was commissioned by TLL to give her expert opinion on whether TLL could have completed more work in RP1 given the delays and additional work on the JLU. Charteris does not offer any opinion on the reasons for delay and concludes that:

- It would not be practicable to train additional specialist resource due to the level of expertise required, the scare resources with such knowledge and the diversion of existing resource for knowledge transfer would result in delays therefore seeking to add additional resource would be counter-productive.
- With the specialist resources still finalising the Jubilee Line Seltrac Signal Plan (SSP) very limited work has been possible on the NLU SSP.
- Without the NLU SSP, the Bookwiring cannot be started for the NLU. Additionally, the specialist Bookwiring resource is still completing JLU Bookwiring.
- Diverting existing resources to the NLU from the JLU would result in delays to the completion of the JLU SSP's and Bookwiring. NLU is reliant on the JLU outputs as the baseline for the NLU SSP's.

It was therefore Charteris's view that the delay to the JLU had impacted the amount of work possible on the NLU. In the context of this analysis, this shows the importance of early assurance of a stable design to avoid a tightening of a schedule constrained by the availability of critical resources.

1.3.9 MTR – Independent Review of Piccadilly Line Upgrade Signalling Works Estimation Process (November 2009)

TLL commissioned MTR to carry out an independent review of the PLU estimation process for the Thales work taking account of client requirements and practical installation aspects

The review required a statement of how MTR assures its own estimation process, a review of TLL's estimation process and a comparison between the two methodologies.

MTR describes its approach in detail and includes a specific amount for contingency management generally at 20% for signalling projects and 15% on other projects.

MTR concluded that it was satisfied with TLL's approach to estimation. MTR also suggested that due to the nature of LUL's special requirements, a careful consideration of the Thales approach should be carried out and reflected in contingency and risk allowances.

1.3.10 MTR – Independent Review of Halcrow's Notional Infraco Strategy and PLU Estimating Methodology (January 2010)

TLL commissioned MTR to provide an independent review of the methodology applied by Halcrow in developing the NI Strategy (16 December 2009) and compare Halcrow's methodology with MTR estimation and approval processes for major upgrade projects.

MTR questioned the 'width of accuracy' in Halcrow's use of Benchmarking. MTR suggested that the factors used for converting route km to track km, the inflation and indexation rates utilised and certain inputs such as track length were inaccurate and therefore produced unreliable benchmarking analysis from which the project costs were determined.

MTR suggested that a detailed activity based bottom-up estimation would be required with an additional top-down estimate to be used as a sense check.

In addition, MTR also questioned the basis on which Halcrow selected the chosen benchmark peers. MTR do not agree that the Canarsie Line should have been dismissed as unrepresentatively expensive or that the Madrid lines were of a comparable technical and commercial scope.

MTR suggested that in order to utilise the available benchmarking, the technical and commercial similarities should have been demonstrated.

MTR dismiss Halcrow's approach on the basis that is does not consider delivery risk and utilises a P50 uncertainty risk which further skews the NI price estimate.

1.3.11 Tube Lines – Jubilee & Northern Line Upgrade Project, Contracting and Procurement Strategy (February 2003)

At the time of procurement in 2003, Tube Lines commissioned Booz Allen Hamilton to assist them in specifying and procuring the (TBTC) system for installation on the Jubilee and Northern lines. As part of this assistance they investigated various issues relating to procurement methodologies and lessons learned from 14 different projects worldwide.

The purpose of the review was to determine the correct contracting approach for TLL and to confirm the procurement process and programme. 13 of the projects reviewed had used fixed price contracts. The lessons included:

- Contractors over estimating the amount of software (architecture and functionality) that can be re-used from other projects.

- Planning the process 'right the first time' saves time and money, rather than a 'recovery programme/patch method'.
- Contractors have a limited operational perspective, and hence, the operability of the system is designed for technical debugging, rather than developing operational staff's knowledge of the dynamics of the system.
- Operational simulation and operational testing are essential to the successful integration/migration of a new system, but are often an after thought rather than an integral part of the development & delivery process.
- Hence, a contracting approach providing Tube Lines with access and insight into the detailed software development process, together with the ability to influence the integration and migration process is essential.

The conclusion of the review was that based on the risks identified and experience from the development and delivery of TBTC signalling and control systems for a range of projects, a target cost contract structure was recommended for the procurement of the Jubilee and Northern Line Upgrade Project.

2. Procurement Approach

2.1.1 Overview

Halcrow has developed this section based on its independent view as to how the NI would approach procuring and delivering the Line Upgrades. This was developed without reference to all the evidence provided since September 2009 and therefore is believed not to be influenced by hindsight.

Halcrow was specifically asked by OPPPA to undertake procurement and contract review of TLL's actual approach to inform a decision on whether the NI should follow the same approach.

The conclusion of this review was that there was insufficient evidence to demonstrate that TLL had followed GIP in procuring and then managing the signalling contracts. Therefore, for the purposes of the Line Upgrades the NI disregards this contract and follows the approach developed below.

2.1.2 Jubilee and Northern Lines

At Transfer, the NI is assumed not to be in a consortium with a signalling or rolling stock supplier. It is also assumed that during shadow running the NI would have limited funds to develop proposals for how the TBTC solution would be developed and procured.

Therefore, the NI would first seek to establish a competent team through both engaging external expertise and partnership with the relevant third-party, for example, the train owner Alstom and LUL engineers and operators.

The purpose of establishing a competent team would be to seek to resolve many unknowns before procurement of the TBTC supplier, such that the specification and requirements within the ITT have limited scope for change. This would also provide the opportunity to ensure the tender evaluation criteria addressed stakeholder requirements.

The NI would undertake capability modelling of different technical solutions and resolve any areas of uncertainty in interpretation of the PPP Contract with LUL.

In parallel the NI would undertake all necessary surveys for the enabling works including agreeing any planned track layout changes and power supply upgrades. The outcome of this work would be a confirmed outline design sufficient for all potential bidders to develop an informed technical response. There would also be an opportunity for the NI to develop operating concepts and ensure there was a good understanding across all stakeholders of how any potential TBTC solution would work.

Given that the expected bidders would include those suppliers who had partnered with other consortia, it is likely that they would already have developed preferred solutions and would have a good understanding of the JNP requirements.

Therefore, to enable an effective tender evaluation and contract negotiation, the NI would establish itself as an informed buyer and allow sufficient time to build reference models and import international experience from other TBTC installations into the procurement process.

Given that winning the TBTC contract may result in a company receiving some £600m in capital payments and some £30m a year in maintenance across all three Lines, the NI would plan to maintain competition with 2 suppliers through to contract award. This would also offset the internal pressure within the NI to achieve contract award quickly to avoid the perception of future project overruns.

Indicative timeframes for the NI to complete this would be:

- Issue TBTC OJEU Contract Notice on PPP Contract award.
- Establish competent team and working relationships with stakeholders (6 months)
- Develop procurement documentation (6 months)
- Undertake track and site surveys and provide outline designs for enabling works to ensure interfaces can be delivered (1 year in parallel with the above two items)
- Issue formal OJEU ITT for TBTC (3 months)
- Undertake Tender evaluation (3 months)
- Undertake detailed negotiations with two bidders (3 months)
- Select preferred bidder and award contract (3 months)

It is assumed that the NI would plan to take 2 years to procure a TBTC solution with a TBTC contract start date of January 2005.

Given that there are 2 years between the Jubilee and Northern Line Latest Implementation Dates, the NI would procure these two lines together such that resources and experience would roll between these lines. The NI would seek to obtain prices for both infrastructure and rolling stock fitment to ensure an integrated approach to technical and programme development.

The NI would seek competitively tendered prices for the on-going maintenance and would expect the tenders to explain how they would provide the support and spares if this option was not included in the contract.

The NI would seek to back-to-back the performance regimes (JTC, availability and Condition) through the contract and ensure that bidders effectively understood the PPP requirements and priced this accordingly.

The NI would evaluate different forms of contract and ensure that appropriate competences and processes were in place to manage these. The final form of contract may be either independent or co-terminus with the PPP Contract to ensure efficient whole-life pricing. The NI would also include break clauses in the contract in line with the 7.5 year Periodic Reviews to ensure their was the opportunity to realign outputs and costs.

2.1.3 Piccadilly Line

The NI procurement of a TBTC system for the Piccadilly Line would follow the same principles as the Jubilee and Northern Line procurement described above. The NI would not expect to simply offer the Piccadilly Line contract to the existing TBTC supplier and it would not have formed part of the original procurement as the signalling and infrastructure constraints are different.

Given the signalling integration challenges with the District and Metropolitan Lines, instead of the 2 years development and procurement of the Jubilee and Northern Lines, the NI would plan to undertake this in 3 years. This would include developing such interface works as required to enable potential bidders to fully understand these requirements.

There is a clear dependency and risk in the overall programme with LUL (Metronet) and other third parties. Substantial early work is assumed to be required to ensure a safe operating concept across the whole Piccadilly Line and to demonstrate that all degraded mode operating rules can be implemented. There is a risk that there could be 3 signalling systems (TBTC, SSL-TBTC, Tripcock) which would require integration within the line side equipment.

Halcrow has assumed that there is no substantial funding for the delivery of the infrastructure or new Piccadilly Line trains in RP1. Therefore, without the security of funding from Restated Terms the NI would only commission a limited amount of work (for example site surveys or concept designs) from any supplier before 30 June 2010.

Therefore the NI would plan to initiate discussions on the PLU from mid 2007 which would capture 4.5 years of project development of the Jubilee and Northern Lines, development with the SSL-TBTC solution and technical progress on other TBTC lines, with the intention of letting the contract at the beginning of RP2. This process would also have allowed for transparent pricing of the contract within Restated Terms (in a similar way to the approach to the new Piccadilly Line rolling stock).

3. Line Upgrade Schedule

To establish a schedule for the NI the following factors have been taken into account:

- programme constraints
- the efficient time to deliver the infrastructure solution
- the efficient time to deliver the train solution

3.1 Jubilee & Northern Lines

Based on a 2 year procurement window this sets the following timeframe for the delivery of the Line Upgrades:

	Jubilee	Northern
Procurement Start Date	1 January 2003	1 January 2003
Contract Start Date	1 January 2005	1 January 2007
Completion Date	31 December 2009	31 December 2011
Programme Length (P80)	5 years	5 years

Figure 3.1: NI Jubilee and Northern Line Programme Key Dates (NI Line Upgrades 3Mar10.xls)

The following table describes a high level programme with estimates of the total costs which may be likely to arise:

Activity	Timeframe	% of Total Cost
Detailed Design	2 years (0 - 2)	15%
Construction / Fitment (including Trial area)	3 years (0.5 - 3.5)	35%
Software Development	2.5 years (1.5 - 4)	30%
Commissioning / Testing Approval	1 year (3.5 - 4.5)	20%

Figure 3.2: NI Scheduling Assumptions (NI Line Upgrades 3Mar10.xls)

The NI considers 4.5 years to be a realistic timeframe to deliver the infrastructure fitment for both the Jubilee and Northern Lines.

It would be expected that many of the lessons learnt from the Jubilee could be used directly on the Northern Line and therefore work could be undertaken more quickly.

3.1.1 Train Schedule

All of the trains have to be fitted with the new signalling system and be capable of operating in either TBTC or Tripcock mode. The NI would aim to ensure all trains were fitted 6 months before the Latest Implementation Date to enable resolution of faults arising from the fitment.

It would be expected that the train borne signalling equipment would be designed to be fitted during maintenance periods or at the end of a heavy maintenance period, therefore minimising or removing unavailability.

It is estimated that it would take around 1 week to fit and test each train as follows:

	Jubilee	Northern
No. of Trains	63	106
Cabs to be fitted	126	212
Time to fit fleet including 10% contingency	70 weeks (1.4 years)	120 weeks (2.4 years)

Figure 3.3: NI Fleet Fitment Timeframes (NI Line Upgrades 3Mar10.xls)

The following table describes a high level programme with estimates the total costs for the Jubilee Line fleet:

Activity	Timeframe	% of Total Cost
Detailed Design	1 year (0 -1)	10%
Software Development	1 years (0.5 – 1.5)	10%
First Train	1 year (0.5 – 1.5)	60%
Construction / Fitment (including Trial area)	1.4 years (1.5 – 3)	
Commissioning / Testing / Approvals	in service	20%

Figure 3.4: NI Jubilee Fleet Fitment Timeframes (NI Line Upgrades 3Mar10.xls)

The overall timeframe is 3 years for the Jubilee Line and therefore rolling stock fitment should not be a constraint on the infrastructure delivery and could be extended up to 4 years to optimise fitment around existing maintenance cycles.

Based on the same principles, the overall timeframe for the Northern Line is 4 years, which would mean fleet design could commence after the successful trial of the first Jubilee Line train.

3.1.2 Overall Schedule

Based on these dates the Jubilee and Northern Line infrastructure programme is as shown below:

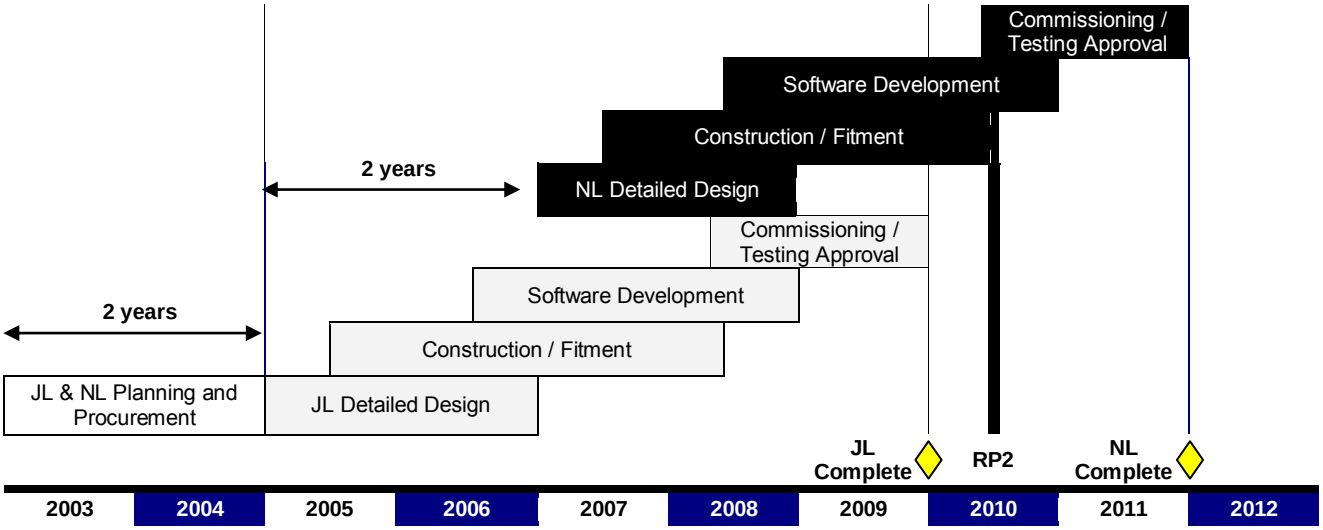

Figure 3.5: NI Jubilee and Northern Line Programme (NI Line Upgrades 3Mar10.xls)

3.2 Piccadilly Line

To establish a schedule for the NI the following factors have been taken into account:

- the programme constraints
- the efficient time to deliver the infrastructure solution
- the efficient time to deliver the train solution

3.2.1 Programme Constraints

Section 2.1.3 concluded that the NI would not start any substantial work on the PLU in RP1 but would allow 3 years before the beginning of RP2 to define requirements and procure the signalling and rolling stock required for the Piccadilly Line Upgrade. At the beginning of RP2 it would let the signalling and rolling stock contracts.

Assuming the NI would intend to deliver on time, the table summarises the key dates that the NI would intend to meet.

Key Dates	Piccadilly
Procurement Start Date	June 2007
Contract Start Date	July 2010

Key Dates	Piccadilly
Completion Date (PLU1 and Trains)	11 October 2014
Programme Length (P80)	4.25 years
Completion Date (PLU2)	10 October 2015
Programme Length (P80)	1 year

Figure 3.6: NI Programme Key Dates (NI Line Upgrades 3Mar10.xls)

The analysis for Jubilee and Northern Line showed that 4.5 years would be a reasonable time to deliver the Line Upgrades and that the rolling stock fitment was not a constraint.

The Piccadilly Line is of similar length to the Northern Line, but interfaces with the District and Metropolitan Lines which at Transfer was expected be signalled with a new signalling system (which may or may not have been expected to be different to that on the Piccadilly Line).

3.2.2 Infrastructure Schedule

Given the extended development and procurement period, it would be expected that all key risks and interfaces would be resolved by the time of the contract being let and therefore the timeframes for the Piccadilly Line would follow those of the Jubilee and Northern Lines at 4.5 years as follows.

Infrastructure Activity	Timeframe	% of Total Cost
Detailed Design	2 years (0 - 2)	15%
Construction / Fitment	3 years (0.5 - 3.5)	35%
Software Development	2.5 years (1.5 - 4)	30%
Commissioning / Testing Approval	1 year (3.5 - 4.5)	20%

Figure 3.7: NI Piccadilly Line Infrastructure Time and Cost Assumptions (NI Line Upgrades 3Mar10.xls)

3.2.3 New Piccadilly Line Fleet

TLL and LUL issued under Paragraph 6.6 a draft Memorandum of Understanding (MoU) to the Arbiter in October 2009.

This confirms that the NI is intending to purchase 93 trains through a lease and the agreed lease charges are set out in the rolling stock section **Error! Reference source not found.**.

Appendix 2 to the MoU sets out the expected delivery schedule of the new Piccadilly Line fleet. The schedule indicates that the new trains will be delivered over a 20-month period from 1 April 2012 to 1 February 2014, just over 8 months prior to Latest Implementation Date for PLU1 of 11th October 2014. It is assumed, therefore, that all new trains will be available for the delivery of PLU1.

3.2.4 Overall Schedule

Assuming both the infrastructure and rolling stock take up to 4.5 years to deliver, the programme will be delivered according to the PPP contractual requirements:

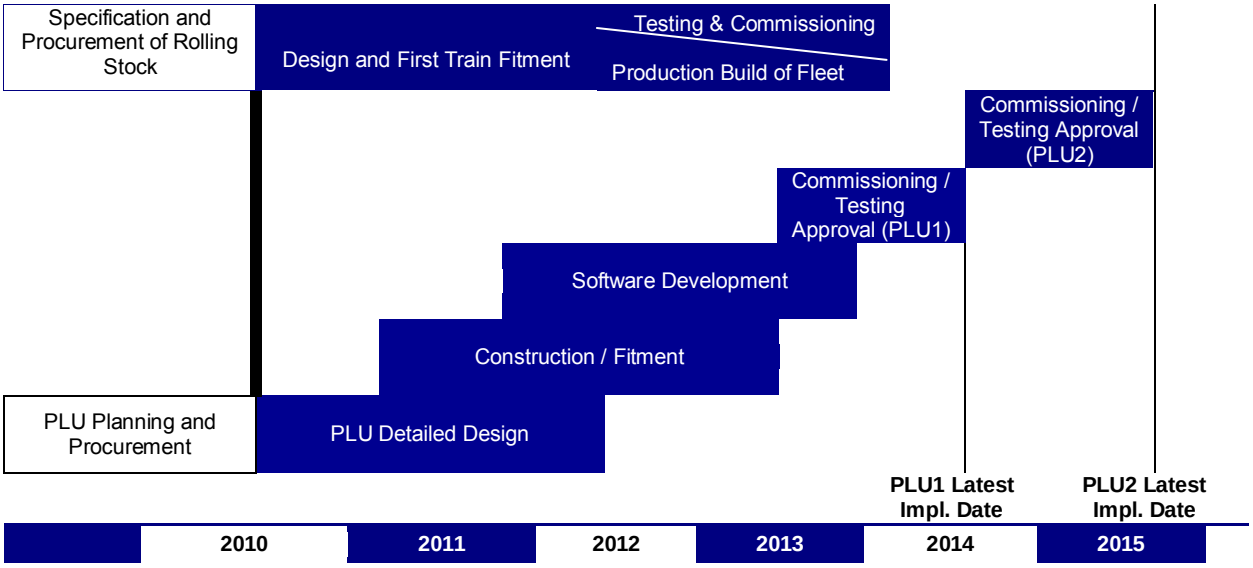

Figure 3.9: NI PLU Programme Summary (NI Line Upgrades 3Mar10.xls)

4. Line Upgrade Costs

4.1 Benchmarking Evidence

This section describes the approach to determining the NI Line Upgrade costs. The objective was to establish a methodology which evaluated available data to provide a NI efficient cost for delivering a TBTC following GIP.

At Transfer, there was no implemented and operational TBTC solution on an existing metro. Many metros were looking at implementing TBTC systems to improve capacity, but none had an operational system. The following metros/lines are considered as valid benchmarks as they would have all been faced with the same choices as to the best procurement and contracting approach to meet their overall strategy:

- **Madrid Metro** – Lines 1 and 6
- **Paris Metro** – Line 3
- **New York** – Canarsie Line
- **London Underground** – Victoria Line

A metro would decide which procurement approach to take either through a single supplier or by developing an interoperable solution. (An interoperable solution means an overarching signalling architecture with defined interfaces such that suppliers could develop their own technical solutions to components of the overall system.)

They would also need to consider whether they would contract directly with the supplier(s) or work through a third party as project manager or as an integrator.

The table below summarises the approach taken by the benchmark metros:

Approach	Single Supplier	Interoperable
Direct Contracts	Madrid - Lines 1 & 6 Paris - Line 13 LUL – SSL (and VLU currently)	Paris - Line 3 & other Lines
Third Party	LUL - JNUP (using Infraco) LUL - VLU (with Metronet)	New York MTA - Canarsie and all Lines (using a lead integrator consortium)

Figure 8: Assessment of metro TBTC signalling strategies

For the purposes of identifying comparable benchmarks, the following classification of costs is established:

- **Core Signalling** – all signalling equipment and software likely to be provided designed and integrated to deliver a TBTC solution. This would include project management

and contractor profit. Within this are fixed costs for each system which would then be scalable across other lines.

- **Rolling Stock Fitment**– the design, supply and fitment of on train signalling equipment.
- **Enabling Works** – typically all civils and power works specific to support the new signalling system. This may also include other works to support the increased capacity including track and depot works. These will tend to be metro and line specific with some relationship to the choice of TBTC system (for example, the number of SERs).

The methodology adopted is to identify and evaluate the core signalling costs for each of the benchmark metros. As a signalling system contains both fixed and linear costs, the number of track km is used as a proxy for a fully scalable system. This also benefits the benchmarking of longer lines as the fixed costs are more distributed.

4.1.1 Madrid Metro

OPPPA, Halcrow, LUL and TLL visited Metro de Madrid on 27 November 2009. Metro de Madrid presented their approach to undertaking their Line Upgrades work and provided cost information.

[✂]

Metro de Madrid identified specific requirements which included:

- upgrading the signalling system without any line closures
- developing the system to deliver bespoke operating requirements
- overlaying the new signalling system on to the old system so that the old system can operate concurrently and therefore allow non-TBTC fitted trains to run over the lines
- fitting existing and new fleets
- ensuring the supplier provided maintenance (and training) during a warranty period
- withholding a decision on decommissioning the existing system until the operational proving of the TBTC system.

Their overall approach was to have a small and focused client team (c10 people) which provided the interface between the operational railway and the signalling supplier.

In January 2010, Metro de Madrid provided the following costs for their Lines. The total costs reflect outturn €2009 prices. These costs have been converted to £2008 prices taking

into account PPP rates, inflation and project phasing (NI Line Upgrades Benchmarking 3Mar10.xls):

[✂]

Figure 4.9: Metro de Madrid Line Upgrade Costs

[✂]

Both Parties made Representations (February 2010) that the incorrect line length had been the used. The figures above have been confirmed by Metro de Madrid by Carlos Esquiroz to Peter Dickinson on the 26 January 2010.

TLL also made Representations that the Madrid system was a smaller technology leap than other systems as they had already installed ATO and therefore this did not represent a comparable upgrade to those in London.

4.1.2 Paris Metro

OPPPA, Halcrow, LUL and TLL visited RATP on 30 November 2009. RATP provided information on their current approach to upgrading signalling across all its Lines.

[✂]

RATP provided the following cost estimate for Line 3:

[✂]

Figure 4.10: RATP Line Upgrade Costs

For the purposes of this analysis the maximum scenario costs have been used to reflect expected outturn costs. To establish the core signalling costs, the following approach has been taken (NI Line Upgrades Benchmarking 3Mar10.xls):

- Include all the core Ouragan signalling costs ([✂])
- Identify all the costs elements associated with the fixed infrastructure (marked as *)
- Pro-rata the management costs
- Pro-rata the miscellaneous and risk provisions

Based on this approach, the total expenditure for the core signalling is [✂]. This has been phased over the project timescales and converted using PPP and inflation into £2008.

The total cost is calculated at [✂] which for a 15km route is equivalent to between 30 and 31.5 track km. This gives a benchmark range of between [✂] per track km for the core signalling works.

Both Parties made Representations (February 2010) that the RATP costs were not comparable on the basis that they were contract prices and not outturn. The above analysis uses the maximum scenario costs as a proxy to reflect outturn prices.

4.1.3 New York - Canarsie Line

No substantial cost information was available for the Canarsie Line. BSL (p16, Typical Prices for Metro Rolling Stock and Signalling, 11 July 08) quoted a figure of [✂] (2008) for a route length of 17.7km. The total for all costs to date was stated by BSL (December 09) at $313m (2007) which is in line with public data at $326m (2009). BSL have also confirmed to OPPPA that contractor costs are c56% of the total signalling cost.

Therefore an assumed range of 50% - 60% of the outturn cost is used to determine the core signalling cost per track km (NI Line Upgrades Benchmarking 3Mar10.xls). This was calculated at between [✂] and [✂] per track km in 2008 prices.

TLL made Representations (February 2010) that the exclusion of the Canarsie Line as a benchmark was not acceptable on the basis that like the Jubilee Line, it was the first line chosen to for TBTC upgrade and argues that being a self-contained line, not operating in conjunction with other lines would in fact make the Canarsie Line and easier installation and testing environment. The Canarsie Line is now included in the benchmarking sample.

4.1.4 LUL - Victoria Line

In February 2010, Halcrow was provided with VLU cost reconciliation information from OPPPA's Independent Reporters. This is summarised below:

	£m 2008	Comments
Core Signalling Costs		
Westinghouse Contract	156.4	
Less		
Point Machines	[✂]	
Spares	[✂]	NB: TLL stated that limited spares were included (Letter 15Feb)
Total	[✂]	LUL state development is £58m
Bombardier PM & Profit	[✂]	Halcrow was informed that this was notionally 50% of the total BT PM/profit costs and that the split as broadly 50%/50% between PM and profit.
Total Core Signalling Costs	[✂]	

	£m 2008	Comments
Enabling Works		
Track & Power	[✂]	
Control Centre	[✂]	
SERs & CMS	[✂]	
Point Machines	[✂]	
Spares	[✂]	
BCV PM	44.3	
Total Enabling Works	[✂]	
LUL PM (Systems Integration)	**36.9**	
TOTAL COSTS	**464**	
Comparison with 10-11 AAMP		
BTUK/WRSL New Signalling Phase	226.6	Broadly consistent with the £230m Total Core Signalling
All remaining non-material projects	139.1	Broadly consistent with Enabling Works (Track, CC, SERs) at £134m
Project Management Costs	103.0	Broadly consistent with PM + Point Machines & Spares at £97m
	468.7	

Figure 4.11: Independent Reporter view of VLU Costs (February 2010)

This shows that the current core signalling contract is £230m (noting that current forecast costs may increase). However, without the core Bombardier costs the overall cost is some [✂], which would be the minimum amount incurred in delivery of the core signalling.

The stated track lengths vary from 43km (stated in LUL November 2009 Representations) to 47.3km (Independent Reporter / LUL FOIA response, February 2010).

Therefore the low and high benchmarking range for the Victoria Line is calculated as £3.0m to £5.5m per track km.

The VLU was characterised by the following factors which would be expected to increase costs:

- Westinghouse-Bombardier were part of the Metronet consortium.
- Administration of Metronet and subsequent integration with LUL.

It is not possible to estimate what impact Administration had on the overall cost of the VLU, however it would be expected to increase costs through uncertainty and changing roles resulting in delays to the programme.

During February 2010, both LUL and TLL made specific Representations to the Arbiter as to how the VLU costs should be considered.

Following the Independent Reporter's report, TLL made Representations that the costs supplied by LUL for the VLU were incorrect and did not make justification for costs removed.

LUL suggest that the core signalling costs only equate to £93.4m. In further Representations on the 16 February 2010, TLL disagreed with the costs LUL had removed on the basis that they did not believe them to constitute core signalling costs. TLL concluded that an additional £43m should be added giving a total of £136m which is comparable to the Halcrow analysis above.

TLL further suggested that the Systems Integration cost of £36.9m should also be included in the core signalling costs. Halcrow consider that systems integration costs, reflect the costs incurred by LUL's own team and are therefore not applicable to this benchmarking.

Therefore based on the data supplied by the Independent Reporters (which has not been amended by the above Representations), the low and high benchmarking range for the Victoria Line is calculated as £3.0m to £5.5m per track km.

4.1.5 Analysis

The following table summarises the outcome of the analysis and shows the average track km costs from the benchmark data:

Metro	Line	Approximate Core Signalling Cost / £m 2008		Track km		£m / track km	
		Low	High	Low	High	Low	High
Madrid	Line 1 / 6	[✂]	[✂]	[✂]	[✂]	[✂]	[✂]
Paris	Line 3	[✂]	[✂]	[✂]	[✂]	[✂]	[✂]
New York	Canarsie	[✂]	[✂]	[✂]	[✂]	[✂]	[✂]
LUL	Victoria	138	230	43.0	47.3	3.0	5.5
Average						**2.2**	**3.2**

Figure 4.12: Summary of Benchmarking Data

Each of the four benchmark metros faced the same strategic decisions about procuring a TBTC system in 2002/03. The benchmark data is comparable as it reflects the same strategic time base (of which any approach was possible) and reflects establishment costs and metro specific factors.

Therefore to determine the NI cost per track km, averaging the whole data set provides a reasonable basis for a P50 cost as follows:

£m / track km	Low	High	Avg
Average of Benchmark Metros	2.2	3.2	**2.7**

Figure 4.13: NI P50 basis for signalling costs

It is therefore assumed that a NI planning to deliver a TBTC solution would set a P50 at £2.7m per track km. The P20 reflects the low average of £2.2m and the P80 £3.2m per track km.

As the Jubilee and Northern Lines were procured as a single contract at the same time, the benchmark unit rate is applied to both lines. For presentational purposes, it is possible to account for more establishment costs on the first line, but for the purposes of determining a cost there would be little opportunity to achieve efficiencies between lines (for example the system design and equipment specification is likely to be the same on both lines).

The NI would procure the Piccadilly line towards the end of RP1 such that its contract starts at the beginning of RP2. Therefore the NI would benefit from developments across all TBTC systems and would be expected to achieve lower unit costs.

However, none of the benchmarking metros have completed their second lines. However, based on information from the benchmark metros, the following can be stated:

- Madrid Metro has extended both their lines and the costs of these extensions are slightly lower on average [✂] compared with [✂] per track km for the first lines.
- Paris's fixed cost of Ouragan ([✂]) has been fully attributed to Line 3. Therefore removing this cost could reflect the unit cost of subsequent lines which would reduce the average rate by c50% to [✂] per track km.
- New York invested heavily in the Canarsie line through their leader-follower model to ensure interoperability for all subsequent lines and therefore it would be expected these fixed costs would be removed. As the model is similar to Paris's Ouragan approach, it may be expected that they also achieve savings of c50% which would reduce their costs to [✂] per track km.
- The development of the VLU reflected Metronet's contracting structure and Administration, both of which increased costs, although it is not possible to quantify these.

The NI would expect unit costs for the Piccadilly Line at P50 to be lower than the benchmark average of £2.7m per track km. The benchmarking data, excluding the Victoria Line, would suggest a figure around £1.5m.

The evidence above is not detailed enough to form a strong view and therefore professional judgement is used to determine that £2.0m per track km would reasonably reflect a P50 cost for delivery of the Piccadilly Line.

The P20 reflects the non-LUL benchmarking average of at £1.5m per track km.

The P80 is assumed as no worse that the cost of the Jubilee and Northern Lines at £2.7m reflecting both the additional technical complexity of the Piccadilly line (MMA) and reductions expected through having substantially lower establishment costs.

4.1.6 Impact of Schedule on Core Signalling Costs

TLL made Representations (February 2010) that benchmarks for programme completion had not been considered. The table below shows the times to deliver an operational system from main contract award.

Metro	First Contract Let	Line Operational	Delivery length / years
Madrid – Line 6	2004	2009	6
Paris – Line 3	2004	2009	6
New York - Canarsie	1999	Feb 2009	9
LUL - VLU	Apr 2003	2011	8
		Average	**7.3**

Figure 4.14: Summary of Time Benchmarking Data

Other time benchmarks include Boston Blue Line at 4 years and a Barcelona TMB at 7 years (Figure 111, BSL International Benchmarking, February 2010).

This shows that delivery of the Jubilee Line at 7 years from Transfer l was a reasonable expectation, noting also that LUL and the potential Infracos were working on solutions for some years before this (for example during Shadow Running, TLL issued an OJEC notice in October 2001 for the JNP Line Upgrades). Therefore the Contract schedule would not have increased costs for an accelerated delivery.

4.1.7 Assumed Length of Line

The track lengths used are as follows:

km	Jubilee	Northern	Piccadilly	Total
Total track km	**79.1**	**117.9**	**132.6**	**329.6**
Source	TLL Submission, p6 Section12D, June 09		TLL email 24 February 2010	

Figure 4.15: NI Assumed TBTC track lengths

4.1.8 Summary

The table below summarises the unit rates for the core signalling systems:

£m / track km	Jubilee	Northern	Piccadilly
P50	2.7		2.0
P20	2.2		1.5
P80	3.2		2.7

Figure 4.16: NI Core Signalling Costs per Track km

The graph below summarises the signalling and on-costs for each of the Lines. It shows a glidepath between the Jubilee & Northern and Piccadilly Lines reflecting the improvement in knowledge, international experiences and technology maturity.

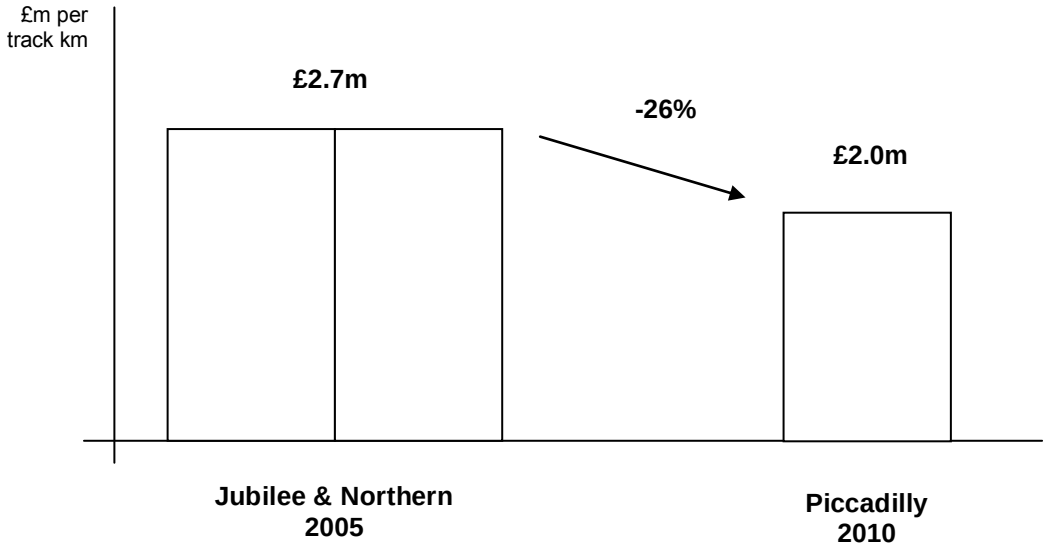

Figure 4.17: NI Core Signalling Costs

4.2 Enabling Works

Halcrow has reviewed the Parties' original submissions from June 2009, the 6.5 Guidance papers issued in September 2009, the Representations to the Arbiter from the Parties in October and November 2009 and February 2010, and taken an independent view of the differing costs (NI Line Upgrades 3Mar10.xls).

The basis for the enabling works scope is LUL's Representations (20 October , p19 Annexes 1 and 2). This sets out LULs and TLL cost positions for each item of scope. To develop a NI view, the following approach was taken:

- Where LUL and TLL have agreed the cost of works, the agreed cost has been included.
- In a number of cases there is no site specific information or detailed scope identified, without which it is not possible to make a qualified judgement as to the validity of the assigned cost. Where this is the case, the NI had adopted an average between TLL and LUL's submitted costs.
- If the costs are included elsewhere (eg rolling stock fitment) these are not included in the enabling works.
- Where there is some discrepancy or inconsistency, Halcrow has exercised its professional judgement as to the approach adopted by the NI.

It is assumed that LUL/TLL costs reflect all-in costs including any on-costs and project management by the Infraco.

4.2.1 RP1 Enabling Works

The JNUP enabling works scope and costs from the Parties only reflect RP2. Therefore to determine the NI costs for RP1 the Parties DBS's were reviewed:

RP1 Enabling Works / £m	TLL DBS	LUL DBS	Average
JNUP	182.5	167.0	174.7
Piccadilly	6.3	7.0	6.6

Figure 4.18: LUL and TLL RP1 Enabling Works Costs

As the Parties costs are sufficiently similar, the NI uses the average cost as the basis for enabling works costs in RP1.

However, it should be noted that the Parties dispute what should have been achieved for this money, with LUL believing that more work should have taken place in RP1.

4.2.2 RP2 Enabling Works

The analysis (NI Line Upgrades 3Mar10.xls) sets out the key scope and cost assumptions for each part of the NI Enabling Works. The tables below summarise this outcome:

JNUP Enabling Works	RP2 £m
Signalling Enabling Works	18.4
Rolling Stock Enabling Works	1.0
Depot Related Enabling Works	15.6
JTC Track Upgrade Enabling Works	6.6
Other	0.0
TOTAL	**41.5**

Figure 4.19: NI JNUP Enabling Works Costs

Piccadilly Enabling Works	RP2 £m
Signalling Enabling Works	103.1
Rolling Stock Enabling Works	9.5
Depot Related Enabling Works	27.1
JTC Track Upgrade Enabling Works	10.7
Other	0.0
TOTAL	**150.3**

Figure 4.20: NI Piccadilly Line Enabling Works Costs

4.2.3 P20 and P80

Each of the enabling works scopes was reassessed to determine a P20 and P80 position. These have been determined by reference to the original NI assumption. In some cases where no analysis is possible, the Parties low and high figures have been taken as P20 and P80 (section **Error! Reference source not found.**).

4.2.4 Summary

The outcome of this analysis is as follows:

Enabling Works	RP1	RP2	TOTAL
JNUP	174.7	41.5	**216.2**
Piccadilly	6.6	150.3	**156.9**
Total	**181.4**	**191.8**	**373.2**

Figure 4.21: NI Enabling Works Costs

4.3 Train Fitment Costs

The NI is required to fit the TBTC equipment to:

- Jubilee & Northern Line trains
- Engineering Trains

The total cost of fitting the equipment is considered as:

- Design and Installation
- Equipment Supply
- NI Project Management

Benchmarking data is available for the Madrid and Paris metros as follows:

Metro	No. of Trains	Total Cost per Cab / £k 2008
Madrid	[✂]	[✂]
Paris	[✂]	[✂]

Figure 4.22: NI Core Signalling Costs

This shows that a typical all in GIP fitment cost would be £105k per cab. The Paris costs include for Project Management, but it is not known whether the Madrid costs do.

It would also be expected that the larger the fleet the lower the unit costs and vice-versa.

TLL has stated that they have let the following contracts for the design and installation of the TBTC equipment (but not the supply):

TBTC Design & Install	No of Trains	Value / £m (2004)	Value / £m (2008)	Cost per Cab /£k
Jubilee	63	7.6	8.5	68
Northern	106	18.0	20.2	95
Total / Average		**25.6**	**28.7**	**82**

Figure 4.23: Jubilee and Northern TBTC fitment costs

This shows that the contracts let by TLL are probably in line with GIP given that professional judgment concludes that equipment per cab may be £20k - £30k.

The GIP cost for fitment of all the Jubilee and Northern Line cabs (338 cabs) at £105k totals £35.5m and therefore the NI accepts the GIP cost as an all in TBTC fitment cost including project management

In addition, TLL made Representations (Section 2.86; 1 February 2010) that the VOBC cost for the Northern Line is £15.96m and Transplant engineering trains is £7.2m.

The NI programme shows that 82% of the total cost of the fitment of TBTC is completed on the Northern Line. This would leave 19 trains (38 cabs) for RP2 at an all in GIP cost of £4m.

Within TLL Submission (Section 12I, Scare Resources; 30 June 2009) a cost of £4.2m is included for 'TBTC fitment (TLL Only)' of which it is stated that TBTC fitment is required to a further 11 locos with 18 fitted in RP1. Therefore the TLL unit price for fitment (assuming the locos have two cabs) is £4.2m / 22 = £190k. It is subsequently stated that the costs are also higher due to inclusion of TBTC spares and maintenance.

It would be expected that the fitment of the Transplant fleet is higher as the locos are likely to be from different suppliers and have different internal configurations. Therefore, it is assumed that the Transplant fitment in RP2 is as set out in the June Submission (Section 12I, June 2009).

	Cost per Cab / £k	Total Cost / £m
Jubilee & Northern	105	35.5
Transplant	190	4.2 (included within Scare Resources)

Figure 4.24: NI Jubilee and Northern TBTC fitment costs

4.4 Project Management

The core signalling costs are based on benchmarked costs which include project management. The enabling works costs are all in-costs which include project management. The TBTC fitment costs are also derived from benchmarking which included project management.

Based on professional judgement it is assumed that 15% of all of these costs would reflect an efficient level of project management. Therefore, for the purposes of populating the DBS, 15% is taken off the costs and added to the project management line.

This is calculated as £105.3m for JNUP and £55.7m for the Piccadilly Upgrade. Assuming an 11 year programme from 2005 to 2015 inclusive, this would equate to an average of £14.6m per year which assuming an all in rate of the average project team member of £100k per year, this would reflect a team size of some 150 people full time. This is considered more than sufficient for the NI to manage the delivery of the works.

4.5 Restated Terms Capability Modelling

4.5.1 Jubilee and Northern

SDG has undertaken the JTC modelling for OPPPA. The approach taken by SDG was initially to calculate the JTC improvement which could be delivered by the trains and signalling.

It is assumed that the NI will meet the Jubilee Line JTC target in specified in Restated Terms.

From the capability modelling for the Northern Line the position after Trains and signalling was 17.6316. The Northern Line JTC target is 17.0361 seconds.

There is a 'gap' of 0.5955 between the JTC of the technical solution and meeting the target. SDG has calculated the value of the JTC 'gap' as £67.1m which includes the financial consequences of the Capability regime (foregone revenue) and the Specific Projects Adjustments (abatements). This compares to £24.0m assumed to be required by TLL in the in their Submission.

Therefore the NI assumes that the TLL figure is the amount of money the NI would expect to spend (P50) on linespeed improvement works. However, the P80 is assumed as the SDG calculated gap of £67.1m as this reflects the expected maximum amount on infrastructure the NI would undertake.

This is considered a P80 (as against P100) as if the work was actually completed but still failed to deliver the JTC, further costs would be incurred. The P20 position is considered to be £0m as none of these works may actually be required after implementation of the trains, signalling and enabling works (and the P0 reflecting that with just the trains and signalling, the JTC target may be exceeded).

SDG has identified 21 potential track sites where there is the opportunity to improve line speed of which 13 were needed to meet the JTC target. For more detailed analysis of the Capability modelling, please see the SDG Notional Infraco Performance Report March 2010.

4.5.2 Piccadilly Line

Restated Terms has split the Piccadilly Line Upgrade in to two phases (PLU1 and PLU2) with two different JTC targets:

- Under PLU1, Cockfosters to South Ealing and South Harrow will be completed.
- Under PLU2 , South Ealing to Heathrow and the Rayners Lane branch will be re-signalled as far as Rayners Lane Station. (Re-signalling of Rayners Lane to Uxbridge will be a Specified Right).

Restated Terms specifies the Journey Time Capability (JTC) targets as follows:

	PLU1	PLU2
Latest Implementation Date	11 October 2014	10 October 2015
JTC Target	18.0336	17.1331

Figure 4.25: Piccadilly Line Upgrade JTC Targets

As with the Northern Line, the approach taken by SDG was first to calculate the JTC improvement that could be delivered by the trains and signalling and if a 'gap' was identified, specific track section locations would be evaluated to determine what line speed improvements could be made to meet the JTC target.

After implementing the new 93 trains and the TBTC signalling the JTC was modelled as 17.2047s. There is a small gap between the train and signalling solution and meeting the JTC target for PLU1. SDG has calculated the value of the JTC 'gap' at £4.8m.

Given the small amount of work and the relative proximity of the upgrade delivery dates we assume that the NI would spend (P50) this money to implement track speed improvement work under PLU1. However, if this failed to deliver the JTC improvement and further works were required, a P80 position of £10m is used. The P20 position is considered to be £0m as none of these works may actually be required after implementation of the new trains, signalling and enabling works.

SDG has identified up to 7 potential track sites where there is the opportunity to improve line speed if required.

4.5.3 Summary

In addition to the direct Line Upgrade costs, the following costs have been included to reflect additional track and civils works required to achieve the capability target:

£m	P50	P20	P80
Jubilee	0	0	0
Northern	24.0	0	67.1
Piccadilly	4.8	0	10.0

Figure 26: JTC Capability driven Track Works

4.6 Access Assumptions

The NI would seek to minimise the amount of disruption caused through closures. It would have been a key requirement during procurement that the suppliers provide details on how they would meet this objective.

It would be expected that no closures would be required for the installation and component testing which should all be achievable during Engineering Hours or through synergies with other closures.

However, it would be expected that the NI would plan for some weekend closures to enable full system testing. It would also be pragmatic to plan for some contingency through booking closures, even if they are subsequently not taken.

It is considered that it would be operationally unacceptable to have procured on the basis of closing any line more frequently than 1 weekend in four over a 2 year testing and commissioning timeframe – i.e. a maximum of 25 weekend closures per Line.

If testing and commissioning was shortened to 1 year, this would effectively mean closing a Line every other weekend and this would be seen as a substantial loss of service. Therefore a key operational requirement for the NI during the procurement of a TBTC would have been to set the maximum number of closures.

Halcrow does not have sufficient information (eg information on access from all the metro/lines used in the TBTC analysis) to calculate an efficient level of access. However, the limited evidence from Paris suggests that they used less than 6 weekend closures and Madrid Line 1 that they have used none. In both cases it was a key planning and procurement assumption that the system had to be delivered and commissioned with minimal or no loss to operational service.

It would be expected that more closures (per line km) were required for the Jubilee Line as this is the first line to be upgraded. However, the Northern and Piccadilly Lines are some 30% longer and more complex which may require more closures.

Therefore 25 Minor Closures is considered an acceptable number of Closures for all three Lines. Taking into account the testing and commissioning programmes, it is calculated that the indicative number of Minor Closures required to deliver the Line Upgrades would be:

Line	RP1	RP2	Total
Jubilee	25	0	25
Northern	6	19	25
Piccadilly	0	25	25
Total	**31**	**44**	**106**

Figure 4.27: NI Assessment on number of Weekend Minor Closures

However, it is important to note that the available access is currently set out in Restated Terms which takes into account all minor closures (see the Access section **Error! Reference source not found.**).

4.7 DBS Population

Taking into account the TBTC core signalling costs, enabling works, track capability costs and rolling stock, the Line Upgrades costs are calculated as follows:

DBS ID	£m	RP1	RP2	TOTAL
	JNUP			
0.2.1.11	**Core Signalling**	351.7	110.7	462.5
	Enabling Works			
0.2.2.11	Signalling	120.1	16.0	136.0
0.1.2.11	Rolling Stock	0.0	0.9	0.9
ACN0.3.1.6	Depot	9.1	13.6	22.7
ACN0.4.1.6	Track (inc Track Capability)	6.8	26.6	33.3
ACN0.5.1.6	Civils	16.0	0.0	16.0
0.1.2	**Rolling Stock**	27.5	3.4	30.9
0.2.3	**Project Management**	79.7	25.7	105.3
	JNUP TOTAL	**610.8**	**196.7**	**807.6**
	Piccadilly			
0.2.1.11	**Core Signalling**	5.8	224.8	230.6
	Enabling Works			
0.2.2.11	Signalling	5.8	89.7	95.4
0.1.2	Rolling Stock		8.3	8.3
0.3.1	Depot		23.5	23.5
0.4.1	Track (inc Track Capability)		13.4	13.4
0.2.3	**Project Management**	1.7	54.0	55.7
	Piccadilly TOTAL	**13.3**	**413.7**	**426.9**
	TOTAL	**624.1**	**610.4**	**1,234.5**

Figure 4.28: JNP Upgrade Total Costs (NI Line Upgrades 3Mar10.xls)

In addition there is the agreed Piccadilly Lease Charges in RP2 which are included in the Rolling Stock section (**Error! Reference source not found.**).

5. Appendix: TBTC Contract Review

[excluded]

APPENDICIES

[excluded]