

**TRANSPORT AND WORKS ACT 1992
TOWN AND COUNTRY PLANNING ACT 1990**

PLANNING (LISTED BUILDINGS AND CONSERVATION AREAS) ACT 1990

**PROPOSED LONDON UNDERGROUND
(VICTORIA STATION UPGRADE) ORDER**

PROOF OF EVIDENCE

OF

Philip McKenna BA (Hons), MSc

FOR

LONDON UNDERGROUND LIMITED

Scheme Need and Benefits

DOCUMENT LUL.P1

September 2008

TABLE OF CONTENTS

- 1. Qualifications and Experience**
- 2. Knowledge of the VSU Scheme**
- 3. Scope of Evidence**
- 4. Structure of Proof and Statement of Matters**
- 5. The Role of Victoria Underground Station**
- 6. The Need for Improved Infrastructure**
- 7. Public Policy Considerations**
- 8. Description of the Existing Station and the Causes of Congestion**
- 9. Principal Project Objectives**
- 10. Safety Matters**
- 11. Step Free Access**
- 12. Development of the Project**
- 13. Victoria and District & Circle Line Train Service Upgrades**
- 14. Assessing Demand in Future Years**
- 15. Description of the Project**
- 16. Benefits of the Project**
- 17. Consultation**
- 18. Funding**
- 19. Response to Objectors**
- 20. Conclusions**
- 21. Witness Declaration**

Appendices

1. Station Staffing
2. Station Control
3. Station Opening Hours

Figure 1	Street Plan of the area around Victoria Underground Station
Figure 2	Plan of existing Ticket Halls at Victoria
Figure 3	Plan of the District and Circle Line Platforms
Figure 4	Plan of the Victoria Line Platforms and adjacent concourses
Figure 5	Plan of the Intermediate concourse level
Figure 6	Axonometric representation of the existing station
Figure 6a	Plan representation of the existing station
Figure 7	Distribution of delay time for the peak period travellers between mainline station and Victoria northbound platform
Figure 8	Picture of peak passengers being held outside Victoria Station
Figure 9	Picture of peak passengers being held at ticket gateline in Victoria Station
Figure 10 a-f	Peak passenger densities existing layouts 2016 demand
Figure 11 a-f	Peak passenger densities scheme layout 2016 demand
Figure 12	2001 Station Footprint 7.00 to 10.00 Egress
Figure 13	2001 Station Footprint 16.00 to 17.00 Access
Figure 14a	Victoria NB Platform Distribution of Incoming On Train Loads
Figure 14b	Victoria NB Platform Distribution of Boarding Load
Figure 15	Overall VSU Scheme Layout
Figure 16	Scheme Layout : Street and Mainline Station Level
Figure 17	Scheme Layout : Ticket Hall Levels
Figure 18	Scheme Layout : District Line Platform Level
Figure 19	Scheme Layout : Intermediate Concourse Level
Figure 20	Scheme Layout : Victoria Line Platform Level
Figure 21	Passengers held outside Kent Stairs Entrance AM Peak
Figure 22	Passengers held outside Kent Stairs Entrance AM Peak

- Figure 23 Passengers held outside Sussex Stairs Entrance AM Peak
- Figure 24 Passengers held outside Sussex Stairs Entrance AM Peak
- Figure 25 Passengers queuing to enter Sussex Stairs AM Peak
- Figure 26 Very Crowded Victoria Station Concourse AM Peak
- Figure 27 Passengers held at Victoria Ticket Hall Gateline AM Peak
- Figure 28 Passengers queuing to join down escalator 3 AM Peak
- Figure 29 Passengers waiting for trains Victoria NB Platform at South End AM Peak
- Figure 30 Passengers waiting for trains Victoria NB Platform at North End AM Peak
- Figure 31 Passengers queuing to use up escalators 1 & 2 AM Peak
- Figure 32 Passengers queuing to use up escalators 4 & 5 AM Peak
- Figure 33 Passengers stopping to check District & Circle Diagram at top of Interchange Concourse AM Peak

GLOSSARY

LUL	London Underground Limited – the Promoter (part of TfL)
TfL	Transport for London – transport authority for London
VSU	Victoria Station Upgrade – the Scheme
VLU	Victoria Line Upgrade – upgrade of the train service on the Victoria Line
D&C	District and Circle Lines – two lines running through Victoria Station sharing the same tracks
NR	National Rail or mainline railway
AM Peak	The period between 7.00 and 10.00 Mondays to Fridays
PM Peak	The period between 16.00 and 19.00 Mondays to Fridays
Off Peak	All other time periods
CoW	City of Westminster – the local planning authority
Gatelines	The line of ticket checking gates in a station ticket hall
East West Crossrail	The planned link from Paddington to Stratford and Abbey Wood
Thameslink	The improved National Rail link from Kings Cross to London Bridge and beyond via Blackfriars.
Tph	Trains per hour (per direction)
GLA	Greater London Authority
LTS	London Transportation Survey – model used for assessing transport flows and usage across London
Railplan	Model used for assessing public transport flows across London
Oyster Pre-Pay	A pre paid stored value ticket for public transport travel in London
PEDROUTE	A model for assessing pedestrian movements through a station
BCDM	TfL’s Business Case Development Manual which sets out rules and guidance for appraisals and business cases
DfT	Department of Transport
RIBA	Royal Institute of British Architects who have set criteria for design stages of building projects
CSA	Customer Service Assistant

1 Qualifications and experience

1.1 My name is Philip McKenna and I am Head of Service Development (Time) at London Underground. The Service Development (Time) team is responsible for initiating and developing projects (capital and operating only) which meet LUL's overall strategies and priorities. My qualifications include BA (Hons) in Mathematics, an MSc in Statistics and Operational Research.

1.2 I have over 20 years of experience working in the fields of transport planning and project planning. During this time, I have led or been involved in the design of upgraded stations at Bank, Tottenham Court Road, Angel, Paddington, Camden Town and Victoria. I have developed LUL's long term strategy for the upgrade of its train services and subsequent specification of line upgrades for LUL.

2 Knowledge of the VSU Scheme

2.1 I was responsible for promoting the development of options for Victoria Station since 2000 to the point of setting up a VSU project team which originally reported to me. I have continued to support the sponsor role in evaluation and appraisal of the project.

3 Scope of Evidence

3.1 My evidence will cover the overall evaluation of the VSU scheme, setting objectives, the development of the project, the transport, customer and operational benefits of the project, the business case and overall conclusions.

3.2 My proof needs to be read in conjunction with that of Mr. Philip Rowell on matters of public policy and with that of Mr. Alan Finch on matters of scheme selection.

4 Structure of Proof and Statement of Matters

4.1 My proof starts with statements on the role of Victoria Underground Station, the need for improved infrastructure and public policy considerations. This is followed by a description of the existing station and the causes of congestion.

4.2 The Principal Project Objectives are next. These sections therefore cover the project aims and objectives and the need for the improvements to Victoria Station as required in the Secretary of State's **Statement of Matters (1)**. This will in part cover **Statement of Matters 2(a)**.

4.3 The development of the scheme follows next, along with plans for upgrading the train service and expectations of future traffic levels. This along with the proof of Mr. Alan Finch will cover **Statement of Matters 2(c)**.

4.4 A number of changes to the proposals were submitted to the Secretary of State on 5 August 2008. The changes proposed do not alter the essential nature of the scheme. The changes were made for various reasons, including that the requirements of LUL's "Cooling the Tube" Project had changed and because it was no longer necessary to accommodate a traction substation in the North Ticket Hall.

4.4.1 The scheme changes are explained in more detail in the SES (Main Report, Annex IV) and in the evidence of Brian Bell. My evidence, in describing the benefits that the scheme will bring, refers to the scheme proposals as amended.

4.4.2 The scheme changes have been discussed directly with objectors to the proposals. Although not a fresh application, for the purposes of notification and service of documents, the submission of the scheme changes to the Secretary of State on 5 August 2008 was treated as a fresh application. Accordingly the revised proposals were the subject of notices in the London

Gazette and Evening Standard, site notices and notices served by reference to the Transport and Works (Applications and Objections Procedure)(England and Wales) Rules 2006. In addition a number of parties received a full set of the revised application documents and plans. Those who received these documents and plans were not confined to those with an entitlement to do under the 2006 Rules. A full set of the application documents was placed on deposit for public inspection at the offices of Westminster City Council and of our solicitors, Bircham Dyson Bell.

- 4.5** The next part of the proof covers the description of the scheme and the benefits of the Project. This will address **Statement of Matters (2b)** along with the proof of Mr. Philip Rowell.
- 4.6** The penultimate sections consider funding, consultation, response to objectors and general policies on planning conditions and reinstatement. This will address **Statements of Matters 10**.
- 4.7** The final conclusion will summarise the overall case and address **Statement of Matters (7)** in respect of the public interest case and listed building consent applications **Statement of Matters (4)**, the extent to which the proposals will bring substantial benefits to the area.

5. The Role of Victoria Underground Station

- 5.1** Victoria Underground Station is part of one of the main transport hubs in London that also includes the Victoria mainline station (“the National Rail (NR) Station “), a major bus station and taxi rank. London’s main coach station is close by on Buckingham Palace Road. **Figure 1** shows a street plan of the area around the station.
- 5.2** The Underground Station serves as a gateway to the National Rail Station, an access point for local employment and an interchange between the Victoria and District and Circle (D&C) lines.

- 5.3 In 2006 around 91 million passengers entered, exited or interchanged at Victoria Underground Station over the whole year.
- 5.4 During 2006 the typical weekday flow of passengers stood at 285,500 with around 72,500 using the station during the morning 7:00 to 10:00 peak. In 2006, the station was the second busiest Underground station (equal to King's Cross) only superseded by Oxford Circus. Unlike King's Cross or Oxford Circus, the flow is concentrated on just two lines. This makes Victoria Station the busiest in terms of usage per line.
- 5.5 In terms of mainline interchange, Victoria is the second busiest on the Underground after Waterloo. In 2006, Victoria processed 26,200 passengers (compared to 42,900 at Waterloo) in the morning peak. Victoria Station however handles all its interchange passengers on two lines compared to four at Waterloo.
- 5.6 The type of traffic using the station varies between time of day and day of week. Characteristically those using the station at peak times are regular commuters who in large measure know where they are going and how to use the system.
- 5.7 At other times traffic is characterised by tourists and leisure travellers who tend to progress less quickly through the station due to their unfamiliarity with the Underground system.

6. The Need for Improved Infrastructure

- 6.1 During peak periods, the Underground Station currently suffers major congestion, particularly for passengers using the Victoria line. This congestion is experienced as delay and dense crowding moving along platforms, delay boarding escalators, delay being held outside ticket gatelines and entering the Underground station.
- 6.2 In order to accommodate current demand and safely manage passengers within the station during peak hours, gateline restrictions and ticket hall

closures currently occur on a regular basis. However, such measures do not provide an acceptable long term solution to the Underground station's congestion problems as closures and restrictions cause delay and discomfort to existing passengers and create a strong disincentive to growth in the Victoria area and to the use of Underground and National Rail services at Victoria. The regulation of traffic is viewed by users of the station as if the station is closed to them and is a source of particular annoyance and frustration. LUL attempts to ameliorate the frustration which arises by providing CCTV images of the platforms at key entrances to the station to illustrate the extent of congestion. Regular announcements are also made during times of such congestion to inform customers of the reason for their journeys being delayed.

- 6.3 Congestion at Victoria is not just a recent but a long standing phenomenon. The Underground station has been subject to severe constraints for many years. Measures were taken in the early 1990s to ease some of the pressure principally from additional interchange capacity. Since then, a number of scheme options and variations have been identified, reviewed and developed further. Many have been rejected. The elements of some of them form part of the scheme for which consent is now being sought. The history of these alternatives and developments is described in more detail in section 12 on Development of the Project.
- 6.4 By 2012, LUL plan to have upgraded the Victoria Line train service to provide additional capacity and a faster service. This upgrade and growth in central London employment is forecast to add further to current demand. The number of passengers using the Underground station in the AM and PM peaks (7:00-10:00 and 16:00-19:00 Monday to Fridays) is expected to increase by 12% from 153,000 to 171,000 from 2006 to 2016. This growth will intensify the congestion problems at the station particularly during the morning peak. This rise in peak demand will mean that gateline restrictions and closures will continue to be necessary but with increasing frequency.

6.5 In addition to these congestion problems, the existing Underground Station entrances are mainly focussed on the National Rail Station and bus station. The Underground Station currently has no provision for step free access from the street to the platforms, making the station difficult or impossible to use for passengers with impaired mobility. Indeed, the Victoria line as a whole is relatively inaccessible for those with reduced mobility.

6.6 Passengers entering the station during the peak hour experience significant crowding and delay. Any additional peak entry traffic will experience disproportionate delay as the demand exceeds the station's capacity.

7. Public Policy Considerations

7.1 The development of the VSU Project needs to be considered in the context of national, regional and local planning, transport, economic and environmental policies. The regional authority is the Greater London Authority and the local authority the City of Westminster.

7.2 A common theme running through these policies is the need for a public transportation system of sufficient capacity to support sustainable economic development while promoting social inclusion and protecting and enhancing the environment.

7.3 The London and City of Westminster policies recognise Victoria as an opportunity area and Westminster as the commercial, cultural and administrative centre for the nation. The national, London and Westminster policies recognise that the quality of transport in London has a major impact on its competitiveness and international image, the quality of the environment, the health and well being of Londoners and the City's economic success.

7.4 The Mayor's 2001 Transport Strategy (VSU C21) reference's the Undergrounds crowding problems and the need to increase capacity including the capacity of stations and interchanges such as Victoria.

7.5 The City of Westminster recognises the area around Victoria as providing transport facilities for public transport of regional, national and international importance. The City of Westminster in its Victoria Area Planning Brief (VSU C42) states 'The City Council fully supports the Victoria Station Upgrade'. The development of the VSU has taken into account policies on design, the environment and the impact on the built environment. A more detailed elaboration on how the VSU project fits with national, regional and local policies is provided in the Proof of Evidence of Philip Rowell (Adams Hendry Consulting Ltd.).

8. Description of the Existing Station and the Causes of Congestion

8.1 The station is described from the vantage point of someone standing outside the entrance to the National Rail station (Sussex side).

8.2 District & Circle Line: The original station just serving the District & Circle lines has two platforms (110 metres long) running East to West (6.3 metres below street level) with a ticket hall sitting astride the middle of the platforms. The two platforms on the District & Circle Line are labelled number one westbound and number two eastbound. Access to the District & Circle Line is by means of stairs. Entrance and exit to and from the platforms is segregated. To facilitate safe evacuation the more capacious stairs are given to exiting passengers. Separate way in and way out gate lines are provided in the District & Circle ticket hall. **Figure 2** shows a plan of the existing ticket halls and **Figure 3** a plan of the District & Circle Line Platforms.

8.3 Victoria Line: In March 1969 the Victoria line opened through Victoria station. The line has two platforms (130 metres long) running on a north easterly alignment, 18.5 metres below street level. The two platforms on the Victoria Line are labelled number three northbound and number four southbound. **Figure 4** shows a plan of the existing Victoria Line platforms.

8.4 Victoria Line Ticket Hall: Immediately north of the National Rail station and below the bus station is the Victoria Line ticket hall, 4 metres below street level.

Ticket selling windows and machines are available on the west side of the ticket hall. Three escalators run from the north side of the ticket hall down to the Victoria Line platforms.

8.4.1 Two sets of stairs are provided at the south side of the ticket hall to the mainline station, one for each side of the mainline station. A further flight of stairs leads to Wilton Road.

8.4.2 A passage between the ticketing area and the escalators connects to the District & Circle ticket hall. The station is monitored from a small, somewhat cramped control room adjacent to this passageway.

8.5 Ticket Offices

8.5.1 Ticket offices are normally available in both ticket halls. At the time of writing the ticket office in the Victoria line ticket hall has been temporarily moved to the concourse of the National Rail station to facilitate works in the ticket hall. It is planned to reinstate the ticket office in the ticket hall during the main VSU construction work.

8.5.2 Sales are made by a combination of staffed windows and passenger operated machines.

8.5.3 A way in/way out ticket gate line is provided in the Victoria ticket hall for Victoria Line passengers.

8.6 Vertical Connections

8.6.1 The three escalators (numbered 1, 2 and 3) from the Victoria Ticket Hall connect to the very south end of the Victoria Line. They run on to a concourse from which five cross passages or adits connect to each of the platforms as shown in **Figure 4**.

8.6.2 Two of the escalators operate in the up direction, the third in the down direction.

Two up escalators are needed to provide the capacity in emergencies to evacuate passengers from platform level within the necessary times.

8.6.3 In operating the station sufficient space must be available between the top of the escalators and ticket gates to minimise the likelihood of congestion leading to passengers blocking free flow exit from the top of the escalators.

8.6.4 The District Line is connected to the Victoria Line via sets of stairs at the east end of the District Line platforms and passageways that lead down to an 'Interchange Concourse' 4.5 metres below the District Line (6.5 metres below street level). From this interchange concourse another three escalators lead down to a concourse that sits between the Victoria Line platforms half way along the platforms. The District Westbound platform has one set of stairs, the Eastbound, two parallel sets, one built in the early 1990's. **Figure 5** shows a plan of the intermediate concourse level.

8.6.5 Each set of three escalators run in one 'barrel'. In each barrel two escalators run up and one down.

8.6.6 **Figure 6** provides an axonometric representation of the existing station, and **Figure 6a** provides a plan representation.

8.7 Congestion Pressures

8.7.1 The bulk of congestion and congestion delay is experienced by passengers going from the National Rail station to the Victoria Line. The delay is experienced walking along the platform, being held outside the gateline and in some cases being held outside the Underground Station altogether.

8.7.2 The level of delay compared to free flow conditions observed from surveys carried out in February 2005 averaged around 2.5 minutes at the height of the peak. **Figure 7** shows the distribution of delay times. When passengers walk down the escalator the times range from a minimum of 140 seconds to maximum of 293 seconds, a difference of 153 seconds. For passengers

standing the observed range is 167 seconds (332-165). There has been a small growth in am peak hour entry traffic since then (around 2.5% between Autumn 2004 and Autumn 2006) which will have increased slightly the delay in 2006. **Figure 8** is a photograph of passengers being held outside the underground station **Figures 21 to 25** are photographs of passengers being held outside the station. **Figures 9 and 27** are photographs of passengers being held at the south ticket hall gateline.

8.7.3 For passengers exiting the Victoria Line platforms to the National Rail station are slightly delayed by congestion at the south of the platform in the peaks. Typically, this is of the order of half a minute.

8.7.4 For passengers travelling to the District & Circle Line from the National Rail station, the delay is generally less than to the Victoria Line except when the station entrance is temporarily closed because of crowding problems on the Victoria Line.

8.7.5 The reasons for the congestion accessing the Victoria Line are threefold:

8.7.6 Firstly, during the peak hour the trains departing Victoria on the Victoria Line are very heavily loaded (in 2006 the load was 94% of scheduled capacity). The proportion of the load who board at Victoria is also high at 42%. If the interval between trains is significantly longer than scheduled many passengers cannot board and are left behind to wait for the next train. As more passengers arrive on the platform the platform could become full to the extent that the passengers coming in on the next train do not have sufficient space to alight, there is risk of passengers falling on the track or there is a risk of crushing. Staff intervene before this point to shut off the flow of arriving passengers.

8.7.7 Secondly, because of the disposition of escalators at the south end and middle of the platform the south end of the platform becomes full before the north end so the full capacity of the platform cannot be exploited. The uneven distributions of incoming load and boarders is shown in **Figure 14a and 14b** respectively over the peak 2 hours. **Figures 29 and 30** are photographs of

passengers waiting at the south and north ends of the northbound platform. The southbound can be seen to be much busier.

8.7.8 Thirdly, there is a limit on escalator capacity. The escalators have a maximum flow capacity of 100 passengers per minute or 6,000 per hour. In the am peak in 2006 around 8,700 came in. Most try to use the Victoria entrance and escalators. However, a third have to divert via the District & Circle Line or have to queue. In the peak hour there is normally a queue to go down escalator 3 as seen in the photograph at **Figure 28**.

8.8 The Use of Station Control

8.8.1 As indicated above staff intervene if the level of congestion on the platforms become unsafe or inoperable. The intervention takes the form of closing the entry gates in the Victoria ticket hall for short periods of typically 1 or 2 minutes.

8.8.2 If the flow is such that it temporarily exceeds the capacity of the down escalators and passengers queue back to the gateline the entry gates are again closed for short periods until the queue has abated.

8.8.3 In closing the gates there is of course a build up of passengers outside the gateline. If this build up reaches a point where the queue of passengers risks blocking other exiting flows or flows to and from the District line then the entrances to the station on the Kent and Sussex stairs, Wilton Road and into the District ticket hall are also closed temporarily. A photograph of the ticket hall queuing up to this point is at **Figure 26**. Passengers tend to experience delay while held outside the ticket gatelines or station entrances.

8.8.4 For more detailed explanation of station control, see **Appendix 2**.

8.8.5 Modelling of the existing station with 2016 levels of demand estimates extensive closures of the entrance gates in the am peak. The current 1 to 3 closures around 8.45 to 9.00 would extend to intermittent closures up to around 9.55. This is discussed further in section 16.2.

8.9 Exiting Delay

8.9.1 The congestion and delay leaving the Victoria Line northbound platform arises from the heavy density on the platforms described above. The numbers exiting the northbound however are not that high.

8.9.2 Larger numbers exit the southbound platform. Congestion arises both approaching escalators 1 and 2 (see **Figure 31**) and at the south end of the platform as the passengers can alight from the train quickly (usually with 10 to 15 seconds) but the platform capacity limits the flow rate so it takes longer to process all the exiting load. At the height of morning peak the exiting load is around 240 per train, the platform capacity is 166 per minute so it takes 87 seconds to clear the platform.

8.10 Interchange Delay

8.10.1 Some small delay arises in the peak as the concentration of Victoria to District passengers alight Victoria Line trains and concentrate around the passageways/adits to the interchange concourse. **Figure 32** shows passengers queuing to go up escalators 4 and 5.

8.10.2 Delay is also experienced approaching the stairs between the District westbound platform and the Victoria Line. Again the concentrated flow of alighting District Line passengers is limited by the capacity of the narrow stairs (1.2 metres), which can handle passengers at a rate of 60 passengers/minute. In the peaks it can take over 40 seconds to process this interchange flow. As a consequence congestion builds up on the District Line platform at the top of these stairs.

8.10.3 The interchange flows between the District eastbound and Victoria Line do not suffer delay because there are two sets of stairs to handle this flow (one having been built as part of the 1990s congestion relief work).

8.11 Station Opening Hours and Staffing

8.11.1 The station is open for 19.5 hours a day Monday to Saturday and 17.5 hours on a Sunday. Details of times are shown in **Appendix 3**. Outside passenger service hours the station is very busy with engineering staff. To cover the customer flows, ticket selling, safety, customer service and overall management needs of the station, 54 staff are rostered every week day. These staff have their own accommodation needs. The breakdown is shown in **Appendix 1**.

9. **Principal Project Objectives**

9.1 The principal objectives of the Victoria Station Upgrade scheme are as follows:

- to increase the capacity of Victoria Underground Station so that it is fit for purpose for handling forecast demand;
- to minimise passenger journey time; and
- to improve the quality of access, interchange and ambience to the maximum extent practicable within physical, schedule and financial constraints.

9.3 In order to ensure each of the principal scheme objectives are met, four supporting objectives have been developed as follows:

- (a) Increasing the entrance capacity of the Underground Station through delivery of
- *a 50% increase in escalator capacity to/from the Victoria line with linking routes providing at least matching capacity; and*
 - *a new station entrance near the Victoria Street / Bressenden Place junction.*

- (b) Minimising journey times for passengers entering, leaving and interchanging at the Underground Station through
- *a targeted improvement of at least 5 minutes in the current journey time from Victoria Street to the Victoria line platforms;*
 - *making the location, orientation, facilities and signage of the Bressenden Place entrance prominent and welcoming in order to attract passengers towards the quickest route into the Underground Station;*
 - *designing passenger flows in normal operation to avoid queues blocking or conflicting with other flows;*
 - *avoiding in normal operation closures of the inward ticket gates;*
 - *making routes through the station as short, and as self-directing as possible; and*
 - *avoiding flows entering and leaving the Victoria line platforms delaying the operation of the upgraded train service.*
- (c) The provision of step-free access between the existing National Rail Station entrance and Bressenden Place entrance and all platforms.
- (d) Fitness for purpose: the Underground Station should meet standards and consents from regulatory and planning authorities.

10. Safety Matters

- 10.1 London Underground plans its operations on the basis that safety risks are kept as low as reasonably practicable. As well as building the station to stringent fire and other regulations, the station is staffed to prevent

crowding based risks that could lead to crushing incidents or falling under trains. London Underground does not generally manage risks outside its domain such as on the street.

- 10.2 However, one of the significant safety hazards is the crossing of pedestrians on busy streets and across the bus forecourt. The VSU project will divert a large number of passengers travelling between the Victoria Line and Victoria Street to the northern ticket hall entrance removing the need for these passengers to cross three major roads to reach the north side of Victoria Street from Wilton Road and the attendant risks.

11. Step Free Access

- 11.1 The current station requires passengers to use stairs to go from street to ticket hall level to the District line and to interchange between the District and Victoria Lines. Stairs are difficult for those with heavy luggage, with pushchairs or those not very ambulant. Stairs and escalators are impossible for those in wheelchairs. To provide for the full range of passengers, LUL needs to provide step free access from street to platform and between platforms. By 2013, LUL anticipate having provided step free access at Brixton, Vauxhall, Green Park, Kings Cross, Finsbury Park and Tottenham Hale on the Victoria Line and Richmond, Kew Gardens, Hammersmith, West Kensington, Wimbledon, Southfields, Fulham Broadway, Earls Court, Kensington Olympia, South Kensington, Westminster, Blackfriars, West Ham, East Ham, Upney, Dagenham Heathway, Elm Park and Upminster on the District Line. Victoria will therefore fill an important gap in the step free network.

12. Development of the Project

- 12.1 LUL have been examining ways of easing congestion at Victoria Underground Station since the mid 1980s. LUL deposited a Bill in November 1989 to obtain powers to create an additional interchange link between the District and Circle and Victoria Lines and additional circulation

space at the level of the Victoria Line platforms. These powers were used in the early 1990s to build these extra facilities. More extensive works were delayed pending a decision on the pursuit of the Chelsea Hackney line which would have connected Victoria and King's Cross Underground Stations via Tottenham Court Road and provided significant relief to the Victoria line.

12.2 Strategic Line Capacity

12.2.1 Of the various strategic line extensions considered in the late 1980s, the Jubilee line extension has been built, the Thameslink project was given the go-ahead by the Government in July 2007 and East West Crossrail 1 now has a funding package and received Royal Assent in July 2008. Though the Chelsea-Hackney route is safeguarded, it is not being actively pursued at the moment. TfL will be reviewing the alignment and therefore there is no guarantee that a new line would go through Victoria. In any event the project will not be pursued for some time given the scale of resource and funding already needed to deliver LUL's own upgrade programme, Crossrail 1 and the Thameslink Project.

12.2.2 For the reasons stated above, it is not sensible to rely on new line capacity to solve the congestion problems at Victoria Station.

12.3 Elements of Potential Options

12.3.1 Since the mid 1990s LUL have been looking at schemes to tackle congestion at Victoria. All of the schemes have incorporated some combination of:

- (i) additional running tunnel and platform for the Victoria Line;
- (ii) a more even spread of access points to the Victoria Line via additional stairs or escalators from the north end of the Victoria line;
- (iii) enlarged Victoria ticket hall;

- (iv) increased stair or escalator capacity between the mainline station and the Victoria ticket hall;
- (v) improved access from the Victoria ticket hall to the District line;
- (vi) Victoria line ticket hall lowered to the level of the District line platforms for ease of District line access;
- (vii) Increased vertical capacity from the Victoria ticket hall to the Victoria line;
- (viii) Additional interchange with stairs or escalators between the District and Circle lines and the Victoria line;
- (ix) An entrance point and ticket hall near the north end of the Victoria line;
- (x) New entrances and ticket halls near the existing District line ticket hall;
- (xi) Lift links for step free access;
- (xii) Repositioned ticket offices, ticket selling machines, control rooms and staff accommodation;
- (xiii) Passage ways to link the above. Some of the schemes have been linked to above station property developments. Some have been linked to enlarged or rearranged facilities for buses.

12.3.2 The evolution of the concept design is best considered by examining the main issues being tackled and how effective and cost efficient each of the above elements have been in addressing these issues.

12.4 Platform Capacity

12.4.1 Three approaches have been taken to ease on-platform congestion and delay. The first has been to build a third platform and running tunnel. During the peaks, the service in the northbound direction would alternate between two platforms. Whilst the option eases the on platform congestion, it has a number of drawbacks. Firstly, the train service frequency effectively halves and the waiting time doubles if passengers have to go to one or other platform.

- 12.4.2 If for some reason a train has not got enough capacity for all the boarding passengers, those left behind either have to go to the other platform or wait two trains to board.
- 12.4.3 Thirdly, the third new platform would be further away from the entrances and exits than existing platforms so extending passengers' journey time.
- 12.4.4 Fourthly, the construction of the new platform would probably require a larger land take or increase the disturbance to properties above. The new platform and track would need to connect back into the existing tunnels. The building of this connection would require a long duration temporary speed restriction which would not only slow down the service but reduce the capacity of the line significantly.
- 12.4.5 This option was therefore judged to be operationally challenging, less beneficial for passengers, very disruptive and poor value for money.
- 12.4.6 The second approach has been to build an additional connection to the north end of the platform so that the current bias of boarding and alighting towards the south end of the platforms is reduced and the spare capacity at the north end of the platform is more fully utilised.
- 12.4.7 Pedestrian modelling of the VSU Scheme, which takes this approach shows that even with significant additional traffic, the south end of the Victoria Line platform is no busier than with the existing station layout. The north end becomes busier though not quite as busy as the south end. This is discussed more fully in Section 16.
- 12.4.8 The third approach has been to open out more concourse space between the Victoria line platforms continuing the approach of the 1990s works. Because of the configuration of the existing escalators, it is not possible to gain any more space without moving the escalators. Accordingly, the one option that took this approach had to extend the Victoria line platforms 30

metres to the south and create a box from the surface to the platform level to hold the platform, concourse and connecting escalators.

12.4.9 The additional benefit over and above the solutions in the second approach have been found to be limited. The construction costs and disruption however are significant. It would require the temporary “not stopping” of Victoria Line trains whilst escalators are repositioned.

12.4.10 Overall the second approach has been favoured.

12.5 Vertical Capacity

12.5.1 Vertical capacity needs to be considered differently for entry and exiting traffic.

12.5.2 The existing station provides two down escalators to the Victoria Line, one from the Victoria ticket hall and one from the Interchange concourse. The escalator from the Victoria ticket hall is insufficient (at 6,000 per hour) to handle the current am peak hour flow at c8,700 per hour. There is an alternative route via the District & Circle Line and the interchange concourse and down escalator (No. 6). However, if the interchange traffic from the District and Circle is added to this overflow traffic the combined peak traffic comes to 5,140 just below the capacity of the existing down escalator. Any further growth in entry plus interchange flows needs extra capacity otherwise passengers have to be held up outside the ticket gates or station entrance.

12.5.3 Exiting traffic comes in pulses as trains deliver every 2 or 3 minutes a group of up to three hundred passengers on to a platform in just 10 to 15 seconds. The majority of these passengers can reach their platform exit point assuming free flow conditions with 30 seconds. To minimise passenger delay the vertical capacity needs to be able to handle the flow rate of the pulse which, being concentrated, will be much higher than the average flow rate.

- 12.5.4 A further consideration comes into play for escalators taking passengers off platforms. If the surge of passengers coming off a platform cannot be handled by the escalators then passengers can queue back onto the platform to the point where the passengers block the platform around the area of the exit. This creates serious risks if passengers slip, trip up or fall as they could fall in front of an in-coming train.
- 12.5.5 Entry traffic on the other hand will come in at a much more even rate so for a given overall flow the capacity provided can be closer to the overall flow without causing delay.
- 12.5.6 It also important to arrange flows as far as possible so that exiting flows (coming in pulses) avoid crossing entry flows in densely packed spaces to minimise delay. One such space is potentially the interchange concourse.
- 12.5.7 Options for additional capacity have been of two types:
- an additional set of escalators from the Victoria ticket hall connecting into the existing intermediate concourse plus an 'overflow' connection to the north end of the Victoria line usually from the District eastbound platform
 - extending the Victoria platforms south so that an additional set of escalators can come in at the new southern end of the platform.
- 12.5.8 As referred to earlier the option of extending the platforms south would be very disruptive and poor value for money.
- 12.5.9 The current (2006) flows leaving the Victoria line come to around 12,600 in the peak hour. Taking the forecast demand for 2016, and allowing for 20% further growth in the long term the total peak hour exit and interchange flow from the Victoria line would reach around 16,000. Whilst up three escalators could handle this flow if the flows were perfectly even, the

pulsing effect as described above means that 5 to 6 up escalators are needed to minimise delays.

12.6 Victoria Line Ticket Hall

12.6.1 The Victoria Line ticket hall needs to perform seven principal functions:

- to sell tickets using staff and automatic self service machines;
- to check ticket validity through ticket gates;
- to control the flow of passengers onto the escalators going to the Victoria line;
- to provide an unimpeded way from the ticket gates to exits to the mainline station and the street;
- to provide a route through between the mainline station and the District line
- to provide a rendezvous point for customers to meet up with each other, (an important feature off peak);
- to provide information and other facilities (an important feature off peak)

12.6.2 The existing station outside the peaks is efficient in quickly linking the mainline station and the Victoria line. Any upgraded station would want to avoid losing this benefit.

12.6.3 The ticket selling functions will become less important as pre-paid and off site electronic ticketing increases. Nevertheless, as a gateway station for many visitors to London, Victoria will continue to have an important ticket selling role. The existing ticket machines and windows are very busy so overall LUL would not want to lose space for ticket selling but would not need to increase it.

- 12.6.4 The existing ticket facilities are to one side of the main entry and exit flows and therefore minimise conflicting flows. Temporarily, ticket selling facilities have been moved to a point at street level beside the Sussex stairs.
- 12.6.5 If sufficient additional vertical capacity is provided and the train and platform capacity issues are dealt with, the use of the gatelines to hold passengers to avoid overloading escalators should be minimal. Nevertheless, the flows from the National Rail station in particular can be peaky because of the arrival pattern of mainline trains (it is possible for four mainline trains to arrive and unload passengers simultaneously). These peak flows can temporarily overload the gateline so a short queuing in front of the gateline may sometimes be necessary.
- 12.6.6 If the Victoria mainline train service is experiencing major disruption then the gateline has to be used to control flows in and larger queues will form. Additional vertical capacity will need additional gateline capacity. To avoid entry flows which may be in a queue conflicting with exiting flows, it is important to have a gateline which is or is close to straight. The additional gatelines will therefore need a wider ticket hall to accommodate them.
- 12.6.7 Architecturally, the existing Victoria ticket hall feels congested in part because it has a low ceiling. Creating extra headroom however requires lowering floor levels or raising the ceiling. The former means amongst other things rebuilding the escalators and creating a steeper stair rise from/to the National Rail station at considerable expense. The latter requires removal of the bus station above.
- 12.6.8 Overall options which widen the ticket hall to hold more gatelines but maintain the short direct route to the Victoria line at current floor levels are preferred.
- 12.6.9 The National Rail station is in effect two stations adjacent to each other. The one side serves south London and Sussex including Brighton and

Gatwick. The other side serves south east London and Kent. The Sussex side is the busier side creating 64% of all am peak entries to the underground station. Each side is linked by a flight of stairs called the Sussex and Kent stairs. The stairs provide a reasonably direct link between the mainline platforms and the Victoria line ticket hall. However, the Sussex stairs during the peak is expected by 2016 with reasonable growth to be close to capacity. The peakiness of mainline traffic previously described can create queues at the top of the Sussex when trains arrive simultaneously creating delay. The Kent stairs with half the demand but two thirds of the capacity will not be under such pressure.

12.6.10 The mainline and the Gatwick link also creates a significant proportion of passengers with luggage. Carrying luggage larger than 'hand' luggage also creates delay and blockages on the stair cases and is very inconvenient for those carrying the luggage.

12.6.11 For the above reasons options which provide additional capacity from either widened stairs or additional escalators and lifts for encumbered passengers are preferred.

12.6.12 The stairs to Wilton Road currently provide the main connection between the Victoria Line and many of the local destinations. The stairs are in two flights. The upper flight has two legs. The first faces Wilton Road and is well used. The second faces back towards the mainline station and is little used. The upper flight, however, is very close to the area where passengers queue for buses and is not particularly visible to passengers entering the station.

12.6.13 LUL's preference is to keep a flight of stairs broadly in this locality to serve the area to the south east but with improved positioning. Its capacity depends on whether alternative entry/exits points are available to the north east.

12.7. The District Ticket Hall

12.7.1 The main ways into the District ticket hall are via the connecting passageway from the Victoria ticket hall and via a flight of stairs to Victoria Street. A second flight of stairs connects the ticket hall to the bus station.

12.7.2 The ticket hall has clearly similar functions to the Victoria ticket hall but is less busy.

12.7.3 The main pressure points are:

- on the inbound gateline particularly to the District westbound platforms;
- at the point where the connecting passageway joins the ticket hall and on the stairs down to each of the westbound platforms.

12.7.4 During the peaks, passengers experience a slight delay accessing the District Line platform from the Victoria National Rail station.

12.7.5 Options for the District Line have included:

- a new ticket hall with more capacious access to platforms;
- direct passageway connections from the Victoria ticket hall to the District westbound platform.
- new entrances on the north side of Victoria Street associated with a new ticket hall.

12.7.6 All of the proposals for a new ticket hall have involved terminating leases on property on Terminus Place either side of the existing ticket hall. This has usually prompted consideration of the redevelopment of Terminus Place (owned by TfL).

- 12.7.7 A redevelopment of Terminus Place is likely to involve the removal of Victoria Station House which sits on top of the ticket hall. The construction of Victoria Station House and the ticket hall is such the ticket hall has to be removed as well. This forces the prior installation at a new ticket hall. The consequence is that any redevelopment of Terminus Place has a very significant cost associated with replacing the ticket hall and installing new access stairs or escalators.
- 12.7.8 The transport benefits of a new District & Circle ticket hall have been found to be relatively modest and not worth the significant cost associated with replacing the ticket hall and installing new access stairs or escalators.
- 12.7.9 Redevelopment would only be worthwhile if the property return from redeveloping Terminus Place is sufficient to fund the transport costs.
- 12.7.10 Creating a new entrance on the north side of Victoria Street for the District & Circle Line would require building a passageway underneath Victoria Street and acquiring property on the north side of Victoria Street for the entrance itself. The transport benefits by themselves would not justify the costs. However, there may be commercial benefits in the redevelopment of the area to the north of Victoria Street in creating such an entrance.
- 12.7.11 So far, LUL and TfL have not found a viable property scheme to fund a new District & Circle ticket hall. TfL have been examining with Land Securities redevelopment proposals in the vicinity. This redevelopment is sometimes referred as the Victoria Transport Interchange or VTI scheme. Land Securities submitted a planning application for its VTI scheme in August 2007. However this application has been held in abeyance and I understand is unlikely to be progressed although a further set of applications for planning permission has, I understand, been made by Land Securities for an area to the north side of Victoria Street.

12.8 Development of other modes that affect the District & Circle Line

12.8.1 Proposals have been put forward for the demolition of the buildings on Terminus Place to allow for either the extension of the bus station or the repositioning of Victoria Street. In either case, this would require the rafting over of the District & Circle Line to take the weight of vehicular traffic and to create a new ticket hall as described above. The costs and disruption of such schemes have been found to exceed any transport benefits.

12.9 New Access Points

12.9.1 Victoria Underground Station is both a major interchange with the National Rail terminus and an access point for local employment. The entry and exit points for the Victoria Line users are focussed on and beside the National Rail station. For District & Circle line users, there are entrances via the Victoria ticket hall linking to the National Rail station, to the bus station and to Victoria Street close to Buckingham Palace Road.

12.9.2 In providing additional capacity to ease congestion, LUL could simply widen, increase the capacity along existing routes or it could create new entrances.

12.9.3 A significant proportion of the passengers using Victoria to travel to local employment have destinations to the north and east of the existing station (see **Figures 12 and 13**). With the existing layout these passengers after alighting from their trains head towards the mainline station, leave the Wilton Road exit and then have to cross two or three busy roads – Wilton Road, Vauxhall Bridge Road and Victoria Street to get to their destinations. An exit near the north end of the Victoria Line and leading out to Victoria Street would save these passenger considerable delay and congestion. It would also reduce some of the heavy pedestrian flow from the Wilton Road exit and mainline station that delays other passengers and vehicular traffic through the three crossing points referred to above.

12.9.4 As well as providing a quicker route for these passengers an exit route via the north end of the Victoria Line also creates a more even distribution of alighters along the Victoria platforms instead of being biased to the south end. This in turn decongests the platform and allows passengers to exit more quickly.

12.10 Property Developments

12.10.1 A number of property schemes have been proposed for the area on and around Terminus Place. Most of them have proposed the demolition of Victoria Station House which contains the existing District & Circle ticket hall. This would have forced a rebuilding of the District & Circle entrances and links to platforms. Given that these projects tend to encase for ever the platforms on the District & Circle lines, these projects have also generally widened the platform areas as well. The cost of the station related work has however made such a call on the property development case as to make these projects not commercially worthwhile so far.

12.11 In summary, the review of all these factors has led LUL to look for a project which:

- provides additional connections to the north end of the Victoria line platforms so that the current bias of movement to the south end is reduced and the spare capacity at the north end of the platform is more fully utilised;
- widens the existing Victoria ticket hall to hold ticket gates but maintains the short direct route between the National Rail station and the Victoria line, and maintains the current floor level;
- increases the combined capacity of the Kent and Sussex stairs to meet long term demand needs;

- increases the vertical capacity from the Victoria ticket hall to the intermediate concourse to handle the current and future demand excess on the south end escalator and to distribute the entry and exit demand more evenly along the Victoria Line platforms;
- creates a lower level network of passageways that allows passenger flow to be managed so that demand can be spread along the Victoria line platforms without overloading either the interchange concourse or the Victoria line middle concourse;
- provides a north end connection to the main part of Victoria Street to shorten passengers journey time to the north east side of the station;
- provides step free access between the National Rail station and new entrances to all the platforms and step free interchange between all the platforms.

12.12 Phased Project

12.12.1 LUL and TfL have considered in the past redevelopment options that incorporate in one project the ‘ideal’ option for all modes and for a measure of property development usually in conjunction with a commercial partner. The difficulty with this “all in one” approach is that it requires a very large financial commitment which is at risk if either private or public partner cannot jointly commit at the same time.

12.12.2 Accordingly, LUL and TfL have also sought to separate work at Victoria into a number of phases so that each phase is worthwhile on its own and should funding be limited those phases that are fundable can be delivered. In 2004, TfL and LUL commissioned Arup to devise a 6 phase upgrade of the Underground station. The phases were as follows:

- (i) build a new entrance/ticket hall near the north end of the Victoria Line and connect it into the north end of the Victoria Line with step free access to the Victoria Line;
- (ii) connect at sub-surface level the intermediate concourse with the north end of the Victoria Line so that step free access could be provided between District & Circle and Victoria lines and build an improved or additional link from the interchange concourse to the District westbound platform;
- (iii) build additional vertical capacity from the existing Victoria ticket hall to the intermediate interchange concourse between the Victoria and District and Circle lines and improve links to the mainline station;
- (iv) enlarge the Victoria ticket hall and build a direct link from the Victoria ticket hall to the District and Circle westbound platform;
- (v) replace stair links with an escalator link between District & Circle eastbound and the interchange concourse;
- (vi) provide a new entrance on the north side of Victoria Street as a way into the District & Circle eastbound platform.

12.12.3 A number of options were considered by Arups for Phase 1. The option developed was for a ticket hall just below ground underneath Bressenden Place with lifts and escalators on the east side of Bressenden Place and stair access both to the north and south sides of Victoria Street. From the ticket hall, three escalators ran down to a level above the north end of the Victoria line whence stairs ran down to the Victoria middle concourse. A separate ramped passage also ran down the bottom of the escalators to the interchange concourse.

12.12.4 For construction reasons Phase 2 and 3 were merged. Starting from the interchange concourse level a passage way ran south and the south west to a set of three escalators which lead up to the Victoria ticket hall. Off this passage way, a stair and lift connection ran up to the District & Circle westbound platform.

12.12.5 At the Victoria ticket hall level the stairs to the Sussex side of the mainline station widened to 12.8m.

12.12.6 A number of other options for vertical links to the National Rail station were examined from a third exit that linked into a second entrance to the Sussex side of the National Rail station to a sub-surface link that came up in the middle of the Sussex side National Rail concourse. In terms of value these alternative options tended to cost more for little extra value.

12.12.7 Developing Phases 1, 2 and 3

12.12.8 Analysis of the costs and benefits for the six phases showed that:-

- Phases 1, 2 and 3 had a worthwhile business case. Furthermore the costs would be slightly cheaper if phases 1, 2 and 3 were done together.
- Phase 4 was marginal. If however, a property scheme was developed for the Terminus Place area that required the replacement of the District Ticket Hall, then phase 4 could be redundant.
- Phase 5 and 6 did not have a worthwhile business case.

12.12.9 LUL and TfL therefore took the decision to develop the Victoria Station Upgrade on the basis of a merged Phase 1, 2 and 3. These phases solve most of the congestion problems associated with the Underground Station and provide a much shorter route from the Victoria Line to the main employment area along Victoria Street.

The development of VSU from this point on has focussed on:

- finding a design that is buildable;
- minimising land take and disruption whilst meeting the primary project goals;
- optimising passenger journey times balancing delays that can arise along busy but popular routes that can become congested with routes that have longer free flow times but have less congestion delay;
- providing the resilience to accommodate assets out of service for repair, maintenance or replacement.

12.12. Refining Options

12.13.1 The phases 1, 2 and 3 designs were merged and developed into a stage D option by Scott Wilson in 2006.

12.13.2 In early 2007 this option was reviewed by testing several variants. The variants generally kept the positions of the platforms, ticket halls and existing fixed assets in the stage D option. The variations were in the connecting passageways, stairs and escalators.

12.13.3 The variants are discussed in the Proof of Mr. Alan Finch (LUL.P3). The preferred one was labelled option 6 which moved the Paid Area Link to under Allington Street with a short additional connecting passage to the District eastbound interchange stairs. This one was preferred as it was less disruptive of the Victoria Palace Theatre and easier to construct.

12.13.4 The others were rejected on grounds of either:

- additional expense;
- longer passenger walking route;
- inadequate space at platform concourse level;

- more complex/risky engineering;
- inadequate escalator capacity
- more property take; or
- engineering infeasibility

12.13.5 The option selection was further refined in 2008. This process confirmed the selection of Option 6. The process is described in detail in the proof of Mr. Alan Finch. **Figure 15** shows the scheme layout now submitted for the TWA order which is based on option 6.

13. Victoria Line and District and Circle Line Train Service Upgrades

13.1 London Underground is implementing a major capacity upgrade of the train service on most lines to be completed by 2018. Both the Victoria and District and Circle lines are included.

13.2 The present Victoria Line schedules 28 trains per hour in the peak. Each train has a capacity of 833 fully loaded (passengers standing to a density of 4 passengers per square metre).

13.3 This provides a capacity of 23,324 per hour per direction.

13.4 The upgrade of the Victoria Line train service is planned to run 33 trains per hour in each direction in the peak. The trains currently being built will have a capacity of 857 passengers (3% more than the existing trains) to give an hourly capacity of 28,281. This is 21% higher than that currently scheduled.

13.5 The current District Line trains have a capacity of 820 passengers and Circle line trains 739. These trains will be replaced by one common new train which will be longer than either of the existing trains and have a capacity of 1,031. The scheduled service frequency is also being increased from 21 tph District plus 7 tph Circle to 24 tph District to 8 tph Circle. The

combination of higher capacity trains and higher frequency will deliver an overall increase in capacity of 47%.

- 13.6 Although not a part of scheduled operation, Victoria Line trains can be reversed southbound to northbound and northbound to southbound at the station in times of disruption or special service operation.
- 13.7 Such reversal of trains may require passengers to be detrained onto the platforms and station control may be invoked to avoid overloading platforms.
- 13.8 There are two tunnel sidings at the south end of the Victoria Line platforms.
- 13.9 One train is stabled overnight in the sidings and enters service at the station each morning.
- 13.10 The line upgrades as well as providing significantly more capacity will also see quicker journey times as trains are designed to have faster running times between stations, shorter times in the station and shorter waiting times for trains at the platforms through higher frequencies. This investment in capacity and shortening passenger journey times fits with TfL's objectives of improving door to door journey times and providing sustainable capacity to support the London economy.

14. Assessing Demand in Future Years

- 14.1 Traffic levels are unlikely to be static and LUL needs some way of assessing future demand. The influences on traffic levels tend to be a mixture of economic demographic, geographical, fares and service factors.
- 14.2 TfL uses modelling tools, principally LTS and Railplan, to provide forecasts for 5 yearly horizons, 2011, 2016, 2021 and 2026. They use GLA estimates of population and employment levels in and around London and the expected private and public transport provision. LUL has chosen to use 2016 as a reference year partly as it is close to the expected completion

date of a number of projects such as Thameslink and many of LUL's line upgrades and most of the transport Infrastructure improvements significant to Victoria should have been implemented by then.

- 14.3 It is probable that there will be some growth after this time. The scale and timing of this growth is difficult to judge. So LUL have used expected network growth levels after 2016. For business case purposes, taking a conservative, pessimistic outlook these have been capped at 15% above the 2016 level. For design purposes higher levels of demand growth have been used.

14.4 Drivers of Growth

- 14.4.1 One of the effects of the train service upgrades is that they will draw traffic away from other modes so that the growth in Underground usage will be greater than simply the growth in employment, particularly in central London.
- 14.4.2 Employment around Victoria and in other parts of central London served by the Victoria, District and Circle lines will increase usage of Victoria Underground Station both as a destination and as an interchange point.
- 14.4.3 The Government announced in July 2007 the go-ahead for the north south Thameslink upgrade project. The project will draw some traffic away from the Victoria Line. Nevertheless, the overall forecast is one of growth. The overall movement of passengers is expected to rise by 12% between 2006 and 2016.
- 14.4.4 Using GLA assumptions of employment and population growth, and LUL's upgrade programme and taking on board the Thameslink project the significant changes in passenger flows for the AM peak (7.00 to 10.00) between 2006 and 2016 are shown below:

Table: 1 – Key Flows in AM Peak (7.00 to 10.00)

Flow	2006	2016	Growth
Overall	72,554	81,404	12%
Ticket Halls to Victoria Line	19,401	20,319	5%
D&C to Victoria Line	4,554	5,842	28%
Total Flow to Victoria Line	23,955	26,161	9%
Victoria Line to District & Circle Line	10,496	11,456	9%
Total Exiting	25,580	28,618	12%
Ticket Halls to District & Circle Line	12,523	15,167	21%

14.4.5 The increases on flows on all the major flows to and from the Victoria Line will lead to steeply rising congestion and delay in the existing station.

14.5 Crossrail Impacts

14.5.1 Since the demand figures for the business case was prepared the Government announced in October 2007 a funding agreement for the east west Crossrail project. Royal Assent was given for the Project in July 2008.

14.5.2 An evaluation of the impact of Crossrail on the underground station was carried out. It showed that overall there is a slight increase in flows to and from the Victoria Line (1.4%) and a slight decrease on flows to and from the District & Circle lines (-1.6%). Overall the station usage changes by -0.1%

14.5.3 For business case purposes, it has been assumed that the per passenger effect is neutral but the benefits have been factored down by the overall drop in demand.

15. **Description of the Project**

15.1 The scheme would be built around the existing station and would have the following additional features:

- (i) a new entrance and ticket hall underneath Bressenden Place and new escalators down to the north end of the Victoria Line;

- (ii) Expansion of the Victoria Ticket Hall to form the South Ticket Hall, extra escalators from the South Ticket Hall to the interchange concourse and the new northern end escalators;
- (iii) Step Free access from street to platform.

Figure 15 shows the overall VSU Scheme Layout, Street Level Entrances are shown in **Figure 16**, Ticket Halls in **Figure 17**, the District Line Level in **Figure 18**, the Interchange Concourse Level in **Figure 19** and the Victoria Line in **Figure 20**.

15.2 A more detailed description is provided below:

15.3 A new entrance and ticket hall (referred to as the north ticket hall) underneath Bressenden Place.

15.3.1 The ticket hall 5.4 metres below street level would be accessed by a flight of stairs and a lift on the east side of Bressenden Place near the junction with Victoria Street. The ticket hall would have passenger operated ticket selling machines.

15.3.2 Ticket window selling will be concentrated in the South Ticket Hall where most of the demand for more complex ticket selling or customer information from infrequent users is likely to take place. The north ticket hall would have a gateline of 10 Gates. This would allow in the morning peak for 2 entry and 8 exit gates. The exit gates are sufficient to handle the flow from 2 escalators running up.

15.3.3 From the ticket hall level, 3 escalators would run down to a level 7 metres below the ticket hall. A passageway connects the bottom of the escalators to a landing above the north end of the Victoria Line platforms.

- 15.3.4 From this landing 3 escalators would run down 7 metres to the north end of the existing middle concourse between the Victoria Line platforms.
- 15.3.5 Passageways and lifts would connect the new ticket hall to the northern landing level and from there a lift would lead down to the north end of the Victoria Line platform.
- 15.4 Extra escalator connections from the south ticket hall to the interchange concourse and the new northern end escalators;
- 15.4.1 Three new escalators (7, 8 & 9) would run down from a point to the east side of the existing escalators. From the bottom of the escalators passageways would connect to the east side of the interchange concourse and then run on to the west side of the landing at the top new north end escalators. These passageways are referred to as 'the paid area link'.
- 15.4.2 A new lift would also link the south ticket hall to the District Line westbound platform, the passageways at the bottom of the escalators and from there to the intermediate concourse and the north end level.
- 15.4.3 In addition, a passageway would link the bottom of the existing District & Circle eastbound stairs to the northbound landing.
- 15.5 Step Free Access Provision
- 15.5.1 Step Free Access from the street to the platforms and between the platforms would be provided by a set of seven lifts. It is easiest describe the connections by defining five levels:
1. Street and mainline station;
 2. Ticket Hall levels;
 3. District Line platforms

4. Interchange concourse and north end concourse
5. Victoria Line platforms

15.5.2 The scheme layouts level by level are shown in **Figures 16 to 20**.

15.5.3 The lift connections would be as follows:

Table 2 : Lifts

Lifts	Levels	Connection
A1 &A2	1 to 2	National Rail Concourse to south ticket hall between Kent and Sussex Stairs
C	1 to 2	Cardinal Place to north ticket hall on Cardinal Place side of Bressenden Place
E	1 to 2	Bressenden Place (west side) to north ticket hall and basement below (only for use of fire fighters)
B	2 to 3 to 4	South ticket hall between escalators to District Line westbound, then to passageways leading to interchange concourse
F	3 to 4 to 5	District Line eastbound platform to interchange concourse to Victoria Line platforms
D	2 to 4	North ticket hall to north end concourse
G	4 to 5	North end concourse to Victoria Line platforms. passenger and fire fighter lifts.

15.5.4 The lifts positions are shown in Figure 15. The lifts used to link street entrances to the platforms would be as follows:

Table 3 : Connections by Lift

National Rail Station/Wilton Road to:	Lifts
District westbound platforms	A and B
District eastbound platforms	A, B and F
Victoria platforms	A, B and F or A, B and G
Victoria Street /Bressenden Place to:	Lifts
District westbound platforms	C D and B
District eastbound platforms	C, D and B
Victoria platforms	C, D and G

To link the Victoria Line to the District Line the lifts used would be as follows:

Victoria Line Platforms to:	Lifts
District westbound platforms	F and B
District eastbound platforms	F

15.5.5 All these links would be reversible.

15.6 Gateline Provision

15.6.1 In the south ticket hall 20 ticket gates would be provided including two ‘wide-aisle’ gates for passengers with luggage or otherwise encumbered.

15.6.2 The 20 gates will allow 500 passengers per minute to flow through or 30,000 in one hour. This should be more than adequate for opening demand. There is space for more gatelines in the long run should they be needed.

15.7 Resilience for Escalator Repair, Replacement and Renewal

15.7.1 Escalators are planned to have an extensive overhaul or be replaced every 20 years. These tasks can take 6 months to a year. Therefore, it is quite likely that at any one time one escalator is out of service. Whilst 9 escalators (Nos. 1, 2, 3, 4, 5, 6, 10, 11 and 12) would be installed that link into the Victoria Line level the station should work reasonably comfortably with 8. Similarly, if any of the remaining 6 (Nos. 7, 8, 9 from the south ticket hall and Nos. 13, 14 and 15 from the north ticket hall) are not available the 5 left should be able to handle the volumes perhaps with some diversion of flows between the ticket halls at the height of the peak.

15.8 Optimising Entry Flow for Upgraded Station

15.8.1 At low levels of demand, off peak and in the shoulders of the peak, passengers from the mainline station going to the Victoria line can go via the existing escalators. As demand builds up passengers need to split

between the existing and the new escalators. Those that come down the new escalator would use the interchange concourse until the interchange concourse becomes too busy with the cross flows from exiting and interchange passengers. At this point, the traffic from escalator 9 would be routed via escalators 11 &12 at the north end of the station.

15.8.2 For the Upgraded station the escalators will be arranged as in Table 4 below.

Table 4 : Escalator Directions (up to 10% above 2016 demand)

Victoria Line TH (existing escalators)	1	UP
	2	UP
	3	DOWN
Interchange concourse	4	UP
	5	UP
	6	DOWN
Victoria Line TH (new escalators)	7	UP
	8	UP
	9	DOWN
Victoria North End escalators	10	UP
	11	DOWN
	12	DOWN
North Ticket Hall	13	UP
	14	UP
	15	DOWN

15.8.3 From the Victoria Line platforms, five escalators would run up (1, 2, 4, 5 and 10) and four will run down (3, 6, 11 and 12), a predominance of up escalators.

15.8.4 The down traffic in the peak hour from the South Ticket Hall could not all be handled on one escalator and would need to be split between escalators 3 and 9. For modelling purposes 60% of passengers have been allocated to escalator 3 and 40% to escalator 9 in the AM peak and 70% to escalator 3 in the PM peak. The route via escalator 9 is longer in free flow conditions but the allocation described has been found to minimise the overall time including delay. From escalator 9 entry traffic to the Victoria Line then would go down escalator 6 unless the interchange concourse becomes too

busy, then the traffic would be routed via escalator 12 to the north end of the Victoria Line platforms.

- 15.8.5 When the demand level rises by more than 10% above the 2016 level, escalators 4, 5 and 6 are all set as up and connecting interchange flows to and from the District and Circle adapted accordingly. This change would thereby avoid overcrowding in the intermediate concourse.
- 15.8.6 Between the District and Circle and Victoria Lines the interchange flows would be directed as today except that the current two way link from the interchange concourse to the District and Circle (D&C) westbound becomes one way only towards the District Line in the peaks. Flows from the westbound D&C will take the new interchange stairs.
- 15.8.7 The District and Circle Line eastbound to the Victoria Line passengers would be routed via the District and Circle eastbound Connection (PAL 22), PAL North (4b) and escalators 11 and 12.
- 15.8.8 At this point the busiest 15 minute flow from the Victoria to the District & Circle platforms should average 89 passengers per minute. However, this flow would be very peaky as it arises from surged alighting flows from the Victoria Line platform. Should two trains arrive simultaneously nearly 200 people will come off both trains. To avoid queues of passengers backing up on to the platform and to minimise the delay to interchanging passengers three escalators would be used to clear these surges quickly. This does mean that interchanges from the District and Circle to the Victoria Line would take the longer routes described above. In the evening peak, the interchange flow from the Victoria Line is estimated to be relatively less and the optimal use of escalators would become two up and one down.
- 15.8.9 When the escalators are run two up and one down, it is of course possible for queues to form at the top of the down escalator with a surge of flows from the District and Circle lines. Should these queues become large there

is a risk of them blocking the run offs on the up escalators. To mitigate this risk, barriers would be installed to contain the queues, and if still insufficient flows would be directed via PAL 22 from the D&C eastbound and via PAL 5 and 4 from the D&C westbound.

15.9 The Need for PAL 22

- 15.9.1 If PAL 22 was not available then a number of operational risks arise. If the escalators are running one down and 2 up then the queue for the down escalator following a surge of passengers could run back to the interchange stairs. This presents a hazard of passengers tripping on the stairs, falling with some force into a stationary queue resulting in multiple injuries or fatalities. To prevent this happening staff might have to control flows from the top of stairs. This could lead to queues building back onto the platform and in turn incoming passengers to the District and Circle Lines being held outside the gateline to avoid platform overloading.
- 15.9.2 The frequency of the above occurring is difficult to assess but this outcome is reasonably likely if the Piccadilly Line was down and its traffic to and from the west transferred to the District and Victoria Lines.
- 15.9.3 If the escalators are running all on the up then the only way for District Eastbound passengers to access the Victoria Lines is to go across the top of the interchange concourse to PAL 7, then use PAL 4a and 4b. This clearly increases the interchange time for passengers from the District Eastbound. It also presents a hazard if two heavy surges from the Victoria Lines and the District eastbound try to cross each other and a queue from the Victoria Line builds back towards the up escalators, blocking their run-off.
- 15.9.4 Congestion in this area is also increased by passengers from the Victoria Line stopping for way finding purposes as shown in Figure 33.

15.9.5 In summary, without PAL 22, the safe management of the station would require the holding back of entry traffic to the District & Circle Lines.

15.10 Ticket Selling Facilities

15.10.1 London Underground is selling a declining proportion of tickets through station ticket windows for each journey made. Although the number of journeys has risen, the number of tickets sold has stayed constant or declined. This is as a result of the development of Oyster Pre-pay and the ability of more and more tickets to be bought either on the internet or via outside agencies.

15.10.2 Nevertheless, Victoria is a gateway station with many visitors to London arriving at Victoria. It is proposed therefore not to increase ticket selling facilities at Victoria but not to remove ticket selling windows either in the south ticket hall.

15.11 Operation of the enlarged station

15.11.1 The operation of a station is a dynamic process influenced by interaction between passengers, facilities, staff and train services, so it is not possible to determine precisely how the enlarged station would function.

15.11.2 The District side of the station is not directly affected by the proposals

15.11.3 Based on what is known of passenger flows and the facilities to be provided I would anticipate the following:

15.11.4 Staffing levels

It is likely that the level of staffing would increase on each shift by 5. This would be driven by the expansion of the station facilities. The staff would be deployed on the expanded gateline and new ticket hall

- 15.11.5 The station Congestion Control & Emergency Plan would be revised to take account of the enlarged facilities
- 15.11.6 The combined increase in escalator capacity and improved distribution of passengers to and from the Victoria Line platforms would ease the extent of congestion by facilitating an increased flow to the platforms, providing a more effective distribution of passengers to the platforms, reducing the south end bottleneck.
- 15.11.7 The access and egress via the new North Ticket Hall would further ease congestion by providing more capacity which would allow traffic to be more evenly distributed about the enlarged station.
- 15.11.8 I would envisage the need for station control to be implemented on a routine basis to disappear at the expected 2016 traffic levels.
- 15.11.9 If required however, in the event of significant train service disruption, station control would be implemented in accordance with the principles previously described and in accordance with the revised Congestion Control & Emergency Plan
- 15.11.10 Whereas at present flows are controlled at station entrances I would envisage the increased capacity provided by the additional ticket hall and the enlarged Victoria line ticket hall would allow this to be managed by use of escalators and ticket gatelines as opposed to the station's entrances.

16. Benefits of the Project

- 16.1 The benefits to users of the station will be four fold:
- less congestion and delay particularly in the peaks;
 - a shorter time travelling at street level for those with origins or destinations to the north and east of the station;

- step free access from street to platform and between platforms;
- an improved environment in most of the station.

16.2 Congestion and its Consequences

16.2.1 Congestion within stations on London Underground is assessed on the basis of density of passengers. The densities are banded into six groups of increasing density:

- 0 or A Free Circulation
- 1 or B Free circulation on unidirectional flows with minor conflicts on cross flows;
- 2 or C Slightly restricted circulation, difficulty in passing others, reverse and cross flows with difficulty
- 3 or D restricted circulation for most passengers. Significant difficulty for reverse and cross flows;
- 4 or E restricted circulation for all pedestrians. Intermittent stoppages and serious difficulties for reverse and cross flows.
- 5 or F Complete breakdown in traffic flow with many stoppages.

16.2.2 The heavier densities can lead to delay to passenger movement the scale of which depends on the nature of the movement. When modelling stations visual plots of the expected densities are created which can be used to explain delay and to identify potential hazards.

16.2.3 For the safe management of stations, it is important that certain areas are kept relatively free flow. These include the areas immediately beyond escalators, gatelines and stairs.

16.2.4 The areas immediately before escalators, gatelines and stairs on the other hand can experience queues and congestion as they are natural bottlenecks on surged or irregular flows.

16.2.5 For passengers riding on escalators high densities do not cause delay except to those wishing to walk up or down.

16.2.6 Platforms perform two functions: waiting areas for trains and circulating spaces to and from entry and exit points. Relatively heavy densities for circulating passengers can cause delay. Staff will normally intervene however to prevent densities reaching a point where there is risk of passengers falling onto the track or evacuation being hampered.

16.2.7 Heavy densities in passageways or across concourses usually signifies delay.

16.2.8. In the attached figures the following colour coding is used:

<u>Level of Service</u>	<u>Colour</u>
A to B or 0 to 1	Dark Blue
B to C or 1 to 2	Light Blue
C to D or 2 to 3	Green
D to E or 3 to 4	Yellow
E to F or 4 to 5	Maroon

16.2.9 The estimated densities are the outputs of the Pedroute model.

16.2.10 PEDROUTE is a computer model used by LUL of passenger flows through the station. It can assess congestion and delay for different levels of traffic and different layouts.

16.2.11 PEDROUTE has been used for simulating congestion in the morning and evening peaks (7.00 to 10.00 and 16.00 to 19.00). Two layouts have been compared, namely the existing one and the proposed upgrade.

- 16.2.12 **Figures 10a to 10f** show the density levels in the existing station forecast for 2016 for 15 minute time slots at 8.30, 8.45, 9.00, 9.15, 9.30 and 9.45
- 16.2.13 These figures show for a period of nearly 90 minutes high service factors (high densities) in the Victoria ticket hall and outside the station entrance indicating gateline and station entrance closures with significant delay for passengers entering the station and going through the gateline. There is heavy congestion at the south end of the Victoria Line platform. The consequence of this is that it creates a very uneven distribution of passengers boarding the trains making the back end of the trains very crowded. There is also congestion and delay on the passageway leading from the intermediate concourse to the District Line westbound platform and on the approach to escalator 3 (going from ticket hall to the Victoria Line).
- 16.2.14 **Figures 11a to 11f** show the level of congestion with the new station for the same peak period.
- 16.2.15 There is no congestion in the South Ticket Hall or on the interchange link to the District and Circle westbound. There are no gateline or ticket entrance closures. There is still some queuing approaching escalator 3. The south end of the Victoria northbound platform is very busy but passengers now have other routes via the new escalators.
- 16.2.16 The Victoria southbound platform is less busy indicating faster exiting helped by the new North Ticket Hall.
- 16.2.17 With 20% more demand, the model shows some queuing delay entering the gates for escalator 3. In practice one would expect some shift in passenger flow towards the gates and new escalators 7, 8 and 9 to reduce this queuing.
- 16.2.18 The Victoria Line platforms are busier but the extra traffic tends to fill the less busy north end.

- 16.2.19 Overall, the new station experiences far less congestion and delay, even with growth in demand, than the existing station.
- 16.2.20 In section 8.7 three reasons for congestion for those accessing the Victoria Line were set out:
- (b) the heavy loads on trains departing the Victoria northbound platforms
 - (c) the disposition of escalators biasing boarders to the south end of the line
 - (d) the limitation on escalator capacity
- 16.2.21 The first of these will be addressed by the additional train capacity being provided by the Victoria Line Upgrade
- 16.2.22 The second and third would be addressed through the additional escalator capacity from the south ticket hall and via the Paid Area Link to the new escalators to the north end of the station.
- 16.2.23 If however, the implementation of the VSU scheme is delayed, LUL's passengers would continue to experience today's unsatisfactory delay and congestion which will worsen with rising demand.
- 16.2.24 The absence of the VSU project would also mean that the benefits of the line upgrade in terms of faster, more frequent and capacious trains would be counteracted by the long peak delays described above. The station and the line upgrade are complementary projects. Together they reduce journey times and congestion for passengers using both Victoria Station and the Victoria Line.

Congestion Relief Appraisal

- 16.2.25 For appraisal purposes demand at the 2016 reference year has been used for both peaks and demand 5% above and 10% above for the evening

peak. The 5% and 10% levels for the morning peaks were not included in the project appraisal. This is because at this level of demand the modelling suggests the existing station experiences very long delays, and may lock up. This makes the model results less reliable for higher levels of demand. In practice, some of the demand may find alternative bus, walking, or other Underground routes which will in most cases be as long or longer than the delay that would otherwise be experienced. For quantitative appraisal purposes however it has been assumed that the delay per passenger does not rise after 2016. In practice it is expected to rise but is very difficult to estimate.

16.2.26 To put a value on passenger's time TfL provides appraisal guidance in its Business Case Development Manual VSU.B35. The guidance stipulates a value of £8.38 per hour saved (2007 value). This value, with appropriately inflated growth in incomes, is used in the appraisal.

16.2.27 The Pedroute model has assessed the comparative times as shown in Table 5 for the AM peak and Table 7A, 7B and &C for the PM peak. The time is split into three components namely movement, delay and other. The movement time is the free flow time given the layout and routing rules previously described. The delay time is the additional delay time moving between entrance and platform and vice versa caused by congestion. The 'other' time includes waiting for trains and boarding and alighting times on the platform. For 2016 the train service is assumed to have been upgraded to higher frequencies and capacity (33 trains per hour compared with 28 today on the Victoria Line).

Table 5 : AM Peak 7:00 to 10:00 Station Times (weighted minutes) 2016 Demand

	Movement	Delay	Other	Total
Existing Layout	5.5	5.6	1.8	12.9
Scheme Layout	4.8	0.9	1.8	7.5
Difference	0.7	4.7	0.0	5.5

16.2.28 There is a small difference in movement time from the reallocation of entry/exit points. The biggest improvement is in delay time.

16.2.29 The scheme layout needs, of course, to work with demand above the 2016 levels. As demand rises, the delay and movement times increase slightly with demand as shown in the table below but the station is well able to cope.

Table 6 : AM Peak 7:00 to 10:00 Station Times (weighted minutes) Scheme Layout with Rising Demand

Demand	Movement	Delay	Other	Total
2016	4.8	0.9	1.7	7.5
2016 +5%	5.1	1.0	1.8	7.8
2016 +10%	5.2	1.1	1.8	8.1
2016 +15%	5.2	1.2	1.8	8.3

Table 7A : PM Peak 16:00 to 19:00 Station Times (weighted minutes) 2016 Demand

	Movement	Delay	Other	Total
Existing Layout	4.8	1.5	1.5	7.8
Scheme Layout	4.9	1.1	1.4	7.4
Difference	-0.1	0.4	0.1	0.4

Table 7B : PM Peak 16:00 to 19:00 Station Times (weighted minutes) 2016 Demand + 5%

	Movement	Delay	Other	Total
Existing Layout	5.0	1.9	1.5	8.4
Scheme Layout	4.9	1.1	1.6	7.6
Difference	0.1	0.8	-0.1	0.8

Table 7C : PM Peak 16:00 to 19:00 Station Times (weighted minutes) 2016 Demand + 10%

	Movement	Delay	Other	Total
Existing Layout	5.3	3.2	1.5	10.0
Scheme Layout	5.0	1.3	1.5	7.8
Difference	0.3	1.9	0.0	2.3

16.2.30 In the evening peak the biggest change is in delay time though the scale of benefit is less than the AM peak as there is a higher proportion of alighting passengers than boarding passengers. (The priority for escalators is towards alighting passengers to clear passengers from the platforms).

16.2.31 The per passenger benefits can be converted into annual benefits by multiplying by the numbers using the station in the peaks in a year and the value of time.

16.2.32 The value for each of these is as follows:

2016 AM peak usage	81,404	(see Table 5)
2016 PM peak usage	89,498	(see Table 6)
Peaks per year	250	
Value of Time (£/hour)	8.38	(2007)

16.2.33 The annual benefits for AM and PM peaks are shown in Table 17 below:

In Station Time Benefits (Annual £'000)

AM Peak	2016	15,488
PM Peak	2016	1,312
	2016 + 5%	2,641
	2016 + 10%	7,963

16.3 Shorter Time on the Street

16.3.1 Passengers coming from the Bressenden Place entrance instead of from Wilton Road and going to point on Victoria Street adjacent to the Cardinal Place building would save 412 seconds (weighted) i.e. nearly 7 minutes.

16.3.2 This time saving is assumed to apply to all the passengers who are travelling from/to Victoria Street to and from the Victoria Line platforms. The total peak flows for 2016 along this route are 20,930.

16.3.3 The peak volumes need to be brought to an annual figure. This has been done using the LUL counts data for 2004. The annual usage came to 68,863,000 compared to 116,000 daily peak entries and exits. This gives a grossing up factor of 593.6

16.3.4 The overall annual benefits are therefore:

$$\frac{412 \text{ seconds} \times 20,930 \text{ peak usage} \times 593.6 \text{ peaks to annual} \times \text{£}8.38 \text{ VoT}}{3600}$$

$$= \text{£}11.915 \text{ million}$$

16.4 Ambience

16.4.1 The station upgrade will provide facilities, finishes and general ambience around the access to the Victoria Line and District and Circle interchange. In parallel with the upgrade the District and Circle Line platforms and access routes will be modernised which will also upgrade the facilities of the station. The project appraisal includes ambience benefits quantified at £0.5 million per annum.

16.5 Step Free Access

16.5.1 Estimated benefits for Victoria have been extracted from LUL's network wide assessment of the Step Free Access Programme benefit appraisal. Benefits will exist for both Victoria Line and District & Circle line users. For the purpose of this appraisal only Victoria Line benefits have been added, reflecting sub-optimal access from ticket hall to District & Circle areas. The annual benefits (2007 prices) are estimated at £1.44 million.

16.6 Disbenefits during Implementation

16.6.1 The project construction will require a number of weekend closures, mainly shutting the District Line between Embankment and South Kensington. There will also be restrictions at surface level affecting passenger and vehicular movement. The disbenefit has been valued at £26.46 million.

16.7 Non Customer Benefits of VSU

- 16.7.1 As indicated earlier the existing station has reached the point where any additional demand in the peak flow of entering or interchanging to the Victoria Line will exceed the vertical capacity of the station. This is true even when the line upgrade of the train service is complete. This extra demand has to queue up to enter during the peak hours.
- 16.7.2 Doing nothing will frustrate the growth in journeys from South and South East London, Kent and Sussex that rely on mainline services to Victoria. This will in turn make employment along the route of the Victoria Line in Central London less attractive and frustrate its growth. It will also frustrate residential growth around Victoria that in part relies on the Victoria Line to access employment.
- 16.7.3 The scheme will not only enable the expansion of traffic referred to above, it will improve access times to Victoria, already improved with the train service upgrade and thereby make Victoria a more attractive place for employers and employees and enable the regeneration of the Victoria as a designated opportunity area in the Mayor's London Plan.

16.8 Quantified Business Case

- 16.8.1 London Underground have prepared a quantified business case appraisal of this project. The appraisal follows the principles set out in TfL's Business Case Development Manual (VSU. B35)
- 16.8.2 The business case is detailed in the Background Report for Transport and Works Act Submission (January 2008) (VSU.B9) It has been updated to take account of design changes in VSU.B36.
- 16.8.3 These costs and benefits have been brought up to an appraisal reference point of Quarter 2 2007. The quoted capital costs differ from those set out

in the revised Estimate of Costs (VSU.A28) because the latter is updated to 2008 prices but excludes fees expected up to the point of the Secretary of State's decision on the TWAO application.

16.8.4 The Capital costs of the project are set out in the Background Business Case Report (VSU: B36). Other ongoing costs mainly additional staffing, additional maintenance and renewal have been included in the appraisal.

16.8.5 Costs and benefits have been compared by being discounted in line with BCDM guidance and have been added up over a period that extends 60 years from the completion of the project. The Capital costs have had additional inflation applied to allow for the expected differential inflation for construction projects compared to Retail Price Index inflation. The project has been designed to RIBA Stage E. Optimism bias has applied to the capital costs at 18% in line with DfT Web Tag guidance .

16.8.6 Overall the benefit to cost ratio is 4.4 to 1. For capital projects of this scale this is a very worthwhile project.

17. External Consultation on the Victoria Station Upgrade

17.1 Consultation undertaken by LUL in respect of the VSU scheme has involved:-

- Over 1,000 letters, introducing the project and providing a point of contact, being sent in April 2006 to stakeholders including local residents and businesses, user groups, accessibility groups and statutory consultees.
- Regular meetings with key stakeholders including Westminster City Council, Land Securities, the owners of the Victoria Palace Theatre, Network Rail, CIS AXA (who are redeveloping Abford

House) and relevant utility companies. Meetings have also been held with representatives of the Apollo Theatre.

- Briefings with numerous organisations and local businesses including London TravelWatch, London First, Greater London Authority, Disabled Persons Transport Advisory Committee, Victoria Interchange Group (a local residents group) John Lewis Partnership and Thistle Hotels (owners of the Thistle Victoria).
- Project updates being sent on roughly a 6 monthly basis to over 1,000 stakeholders including local residents, resident associations and businesses, to report on progress and provide a point of contact for feedback.
- Public exhibitions in May and July 2007 to allow a wider audience to view and comment on the proposals. The exhibitions were held close to the Underground station and members of the VSU team were present throughout to answer any questions raised by visitors. For both exhibitions all residents in the consultation area received invitations with contact details for further information.

17.2 Main outcomes of the Consultation Process

- 17.2.1 Over 1,400 people visited the public exhibitions. Most of the comments made at both exhibitions were supportive and all detailed points made were considered by LUL. The exhibition in July 2007 displayed some of the most common questions/comments received at the May exhibition along with LUL's response. LUL responded individually to all feedback forms received at both exhibitions except where no address was left by the individual commenting.

17.2.2 In the Consultation process the following suggestions were made by those who participated in the process:

- provision of an escalator link from the South Ticket Hall to the National Rail station.
- building a link from the North Ticket Hall underneath Victoria Street to come to surface on the south side of Victoria Street.

Escalator Link

17.2.3 LUL has considered an option to put escalators between the South Ticket Hall and mainline station, but have not found a workable solution because of space constraints.

Link Under Victoria Street

17.2.4 A link under Victoria Street would require a new passage over the District and Circle lines, a tunnel under Victoria Street and a set of steps up to Victoria Street (south side). The positioning of stairs would be difficult given the adjacent road crossings, utilities, sewers and the buildings that overhang Victoria Street in this location. There are street crossings nearby which give broadly a similar level of convenience as an underpass. The likely costs and risks were judged to outweigh the benefits to users.

17.3 Ongoing Consultation

17.3.1 Discussions are ongoing with all the main stakeholders for VSU e.g. Land Securities, the owners of the Victoria Palace Theatre, Network Rail, Westminster City Council, Victoria Interchange Group/Cathedral Area Residents Group and the relevant utility companies.

17.3.2 LUL will continue to work with objectors and other stakeholders to address their concerns as far as is reasonably practicable.

- 17.3.3 It is the intention of LUL to set up a community liaison group made up of representatives from the local authority, the project team, the contractor, local residents and businesses. This would provide residents with an opportunity to raise concerns and comment on the details of the construction process including the CoCP part B and section 61 applications.
- 17.3.4 Consultation and communication with stakeholders will continue whilst the project seeks authorisation and throughout construction.

18. Funding & Approval

- 18.1 The TfL Board has approved the VSU project budget up to 2009/10 to a total sum of £124m up to that date.
- 18.2 On 6 February 2008 the Department of Transport confirmed TfL's total funding of £39 billion until 2017/18, £33 billion to be paid as grant funding with up to a further £6 billion of borrowing by TfL.
- 18.3 As part of TfL's Business Plan for 2009/10 LUL has submitted a current budget proposition for its capital programme that has £591m (outturn prices) for VSU from 2009/10 to project completion. This plan has been accepted by TfL, pending TfL Board approval, as a core element in the balanced TfL plan.
- 18.4 On 27 June 2007 the TfL Board formally endorsed the TWAO application. It was further endorsed by the Mayor of London in July 2007.
- 18.5 In the light of the 10 year funding package for TfL and the project endorsement signalled on 27 June 2007, LUL is confident that funding will be available to implement the scheme. I therefore conclude in relation to Statement of Matters 10, that the proposals are reasonably capable of attracting the necessary funding.

19. Response to Objectors

19.1 Land Securities (Obj 3)

19.1.1 The Land Securities' Statement of Case argues that the business case allowance for acquisition of land and rights over land of £66.8m is understated. This issue is dealt with in the evidence of Mr. Colin Smith.

19.1.2 Their Statement of Case states that LUL could achieve the main objectives of the VSU by choosing an alternative option for the route of the Paid Area Link. The main reasons for choosing the route under Allington Street are dealt with in the proof of Mr. Alan Finch (LUL. P3).

19.1.3 It would not be against the interests of the travelling public to delay the implementation of the VSU scheme as this would continue the unsatisfactory delay and severe congestion experienced today, a problem which will worsen with rising demand. Further it would defer the benefits worth over £35 million annually.

19.2 Victoria Palace Limited (Obj 21)

19.2.1 The Statement of Case submitted by the owners of the Victoria Palace Theatre questions whether the VSU scheme "is the only one which can properly satisfy such need as is shown to exist" (paragraph 11).

19.2.2 London Underground has examined a wide range of options for developing Victoria Station. The key piece of infrastructure that potentially impacts the VPT is the Paid Area Link. This link allows passengers from the National Rail station and south ticket hall to access the Victoria Line via the new north end escalators. This route is necessary in the peaks when the existing down escalators are full and the intermediate concourse becomes

full. The exact position of the route and the reasons for it being proposed to be located under Allington Street is dealt with in the proof of Mr. Alan Finch.

19.3 Victoria Interchange Group (Obj 12)

19.3.1 The Statement of Case of the Victoria Interchange Group looks for reassurance that commuters will 'volunteer' to use the Paid Area Link (PAL) to access the northern end of the Victoria Line platforms.

19.3.2 Passengers will use, or learn to use, the PAL as it would enable them to keep moving and get to the quieter end of the platforms and possibly get a seat on the train. However, at the busiest times staff would be able to avoid closing the station by actively marshalling passengers to use the PAL. The PAL is an important element in terms of the objective of increasing capacity.

19.4 Cathedral Area Residents Group (CARG) (Obj 10)

19.4.1 The adequacy of consultation with local residents has been questioned by a CARG. LUL does not agree with this assertion:

- All residents in the consultation area received invitations to public exhibitions in May & July 2007 with contact details for further information. Other local residents group outside the consultation area, including Ashley Gardens Residents Association, received invitations to the exhibitions. The main residents associations representing many of the residents' views and concerns also received an offer of a meeting.
- An initial meeting was held in November 2007 with representatives from the Evelyn Mansions Residents Association (residential property close to worksites) to explain the impact of the scheme. A further meeting was held in April

2008 to discuss how, where practicable, LUL could meet their concerns.

- LUL met with the Cathedral Area Residents Group and Victoria Interchange Group in early April 2008 with five further meetings held during May – July 2008 to discuss noise, dust and construction traffic in more detail.

19.5. The project team also met representatives for the owners of the Apollo Theatre in June 2008 to discuss their objection and an agreement is being developed which LUL considers ought to address their concerns.

19.5.1 London Travel Watch

19.5.1.1 London Travelwatch has written to support the Scheme in a letter dated 13th August 2008 in respect of the scheme modifications, they suggest that consideration be given to passive provision of a ticket office in the North Ticket Hall.

19.5.1.2 Deletion of the ticket office in the North Ticket Hall will save considerable cost (see evidence of Mr. Brian Bell LUL P.2) with virtually no impact on customers. LUL have said that it is possible to make space for a small travel information window if necessary. However, within the proposed design there would not be space for a ticket office window with all the necessary ancillary support that a ticket office needs.

Select Service Partner Limited (Obj 45)

19.6 Service Select Partner Limited questions the availability of funding beyond 2010. This issue is considered in Section 18 and LUL believes it amply satisfies the tests set out in Circular 6/04.

20 Conclusions

- 20.1 My evidence to the Inquiry covers the overall case for the VSU scheme and in detail the transport and operational impacts of the scheme.
- 20.2 My conclusions are that the Victoria Station Upgrade will largely remove the congestion related delay currently experienced and considerably shorten the journeys of passengers coming from the north and east of the station. It will allow step free access from street to platform to those mobility impaired and encumbered. The design of the station will allow for long term growth in usage and thereby support Victoria as a key employment, commercial and administrative centre and as a strategic transport interchange.
- 20.3 The project in its construction phase will have local highway, train service closure and noise and vibration effects which will be kept as low as practicable. The project also has land take needs which have been kept to a minimum compatible with sound engineering and with developments known at the time of design. The transport benefits and project costs including the cost of land have been included in an overall project appraisal which shows a strong benefit to cost ratio of 4.4 to 1.
- 20.4 Overall, I consider the scheme to be a very worthwhile public investment to improve transport at a highly congested location. It would support the continued development of this important area of London and there is a compelling case in the public interest for acquiring the land necessary to implement the scheme.

21. Witness Declaration

- 21.1 I hereby declare as follows:
- This proof of evidence includes all facts which I regard as being relevant to the opinions that I have expressed and that the inquiry's

attention has been drawn to any matter which would affect the validity of that opinion;

- I believe the facts that I have stated in this proof of evidence are true and that the opinions I have expressed are correct; and
- I understand my duty to the inquiry to help it with matters within my expertise and I have complied with that duty.