Thameslink 2000
Environmental Statement

Alternatives report
Prepared by Temple Environmental Consultants Ltd for Network Rail Infrastructure Limited
Thameslink 2000 Environmental Statement:

Alternatives

Principal author: Matt Dormer

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Authorised by: Mark Southwood

Date 14th June 2004

Main contributors:

Mark Southwood
Mervyn Dunwoody
Eugene Cotterell
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1.0 Introduction

1.1. Purpose of the report

1.1.1 Proposals to enhance the Thameslink service have been under consideration since shortly after the service opened in 1988. This report describes the main alternatives considered during the development of the Thameslink 2000 scheme. The majority of these alternatives have already been reported in Environmental Statements (ES) that accompanied the 1997 and 1999 applications under the Transport and Works Act (TWA). This report summarises the alternatives previously reported and also describes further options that have been examined since the 1999 TWA application and the reasons why these options were discarded. References in this report to the 'TWA Inquiry' mean the TWA Inquiry held in 2000-2001 into the consolidated 1997 and 1999 TWA application. References to the ES refer to the 2004 Environmental Statement unless otherwise indicated.

1.1.2 In relation to the alternative scenarios presented to the TWA Inquiry by third parties, the Inspector concluded in paragraph 44.3.87 of his report:

‘None of the matters raised cause me to differ from my conclusion …. that, on balance, the Thameslink 2000 proposals, including their effects on Borough Market, are acceptable by comparison to alternatives put forward in evidence.’

1.1.3 Where the Inspector has made comments or observations on specific alternatives, these have been included in the relevant section as appropriate.

1.1.4 Most of the alternatives considered have been rejected for non-environmental reasons. Where such options were impractical or there were other compelling reasons to reject the option, it was not considered necessary to carry out environmental studies. Where environmental studies were carried out as part of the decision making process, then the results and findings are reported. The report considers the main alternatives that were considered during the project design process.

1.1.5 Section 1.4 of the ES Main Report provides an overview of the development of the Thameslink 2000 project since 1990 and Section 2 of the ES Main Report describes the current proposals and the changes to the scheme compared to the 1999 scheme. In developing some aspects of the scheme since 1999, a number of alternatives have been considered, both to address specific deficiencies in the scheme as identified by the TWA Inquiry Inspector and as part of the design development process. In summary, these are:

i) at Blackfriars, alternatives to the proposed ‘Cathedral Entrance’ to the station on the north bank, the bridge roof, the solution to the widening of the bridge and the accommodation building, see Section 5.5 of this report;

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1 The term ‘Cathedral Entrance’ refers to the adopted design for the structure enclosing the combined LUL/Network Rail ticket hall at Blackfriars. A full description of this structure can be found in Section 2 of the Environmental Statement Main Report Inner Area.
At Borough Market, an alternative to the proposed solution to the re-instatement of the listed building at 16–26 Borough High Street\(^2\), see Section 6.6 of this report; and

At London Bridge, two alternatives were considered prior to the adoption of the scheme presented to the TWA Inquiry. Following the Inquiry, the consented ‘Masterplan’ scheme (a comprehensive re-development of the station) has been incorporated as part of Thameslink 2000, see Sections 7.5 of this report.

In addition, two further alternatives have been re-examined: the Elephant & Castle and Herne Hill option and the Thameslink Tunnel alternative, see Section 3.0.

1.2. Report structure

The remainder of this report is structured as follows:

- Section 2 summarises the development of alternative service patterns;
- Section 3 describes the development of alternative routes for Thameslink 2000;
- Section 4 describes the development of alternatives for Farringdon Station;
- Section 5 describes the development of alternatives for Blackfriars Station;
- Section 6 describes the development of alternatives for the route between Metropolitan Junction and London Bridge, including Borough Market;
- Section 7 describes the development of alternatives for London Bridge Station;
- Section 8 summarises the development of the signalling system since the TWA Inquiry;
- Section 9 describes the development of alternatives for stations and infrastructure in the outer areas; and
- Section 10 summarises the conclusions of the report.

1.3. Methodology

**Overview of EIA requirements**

- The regulations relating to projects requiring Environmental Impact Assessment\(^3\) (EIA) require:

  ‘An outline of the main alternatives studied by the applicant or appellant and an indication of the main reasons for his choice, taking into account the environmental effects.’

- Government guidance on Environmental Impact Assessment\(^4\) states:

  ‘….developers are now required to include in the environmental statement an outline of the main alternative approaches to the proposed development that they may have considered, and the

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\(^2\) Applications have also been made in respect of re-instatement proposals at 11–15 Borough High Street; 2–4 Bedale Street; and 7 Stoney Street. However, no alternatives were worked up in developing the proposals for these buildings.


main reasons for their choice. It is widely regarded as good practice to consider alternatives, as it results in a more robust application for planning permission. Also, the nature of certain developments and their location may make the consideration of alternatives a material consideration. Where alternatives are considered, the main ones must be outlined in the environmental statement.’

**Approach**

1.3.3 The appraisal of options considered four principal issues:

i) business implications, including passenger benefits;

ii) transportation issues such as integration and capacity requirements;

iii) engineering and operational factors (including safety considerations); and

iv) environmental issues.

1.3.4 In most cases, options were rejected on engineering and operational grounds and in each case the reason for rejection is identified. It should be recognised that, in assessing the environmental issues associated with each option, it is neither appropriate nor practicable to adopt the same level of appraisal as for the scheme itself.

1.3.5 The Thameslink 2000 Scoping and Methodology Report explains the criteria used to assess the significance of impacts in the main EIA. For the purpose of the appraisal of alternatives however, potential impacts were not assigned a threshold of significance since it was not possible to assess the alternatives with the same degree of rigour as for the EIA.

1.3.6 A similar approach has been adopted in respect of a number of other major proposals (for example the Channel Tunnel Rail Link) and is consistent with good practice in Environmental Impact Assessment of projects of this nature.

1.3.7 For the tunnelled alternative and the Herne Hill/ Elephant & Castle scheme, environmental effects (positive and negative) were identified using a structured environmental appraisal to enable a comparison to be made with the adopted scheme. In each case relevant information was gathered through:

i) desk-top appraisal

ii) site-visits; and

iii) relevant local authority Unitary Development Plans.

1.3.8 An evaluation was then made, based on professional judgement, and any key environmental concerns were identified. In some cases, the findings were also supported by specialist appraisals. A preference was then identified on a topic-by-topic basis with some explanation or justification and an overall environmental preference expressed.

1.3.9 In relation to the other alternatives discussed in this report, a simplified approach was taken akin to ‘commentary level’, where only the major environmental benefits or concerns were identified on the basis of a professional judgement.
2.0 Alternative service patterns

2.1 Development of the indicative service pattern

2.1.1 The indicative service pattern described in Section 2 of the ES Main Report remains unaltered from that assumed at the time of the 1999 Environmental Statement. This service pattern was devised by the SRA and agreed by Network Rail for the purposes of planning and assessing the project. However, the service pattern is not fixed. The eventual pattern of services will depend on the future commercial views of operators and on the views of the Strategic Rail Authority on how revenue support should be allocated to provide the best value from public funds.

2.1.2 During the development of the project since 1991, the proposed range of destinations offered by Thameslink 2000 has been re-assessed on a number of occasions and the indicative service pattern has changed accordingly.

2.1.3 Following submission of the 1997 TWA Order application, the scope of the project and the service assumptions were reviewed and revised in response to the objections received. In addition, a thorough review of the project was conducted during the renegotiation of a new agreement between the Secretary of State, Railtrack and London & Continental Railways to build the CTRL project.

2.1.4 The inclusion of the Horsham via Dorking route as part of the network proposed in 1997 would have resulted in a reduced level of service from stations on that route to Victoria. Westminster City Council’s objection to the scheme as then proposed in part related to this issue. Alternative southern destinations were considered which would not have an adverse effect on service levels to Victoria. The routes considered included:

i) Dartford, via Greenwich;

ii) Hastings, via Tunbridge Wells;

iii) Hayes;

iv) Caterham, via East Croydon and Purley;

v) Tattenham Corner, via East Croydon and Purley; and

vi) East Grinstead, via East Croydon and Oxted.

2.1.5 The alternative routes were assessed in terms of their suitability, integration with the core capacity requirements and capital investment implications. As all of the routes considered were along existing operational lines, the environmental impacts of the operation of Thameslink services on the alternative routes were considered to be similar to those of the existing services. This analysis concluded that East Grinstead route should be adopted in place of the Horsham via Dorking route. Environmental factors were not considered to be significant to the decision.
2.1.6 The introduction of the East Grinstead route resulted in the following additional stations being included in the 1999 TWA proposals:
   i) Sanderstead, Riddlesdown, Upper Warlingham, Woldingham, Oxted, Hurst Green, Lingfield, Dormans and East Grinstead.

2.1.7 The deletion of the Horsham via Dorking service resulted in the following stations being removed from the Thameslink 2000 programme of works:
   i) New Cross Gate, Forest Hill, Sydenham, Waddon, Wallington, Carshalton Beeches, Cheam, Ewell East, Dorking, Holmwood, Ockley and Warnham.

2.2. Thameslink enabling works

2.2.1 The structures that will accommodate the new St Pancras Midland Road station and the tunnels to its north that will link the Great Northern Line with the Thameslink tracks, are currently being built as part of the second phase of the CTRL project (CTRL Phase 2). These works are part of the Thameslink enabling works. During the period of uncertainty over the timing of CTRL Phase 2, alternative routes were considered to Cambridge, Hertford East and Stansted, via the Tottenham & Hampstead and Lea Valley lines, which would not have required these Thameslink enabling works. Inclusion of these routes would have required costly reconstruction of previously abandoned connections in the Kentish Town and Tottenham Hale areas, with associated electrification and considerable extra re-signalling. Abandonment of these Thameslink enabling works would also have required an upgrade of the existing King's Cross Thameslink Station, at substantial cost.

2.2.2 A Thameslink 2000 service to Heathrow, via the Dudding Hill route was also considered as an alternative in the event that the Thameslink enabling works did not proceed. This would have required a grade-separated junction at Cricklewood to provide a link to the Thameslink tracks and to avoid conflicts on the Midland Line at either West Hampstead or Carlton Road Junction.

2.2.3 Nothing in the review suggested that the alternative options considered were preferable to utilising the works being constructed as part of CTRL Phase 2. Therefore, with the decision to go ahead with the CTRL project, these options were put aside in favour of the preferred option to serve Great Northern destinations via the connecting tunnels.

2.3. Terminating services to Moorgate

2.3.1 The existing Thameslink branch to Moorgate will be closed and removed in order to enable the increased number of Thameslink 2000 trains to operate to the required schedule and to provide space for the extension of the southern end of the Thameslink platforms at Farringdon. This proposal was an integral part of the 1997 TWA application and continues to be a part of the current proposals.
2.3.2 In response to the Corporation of London’s objection to the closure of Moorgate, further detailed consideration was given prior to the submission of the 1999 TWA application to service patterns which would allow its retention. For all of the options considered, allowance was made for 4 trains per hour in each direction during the peak period to and from Moorgate. The number of through Thameslink pathways available during the peak period was reduced to 16 per hour in each direction (compared with 24 per hour in the proposed scheme) to allow adequate timings for train movements over the flat junction that would then need to be retained at Farringdon.

2.3.3 It was concluded that the reduced number of through train pathways that would be possible with 16 trains per hour would severely limit some of the important benefits of Thameslink 2000.

2.3.4 In addition, the retention of the junction with the Moorgate branch at Farringdon would remove the possibility of extending the existing Thameslink platforms southwards to accommodate 12-car trains. The option of extending the platforms to the north was examined but was rejected, see Section 4.4 of this report. The retention of the Moorgate branch would, therefore, be incompatible with 12-car operation and the additional capacity that it would provide. In respect of the Moorgate closure, the Inspector concluded (Inspector’s Report paragraph 45.4.3) that the benefits of the closure of the Moorgate branch outweigh the disadvantages.
3.0 Alternative routes

3.1. Introduction

3.1.1 Thameslink services currently operate through Farringdon and King’s Cross Thameslink Stations and also between Farringdon and Moorgate Stations. In addition, Thameslink services share tracks on the approaches to London Bridge Station with other operators’ services accessing Waterloo East, Cannon Street and Charing Cross Stations. There are a number of ‘flat’ junctions, where conflicting movements can give rise to performance and line capacity constraints. These occur at Farringdon, Blackfriars Junction (south of Blackfriars rail bridge), Metropolitan Junction (west of Borough Market), and Spa Road Junction (in Bermondsey).

3.1.2 The Central London section of the Thameslink network therefore acts as a bottleneck which constrains journey times and frequencies. This constraint can only be addressed by investing in new infrastructure to provide grade-separation (as at Bermondsey), dedicated track for Thameslink 2000 services, or better alignment of train pathways. Three principal features of the Thameslink 2000 project that remove two of these constraints are:

   i) The provision of two new elevated tracks through the Borough Market area between Metropolitan Junction and London Bridge Station in Southwark to enable a dedicated corridor to be provided for Thameslink 2000 services;

   ii) The construction of a dive-under at Bermondsey to carry the lines to Kent and Charing Cross beneath the tracks used for Thameslink services; and.

   iii) The transposition of through and terminating platforms at Blackfriars.

3.1.3 During development of the project, the Thameslink 2000 project team has considered a number of alternative options that would achieve the removal of these constraints but which would also avoid works in the Borough Market area. The main alternative options considered were:

   i) A route via Herne Hill and Elephant & Castle; and

   ii) A tunnel between Bermondsey and either King’s Cross/St Pancras, Farringdon Station or a point between the two.

3.1.4 These two main alternatives, illustrated in Figures 3.1 and 3.3 and described below, both offer a way of avoiding having to construct a new viaduct through the Borough Market area, although both are unworkable for a number of reasons.
3.2. Alternative routes through Elephant & Castle and Herne Hill

Alternatives considered 1989-1997

3.2.1 The possibility of routeing an enhanced Thameslink service through Elephant & Castle and Herne Hill was first put forward in the Central London Rail Study in 1989 (the ‘Thameslink Metro’ scheme), shortly after the Thameslink service opened in 1988.

3.2.2 However, British Rail decided not to progress the ‘Thameslink Metro’ scheme. It was concluded that additional tracks and a grade-separated junction would have been required at Herne Hill Station in order to prevent capacity constraints between Thameslink services and both Eurostar services from Waterloo International and Kent services from Victoria. It should be noted that the conflict identified at this time between an enhanced Thameslink service and Eurostar services was in the context of the Eurostar route to Waterloo International via the Channel Tunnel Route 1 (CTR1). The opening of St. Pancras International in 2007 is likely to significantly reduce the number of Eurostar services utilising CTR1. The feasibility of the Elephant & Castle/Herne Hill route, including the question as to whether the removal of conflict with Eurostar services improves the case for it, has been re-examined in preparing the 2004 Environmental Statement and the conclusions are reported in sections 3.2.33 – 3.2.34 below.

3.2.3 Four options were considered for grade-separation of the CTR1 and Thameslink 2000 tracks in the Herne Hill area. The preferred option in engineering and cost terms was to provide a new viaduct for Thameslink 2000 services to the east of the CTR1, with a flyover to Knights Hill Tunnel, as shown in Figure 3.2.

Reasons for Rejection

3.2.4 The London Bridge route was ultimately preferred to the Herne Hill route and was adopted under the 1997 TWA Order application, owing to the superior interchange options offered at London Bridge Station. Interchange opportunities included those with Cannon Street and Charing Cross services, the Jubilee Line Extension (which at that time had not yet been completed), the Northern Line and with bus services.

3.2.5 The London Bridge route also offered the following benefits: faster journey times to Croydon; addressed significantly greater passenger demand than the Herne Hill route; and, with the enlargement of the dive-under at Bermondsey, allowed Kent destinations to be served by Thameslink 2000 via London Bridge (see Section 3.4).

3.2.6 In addition, the new viaduct and flyover proposed at Herne Hill would have been built through a residential area. The assessment at that time identified land-take from the gardens of about 30 residential properties, resulting in the demolition of four houses and a number of commercial premises, including a petrol filling station. Although no formal assessment was carried out at the time, professional judgement indicated that this option would have resulted in significant adverse environmental effects which were significantly worse than the London Bridge route. An updated assessment of these impacts is summarised in sections 3.2.33 – 3.2.34 below and confirms the conclusions reached at that time.
Fig 3.1 Herne Hill and Elephant & Castle route
Fig 3.2 Herne Hill route – possible option
**Alternatives Reported to the TWA Inquiry**

3.2.7 In June 2000, just prior to the commencement of the TWA Inquiry the Secretary of State requested, in respect of the consideration of alternatives at the Inquiry, that consideration should be given to ‘the relative costs, benefits, and disadvantages of routeing most of the Thameslink services through the Elephant and Castle and Heme Hill … rather than through London Bridge,…’

3.2.8 It should be noted that the request to consider this alternative in greater detail post-dated the completion of the 1999 ES and so details of the scheme and the assessment of its environmental impact could not be included within that document.

3.2.9 In response to the Secretary of State’s request, Railtrack undertook a further assessment of the implications of routeing Thameslink services via Elephant & Castle, which resulted in four scenarios being developed, evaluated and reported to the Inquiry. The four scenarios considered were:

i) All Thameslink 2000 services diverted via Elephant & Castle;
ii) 24 trains per hour routed via Elephant & Castle but as a ‘metro style’ service;
iii) Provision of an increased level of the Thameslink 2000 services on the Elephant & Castle route with corresponding reductions on the London Bridge route; and
iv) Operation of additional services to terminate at Blackfriars.

3.2.10 The appraisal process employed to assess these scenarios comprised three stages: operational assessment, engineering assessment and environmental appraisal, as well as transportation and cost benefit assessment.

3.2.11 The following is a summary of these four scenarios together with the reasons for their rejection.

**Scenario 1**

3.2.12 This scenario involved running all the proposed 24 trains per hour (the maximum Thameslink 2000 service frequency through the core area) via the route through Elephant & Castle. This scenario included provision for interchange with London Underground services at Elephant & Castle, although the proposals did not include the more radical works that would be necessary to improve the interchange with other modes of transport, which it was assumed would be addressed as part of the various redevelopment proposals for the area. In addition, in order to provide similar interchange opportunities with JLE in the north of Southwark to those available at London Bridge, this scenario incorporated a new station at Bankside close to the new Southwark Jubilee Line Underground station. Suburban trains would have had a revised calling pattern, including stopping at a possible new station at Camberwell.

**Scenario 2**

3.2.13 This scenario also specified a 24 trains per hour service, but formed, in the main, a ‘metro-style’ service pattern south of Blackfriars (i.e. a high-frequency suburban service offering services into central London).
3.2.14 In this scenario there would have been significant changes in the number of trains passing through key parts of the network in the Lewisham area. In particular, the operational assessment carried out at that time suggested that the lines in the Lewisham Station area could have proved to be a bottleneck. More detailed timetabling work would have been necessary to determine whether the infrastructure could cope with revised service specifications. Some initial pre-feasibility work was undertaken to consider how additional capacity could be provided in the Lewisham area. However, it immediately became apparent that there would be significant environmental impacts and effects on adjoining property resulting from the provision of additional railway infrastructure. The railway geography is characterised by lines at different levels (Lewisham Station is above street level), by sharp curvature and by a number of closely-spaced junctions. In the absence of any clearly-defined outputs that would have identified where additional capacity would be needed, no outline design work was carried out.

3.2.15 In addition, for scenarios 1 and 2, grade separation of the conflicting routes in the Herne Hill area would have been required. As a consequence of the very substantial nature of these potential works, two sub-options for providing this grade separation were assessed.

**Dive-under sub-option (scenarios 1 and 2)**

3.2.16 This option would have taken the Thameslink 2000 route east of Herne Hill into a dive-under below the Victoria-West Dulwich lines and the Peckham Rye-Tulse Hill lines, below Croxted Road regaining the current rail level to the east of and parallel to the Peckham Rye-Tulse Hill lines.

3.2.17 Two new single bore tunnels would then have taken the Thameslink 2000 lines parallel to the existing Knights Hill Tunnel and on to Tulse Hill station.

**Fly-over sub-option (scenarios 1 and 2)**

3.2.18 This option would have taken the Thameslink 2000 route east of Herne Hill on to a flyover over the Victoria - West Dulwich lines and then down on to the existing alignment of the Peckham Rye-Tulse Hill line. The Peckham Rye-Tulse Hill line would have been diverted to the east through two new tunnels constructed parallel to the existing Knights Hill Tunnel. All lines would then have continued south to Tulse Hill station.

3.2.19 An operational assessment of these options showed that only the flyover option would deliver the required capacity. This option was therefore used in the analysis of Scenarios 1 and 2.

**Scenario 3**

3.2.20 The Thameslink 2000 service specification requires eighteen trains to be routed through London Bridge and six trains on the route through Elephant & Castle in the busiest hour. The third scenario involved changing this split to fourteen trains and ten trains respectively in the peak hour.

**Scenario 4**

3.2.21 A fourth scenario was reported to the Inquiry, comprising the operation of additional services to terminating platforms at Blackfriars.
Reasons for rejection

3.2.22 The appraisal presented to the TWA Inquiry in response to the Secretary of State’s request for the consideration of alternatives concluded that Scenario 1 would have required significant civil engineering works. In particular, it was concluded that works required to resolve the bottlenecks at Herne Hill and Tulse Hill would be substantial, requiring the demolition of 54 homes to make way for a dive-under scheme, or 87 homes for a flyover scheme, with a probable land take from a further 51 or 49 respectively (ignoring the loss of subsoil rights in connection to tunnelling). Businesses and schools would also have been affected and a large number of lockup garages demolished. The assessment undertaken identified more impacts to property than predicted in the 1991-1992 studies, reported in section 3.2.4 – 3.2.6, as a result of more detail being available and changes in the baseline environment being taken into account.

3.2.23 Providing a pattern of railway services approximating the Thameslink 2000 proposals would have introduced additional costs of about £270 million, but failing to serve London Bridge, one of the most important stations in the service pattern. Both construction and operational noise and vibration effects would have been more widespread and severe compared with the preferred scheme. It was concluded that the position would not improve were a ‘metro’ service to have been substituted for the ‘similar destinations’ service pattern (Scenario 2). No assessment was made of relative benefits for passengers served by the Thameslink 2000 services to either Elephant and Castle or London Bridge, although the latter will almost certainly be significantly greater. Although the proposed station at Bankside (under Scenario 1) would provide a connection to the Jubilee Line, a substantial amount of inconvenience and lost time would affect passengers wishing to use London Bridge Station. Without a station at Bankside, the choice would lie between using Elephant & Castle and Blackfriars. No convenient interchange with the Jubilee Line would be available although passengers could walk between Blackfriars (South) and Southwark Jubilee Line Station (a distance of approximately 800 metres).

3.2.24 On the basis of the expected pattern of works for Scenario 1, the benefit to cost ratio was calculated to be 0.97:1 equating to a negative present value of -£42 million. For the ‘metro’ type service (Scenario 2) the benefit/cost ratio was calculated to be 1.13:1. A division of services that retains a substantial proportion of the London Bridge services (Scenario 3) showed further improvements in the benefit/cost ratio at 1.2:1.

3.2.25 Scenario 2 would avoid the works at Norbury and vary the Herne Hill station works, but would introduce a requirement for platform extensions at Denmark Hill, Peckham Rye and Nunhead, plus an additional siding at Bellingham and, possibly, grade separation at Nunhead Junction. The time-scale for obtaining powers and construction would be unlikely to differ much from that for the principal Elephant & Castle alternative (scenario 1).

3.2.26 In relation to Scenario 3, the provision of additional line capacity through the London Bridge – Borough Market – Metropolitan Junction area would still be required with the revised 14/10 London Bridge/Elephant & Castle service split, as well as requiring all of the proposed Thameslink 2000 works between Blackfriars Junction and New Cross Gate and Tanners Hill (St John’s). No advantage over the adopted TWA scheme was therefore apparent.
3.2.27 An overall comparison of environmental implications between Scenarios 1-3 and the promoted scheme indicated that, whereas the Elephant & Castle alternatives are preferable in relation to archaeology and built heritage, the promoted Thameslink 2000 scheme is preferred in relation to its community, socio economic effects, noise and vibration effects and landscape, visual and ecological effects.

3.2.28 It was concluded that adoption of this alternative would affect the timescale for Thameslink 2000. Even if development work had started immediately, it would have been unlikely that the project could have been delivered without significant further delay, given that a further TWA Order would have been necessary.

3.2.29 In relation to Scenario 4, while there is physically room to provide additional terminating platforms at Blackfriars, there would be significant additional costs and impacts on the environment including adjacent property. The proposed design submitted to the TWA Inquiry for Blackfriars station would have required substantial reworking and a further EIA would have been required. In addition, because the most realistic options would put the terminating platform(s) closer to Blackfriars Road Bridge, the new station roof would intrude significantly more into St. Paul’s Heights. The Inquiry Inspector agreed with Railtrack’s assessment that this scenario was not a genuine alternative to Thameslink 2000 (Inspector’s Report paragraph 3.1.40).

3.2.30 One of the operational options considered to achieve Scenario 4 comprised running a shuttle service between Herne Hill and Blackfriars. This would have required provision of an additional crossover at Herne Hill to allow trains to start back towards Blackfriars and to gain access to the required line.

3.2.31 Capacity bottlenecks exist on the routes accessed via the Elephant & Castle route and, although no train service specification was developed for this scenario, the assessment concluded that it was likely that additional infrastructure would be required to provide additional capacity on the routes approaching Blackfriars. For these reasons, Scenario 4 was not taken forward.

3.2.32 In response to the matters raised by the Secretary of State, the consequences of avoiding undertaking works at Borough Market were evaluated. It was concluded that alternative works in the Elephant & Castle, Herne Hill and Tulse Hill areas would bring lower levels of benefit for passengers at greater cost, with considerably more property demolition being required. Passengers would not be able to access the London Bridge area as easily as at present. Changing the service pattern to serve suburban locations south of Blackfriars could offer improved benefits to users of the rail network in Southwark. However the alternative works would still be required, and the overall value for money would be lower than the TWA scheme.

Elephant & Castle/ Herne Hill re-evaluation (2004)

3.2.33 The feasibility of the Elephant & Castle/ Herne Hill route, and the question as to whether the removal of conflict with Eurostar services improves the case for it, has been re-appraised in preparing the 2004 Environmental Statement. This re-appraisal concluded that the works required to implement this alternative essentially remain unchanged. However, the following issues are now relevant:
i) There are now buildings on the proposed site for Bankside Station and additional development at Rosendale Primary School, Herne Hill, all of which would additionally need to be demolished.

ii) On completion of CTRL Phase 2 in 2007, up to 2 Eurostar paths per hour would become available for other services through Herne Hill. However, the re-scheduling of existing train services to facilitate some additional services in the Summer 2003 and Winter 2003/2004 timetables has already put additional pressure on the current infrastructure. The release of the Eurostar paths will reduce but not remove this pressure.

3.2.34 Given the additional buildings that would now require demolition, the environmental and community effects would be worse than identified in 2000. The re-appraisal therefore concluded that the original reasons for rejecting this alternative remain valid.

3.3. **Long tunnel from King’s Cross or Farringdon to Bermondsey**

3.3.1 The second main alternative route considered during the development of the project has been the proposal for a tunnel from either King’s Cross or Farringdon (or a point between) to Bermondsey, as an alternative to the existing tunnelled and surface route over that section. A sub-option via the City of London was also considered.

**Alternatives considered in 1992**

3.3.2 In 1992, the project team considered two routes for a tunnel from either King’s Cross or Farringdon to Bermondsey, as shown in Figure 3.3. For both options, the existing surface stations at Farringdon, City Thameslink and Blackfriars Stations would have continued to serve trains operating southwards through Elephant and Castle. There would, therefore, have been both sub-surface and surface stations at each of these locations, together with a new underground station at London Bridge.

3.3.3 In considering this alternative, the project team studied cost information from development work on other tunnelling projects in London at that time, notably Crossrail and the Channel Tunnel Rail Link, and made the following assumptions:

i) a deep tunnel would be required in order to pass beneath building foundations and other deep tunnels, such as those for the Jubilee Line Extension in the London Bridge area and the protected Crossrail route at Farringdon;

ii) two separate tunnels were assumed, each carrying a single track; and

iii) cross-linking passages would be required at regular intervals, together with two access and vent shafts between Bermondsey and London Bridge Station. (It was assumed that the underground stations would provide emergency access between King’s Cross and London Bridge surface stations.)
Fig 3.3 Tunnel alternatives
3.3.4 The main reason for the rejection of this alternative at that time was the high capital cost of the works. In comparison with the surface route, the long tunnel options showed an increase in capital cost as assessed at the time, of between £450m and £800m, with no significant increase in revenue or direct benefits. The long tunnel options were also below the threshold of economic viability set by the Government at the time.

Tunnelled alternatives considered since 1999

3.3.5 The conclusions summarised above on the tunnelled alternative, which were included within the 1997 ES were re-affirmed by Railtrack during the 2000/2001 TWA Inquiry.

3.3.6 However, the case for a tunnelled alternative was re-examined in 2003, taking into account further information on tunnelling derived from experience gained from the construction of schemes such as the Channel Tunnel Rail Link and the Jubilee Line Extension. The scheme assessed was similar in concept to that considered in 1992, although worked up to a greater level of detail in terms of engineering (the scheme was developed to a feasibility level), cost and environmental impact. The conclusions of this further study are summarised below.

Scheme description

3.3.7 The scheme assessed comprised a new tunnel from the existing Thameslink alignment at Clerkenwell to Bermondsey, with connections to the North Kent and Brighton Lines and including new sub-surface stations at Farringdon, New Bridge Street (serving both City Thameslink and Blackfriars) and London Bridge, as shown in Figure 3.3.

3.3.8 Coming from the south and east, the scheme includes branches from the South Eastern (Kent) Lines and the South Central (Sussex) Lines. These would have joined up before entering a new tunnel portal between the existing railway viaduct and Galleywall Road in Bermondsey. An emergency escape and ventilation shaft would have been required at Enid Street, between Bermondsey and London Bridge.

3.3.9 A new London Bridge Thameslink Station would have been constructed at a very low level below the concourse of the existing Network Rail station in order to avoid existing LUL tunnels and stations. The depth of the station at 50m below ground level would require four successive escalators to concourse level and three to the LUL station.

3.3.10 After London Bridge Station, the tunnels would follow the existing Thameslink viaduct remaining deep in order to avoid the LUL Jubilee line tunnels that follow the same horizontal alignment.

3.3.11 A second ventilation and emergency escape shaft would be required in the Great Suffolk Street area. The tunnel would then turn to the north before crossing under the Thames and entering a second new station (again 50 metres below ground level) serving both Blackfriars and City Thameslink Stations. Without requiring the demolition of a number of buildings, the only available location to build the station box would be beneath New Bridge Street. This Blackfriars & City low level station would be connected to the London Underground at Blackfriars and to both Blackfriars and City Thameslink Network Rail stations.
3.3.12 The tunnels would then rise northwards to a third low level station at Farringdon. Again, the route is highly constrained by the foundations of existing buildings and the new station would have to be located to the east of the existing station under Turnmill Street. This station would have interchange facilities with London Underground, Crossrail, and the existing Network Rail station. It would have to be located at 40m depth, to avoid Crossrail and have tunnelled connections to the other stations at Farringdon.

3.3.13 North of the new Farringdon low level station, the tunnel would rise at the 3% maximum permissible gradient to join the existing Thameslink route just to the south of the existing Kings Cross Thameslink Station. This route lies to the east of the existing Thameslink corridor and passes beneath and through a residential area. Substantial works, including the widening of the existing Thameslink tunnel and retained cutting and the construction of a new ramp structure would be required here to allow the two new lines to join to the existing tracks.

City of London sub-option

3.3.14 A sub-option for an alternative tunnel alignment via the City of London was also evaluated. The route of this sub-option would follow the tunnelled alternative route from Bermondsey to London Bridge Station, thereafter diverging from it west of the station, following the Cannon Street viaduct to the north of Southwark Cathedral and taking a long diagonal route towards the northwest underneath the Thames. A new low-level station built under Aldersgate Street would have been provided. The tunnel would have then turned west to rejoin the tunnelled alternative alignment at the Northern Portal. Figure 3.3 also shows the alignment of the City of London sub-option.

Reasons for rejection

3.3.15 Both tunnelled alternatives were rejected on operation, construction, cost and environmental grounds. In summary, the reasons for rejection were as follows:

i) It is unlikely that passengers would wish to travel down a number of escalators to a deep level station for interchange purposes. This would mean that the high level services would continue to carry the majority of interchanging passengers;

ii) The scheme would not be likely to reduce significantly overcrowding at London Bridge Station without incorporation of other works. It would make interchange between Thameslink services and those to Cannon Street and Charing Cross more difficult because of the greater interchange distances involved;

iii) Significant expenditure would still be required at London Bridge to improve the station for the Cannon Street, Charing Cross and terminating services, even with the two low level Thameslink platforms;

iv) This would be a technically demanding scheme, particularly the very deep station construction. A great deal of design development work would need to be carried out to confirm that construction and operation would meet with HSE and HMRI approval. There is a significant risk that during the detailed engineering of the scheme further problems would be encountered and that overcoming these would cause major time delay and cost increases;
v) Thameslink 2000 with the tunnelled alternative is more than twice as expensive as the present Thameslink 2000 scheme on a like-for-like basis, with no additional economic, operational or environmental benefit (taking into account the benefits of avoiding significant environmental effects at Borough Market with the environmental dis-benefits of the scheme). The costings have been independently verified and are based on CTRL and Crossrail costings. The costs also reflect the substantial risks and uncertainties at this feasibility stage and the inherent risks associated with developing and constructing a scheme of this type;

vi) The tunnelled alternative would take approximately 70 months to construct compared with 60 months for the proposed scheme (excluding enabling works);

vii) A substantial period (of up to 5 years) would be required in advance to progress the required Transport & Works Order;

viii) The location of the proposed Farringdon Low Level station relies on this work being carried out before construction of Crossrail commences and could result in delay to Crossrail, should that project be authorized. Construction of the Farringdon Low Level Station after Crossrail would have significant cost and programme implications;

ix) Construction of a low-level station at London Bridge would remove the need to upgrade the surface level station as part of the Thameslink 2000 programme and the passenger and local benefits of Masterplan would therefore not materialise; and

x) The environmental effects of the tunnel scheme would be considerably worse than the proposed scheme. Indeed, these effects are arguably so severe in their own right as to merit the rejection of scheme irrespective of the other reservations/disbenefits set out above. At Clerkenwell, the excavation of the widened cutting would necessitate the demolition of approximately 92 properties, many within Bloomsbury and New River Conservation Areas, including Clerkenwell Police Station, part of Clerkenwell Magistrates Court, a number of shops and open space. Seven listed buildings would require partial or total demolition. At Bermondsey, property in Galleywall Road and Bermondsey Trading Estates, Rotherhithe New Road, garages to the rear of Landmann House and warehouses between the railway viaducts east of Bolina Road would need to be demolished.

3.3.16 The environmental impacts of the City of London alternative route would be broadly similar to the tunnelled alternative, although there are some notable differences, as follows:

i) The scheme would include one less station and therefore would not offer the same level of passenger accessibility; and

ii) The additional ventilation shaft may cause additional temporary construction noise or permanent community impacts, depending on its location.
3.4. Alternatives to the four-track dive-under at Bermondsey

Bermondsey dive-under and New Cross Gate Flyover

3.4.1 The original proposals were for a two-track dive-under at Bermondsey. This would have carried the Kent-Charing Cross tracks through a concrete box structure beneath the Thameslink 2000 tracks, which would have joined the existing alignment via a new section of embankment. Additional grade-separation would have been required at New Cross Gate to allow terminating services from London Bridge (Low Level) to cross the tracks carrying the Thameslink 2000 services onto the Brighton main line. The project team considered a number of different options for a single track flyover at New Cross Gate during 1992-94.

3.4.2 Following an operational review in late 1996, the project team decided that the two-track dive-under could be enlarged to three tracks, as shown in Figure 3.4, in order to provide better routeing opportunities. The additional track would be used by Thameslink services from Kent. The location of the New Cross Gate flyover, which would still have been required, is shown in Figure 3.5.

Fig 3.4 Bermondsey dive-under
Reasons for rejection

3.4.3 The New Cross Gate flyover and three-track dive-under were both rejected in early 1997 and a decision made to expand the dive-under to four tracks. The addition of a fourth track to the dive-under at Bermondsey removed the need for the New Cross Gate flyover. This decision was taken on the grounds that it would concentrate all construction works on one site, thereby reducing the impact of multiple sites, reducing the number of possessions and the disruption to South Central services during construction. It would also remove potential interference between the New Cross Gate flyover, the East London Line, and its future development, near New Cross Gate Station.
Union Street fly-over

3.4.4 An alternative to a dive-under at Bermondsey was developed in mid 1996 as part of an operational review of the project. The proposal was for a flyover carrying two tracks for Thameslink 2000 services over the tracks into and out of Charing Cross. The flyover would have been located to the south of Blackfriars Junction on the spur to London Bridge, see Figure 3.6.

Fig 3.6 Union Street fly-over
3.4.5 Six options were examined for the alignment of the flyover. These were similar in location and, for the purposes of this report, are considered as one proposal. The flyover would have commenced to the east of Southwark Bridge Road, where a new bridge would be required. It would have continued on new viaduct to the south of the existing railway viaduct, rising at a steep gradient. Sweeping to the right to cross over the Charing Cross tracks close to Great Suffolk Street, it would then have descended to join the existing alignment at Blackfriars Junction.

**Reasons for rejection**

3.4.6 The alternative would have provided an alternative location to Bermondsey dive-under for grade separation of South Central, Thameslink and South Eastern services to and from Charing Cross. However South Eastern, South Central and Thameslink services would need to be combined on to one pair of tracks on the level east of London Bridge in order to equalise platform utilisation at London Bridge station. This would require a reduction in either the quantity of Charing Cross or Thameslink services to match the available track capacity, thus compromising one of the objectives of Thameslink 2000. In addition, construction of a grade separated junction at Bermondsey was also considered to be less disruptive than at Union Street.

3.5. **Other route alternatives**

3.5.1 In addition to the Herne Hill/Elephant & Castle and tunnelled alternative routes, the TWA Inquiry considered other alternative routes put forward by objectors to the 1999 TWA application which sought to avoid impacts at Borough Market: ‘RACPLAN’ and its derivative ‘CARAPLAN’. In summary, these were proposed as metro services routed through Elephant & Castle.

3.5.2 In relation to CARAPLAN, the Inspector concluded (paragraph 10.6.82):

   ‘It is my view that, on balance, the proposals, including their effects on Borough Market are acceptable by comparison to the alternatives examined in CARA’s evidence’.

3.5.3 A further option was considered in response to an objector to the 1999 scheme, involving the routeing of Thameslink 2000 to the north of Borough Market. This option was rejected given the disruption to Cannon Street services and the substantial additional infrastructure works that would be required.
4.0 Farringdon Station

4.1. Objectives at Farringdon Station

4.1.1 The project objectives at Farringdon Station are to:

i) extend the Thameslink platforms to accommodate 12-car operation;

ii) improve passenger access and facilities;

iii) facilitate 24 train per hour operation in each direction;

iv) accommodate the predicted growth in passenger numbers;

v) improve interchange with the Underground station; and

vi) provide passive provision for Crossrail works.

4.2. Alternatives considered up to 1997

The 1993 proposals

4.2.1 The Thameslink 2000 proposals for Farringdon Station developed in 1993 were based upon a feasibility study for a Thameslink 2000-only scheme. However, at that time a Crossrail station was also proposed at Farringdon, which was expected to be constructed before the Thameslink 2000 station. As a result, the Thameslink 2000 proposals showed the minimum requirements thought to be necessary at the time for the construction of 12-car Thameslink platforms, see Figure 4.1.

4.2.2 The south-bound platform would be extended by 80 metres southwards, and the Moorgate branch closed. In order to provide sufficient platform width, the bridge supporting Cowcross Street and Nos. 54 to 57 Cowcross Street would be replaced. As a result, the western end of the listed terrace of shops at Nos. 54 to 60 Cowcross Street (Nos. 54 to 56 and part of No. 57) would be demolished. This terrace is listed, Grade II, for its group value with other nearby listed buildings. The existing London Underground Limited station at Farringdon would have been used, as at present, by Thameslink passengers entering or exiting Farringdon Station.

Reasons for rejection

4.2.3 The reasons for the rejection of the 1993 proposals were operational. Subsequent passenger flow studies have indicated that additional passenger facilities would be required to service the Thameslink 2000 platforms. This would require the construction of a new Thameslink 2000 station entrance and booking hall to the south of Cowcross Street, together with new access routes to the Thameslink 2000 platforms. It was further demonstrated that the listed terrace was unsuitable for conversion to accommodate the new entrance and booking hall because of its layout and its condition. In order to obtain sufficient room for the new facilities, a longer section of the listed terrace, from No. 54 to 58 Cowcross Street would need to be demolished. It was further decided that the retention of the remaining short section of the listed terrace (Nos. 59 and 60 Cowcross Street) was not a viable option, and that taking into account the overall urban fabric of the street, the whole block would be demolished and replaced. The replacement
building would accommodate the station entrance and booking hall, together with some retail space, and would have a similar height and form to the existing building.

**Fig 4.1 1993 Proposals – Farringdon Station alternative without southern concourse**

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![Diagram showing the proposed layout of Farringdon Station alternative without southern concourse](image)

- **Red**: Buildings to be demolished (34-56 and part of 57 Cowcross Street)
- **Blue**: Platform extensions
Extending platforms to the north

4.2.4 The alternative of extending the platforms to the north was considered by the project during the development of the Farringdon proposals, see Figure 4.2. This alternative would avoid the need to reconstruct the bridge and to demolish Nos. 54 to 60 Cowcross Street. It would also remove the need to build platforms to the south that would conflict with the Moorgate branch.

Fig 4.2 1993 Proposals – Farringdon Station alternative extension of platforms to the north
4.2.5 The railway descends at a steep gradient (of about 1 in 27) to the north of the station to pass beneath the London Underground lines. The construction of platforms at this gradient would exceed Health and Safety Executive standards then applicable (and would not comply with current Railway Group Standards). In order to meet these standards, extensive vertical and horizontal track realignment would be required for both the Thameslink and London Underground lines. Such remodelling would require new bridges, cuttings and tunnels to be constructed within a congested urban area. For this reason, the project team considered this alternative to be impracticable.

4.3. The 1997 Scheme

4.3.1 The 1997 Farringdon scheme is illustrated on Figures 4.3 and 4.4. Both Thameslink platforms were to be extended to the south, the Moorgate line was to be closed and provision made for a new Thameslink 2000 station concourse and booking hall to provide additional passenger capacity. These were required because the existing station concourse and booking hall do not have sufficient capacity to accommodate the forecast level of passenger use. A new concourse and ticket hall were proposed on the south side of Cowcross Street. The scheme also made passive provision for a future interchange with Crossrail, should that scheme proceed.

4.3.2 Demolition of part of the listed terrace at Nos 54 to 58 Cowcross Street was required as a consequence of the need to reconstruct the Cowcross Street bridge which supports it to permit southward extension of the Thameslink platforms. It would also have provided the site for the new ticket hall. The retention of the remainder of the listed terrace (Nos. 59 and 60 Cowcross Street) was not a viable option and, taking into account the overall urban fabric of the street, it was proposed that the whole block would be demolished and reinstated with a building in keeping with the local area. The replacement building would accommodate the new station entrance and booking hall, together with some retail space, and would have similar height and form to the existing listed building.

Reasons for rejection

4.3.3 The responses received to the 1997 scheme included objections from London Underground Limited and the Corporation of London. In addition, HMRI had concerns about the general quality of the platform environment for both passengers and train drivers at the south end of the northbound platform, which would have been on a curve.

4.3.4 LUL were concerned about the increased number of passengers expected to interchange with their services and requested improvements to passenger interchange facilities to cope with the numbers predicted. The Corporation of London objected to the closure of the Moorgate branch line.

4.3.5 Furthermore, whilst the 1997 design made provision for the increased numbers of Thameslink passengers predicted, it did not sufficiently address the issue of access for interchanging passengers. As a result, the 1997 scheme was not progressed, and new proposals were developed.
Fig 4.3 Farringdon Station – 1997 scheme - plan
Fig 4.4 Farringdon Station – 1997 scheme – sections
4.4. **Alternative schemes considered 1997-1999**

4.4.1 In order to address the concerns of LUL, HMRI and others, a number of alternative schemes were developed between 1997 and 1999, as follows:

i) the North Concourse Alternative;

ii) the Enhanced Stage D Plus Alternative;

iii) the South East Alternative;

iv) the Parallel Option;

v) the SDr1 Option (which is now the proposed design); and

vi) the SDr2 Option.

4.4.2 For all of these alternatives, with the exception of the North Concourse alternative, the extension of the platforms for 12-car operation was southward, which would require the closure of the Moorgate branch line. For all alternatives, passive provision was also made for a future Crossrail station entrance.

4.4.3 The SDr1 Option became the scheme submitted as part of the 1999 TWA application. The design was subsequently developed during the Inquiry and planning applications made in October 2000 reflecting the changes. The revisions to the design reflected in the revised planning applications included the roof structure, the footbridge between the platforms and station accommodation. The five alternatives considered prior to the submission of the 1999 TWA application are described in the following sections.

**The north concourse alternative**

4.4.4 In the North Concourse Alternative, the Thameslink platforms would be extended to the north. Although the Moorgate branch line could physically remain open, the proposed service pattern of 24 trains per hour in each direction would be compromised by the constraint of the flat junction south of Farringdon if a Moorgate service was retained.

4.4.5 A new concourse would have been provided above both the LUL and Thameslink tracks at the north end of the existing train shed, see Figure 4.5. It would have been a single entrance from Turnmill Street, which would have served both LUL and Thameslink passengers, with access to all platforms via stairs and lifts. The concourse would have been a low single-storey building.

4.4.6 The brick retaining wall alongside Turnmill Street would be rebuilt further back to allow the LUL tracks to be realigned to make room for the new Thameslink platforms, which would have been extended northwards at a steep gradient under the Clerkenwell Road bridge. HMRI had additional concerns about the steep gradient on these northern Thameslink platform extensions.

4.4.7 Extension of the Thameslink platforms to the north would also remove the need for reconstruction of the Cowcross Street Bridge and the loss of the listed buildings at Nos 54 to 60 Cowcross Street. Turnmill Street would have been narrowed to one lane locally at the North Concourse entrance and would be made one-way northbound, Cowcross Street would have remained open to traffic at the existing LUL station entrance and the access ramp to the Lincoln Place underground car-park would be removed and replaced by a car lift.
Fig 4.5 Farringdon Station – north concourse alternative
4.4.8 The benefits of this scheme were that demolition of the listed buildings at Nos 54 to 60 Cowcross Street, which resulted in a significant environmental effect in the 1997 scheme, would not be required. Other environmental effects at the construction and operational stages would be similar to those of the 1997 scheme, although the opportunity of providing significant benefits to pedestrian amenity by closing Cowcross Street to traffic would have been lost.

**Reasons for rejection**

4.4.9 The retention of the Moorgate branch line would restrict the number of destinations to be served, both to the north and south of the Thames and the Thameslink platform extensions would be at a severe gradient. In addition, the constraints of the site compromise the ability to create sufficient circulation and standing space in the most appropriate part of the station. This would result in, amongst other things, an insufficient level of capacity adjacent to the new staircases. There would also be substantial land-take from, and disruption to, Lincoln Place.

4.4.10 It was also considered that this alternative might also have compromised the potential for making modifications to improve the future Crossrail interchange, as then envisaged.

**The enhanced stage D plus alternative**

4.4.11 In the Enhanced Stage D Plus Alternative, the locations of the tracks and platforms would be broadly similar to those proposed in 1997, but the arrangement of the stairs and lift on the southern end of the northbound Thameslink platform would be amended to improve the forward visibility for train drivers, see Figure 4.6. A northern concourse, with an entrance from Turnmill Street and access to all platforms, would be provided over the tracks to the north of the listed train shed. The stairs at the northern end of the north-bound Thameslink platform would be improved. There would be three station entrances: the existing entrance, the new entrance on the south side of Cowcross Street and the new entrance from Turnmill Street.

**Reasons for rejection**

4.4.12 The Enhanced Stage D Plus Alternative was rejected for operational reasons. Whilst there would be improved access and facilities for Thameslink passengers, the creation of a new north concourse, with an additional station entrance and new stairs to the LUL platforms, would attract more passengers to the northern ends of the LUL platforms. This would have led to an insufficient level of capacity on the platforms adjacent to the new stairs. This could only be removed by widening the LUL platforms, which would have required the demolition of the existing train shed wall.

4.4.13 The environmental impacts of the Enhanced Stage D Plus Alternative would be broadly similar to those of the 1997 scheme with the loss of the same buildings, including listed buildings. Therefore the alternative would offer no environmental advantages over the proposed scheme.
Fig 4.6 Farringdon Station – enhanced stage D plus alternative

[Diagram of Farringdon Station showing Lincoln Place and Turwhall Street with the note "NOT TO SCALE"]
The south-east alternative

4.4.14 The south-east alternative and the parallel option were developed to investigate possible solutions to accommodate higher levels of passengers, by removing the constraint represented by the existing station buildings.

4.4.15 In both cases, the existing station building, the train shed and the terrace opposite (Nos 54 to 60 Cowcross Street), all of which are listed, would be demolished. New commercial development would take place over the tracks, fronting onto Turnmill Street.

4.4.16 In the south-east alternative, the tracks and platforms would be rearranged, with the LUL platforms to the south of their existing locations and the Thameslink platforms extended both to the south and the north, see Figure 4.7. The Thameslink and LUL stations would each have an island platform. The Thameslink platforms would be accessed from three separate concourses with entrances from both sides of Cowcross Street and from Turnmill Street. The LUL platforms would be accessed from new entrances on the south side of Cowcross Street and the north side of Charterhouse Street. Cowcross Street would be pedestrianised between the two station entrances.

Reasons for rejection

4.4.17 The south-east alternative was rejected for cost, operational and environmental reasons. The LUL platforms would be on a sharp curve, which would raise operational safety objections. Given the location of the platforms, interchanging passengers between Thameslink and LUL services would converge on the Cowcross Street entrances at street level, which would result in an unacceptable level of crowding.

4.4.18 The listed LUL station building and train shed would be lost, in addition to the listed terrace at Nos 54-60 Cowcross Street lost in the 1997 scheme. This was considered to result in an additional significant adverse environmental effect.

The parallel option

4.4.19 The parallel option was a development of the south-east alternative, in which both the Thameslink and LUL platforms would be widened, but in the same approximate locations as in the 1997 scheme, see Figure 4.8. The Thameslink platforms would be extended southwards, as in the 1997 scheme. Additional space would be provided by demolishing the existing train shed and the rooms behind the train shed wall to the east of the existing LUL platforms. In addition, the brick retaining wall alongside Turnmill Street would be rebuilt further back to allow room for the widened Thameslink platforms. Two large concourses, one at each end of the LUL platforms, would be provided over the tracks, with access to all platforms. Entrances to the new station concourses would be from Cowcross Street and Turnmill Street. Three wide pedestrian bridges over the tracks would also assist in interchange movements.

Reasons for rejection

4.4.20 The parallel option was rejected on both cost and environmental grounds. The construction cost of this (and the south-east alternative) would be substantially more than for the proposed scheme. The listed LUL station building and train shed would be lost, in addition to the listed terrace at Nos 54 to 60 Cowcross Street lost in the 1997 scheme.
Fig 4.7 Farringdon Station – south east alternative
Fig 4.8 Farringdon Station – parallel option
The SDr2 option

4.4.21 The SDr2 option is a development of the 1997 scheme, in which the Thameslink and LUL platforms would be widened and the LUL platforms relocated northwards, see Figure 4.9. Extensive alterations to the listed train shed building would be required. The entire east wall would be demolished to provide space for the widened platforms and new stairs, and the cast iron columns on the island platform would be reconfigured. The existing train shed roof would be retained and would be supported on new columns and steel supports along its eastern side. In addition, the brick retaining wall alongside Turnmill Street would be rebuilt further back, to allow room for the relocated LUL platforms.

4.4.22 The SDr2 option would require the reconstruction of the Cowcross Street bridge and the demolition of the listed terrace at Nos 54 to 60 Cowcross Street. It would also require the demolition of properties on the west side of Turnmill Street.

Reasons for rejection

4.4.23 The SDr2 option was rejected for operational, cost and environmental reasons. The demolition of the east wall of the train shed, and the reconstruction of the brick retaining wall alongside Turnmill Street, required for the SDr2 option, is not required to cope with the forecast level of demand. It is not therefore part of the proposed scheme, which has less impact on cultural heritage. The SDr2 option would also be considerably more expensive than the proposed scheme and would take longer to construct, resulting in a longer period of potential disruption to rail services and disturbance to local residents and businesses.

4.5. Alternatives considered since 1999

4.5.1 As noted at the beginning of Section 4.0, revisions to the design at Farringdon were submitted in October 2000. The TWA design (which incorporates the SDr1 option referred to above, together with the October 2000 revisions are described in the ES Main Report (Inner Area). No further main alternatives have been considered for Farringdon since October 2000.
Fig 4.9 Farringdon Station – SDr2 option
5.0 Blackfriars Station

5.1. Objectives at Blackfriars Station

5.1.1 The project objectives at Blackfriars are to:

i) provide Thameslink platforms to accommodate 12-car operation and 24 trains per hour in each direction;

ii) reduce the number of conflicting train movements at Blackfriars Junction;

iii) provide platform capacity to cater for both existing and new services;

iv) provide full weather protection to passengers on platforms;

v) improve passenger access and facilities;

vi) accommodate the predicted growth in passenger numbers;

vii) provide a station entrance on the south bank of the River Thames; and

viii) improve interchange within the LUL station.

5.2. Alternatives considered up to 1997

Track layout

5.2.1 There is an at-grade conflict at Blackfriars Junction, immediately to the south of the station, which results in many through Thameslink services having to cross the paths of terminating services. It was proposed to remodel the track and platform layout at Blackfriars to provide two through platforms on the eastern side of the bridge and two terminating platforms on the west side, thus eliminating the need for terminating services to cross the path of Thameslink 2000 services. Throughout the development of the proposals at Blackfriars, a number of track layouts were considered.

5.2.2 A design considered in 1991 at an early stage of project development consisted of four through-tracks, as shown on Figure 5.1. This layout would have required an independent access to a new island platform and, since it did not utilise the piers of the former West Blackfriars & St. Paul’s railway bridge to the west (also known as the ‘409’ piers), would have resulted in narrow platforms. When further work was carried out on passenger flows in 1992, it was considered that the platform widths were insufficient.
Fig 5.1 Blackfriars Station – 4 track layout (1991)

5.2.3 The 1993 layout provided one terminating track, on the west side of the bridge, and two through tracks, as shown in Figure 5.2. This arrangement provided sufficient platform widths but only one terminating platform. As a result, only six of the existing nine terminating services operating out of Blackfriars Station during the peak hour, could be accommodated, with attendant operating risk.
5.2.4 In 1996, further consideration was given to the track arrangements in order to provide greater flexibility to accommodate the existing terminating services. As a result, the three-track scheme was rejected in favour of the four track scheme (two through tracks and two terminating tracks) proposed in 1997, which makes use of the first row of redundant piers to the former railway bridge to support the widened platforms and roof structure above. This allows the platforms to be wider than those originally proposed in 1991.
**Roof designs**

5.2.5 It was recognised that the improvement of Blackfriars Station to accommodate 12-car trains would require platforms to be extended across the whole length of the bridge.

5.2.6 The standards of weather protection at the existing Blackfriars Station are poor and so design studies were undertaken which examined various options to provide effective weather protection to the platforms with partial roof covering. The conclusion of these studies was that effective protection could not be provided without a roof over the whole platform environment.

5.2.7 Views of St Paul’s Cathedral from certain viewpoints are protected by the St Paul’s Heights Limits, which restrict the heights of proposed developments in the area. Throughout the development of the designs for Blackfriars Station, a number of alternatives for the roof were considered in order to reduce its potential intrusion into views of both St Paul’s and the River Thames. However, it was not possible to produce a roof design which did not infringe St Paul’s Heights to some degree.

5.2.8 The alternative roof designs considered prior to 1997 included a number of design and materials options. These culminated in an overall roof enclosure with a roof line of varying height using metal and glass cladding; and a roof design consisting of a flat glass roof approximately 10 metres above platform level, supported on lightweight steel trusses, in turn supported on the existing bridge piers and the columns of the former railway bridge. The roof structure included the provision of a high level pedestrian walkway linking the north and south banks of the river. The walkway was later removed in order to reduce the overall height of the roof.

**Entrance arrangements**

5.2.9 As part of the 1997 scheme a new station entrance and concourse with links to Hopton Street was to have been provided on the South Bank, where a section of the Riverside Walk would have been re-routed. A new station entrance and ticket hall would have been located in the arch currently occupied by the Riverside Walk. There would also have been a new station entrance on Blackfriars Passage, and an upgraded main concourse on the North Bank.

5.2.10 Different access arrangements were considered for both the north and south ends of the station as part of the process of developing the architectural design, as follows:

i) In 1993, a number of options for the southern entrance were proposed which culminated in a proposed location over the Lloyds Bank car park entrance off Hopton Street. The 1993 proposals were discarded following consultations in 1995 because of the proximity of the flats at Falcon Point.

ii) In 1996, two free-standing pedestrian access towers were proposed - one on the South Bank to the east of the railway bridge and one built in the river downstream of the first line of bridge piers near the North Bank. The free standing towers were rejected due to the omission of a public walkway within the roof structure for which they provided access. The walkway was removed in order to reduce the overall height of the roof.
5.3. The 1997 scheme

5.3.1 The main features of the 1997 proposals were (see Figures 5.3 and 5.4):

i) re-modelled track layout providing two through Thameslink tracks on the eastern side of the station and two terminating tracks on the western side;

ii) extended platforms along the whole length of the bridge;

iii) a new station concourse and accommodation, with an additional entrance on Blackfriars passage;

iv) a new footbridge over the LUL lines;

v) a new station entrance and ticket hall on the South Bank of the Thames, with links to Hopton Street and a diverted Riverside Walk;

vi) an upgraded main concourse;

vii) improved passenger circulation; and

viii) a roof across the entire length and width of the bridge, providing protection from the weather.

5.3.2 The most visible element of the proposal was the roof, which consisted of a horizontal glazed canopy at a height of approximately 10 metres above the platforms, which was intended to create a new 'landmark' building. The canopy was to be supported on steel trusses, which in turn were to be supported on steel cross-beams. On the eastern side, the cross-beams were to be supported on the piers of the existing railway bridge. On the western side, the cross-beams and outer platform were to be supported on the first set of piers of the former railway bridge.

5.3.3 Responses received to the 1997 proposals included objections from LUL, English Heritage, the Royal Fine Art Commission (the RFAC), the City of London, LB Southwark and local businesses, passengers and residents. Their comments focused on the following issues:

i) obstruction to views of St Paul’s Cathedral, particularly from Blackfriars Road Bridge;

ii) congestion arising from the degree of interchange provided between Thameslink 2000 and LUL services, taking into account the increased passenger numbers predicted;

iii) the amount of floor area taken from, and the disruption to No. 1 Puddle Dock (occupied by KPMG); and

iv) the number of terminating platforms to be provided.

Reasons for rejection

5.3.4 The 1997 scheme was not progressed for environmental and operational reasons, and a new design developed. It was considered that the degree of intrusion to views of St Paul’s from Blackfriars Road Bridge could be reduced, and that better interchange with LUL could be achieved with a new LUL station concourse, integrated with the new Thameslink station.
Fig 5.3 Blackfriars Station – 1997 scheme – plan
Fig 5.4 Blackfriars Station – 1997 scheme – elevation and section
5.4. Alternatives considered 1997-1999

5.4.1 A number of alternatives were examined between 1997 and 1999, as follows:

**Alternative track layouts**

5.4.2 Under the 1997 scheme, Railtrack proposed to remodel the track and platform layout to provide two through platforms on the east side of the bridge and two terminating platforms on the west side, thereby eliminating this conflict. This arrangement still applies in the present proposals. However, two alternative track layouts were examined.

**Six track alternatives**

5.4.3 Following submission of the 1997 scheme, the Corporation of London had concerns that the existing level of service to Blackfriars Station, which currently has three terminating platforms, could not be maintained with the two terminating platforms provided in the 1997 scheme. Accordingly, they proposed two alternatives with six tracks, four of which would serve terminating platforms, and two of which would be through tracks. These proposals were developed and costed by Railtrack.

5.4.4 Both alternatives used the redundant piers of the former railway bridge to extend the track-work to the west. In Option 1, the through tracks were the two central tracks, and in Option 2, the through tracks were the eastern-most tracks, see Figure 5.5.

**Reasons for rejection**

5.4.5 Both six-track options were rejected because of the lack of operational need, cost and environmental impact. The reduction in the number of terminating platforms would be compensated by the change in service pattern, as many of the current terminating services would become through Thameslink services. Railtrack concluded that the proposed four-track arrangement, with two through platforms serving up to 24 trains per hour in each direction, together with two terminating platforms, could provide for the anticipated future level of services to Blackfriars. The estimated cost of both six-track options would be substantially greater than that of the proposed four-track scheme. In addition, because both six-track alternatives would be closer to Blackfriars Road Bridge, the new station roof would result in a greater degree of obstruction to views of St Paul’s Cathedral than that of the proposed scheme.

**Alternative designs for the station roof**

5.4.6 Studies carried out before 1997 demonstrated the need for a roof over the platforms along the full length of the bridge. In part, the provision of weather protection for passengers will prevent crowding in wet weather causing delay in train departures and therefore compromising service frequency. In 1998, Railtrack examined ways in which the roof design could be improved to meet the concerns of English Heritage, the Royal Fine Art Commission (RFAC), the Corporation of London and the London Borough of Southwark. As part of this process, a number of alternative roof designs were considered and, in early 1999, the main options were presented to a consultation workshop attended by representatives of English Heritage. The objective of the workshop was to identify the option, or options, which both Railtrack and English Heritage would find acceptable.

The options considered were:

i) the Awning Alternative;
ii) the Extended Awning Alternative;

iii) the Truss Alternative;

iv) the Arch Alternative; and

v) the Column Alternative (which was taken forward as part of the 1999 TWA application).

5.4.7 In all cases, the track and platform layout would remain basically the same as that in the 1997 scheme (i.e. two terminating and two through Thameslink platforms and new platforms extending over the full length of the bridge).

5.4.8 All alternatives, other than the Extended Awning Alternative, would take support from one set of the 409 piers and it was agreed that the Column Alternative would be developed to become the proposed scheme that went forward with the 1999 TWA application. This scheme had a low level lightweight aluminium roof across the entire length and width of the railway bridge. The reasons for this are set out below. For all alternatives, a new concourse and ticket hall would be provided on the north bank to improve access and interchange with LUL, and a new concourse and ticket hall would be provided on the South Bank, requiring the realignment of part of the Riverside Walk. The rejected roof alternatives are described below.

**Awning alternative**

5.4.9 The Awning Alternative comprised a series of low canopies, each of which would be approximately 3.3 metres above platform level, see Figure 5.6. The tracks would be open to the weather and wind shields would be provided at platform level along each side of the bridge. The canopies would be lightweight, and would take support from the bridge, which would require strengthening. Signals and overhead power supply cables would be supported on separate gantries, which would be approximately 1 metre higher than the canopies.

**Extended awning alternative**

5.4.10 The Extended Awning Alternative was similar to the Awning Alternative with canopies of the same height above the platforms, and signals and overhead power supply cables on separate gantries. Waiting rooms would be provided at intervals along the platforms, see Figure 5.7, requiring wider platforms than for the Awning Alternative. The westernmost platform and tracks would take support from two sets of the piers of the former railway bridge.

**Truss alternative**

5.4.11 The Truss Alternative comprised tubular steel trusses spanning between the piers along the full length of both sides of the bridge, supporting shallower tubular steel cross-trusses which would span the width of the bridge, see Figure 5.8. These cross-trusses would carry a gently curving roof, approximately 6.8 metres above the platforms, and would also support the signals and overhead power supply.

**Arch alternative**

5.4.12 The Arch Alternative comprised a low roof across the full width of the bridge, at a height of 4.6 metres above the platforms. The roof would be provided with intermediate support from above by stays connected to a series of tubular steel bowstring arches along each side of the bridge, see Figure 5.9. The bowstring arches would, at their highest points, be approximately 10 metres above the platforms.
Fig 5.5 Blackfriars Station – six track options
Fig 5.6 Blackfriars Station – awning alternative
Fig 5.7 Blackfriars Station – extended awning alternative
Fig 5.8 Blackfriars Station – truss alternative
Fig 5.9 Blackfriars Station – arch alternative
5.4.13 **Column alternative**

This alternative was taken forward within the 1999 scheme, described in Section 5.5.3 and illustrated in Figure 5.10.

5.4.14 **Reasons for rejection**

All the alternative roof schemes except for the columns alternative were rejected because they would result in a much greater degree of intrusion into the view of St Paul's Cathedral from Blackfriars Road Bridge than the proposed scheme. For the Awning and Extended Awning Alternatives, the view would be affected by the gantries, signals and overhead power cables; and for the Truss and Arch Alternatives, by the roof structure itself.

5.4.15 Additionally, the Awning and Extended Awning Alternatives were rejected because they would provide poor weather protection to passengers, in comparison with the proposed scheme and the other alternatives.

5.4.16 **LUL concourse at Blackfriars Station**

In response to LUL’s objection to the lack of integration between the Thameslink and LUL stations, the northern concourse was redesigned in the 1999 scheme to include a new LUL station entrance and forecourt. The 1999 scheme provided for the demolition of the building at 167-179 Queen Victoria Street to provide space for the new LUL station concourse and integration with the proposed Thameslink station.

5.4.17 The new LUL station would require the provision of smoke ventilation and alternative designs, with natural and mechanically assisted ventilation, were considered. The naturally ventilated option would require a flue, approximately 15 metres high, and the mechanically ventilated option would require a plant enclosure building approximately 5 metres high, both to be located in a traffic island at the north end of Blackfriars Road Bridge. Following consultation with the Corporation of London and English Heritage, the naturally ventilated option was rejected on the grounds that the high flue would have had a greater impact on the townscape than the lower plant enclosure building of the mechanically ventilated option.

5.4.18 **Canopy over tracks north of Blackfriars Station**

A canopy, to provide weather protection to the tracks on the incline to the north of Blackfriars Station, was considered for operational reasons. However, this proposal was rejected as it would have resulted in an increase in visual intrusion into views along Queen Victoria Street.

5.5. **Alternatives considered since 1999**

5.5.1 In the light of the alternatives described above, a revised scheme was submitted with the 1999 TWA application. Following the Inquiry, four elements of the scheme at Blackfriars have been revised:

   i) The design of the north bank station entrance;

   ii) The solution to the requirement for bridge widening;

   iii) The bridge roof; and

   iv) The north bank station accommodation building.
5.5.2 In respect of the north bank station entrance, the changes to the 1999 scheme have been brought about in response to the recommendation of the TWA Inquiry Inspector that planning consent be refused pending the inclusion in the scheme of an appropriate structure to fill the gap left by the demolition of 167-179 Queen Victoria Street. The changes to the other three elements of the scheme have arisen as a result of further design development work and further consultation with key stakeholders such as LB Southwark, Corporation of London, KPMG, English Heritage and LUL. Alternative proposals were examined in each case and these alternatives are described below, together with the reasons for their rejection.

**Bridge roof**

**The 1999 scheme**

5.5.3 The design of the bridge roof submitted with the 1999 TWA application comprised a series of twisted ‘monocoque’ aluminium panels, spanning over the tracks and supported by a series of raked columns on either side, see Figure 5.10.

*Fig 5.10 Bridge roof TWA design*
‘Stage D’ design

5.5.4 Following the conclusion of the TWA Inquiry the design team developed the roof design to RIBA Stage D. However, the Stage D design (an ‘engineered with minimum change’ development of the TWA design) was found not to be optimal, for a number of reasons:

i) the arrangement of roof elements and glass infill sections, combined with the low height of the roof, would create high temperatures on the platforms during summer and would generate a ‘stroboscopic’ effect in bright sunlight which would potentially be distracting to drivers, and could result in signals being missed.

ii) The monocoque elements derive their structural strength from the outer skin. Damage to the skin would require the replacement of the entire monocoque element, which would in turn require the temporary closure of the station.

iii) It was found that the monocoque roof elements could not be adequately supported without a central column, which would reduce the transparency of the structure seen from either side and would, at the north end of the central platforms, form a pinch point where the through tracks curve northwards. The ‘transparent’ quality of the roof design was commended by the Inquiry Inspector and was a feature that it has been considered essential to maintain in design development.

iv) In addition to the central column, the lateral roof support would necessitate A-frame columns on both sides of the roof, together with interspaced vertical drainpipes, thus further reducing the ‘transparency’ of the roof.

v) The monocoque elements would represent a novel roof technology with a very high risk that in practice the desired quality of finish would be difficult to achieve consistently.

5.5.5 It was therefore concluded that alternative designs should be identified which addressed the potential for improvements to be made to the 1999 TWA concept, while retaining the overall design concept and those features which had led to its general endorsement in the Inquiry. It was recognised that, in addition to meeting the key user requirements of the bridge roof, it was essential that alternative designs also met or improved on the key design constraints applying to the roof design, in particular in relation to impact on St. Paul’s Heights restriction and the need to maintain a very high quality and transparent design. The alternatives investigated, illustrated in Figures 5.11 to 5.14, are described below.
Fig 5.11 Bridge roof option 1

Fig 5.12 Bridge roof option 2
Fig 5.13 Bridge roof option 3

Fig 5.14 Bridge roof option 4 – north lights (adopted scheme)
Option 1

5.5.6 This option comprised a roof with a similar twisted and wasted profile to the TWA design with alternating solid and transparent panels, See Figure 5.11. The solid panels were clad structural roof beams, as opposed to the stressed skin monocoque presented to the TWA Inquiry, while the transparent panels comprised ETFE plastic as an alternative infill material to the louvered glass proposed by the TWA and ‘Stage D’ designs. This option required a column per solid panel at each end as well as at mid span.

Option 2

5.5.7 This option comprised a series of alternating north and south lights replicating the TWA design side-on profile, see Figure 5.12. The primary roof structure comprised trusses located in the north and south lights, with a conventionally clad second structure spanning between the trusses. This option required a column per panel at each end as well as at mid span.

Option 3

5.5.8 This option comprised a series of canopies over the two side and central platforms, similar in concept to the alternative examined in 1998, see Figure 5.13. The canopies had a similar end shape to the panels proposed in the TWA design. The canopy roof structure would need to be continuous across the width of the bridge with gaps above the tracks to give the canopy impression.

Option 4

5.5.9 This option comprised a series of parabolic north light clad panels, each with the same end shape as the TWA design, see Figure 5.14. The primary structure comprised a parabolic truss located in the north lights with a conventionally clad secondary structure linking the top and bottom cords of the alternate trusses. The north lights would have been infilled by a series of horizontal and vertical louvers. This proposal spanned the full width of the bridge and addresses both the stroboscopic effect of the TWA design and platform temperature concerns.

Reasons for rejection of options 1, 2 and 3

5.5.10 Following a formal review of the alternatives investigated it was concluded that Option 4 (the north light option), somewhat modified to enhance its appearance by the introduction of a parabolic shape, best satisfied the key user requirements and was the most likely to meet the TWA commitments and design constraints (particularly in respect of transparency) and ultimately achieve planning approval. The added benefit of this option is the flexibility it provides in addressing critical design criteria i.e. ventilation, noise breakout, structural performance and overhead line equipment (OLE) compatibility.

5.5.11 The use of ETFE materials so close to the operational railway (Option 1) would be novel in a railway environment and concerns were expressed in relation to its proximity to the OLE. Central columns would still be required in order to provide the necessary structural support.

5.5.12 Option 2 was not considered aesthetically pleasing, would not remove the need for central columns and would still create a stroboscopic effect through the south lights.
5.5.13 In Option 3 the gaps between the canopies would reduce the effectiveness of the weatherproofing. This would result in the full platform width not being available to passengers during wet weather, causing overcrowding on protected areas of the platform and thus reducing the efficient operation of the station. A canopy on the central platforms would need to be supported by columns, which would add visual clutter and reduce the overall ‘transparency’ of the roof elements.

**Bridge widening**

5.5.14 The Blackfriars rail bridge (Bridge 410) is narrower than the proposed footprint of the new station and therefore needs to be widened to accommodate the Thameslink 2000 track and station layout.

**The 1999 scheme**

5.5.15 The key elements of the TWA proposal, see Figure 5.15, were to:

i) Locate an independent bridge, comprising slender tubular elements, off the existing redundant piers, Bridge 409, to support the roof and upstream platform structures;

ii) Provide an additional rib arch springing from the existing 409 piers to support the roof and downstream platform structures; and

iii) Widen the north and south abutments.

*Fig 5.15 Bridge widening TWA design*
5.5.16 Following the end of the Inquiry and further engineering design of the bridge widening proposal, concerns arose with the TWA design. In particular:

i) the behaviour of the new independent bridge was incompatible with Bridge 410 so that there would be a differential movement between the platform and track; and

ii) the piers and tubular elements lacked the strength to accommodate train derailment when ship impact effects were taken into account.

5.5.17 A revised design was therefore developed to RIBA Stage D which sought to address these deficiencies whilst adhering to the 1999 TWA overall design concept.

5.5.18 The ‘Stage D’ design is illustrated in Figure 5.16. It comprised a ‘one-bridge’ solution, compared to the 1999 TWA, which in structural terms comprised two bridges, mimicking the existing structure in behaviour and appearance. New reinforced concrete pier caps on the easternmost of the disused 409 piers above high water level were proposed, connecting with the existing 410 piers, carrying three additional rib arches in spans 2-5 on the western side. On the eastern side, one additional rib arch would be accommodated on spans 3-5 by dismantling the cladding and rebuilding the east ends of the piers to anchor the new bearings to the existing piers.

5.5.19 In the Stage D design, the 409 and 410 piers were initially proposed to be tied together from the top of the 409 piers to river bed level. Although an undertaking was given during the Inquiry by Railtrack to the Environment Agency not to construct works in the river, discussions in January 2003 indicated that the proposal to fill the gap between the easternmost 409 piers and 410 piers may well assist the river flow in the vicinity of the piers. This is subject to confirmation through a detailed hydraulic study, following which it is intended to agree a modification to the undertaking with the Environment Agency.

**Fig 5.16 Bridge widening ‘Stage D’ design**
5.5.20 Following completion of the Stage D design, the design team also undertook further rigorous analytical assessment of the risk of a ship striking the 409 or 410 piers. This assessment concluded that forces of 11 MN (head on) and 4 MN (lateral) would need to be resisted in the widened bridge design. Five options for widening the 410 bridge were developed in the light of this analysis, as follows, see Figures 5.17 to 5.21.

Fig 5.17 Bridge widening option I
Fig 5.18 Bridge widening option 2

Fig 5.19 Bridge widening option 3A (adopted scheme)
Fig 5.20 Bridge widening option 3B

Fig 5.21 Bridge widening option 4
Option 1

5.5.21 This option comprised a nominal stitch to the 410 pier above high water level and nominal piling down through the core of the 409 pier and is similar in concept to the Stage D proposal, see Figure 5.17.

Option 2

5.5.22 In this option it was proposed to cantilever the bridge widening off the 410 piers, see Figure 5.18. This would require substantial strengthening of the foundations to the 410 piers.

Option 3A (adopted scheme)

5.5.23 This option was an enhanced version of Option 1 with more stitching and piling of the 409 pier with small diameter piles, see Figure 5.19. This proposal met the ship impact load requirements and removed the need to do any permanent works in the river.

Option 3B

5.5.24 This option proposed stitching to the 410 pier as well as the construction of a reinforced concrete core in the 409 pier, using large diameter piles, see Figure 5.20. This option also removed the need to do any permanent works in the river. However, providing large diameter piles through the core was considered to pose a risk of the 409 piers being ruptured.

Option 4

5.5.25 This option proposed a full encasement of the easternmost 409 pier and a stitched connection to the 410 pier above low water level, see Figure 5.21. This proposal met the ship impact load requirements but required permanent works in the river.

Reasons for rejection

5.5.26 Option 1 did not provide the required pier strength. Option 2 was found to provide adequate ship impact loading but would have required significant piling of the 410 pier which was deemed to have unacceptable construction implications and could also compromise the stability of the bridge when the works are being undertaken. Although Option 3B met the ship impact load requirements it was considered too risky in terms of piling and the equipment needed for this in a river environment.

5.5.27 Following this assessment, options 3A and 4 were worked up further for a constructability and cost review. Both options could be built on the basis that work will be undertaken on one or two piers at a time, the latter approach providing programme advantages.

5.5.28 The following conclusions were drawn from a detailed constructability and cost review of options 3A and 4:

i) Construction of Option 3A is more straightforward than Option 4, which would require divers in the river resulting in risk to them and to the programme;

ii) The plant and material requirements for Option 3A are far less than that required for Option 4;

iii) Option 3A will take 4 months per pair of adjacent piers while Option 4 will take 6 months for each pair. There are 4 piers to be strengthened (2 sets of 2). The reasons for this increase in duration are the additional work content and complexity of the Option 4 design;
iv) Option 3A is cheaper to build than Option 4; and 

v) Option 4 requires permanent works in the river, whereas Option 3A does not.

5.5.29 Given these conclusions, option 3A was therefore taken forward and forms part of the current proposals at Blackfriars.

**North bank station entrance**

**The 1999 Scheme**

5.5.30 The design for the station entrance included within the 1999 TWA application is described in the main report of the 1999 Environmental Statement and shown in Figure 5.22. In summary, the station entrance comprised the following:

i) a crash deck transfer structure located at Network Rail platform level with supports taken down through LUL platform areas;

ii) a shared station entrance on the North Bank and a ticket hall below the crash deck;

iii) a shared secure ticket office suite located at ground and basement levels within the ticket hall;

iv) a single storey glazed screen façade; and

v) all station entrance retail units would be converted and provision made for any future commercial development above the crash deck.

**Fig 5.22 Station entrance TWA scheme**
5.5.31 The 1999 TWA Scheme for the station entrance was opposed by the Corporation of London and rejected by the 1999 TWA Inquiry Inspector on the grounds that it would leave an unacceptable gap in the important street frontage at the north end of Blackfriars Road Bridge. The Inspector concluded that the TWA Order should not be confirmed until *inter alia* an alternative scheme for the ‘missing tooth’ was approved.

5.5.32 Following the conclusion of the TWA Inquiry, work commenced to identify an alternative to the missing tooth that would be acceptable to the Corporation of London. Three options were considered and rejected prior to adoption of the ‘Cathedral Entrance’ proposals which now form part of the Thameslink 2000 scheme and which are described in the main report of the Environmental Statement. These options are shown in *Figure 5.23* and comprised a screen, air rights building and a hybrid screen/air-rights building.

*Fig 5.23 Blackfriars station entrance options*
Option 1: cathedral entrance (adopted scheme)

5.5.33 The ‘Cathedral Entrance’ option comprised a full height structure with a primarily glass façade to Queen Victoria Street enclosing the Network Rail/ LUL concourse. The space behind the glass façade was proposed to be essentially empty, thereby creating a dramatic entrance to the station not offered by alternatives based on a transfer structure at first floor level. The ‘Cathedral Entrance’ option was subsequently developed to include station accommodation and ventilation structures within the full height space and comprises the current proposal for re-instatement of 167-179 Queen Victoria Street.

Option 2: screen

5.5.34 This option would have comprised a substantially glazed screen rising from the single storey crash deck proposed in the 1999 TWA scheme, to the full height of the existing building. It was envisaged that the screen would be a temporary structure allowing for future commercial redevelopment over the new station entrance. Prior to any such future commercial development, it was envisaged that the screen would conceal a roof garden accessed from within the new station concourse. With a high quality design it was envisaged initially that the screen could overcome the Inspector’s objections to the ‘missing tooth’ and provide a replacement to the façade of 167-179 Queen Victoria Street.

Option 3: air-rights building

5.5.35 The Inspector disagreed with Railtrack’s proposal at the 1999 Inquiry that the ‘missing tooth’ be replaced at a future date with a commercial development, on the grounds that the gap in the Queen Victoria Street façade was a direct result of Thameslink 2000 proposals and so should be mitigated as part of the scheme. A second option therefore would be to replace 167-179 Queen Victoria Street with a new commercial development within the Thameslink 2000 programme. Again, such a scheme would be constructed from a single storey transfer structure forming the roof of the new ticket hall below. Informal consultation with the Corporation both during and after the Inquiry revealed that suitable treatment of the façade of such a building could address satisfactorily the importance of the site in townscape terms, and achieve an improvement over the present building. This option would avoid risk of future disruption to the station inherent in the screen option as a result of commercial redevelopment being taken forward after the station had opened.

Option 4: hybrid screen/ air-rights building

5.5.36 A third option would be to construct a single floor of station accommodation above the new ticket hall with a full height glazed façade above, the development of the remaining space above the floor of station accommodation remaining outside the Thameslink 2000 programme. This option is therefore a hybrid of Options 1 and 2.

Reasons for rejection of options 2, 3 and 4

5.5.37 The air-rights building option, while offering the opportunity to provide a high quality permanent façade to Queen Victoria Street and a solution acceptable in principle to the Corporation of London was found to be non-viable in commercial terms following a detailed financial appraisal. Construction of an air-rights building over a single-storey transfer structure would also make any changes to the concourse/entrance that might be required in the future difficult to incorporate by restricting the amount of space available at ground floor (concourse) level.
5.5.38 An air-rights building would also require space at ground floor level to be used for services cores, reducing space which could otherwise be used for retail uses, that would add to the attractiveness of the station for passengers and enhance the vitality of the station and that part of Queen Victoria Street. At the time these options were being evaluated it was recognised that ventilation of the LUL tunnels below would be required to prevent over-heating. While a solution had not then been identified it was recognised that more of the entrance footprint might be required to accommodate either a passive vent or mechanical solution, thereby further restricting space within the entrance.

5.5.39 In relation to Options 2 and 4, the project team considered that neither alternative would provide a high quality permanent replacement to the missing tooth that would adequately address the significant townscape impacts identified by the TWA Inspector. The screen and hybrid options also suffer the same disadvantages as the air-rights building in terms of the consequent restrictions on space and flexibility for future operational requirements below, but would also result in disruption to the station if and when commercial redevelopment above went ahead. Furthermore, the screen and roof garden would need to be maintained to a high standard, which would also comprise an on-going liability. Finally, the commercial element of the hybrid option would be even less viable than the air-rights building.

**Accommodation building**

**The 1999 TWA scheme**

5.5.40 In the 1999 TWA scheme, station accommodation was provided in a 3 storey block located on the west side of the station adjacent to Blackfriars Passage, see Figure 5.24. Following the Inquiry, it was found that this design could not provide adequate emergency escape to the top floor.

**Fig 5.24 Blackfriars Station accommodation building – TWA scheme (indicative drawing only)**
Stage D design

5.5.41 An alternative design for the station accommodation building was therefore proposed. This was based on a comprehensive review of station accommodation and electrical plant requirements and the re-planning of the station layout, see Figure 5.25. In summary, this design comprised a distinct, single rectilinear element which projected over Blackfriars Underpass and straddled Blackfriars Passage and both the Railtrack and LUL concourse areas before abutting No.1 Puddle Dock. This proposal was longer and projects further to the south over the roads than the 1999 TWA proposal but is lower than the station platform roof plane which spans across the river. The sightlines and viewing corridor from Blackfriars Road Bridge towards St. Paul’s are therefore improved. The building provides platform access via stairs and escalators from concourse level towards the south and pedestrian routes through to the Queen Victoria Street footbridge at the northern end. Some station accommodation is also provided at Network Rail platform level. The single storey basement level houses station plant.

Fig 5.25 Blackfriars Station accommodation building – stage D scheme (indicative drawing only)

Reasons for rejection

5.5.42 The Stage D design has been modified in the current proposals to shorten the length of the accommodation building to the south so that it is no longer cantilevered over Blackfriars Underpass.
6.0 Metropolitan Junction to London Bridge Station

6.1 Objectives at Borough Viaduct

6.1.1 The existing Thameslink service shares a double-track viaduct through the Borough Market area, between Metropolitan Junction and London Bridge Station with services terminating at Charing Cross. In order to remove this constraint, an additional section of double track for the Charing Cross services is proposed to the south of the existing line leaving Thameslink 2000 with exclusive use of the existing track.

6.1.2 The project objectives at Metropolitan Junction to London Bridge Station are:

i) to provide two new tracks for the Charing Cross services;

ii) to release two tracks for Thameslink services (the tracks currently serving Charing Cross); and

iii) to reduce the environmental impact on the surrounding area at construction and operational stages to a practicable minimum.

6.2 Alternatives considered up to 1997

Double deck viaduct

6.2.1 In 1992, as an alternative to the new two track viaduct proposed at the time, English Heritage and the London Borough of Southwark proposed double decking the existing viaduct through the Borough Market area. This proposal aimed to reduce the number of properties affected by the proposed scheme, since there would be no need for a new horizontal track alignment.

6.2.2 The double deck viaduct would have followed the route of the existing tracks from Borough High Street through the Borough Market area to Southwark Street Bridge, see Figure 6.1. The new tracks would have been carried on a viaduct immediately above the existing tracks. New bridges would have been required over Borough High Street and Southwark Street, together with approach ramps carried on viaducts over Railway Approach to the east, and over existing tracks to the west, requiring the reconstruction of the O’Meara Street Bridge.
Fig 6.1 Metropolitan Junction to London Bridge – double deck option

Alignment of proposed new tracks
6.2.3 The double deck option would not only have required the construction of a new viaduct over a longer length of track and above the existing track, but would also have required the strengthening of the existing viaduct. In addition, the supports to the new high-level viaduct would have needed to be constructed so as to withstand impact loads from trains on the existing lines beneath.

6.2.4 Disruption to the existing lines would have been severe, and it was anticipated that the Charing Cross service would have had to be closed for a significant period (possibly up to 12 months). The double deck option was rejected in 1992/3 due to the engineering and construction implications described above, together with increased construction costs estimated at £41 million at the time. The gradient (1 in 39) was also undesirable for both service reliability and traction.

**New viaduct close to the existing viaduct**

6.2.5 Proposals developed in the period up to 1993 involved a new route through the Borough Market area along an alignment close to, and to the south of, the existing lines and at the same level, see **Figure 6.2**.

**Fig 6.2 Metropolitan Junction to London Bridge – 1993 alignment**
6.2.6 The 1993 alignment would have resulted in the demolition of approximately the same number of buildings as the 1997 scheme but in different locations. It would have required an additional tight radius curve over Green Dragon Court, potentially resulting in additional noise from “wheel squeal”. It also would have resulted in the demolition of the Grade II listed Globe public house. There would also have been less light penetration between the existing and new viaducts over the Borough Market, Bedale Street and Green Dragon Court.

6.2.7 In addition, the 1993 alignment would have been more difficult to construct, due to the safety and operational implications of working in close proximity to the existing viaduct. This was a further reason for its rejection.

**High-level viaduct options**

6.2.8 Two ‘high-level’ options for the route through the Borough Market area were also considered at the same time as the double deck viaduct. These followed the line of the proposed scheme, but at a higher level, see Figure 6.3. Option 2 was slightly higher than Option 1 and cleared the Globe public house. Both options would have reduced the disruption to existing rail services during construction, in comparison with the double deck option.

**Fig 6.3 Metropolitan Junction to London Bridge – high level option**
6.2.9 These options would have reduced the closure period for the Charing Cross services during construction in comparison with the double deck option, but would have resulted in a greater number of properties being affected.

6.2.10 The high-level options and the double deck option were rejected for the same reason i.e. the increased construction cost in comparison with the viaduct currently proposed. Both high level options would have required new bridges over Southwark Street for all tracks and extensive reconstruction of the existing railway for the ramps to the west. These works would have increased the construction costs above those for the 1997 scheme.

6.2.11 Disruption to the existing lines would also have been more severe than in the 1997 scheme, although it would not have occurred for such a long period as for the double deck option. The high level options would also have resulted in unacceptably steep gradients for both service reliability and traction.

6.3. The 1997 scheme

6.3.1 In the 1997 scheme, the new line between Metropolitan Junction and London Bridge Station was to be carried on a series of viaducts and bridges to the rear of the Hop Exchange, through the Borough Market, over Borough High Street, over Railway Approach and Station Approach and into London Bridge Station.

6.3.2 An alignment was proposed to the south of the existing viaduct, which avoided demolition of the Globe public house. The new tracks were to be carried on a series of viaducts and bridges approximately 9 metres wide and 4-6 metres above street level.

Reasons for rejection

6.3.3 Responses to the 1997 scheme included objections from English Heritage, the Borough Market Trustees, Southwark Cathedral, the London Borough of Southwark and local businesses and residents. Their main concerns related to the loss of buildings of heritage value, some of which had recently been listed, and the visual impact of the proposed new bridge over Borough High Street.

6.4. The 1999 scheme

6.4.1 The 1999 scheme was developed in consultation with the bodies noted above and sought to address their concerns by making changes to the design. The main differences made were in the structural form, the use of slab track and the locations of columns. The adoption of slab track enabled the viaduct structure to be substantially narrower, although the alignment remained generally the same as for the 1997 scheme but with a minor readjustment near the Hop Exchange to reduce the extent of demolition needed to the Park Street houses. The columns were relocated to suit the street layout and to enable the reinstatement of more buildings.

6.4.2 The physical impact on nearby buildings was less than with the 1997 scheme, a substantial part of the Wheatsheaf public house could be retained and the two-storey buildings on Bedale Street could be reinstated.
6.4.3 The bridge over Borough High Street has been redesigned to reduce the visual impact in views along the street from the south and in views from London Bridge Street. The overall height and impact is reduced in comparison with the 1997 proposal.

6.4.4 The current proposals for the viaduct and trackwork remain unaltered from those described above.

6.5. **Reinstatement of the Borough Market roof**

6.5.1 Under the 1997 scheme, the new viaduct crossed the Borough Market roof between the existing viaduct and the buildings fronting onto Borough High Street. This would require the removal of a section of the Victorian roof which currently fronts on to Stoney Street, together with some 20th Century roof structures. This would leave two areas to be re-roofed on each side of the new viaduct.

6.5.2 In early 1999, options were explored for the refurbishment and re-use of two of the bays of the existing Victorian roof. The three options examined were:

i) **Option 1:** To relocate the bays to the Winchester Walk area of the market and provide a completely new replacement roof structure on each side of the new viaduct;

ii) **Option 2:** To reposition the bays within the replacement roof structure, with one bay fronting onto Stoney Street; and

iii) **Option 3:** To reposition the bays within the replacement roof structure, but not on the Stoney Street frontage.

6.5.3 These alternative locations are shown on Figure 6.4. Option 2 has been developed and forms a part of the proposed design. It was selected following consultations with the Borough Market Trustees and English Heritage, and taking into account their preferences. It is preferred because it retains the concept of the current streetscape.

6.5.4 This option does, however, require the additional demolition of a small section of the existing 20th Century market buildings on the Stoney Street frontage.

6.6. **Building demolitions**

6.6.1 The works at Borough Market proposed as part of the 1999 TWA scheme involved the demolition or partial demolition of a number of buildings, some listed, with a significant role in the setting and heritage of the Borough High Street Conservation Area. The Inquiry Inspector recommended that Railtrack obtain consent for and undertake as part of the Thameslink 2000 programme of work, the re-instatement of:

i) 16-26 Borough High Street (listed Grade II);

ii) 11-15 Borough High Street;

iii) 2-4 Bedale Street; and

iv) 7 Stoney Street
6.6.2 In developing the required re-instatement schemes, which are described in Section 2 of the ES Main Report (Vol. 1), an alternative was considered for the re-instatement of 16-26 Borough High Street, as follows:

**Fig 6.4 Borough Market – alternative locations for re-instated roof bays**

![Diagram showing three options for re-instatement of roof bays. Option 1, Option 2, and Option 3 are illustrated with labels for existing and relocation locations.](image-url)
‘Glass Box’ market extension building

6.6.3 This option, see Figure 6.5, was conceived during consultation with statutory and local bodies to respond to three objectives whilst providing a defined curtilage for the extended market facilities. In particular, it would:

i) provide a frontage for the Borough Market on to Borough High Street;

ii) make provision for a high street bookshop for Southwark Cathedral; and

iii) secure additional views from Borough High Street of the tower of Southwark Cathedral

Fig 6.5 16-26 Borough High Street alternative

6.6.4 The design met with general approval from consultees. However, the uses to which the structure could be put were effectively restricted to an extension to the existing Borough Market. Network Rail therefore has stated that it would not be taken forward through the planning process unless the Trustees of the Borough Market undertook to lease the land on which it would stand and fund its construction.

Reason for rejection

6.6.5 The Trustees of the Borough Market stated that they were not in a position to be able to guarantee to construct the market extension structure, as a result of which Network Rail has not pursued this option. Network Rail has, however, undertaken that, should the Trustees decide in due course that they wish to submit a planning application for the market extension structure, then Network Rail will not oppose such an application.
## 7.0 London Bridge Station

### 7.1 Objectives at London Bridge Station

#### 7.1.1 The project objectives at London Bridge Station are to:

i) maintain the existing service level to Charing Cross;

ii) provide three new through platforms for 12-car operation, to be served by the tracks from the new viaduct at Borough Market;

iii) improve passenger circulation and accommodate the predicted numbers of passengers;

iv) reorganize the interchange with the LUL station and LT buses, reflecting the changes that Thameslink 2000 will bring;

v) improve interchange between terminating and through services;

vi) allow for 18 Thameslink services per hour through the station.

#### 7.1.2 The existing station at London Bridge has nine terminating tracks, eight of which are accommodated in the train shed, and seven through tracks located at a higher level, six of which have a platform face (the other being a through line). The proposed new tracks between London Bridge Station and Metropolitan Junction will require changes to the track and platform arrangements and the increases in passenger numbers will require improvements to the through platforms and platform access arrangements.

### 7.2 The 1997 scheme

#### 7.2.1 In the 1997 scheme, the double track from Borough High Street, to be used by Charing Cross services, was continued into the station to serve both faces of a new island platform. The 1997 scheme included the relocation of station facilities, such as the ticket office, and the re-modelling of the existing main concourse.

#### 7.2.2 The main works proposed at London Bridge Station in 1997 were:

i) removal of existing terminating platform No 8;

ii) a new ticket office on the southern side of the main concourse;

iii) demolition of the buildings containing railway offices;

iv) new high-level through tracks carried partly on viaduct;

v) new platforms serving these high level tracks;

vi) a new retail arcade;

vii) extension and widening of the existing pedestrian overbridge; and

viii) redesign of the concourse roof and refurbishment of some of the canopies over the through platforms.
Reasons for rejection

7.2.3 The existing track layout at London Bridge Station includes a single track, known as the Charing Cross Up Passenger Loop, which runs to the south of the track at Platform 6. Whilst this track does not pass a platform, it provides additional capacity through the station for through services and empty train movements to Charing Cross Station.

7.2.4 The 1997 scheme omitted the Charing Cross Up Passenger Loop and provided only three tracks serving Charing Cross. Consequently, it was not possible to retain all the existing services to and from Charing Cross in the peak period. Westminster City Council objected to this reduction in service. The review of service patterns carried out in 1998 also established the value of maintaining the existing level of service to Charing Cross.

7.2.5 Railtrack therefore decided not to proceed with the 1997 scheme, and to review alternative options for meeting the project objectives at London Bridge Station.

7.3. Alternatives considered since 1997

7.3.1 The only way to retain the existing level of peak period services is to provide four tracks within the station serving Charing Cross. The additional track required to do this requires the demolition of the northern wall of the train shed, which is a Grade II listed structure. The need for this was discussed with and accepted by the London Borough of Southwark and English Heritage.

7.3.2 In late 1998, forecasts of passenger flows showed a substantial increase in the numbers of passengers predicted to be using the station. As a result, the platform widths and, critically, the widths of the access stairs to the platforms were increased above those proposed in 1997.

7.3.3 Once the decision had been taken that the Charing Cross service should be retained at its existing level, and acknowledging the requirement for wider platforms, the benefits of providing a new platform face to serve Charing Cross were reviewed. Three alternative layouts were considered, all of which could accommodate the requirements. These were:

i) Option 1: Additional track with a new platform face (which became the 1999 scheme);

ii) Option 2: Passing Loop South of Platform 8; and

iii) Option 3: Passing Loop between Platforms 6 and 7.

7.3.4 All of the options, including the scheme proposed in 1999, would have required the demolition of the northern wall of the train shed and the northern bay of the train shed roof, which was not required in the 1997 proposals.

Option I: additional track with a new platform face

7.3.5 Option 1 has been developed to become the proposed scheme and is described in the ES Main Report for the Inner Area. Options 2 and 3 are alternatives and are reported below.
Option 2: passing loop south of platform 8

7.3.6 In Option 2, the passing loop is added as an additional track to the south of Platform 8, see Figure 7.1. It does not pass a platform face, can only be used for through services or empty train movements (as now) and therefore does not facilitate passenger interchange.

Fig 7.1 London Bridge – option 2 alternative layout: passing loop south of platform 8
**Option 3: passing loop between platforms 6 and 7**

7.3.7 In Option 3, the passing loop is accommodated as an additional track between Platforms 6 and 7, see Figure 7.2. It is the central of three tracks between the platforms. As in Option 2, it does not pass a platform face, can only be used for through services or empty train movements and therefore does not facilitate passenger interchange.

Fig 7.2 London Bridge – option 3 alternative layout: passing loop between platforms 6 and 7
Reasons for rejection of options 2 and 3

7.3.8 Both Options 2 and 3 were rejected for operational reasons. Option 1, which became the scheme submitted to the TWA Inquiry includes a new platform face to serve the additional track, and offered a more flexible arrangement than either Option 2 or Option 3.

7.3.9 Environmental considerations were taken into account, but all three options would result in a similar level of environmental impact and therefore this was not critical to the decision-making process.

7.4. The 1999 scheme

7.4.1 The 1999 scheme was fundamentally similar to the 1997 scheme with respect to the platform and track arrangements, with the new (Charing Cross) tracks carried through the station at high level by means of a widened viaduct over Station Approach, a new slab supported by the existing brick arches east of Joiner Street and a new retaining wall east of Stainer Street. However, the tracks were proposed to be aligned further south than before in order to accommodate a third new platform and track in addition to the island platform proposed previously. The 1999 proposals for London Bridge are described further in the 1999 ES

7.5. Alternatives considered since 1999

7.5.1 Following the conclusion of the TWA Inquiry and in response to concerns expressed by the Inquiry Inspector, the SRA has requested Network Rail to proceed with development of Thameslink 2000 proposals on the basis of an alternative scheme for London Bridge to that presented to the TWA Inquiry. This alternative ‘Masterplan’ scheme, which was developed by Railtrack Major Stations separately from the Thameslink 2000 project, provides for the comprehensive redevelopment of London Bridge Station and has received planning and listed building consent from the LB Southwark. The ‘Masterplan’ scheme is described in Section 2 of the ES Main Report.
8.0 Signalling systems

8.1.1 There have been two principal changes to the design of the signalling system since the conclusion of the TWA Inquiry.

8.1.2 As a result of further design development work it has been established that 4-aspect signalling would not be feasible through the core area. This is because the low line speed through the core area and the close spacing of signals was found to give rise to unacceptable levels of reliability and, secondly, safety concerns relating to the operation of trains and the effect on drivers. As a result, a more widely spaced 3-aspect signalling has been adopted through the core area.

8.1.3 Proposals to utilise a computer-based signalling system known as Ebilock and its associated control system known as Ebicos, have been abandoned since the conclusion of the TWA Inquiry as a result of problems in meeting the UK-specific safety requirements for this European technology. The project has therefore reverted to a conventional SSI (solid state interlocking) technology, an associated IECC (Integrated Electronic Control Centre) and Automatic Route Setting (ARS) technology. This system will still allow the passage of 24 trains per hour during peak times.

8.1.4 Environmental impacts were not relevant to the decision to adopt these alternative systems.

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4-aspect signalling is a means of controlling trains on heavily used and high speed lines, using signals which display red, yellow, double yellow and green aspects to provide advanced warning of a requirement to stop, enabling trains to run more closely together without compromising safety.
9.0 Outer Area stations and infrastructure

9.1. Introduction
9.1.1 Changes to the design of outer areas stations and infrastructure since the conclusion of the TWA Inquiry are described in Section 2 of the ES Main Report for the Outer Areas. In developing these design changes, no main alternatives were considered. However, the alternatives considered during design development between 1997 and 1999 are described below.

9.2. Stations
9.2.1 Station proposals in 1999 did in some cases differ from those of 1997. These resulted from a change to the service pattern and local objections to the 1997 scheme, and in most cases did not involve the consideration of alternatives. There was however an alternative explored at the time relating to New Cross Station, described below:

**New Cross Station**

9.2.2 The current proposals for New Cross Station are for the extension of the island platform (Platforms A and B) on the slow lines. No works were proposed at New Cross Station in 1997.

9.2.3 As a part of the review of the service pattern in early 1999 at the request of the then shadow SRA and the train operating company, Railtrack investigated the option of providing an additional island platform, suitable for 12-car operation on the fast lines, to allow fast trains to stop. An outline design was developed, see Figure 9.1.

9.2.4 The option included track works and a new island platform on the west side of the station. The new tracks would have required land to be taken from the back gardens of six houses in Exeter Way, to the south-west of the station. At this location, the existing tracks are elevated about 4 metres above ground level on a brick retaining wall, which is approximately 5.2 metres high, including the parapet. The retaining wall is approximately 6 metres from the nearest house.

9.2.5 The new tracks would also be elevated about 4 metres above ground level on a new brick retaining wall, but would be closer to the houses.

**Reasons for rejection**

9.2.6 The option was rejected for operational reasons by then shadow SRA, who considered that it did not demonstrate sufficient operational benefit to justify the costs.
Fig 9.1 New Cross Station – alternative with fast line platform
9.3. Power reinforcement works

9.3.1 The locations and nature of some of the proposed power reinforcement works in the 1999 and current scheme differ from those proposed in 1997. This was as a result of the changes to the indicative service pattern and the extension of 12-car operation to new destinations. Additionally, all new feeder stations now require the installation of harmonic filters, which were not proposed in 1997.

9.3.2 These changes were made because both the project specification and the indicative service pattern in the 1999 scheme differed from those in 1997.
10.0 Summary

10.1.1 This report has presented an outline of the main alternatives and options addressed during the development of the Thameslink 2000 project. It describes the key reasons for the choice of alternatives, taking into account the environmental effects, as required by the EIA regulations.

10.1.2 In developing Thameslink 2000 since the early 1990s, a number of alternatives have been considered. In summary, these are:

i) at Blackfriars, alternatives to the proposed ‘Cathedral Entrance’ to the station on the north bank, the bridge roof, the solution to the widening of the bridge and the accommodation building.

ii) at Borough Market, an alternative to the proposed solution to the re-instatement of the listed building at 16-26 Borough High Street.

iii) at London Bridge, two alternatives considered prior to the adoption of the current plan to incorporate the consented ‘Masterplan’ scheme (a comprehensive re-development of the station) as part of Thameslink 2000,

iv) an alternative service pattern for Thameslink 2000 was developed after 1997.

v) the feasibility of two alternative routes, which would avoid works at Borough Market, was evaluated: a tunnel from Bermondsey to Clerkenwell, and an over-ground route through Elephant & Castle and Herne Hill.

vi) alternatives at Farringdon, including options for platform extensions, were assessed.

vii) alternatives at New Cross station.

10.1.3 Alternatives were rejected because they did not meet the strategic or financial objectives of the project, were not the most practicable options in engineering or operational terms or had significant environmental drawbacks compared to the proposed scheme.

10.1.4 In relation to the alternative scenarios presented to the TWA Inquiry by third parties, including the proposals to route Thameslink 2000 through Elephant & Castle, the Inspector concluded in paragraph 44.3.87 of his report:

‘None of the matters raised cause me to differ from my conclusion … that, on balance, the Thameslink 2000 proposals, including their effects on Borough Market, are acceptable by comparison to alternatives put forward in evidence.’
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