Thames Tideway Tunnel
Thames Water Utilities Limited

Application for Development Consent

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Transport Assessment

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Blackfriars Bridge Foreshore

Main Report

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Thames Tideway Tunnel
Creating a cleaner, healthier River Thames

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Thames Tideway Tunnel

Transport Assessment

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18.1 Introduction

18.1.1 This site-specific *Transport Assessment (TA)* presents the findings of the assessment of the transport issues of the Thames Tideway Tunnel project at the Blackfriars Bridge Foreshore site located within the City of London (CoL).

18.1.2 The assessment takes into consideration the changes as a result of all other Thames Tideway Tunnel project sites to ensure that results indicate the significance of each individual site in combination with construction works being undertaken at other sites.

18.1.3 The site is adjacent to Blackfriars Bridge (A201) and south of the westbound on-slip road to Victoria Embankment (A3211). It is located in the reclaimed foreshore area including the river wall. The site area also includes the Blackfriars Millennium Pier and one permanently moored vessel, the President.

18.1.4 The purpose of this *TA* is to identify the site context, development proposals and any transport implications arising from these proposals to ensure that appropriate mitigation measures are identified, where necessary.

18.1.5 The *TA* draws on a number of project-wide and common documents which include the *Transport Strategy* and the *Code of Construction Practice*[i] *(CoCP)*. Further detail on these documents which form the background to the *TA* can be found in Section 1 of the *TA.*

18.1.6 The *TA* structure is as follows:

a. Section 18.2 includes a description of the proposed development. This details construction phasing, vehicle and person trip generation and construction traffic routing. It also provides details on transport during the operational phase.

b. Section 18.3 outlines the assessment methodology used for the *TA* for the construction and operational phases.

c. Section 18.4 details the baseline conditions on the transport network surrounding the site, including survey data analysis and accident analysis.

d. Section 18.5 provides the assessment of the construction phase of the project, including a comparison between the construction base case and the construction development case. This section also outlines sensitivity testing for the highway network.

[i] The *Code of Construction Practice* (CoCP) is provided in Vol 1 Appendix A of the *Environmental Statement*. It contains general requirements (Part A), and site specific requirements for this site (Part B).

e. Section 18.6 provides the assessment of the operational phase of the project.

f. Section 18.7 summarises the *TA* findings.

18.2 Proposed development

18.2.1 The proposed development at Blackfriars Bridge Foreshore would connect the existing northern low level sewer No.1 and the Fleet Main CSO through a CSO drop shaft to the Thames Tideway Tunnel. Figure 18.2.1 in the Blackfriars Bridge Foreshore *Transport Assessment* figures indicates the Blackfriars Bridge Foreshore site location.

18.2.2 The site is situated on the foreshore of the River Thames adjacent to the Victoria Embankment (A3211) westbound on-slip road. To the east of the site is Blackfriars Bridge (A201). The Millennium Pier and President are within the site, south of the slip road and embankment.

18.2.3 Existing access to the site is directly from the Victoria Embankment (A3211) westbound on-slip road via the junction of Blackfriars Bridge Road (A201) with New Bridge Street (A201).

18.2.4 The development at Blackfriars Bridge Foreshore consists of a CSO drop shaft, a connection to the Fleet Main CSO outfall, an overflow weir chamber on the northern Low Level Sewer No.1 and culverts to connect them to the CSO drop shaft.

Construction

18.2.5 The construction site would be located in the foreshore of the River Thames. In order to provide working areas, the site would also occupy part of the riverside footway, from Paul's Walk adjacent to Blackfriars Bridge to Victoria Embankment (A3211), opposite Temple Avenue. Prior to main construction works, Blackfriars Millennium Pier would be relocated east of Blackfriars Rail Bridge, to a position opposite Puddle Dock, and the President would be moved and re-moored approximately 140m to the west, at Chrysanthemum Pier.

18.2.6 Construction at the Blackfriars Bridge Foreshore site would provide a connection to the northern Low Level Sewer No. 1, with construction anticipated to last for approximately five years. There would be four phases of construction at the Blackfriars Bridge Foreshore: phase 1 - covering site set-up, phase 2 - shaft construction, phase 3 - construction of other structures, and phase 4 - site demobilisation. The highway layout during construction – phase 1, phase 2 and phase 3 in the Blackfriars Bridge Foreshore *Transport Assessment* figures present the highway layout during construction.

18.2.7 Stage 1 *Road Safety Audits* have been carried out on the illustrative highway layouts proposed for this site. The *Road Safety Audits* for this site are contained in Section 18 Appendix G.

18.2.8 The Thames Path runs along Paul's Walk and the southern footway of Victoria Embankment. It would require closure and diversion as a result of the construction works. This would be necessary throughout the construction works.

18.2.9 The pedestrian route would be diverted from Paul's Walk up to Blackfriars Bridge using the existing staircase on the eastern side of the bridge. A lift would be provided so that mobility-impaired pedestrians could follow the same route and the staircase would be relocated to accommodate the lift.

18.2.10 All pedestrians would then use the at-grade crossing points on Blackfriars Bridge to reach the footway on the Victoria Embankment (A3211) eastbound off-slip road, on the north side of Victoria Embankment (A3211). Pedestrians would then walk along Victoria Embankment (A3211) and would be able to cross back to the southern footway at the pedestrian crossings at the junctions of Temple Avenue or Temple Place.

18.2.11 During phases 1 and 2, all construction vehicles would approach via the signal junction to the north of the site via Blackfriars Road (A201), New Bridge Street (A201) or Queen Victoria Street and access the site via the westbound exit slip road from Blackfriars Bridge. Construction vehicles would depart westbound on Victoria Embankment (A3211). Entry to the site for construction vehicles is not proposed directly from Victoria Embankment (A3211) via Upper Thames Street (A3211) during phases 1 and 2.

18.2.12 During phases 1 and 2 of construction the carriageway width of the westbound off-slip road leading to Victoria Embankment (A3211) would be reduced, maintaining a minimum width of 3.25m, during periods of greater construction activity to accommodate construction vehicles arriving at and departing from the site. In phases 1 and 2 there would be a gated site access for the left-turn in / left-turn out movements of construction traffic.

18.2.13 In phase 3 of construction the westbound on-slip road would be closed to all vehicles. Signed diversion routes for traffic would be in place. Construction works in this phase would prevent access from the westbound exit slip road from Blackfriars Bridge. Construction vehicles would therefore approach the site westbound on Upper Thames Street (A3211) through the Blackfriars Underpass (A3211) and depart westbound on Victoria Embankment (A3211). Traffic management would be required on Upper Thames Street (A3211) (westbound) leaving Blackfriars Underpass, to facilitate safe exit of construction vehicles onto Victoria Embankment (A3211).

18.2.14 Alternatives to closure of the westbound on-slip road were considered during the design process and are summarised in a report in Appendix F. The proposed solution is considered to be the least disruptive of the alternatives considered.

18.2.15 In phase 3 there would be a gated site access for left-turn in / left-turn out for construction traffic approaching westbound through the Blackfriars Underpass (A3211).

18.2.16 During construction, cofferdam fill (import and export), shaft and other excavated material (export) would be transported by barge. All other materials would be transported by road. For the assessment it has been assumed that 90% of these materials would be taken by river. This allows for periods when the river is unavailable and material unsuitable for river transport. All other material would be transported by road.

18.2.17 Parking for five essential maintenance vehicles would be provided on site. No worker parking would be provided. Construction details for the site relevant to the construction transport assessment are summarised in Table 18.2.1.

Table 18.2.1 Construction details

Description	Assumption
Assumed peak period of construction lorry movements	Site Year 2 of construction
Assumed average peak daily construction lorry vehicle movements (in peak month of Site Year 2 of construction) and duration	92 movements per day (46 vehicle trips) for one month
Assumed peak period of construction barge movements	Site Year 4 of construction
Assumed average peak daily construction barge movements (in peak month of Site Year 4 of construction)	6 movements per day (3 barge trips)
Types of lorry requiring access (comprising rigid-bodied, flatbed and articulated vehicles)	Excavated material lorries Plant and equipment deliveries Imported fill lorries Ready mix concrete lorries Office/general delivery lorries Rebar lorries Pipe/track/oils lorries Segments lorries

Note: a movement is a construction vehicle moving either to or from the site. A Site Year is a 12 month period, one in a series of Site Years; Site Year 1 commences at the start of construction.

Construction routes

18.2.18 Figure 18.2.2 in the Blackfriars Bridge Foreshore *Transport Assessment* figures shows the construction route for the Blackfriars Bridge Foreshore site. These have been discussed with both Transport for London (TfL) and the Local Highway Authority.

18.2.19 The Blackfriars Bridge Foreshore site is located on the Transport for London Road Network (TLRN) on Victoria Embankment (A3211) approximately 200m west of the junction with Blackfriars Bridge Road (A201). The main junctions along the construction traffic routes are:

a. Blackfriars Bridge Road (A201) and Victoria Embankment (A3211) slip roads

b. New Bridge Street (A201), Queen Victoria Street and Blackfriars Bridge Road (A201) junction

c. Upper Thames Street (A3211) and Puddle Dock junction

d. Queen Victoria Street and Puddle Dock junction

e. Victoria Embankment (A3211) and Temple Avenue junction.

18.2.20 During construction phases 1 and 2 at Blackfriars Bridge Foreshore construction vehicles would use the TLRN and the site would be accessed from the westbound on-slip road from Blackfriars Bridge to Victoria Embankment (A3211). In phase 3 construction vehicles would access the site directly from Victoria Embankment (A3211), westbound only.

18.2.21 Vehicles leaving the site would travel west towards Westminster Bridge (A302). Vehicles would then cross Westminster Bridge to continue south along the A3036 towards Lambeth, or alternatively turn towards the northeast through Southwark along the A3200 or southeast via Elephant and Castle.

18.2.22 This construction vehicle routing may overlap for a period with the works at the Victoria Embankment Foreshore site. The assessment of the combined effect of construction traffic movements associated with Blackfriars Bridge Foreshore and Victoria Embankment Foreshore is located in the *Project-wide TA*.

18.2.23 The exact routing of construction traffic depends on the origins and destinations of construction materials which are shown indicatively in the *Project-wide TA.*

Proposed construction flows

Construction vehicles and barges

18.2.24 Vehicle movements would take place during the standard day shift of ten hours on weekdays (08:00 to 18:00) and five hours on Saturdays (08:00 to 13:00).

18.2.25 In exceptional circumstances HGV and abnormal load movements could occur up to 22:00 for large concrete pours and later at night by agreement with the City of London Corporation and TfL.

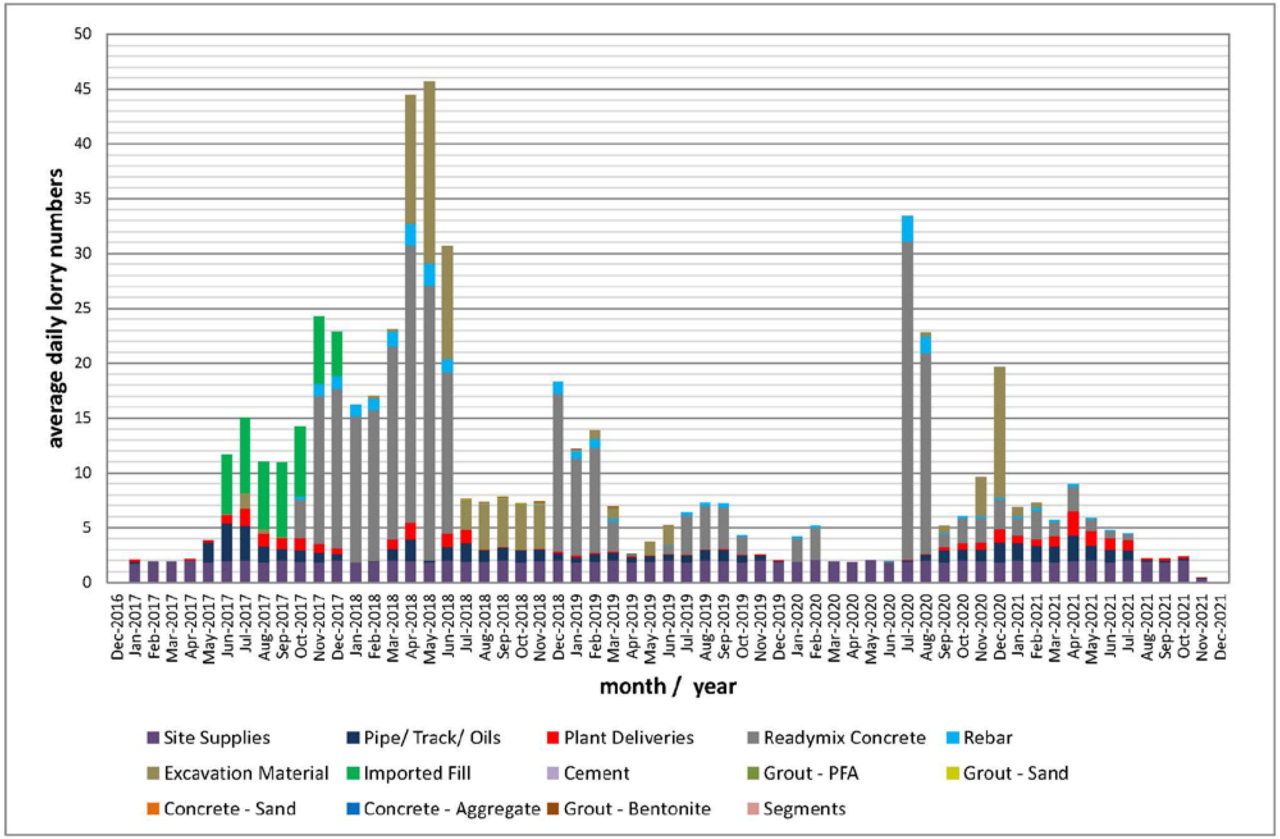
A site-specific peak construction assessment year has been identified. The histograms in Plate 18.2.1 and Plate 18.2.2 show the construction traffic and barge profiles throughout the construction period. These show that the peak site-specific activity at the Blackfriars Bridge Foreshore site for construction lorries would occur in Site Year 2 of construction. The peak activity for construction barges at this site would occur in Site Year 4 of construction.

18.2.26 This *TA* assesses these site-specific peak construction years. As detailed in Table 18.2.1, there would be 92 average peak daily construction lorry vehicle movements in the peak month of the peak year. Plate 18.2.2

indicates that there would be a maximum of three barges (six barge movements) in the peak month of the peak year.

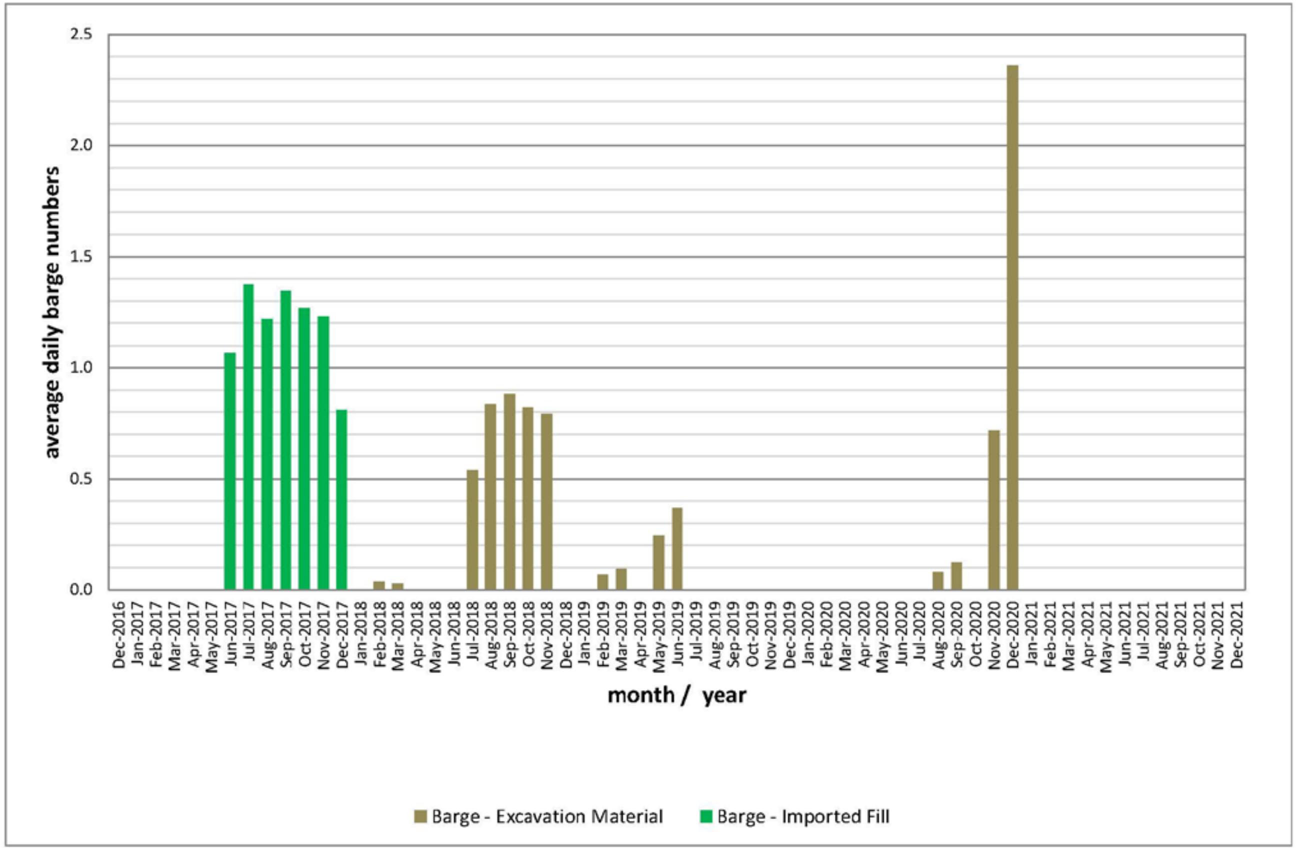
18.2.27 The assessment has been based on 10% of the daily number of lorry journeys occurring in the peak hours, which has been agreed with TfL as a reasonable approach. It is recognised that it may be desirable to reduce the number of construction lorry movements in peak hours and the mechanisms for addressing this would form part of the *Traffic Management Plans* (*TMP)* which are required as part of the *Code of Construction Practice (CoCP).*

Plate 18.2.1 Estimated construction lorry profile



Note: Plate shows approximate volumes and number of vehicle trips based upon assumed timings for the works. It is not a programme and remains subject to change.

Plate 18.2.2 Estimated construction barge profile



Note: Plate shows approximate volumes and number of barge trips based upon assumed timings for the works. It is not a programme and remains subject to change.

18.2.28 As the *Project-wide TA* explains, the TfL Highway Assignment Models (HAMs) used for the strategic highway modelling represent peak hours of 08:00 to 09:00 and 17:00 to 18:00 and these have been taken as being the network-wide AM and PM peak hours in the project-wide and site-specific assessments.

18.2.29 The 07:00 to 09:00 periods identified from the local traffic surveys are busier on the network in the weekday than those encountered at the weekends (this is discussed in Section 18.4). Whilst the AM and PM peak hours differ slightly from these network-wide peak hours, in practice the number of vehicle movements at this site would be low in comparison to base case traffic flows on the adjacent network and is expected to be constant throughout the day.

18.2.30 Hourly construction vehicle trips during the inter-peak period are not expected to exceed the hourly trips assumed for the 08:00 to 09:00 and 17:00 to 18:00 periods used in this assessment. The peak travel periods used for the modelling in this assessment are therefore the weekday periods between 08:00 and 09:00 and 17:00 and 18:00.

18.2.31 Other construction vehicle movements associated with site operations and contractor activities would be cars and light goods vehicles (LGVs). The construction vehicle movements expected to be generated by the Blackfriars Bridge Foreshore site are shown in Table 18.2.4.

Construction workers

18.2.32 The construction site is expected to require a maximum workforce of 70 workers on site at any one time. The number and type of workers is shown in Table 18.2.2.

Table 18.2.2 Maximum estimated construction worker numbers

Contractor		Client
Staff[a]	Labour[b]	Staff[c]
08:00-18:00	08:00-18:00	08:00-18:00
30	30	10

[a]Staff Contractor – engineering and support staff to direct and project manage the engineering work and site.
[b]Labour – those working on site doing engineering, construction and manual work.
[c]Staff Client – engineering and support staff managing the project and supervising the Contractor.

18.2.33 The mode split outlined in Table 18.2.3 has been used to assess the changes as a result of the worker journeys on the highway and public transport networks. It has been derived using the 2001 Census journey[ii] to work data for the area in the vicinity of the Blackfriars Bridge Foreshore site. The Census data indicates that the predominant mode of travel for journeys to work in this area is public transport.

18.2.34 At this site there would be no parking provided within the site boundary for workers. As parking on surrounding streets is also restricted, and measures to reduce car use would be incorporated into site-specific *Travel Plan* requirements, it is highly unlikely that any workers would travel by car. The Census mode shares have therefore been adjusted in Table 18.2.3 to reflect increased levels of non-car use by workers at this site. The assessment has been undertaken on this basis.

Table 18.2.3 Transport mode split

Mode	Percentage of trips to site	Equivalent number of worker trips (based on 70 worker trips)	
		AM peak hour (07:00-08:00)	PM peak hour (18:00-19:00)
Bus	7%	5	5
National Rail	48%	34	34
Tube	38%	27	27
Car driver	<1%*	0	0
Car passenger	<1%*	0	0
Cycle	2%	1	1
Walk	3%	2	2
River	<1%*	0	0
Other (taxi/motorcycle)	2%	1	1
Total	100%	70	70

** assuming to be zero for the purpose of this assessment*

18.2.35 As indicated in Table 18.2.3, it is assumed that the predominant mode of travel for journeys to work in this area is public transport and it is assumed that the primary public transport services used would be London Underground and National Rail services from Blackfriars station and the bus services from the bus stops on

[ii] Based on 2001 Census. This type of data had not been released from the 2011 Census at the time of the assessment

Blackfriars Bridge (A201), New Bridge Street (A201) and Queen Victoria Street.

Vehicle movements summary

18.2.36 The total anticipated number of construction-related vehicle movements in the peak month of activity at this site is set out in Table 18.2.4.

Table 18.2.4 Peak construction works vehicle movements

Vehicle type	Vehicle movements per time period				
	Total Daily	07:00 to 08:00	08:00 to 09:00	17:00 to 18:00	18:00 to 19:00
Construction lorry vehicle movements 10%[a]	92	0	9	9	0
Other construction vehicle movements[b]	36	4	4	4	4
Worker vehicle movements[c]	nominal	0	0	0	0
Total	**128**	**4**	**13**	**13**	**4**

[a] The assessment has been based on 10% of the daily construction lorry movements associated with materials taking place in each of the peak hours.
[b] Other construction vehicle movements includes cars and light goods vehicles associated with site operations and contractor activity.
[c] Worker vehicle numbers are based on less than 1% of workers driving, on the basis that there would be no worker parking on site, on-street parking in the area is restricted, and site-specific Travel Plan measures would discourage workers from driving by car. In practical terms, this would be close to zero.

18.2.37 An average peak flow of 128 vehicle movements a day is expected during the months of greatest activity during Site Year 2 of construction at this site. At other times in the construction period, vehicle flows would be lower than this average peak figure.

18.2.38 Table 18.2.4 shows that in the AM and PM peak hours, the Blackfriars Bridge Foreshore site would generate approximately 13 vehicle movements.

Code of Construction Practice

18.2.39 Measures incorporated into the *CoCP Part A (Section 5)* to reduce transport effects include:

a. Site specific *TMPs*: to set out how vehicular access to the site would be managed so as to minimise impact on the local area and communicate this with the local borough and other stakeholders. This includes any works on the highway, diversion or temporary closure of the highway or public right of way

b. HGV management and control: to ensure construction vehicles use appropriate routes to the sites and the vehicle fleet and/or drivers meet current safety and environmental standards

c. Site specific *River Transport Management Plans (RTMP)* are to be produced for each relevant worksite. As with the TMP's this would set out how river access to site would be managed so as to minimise impact on the river and communicate this with the PLA, local borough and other stakeholders.

18.2.40 In addition to the general transport measures within the *CoCP Part A*, the following measures have been incorporated into the *CoCP Part B* relating to the Blackfriars Bridge Foreshore site:

a. site access for construction is to be from the new entrance from the westbound ramp leading down from Blackfriars Bridge, apart from the period where the Low Level No. 1 interception chamber works are undertaken. During this construction phase access would be from Blackfriars underpass

b. lorry arrivals would be strictly controlled and co-ordinated to set times to ensure that no lorries queue outside the site

c. the westbound ramp can only take standard HGVs and not abnormal loads

d. the area shown for temporary traffic lane closure at the end of the down ramp is to be used only when required. After use, the area would be restored to highway use. Given notice by the City of London Corporation and TfL for traffic reasons, the area would be restored to traffic as soon as practical after notice

e. the minimum width of traffic lane to be retained on the westbound ramp would be 3.25m

f. existing coach parking and loading bay on the westbound ramp and Victoria Embankment (A3211) would be suspended

g. the duration of works effecting traffic lanes including the ramp closure would be minimised

h. the new pier is to be in place before the closure of the existing pier

i. access to the existing and relocated pier to be maintained for both pedestrians and services. Liaison with London River Services (Transport for London) is required

j. a detailed navigational risk assessment is required as part of the River Works Licence to confirm that the arrangements for river transport from the works are safe and acceptable to the PLA.

k. the diversion of the Thames Path is to be clearly signed

l. coordination is required with both the City of London Corporation and TfL on the requirements of amended pedestrian routes to the relocated Blackfriars Pier. This includes notices, pamphlets, guides and signage to the public

18.2.41 Based on current travel planning guidance including TfL's Travel planning for new development in London (TfL, 2011)[1], this development falls within the threshold for producing a Strategic Framework Travel Plan. A *Draft Project Framework Travel Plan* has been prepared based on the TfL ATTrBuTE guidance (TfL, 2011)[2]; this will accompany the application for development consent (the 'application'). The *Draft Project Framework Travel Plan* addresses project-wide travel planning measures, including the need for a project-wide Travel Plan Manager, initial travel surveys during construction and a monitoring framework. It also contains requirements and guidelines for the development of site-specific *Travel Plans* to be prepared by the site contractors. The site-specific travel-planning requirements of relevance to the *Draft Project Framework Travel Plan* are as follows:

a. information on existing transport networks and travel initiatives for the Blackfriars Bridge Foreshore site

b. a mode split established for the Blackfriars Bridge Foreshore site construction workers to establish and monitor travel patterns

c. site-specific targets and interim targets based on the mode share which would link to objectives based on local, regional and national policy

d. a nominated person with responsibility for managing the *Travel Plan* monitoring and action plans specifically for this site.

Other measures during construction

18.2.42 Embedded design measures which are not outlined in the *CoCP* but are of relevance to the transport assessment at the Blackfriars Bridge Foreshore site include the provision of a permanent lift to maintain the step-free access route from Paul's Walk to Blackfriars Bridge during construction and operation.

Operation

18.2.43 For the operational phase the Victoria Embankment (A3211) westbound on-slip ramp would be returned to the baseline highway layout and it would provide access to the CSO drop shaft.

18.2.44 It is proposed that Blackfriars Millennium Pier would remain in its relocated position to the east of Blackfriars Bridge during the operational phase. The lift to facilitate step-free access from Paul's Walk to Blackfriars Bridge would remain in the operational phase.

18.2.45 Once the Thames Tideway Tunnel is operational it is not expected that there would be any significant issues for the transport infrastructure and operation within the local area, because maintenance trips to the site would be infrequent and short term. On this basis the elements considered in the operational assessment are:

a. pedestrians

b. river usage and access

c. highway layout and operation.

18.2.46 The potential for operational issues to arise is due to the permanent relocation of the Blackfriars Millennium Pier and the short-term changes to the physical aspects of access to the foreshore site for maintenance. These issues have only been considered qualitatively because the changes required to the highway network during maintenance activity would be minor and temporary meaning that a quantitative assessment is not required. The scope of this analysis has been discussed with the City of London Corporation and TfL.

18.2.47 Given the level of transport activity associated with the Thames Tideway Tunnel project during the operational phase, only the localised transport effects around the Blackfriars Bridge Foreshore site have been assessed. Other Thames Tideway Tunnel sites would not affect the area around the site in the operational phase and therefore they have not been considered in the assessment.

18.2.48 Access would be required for a light commercial vehicle on a three to six monthly maintenance schedule. Additionally, there would be more substantive maintenance visits at approximately ten year intervals which would require access to enable two cranes and associated support vehicles to be brought to the site. The cranes would facilitate lowering and recovery of tunnel inspection vehicles and provide duty/standby access for personnel. The movements of these large cranes may require temporary suspension of on-street coach parking in the vicinity of the site.

18.2.49 During operation, maintenance vehicles would enter the site from the Victoria Embankment (A3211) westbound on-slip road via the Blackfriars Bridge and New Bridge Street (A201) junction as set out in the Blackfriars Bridge Foreshore design principles. The permanent highway layout plan in the Blackfriars Bridge Foreshore *Transport Assessment* figures shows the highway layout during the operational phase at Blackfriars Bridge Foreshore.

18.3 Assessment methodology

Engagement

18.3.1 An extensive scoping and technical engagement process has been undertaken. All consultee comments relevant to this site are presented in Volume 18 of the *Environmental Statement.*

18.3.2 Whilst the effects associated with transport for the operational phase have been scoped out of the *Environmental Statement*, the

TA examines the operational phase in order to satisfy the relevant stakeholders that technical issues have been addressed (for example, those associated with access for maintenance activities).

Consultees

18.3.3 Throughout the scoping and technical engagement process, the key stakeholders with regards to transport, primarily TfL and the relevant local borough for each site have been consulted. For Blackfriars Bridge Foreshore, the City of London Corporation has been consulted and the comments which have arisen relating directly to Blackfriars Bridge Foreshore have been recorded and responded to accordingly.

18.3.4 The key technical issues raised have been addressed as far as is practical at this stage within this *TA*, *Project-wide TA* and the *Environmental Statement*, in consultation with both TfL and the City of London Corporation.

18.3.5 The key issues arising from the stakeholder engagement are:

a. the need to consider all transport options to minimise road use and the need for road and / or lane closures

b. Blackfriars Millennium Pier should be re-provided as close to its present location as possible

c. retaining pedestrian routes throughout works with adequate signing and provision of diversion routes

d. current traffic and pedestrian flows in this area may not be representative due to Blackfriars Station redevelopment works (at the time this issue was raised, in 2011)

e. retention of pedestrian connections in the operational phase

f. traffic diversion routes should consider using Stamford Street / Southwark Bridge in preference to Westminster Bridge (A302) as far as possible

g. information on construction traffic associated with other Thames Tideway Tunnel sites should be provided

h. additional details and analyses of type of users involved in the accidents should be shown on a plan

i. Road Safety Audits should be carried out

j. justification should be provided of why some nearby junctions were not modelled

k. clarification of the basis for defining the year of construction is required

l. clarification of working hours assumed in the *TA* for the assessment is required

m. swept path analysis for vehicle access to the construction site and final operational site should be undertaken.

Construction

18.3.6 The assessment methodology for the construction phase follows that described in the *Project-wide TA*. There are no site-specific variations for undertaking the construction assessment of this site.

18.3.7 The effect of all other Thames Tideway Tunnel sites on the area surrounding Blackfriars Bridge Foreshore has been taken into account within the assessment of the peak year of construction at this site.

Construction assessment area

18.3.8 The assessment area for the Blackfriars Bridge Foreshore site includes the site access directly from the westbound on-slip road on Victoria Embankment (A3211) which is part of the TLRN. The junctions of Blackfriars Bridge Road (A201) / New Bridge Street (A201) and Temple Avenue / Victoria Embankment (A3211) have also been assessed.

18.3.9 Consideration has also been given to the potential impacts on pedestrian and cycle routes, including the Thames Path, and on bus services and rail or river services within 640m and 960m of the site respectively. The Public Transport Accessibility Level (PTAL) of the site, calculated using TfL's approved PTAL methodology assumes a walking speed of 4.8km/h and considers rail stations within a 12 minute walk (960m) of the site and bus stops within an eight minute walk (640m).

18.3.10 The extent of the assessment area for the local highway network modelling has been informed by considering the volume of construction traffic at this site and the degree of impact that would be experienced at the nearest junction of the construction vehicle route with the SRN or TLRN. Where the assessment shows that the forecast impacts at this junction would not be significant, junctions further afield on the strategic network have not been assessed. Where impacts are forecast to be significant, a wider area of the local network has been considered in the assessment.

Construction assessment years

18.3.11 To assess the busiest case scenario for the Blackfriars Bridge Foreshore site locality, the peak construction traffic year has been identified for both vehicles and barges. This ensures that the assessment takes into consideration the heaviest flow of construction vehicles at this site on local roads for the local modelling assessment.

18.3.12 The site-specific peak construction traffic year at Blackfriars Bridge Foreshore is Site Year 2 of construction for construction lorries and Site Year 4 of construction for construction barge activity.

18.3.13 The assessment of the aggregated Thames Tideway Tunnel construction traffic flows on the wider highway network is included within the Project-wide *TA*.

Highway network modelling

18.3.14 The assessment for this site takes account of construction vehicle movements associated with Blackfriars Bridge Foreshore, together with construction traffic from other Thames Tideway Tunnel project sites that would use the highway network in the vicinity of this site in Site Year 2 of construction.

18.3.15 As indicated in the *Project-wide TA*, the TfL HAMs have been used as part of the assessment. The strategic highway modelling has used three of the HAMs, which cover west, central and east London. These three models cover the locations of all of the Thames Tideway Tunnel project sites and this approach has been agreed with TfL.

18.3.16 The HAMs have been developed by TfL using GLA employment and population forecast set out in the London Plan (GLA, 2011)[3]. As a result the assessment inherently takes into account a level of future growth and development across London.

18.3.17 For future year assessments for the Blackfriars Bridge Foreshore site, the TfL Central London HAM (CLoHAM) has been used to test the strategic highway network impacts associated with this site. Construction traffic associated with other Thames Tideway Tunnel project sites using the routes in this area has been included in the CLoHAM scenario.

18.3.18 Construction lorry, operational and worker vehicle trips (where relevant) associated with the project peak month were assigned to CLoHAM to create the scenarios for testing strategic highway impacts.

18.3.19 CLoHAM also provides factors for the increase in vehicle-kilometres in the borough between the CLoHAM model base and forecast years (2008/9 and 2021 respectively). The relevant growth factor for the City of London was applied to the traffic data collected in 2011 in the vicinity of the Blackfriars Bridge Foreshore site to produce base case traffic flows for the purposes of local highway modelling.

18.3.20 Construction lorry, operational and worker vehicle movements (where relevant) associated with the Blackfriars Bridge Foreshore site for the site-specific peak month were added to the 2021 base case flows to provide the development case flows for local modelling.

18.3.21 This approach provides a robust assessment case for local modelling as the baseline traffic has been factored to 2021, which is later than the site-specific peak year of construction, and no allowance has been made for existing traffic that might divert to other routes as a consequence of the use of local roads by the project related traffic

Sensitivity testing

18.3.22 The 'core' assessment presented in the *TA* is based on the *Transport Strategy*. It examines the month(s) in which construction vehicle activity at this site would be greatest and uses the average daily number of construction lorry movements that would occur in that month. This is considered to be reasonable because it addresses:

a. the time at which construction vehicle movements would be greatest at this site and there would be longer periods when the number of vehicle movements would be lower

b. although there may be occasions in the peak month when the number of lorry movements in one day might exceed the average daily figure, these would be limited. The number of instances would be small in the context of the overall construction period at this site and would be offset by other times when the number of construction vehicle movements would be lower than the average daily figure for the peak month

c. if lorry movements are required outside the standard hours of 08:00 to 18:00, this would be agreed in advance with TfL and the local highway authority.

18.3.23 The need for sensitivity testing has been discussed with TfL. Such a test could be used to address:

a. variation in construction vehicle numbers around the average daily figure for the peak month

b. a lower level of river transport for construction materials (leading to an increased number of lorry movements)

c. changes in programme which might lead to construction activity peaking at different times and/or a greater coincidence of peaks at adjacent sites which could lead to higher construction lorry flows on the surrounding highway network.

18.3.24 As para. 18.3.22 explains, if construction vehicle numbers were to exceed the average daily figure for the peak month, this would be an infrequent occurrence and should be seen in the context that the assessment is based on the peak month of construction activity at each site, rather than a lower 'typical' month.

18.3.25 It is expected that river transport will be used for certain construction materials and this forms part of the *Transport Strategy*. It is therefore not likely that all materials would be moved by road at all sites. However, there is the possibility that river transport might not be available at a particular site or sites for short periods of time and this might be the result of temporary navigational constraints, local issues temporarily preventing access to the river, or wider issues restricting river movements to a number of sites (such as the closure of the Thames Barrier).

18.3.26 In practice the potential for increased coincidence of construction peaks between sites is limited because of the sequential nature of the construction activities required. Whilst it is possible that individual site peaks might change slightly, it is very unlikely that all sites would experience peak activity in the same period.

18.3.27 Although these events, if they were to arise, would be limited and short-term, it has been agreed with TfL that sensitivity testing would be undertaken within the *TA* to identify the potential impacts associated with such occurrences. It has also been agreed that for consistency, the test would be based on the number of construction lorry movements that would be related to moving all construction materials by road. This has been assumed to act as a proxy for events of this nature and represents an upper bound on the level of construction traffic that could be expected.

Operation

18.3.28 The assessment methodology for the operational phase follows that described in the *Project-wide TA*. There are no site specific variations for undertaking the operational assessment of this site.

18.3.29 Given the level of transport activity associated with the Thames Tideway Tunnel during the operational phase, only the localised transport issues around the Blackfriars Bridge Foreshore site have been assessed. Other Thames Tideway Tunnel project sites would not affect the area around Blackfriars Bridge Foreshore in the operational phase and therefore they have not been considered in the assessment.

Operational assessment area

18.3.30 The assessment area for the operational assessment remains the same as for the construction assessment as outlined in para. 18.3.8.

Operational assessment year

18.3.31 The operational assessment year has been taken as Year 1 of operation which is the year in which it is assumed that the Thames Tideway Tunnel would become operational. As the number of vehicle movements associated with the operational phase would be very low, there is no requirement to assess any other year beyond that date.

18.4 Baseline

18.4.1 This section sets out the baseline conditions on the local transport network in the vicinity of the Blackfriars Bridge Foreshore site in 2012, with the exception of the traffic survey data which was collected in 2011.

Policy review

18.4.2 The site is located within the City of London; the relevant regional, local and national policy documents have been reviewed and included in Appendix A.

Existing land use

18.4.3 The site is located in the foreshore area adjacent to the river wall and currently includes the Blackfriars Millennium Pier and one permanently moored vessel, the President.

18.4.4 The nearest residential area is located approximately 60m from the site, at Kings Bench Walk.

Existing access

18.4.5 The site is not currently accessible by vehicle. There is pedestrian access from the Thames Path along the southern footway along Paul's Walk / Victoria Embankment (A3211) which is indicated in Figure 18.4.1 in the Blackfriars Bridge Foreshore *Transport Assessment* figures.

Pedestrian network and facilities

18.4.6 The key pedestrian network related to the Blackfriars Bridge Embankment Foreshore site comprises:

a. Victoria Embankment (A3211) / Paul's Walk/ Upper Thames Street (A3211) providing the east-west route for the Thames Path.

b. Blackfriars Bridge / New Bridge Road (A201) providing the north-south route for pedestrians to cross the River Thames.

18.4.7 The Thames Path and the London Strategic Walk network in the vicinity of the site are shown on Figure 18.4.1 in the Blackfriars Bridge Foreshore *Transport Assessment* figures. The Thames Path (a Public Right of Way) runs along the southern footway of Paul's Walk / Victoria Embankment (A3211), adjacent to the river. The Thames Path continues to the west along Victoria Embankment (A3211), and to the east along Upper Thames Street (A3211).

18.4.8 Paul's Walk provides a continuous pedestrian route from Blackfriars to the Millennium Bridge. The eastern end of Paul's Walk has been enhanced through the installation of new planters and benches. Lighting has also been installed to make a safer and more attractive visual environment for pedestrians. The western end provides a connection under Blackfriars Bridge Road (A201) to the Victoria Embankment (A3211) southern footway, as shown in Plate 18.4.1.

Plate 18.4.1 Thames Path along Paul's Walk

18.4.9 Pedestrians have access to New Bridge Street (A201) and Queen Victoria Street to the east of the site from Paul's Walk. At the lower level, there is a pedestrian underpass with eight exits leading directly from Paul's Walk in the south and connecting with New Bridge Street (A201), Queen Victoria Street, and Blackfriars station in the north. The underpass has access from Blackfriars Bridge by stairs.

18.4.10 A section of Paul's Walk, adjacent to Blackfriars Bridge including the northeast staircase between Blackfriars Bridge and Paul's Walk is currently closed to pedestrians.

18.4.11 Victoria Embankment (A3211) provides a continuous east-west link for pedestrians along the north bank of the River Thames. Victoria Embankment (A3211) starts at Westminster Bridge, and then follows the course of the north bank of the river, past Hungerford Bridge and Waterloo Bridge, before ending at Blackfriars Bridge.

18.4.12 The footways along either side of Victoria Embankment (A3211) are greater than 2m wide and have viewing / rest points located along the southern footway approximately every 10-20m, as illustrated in Plate 18.4.2.

18.4.13 Signalised pedestrian crossing facilities are provided on the east side of the junction of Victoria Embankment (A3211) and Temple Avenue to aid north-south pedestrian movements.

18.4.14 Additional pedestrian crossings are located to the east of the site at the upper level at the junction of Victoria Embankment (A3211) with

New Bridge Street (A201) / Blackfriars Bridge (A201) / Upper Thames Street (A3211) / Queen Victoria Street.

18.4.15 Pedestrian footways are provided on the eastbound and westbound ramps between Victoria Embankment (A3211) and the junction of Blackfriars Bridge / New Bridge Street (A201) / Victoria Embankment (A3211). There are no pedestrian footways through Blackfriars Underpass.

18.4.16 New Bridge Street (A201) and Temple Avenue both provide north-south links between Victoria Embankment (A3211) to the south and Fleet Street and Ludgate Hill to the north.

Plate 18.4.2 Footway along Victoria Embankment (A3211)

18.4.17 New Bridge Street (A201) has footways of between 3m and 4.5m on both sides of the two-way vehicular carriageway, providing a continuous north-south link of good quality between Victoria Embankment (A3211), Blackfriars Bridge and Queen Victoria Street to the south and Ludgate Hill, Fleet Street and Farringdon Street to the north.

18.4.18 At the signalised junctions of New Bridge Street (A201) / Bridewell Place, and New Bridge Street (A201) / Farringdon Street / Ludgate Hill / Fleet Street, pedestrian crossing facilities with dropped kerbs are provided at all crossing points.

18.4.19 Queen Victoria Street to the north-east of the site provides a link between Blackfriars station and the site. The road has footways of between 2.5m and 7m wide along both sides with pedestrian crossings provided at the junction of Queen Victoria Street and Puddle Dock.

18.4.20 Blackfriars Bridge (A201), illustrated in Plate 18.4.3 crosses the River Thames into the London Borough (LB) of Southwark and has footways on both sides of the road providing a north-south link for pedestrians between Victoria Embankment (A3211) and New Bridge Street (A201) to the north of the river and Blackfriars Road (A201), Southwark Street and Stamford Street (both A3200) to the south of the river.

Plate 18.4.3 Footway along Blackfriars Bridge (A3201)

18.4.21 The western side of the bridge is part of the Thames Path network linking the Thames Path on Victoria Embankment (A3211) and Paul's Walk to the north and the Thames Path along Marigold Alley to the south of the river.

18.4.22 The width of the footways on Blackfriars Bridge is approximately 7m. A signalised pedestrian crossing is located to the south of Blackfriars Bridge north of the junction of Blackfriars Bridge (A201) / Blackfriars Bridge Road (A201) / Upper Ground to aid east-west pedestrian movements. No other marked crossings are provided for pedestrians along the length of the bridge.

Cycle network and facilities

18.4.23 The existing cycle network and facilities in the vicinity of the site are described below and shown on Figure 18.4.1 in the Blackfriars Bridge Foreshore *Transport Assessment* figures.

18.4.24 The main cycle route within the area is National Cycle Network (NCN) Route 4 (on road) which routes through central London along Chelsea Embankment (A3212), Lambeth Bridge, Lambeth Palace Road, Belvedere Road, Upper Ground, Southwark Street

(A3200), and Southwark Bridge Road (A300). At Blackfriars the route is on the opposite bank of the river to the site.

18.4.25 An on-road cycle lane is provided along Victoria Embankment (A3211) between Temple Underground station and the junction with New Bridge Street (A201) and Blackfriars Bridge in both the eastbound and westbound directions as illustrated in Plate 18.4.4. However, the cycle lane is not present on the ramps between the Victoria Embankment (A3211) / Temple Avenue junction and Victoria Embankment (A3211) / New Bridge Street (A201) junction. Queen Victoria Street is recommended by TfL as a quieter route for cyclists.

Plate 18.4.4 Cycle lane along Victoria Embankment (A3211)

18.4.26 There are on-road cycle lanes along both sides of Blackfriars Bridge (A201) which connect to the NCN Route 4 on Blackfriars Bridge Road (A201). The route continues west along Upper Ground and east along Southwark Street (A3200) and eventually links to Cycle Superhighway Route 7 (CS7) on Southwark Bridge Road.

18.4.27 On-road cycle lanes are provided along New Bridge Street (A201) both northbound and southbound, and advanced cycle stop lines are provided at all approaches to the junction of New Bridge Street (A201) / Fleet Street / Ludgate Hill / Farringdon Street (A201), and the junction of New Bridge Street (A201) / Bridewell Place / Apothecary Street.

18.4.28 Advanced cycle stop lines are provided for cyclists along Victoria Embankment (A3211) to the west of the junction with Temple Place (west) and the junction with Temple Avenue. Advanced cycle stop lines are also provided at the junction of Victoria Embankment (A3211) / New Bridge Street (A201) / Queen Victoria Street / Blackfriars Bridge (A201).

18.4.29 There are some sections of the Thames Path in Central London which can be cycled; however, the section which runs along the southern footway of Victoria Embankment (A3211) cannot be used by cyclists. Instead, cyclists are able to use the on-street cycle lane.

Barclays Cycle Superhighways

18.4.30 The closest Barclays Cycle Superhighway (CS) to the site is CS7 which runs between Merton and the City. The cycle route starts on the High Street in Colliers Wood and runs along the A24 Tooting High Street, Balham High Road, Clapham High Street, Kennington Park Road, Southwark Bridge Road, and Southwark Bridge with an approximate 45 minute journey from Merton to the City. The nearest point of approach of CS7 to the Blackfriars Bridge Foreshore site is on the southern side of Southwark Bridge, approximately 1.5km walking distance to the southwest.

Barclays Cycle Hire Scheme

18.4.31 There is a Barclays Cycle Hire docking station opposite the site, on the northern footway of Victoria Embankment (A3211) to the east of the junction with Temple Avenue. This cycle docking station accommodates 20 bicycles, illustrated in Plate 18.4.5.

18.4.32 A further total of 17 docking spaces are provided on Bouverie Street, 300m walking distance away from the site to the north. There are 18 more docking spaces on Milford Lane and 24 on Godliman Street approximately 400m walking distance to the west and 700m walking distance to the east of the site respectively. On Queen Victoria Street 760m walking distance to the east of the site, 32 docking spaces are provided.

Plate 18.4.5 Cycle hire docking station along Victoria Embankment (A3211) – eastbound off-slip road

Cycle parking

18.4.33 There are approximately 100 cycle parking spaces available in the Baynard House Car Park located on Queen Victoria Street approximately 500m to the north-east of the site.

18.4.34 Four Sheffield cycle stands capable of accommodating up to eight bicycles are provided on the northern footway of Victoria Embankment (A3211) to the west of the junction with Carmelite Street. A further four Sheffield cycle stands are available on the footway of Victoria Embankment (A3211) outside Temple Underground station, approximately 800m walking distance to the west of the site.

18.4.35 A further three cycle stands are provided along New Bridge Street (A201), two to the west of the junction with Bridewell Place and one to the south of the junction with Fleet Street / Ludgate Hill / Farringdon Street.

18.4.36 Outside Blackfriars station on Queen Victoria Street, a total of ten cycle stands are provided which are capable of accommodating up to 20 cycles.

Public transport

Public Transport Accessibility Level

18.4.37 The Public Transport Accessibility Level (PTAL) of the site has been calculated using TfL's approved PTAL methodology (TfL, 2010)[4] (analysis is included in Appendix B). The PTAL methodology assumes a walking speed of 4.8km/h and considers rail stations within a 12 minute walk (960m) of the site and bus stops within an eight minute walk (640m).

18.4.38 The site has a PTAL rating of 6b, rated as ‘excellent’ (with 1 being the lowest accessibility and 6b being the highest accessibility). The following sections detail the public transport services in the vicinity of the site which are shown on Figure 18.4.2 in the Blackfriars Bridge Foreshore *Transport Assessment* figures.

Bus services

18.4.39 A total of 14 daytime bus routes and 10 night bus routes operate within 640m walking distance of the site. These bus services form a comprehensive network, extending outwards in all directions from the site. Table 18.4.1 provides a summary of the bus services and their frequencies during the weekday peaks.

Table 18.4.1 Existing day time local bus services and frequency

Bus number	Origin - destination	Nearest bus stop to Blackfriars Bridge Foreshore	Approximate walking distance from Blackfriars Bridge Foreshore site (m)	Weekday peak hour two-way frequencies	
				AM peak (08:00-09:00)	PM peak (17:00-18:00)
4	Archway Station – Waterloo Station	City Thameslink / Ludgate circus stop	450	14	14
11	Fulham Town Hall – Liverpool Street Station	City Thameslink / Ludgate circus stop	450	16	16
15	Blackwall Station – Conduit Street	City Thameslink / Ludgate circus stop	450	16	16
17	Archway Station – London Bridge Station	City Thameslink / Ludgate circus stop	450	17	17
23	Great Western Road – Liverpool Street Station	City Thameslink / Ludgate circus stop	450	19	20
26	Hackney Wick – Waterloo Station	City Thameslink / Ludgate circus stop	450	15	15
45	St Pancras Station – Atkins Road	Blackfriars Station	300	15	15
63	Forest Hill Tavern – King's Cross Station	Blackfriars Station	300	21	21
76	Seven Sisters Station – Lower Marsh	City Thameslink / Ludgate circus stop	450	18	18

Bus number	Origin - destination	Nearest bus stop to Blackfriars Bridge Foreshore	Approximate walking distance from Blackfriars Bridge Foreshore site (m)	Weekday peak hour two-way frequencies	
				AM peak (08:00-09:00)	PM peak (17:00-18:00)
100	Elephant & Castle – St Georges Town Hall	Blackfriars Station	300	17	18
172	King Edward Street – Brockley Street	City Thameslink / Ludgate circus stop	450	14	15
381	Peckham Bus Station – County Hall	Blackfriars Road	640	13	12
388	Hackney Wick – Blackfriars Station	Blackfriars Station	450	14	14
RV1	Covent Garden – Tower Gateway	Blackfriars Bridge	640	12	13

Source: Transport for London (TfL) (2012) Timetables. Available at www.tfl.gov.uk (site last accessed December 2012)

18.4.40 These bus routes operate from the following bus stops:

a. Blackfriars Station bus stop on New Bridge Street (A201) – northbound and southbound, 300m walking distance from the site

b. City Thameslink Station bus stop on Ludgate Hill, (westbound only), 450m walking distance from the site

c. City Thameslink / Ludgate Circus bus stop on Ludgate Hill (eastbound only), 500m walking distance from the site

d. Blackfriars Road bus stop on Southwark Street (A3200) (eastbound and westbound), 640m walking distance from the site

e. Blackfriars Bridge bus stop on Blackfriars Bridge Road (A201) (westbound only), 420m walking distance from the site.

18.4.41 On average there are approximately 220 daytime bus services in total per hour in the AM peak and 222 bus services in total per hour in the PM peak within 640m walking distance of the site.

18.4.42 There are approximately 41 night-time bus services per hour Monday – Friday between 00:00 – 06:00 and a total of 48 night-time bus services per hour on Saturdays between 00:00 – 06:00 within 640m walking distance of the site.

London Underground

18.4.43 Figure 18.4.2 in the Blackfriars Bridge Foreshore *Transport Assessment* figures indicates the London Underground stations in the vicinity of the site.

18.4.44 Blackfriars Underground station is the closest underground station to the site, located approximately 300m walking distance to the east. It is served by the Circle and District lines.

18.4.45 Temple Underground station, which is served by the Circle and District lines, is located approximately 800m walking distance to the west of the site.

18.4.46 Circle Line trains serving both Blackfriars and Temple Underground stations travel clockwise to Edgware Road and anti-clockwise to Hammersmith. In the AM and PM peak periods, the frequency of the Circle Line trains is approximately every ten minutes providing six services per hour in each direction.

18.4.47 District Line trains travel west to Ealing Broadway, Richmond, Wimbledon, and Kensington (Olympia), and east to Upminster, with AM and PM peak frequencies of approximately every three minutes providing 21-22 services per hour in each direction.

18.4.48 On average there are approximately 55 underground services in total during the AM and PM peaks within a 960m walking distance of the site.

18.4.49 Table 18.4.2 provides a summary of the London Underground services and their frequencies during the weekday and weekend peaks.

Table 18.4.2 Existing London Underground weekday peak hour services and frequencies (number of services per hour)

Line	Origin - destination	Nearest London Underground stations to the site	Approximate distance from the site (m)	Weekday peak hour two-way frequencies	
				AM peak (08:00-09:00)	PM peak (17:00-18:00)
Circle Line	Edgware Road – Hammersmith	Blackfriars Temple	300 800	12	12
District Line	Ealing Broadway, Richmond, Wimbledon, Kensington (Olympia) – Upminster	Blackfriars Temple	300 800	43	43

Source: Transport for London (TfL) (2012) Timetables. Available at www.tfl.gov.uk (site last accessed December 2012)

National Rail

18.4.50 The closest National Rail stations to the site are Blackfriars to the northeast and City Thameslink to the north. Blackfriars and City Thameslink are approximately 300m and 500m walking distance respectively from the site.

18.4.51 Blackfriars and City Thameslink stations provide access to both First Capital Connect (FCC) and Southeastern train services. FCC provides northbound services to Bedford, Luton, St Albans, West Hampstead Thameslink, and Kentish Town, and southbound services to Elephant and Castle, Bromley South, Sevenoaks, Sutton, and Brighton.

18.4.52 Southeastern provide northbound services to London Victoria, London St Pancras, and Kentish Town and southbound services to Elephant and Castle, Swanley, Maidstone East, Rochester, Gillingham, Orpington, Sevenoaks and Ashford International.

18.4.53 At both Blackfriars and City Thameslink stations there are approximately 58 services (29 southbound and 29 northbound) in the AM peak. In the PM peak there are approximately 53 services (26 southbound and 27 northbound).

18.4.54 Table 18.4.3 provides a summary of the National Rail services and their frequencies during the weekday peaks.

Table 18.4.3 Existing National Rail weekday peak hour services and frequencies (number of services per hour)

National Rail station	Origin - destination	Approximate walking distance from Blackfriars Bridge Foreshore site (m)	Weekday two-way frequency	
			AM peak (08:00-09:00)	PM peak (17:00-18:00)
Blackfriars	Bedford, Luton, St Albans, West Hampstead Thameslink, Kentish Town, Brighton, Sutton, Kent House, Bromley South, Seven Oaks, Elephant & Castle, Rochester, Three Bridges	300	58	53
City Thameslink	London Victoria, Kentish Town, Sutton, Kent House, Seven Oaks, Rochester, Ashford International, Three Bridges, Bromley South, Elephant & Castle	500	58	53

Source: Railplanner information and timetables: www.nationalrail.co.uk (site last accessed December 2012)

River passenger services

18.4.55 Within the vicinity of the site there are two piers, Temple Pier, approximately 500m walking distance west of the site on the north bank and Blackfriars Millennium Pier, which is within the site. Temple Pier is used by leisure cruises with no set timed departures, with Capital Pleasure Boats operating from this pier. Blackfriars Millennium Pier is served by river bus and leisure cruise services. Figure 18.4.2 in the Blackfriars Bridge Foreshore *Transport Assessment* figures indicates the piers and the river services in the vicinity of the site.

18.4.56 Blackfriars Millennium Pier is served by Thames Clipper and Thames Executive Charters services. It is also used by private charter services and rigid inflatable boats (RIBs), but this is not a regular service. Thames Clipper services run between Embankment Pier in the west and Woolwich Arsenal Pier in the east. The river services operated by Thames Executive charters run between Putney Pier in the west and Blackfriars Millennium Pier in the east.

18.4.57 Eastbound Thames Clippers services from Blackfriars Millennium Pier start at 07:07 running until 23:19 and westbound services start at 06:49 running until 22:58. On weekends, no Thames Clippers service runs from this pier.

18.4.58 During the AM weekday peak, the frequency of the westbound service is approximately every 10-20 minutes and during the PM weekday peak, the frequency reduces to every 20-30 minutes. The eastbound service runs approximately every 10-20 minutes during the AM and PM weekday peaks.

18.4.59 In the weekday AM peak, both eastbound and westbound Thames Executive Charters services from this pier begin at 07:00 running until 09:35 with three eastbound services and only one westbound service during the AM peak. During the PM peak, one eastbound and one westbound service operate from the pier. On weekends, there is no Thames Executive Charters service from this pier.

18.4.60 Blackfriars Millennium Pier and Temple Pier are currently accessed from the southern footway of Victoria Embankment (A3211) and/or Paul's Walk, and do not have a ticket office.

18.4.61 The frequency distribution of the services that stop at Blackfriars Millennium Pier is shown in Table 18.4.4.

River navigation

18.4.62 An analysis has been made of the typical volume of river vessel traffic passing the Blackfriars Bridge Foreshore site, based on published river passenger service timetables and estimates of freight traffic based on discussions with operators.

18.4.63 It is estimated that the peak hour is between 15:00 and 16:00 hours, Monday to Friday. During this hour about 36 vessels are estimated to pass the site. This figure is not constant as freight vessel transit patterns, which are included in the traffic, are influenced by the rising and falling tide. Therefore, such a peak will only occur every 10 to 12 days when the tide is at its highest. Table 18.4.5 shows the estimated passing traffic rate.

Table 18.4.4 Aggregated typical river passenger services frequencies (number of services per hour)

	06:00 – 07:00	07:00 – 08:00	08:00 – 09:00	9:00 – 10:00	10:00 – 11:00	11:00 – 12:00	12:00 – 13:00	13:00 – 14:00	14:00 – 15:00	15:00 – 16:00	16:00 – 17:00	17:00 – 18:00	18:00 – 19:00	19:00 – 20:00	20:00 – 21:00	21:00 – 22:00	22:00 – 23:00	23:00 – 00:00
Blackfriars Bridge Foreshore site	1	6	9	6	1	1	1	1	1	1	1	8	7	7	6	2	2	1

Source: http://www.tfl.gov.uk/modalpages/2648.aspx

Table 18.4.5 Aggregated typical river movement frequencies (number of passing craft per hour)

	06:00 – 07:00	07:00 – 08:00	08:00 – 09:00	9:00 – 10:00	10:00 – 11:00	11:00 – 12:00	12:00 – 13:00	13:00 – 14:00	14:00 – 15:00	15:00 – 16:00	16:00 – 17:00	17:00 – 18:00	18:00 – 19:00	19:00 – 20:00	20:00 – 21:00	21:00 – 22:00	22:00 – 23:00	23:00 – 00:00
Blackfriars Bridge Foreshore site	0	0	0	1	14	19	22	29	25	36	31	14	12	6	4	2	0	0

Note: Table does not include river passenger services that call at Blackfriars Millennium Pier.
Source: http://www.tfl.gov.uk/modalpages/2648.aspx and consultation with aggregates companies, West London Waste Authority, barge operators, Port of London Authority

Taxis

18.4.64 The nearest taxi ranks to the site are 300m walking distance to the north of the main site on John Carpenter Street with two taxi spaces and on Tudor Street approximately 400m walking distance to the northwest with three taxi spaces.

18.4.65 Taxi ranks are located on both sides of Queen Victoria Street approximately 100m walking distance east of the junction with New Bridge Street (A201), approximately 300m walking distance from the main site. The ranks are for licensed taxis only with a maximum stay of 30 minutes, with no return within one hour. Each taxi rank accommodates three taxis.

Highway network and operation

18.4.66 The site is located to the west of the signalised junction of Victoria Embankment (A3211) / Blackfriars Bridge (A201) / New Bridge Street (A201) / Queen Victoria Street.

18.4.67 Victoria Embankment (A3211) forms part of the TLRN and is a wide dual carriageway. A 30mph speed limit applies and the road is suitable for HGVs and long vehicles. The road links to New Bridge Street (A201), Blackfriars Bridge (A201) and Upper Thames Street (A3211) in the east, and Bridge Street (A302) and Westminster Bridge Road (A302) in the west).

18.4.68 To the east of the junction with Temple Avenue, Victoria Embankment (A3211) divides. The Blackfriars Underpass continues under Blackfriars Bridge, whilst slip roads to and from Victoria Embankment (A3211) connect to the junction with New Bridge Street (A201), Queen Victoria Street, and Blackfriars Bridge (A201).

18.4.69 New Bridge Street (A201) is also part of the TLRN and has one northbound and two southbound lanes in the vicinity of the junction with Blackfriars Bridge (A201) / Queen Victoria Street.

18.4.70 At the lower level, the Blackfriars Underpass provides an east-west link between Victoria Embankment (A3211) to the west and Upper Thames Street (A3211) to the east. The Blackfriars Underpass is a dual carriageway and forms part of the TLRN.

18.4.71 Upper Thames Street (A3211) is part of the TLRN and is a dual carriageway providing an east-west link. The London Bridge underpass further east marks the divide between Upper Thames Street (A3211) and Lower Thames Street (A3211).

18.4.72 Queen Victoria Street is a single carriageway with two lanes on the approach to and two lanes on the exit from the junction. Queen Victoria Street is not part of the TLRN or the Strategic Road Network (SRN).

18.4.73 Blackfriars Bridge (A201) forms part of the TLRN with one lane, a bus lane, and a cycle lane in both directions.

18.4.74 There are a number of signalised junctions along Victoria Embankment (A3211) to the west of Temple Avenue, including those at Temple Place, Savoy Street, Northumberland Avenue (A308) and Horse Guards Avenue.

Victoria Embankment (A3211) extends as far west as the junction with Westminster Bridge Road (A302) and Bridge Street (A302) which is 1.8km from the site.

18.4.75 There is no vehicular access to the southern footway of Victoria Embankment (A3211) or to the foreshore in the location of the proposed development.

Parking

18.4.76 Figure 18.4.3 in the Blackfriars Bridge Foreshore *Transport Assessment* figures shows the locations of the existing car and coach parking within the vicinity of the site. The existing off-street/private car parking and car clubs parking spaces are also shown in this figure.

Existing on-street car and motorcycle parking

18.4.77 There are no resident parking bays available on the roads in the vicinity of the site.

18.4.78 There are four car parking bays along the eastbound slip road from Victoria Embankment (A3211) to New Bridge Street (A201) and a further parking bay is located to the east of the Victoria Embankment (A3211) / Temple Avenue junction which accommodates two cars. The permitted maximum stay is 20 minutes, with no return within 40 minutes. There is no charge for parking in these bays.

18.4.79 A total of 22 pay and display car parking bays are provided on Temple Avenue, John Carpenter Street and Tallis Street with a maximum stay of four hours between 08:00 and 19:00 Monday to Friday and between 08:00 and 11:00 Saturday. The charges are £1 for 15 minutes or part thereof Monday to Friday and £2 for all day on Saturday.

18.4.80 On Temple Avenue, John Carpenter Street and Tallis Street, there are six blue badge holder parking bays which are restricted to stays of four hours, no return within one hour, Monday to Friday, along with motorcycle parking bays which accommodate up to eight, 16 and 20 motorcycles on Temple Avenue, John Carpenter Street, and Tallis Street respectively.

18.4.81 Table 18.4.6 summarises the parking restrictions and the number of bays on the roads in the vicinity of the site. The availability and usage of parking capacity on a weekday and a Saturday on the roads in the vicinity of the site is summarised later in this section in Table 18.4.13.

Table 18.4.6 Existing on-street car parking in the vicinity of the Blackfriars Bridge Foreshore site

Road name	Type of parking restrictions and number of bays				
	Pay and display	Resident	Blue badge	Unrestricted	Short-term
Bridewell Place	6	0	1	2	0
Carmelite Street	5	0	1	0	0
Dorset Rise	0	0	2	0	0
John Carpenter Street	14	0	1	0	0

Road name	Type of parking restrictions and number of bays				
	Pay and display	Resident	Blue badge	Unrestricted	Short-term
Tallis Street	0	0	1	0	0
Temple Avenue	9	0	4	0	0
Tudor Street	5	0	2	0	0
Victoria Embankment (A3211)	0	0	0	0	7
Watergate	8	0	0	0	0
Whitefriars Street	6	0	1	0	0

**The maximum stay for short-term parking bays is 20 minutes.*

18.4.82 A motorcycle parking bay is located along Victoria Embankment (A3211) to north of the junction with Temple Place and accommodates ten motorcycles. The motorcycle bay is restricted between 08:00 and 19:00 Monday to Saturday.

18.4.83 Further motorcycle parking bays are also provided on Tudor Street, Whitefriars Street, Carmelite Street and Dorset Rise with capacity for up to 62 motorcycles.

Existing off-street/private car parking

18.4.84 There are four private car parks close to the site at Bouverie Street, Baynard House, Little New Street and Limeburner Street.

18.4.85 Bouverie Street car park is approximately 330m walking distance to the north of the main site. The car park is operated by Green Parking. It is open between 07:00 – 20:00 Monday to Friday. It has a standard charge of £24 per day, £12 from 13:00 and £30 for 24 hours. It also offers parking for vans at £20 per day. Long term passes are available from weekly to annual, with prices ranging from £105 to £4990.

18.4.86 Baynard House car park is approximately 450m walking distance from the main site on Queen Victoria Street to the north-east. The 24 hour car park is managed for the City of London by Apcoa Parking UK Ltd and it has 287 spaces. The rate is £2.50 per hour. Free motorcycle and pedal cycle parking areas are provided in the car park. The maximum headroom is 1.85m (6’1’’).

18.4.87 The International Press Centre car park on Little New Street is approximately 640m walking distance to the north of the main site. The car park is operated by NCP and it has 70 parking bays car. It is open between 06:30 – 20:00 Monday to Friday and the charges are shown in Table 18.4.7.

Table 18.4.7 Private parking charges

Duration	Charge
Up to 1 hour	£8.00
Up to 2 hour	£16.00
Up to 3 hour	£24.00
Up to 4 hour	£32.00
Up to 24 hour	£40.00
Motorcycle per day	£5.00

18.4.88 Limeburner Lane (Hillgate House) car park is approximately 720m walking distance to the north-west of the main site. The car park is operated by NCP and it has 136 parking bays car. It has no disabled bays and maximum headroom of 1.88m (6'2"). It is open 24 hours a day Monday to Sunday and the charges are shown in Table 18.4.8.

Table 18.4.8 Hillgate House parking charges

Duration	Charge
1 hour	£5.70
1 to 2 hours	£11.20
2 to 4 hours	£22.50
4 to 6 hours	£31.00
6 to 9 hours	£33.00
9 to 24 hours	£35.00
2 to 4 hours	£4.00

Coach parking

18.4.89 Coach parking is provided on the westbound on-slip road from Blackfriars Bridge (A201) to Victoria Embankment (A3211). The parking bays can accommodate two coaches and are limited to a maximum stay of 20 minutes, free of charge.

18.4.90 There is additional coach parking on Temple Place to the west of the site. This comprises two bays which are pay by phone and allow parking from 08:00 to 23:59 seven days a week (no overnight parking is permitted). These bays are metered bays and allow a maximum stay of two hours. The charges are £4 per hour and the charged hours are 08:30 to 18:30 Monday to Friday and 08:30 to 13.30 on Saturdays

18.4.91 To the north-east of the site on Queen Victoria Street, eight on-street metered coach parking bays are provided with a maximum stay of four hours. The charges are £6 per hour and the charged hours are 08:00 – 19:00 Monday to Friday and 08:00 – 11:00 Saturday.

Car clubs

18.4.92 Car clubs provide members with easy access to cars for short-term use. Cars are available as and when needed and allow members to access a car without purchase, storage and operational costs associated with owning a private car. Below describes the car clubs available within a 640m walking distance of the site.

18.4.93 The closest car club parking space to the site is operated by ZipCar and is approximately 300m walking distance away on Temple Place where one car is provided.

Servicing and deliveries

18.4.94 Four loading bays are located close to the main site.

18.4.95 The closest loading bay is a shared use loading and disabled parking bay and is located adjacent to the coach parking bays described in para. 18.4.91. It is approximately 130m walking distance to the west of the Blackfriars Bridge (A201) / New Bridge Street (A201) junction on the Victoria Embankment (A3211) westbound on-slip adjacent to the main site. The bay is restricted to stays of 20 minutes Monday to Saturday between 08:00 – 19:00 and loading is prohibited between 10:00 – 16:00. The loading / disabled parking bay to the east of the junction is restricted between 10:00 – 16:00 and 19:00 – 08:00 with a maximum stay of 20 minutes for loading and a maximum stay of three hours for blue badge holders.

18.4.96 A loading/disabled parking bay is located on Victoria Embankment (A3211) and is approximately 180m walking distance to the west of the main site. This 13m loading / disabled parking bay is restricted to stay of 20 minutes for loading and a maximum stay of three hours for blue badge holders. The bay is restricted at all times except 10:00 and 16:00, and 19:00 and 08:00.

18.4.97 Approximately 370m north of the main site a loading / disabled parking bay is located to the north of the New Bridge Street (A201) / Bridewell Place junction. It is restricted Monday to Saturday between 07:00 and 19:00, except 10:00 and 16:00. The maximum stay for loading is 20 minutes and the maximum stay for blue badge holders is three hours.

18.4.98 A further loading / disabled parking bay is located approximately 420m to the north of the main site, north of the New Bridge Street (A201) / Bride Lane junction. It can only be used between 10:00 and 16:00. The maximum stay for loading is 20 minutes and the maximum stay for blue badge holders is three hours.

Baseline survey data

Description of data

18.4.99 Baseline survey data were collected in three phases in May, July, and August 2011 to establish the existing transport movements and usage of parking in the area. Supplementary surveys were also undertaken in May 2012. Figure 18.4.4 in the Blackfriars Bridge Foreshore *Transport Assessment* figures indicates the survey locations in the vicinity of the site. Traffic surveys were carried out on a weekday and a weekend to represent a weekly profile of traffic at particular locations. Where two weekly profiles have been surveyed, the busiest survey was used.

18.4.100 As part of surveys in May and July 2011 and May 2012, manual and automated traffic surveys were undertaken to establish specific traffic, pedestrian and cycle movements including turning volumes, queue lengths and traffic signal timings. Parking surveys were undertaken to establish the usage of pay and display parking in addition to coach parking, loading bays and motorcycle bays. Further pedestrian and cycle movement surveys were conducted in August 2011 to establish the summer usage of the Thames Path. As indicated in para. 18.4.101, the busiest survey data are shown in Table 18.4.10.

18.4.101 Junction movement data from both TRANSYT and LinSig models for the junctions outlined in paras. 18.4.125 to 18.4.129 were also obtained from TfL and assessed alongside the traffic surveys undertaken for the project.

18.4.102 The scope of the surveys in terms of location and time periods was considered to ensure that the data required for assessment was collected. In some cases ATC data was collected on links to validate the junction count data and provide information for noise and air quality assessments. Pedestrian and cycle count data was collected at locations where flows could be affected by pedestrian and cycle diversions during construction, the generation of additional trips or where conflicts could occur with construction vehicles. Parking survey data was collected where it was possible that parking suspensions would be necessary or where additional parking demand might be generated by the proposed development.

18.4.103 The *Baseline Data Report* presents the method for field survey data collection and data collected through other sources which is in Appendix A to Section 3 of the *TA.*

18.4.104 The surveys undertaken and their locations are summarised in Table 18.4.9.

Table 18.4.9 Survey type and locations

Survey type and location	Date
Junction survey (including pedestrian and cycle movements)	
Victoria Embankment (A3211) / Temple Avenue	10 May 2011
A201 Farringdon Street / Ludgate Hill / A201 New Bridge Street / Fleet Street	14 July 2011
A3211 Upper Thames Street / White Lion Hill	14 September 2011
A201 Blackfriars Bridge Road / Victoria Embankment (A3211)	29 May 2012
A201 New Bridge Street / Queen Victoria Street	

Survey type and location	Date
A3211 Upper Thames Street / Puddle Dock	
Automatic Traffic Count (ATC)	
Three ATCs between the junction of Victoria Embankment / Temple Avenue and Victoria Embankment / Blackfriars Bridge	21 May – 13 June 2011
Pedestrian and cycle surveys	
Thames Path – to the west of Blackfriars Bridge	10 May, 25 August and 1 September 2011
Thames Path – Paul's Walk.	
Parking surveys	
Victoria Embankment (A3211)	10 May 2011
Temple Avenue	
Bouverie Street	
Pleydell Street	
Lombard Lane	
Temple Lane	
Tudor Street	
Whitefriars Street	
Tallis Street	
Carmelite Street	
John Carpenter Street	
Hutton Street	
Primrose Hill	
Kingscote Street	
Bride Lane	
Dorset Rise	
Salisbury Court	
Bridewell Place	

18.4.105 The following ATC and junction surveys are on construction traffic routes to and from the Blackfriars Bridge Foreshore site:

a. ATC on Victoria Embankment (A3211) westbound on-slip road from of Blackfriars Bridge Road (A201) to Victoria Embankment (A3211)

b. ATC on Victoria Embankment (A3211) west of on and off slip road to Blackfriars Bridge Road (A201)

c. ATC on Victoria Embankment (A3211) east of Northumberland Avenue.

d. Junction of Blackfriars Bridge Road (A201) / Victoria Embankment (A3211) westbound slip road

e. Junction of Victoria Embankment (A3211) / Temple Avenue

f. Junction of Blackfriars Bridge Road (A201) / New Bridge Street (A201) / Queen Victoria Street

g. Junction of Queen Victoria Street / Puddle Dock

h. Junction of Upper Thames Street (A3211) / Puddle Dock / Blackfriars Passage

Results of the surveys

18.4.106 The surveys inform the baseline situation in the area surrounding the site and are summarised in the following paragraphs.

Pedestrians

18.4.107 Table 18.4.10 shows the pedestrian flows surrounding the site during the AM, PM and weekend peak hours. This indicates that the pedestrian movements along the Thames Path route are typically heaviest in the westbound direction. The inter peak is the busiest period with approximately 320 pedestrians heading east and 500 heading west. The PM peak hour the flow is heavier than the AM peak hour flow with approximately 370 westbound pedestrians and 280 eastbound pedestrians in the same location.

Table 18.4.10 Existing pedestrian flows

Road/route	Direction	Weekday			Weekend
		AM peak (08:00-09:00)	Inter-peak (12:00-13:00)	PM peak (17:00-18:00)	(13:00-14:00)
Specific surveys					
Thames Path (Victoria Embankment foreshore / Paul's Walk)	Westbound	221	498	373	297
	Eastbound	130	324	280	308
Junction counts (pedestrian crossings)					
Blackfriars Bridge (A201) / Queen Victoria Street / New Bridge Street (A201)					
A201 Blackfriars Bridge (South)	Westbound	214	170	322	146
	Eastbound	323	127	246	143
A3211 Victoria Embankment (westbound on-slip and eastbound off-slip roads)	Northbound	1727	288	211	94
	Southbound	135	279	1004	113
A201 New Bridge Street (North)	Westbound	832	98	75	69
	Eastbound	30	109	789	53
Queen Victoria Street (East)	Northbound	2337	454	287	178
	Southbound	181	327	1378	177
Queen Victoria Street / Puddle Dock					
Queen Victoria Street (West)	Northbound	160	97	63	-
	Southbound	40	59	119	-
Queen Victoria Street (East)	Northbound	22	76	31	-
	Southbound	35	67	68	-

Road/route	Direction	Weekday			Weekend
		AM peak (08:00-09:00)	Inter-peak (12:00-13:00)	PM peak (17:00-18:00)	(13:00-14:00)
Puddle Dock	Westbound	81	72	414	-
	Eastbound	515	78	136	-

18.4.108 To establish the Pedestrian Level of Service (LoS) along the footways surrounding the site, a Level of Service assessment has been undertaken and the results indicate there is adequate capacity for pedestrians within the existing network. The main corridor for pedestrians, Paul's Walk and the Victoria Embankment (A3211) riverside footway, indicates a LoS of A and B respectively, which represents conditions in which pedestrians feel there is sufficient space to walk and select routes without hindrance. Table 18.4.11 indicates the LoS in the peak hours along Paul's Walk and the Victoria Embankment (A3211) riverside footway.

Table 18.4.11 Baseline pedestrian level of service

Footway	Weekday			Weekend
	AM peak (08:00-09:00)	Inter-peak (12:00-13:00)	PM peak (17:00-18:00)	13:00-14:00
Paul's Walk	B	B	B	B
Victoria Embankment (A3211) eastbound	B	A	B	A
Victoria Embankment (A3211) westbound	B	B	B	A
Blackfriars Bridge (A201)	A	A	A	A

18.4.109 Appendix C contains the full analysis of the LoS assessment for the footways around the site.

Cyclists

18.4.110 Cycle flows from the surveys indicate the existing usage of the Thames Path and other cycle routes within the area surrounding Victoria Embankment. Table 18.4.12 indicates the flows of bicycles along the main routes surrounding the site.

Table 18.4.12 Existing cycle flows

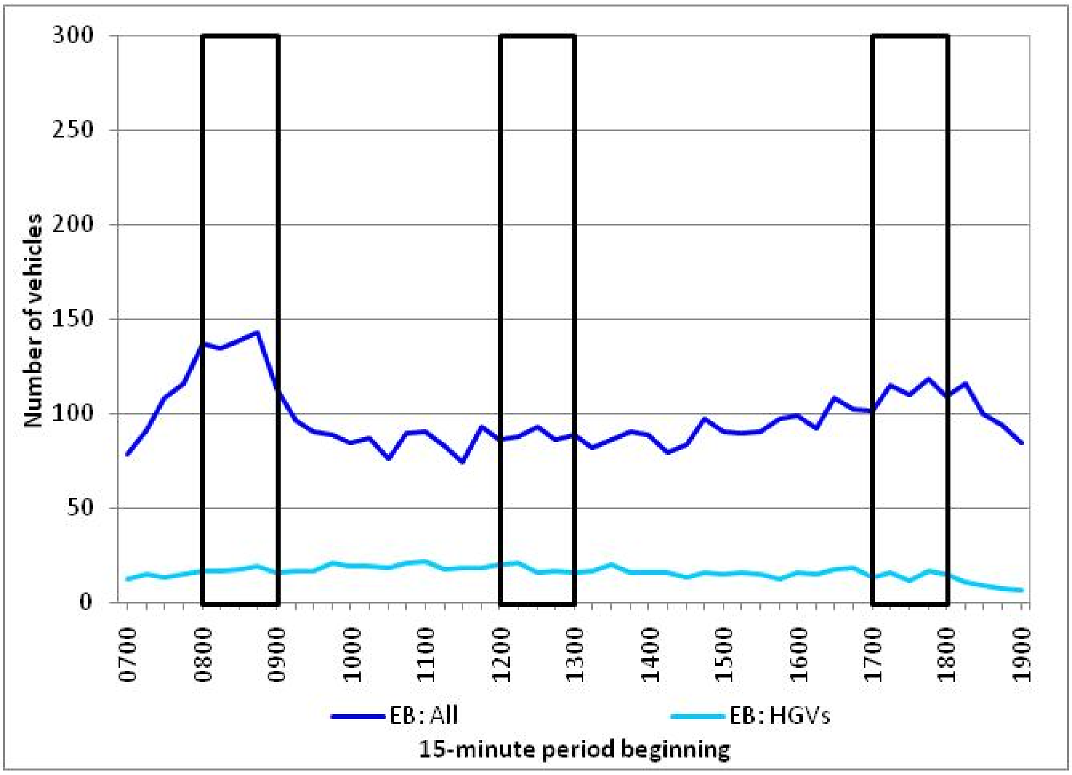
Road/route	Direction	Weekday			Weekend
		AM peak (08:00-09:00)	Inter-peak (12:00-13:00)	PM peak (17:00-18:00)	(13:00-14:00)
Victoria Embankment / Blackfriars Underpass (A3211)	Eastbound	765	85	415	N/A
	Westbound	407	67	738	N/A
Junction counts (pedestrian crossings)					
Blackfriars Bridge (A201) / Queen Victoria Street / New Bridge Street (A201)					
A201 Blackfriars Bridge (South)	Northbound	1275	79	283	81
A3211 Victoria Embankment (eastbound off-slip roads)	Eastbound	276	19	98	30
A201 New Bridge Street (North)	southbound	544	67	1124	95
Queen Victoria Street (East)	Westbound	92	24	336	34
Queen Victoria Street / Puddle Dock					
Queen Victoria Street (West)	Eastbound	324	22	126	N/A
Queen Victoria Street (East)	Westbound	143	24	232	N/A
Puddle Dock	Northbound	100	7	37	N/A

18.4.111 It should be noted that cyclists have been recorded in the survey on Paul's Walk. Cycling is not permitted on this route. The volume of cyclists observed on Paul's Walk has therefore been added to the Blackfriars Underpass totals shown in Table 18.4.12 as it is assumed that these cyclists are making east-west movements within the Victoria Embankment (A3211) corridor.

Traffic flows

18.4.112 The ATC data has been analysed to identify the existing weekday traffic flows along Victoria Embankment (A3211). Weekday flows have been used as this is when the greatest impacts from the project are likely to be experienced. The weekday vehicle and HGV flows for a 12-hour period (07:00-19:00) on the Victoria Embankment (A3211) eastbound slip-road is shown in Plate 18.4.6. The weekend vehicle and HGV flows are shown in Plates 18.4.7 and 18.4.8.

Plate 18.4.6 Existing weekday traffic flow, Victoria Embankment eastbound slip-road (ATC profile)

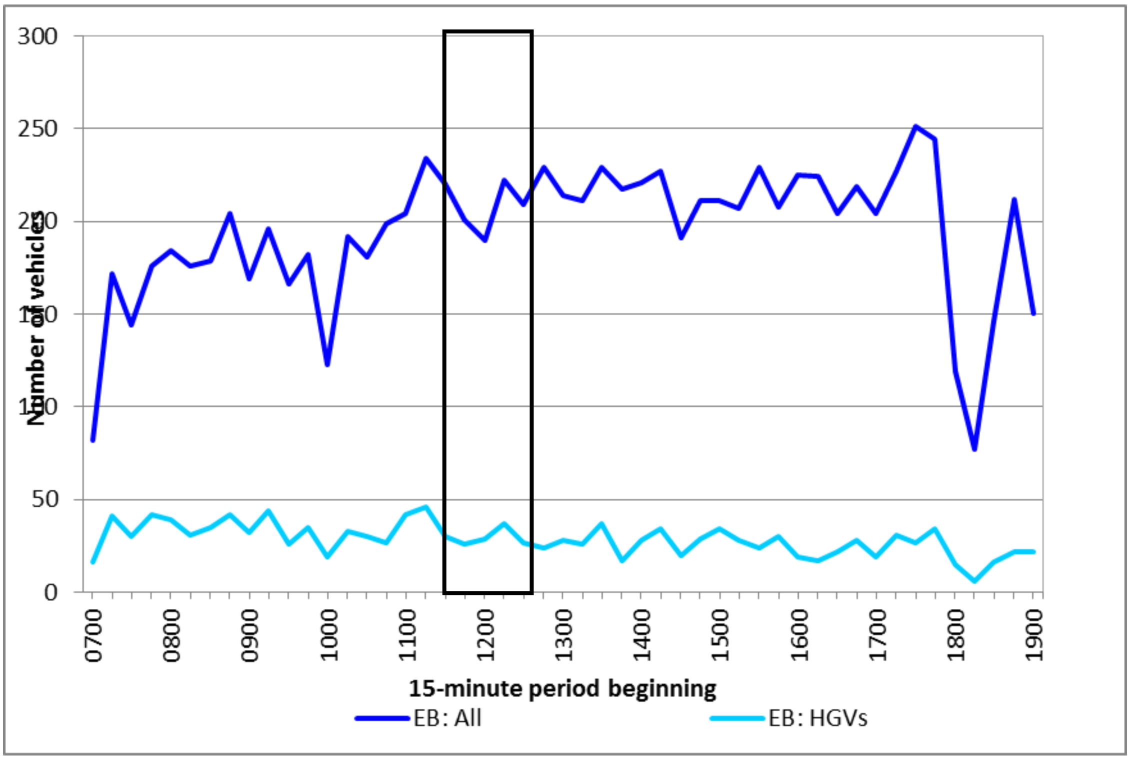


EB – East Bound. The black box represents the peak hour traffic flows used for the traffic assessment

18.4.113 The weekday ATC data shows that between 08:00 and 09:00 there were approximately 554 one-way vehicle movements. The busiest 15 minute peak period in this period occurred after 08:45 with approximately 143 eastbound vehicles.

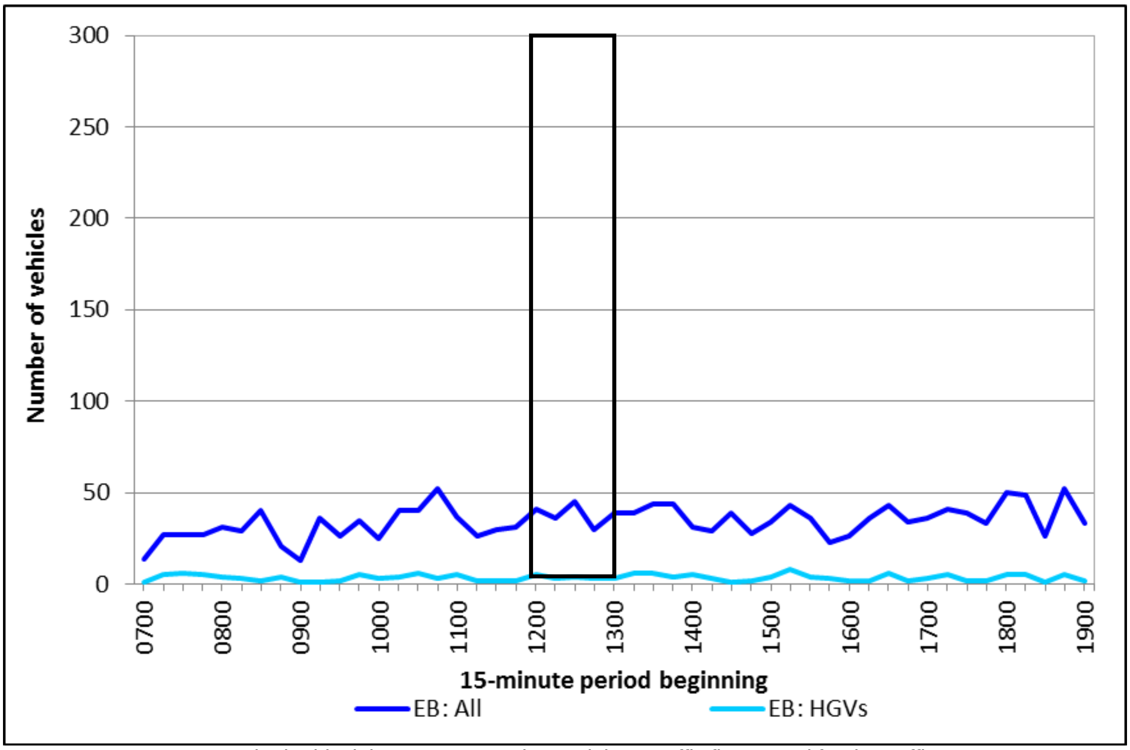
18.4.114 For the period between 17:00 and 18:00 there were approximately 446 one-way vehicle movements. The busiest 15 minute peak period in this period occurred after 17:45 with approximately 119 eastbound vehicles.

Plate 18.4.7 Existing Saturday traffic flow, Victoria Embankment eastbound slip-road (ATC profile)



EB – East Bound. The black box represents the peak hour traffic flows used for the traffic assessment

Plate 18.4.8 Existing Sunday traffic flow, Victoria Embankment eastbound slip-road (ATC profile)



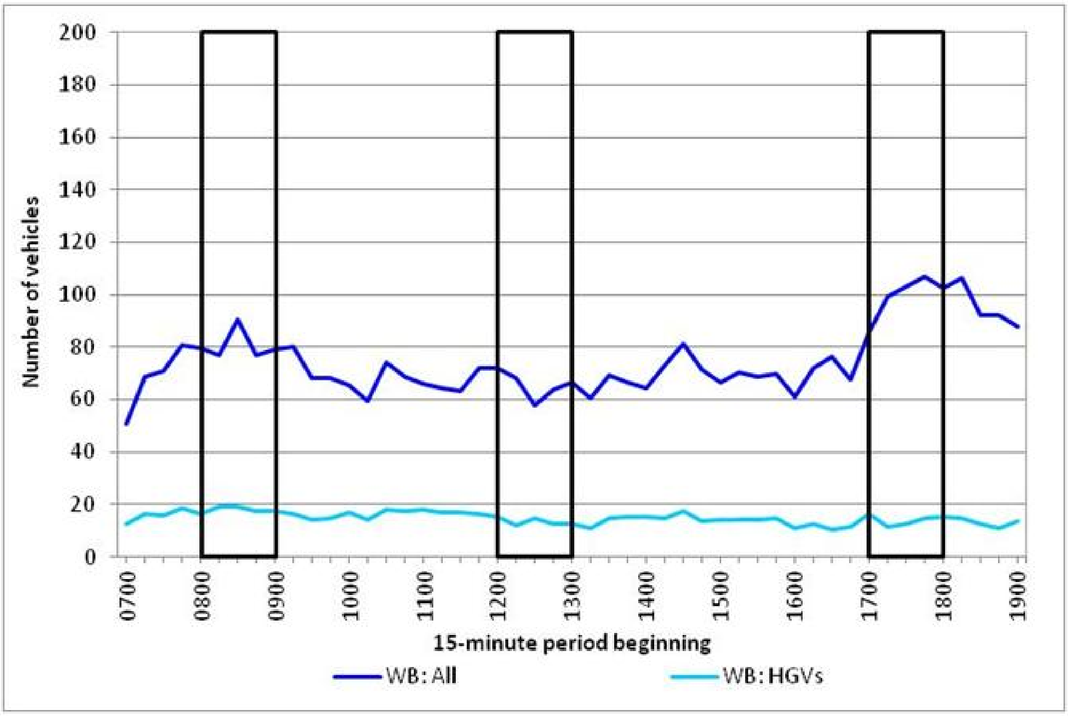
EB – East Bound. The black box represents the peak hour traffic flows used for the traffic assessment

18.4.115 Analysis of the data showed that the Saturday peak travel occurred between 17:00 and 18:00 with 250 one-way vehicle movements recorded. This is less than the AM or PM weekday traffic flows and this period falls outside of the expected weekend construction works vehicle movements period of between 08:00 and 13:00 on a Saturday.

18.4.116 Analysis of the data showed that the Sunday peak travel period occurred between 10:00 to 11:00 and 18:00 to 19:00 with 52 one-way vehicle movements recorded. This is less than the AM or PM weekday traffic flows. However, construction vehicle movements are not expected to take place on a Sunday.

18.4.117 The weekday vehicle and HGV flows on the Victoria Embankment (A3211), westbound slip-road are shown in Plate 18.4.9.

Plate 18.4.9 Existing weekday traffic flow, Victoria Embankment westbound slip-road (ATC profile

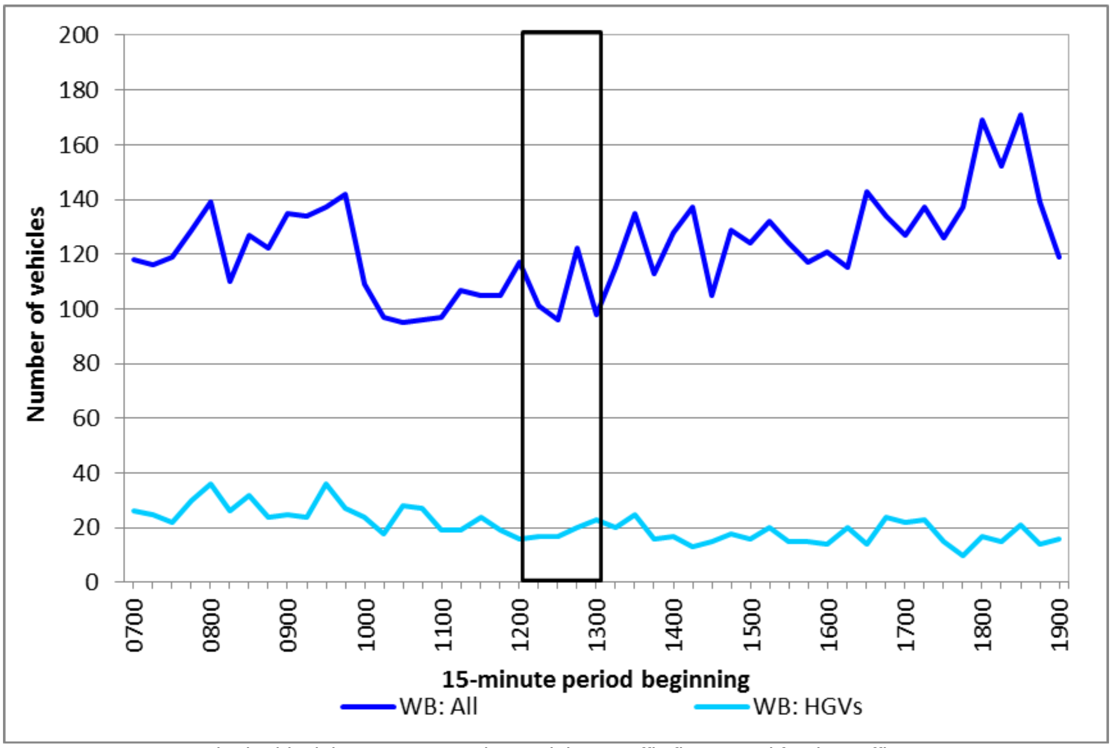


WB – West Bound. The black box represents the peak hour traffic flows used for the traffic assessment

18.4.118 The weekday ATC data shows that between 08:00 and 09:00 there were approximately 324 one-way vehicle movements. The busiest 15 minute peak period in this period occurred after 08:30 with approximately 90 westbound vehicles.

18.4.119 For the period between 17:00 and 18:00 there were approximately 395 one-way vehicle movements. The busiest 15 minute peak period in this period occurred after 17:45 with approximately 107 westbound vehicles

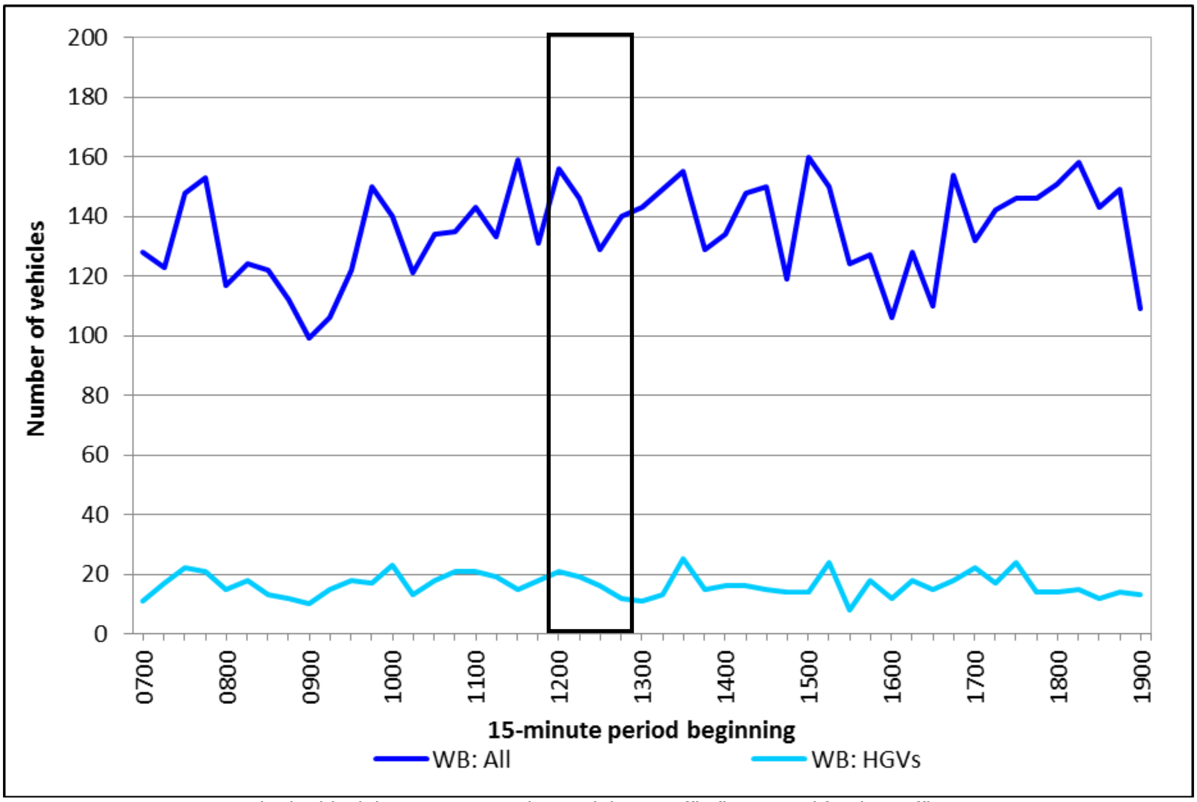
Plate 18.4.10 Existing Saturday traffic flow, Victoria Embankment westbound slip-road (ATC) profile



WB – West Bound. The black box represents the peak hour traffic flows used for the traffic assessment

18.4.120 Analysis of the data showed that the Saturday peak travel period occurred between 18:00 and 19:00 with 631 two-way vehicle movements recorded. This is higher than the AM and PM weekday traffic flows, however the period falls outside the expected weekend construction works vehicle movements period of between 08:00 and 13:00 on a Saturday.

Plate 18.4.11 Existing Sunday traffic flow, Victoria Embankment westbound slip-road (ATC) profile

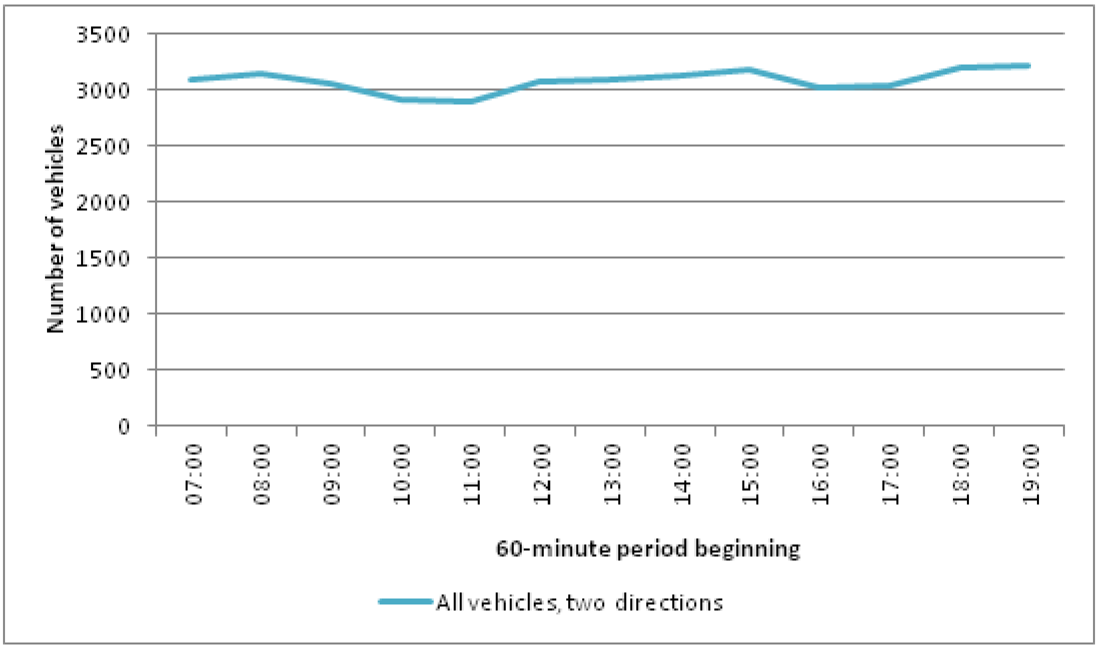


WB – West Bound. The black box represents the peak hour traffic flows used for the traffic assessment

18.4.121 Analysis of the data showed that the Sunday peak travel period occurred between 15:00 and 16:00 with 561 one-way vehicle movements recorded. This is higher than the AM and PM weekday traffic flows. However, construction vehicle movements are not expected to take place on a Sunday.

18.4.122 ATC data for Victoria Embankment (A3211) were also obtained from TfL and analysed to identify the traffic flows in 2011. The weekday vehicle flows for Victoria Embankment (A3211) for a 12-hour period (07:00-19:00) from the TfL ATC data are shown in Plate 18.4.12. Plate 18.4.12 shows that the PM peak hour for Victoria Embankment (A3211) is the busiest hour with a two-way flow of approximately 3,225 vehicles.

Plate 18.4.12 Existing weekday two-way traffic flow, Victoria Embankment (A3211)



Note: along Victoria Embankment (weekday TfL ATC survey)

18.4.123 The traffic flows for the junctions of Victoria Embankment (A3211) / Temple Avenue, and Upper Thames Street (A3211) and Puddle Dock in the AM and PM peak hours are shown in Figure 18.4.7 and Figure 18.4.8 in the Blackfriars Bridge Foreshore *Transport Assessment figures*.

18.4.124 Junction movement data from the TRANSYT model indicate that there is a total flow of 3,237 and 3,258 vehicles in the AM and PM peak hours respectively using the Victoria Embankment (A3211) / Temple Avenue junction. The flow is balanced in both eastbound and westbound directions in the AM and PM peak hours.

18.4.125 Junction movement data from the TRANSYT model indicate that a total traffic flow of 3,234 and 3,243 uses the junction of Blackfriars Bridge (A201) / New Bridge Street (A201) / Queen Victoria Street / Victoria Embankment (A3211) in the AM and PM peak hours respectively. The flow is relatively balanced in both directions in both peak hours. However there is a noticeable tidal pattern of a higher volume of northbound flow in the AM peak and a corresponding higher flow southbound in the PM peak by approximately 200 vehicles.

18.4.126 Junction movement data from the LinSig model indicate that a total traffic flow of 688 and 537 uses Puddle Dock to access Queen Victoria Street in the AM and PM peak hours respectively. The model data for Upper Thames Street (A3211) showed two-way traffic flow to be approximately 2,111 and 2,021 in the AM and PM peak hours respectively. It is noted that this is considerably lower than the flow shown on Victoria Embankment (A3211) in para. 18.4.125.

18.4.127 The junction survey data collected in 2012 has been used to update the base model traffic flows and to provide calibration to ensure that the traffic flows used are representative of the junction network in the peak periods.

Parking

18.4.128 Plate 18.4.13 shows a histogram of the car and motorcycle parking survey results as well as coach parking and loading bay availability and usage in the area surrounding the Blackfriars Bridge Foreshore site during the AM, inter-peak, PM peaks on a weekday and during the weekend peak period

18.4.129 Table 18.4.13 indicates the parking capacity available throughout a weekday and on Saturday on the roads in the vicinity of the site.

Plate 18.4.13 Existing on-street parking availability and usage

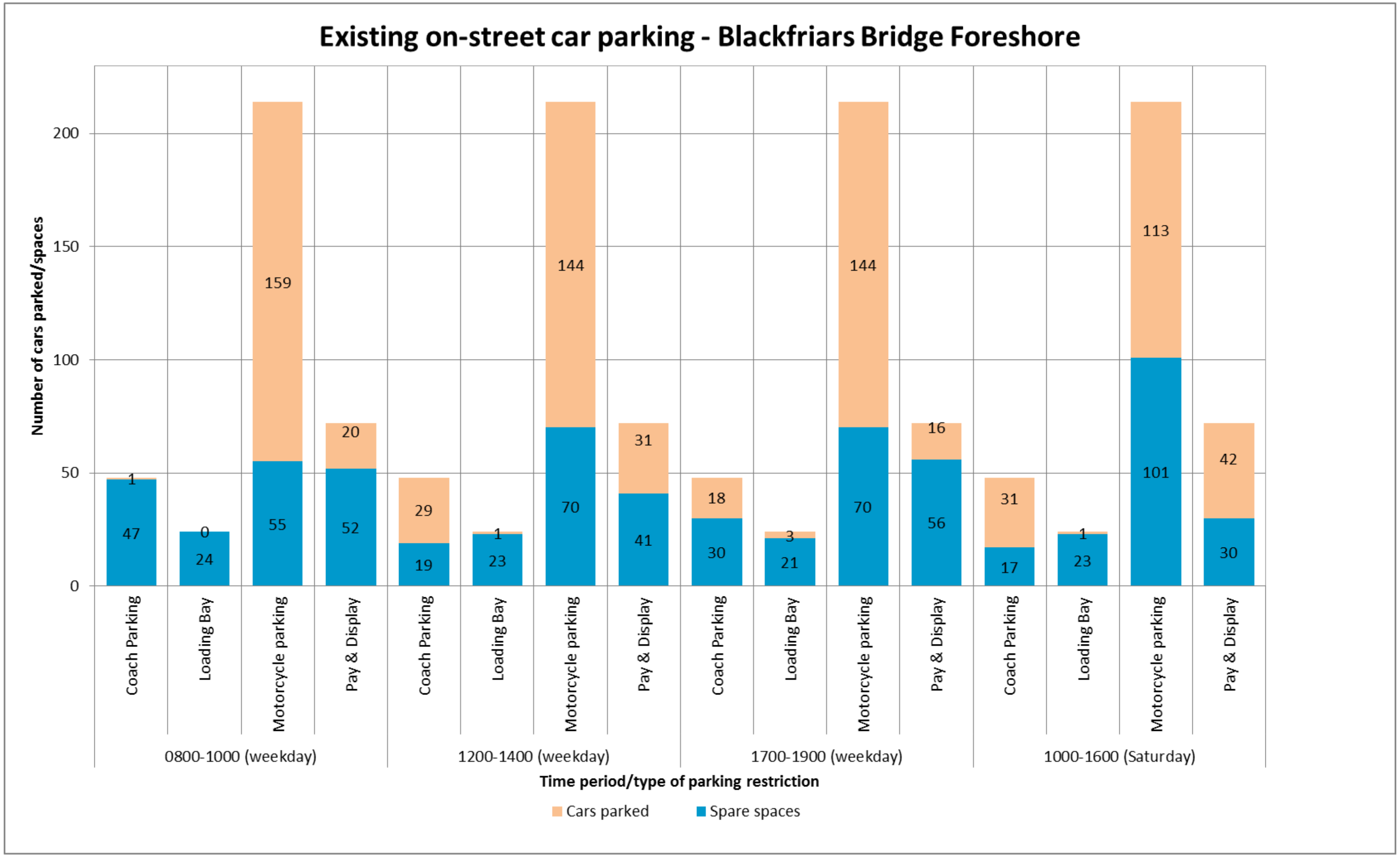


Table 18.4.13 Motorcycle, and pay and display parking bays

Location	Number and Type of bays	No. of spaces available			
		Weekday			Saturday
		08:00-10:00	12:00-14:00	17:00-19:00	12:00-14:00
Motorcycle parking bays					
Carmelite Street	14	3	0	0	14
Dorset Rise	9	9	9	9	9
John Carpenter Street	12	0	0	0	8
Tallis Street	14	11	9	14	14
Temple Avenue	6	3	0	0	6
Tudor Street	17	6	0	0	14
Victoria Embankment (A3211)	131	18	52	47	27
Whitefriars Street	11	5	0	0	9
Total	**214**	**55**	**70**	**70**	**101**
Pay and display parking bays					
Bridewell Place	6	6	5	6	3
Carmelite Street	5	3	0	5	0
John Carpenter Street	14	11	7	12	4
Temple Avenue	9	6	5	6	1
Tudor Street	5	1	1	4	0
Victoria Embankment	19	19	18	18	15
Watergate	8	4	3	1	1
Whitefriars Street	6	2	2	4	6
Total	**72**	**52**	**41**	**56**	**30**
Coach parking bay					
Victoria Embankment (A3211)	48	47	19	30	17
Loading bay					
Victoria Embankment (A3211)	24	24	23	21	23

**Motorcycle spaces available based on an assumed width of 1m per motorcycle*

18.4.130 The results of the parking surveys indicate that usage of motorcycle parking spaces within the area is between 53% and 74% and that there is generally spare capacity available on both weekdays and at weekends.

18.4.131 The usage of pay and display parking bays on the roads in the vicinity of the site is about 25% in the AM and PM peak hours and 43% in the weekday inter-peak. On Saturday the usage of pay and display parking bays is higher (58%).

18.4.132 Surveys were also undertaken to establish the availability of coach and loading bays along Victoria Embankment (A3211). Results indicate there is ample capacity within coach parking bays along this road in the AM and PM peak hours (between 2% and 38% of bays are utilised). The usage of coach parking is heavier in the weekday inter-peak and on Saturday peak (between 60% and 65% of bays are occupied).

18.4.133 Parking survey results indicate that there is ample capacity within the loading bays along Victoria Embankment (A3211) as these are not heavily used for the majority of the day.

Local highway modelling

18.4.134 To establish the existing capacity on the local highway network, a scope was discussed with TfL and the City of London Corporation to model the Victoria Embankment (A3211) / New Bridge Street (A201) / Blackfriars Bridge Road (A201) junction, the Victoria Embankment (A3211) / Temple Place and Queen Victoria Street / Puddle Dock junctions using a LinSig traffic model.

18.4.135 Traffic models for these junctions have been developed for this assessment and where possible suitable models from TfL have been used. The models have been constructed using on-street measurements of classified vehicle volumes and queue lengths.

18.4.136 The signal timings used in the assessment have been obtained from the TfL Signal Timing Sheet, UTC data and site observations for this junction.

18.4.137 The TfL Modelling Guidelines (TfL, 2010)[5] and Modelling Audit Process (MAP) (TfL, 2011)[6] have been used as the basis for preparing and checking models and their outputs. All required input data has been used in order to calibrate the model. Where TfL models have been used, saturation flows have been retained where no change is proposed to junctions; where changes are proposed, saturation flows have been calculated and compared with site observations to determine suitable values. Validation of the models has been used on observed data including signal timings, vehicle volumes and queue lengths to provide the key criteria for comparison with modelled queue lengths.

18.4.138 The models are considered suitable for this planning stage and are intended to demonstrate the nature of the effects of the additional vehicles generated by the Thames Tideway Tunnels project in this location. It is acknowledged that these models may require further refinement as the project moves from planning to detailed design stage; however, as a period of time will elapse before construction commences at this site, it will be necessary in any case to review and revalidate the models against traffic conditions at that time, as is normal practice.

18.4.139 The baseline model simulates the current traffic and transport conditions within the vicinity of the site.

18.4.140 The baseline model was created using the following models:

a. TRANSYT model for the Blackfriars Bridge (A201) / New Bridge Street (A201) / Victoria Embankment (A3211) / Queen Victoria Street junction (post station construction works)

b. LinSig model for the Upper Thames Street / Puddle Dock junction

c. TRANSYT model of Victoria Embankment (A3211) from which junction information was extracted for the Victoria Embankment (A3211) / Temple Place junction.

18.4.141 The model was built as a four junction network in LinSig to determine the localised effects of the changes to traffic movements in the construction base and development cases.

18.4.142 The weekday AM, inter-peak and PM and weekend baseline model flows contained in the traffic models for Blackfriars Bridge Road (A201) and Temple Avenue were compared against observed traffic data for the peak periods to validate the LinSig model and ensure reasonable representation of existing conditions.

18.4.143 Figures 18.4.5 and 18.4.6 in the Blackfriars Bridge Foreshore *Transport Assessment* figures show the traffic flows which were used for the baseline AM and PM peak hour assessments which take into account the observed flows and the TfL model output flows.

18.4.144 Table 18.4.14 shows the modelling outputs for the baseline case.

Table 18.4.14 Baseline LinSig model outputs

Approach	Movement	Weekday							
		AM peak hour (08:00-09:00)				PM peak hour (17:00-18:00)			
		Flow (PCU)	DoS	MMQ (PCU)	Delay (seconds per PCU)	Flow (PCU)	DoS	MMQ (PCU)	Delay (seconds per PCU)
Junction of Blackfriars Bridge Road (A201) / Victoria Embankment (A3211) westbound slip road									
Blackfriars Bridge Road (A201) - northbound	Ahead / left	932	97.6%	33	63	560	81%	15	40
	Ahead	455	47.4%	8	19	314	46%	7	27
Blackfriars Bridge Road (A201) southbound, to Victoria Embankment (A3211)	Right	258	54%	6	48	273	40%	7	35
Victoria Embankment (A3211) - eastbound slip-road	Ahead (nearside lane)	277	82%	9	69	256	87%	9	71
	Ahead (offside lane)	128	34%	3	47	122	42%	3	37
		PRC		**Total delay** (PCU Hours)		**PRC**		**Total delay** (PCU Hours)	
Overall junction performance		-8%		29.7		4%		18	
Junction of Victoria Embankment (A3211) / Temple Avenue									
Victoria Embankment	Ahead	Ahead	1075	100%	45	955	89%	24	30

Approach	Movement	Weekday							
		AM peak hour (08:00-09:00)				PM peak hour (17:00-18:00)			
		Flow (PCU)	**DoS**	**MMQ (PCU)**	**Delay (seconds per PCU)**	**Flow (PCU)**	**DoS**	**MMQ (PCU)**	**Delay (seconds per PCU)**
(A3211) - eastbound	(nearside lane)	(nearside lane)							
	Ahead (offside lane)	Ahead (offside lane)	829	78%	17	706	66%	12	17
Victoria Embankment (A3211) - westbound	Ahead (nearside lane)	Ahead (nearside lane)	245	23%	3	315	29%	3	7
	Ahead (offside lane)	Ahead (offside lane)	610	56%	10	681	63%	12	15
	Ahead (offside lane)	Ahead (offside lane)	791	73%	15	699	64%	12	16
Temple Avenue	Right	Right	74	15%	2	127	25%	3	28
		PRC		**Total delay** (PCU Hours)		**PRC**		**Total delay** (PCU Hours)	
Overall junction performance		**-11.9%**		**39**		**1%**		**22**	
Junction of Blackfriars Bridge Road (A201) / New Bridge Street (A201) / Queen Victoria Street									
Blackfriars Bridge	Ahead	682	63%	6	6	754	73%	5	7

Approach	Movement	Weekday							
		AM peak hour (08:00-09:00)				PM peak hour (17:00-18:00)			
		Flow (PCU)	DoS	MMQ (PCU)	Delay (seconds per PCU)	Flow (PCU)	DoS	MMQ (PCU)	Delay (seconds per PCU)
Road (A201) - northbound	(nearside lane)								
	Ahead (offside lane)	704	64%	18	14	256	25%	3	4
	Right	424	99%	16	75	204	95%	11	114
New Bridge Street (A201)	Ahead	445	74%	11	39	671	86%	18	40
	Ahead	567	94%	20	68	780	100%	33	90
Queen Victoria Street	Left	293	93%	12	93	364	95%	15	96
	Left / right	187	59%	5	31	210	55%	5	24
		PRC		Total delay (PCU Hours)		PRC		Total delay (PCU Hours)	
Overall junction performance		**-5%**		**39**		**-11%**		**47**	
Junction of Queen Victoria Street / Puddle Dock									
Queen Victoria Street -eastbound	Ahead	182	23%	5	16	209	26%	5	18
	Ahead / right	242	31%	6	18	16	3%	1	20
Queen Victoria Street –westbound	Ahead / left	140	25%	3	29	152	29%	4	30
	Ahead	169	30%	4	29	186	35%	4	31
Puddle Dock	Right / left	411	70%	7	46	386	72%	12	35

Approach	Movement	Weekday							
		AM peak hour (08:00-09:00)				PM peak hour (17:00-18:00)			
		Flow (PCU)	DoS	MMQ (PCU)	Delay (seconds per PCU)	Flow (PCU)	DoS	MMQ (PCU)	Delay (seconds per PCU)
	Right	247	76%	8	58	158	52%	5	56
		PRC		Total delay (PCU Hours)		PRC		Total delay (PCU Hours)	
Overall junction performance		**19%**		**14**		**29%**		**11**	
Junction of Upper Thames Street (A3211) / Puddle Dock / Blackfriars Passage									
Upper Thames Street (A3211) - eastbound	Ahead / left	706	59%	5	9	593	62%	7	14
	Ahead	829	67%	5	8	706	70%	8	14
Upper Thames Street (A3211) - westbound	Right	306	71%	8	44	231	36%	5	24
Blackfriars Passage	Ahead	220	37%	1	5	248	41%	1	5
		PRC		Total delay (PCU Hours)		PRC		Total delay (seconds)	
Overall junction performance		**27%**		**9**		**29%**		**7**	

Notes: 1. DoS represents Degree of Saturation; the ratio of flow to capacity. MMQ represents Mean Maximum Queue for the busiest-case 15 minute modelled period (in vehicle lengths). Delay represents the mean delay per PCU. PRC represents Practical Reserve Capacity; measure of how much additional traffic could pass through a junction whilst maintaining a maximum DoS of 90% on all lanes. PCU value for a car is one PCU. Vans and three-axle vehicles are 1.5 PCUs, vehicles with four or more axles are 2.3 PCUs. Buses and coaches are two PCUs. Motorcycles are 0.4 PCUs and pedal cycles are 0.2 PCUs.

18.4.145 The modelling results demonstrate that the network is generally operating below the theoretical capacity of 100% in the weekday AM and PM models. The exceptions to this are Blackfriars Bridge (A201) northbound, Victoria Embankment (A3211) eastbound and the New Bridge Street (A201) southbound approach. All show a high degree of saturation (DoS) and mean maximum queue (MMQ) in both peak periods. The calibrated model indicates that the longest modelled queue during the AM and PM peak hour is 45 vehicle lengths with a delay to vehicles of approximately one minute and 20 seconds.

18.4.146 The junction between Blackfriars Road (A201) and New Bridge Street (A201) is shown to be the busiest with all arms operating at or above DoS of 90% in both peak periods.

18.4.147 At the junction between Victoria Embankment (A3211) and Temple Avenue the baseline model indicates that the Victoria Embankment (A3211) eastbound nearside lane operates at the DoS threshold of 100% in the AM peak period.

18.4.148 At the junction between Queen Victoria Street and Puddle Dock all approaches are within the DoS threshold limit of 90% in both peak periods.

18.4.149 At the junction with Upper Thames Street and Puddle Dock all approaches are within the Queen Victoria Street (westbound) arm is at the DoS threshold limit of 90% in the both peak AM peak periods.

18.4.150 The LinSig junction model outputs shows that total junction delay for the junction of Blackfriars Bridge (A201) / Victoria Embankment (A3211) westbound slip road is 30 PCU hours in the AM peak period assessed and 18 PCU hours in the PM peak period assessed. These equate to 11 seconds per PCU in the AM and 11 seconds per PCU in the PM peak period assessed.

18.4.151 The LinSig junction model outputs shows that total junction delay for the junction of Victoria Embankment (A3211) / Temple Avenue is 39 PCU hours in the AM peak period assessed and 22 PCU hours in the PM peak period assessed. These equate to 21 seconds per PCU in the AM and 30 seconds per PCU in the PM peak period assessed.

18.4.152 The LinSig junction model outputs shows that total junction delay for the junction of Blackfriars Bridge Road (A201) / New Bridge Street (A201) is 39 PCU hours in the AM peak period assessed and 47 PCU hours in the PM peak period assessed. These equate to 11 seconds per PCU in the AM and 9 seconds per PCU in the PM peak period assessed.

18.4.153 The LinSig junction model outputs shows that total junction delay for the junction of Queen Victoria Street / Puddle Dock is 14 PCU hours in the AM peak period assessed and 11 PCU hours in the PM peak period assessed. These equate to 7 seconds per PCU in the AM and 6 seconds per PCU in the PM peak period assessed.

18.4.154 The LinSig junction model outputs shows that total junction delay for the junction of Upper Thames Street (A3211) / Puddle Dock is 9 PCU hours in the AM peak period assessed and 7 PCU hours in the PM peak period assessed. These equate to 31 seconds per PCU in the AM and 31 seconds per PCU in the PM peak period assessed.

18.4.155 More detailed model outputs are included in Appendix D which also supplies diagrams showing the lane structure used for the assessment of the junctions.

Accident analysis

18.4.156 In summary a total of 17 serious accidents and 80 slight accidents have occurred in the Blackfriars Bridge Foreshore assessment area over the five year accident data analysed. There was a single fatal accident.

18.4.157 The area around the Blackfriars Bridge Foreshore site comprises the following junctions:

a. Victoria Embankment (A3211) / Blackfriars Bridge (A201) junction;

b. Victoria Embankment (A3211) / New Bridge Street (A201) junction;

c. Victoria Embankment (A3211) / Queen Victoria Street junction;

d. Victoria Embankment (A3211) / Temple Avenue.

18.4.158 During the five year period, the largest number of road traffic accidents occurred at the junction of Victoria Embankment (A3211) / Blackfriars Bridge (A201). The majority of the 20 accidents which occurred at this junction were classified as slight, with three classified as serious accidents. Of the other three junctions the majority of the accidents which occurred were classified as slight, with five classified as serious accidents.

18.4.159 The one fatal accident that occurred within the assessment area happened at the junction of Victoria Embankment (A3211) and Temple Avenue. It involved the death of a motorcyclist and was attributed to the motorcyclist passing too close to a cyclist. The accident was not considered to be due to road geometry or failure of infrastructure.

18.4.160 The typical causes of the accidents were recorded as road users not looking properly, reckless driving, and failing to judge another user’s path or speed. The 17 serious accidents that occurred within the assessment area are not considered to have occurred as a result of the road geometry.

18.4.161 Of the total accidents, 28 accidents occurred in the assessment area which involved LGVs, MGVs, and HGVs. Of these accidents, 23 were slight accidents and the remaining five accidents were serious accident.

18.4.162 Table 18.4.15 and Figure 18.4.9 in the Blackfriars Bridge Foreshore *Transport Assessment* figures indicate the accidents that have occurred within the vicinity of the site.

Table 18.4.15 Accident severity 2006 to 2011

Location	Slight	Serious	Fatal	Total
Victoria Embankment (A3211) between the junction with Puddle Dock and the junction with Temple Avenue	0	1	0	1
Victoria Embankment (A3211) – on-slip road	1	1	0	2
Victoria Embankment (A3211) – off-slip road	1	0	0	1
Blackfriars Underpass (A3211)	8	2	0	10
Blackfriars Bridge (A201)	2	1	0	3
Victoria Embankment (A3211) / Blackfriars Bridge (A201) junction	17	3	0	20
Victoria Embankment (A3211) / New Bridge Street (A201) junction	6	1	0	7
Victoria Embankment (A3211) / Queen Victoria Street junction	12	2	0	14
Victoria Embankment (A3211) / Temple Avenue junction	2	2	1	5
Blackfriars Underpass (A201) / White Lion Hill junction	4	0	0	4
Blackfriars Underpass (A201) / Puddle Dock junction	12	1	0	13
New Bridge Street (A201) / Watergate junction	1	0	0	1
New Bridge Street (A201) / Queen Victoria Street junction	2	1	0	3
New Bridge Street (A201) / Tudor Street junction	9	2	0	11
Queen Victoria Street / Black Friars Lane junction	3	0	0	3
Total	**80**	**17**	**1**	**98**

18.4.163 Of the seven pedestrian-injury accidents, all occurred on the roads expected to be used by construction vehicles within the assessment area. Inspection of the data showed that four of these occurred at junctions with signalised pedestrian crossing facilities, with the remaining accidents occurring at locations without signal control. Of the 42 accidents involving cyclists, 36 occurred on the roads/junctions expected to be used by construction vehicles within the assessment area. Figure 18.4.10 in the

Blackfriars Bridge Foreshore *Transport Assessment* figures shows the pedestrian and cycle accidents by severity that occurred within the vicinity of the site.

18.4.164 In the context of the construction HGV movements associated with the Blackfriars Bridge Foreshore site, the accident risk to these modes of travel would be managed by providing pedestrian and cyclist awareness training for commercial drivers associated with the construction works as set out in the CoCP. For sections of roads affected by roadworks, the risk to all road users would be managed by the contractor(s) in accordance with the provisions made under the Traffic Signs Manual Chapter 8 – Traffic Safety Measures and Signs for Road Works (DfT, 2009)[7].

18.4.165 Appendix E provides a full analysis of accidents within the local area surrounding Blackfriars Bridge Foreshore.

18.5 Construction assessment

18.5.1 The *TA* for the Blackfriars Bridge Foreshore site including both qualitative and quantitative analysis has been undertaken drawing on discussions with TfL and the Local Highway Authorities, knowledge of the transport networks and their operational characteristics in the vicinity of each site and the anticipated construction programme, duration and levels of construction activity.

18.5.2 The construction assessment compares a construction base case, which represents transport conditions in the assessment year without the Thames Tideway Tunnel project, with a construction development case, which represents conditions with the Thames Tideway Tunnel under construction. The construction base case does not include any traffic related to the Thames Tideway Tunnel, whether from the Blackfriars Bridge Foreshore site or from other sites

Construction base case

18.5.3 As described in Section 18.3 above, the construction assessment year for transport effects in relation to this site is Site Year 2 of construction for construction traffic and Site Year 4 of construction for construction barges.

Pedestrians and cyclists

18.5.4 Completion of the development of Blackfriars station and the surrounding area will result in minor changes to the cycle and pedestrian network by Site Year 2 of construction. A modified junction with revised pedestrian crossing locations, traffic and cycle lanes were brought into operation in 2012 as part of the Blackfriars Station redevelopment works.

18.5.5 The LoS on the surrounding pedestrian network would remain as indicated in the baseline situation, with sufficient capacity and no obstructions to movements.

Public transport

18.5.6 In terms of the public transport network, it is expected that as a result of proposed the TfL London Underground Upgrade Plan (TfL, 2011)[8], compared to the current baseline, London Underground capacity will increase by approximately 24% on the District Line. The TfL Upgrade Plan envisages a combined increase in capacity on the Circle and Hammersmith & City Line of 65% although it is clear that a significant proportion of this increase is attributed to the revised service patterns implemented in 2009, which will already be reflected in the baseline data. It is envisaged that LUL and National Rail patronage will also increase by Site Year 2 of construction.

18.5.7 It is expected that river services between Putney and Blackfriars may increase from baseline conditions as a result of planned service changes which were being tendered at the time of writing.

18.5.8 It is anticipated that patronage on public transport services may change between the baseline situation and Site Year 2 and Site Year 4 of construction. Future patronage changes on bus, rail and river networks will be driven by a range of complex factors and there are inherent uncertainties in setting a patronage level for a future year. Therefore, in order to ensure that a busiest base case scenario has been used in assessing the result of additional construction worker journeys by public transport, the capacity for public transport services in the construction base case has been assumed to remain the same as capacity in the baseline situation. This ensures a robust assessment.

River navigation

18.5.9 The underlying pattern of river use has not substantially changed in recent years, but the Mayor of London and TfL do actively promote the use of passenger services and encourage the provision of more piers. Greater freight use is also encouraged through policies in the London Plan (GLA, 2011)[9]. Consequently it is possible that the nature and number of vessel movements on the River Thames might change over time.

18.5.10 However, it is difficult to determine what the scale and nature of any change might be and at the time of writing there were no specific proposals to alter river navigation patterns from the current baseline conditions in the vicinity of the Blackfriars Bridge Foreshore site. For this assessment, therefore, the construction base case has been assumed to be the same as the baseline position.

18.5.11 It is noted that a separate *Navigational Issues and Preliminary Risk Assessment* has been undertaken for the temporary construction works and barges to be used at the Blackfriars Bridge Foreshore site. This is reported separately outside of the *TA.*

Highway network and operation

18.5.12 Baseline traffic flows (from the junction surveys and TFL models) have been used and forecasting carried out to understand the capacity on the highway network in the vicinity of the Blackfriars Bridge Foreshore site in Site Year 2 of construction without the Thames Tideway Tunnel project. The scope of this analysis has been discussed with the City of London Corporation and TfL.

18.5.13 Strategic highway network modelling has been undertaken at a project-wide level using the TfL HAMs, which include forecasts of employment and population growth in line with the London Plan (GLA, 2011)[10]. Growth factors have been derived at individual Borough level by comparing the 2008/9 base and 2021 forecast years in the HAMs, as described in the *Project-wide TA*.

18.5.14 For the Blackfriars Bridge Foreshore site, CLoHAM has been used. The relevant growth factor for this site is described in para. 18.5.18 which was applied to the survey flows undertaken in 2011 to produce flows for the base and development cases.

18.5.15 It should be noted that these factors represent growth over the period to 2021, which is beyond Site Year 2 of construction at Blackfriars Bridge Foreshore and therefore ensures that the construction base case for the highway network is robust.

Committed developments

18.5.16 The base case in Site Year 2 of construction takes into account the development of Blackfriars Station and the effect that the associated pedestrian and highway modifications could have. All other committed developments identified within 1km of the Blackfriars Bridge Foreshore site would be complete and operational by Site Year 2 of construction. These comprise:

a. Puddle Dock, Mermaid theatre, construction of a new hotel building;

b. 231 – 241 Blackfriars Road, mixed office and retail building;

c. Bankside, 4 Holland Street, mixed residential and retail development;

d. 20 Blackfriars Road, mixed residential, office and retail tower development;

e. Tate Modern, extension to existing building;

f. 32-40 Blackfriars Road, mixed-use office and retail development;

g. 30 Old Bailey, mixed office and retail development;

h. Upper Ground / Doon Street development, mixed residential, commercial and retail tower development;

i. Elizabeth House, office and residential development; and

j. London Eye Pier, extension of existing pier to the south.

18.5.17 The strategic modelling has taken these committed developments into consideration.

Local highway modelling

18.5.18 The growth factors for the City of London based on CLoHAM have been discussed with TfL and the City of London Corporation and applied to the baseline traffic flows. The growth factors are:

a. Weekday AM Peak growth factor – +6.7%

b. Weekday PM Peak growth factor – +8.9%

18.5.19 Para. 18.3.10 explains the definition of the assessment area for local highway network modelling. At this site, the assessment examines the junctions below, which are the nearest junctions of the construction vehicle route with the TLRN.

i Junction of Blackfriars Bridge Road (A201) / Victoria Embankment (A3211) westbound slip road

ii Junction of Victoria Embankment (A3211) / Temple Avenue

iii Junction of Blackfriars Bridge Road (A201) / New Bridge Street (A201) / Queen Victoria Street

iv Junction of Queen Victoria Street / Puddle Dock

v Junction of Upper Thames Street (A3211) / Puddle Dock / Blackfriars Passage.

18.5.20 The resulting construction base case LinSig model for the Victoria Embankment (A3211) / Blackfriars Bridge (A201) / New Bridge Street (A201) junction and adjacent junctions is based on the revised junction layout and operation following completion of the Blackfriars station improvement works.

18.5.21 The operation of the junction model has been optimised as this reflects the expectation that traffic signal timings will be adjusted over time to respond to changes in traffic patterns.

18.5.22 Table 18.5.1 indicates the construction base case model outputs.

Table 18.5.1 Construction base case LinSig model outputs

Approach	Movement	Weekday							
		AM peak (08:00-09:00)				PM peak (17:00-18:00)			
		Flow (PCU)	DoS	MMQ (PCU)	Delay (seconds per PCU)	Flow (PCU)	DoS	MMQ (PCU)	Delay (seconds per PCU)
Junction of Blackfriars Bridge Road (A201) / Victoria Embankment (A3211) westbound slip road									
Blackfriars Bridge Road (A201) - northbound	Ahead / left	1000	90%	26	32	610	82%	16	38
	Ahead	485	44%	8	14	342	46%	7	26
Blackfriars Bridge Road (A201) southbound, to Victoria Embankment (A3211)	Right	276	71%	5	27	297	41%	5	36
Victoria Embankment (A3211) - eastbound slip-road	Ahead (nearside lane)	296	85%	10	61	279	50%	6	37
	Ahead (offside lane)	137	39%	4	36	133	24%	3	32

Approach	Movement	Weekday							
		AM peak (08:00-09:00)				PM peak (17:00-18:00)			
		Flow (PCU)	DoS	MMQ (PCU)	Delay (seconds per PCU)	Flow (PCU)	DoS	MMQ (PCU)	Delay (seconds per PCU)
		PRC		Total delay (PCU hours)		PRC		Total delay (PCU hours)	
Overall junction performance		1%		20		10%		16	
Junction of Victoria Embankment (A3211) / Temple Avenue									
Victoria Embankment (A3211) - eastbound	Ahead (nearside lane)	1147	99%	41	58	1040	90%	26	27
	Ahead (offside lane)	885	76%	17	17	769	66%	13	14
Victoria Embankment (A3211) - westbound	Ahead (nearside lane)	261	21%	2	4	343	27%	4	9
	Ahead (offside lane)	651	55%	10	11	742	63%	12	13
	Ahead (offside lane)	844	71%	15	15	761	64%	12	13
Temple Avenue	Right	79	19%	2	32	138	33%	3	34

Approach	Movement	Weekday							
		AM peak (08:00-09:00)				PM peak (17:00-18:00)			
		Flow (PCU)	DoS	MMQ (PCU)	Delay (seconds per PCU)	Flow (PCU)	DoS	MMQ (PCU)	Delay (seconds per PCU)
		PRC		Total delay (PCU hours)		PRC		Total delay (PCU hours)	
Overall junction performance		-10%		21		1%		18	
Junction of Blackfriars Bridge Road (A201) / New Bridge Street (A201) / Queen Victoria Street									
Blackfriars Bridge Road (A201) - northbound	Ahead (nearside lane)	728	66%	16	22	821	81%	7	13
	Ahead (offside lane)	751	68%	13	23	279	28%	1	5
	Right	452	90%	14	57	222	97%	12	120
New Bridge Street (A201)	Ahead	475	84%	14	48	731	98%	29	82
	Ahead	605	107%	41	189	849	114%	82	288
Queen Victoria Street	Left	313	97%	15	106	396	96%	16	84
	Right	200	64%	6	46	229	55%	7	42
		PRC		Total delay (PCU hours)		PRC		Total delay (PCU hours)	
Overall junction performance		-18%		66		-27%		107	

Approach	Movement	Weekday							
		AM peak (08:00-09:00)				PM peak (17:00-18:00)			
		Flow (PCU)	DoS	MMQ (PCU)	Delay (seconds per PCU)	Flow (PCU)	DoS	MMQ (PCU)	Delay (seconds per PCU)
Junction of Queen Victoria Street / Puddle Dock									
Queen Victoria Street - eastbound	Ahead	194	31%	2	10	228	6%	1	1
	Ahead / right	258	42%	3	11	17	54%	9	9
Queen Victoria Street - westbound	Ahead	149	38%	4	39	166	19%	2	2
	Ahead / left	180	46%	5	40	203	71%	10	10
Puddle Dock	Right / left	439	38%	6	23	420	75%	8	26
	Right	264	46%	6	28	172	60%	5	27
		PRC		**Total delay (PCU hours)**		**PRC**		**Total delay (PCU hours)**	
Overall junction performance		73%		10		34%		9	
Junction of Upper Thames Street (A3211) / Puddle Dock / Blackfriars Passage									
Upper Thames Street (A3211) - eastbound	Ahead / left	753	57%	5	7	646	54%	4	7
	Ahead	855	64%	5	6	769	61%	5	7
Upper Thames Street (A3211) - westbound	Right	327	106%	24	207	252	59%	6	40

Approach	Movement	Weekday							
		AM peak (08:00-09:00)				PM peak (17:00-18:00)			
		Flow (PCU)	**DoS**	**MMQ (PCU)**	**Delay (seconds per PCU)**	**Flow (PCU)**	**DoS**	**MMQ (PCU)**	**Delay (seconds per PCU)**
Blackfriars Passage	Ahead	235	40%	1	5	270	45%	1	5
		PRC		**Total delay (PCU hours)**		**PRC**		**Total delay (PCU hours)**	
Overall junction performance		-18%		22		48%		7	

Notes: 1. DoS represents Degree of Saturation; the ratio of flow to capacity. MMQ represents Mean Maximum Queue for the busiest-case 15 minute modelled period (in vehicle lengths). Delay represents the mean delay per PCU. PRC represents Practical Reserve Capacity; measure of how much additional traffic could pass through a junction whilst maintaining a maximum DoS of 90% on all lanes. PCU value for a car is one PCU. Vans and three-axle vehicles are 1.5 PCUs, vehicles with four or more axles are 2.3 PCUs. Buses and coaches are two PCUs. Motorcycles are 0.4 PCUs and pedal cycles are 0.2 PCUs.

2. Assessment has assumed that traffic signal optimisation has been undertaken as detailed in Volume 2 of the ES.

18.5.23 The key findings from the construction base case model indicate a general decrease in spare capacity across the network compared to the baseline situation, with a corresponding increase in queue lengths and delays on New Bridge Street (A201), Queen Victoria Street, Victoria Embankment (A3211) and Blackfriars Bridge Road (A201).

18.5.24 Results indicate that the local road network will operate at or above the PRC threshold of 90% when compared to the baseline situation.

18.5.25 The LinSig junction model outputs shows that total junction delay for the junction of Blackfriars Bridge Road (A201) / Victoria Embankment (A3211) westbound slip road is 20 PCU hours in the AM peak period assessed and 16 PCU hours in the PM peak period assessed. These equate to 16 seconds per PCU in the AM and 23 seconds per PCU in the PM peak period assessed.

18.5.26 The LinSig junction model outputs shows that total junction delay for the junction of Victoria Embankment (A3211) / Temple Avenue is 29 PCU hours in the AM peak period assessed and 18 PCU hours in the PM peak period assessed. These equate to 27 seconds per PCU in the AM and 44 seconds per PCU in the PM peak period assessed.

18.5.27 The LinSig junction model outputs shows that total junction delay for the junction of Blackfriars Bridge Road (A201) / New Bridge Street (A201) / Queen Victoria Street is 66 PCU hours in the AM peak period assessed and 107 PCU hours in the PM peak period assessed. These equate to 8 seconds per PCU in the AM and 23 seconds per PCU in the PM peak period assessed.

18.5.28 The LinSig junction model outputs shows that total junction delay for the junction of Queen Victoria Street / Puddle Dock is 10 PCU hours in the AM peak period assessed and 9 PCU hours in the PM peak period assessed. These equate to 10 seconds per PCU in the AM and 8 seconds per PCU in the PM peak period assessed.

18.5.29 The LinSig junction model outputs shows that total junction delay for the junction of Upper Thames Street (A3211) / Puddle Dock / Blackfriars Passage is 22 PCU hours in the AM peak period assessed and 6 PCU hours in the PM peak period assessed. These equate to 15 seconds per PCU in the AM and 47 seconds per PCU in the PM peak period assessed.

Construction development case

18.5.30 This section summarises the findings of the assessment undertaken for the peak year of construction at the Blackfriars Bridge Foreshore site (Site Year 2 of construction for road-based transport and Site Year 4 of construction for river transport).

Pedestrian routes

18.5.31 As discussed in Section 18.2, the pedestrian diversions would result in changes to pedestrian movements around the Blackfriars Bridge Foreshore site. The drawings, highway layout during construction, phases 1 to 3 in the Blackfriars Bridge Foreshore *Transport Assessment* figures show the effect on the pedestrian footways during construction.

18.5.32 The existing pedestrian route along Paul’s Walk / Victoria Embankment (A3211) footway would be diverted during all the phases of the construction work. Pedestrians using Paul’s Walk would be diverted to Blackfriars Bridge Road, via either the existing staircase or lift that would be provided. Pedestrians would then be directed to use the at-grade crossing points to gain access to the on the footway on the Victoria Embankment (A3211) eastbound off-slip road. Pedestrians would use the existing crossing facilities at the Victoria Embankment (A3211) / Temple Avenue junction.

18.5.33 To assess a busiest case scenario, it has been anticipated that all worker trips would finish their journeys by foot. As a result the 70 worker trips generated by the site have been added to the construction base case pedestrian flows during the AM and PM peak hours.

18.5.34 Given this increase in pedestrian numbers against baseline usage, an extension to the length of the pedestrian phase at the junctions Blackfriars Bridge Road (A201) / Victoria Embankment (A3211) westbound slip road and Blackfriars Bridge Road (A201) / New Bridge Street (A201) / Queen Victoria Street would not be required. In addition, as the assessment assumes that all construction workers would travel in the peak hours, the increase in pedestrian numbers against baseline usage during the peak hours due to construction workers walking is considered to be a conservative estimate because, due to the site working start and finish times, many workers will be travelling outside of peak network hours.

18.5.35 Table 18.5.2 indicates the pedestrian flows during the construction development case in comparison to the construction base case development flows.

Table 18.5.2 Comparison of pedestrian flows between construction base case and development base case

Road/route	Direction	Weekday						Weekend	
		AM peak (08:00-09:00)		Inter-peak (12:00-13:00)		PM peak (17:00-18:00)		(13:00-14:00)	
		Base case	Development case	Base case	Development case	Base case	Development case	Base case	Development case
Paul's Walk	Eastbound	203	213	476	506	318	328	244	274
Paul's Walk	Westbound	115	175	307	337	248	308	292	328
Junction counts (pedestrian crossings)									
Blackfriars Bridge (A201) / Queen Victoria Street / New Bridge Street (A201)									
4A201 Blackfriars Bridge (South)	Westbound	214	417	170	646	322	640	146	390
	Eastbound	323	438	127	434	246	564	143	435
A3211 Victoria Embankment (westbound on-slip and eastbound off-slip roads)	Northbound	1727	1930	288	764	211	529	94	338
	Southbound	135	250	279	586	1004	1252	113	405

18.5.36 As detailed in Section 18.2, as a result of the pedestrian diversions and increase in worker trips the most significant changes in pedestrian flow would occur on the northern footway along Victoria Embankment (A3211), the at-grade crossings of the Blackfriars Bridge / Victoria Embankment (A3211) junction and the staircase to Paul's Walk. However, analysis shows that the Level of Service (LoS) values change from those in the construction base case with all LoS grades on the Victoria Embankment (A3211) and Blackfriars Bridge Road (A201) reducing by one. This would indicate the LoS on Victoria Embankment westbound crossing changes to C, Victoria Embankment (A3211) eastbound interpeak and weekend changes to B and Blackfriars Bridge Road (A201) changes to B. However, the existing footway widths, crossing points and staircase on Paul's Walk are of sufficient capacity to accommodate the additional pedestrian demand.

18.5.37 Appendix C provides the full analysis of the LoS of the footways adjacent to the site.

18.5.38 During all construction work and on any section of road subject to temporary diversions or restriction imposed by roadworks associated with the Blackfriars Bridge Foreshore site, the risk to all road users would be managed by the contractor(s) in accordance with the provisions made under the Traffic Signs Manual Chapter 8 – Traffic Safety Measures and Signs for Road Works (DfT, 2009)[11]. This would include compliance with the Equality Act 2010[12] to ensure safe passage for mobility and vision impaired pedestrians.

Paul's Walk and access to relocated pier

18.5.39 It is anticipated that relocation of Blackfriars Millennium Pier would also change pedestrian routes and demands in the area. The assessment has considered the operation of Paul's Walk, which would provide the access route to the relocated pier. It takes account of existing pedestrian flows, together with the flows associated with passengers boarding and alighting from vessels at the pier.

18.5.40 As the existing width of Paul's Walk would remain unchanged in accommodating the ramped access to the relocated Blackfriars Millennium Pier, the LoS would remain at the construction base case level of LoS B.

18.5.41 The closure of the southern Victoria Embankment (A3211) footway would result in pedestrians having to make an additional four road crossings and a narrowing of Paul's Walk to accommodate construction works which may potentially lead to an increase in accidents in the local area. Diversion routes would be signed and advice and information provided to people moving through the area to assist their understanding of the changes to the pedestrian network during construction works.

18.5.42 It is anticipated that the pedestrian diversions around the Blackfriars Bridge Foreshore site would result in a worst case journey time increase of approximately three minutes, due to the four additional crossings and extension of the journey by 70m, based on a walking speed of 1.3m/sec.

Cycle routes

18.5.43 Cyclists using the highway would experience an additional delay to journey times as a result of the construction works at the Blackfriars Bridge Foreshore site. The general effect on journey times is outlined under the highway operation and network assessments and would be an increase of a maximum of some 31 seconds over that in the construction base case.

18.5.44 A specific impact on cyclists on Blackfriars Bridge during phase 3 of construction would be caused by the closure of the westbound Victoria Embankment (A3211) slip road. This would require cyclists to use the diversion routes either north and west via Fleet Street and Arundel Place or south and west via Southwark Road / Southwark Bridge Road as shown in Figure 18.5.1 in the Blackfriars Bridge Foreshore *Transport Assessment figures*. This would create an increase in journey time for cyclists of approximately six minutes and 15 seconds for those specific users. Cyclists on other routes, such as Blackfriars Bridge not requiring the use of the westbound slip road, would experience journey time increase of approximately 31seconds as in construction phases 1 and 2.

18.5.45 In relation to accidents and safety for cyclists, there would be an increase in construction traffic flow of between four and 20 two-way HGV movements per hour and would result in a small increase in risk to cyclists.

18.5.46 Measures set out in the *CoCP* described in para. 18.2.39 include increasing driver awareness of restrictions on the road network and marshalling of traffic at the site access. During all construction work and on any section of road subject to temporary diversions or restrictions imposed by roadworks associated with the Blackfriars Bridge Foreshore site, the risk to all road users would be managed by the contractor(s) in accordance with the provision made under the Traffic Signs Manual Chapter 8 – Traffic Safety Measures and Signs for Road Works (DfT, 2009)[13]. This would include compliance with TfL guidance (Cyclists at Roadworks - Guidance[14]) to ensure safe passage for cyclists.

Bus routes and patronage

18.5.47 Three bus services run through the Blackfriars Bridge junction past the site. There would be different impacts on bus routes in different construction phases.

18.5.48 Phases 1 and 2 of the construction works would allow the westbound slip road to be used by all vehicles. However, additional construction vehicles serving the site may affect some bus routes and bus journey times through the Blackfriars Bridge junction and the wider area. The effect on journey times is detailed under the highway operation and network assessment (paras. 18.5.66 to 18.5.92) and would result in an increase in road network delay of approximately 31 seconds.

18.5.49 During phase 3 of the construction works, the westbound slip road would be closed to all traffic. The effect on journey times in phase 3 is detailed under the highway operation and network assessment (paras. 18.5.49 to 18.5.66) and would be similar to phases 1 and 2 for bus routes using the

Blackfriars Bridge (A201) / New Bridge Street (A201) / Queen Victoria Street junction. This does not represent a significant impact. .

18.5.50 It is expected that approximately five additional two-way worker trips would be made by bus during the AM and PM peak hours, which would result in less than one worker trip per bus (based on a service of approximately 220 buses per hour within a 640m walking distance during the AM and PM peak hours. On this basis the additional worker trips made by bus in peak hours would be capable of being accommodated on the base case bus services and would typically be within the normal daily variation in bus patronage on these routes.

London Underground and patronage

18.5.51 No underground stations are directly adjacent to the site and therefore none would be directly affected by the construction site development. It is anticipated that approximately 27 construction workers and labourers would use LUL services to access the site in each of the AM and PM peak hours.

18.5.52 Due to the large number of LUL services provided by the two LUL stations within the vicinity of the site, this equates to less than one person per train during the AM and PM peak hours based on a frequency of approximately 55 services during these periods.

18.5.53 This would result in a very small number of additional passengers on the London Underground services in the local area, which could be easily accommodated within existing capacity.

National Rail and patronage

18.5.54 It is anticipated that construction at Blackfriars Bridge Foreshore would result in 34 additional person trips on National Rail services in each of the AM and PM peak hours.

18.5.55 On National Rail services from Blackfriars and City Thameslink there would be less than one additional passenger per train based on the AM peak service of 58 services per hour and PM peak service of 53 services per hour and thus this additional demand could be easily accommodated within the existing capacity.

River services and patronage

18.5.56 To facilitate construction works the President, a permanently moored restaurant/pub boat, would be temporarily moved to a new location to the west of the construction site. The loading bay associated with the President would be suspended during construction, however there is an alternative loading bay near to the relocated vessel.

18.5.57 In order to facilitate construction works, Blackfriars Millennium Pier would need to be permanently relocated to the east of Blackfriars Rail Bridge. The new pier would be operational prior to removal of the existing pier to enable continuity of service. The development includes construction of a lift to the east of Blackfriars Road Bridge to enable step-free interchange between the relocated pier and Blackfriars Station.

18.5.58 It is anticipated that few, if any, construction workers and labourers would use the river services to access the construction site, based on the mode shares set out in Table 18.2.3 and therefore there would be no discernible change in river patronage as a result of the construction proposals at this site.

River navigation

18.5.59 During construction it has been assumed that 90% of the cofferdam fill (import and export) and shaft and other excavated material (export) would be transported by barge. The peak number of barge movements would occur in Site Year 4 of construction and would be an average of six barge movements a day.

18.5.60 It is anticipated that 800T barges would be used at this site. Barges would be hauled by tugs which may be capable of hauling two barges together. The number of transit movements required on the river may therefore be lower than the number of individual barge movements.

18.5.61 It is noted that a separate *Navigational Issues and Preliminary Risk Assessment* has been undertaken for the temporary construction works and barges to be used at Blackfriars Bridge Foreshore. This is reported separately outside of the *Environmental Statement* and *TA*.

Parking

18.5.62 Victoria Embankment (A3211) does not have any on-street car parking available due to TLRN restrictions in the area in the immediate vicinity of the site. There would be no changes to on-street car parking or private parking in the vicinity of the site as a result of the construction works.

18.5.63 To enable construction vehicles to access the site from the westbound slip road in phases 1 and 2 and as a result of the closure of the slip road in phase 3, two coach parking bays on the slip road would require suspension. Two bays would be provided on Blackfriars Road (A201) approximately 450m to the south of the Blackfriars Bridge Foreshore site. TfL and the City of London Corporation have agreed in principle the suspension and re-provision of these two coach parking bays.

18.5.64 The loading bay in the westbound carriageway, to the east of the coach parking bays would be suspended during the construction works. A loading bay would be located on White Lion Hill approximately 300m to the east of the Blackfriars Bridge Foreshore site and be utilised during this period. TfL and the City of London Corporation have agreed in principle the suspension and reprovision of the bay.

18.5.65 The highway layout during construction, coach parking relocation and loading bay relocation plans in the Blackfrairs Bridge Foreshore *Transport Assessment* figures show the proposed restriction of coach and loading bays associated with the construction works at the Blackfriars Bridge Foreshore site.

Highway assessment

Highway layout

18.5.66 The highway layout during construction, phases 1 to 3 plans in the Blackfriars Bridge Foreshore *Transport Assessment* figures show the highway layout during all phases of the construction of proposed Blackfriars Bridge Foreshore site. The site is on the southern side of Victoria Embankment (A3211) and would be accessed from the westbound off-slip lane.

18.5.67 The highway layout during construction vehicle swept path analysis plans in the Blackfriars Bridge Foreshore *Transport Assessment* figures show the swept path movements and demonstrate that the construction vehicles are able to safely enter and leave the site.

Highway network

18.5.68 Construction lorry movements would be limited to the day shift only (08:00 to 18:00). In exceptional circumstances HGV and abnormal load movements could occur up to 22:00 for large concrete pours and later at night on agreement with the City of London Corporation.

18.5.69 Table 18.2.4 in Section 18.2 shows the vehicle movement assumptions for the local peak traffic periods based on the peak months of construction activity at this site.

18.5.70 Assuming that 90% of the cofferdam fill (import and export), and shaft and other excavated material (export) would be transported by barge with all other material by road, Table 18.2.4 shows that in the AM and PM peak periods, the Blackfriars Bridge Foreshore site would generate approximately 128 vehicle movements a day during the months of greatest activity during Site Year 2 of construction at this site. In the AM and PM peak hours, the Blackfriars Bridge Foreshore site would generate approximately 13 vehicle movements.

18.5.71 The busiest peak in the AM and PM period for each type of movement (construction lorries and other construction vehicles) has been combined in the development case and assessed against the peak hour operation of the highway network. In reality, not all peaks for these movements will occur concurrently and the peak for worker trips will be outside of the highway network peak hour, therefore, the assessment is considered to be robust.

18.5.72 The *Project-wide TA* explains the method used to assign construction traffic to the HAMs, from which the likely changes in turning movements at local junctions have been identified and added to the construction base case flows.

18.5.73 The assignment of construction lorry trips has been undertaken using OmniTrans[iii] software, which enables a fixed assignment to be created for

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[iii] OmniTrans is a software package used for multi-modal transport network modelling and in this case has been used to produce assignments of construction traffic across the proposed network of routes to be used for the project.

these trips in order to ensure that they are assigned only to the proposed construction routes. The OmniTrans outputs also identify lorry traffic which would be associated with the Blackfriars Bridge Foreshore site, or with other Thames Tideway Tunnels sites, that would use routes in the vicinity of the Blackfriars Bridge Foreshore site. Figure 18.5.2 in the Blackfriars Bridge Foreshore *Transport Assessment* figures shows the OmniTrans plot for the local road network around the Blackfriars Bridge Foreshore site.

18.5.74 In addition to the construction HGV movements associated with the Blackfriars Bridge Foreshore site, it is anticipated that there would be two two-way HGV movements along Upper Thames Street (A3211) and Victoria Embankment (A3211) during the peak hours associated with other Thames Tideway Tunnel sites during Site Year 2 of construction at Blackfriars Bridge Foreshore.

18.5.75 Changes to the highway network during construction and the additional construction traffic generated by the project may lead to local changes in traffic flow and capacity. Local modelling has been undertaken to assess the effect on the highway operation resulting from these changes. The construction development case includes the optimisation of traffic signal timings in order to minimise journey time increases within the local area.

18.5.76 A LinSig model has been used to apply the construction traffic demands and local geometrical changes to the construction base case to determine the changes in the highway network operation due to the project (i.e., comparison of base and development cases).

18.5.77 The junctions tested in the model are as follows:

a. Blackfriars Bridge Road / New Bridge Street (A201)
b. Victoria Embankment / Blackfriars Underpass (A3211) / Temple Avenue.
c. New Bridge Street / Queen Victoria Street (A201)
d. Queen Victoria Street / Puddle Dock
e. Upper Thames Street (A3211) / Puddle Dock

18.5.78 A summary of the construction assessment results for the weekday AM and PM peak hours is presented in Table 18.5.3 and Table 18.5.4 for construction phases 1 and 2. Table 18.5.5 and Table 18.5.6 present a summary of the construction phase 3 works.

Table 18.5.3 Construction LinSig model outputs, AM peak Phase 1 and 2 of construction

Approach	Arm	Dev Flow (PCU)	Weekday								
			AM peak hour (08:00-09:00)								
			DoS			MMQ (PCU)			Delay (seconds per PCU)		
			Base case	Devt case	Change	Base case	Devt case	Change	Base case	Devt case	Change
Junction of Blackfriars Bridge Road (A201) / Victoria Embankment (A3211) westbound slip road											
Blackfriars Bridge Road (A201) - northbound	Ahead / left	1004	90%	98%	+10	26	36	+10	32	61	+31
	Ahead	487	44%	48%	+3	8	9	+1	14	17	+3
Blackfriars Bridge Road (A201) southbound, to Victoria Embankment (A3211)	Right	333	25%	20%	-5	1	1	-	1	2	+1
Victoria Embankment (A3211) - eastbound slip-road	Ahead (nearside lane)	257	85%	60%	-25	10	7	-3	61	39	-22
	Ahead (offside lane)	177	39%	41%	+2	4	5	+1	36	34	-2
			PRC						Total delay (PCU Hours)		
Overall junction performance			+1%	-9%	-10				20	29	+9
Junction of Victoria Embankment (A3211) / Temple Avenue											

Approach	Arm	Dev Flow (PCU)	Weekday								
			AM peak hour (08:00-09:00)								
			DoS			MMQ (PCU)			Delay (seconds per PCU)		
			Base case	Devt case	Change	Base case	Devt case	Change	Base case	Devt case	Change
Victoria Embankment (A3211) - eastbound	Ahead (nearside lane)	1129	99%	97%	-2	41	37	+11	58	48	+10
	Ahead (offside lane)	873	76%	75%	-1	17	16	-1	17	17	-
Victoria Embankment (A3211) - westbound	Ahead (nearside lane)	330	21%	26%	+5	2	2	-	4	4	-
	Ahead (offside lane)	672	55%	57%	+2	10	10	-	11	12	+1
	Ahead (offside lane)	833	71%	71%	-	15	14	-1	15	15	-
Temple Avenue	Right	78	19%	19%	-	2	2	-	32	32	-
			PRC						Total delay (PCU hours)		
Overall junction performance			-10%	-8%	+2				32	28	-4
Junction of Blackfriars Bridge Road (A201), New Bridge Street (A201) / Queen Victoria Street											
Blackfriars Bridge	Ahead	730	66%	65%	+1	16	7	-9	22	10	-12

Approach	Arm	Dev Flow (PCU)	Weekday								
			AM peak hour (08:00-09:00)								
			DoS			MMQ (PCU)			Delay (seconds per PCU)		
			Base case	Devt case	Change	Base case	Devt case	Change	Base case	Devt case	Change
Road (A201) - northbound	(nearside lane)										
	Ahead (offside lane)	704	68%	62%	-6	13	10	-3	23	7	-16
	Right	471	90%	90%	-	14	13	-1	57	55	-2
New Bridge Street (A201)	Ahead	478	84%	92%	+8	14	14	-	48	48	-
	Ahead	608	107%	116%	+9	41	43	+2	189	197	+8
Queen Victoria Street	Left	324	97%	99%	+2	15	15	-	106	119	+13
	Left / right	207	64%	71%	+7	6	7	+1	46	51	+5
			PRC						Total delay (PCU Hours)		
Overall junction performance			-18%	-19%	-1				68	64	-4
Junction of Queen Victoria Street / Puddle Dock											
Queen Victoria Street -eastbound	Ahead	229	31%	39%	+8	2	3	+1	10	12	+2
	Ahead / right	242	42%	42%	-	3	4	+1	11	13	+2
Queen Victoria	Ahead	140	38%	40%	+2	4	4	-	39	42	+3

Approach	Arm	Dev Flow (PCU)	Weekday								
			AM peak hour (08:00-09:00)								
			DoS			MMQ (PCU)			Delay (seconds per PCU)		
			Base case	Devt case	Change	Base case	Devt case	Change	Base case	Devt case	Change
Street -westbound	Ahead / left	169	46%	48%	+2	5	5	-	40	43	+3
Puddle Dock	Right / left	465	52%	51%	-1	6	6	-	23	32	+9
	Right	264	52%	49%	-3	6	7	+1	28	35	+7
			PRC						Total delay (PCU hours)		
Overall junction performance			73%	76%	+3				10	12	+2
Junction of Upper Thames Street (A3211) / Puddle Dock / Blackfriars Passage											
Upper Thames Street (A3211) - eastbound	Ahead / left	731	57%	62%	+5	5	6	+1	7	7	-
	Ahead	873	64%	70%	+6	5	10	+5	6	8	+2
Upper Thames Street (A3211) - westbound	Right	353	106%	74%	-32	23	9	-14	207	46	-161
Blackfriars Passage	Ahead	236	40%	40%	-	1	1	-	5	5	-
			PRC						Total delay (PCU hours)		
Overall junction performance			-18%	22%	+40				23	9	-14

Notes: 1. DoS represents Degree of Saturation; the ratio of flow to capacity. MMQ represents Mean Maximum Queue for the busiest-case 15 minute modelled period (in vehicle lengths). Delay represents the mean delay per PCU. PRC represents Practical Reserve Capacity; measure of how much additional traffic could pass through a junction whilst maintaining a maximum DoS of 90% on all lanes. PCU value for a car is one PCU. Vans and three-axle vehicles are 1.5 PCUs, vehicles with four or more axles are 2.3 PCUs. Buses and coaches are two PCUs. Motorcycles are 0.4 PCUs and pedal cycles are 0.2 PCUs. Thames Tideway Tunnel construction vehicles would be a mixture of three- and four-axle vehicles and have therefore been given a PCU value of two.

2. Assessment has assumed that traffic signal optimisation has been undertaken as detailed in Volume 2 of the ES.

Table 18.5.4 Construction LinSig model outputs, PM peak phase 1 and 2 of construction

Approach	Arm	Dev Flow (PCU)	Weekday								
			PM peak hour (17:00 - 18:00)								
			DoS			MMQ (PCU)			Delay (seconds per PCU)		
			Base case	Devt case	Change	Base case	Devt case	Change	Base case	Devt case	Change
Junction of Blackfriars Bridge Road (A201) / Victoria Embankment (A3211) westbound slip road											
Blackfriars Bridge Road (A201) - northbound	Ahead / left	611	82%	80%	-2	16	16	-	38	36	-2
	Ahead	342	46%	45%	-1	7	7	-	26	25	-1
Blackfriars Bridge Road (A201) southbound, to Victoria Embankment (A3211)	Right	334	31%	29%	-2	1	1	-	2	1	-1
Victoria Embankment (A3211) - eastbound slip-road	Ahead (nearside lane)	314	50%	48%	-2	6	6	-	37	32	-5
	Ahead (offside lane)	133	24%	20%	-4	3	3	-	32	19	-13
			PRC						**Total delay (PCU hours)**		
Overall junction performance			10%	13%	-3				16	14	-2
Junction of Victoria Embankment (A3211) / Temple Avenue											

Approach	Arm	Dev Flow (PCU)	Weekday								
			PM peak hour (17:00 - 18:00)								
			DoS			MMQ (PCU)			Delay (seconds per PCU)		
			Base case	Devt case	Change	Base case	Devt case	Change	Base case	Devt case	Change
Victoria Embankment (A3211) - eastbound	Ahead (nearside lane)	1065	90%	92%	+2	26	28	+2	27	30	+3
	Ahead (offside lane)	787	66%	68%	+2	13	13	-	14	14	-
Victoria Embankment (A3211) - westbound	Ahead (nearside lane)	382	27%	27%	-	4	4	-	9	7	-2
	Ahead (offside lane)	757	63%	64%	+1	12	12	-	13	13	-
	Ahead (offside lane)	758	64%	64%	-	12	12	-	13	13	-
Temple Avenue	Right	136	33%	32%	-1	3	3	-	34	34	-
			PRC						Total delay (PCU hours)		
Overall junction performance			1	-2	-3				21	22	-+1
Junction of Blackfriars Bridge Road (A201), New Bridge Street (A201) / Queen Victoria Street											
Blackfriars Bridge	Ahead	812	81%	77%	-4	7	9	+2	13	14	+1

Approach	Arm	Dev Flow (PCU)	Weekday								
			PM peak hour (17:00 - 18:00)								
			DoS			MMQ (PCU)			Delay (seconds per PCU)		
			Base case	Devt case	Change	Base case	Devt case	Change	Base case	Devt case	Change
Road (A201) - northbound	(nearside lane)										
	Ahead (offside lane)	300	28%	30%	+2	1	1	-	5	5	-
	Right	240	97%	96%	-1	11	11	-	120	109	-11
New Bridge Street (A201)	Ahead	733	98%	102%	+4	29	35	+6	82	112	+30
	Ahead	852	114%	118%	+4	82	94	+12	288	346	+58
Queen Victoria Street	Left	423	96%	96%	-	16	16	-	84	83	-1
	Left / right	263	55%	63%	+8	7	7	-	42	38	-4
			PRC						Total delay (PCU hours)		
Overall junction performance			-27%	-31%	+4				108	128	+20
Junction of Queen Victoria Street / Puddle Dock											
Queen Victoria Street -eastbound	Ahead	17	6%	6%	0%	1	24	23	1	24	23
	Ahead / right	228	54%	54%	0%	9	43	34	9	43	34
Queen Victoria	Ahead	166	19%	19%	0%	2	30	28	2	30	28

Approach	Arm	Dev Flow (PCU)	Weekday								
			PM peak hour (17:00 - 18:00)								
			DoS			MMQ (PCU)			Delay (seconds per PCU)		
			Base case	Devt case	Change	Base case	Devt case	Change	Base case	Devt case	Change
Street -westbound	Ahead / left	203	71%	71%	0%	10	41	31	10	41	31
Puddle Dock	Right / left	446	75%	58%	0%	8	8	0	26	26	0
	Right	172	60%	61%	1%	5	5	0	27	27	0
			PRC						Total delay (PCU hours)		
Overall junction performance			34%	65%	+31				9	10	-1
Junction of Upper Thames Street (A3211) / Puddle Dock / Blackfriars Passage											
Upper Thames Street (A3211) - eastbound	Ahead / left	706	54%	57%	+3	4	4	-	7	6	-1
	Ahead	787	61%	60%	-1	5	6	+1	7	6	-1
Upper Thames Street (A3211) - westbound	Right	276	59%	90%	+31	6	11	+5	40	82	+42
Blackfriars Passage	Ahead	271	45%	45%	-	1	1	-	5	6	+1
			PRC						Total delay (PCU hours)		
Overall junction performance			48%	38%	-10				7	7	-

Notes: 1. DoS represents Degree of Saturation; the ratio of flow to capacity. MMQ represents Mean Maximum Queue for the busiest-case 15 minute modelled period (in vehicle lengths). Delay represents the mean delay per PCU. PRC represents Practical Reserve Capacity; measure of how much additional traffic could pass through a junction whilst maintaining a maximum DoS of 90% on all lanes. PCU value for a car is one PCU. Vans and three-axle vehicles are 1.5 PCUs, vehicles with four or more axles are 2.3 PCUs. Buses and coaches are two PCUs. Motorcycles are 0.4 PCUs and pedal cycles are 0.2 PCUs. Thames Tideway Tunnel construction vehicles would be a mixture of three- and four-axle vehicles and have therefore been given a PCU value of two.

2. Assessment has assumed that traffic signal optimisation has been undertaken as detailed in Volume 2 of the ES.

Table 18.5.5 Construction LinSig model outputs, AM peak Phase 3 of construction

Approach	Arm	Dev Flow (PCU)	Weekday								
			AM peak hour (08:00-09:00)								
			DoS			MMQ (PCU)			Delay (seconds per PCU)		
			Base case	Devt case	Change	Base case	Devt case	Change	Base case	Devt case	Change
Junction of Blackfriars Bridge Road (A201) / Victoria Embankment (A3211) westbound slip road											
Blackfriars Bridge Road (A201) - northbound	Ahead / left	946	90%	83%	-7	26	22	-4	32	25	-7
	Ahead	487	44%	43%	-1	8	8	-	14	13	-1
Blackfriars Bridge Road (A201) southbound, to Victoria Embankment (A3211)	Right	442	25%	23%	-2	1	1	-	1	1	-
Victoria Embankment	Ahead (nearside	257	85%	78%	-7	10	8	-2	61	53	-8

Approach	Arm	Dev Flow (PCU)	Weekday								
			AM peak hour (08:00-09:00)								
			DoS			MMQ (PCU)			Delay (seconds per PCU)		
			Base case	Devt case	Change	Base case	Devt case	Change	Base case	Devt case	Change
(A3211) - eastbound slip-road	lane)										
	Ahead (offside lane)	177	39%	54%	+15	4	5	+1	36	39	+3
			PRC						Total delay (PCU hours)		
Overall junction performance			+1%	8%	+7				20	16	-4
Junction of Victoria Embankment (A3211) / Temple Avenue											
Victoria Embankment (A3211) - eastbound	Ahead (nearside lane)	1129	99%	97%	+2	41	37	-4	58	48	-10
	Ahead (offside lane)	873	76%	75%	-1	17	16	-1	17	17	-
Victoria Embankment (A3211) - westbound	Ahead (nearside lane)	0	21%	0%	-21	2	0	-2	4	0	-4
	Ahead (offside lane)	672	55%	57%	+2	10	10	-	11	12	+1
	Ahead (offside	912	71%	77%	+6	15	18	+3	15	17	+2

Approach	Arm	Dev Flow (PCU)	Weekday								
			AM peak hour (08:00-09:00)								
			DoS			MMQ (PCU)			Delay (seconds per PCU)		
			Base case	Devt case	Change	Base case	Devt case	Change	Base case	Devt case	Change
	lane)										
Temple Avenue	Right	78	19%	19%	-	2	2	-	32	32	-
			PRC						Total delay (PCU hours)		
Overall junction performance			-10%	-8%	+2				32	28	-4
Junction of Blackfriars Bridge Road (A201), New Bridge Street (A201) / Queen Victoria Street											
Blackfriars Bridge Road (A201) - northbound	Ahead (nearside lane)	730	66%	66%	-	16	10	-6	22	10	-12
	Ahead (offside lane)	704	68%	63%	-5	13	15		23	12	
	Right	471	90%	83%	-7	14	12		57	43	
New Bridge Street (A201)	Ahead	476	84%	88%	+4	14	14	-	48	59	11
	Ahead	442	107%	95%	-12	41	18	-23	189	80	-109
Queen Victoria Street	Left	286	97%	92%	-5	15	12	-3	106	78	-28
	Left / right	200	64%	64%	-	6	6	-	46	46	-
			PRC						Total delay (PCU hours)		

Approach	Arm	Dev Flow (PCU)	Weekday								
			AM peak hour (08:00-09:00)								
			DoS			MMQ (PCU)			Delay (seconds per PCU)		
			Base case	Devt case	Change	Base case	Devt case	Change	Base case	Devt case	Change
Overall junction performance			-18	-5%	+13				68	38	-30
Junction of Queen Victoria Street / Puddle Dock											
Queen Victoria Street -eastbound	Ahead	229	31%	38%	+7	2	4	+2	10	12	+2
	Ahead / right	242	42%	41%	-1	3	4	+1	11	12	+1
Queen Victoria Street -westbound	Ahead	140	38%	38%	-	4	4	-	39	40	+1
	Ahead / left	161	46%	43%	+3	5	4	-1	40	41	+1
Puddle Dock	Right / left	440	52%	52%	-	6	6	-	23	32	+9
	Right	264	52%	51%	-1	6	7	+1	28	35	+7
			PRC						**Total delay (PCU hours)**		
Overall junction performance			73%	72%	-1				10	12	+2
Junction of Upper Thames Street (A3211) / Puddle Dock / Blackfriars Passage											
Upper Thames Street (A3211) - eastbound	Ahead / left	575	57%	30%	-27	5	1	-4	7	1	-6
	Ahead	735	64%	39%	-25	5	1	-4	6	2	-4
Upper Thames Street (A3211) -	Right	328	106%	77%	-29	23	10	-13	207	50	-157

Approach	Arm	Dev Flow (PCU)	Weekday								
			AM peak hour (08:00-09:00)								
			DoS			MMQ (PCU)			Delay (seconds per PCU)		
			Base case	Devt case	Change	Base case	Devt case	Change	Base case	Devt case	Change
westbound											
Blackfriars Passage	Ahead	236	40%	40%	-	1	1	-	5	5	-
			PRC						Total delay (PCU hours)		
Overall junction performance			-18%	16%	+34				22	8	-14

Notes: 1. DoS represents Degree of Saturation; the ratio of flow to capacity. MMQ represents Mean Maximum Queue for the busiest-case 15 minute modelled period (in vehicle lengths). Delay represents the mean delay per PCU. PRC represents Practical Reserve Capacity; measure of how much additional traffic could pass through a junction whilst maintaining a maximum DoS of 90% on all lanes. PCU value for a car is one PCU. Vans and three-axle vehicles are 1.5 PCUs, vehicles with four or more axles are 2.3 PCUs. Buses and coaches are two PCUs. Motorcycles are 0.4 PCUs and pedal cycles are 0.2 PCUs. Thames Tideway Tunnel construction vehicles would be a mixture of three- and four-axle vehicles and have therefore been given a PCU value of two.

2. Assessment has assumed that traffic signal optimisation has been undertaken as detailed in Volume 2 of the ES.

Table 18.5.6 Construction LinSig model outputs, PM peak phase 3 of construction

Approach	Arm	Dev Flow (PCU)	Weekday								
			PM peak hour (17:00 - 18:00)								
			DoS			MMQ (PCU)			Delay (seconds per PCU)		
			Base case	Devt case	Change	Base case	Devt case	Change	Base case	Devt case	Change
Junction of Blackfriars Bridge Road (A201) / Victoria Embankment (A3211) westbound slip road											
Blackfriars Bridge Road (A201) - northbound	Ahead / left	543	82%	53%	-29	16	10	-6	38	18	-20
	Ahead	342	46%	33%	-13	7	6	-1	26	15	-11
Blackfriars Bridge Road (A201) southbound, to Victoria Embankment (A3211)	Right	643	31%	33%	+2	1	1	-	2	2	-
Victoria Embankment (A3211) - eastbound slip-road	Ahead (nearside lane)	279	50%	65%	+15	6	8	+2	37	38	+1
	Ahead (offside lane)	133	24%	31%	+6	3	3	-	32	30	-2
			PRC						**Total delay (PCU hours)**		
Overall junction performance			13%	39%	+26				16	10	-6

Approach	Arm	Dev Flow (PCU)	Weekday								
			PM peak hour (17:00 - 18:00)								
			DoS			MMQ (PCU)			Delay (seconds per PCU)		
			Base case	Devt case	Change	Base case	Devt case	Change	Base case	Devt case	Change
Junction of Victoria Embankment (A3211) / Temple Avenue											
Victoria Embankment (A3211) - eastbound	Ahead (nearside lane)	1064	90%	92%	+2	26	28	+2	27	30	+3
	Ahead (offside lane)	787	66%	68%	+2	13	14	+1	14	14	-
Victoria Embankment (A3211) - westbound	Ahead (nearside lane)	0	27%	0%	-27	4	0	-4	9	0	-9
	Ahead (offside lane)	757	63%	64%	+1	12	13	+1	13	13	-
	Ahead (offside lane)	860	64%	73%	+9	12	16	+4	13	16	+3
Temple Avenue	Right	136	33%	32%	-1	3	3	-	34	34	-
			PRC						Total delay (PCU hours)		
Overall junction performance			1%	-2%	-3				21	21	-
Junction of Blackfriars Bridge Road (A201), New Bridge Street (A201) / Queen Victoria Street											

Approach	Arm	Dev Flow (PCU)	Weekday								
			PM peak hour (17:00 - 18:00)								
			DoS			MMQ (PCU)			Delay (seconds per PCU)		
			Base case	Devt case	Change	Base case	Devt case	Change	Base case	Devt case	Change
Blackfriars Bridge Road (A201) - northbound	Ahead (nearside lane)	777	81%	76%	-5	7	14	+7	13	16	+3
	Ahead (offside lane)	300	28%	29%	+1	1	5	+4	5	10	+5
	Right	280	97%	88%	-9	11	10	-1	120	76	-44
New Bridge Street (A201)	Ahead	609	98%	85%	-13	29	17	-12	82	42	-40
	Ahead	731	114%	102%	-12	82	35	-47	288	112	-176
Queen Victoria Street	Left	364	96%	92%	-4	16	13	-3	84	71	-13
	Left / right	263	55%	67%	+12	7	8	-1	42	3	-39
			PRC						Total delay (PCU hours)		
Overall junction performance			-27%	-12%	+15				108	50	-58
Junction of Queen Victoria Street / Puddle Dock											
Queen Victoria Street -eastbound	Ahead	228	29%	36%	+7	1	2	+1	8	10	+2
	Ahead / right	17	4%	4%	-	1	1	-	9	11	+2

Approach	Arm	Dev Flow (PCU)	Weekday								
			PM peak hour (17:00 - 18:00)								
			DoS			MMQ (PCU)			Delay (seconds per PCU)		
			Base case	Devt case	Change	Base case	Devt case	Change	Base case	Devt case	Change
Queen Victoria Street -westbound	Ahead	166	31%	43%	+12	4	4	-	30	40	+10
	Ahead / left	203	37%	52%	+15	5	5	-	31	42	+11
Puddle Dock	Right / left	421	67%	55%	-12	13	11	+2	24	36	+12
	Right	172	48%	35%	-13	5	4	-1	48	28	-20
			PRC						Total delay (PCU hours)		
Overall junction performance			34%	63%	+29				9	10	+1
Junction of Upper Thames Street (A3211) / Puddle Dock / Blackfriars Passage											
Upper Thames Street (A3211) - eastbound	Ahead / left	706	54%	57%	+3	4	5	+1	7	6	-1
	Ahead	787	61%	60%	-1	5	7	+2	7	6	-1
Upper Thames Street (A3211) - westbound	Right	251	59%	65%	+6	6	7	+1	40	45	+5
Blackfriars Passage	Ahead	271	45%	45%	-	1	1	-	5	6	+1
			PRC						Total delay (PCU hours)		

Approach	Arm	Dev Flow (PCU)	Weekday								
			PM peak hour (17:00 - 18:00)								
			DoS			MMQ (PCU)			Delay (seconds per PCU)		
			Base case	Devt case	Change	Base case	Devt case	Change	Base case	Devt case	Change
Overall junction performance			48%	40%	-8				7	7	-

Notes: 1. DoS represents Degree of Saturation; the ratio of flow to capacity. MMQ represents Mean Maximum Queue for the busiest-case 15 minute modelled period (in vehicle lengths). Delay represents the mean delay per PCU. PRC represents Practical Reserve Capacity; measure of how much additional traffic could pass through a junction whilst maintaining a maximum DoS of 90% on all lanes. PCU value for a car is one PCU. Vans and three-axle vehicles are 1.5 PCUs, vehicles with four or more axles are 2.3 PCUs. Buses and coaches are two PCUs. Motorcycles are 0.4 PCUs and pedal cycles are 0.2 PCUs. Thames Tideway Tunnel construction vehicles would be a mixture of three- and four-axle vehicles and have therefore been given a PCU value of two.

2. Assessment has assumed that traffic signal optimisation has been undertaken as detailed in Volume 2 of the ES.

18.5.79 The construction base case model indicates that the local highway will be operating at or over capacity without the Thames Tideway Tunnel proposals. The construction traffic generated in the construction development case for phases 1 and 2 would produce a marginal increase in demand at the junctions of Blackfriars Bridge Road (A201) / Victoria Embankment (A3211) westbound slip road, Victoria Embankment (A3211) / Temple Avenue, and Blackfriars Bridge Road (A201) / New Bridge Street (A201) / Queen Victoria Street in the AM peak hour. There would be a maximum increase in delay of 31 seconds per vehicle over that in the construction base case along the northbound carriageway of Blackfriars Bridge Road (A201) at the junction of Blackfriars Bridge Road (A201) / Victoria Embankment (A3211) westbound slip road.

18.5.80 In the PM peak hour, there would be a decrease in the overall junction capacity across the junctions. An additional delay of approximately 58 seconds per vehicle would be experienced along New Bridge Street (A201) at the junction of Victoria Embankment (A3211) and Blackfriars Bridge Road (A201)) and Queen Victoria Street.

18.5.81 The LinSig junction model outputs for phase 1 and 2 shows that total junction delay for the Blackfriars Bridge Road (A201) / Victoria Embankment (A3211) westbound slip road would be 9 PCU hours in the AM peak period assessed and 13 PCU hours in the PM peak period assessed. These equate to 15 seconds per PCU in the AM and 19 seconds per PCU in the PM peak period assessed.

18.5.82 The LinSig junction model outputs for phase 1 and 2 show that total junction delay for the junction of Victoria Embankment (A3211) / Temple Avenue would be 26 PCU hours in the AM peak period assessed and 19 PCU hours in the PM peak period assessed. These equate to 30 seconds per PCU in the AM and 35 seconds per PCU in the PM peak period assessed.

18.5.83 The LinSig junction model outputs for phase 1 and 2 show that total junction delay for the junction of Blackfriars Bridge Road (A201) / New Bridge Street (A201) / Queen Victoria Street would be 63 PCU hours in the AM peak period assessed and 127 PCU hours in the PM peak period assessed. These equate to 5 seconds per PCU in the AM and 7 seconds per PCU in the PM peak period assessed.

18.5.84 The LinSig junction model outputs for phase 1 and 2 show that total junction delay for the junction of Queen Victoria Street / Puddle Dock is 12 PCU hours in the AM peak period assessed and 10 PCU hours in the PM peak period assessed. These equate to 7 seconds per PCU in the AM and 7 seconds per PCU in the PM peak period assessed.

18.5.85 The LinSig junction model outputs for phase 1 and 2 show that total junction delay for the junction of Upper Thames Street (A3211) / Puddle Dock / Blackfriars Passage is 8 PCU hours in the AM peak period assessed and 6 PCU hours in the PM peak period assessed. These equate to 32 seconds per PCU in the AM and 33 seconds per PCU in the PM peak period assessed.

18.5.86 The construction traffic and highway layout changes in the construction development case for phase 3 would produce a change in vehicle movements. The overall operation of the junctions would generally improve in the AM and PM peak hours despite the additional construction traffic. This is due to the closure of the westbound Victoria Embankment (A3211) slip road and traffic diversion routes to Fleet Street and Arundel Street, or Southwark Street (A3200) and Southwark Bridge (A300) in addition to optimisation of the traffic signal timings for the junction.

18.5.87 An increase in journey time specifically for vehicles required to use a diversion route during phase 3 of the works would be approximately five to six minutes. This is based on the length of the diversion routes available.

18.5.88 The LinSig junction model outputs for phase 3 shows that total junction delay for the Blackfriars Bridge Road (A201) / Victoria Embankment (A3211) westbound slip road would be 13 PCU hours in the AM peak period assessed and 16 PCU hours in the PM peak period assessed. These equate to 19 seconds per PCU in the AM and 18 seconds per PCU in the PM peak period assessed.

18.5.89 The LinSig junction model outputs for phase 3 shows that total junction delay for the junction of Victoria Embankment (A3211) / Temple Avenue is 26 PCU hours in the AM peak period assessed and 20 PCU hours in the PM peak period assessed. These equate to 29 seconds per PCU in the AM and 34 seconds per PCU in the PM peak period assessed.

18.5.90 The LinSig junction model outputs for phase 3 shows that total junction delay for the junction of Blackfriars Bridge Road (A201) / New Bridge Street (A201) / Queen Victoria Street would be 37 PCU hours in the AM peak period assessed and 49 PCU hours in the PM peak period assessed. These equate to 10 seconds per PCU in the AM and 9 seconds per PCU in the PM peak period assessed.

18.5.91 The LinSig junction model outputs for phase 3 shows that total junction delay for the junction of Queen Victoria Street / Puddle Dock is 12 PCU hours in the AM peak period assessed and 10 PCU hours in the PM peak period assessed. These equate to 7 seconds per PCU in the AM and 7 seconds per PCU in the PM peak period assessed.

18.5.92 The LinSig junction model outputs for phase 3 shows that total junction delay for the junction of Upper Thames Street (A3211) / Puddle Dock / Blackfriars Passage is 8 PCU hours in the AM peak period assessed and 6 PCU hours in the PM peak period assessed. These equate to 32 seconds per PCU in the AM and 33 seconds per PCU in the PM peak period assessed

Construction mitigation

18.5.93 The project has been designed to limit the issues arising on transport networks as far as possible and many measures have been embedded directly in the design of the project. These are summarised in Table 18.5.7.

Table 18.5.7 Blackfriars Bridge Foreshore design measures

Phase	Issues	Design measures
Construction	Creating site access point	• Creation of a minimum 3.25m wide lane on the Victoria Embankment (A3211) westbound off-slip road to accommodate construction vehicles arriving at and departing from the site • Creation of a gated access for the left-turn in / left turn-out movement for construction traffic
	Closure of the Thames Path	• Diversion of pedestrians from the Thames Path to the northern footway of Victoria Embankment (A3211) • Diversion of the Thames Path would be adequately signed directing pedestrians to the existing signal controlled crossings
	Narrowing the carriageway of Victoria Embankment (A3211) on-slip road (phases 1 and 2)	• Maintaining lanes with a minimum width of 3.25m • Restriction of two coach parking bays on the westbound off-slip road. • Restriction of one loading bay on the westbound off-slip road. • Temporary removal of white lining and provision of new white lining and road markings as appropriate
	Closure of the westbound off-slip road in phase 3 of the construction works	• Providing adequate advance notification and signage for traffic to use appropriate diversion routes.
	Movement of construction traffic flows on the local highway network	• Traffic signal optimisation at the four junctions in the vicinity of the site to achieve the most efficient operation of the junction
Operation	Creating access point	• Provision of new mountable kerb/reinforced vehicle crossing for maintenance access • To accommodate ten yearly maintenance vehicles

Sensitivity testing

18.5.94 The assessment outcomes reported earlier in this Section and in Volume 18 of the *Environmental Statement* are based on the *Transport Strategy*, as outlined in section 18.2. In that scenario, the number of construction vehicle movements generated by Blackfriars Bridge Foreshore in the peak year of construction would be approximately 13 movements in the AM and PM peak hours respectively, which would pass through the junctions on Blackfriars Bridge.

18.5.95 A sensitivity test has been undertaken to examine the implications of variation in the number of construction vehicle movements in the peak month of activity at this site, including the possibility that river transport is not available for short periods of time which could temporarily increase vehicle numbers. In this sensitivity test, the number of construction vehicle movements in the peak year of construction would be approximately 27 movements in the AM and PM peak hours respectively. This would be an increase of 10 construction vehicles in the AM and PM peak hours compared with that for the *Transport Strategy*.

18.5.96 A summary of the construction assessment results from the LinSig model for the junctions during phase 1 and 2 in the weekday AM and PM peak hours using the sensitivity test figures are presented in Table 18.5.8 and Table 18.5.9.

18.5.97 A summary of the construction assessment results from the LinSig model for the junctions during phase 3 in the weekday AM and PM peak hours using the sensitivity test figures is presented in Table 18.5.10 and Table 18.5.11

Table 18.5.8 Construction development case LinSig model outputs, sensitivity test (AM peak) – phase 1 and 2

Approach	Arm	Sensitivity test Flow (PCU)	Weekday								
			AM peak hour (08:00-09:00)								
			DoS			MMQ (PCU)			Delay (seconds per PCU)		
			EIA	Sensitivity test	Change	EIA	Sensitivity test	Change	EIA	Sensitivity test	Change
Junction of Blackfriars Bridge Road (A201) / Victoria Embankment (A3211) westbound slip road											
Blackfriars Bridge Road (A201) - northbound	Ahead / left	1004	98%	92%	-6	36	28	+12	61	37	-24
Blackfriars Bridge Road (A201) - northbound	Ahead	487	48%	45%	-3	9	8	-1	17	15	-2
Blackfriars Bridge Road (A201) southbound, to Victoria Embankment (A3211)	Right	409	20%	19%	-1	1	1	-	1	1	-
Victoria Embankment (A3211) - eastbound slip-road	Ahead (nearside lane)	257	60%	70%	+10	7	7	-	61	44	-17
	Ahead (offside	177	41%	48%	+7	5	5	-	36	36	-

Approach	Arm	Sensitivity test Flow (PCU)	Weekday								
			AM peak hour (08:00-09:00)								
			DoS			MMQ (PCU)			Delay (seconds per PCU)		
			EIA	Sensitivity test	Change	EIA	Sensitivity test	Change	EIA	Sensitivity test	Change
	lane)										
			PRC						Total delay (PCU hours)		
Overall junction performance			-9%	-2%	+7				29	23	-6
Junction of Victoria Embankment (A3211) / Temple Avenue											
Victoria Embankment (A3211) - eastbound	Ahead (nearside lane)	1129	97%	97%	-	37	37	-	48	48	-
	Ahead (offside lane)	873	75%	75%	-	16	16	-	17	17	-
Victoria Embankment (A3211) - westbound	Ahead (nearside lane)	330	21%	26%	+5	2	2	-	4	4	-
	Ahead (offside lane)	672	57%	57%	-	10	10	-	12	12	-
	Ahead (offside lane)	833	71%	71%	-	14	14	-	15	15	-
Temple Avenue	Right	78	19%	19%	-	2	2	-	32	32	-

Approach	Arm	Sensitivity test Flow (PCU)	Weekday								
			AM peak hour (08:00-09:00)								
			DoS			MMQ (PCU)			Delay (seconds per PCU)		
			EIA	Sensitivity test	Change	EIA	Sensitivity test	Change	EIA	Sensitivity test	Change
			PRC						Total delay (PCU hours)		
Overall junction performance			-8%	-8%	-				28	26	-2
Junction of Blackfriars Bridge Road (A201), New Bridge Street (A201) / Queen Victoria Street											
Blackfriars Bridge Road (A201) - northbound	Ahead (nearside lane)	730	65%	67%	+2	7	9	+2	10	9	-1
	Ahead (offside lane)	704	62%	65%	+3	10	17	-7	7	16	+9
	Right	471	90%	90%	-	13	15	+2	55	56	+2
New Bridge Street (A201)	Ahead	478	84%	91%	+7	14	16	+2	48	65	+17
	Ahead	608	107 %	116%	+9	43	63	+20	197	324	+127
Queen Victoria Street	Left	324	99%	98%	-1	15	15	-	119	105	-14
	Left / right	207	71%	62%	-9	7	6	-1	51	44	-7
			PRC						Total delay (PCU hours)		
Overall junction performance			-19%	-29%	-10				64	87	+23

Approach	Arm	Sensitivity test Flow (PCU)	Weekday								
			AM peak hour (08:00-09:00)								
			DoS			MMQ (PCU)			Delay (seconds per PCU)		
			EIA	Sensitivity test	Change	EIA	Sensitivity test	Change	EIA	Sensitivity test	Change
Junction of Queen Victoria Street / Puddle Dock											
Queen Victoria Street - eastbound	Ahead	229	39%	39%	-	3	3	-	12	12	-
	Ahead / right	242	42%	42%	-	4	4	-	13	13	-
Queen Victoria Street - westbound	Ahead	140	40%	40%	-	4	4	-	42	42	-
	Ahead / left	169	48%	48%	-	5	5	-	43	43	-
Puddle Dock	Right / left	465	51%	52%	+1	6	6	-	32	33	+1
	Right	264	49%	49%	-	7	7	-	35	35	-
			PRC						**Total delay (PCU hours)**		
Overall junction performance			76%	74%	-2				12	12	-
Junction of Upper Thames Street (A3211) / Puddle Dock / Blackfriars Passage											
Upper Thames Street (A3211) - eastbound	Ahead / left	731	62%	63%	+1	6	7	+1	7	8	+1
	Ahead	873	70%	71%	+1	10	13	+3	8	9	+1
Upper	Right	353	74%	76%	+2	9	10	+1	46	46	-

Approach	Arm	Sensitivity test Flow (PCU)	Weekday								
			AM peak hour (08:00-09:00)								
			DoS			MMQ (PCU)			Delay (seconds per PCU)		
			EIA	Sensitivity test	Change	EIA	Sensitivity test	Change	EIA	Sensitivity test	Change
Thames Street (A3211) – westbound											
Blackfriars Passage	Ahead	236	40%	40%	-	1	1	-	5	5	-
			PRC						Total delay (PCU hours)		
Overall junction performance			22%	18%	-4				9	9	-1

Notes: 1. DoS represents Degree of Saturation; the ratio of flow to capacity. MMQ represents Mean Maximum Queue for the busiest-case 15 minute modelled period (in vehicle lengths). Delay represents the mean delay per PCU. PRC represents Practical Reserve Capacity; measure of how much additional traffic could pass through a junction whilst maintaining a maximum DoS of 90% on all lanes. PCU value for a car is one PCU. Vans and three-axle vehicles are 1.5 PCUs, vehicles with four or more axles are 2.3 PCUs. Buses and coaches are two PCUs. Motorcycles are 0.4 PCUs and pedal cycles are 0.2 PCUs. Thames Tideway Tunnel construction vehicles would be a mixture of three- and four-axle vehicles and have therefore been given a PCU value of two.

2. Assessment has assumed that traffic signal optimisation has been undertaken as detailed in Volume 2 of the ES.

Table 18.5.9 Construction development case LinSig model outputs, All By Road (PM peak) –phase 1 and 2

Approach	Arm	Sensitivity test flow (PCU)	Weekday								
			PM peak hour (17:00 - 18:00)								
			DoS			MMQ (PCU)			Delay (seconds per PCU)		
			EIA	Sensitivity test	Change	EIA	Sensitivity test	Change	EIA	Sensitivity test	Change
Junction of Blackfriars Bridge Road (A201) / Victoria Embankment (A3211) westbound slip road											
Blackfriars Bridge Road (A201) - northbound	Ahead / left	611	82%	80%	-2	16	16	-	36	36	-
Blackfriars Bridge Road (A201) - northbound	Ahead	342	46%	45%	-1	7	7	-	25	25	-
Blackfriars Bridge Road (A201) southbound, to Victoria Embankment (A3211)	Right	643	31%	27%	-4	1	1	-	1	1	-
Victoria Embankment (A3211) - eastbound slip-road	Ahead (nearside lane)	314	50%	48%	-2	6	7	+1	22	32	+10
	Ahead (offside	133	24%	20%	-4	3	3	-	19	28	+9

Approach	Arm	Sensitivity test flow (PCU)	Weekday								
			PM peak hour (17:00 - 18:00)								
			DoS			MMQ (PCU)			Delay (seconds per PCU)		
			EIA	Sensitivity test	Change	EIA	Sensitivity test	Change	EIA	Sensitivity test	Change
	lane)										
			PRC						Total delay (PCU hours)		
Overall junction performance			13%	13%	-				14	15	+1
Junction of Victoria Embankment (A3211) / Temple Avenue											
Victoria Embankment (A3211) - eastbound	Ahead (nearside lane)	1065	92%	92%	-	28	28	-	30	30	-
	Ahead (offside lane)	787	68%	68%	-	13	13	-	14	14	-
Victoria Embankment (A3211) - westbound	Ahead (nearside lane)	382	27%	29%	+2	4	4	-	7	9	+2
	Ahead (offside lane)	757	64%	64%	-	12	12	-	13	13	-
	Ahead (offside lane)	758	64%	64%	-	12	12	-	13	13	-
Temple Avenue	Right	136	32%	32%	-	3	3	-	34	34	-

Approach	Arm	Sensitivity test flow (PCU)	Weekday								
			PM peak hour (17:00 - 18:00)								
			DoS			MMQ (PCU)			Delay (seconds per PCU)		
			EIA	Sensitivity test	Change	EIA	Sensitivity test	Change	EIA	Sensitivity test	Change
			PRC						Total delay (PCU hours)		
Overall junction performance			-2%	-2%	-				22	20	-2
Junction of Blackfriars Bridge Road (A201), New Bridge Street (A201) / Queen Victoria Street											
Blackfriars Bridge Road (A201) - northbound	Ahead (nearside lane)	812	77%	84%	+7%	9	17	+8	14	21	+7
	Ahead (offside lane)	300	30%	31%	+1%	1	2	+1	5	5	-
	Right	240	96%	96%	-	11	11	-	109	108	-1
New Bridge Street (A201)	Ahead	733	102 %	108%	+6	35	53	+18	112	204	+92
	Ahead	852	118 %	126%	+8	94	116	+22	346	437	+91
Queen Victoria Street	Left	423	96%	93%	-3	16	15	-1	83	63	-20
	Left / right	263	63%	58%	-5	7	7	-	38	34	-4
			PRC						Total delay (PCU hours)		
Overall junction performance			-	-40%	-9				128	167	+39

Approach	Arm	Sensitivity test flow (PCU)	Weekday								
			PM peak hour (17:00 - 18:00)								
			DoS			MMQ (PCU)			Delay (seconds per PCU)		
			EIA	Sensitivity test	Change	EIA	Sensitivity test	Change	EIA	Sensitivity test	Change
			31%								
Junction of Queen Victoria Street / Puddle Dock											
Queen Victoria Street - eastbound	Ahead	228	55%	39%	-16	43	3	-40	43	11	-32
	Ahead / right	17	6%	5%	-1	24	1	-23	24	13	-11
Queen Victoria Street - westbound	Ahead	166	19%	48%	+29	30	5	-25	30	43	+13
	Ahead / left	203	71%	58%	-13	41	6	-35	41	46	+5
Puddle Dock	Right / left	446	75%	57%	-18	8	14	+6	26	16	-10
	Right	172	61%	32%	-31	5	4	-1	27	32	+5
			PRC						**Total delay (PCU hours)**		
Overall junction performance			65%	55%	-10				10	9	-1
Junction of Upper Thames Street (A3211) / Puddle Dock / Blackfriars Passage											
Upper Thames Street (A3211) - eastbound	Ahead / left	706	57%	54%	-3	4	6	+2	6	7	+1
	Ahead	787	60%	57%	+3	6	5	-1	6	7	+1

Approach	Arm	Sensitivity test flow (PCU)	Weekday								
			PM peak hour (17:00 - 18:00)								
			DoS			MMQ (PCU)			Delay (seconds per PCU)		
			EIA	Sensitivity test	Change	EIA	Sensitivity test	Change	EIA	Sensitivity test	Change
Upper Thames Street (A3211) - westbound	Right	276	65%	90%	+25	7	11	+4	45	82	+37
Blackfriars Passage	Ahead	271	45%	45%	-	1	1	-	6	6	-
			PRC						Total delay (PCU hours)		
Overall junction performance			38%	1%	-37				7	9	+2

Notes: 1. DoS represents Degree of Saturation; the ratio of flow to capacity. MMQ represents Mean Maximum Queue for the busiest-case 15 minute modelled period (in vehicle lengths). Delay represents the mean delay per PCU. PRC represents Practical Reserve Capacity; measure of how much additional traffic could pass through a junction whilst maintaining a maximum DoS of 90% on all lanes. PCU value for a car is one PCU. Vans and three-axle vehicles are 1.5 PCUs, vehicles with four or more axles are 2.3 PCUs. Buses and coaches are two PCUs. Motorcycles are 0.4 PCUs and pedal cycles are 0.2 PCUs. Thames Tideway Tunnel construction vehicles would be a mixture of three- and four-axle vehicles and have therefore been given a PCU value of two..

2. Assessment has assumed that traffic signal optimisation has been undertaken as detailed in Volume 2 of the ES.

Table 18.5.10 Construction development case LinSig model outputs, All By Road (AM peak) – phase 3

Approach	Arm	Sensitivity test Flow (PCU)	Weekday								
			AM peak hour (08:00-09:00)								
			DoS			MMQ (PCU)			Delay (seconds per PCU)		
			EIA	Sensitivity test	Change	EIA	Sensitivity test	Change	EIA	Sensitivity test	Change
Junction of Blackfriars Bridge Road (A201) / Victoria Embankment (A3211) westbound slip road											
Blackfriars Bridge Road (A201) - northbound	Ahead / left	946	83%	83%	-	22	22	-	25	25	-
Blackfriars Bridge Road (A201) - northbound	Ahead	487	43%	43%	-	8	8	-	13	13	-
Blackfriars Bridge Road (A201) southbound, to Victoria Embankment (A3211)	Right	444	23%	23%	-	1	1	-	1	1	-
Victoria Embankment (A3211) - eastbound slip-road	Ahead (nearside lane)	257	78%	78%	-	8	8	-	53	53	-
	Ahead (offside	177	54%	54%	-	5	5	-	39	39	-

Approach	Arm	Sensitivity test Flow (PCU)	Weekday								
			AM peak hour (08:00-09:00)								
			DoS			MMQ (PCU)			Delay (seconds per PCU)		
			EIA	Sensitivity test	Change	EIA	Sensitivity test	Change	EIA	Sensitivity test	Change
	lane)										
			PRC						Total delay (PCU hours)		
Overall junction performance			8	8	-				16	15	-1
Junction of Victoria Embankment (A3211) / Temple Avenue											
Victoria Embankment (A3211) - eastbound	Ahead (nearside lane)	1129	97%	97%	-	37	37	-	48	48	-
	Ahead (offside lane)	873	75%	75%	-	16	16	-	17	17	-
Victoria Embankment (A3211) - westbound	Ahead (nearside lane)	0	0%	0%	-	0	0	-	0	0	-
	Ahead (offside lane)	697	57%	59%	+2	10	11	+1	12	12	-
	Ahead (offside lane)	912	77%	77%	-	18	18	-	17	17	-
Temple Avenue	Right	78	19%	19%	-	2	2	-	32	32	-

Approach	Arm	Sensitivity test Flow (PCU)	Weekday								
			AM peak hour (08:00-09:00)								
			DoS			MMQ (PCU)			Delay (seconds per PCU)		
			EIA	Sensitivity test	Change	EIA	Sensitivity test	Change	EIA	Sensitivity test	Change
			PRC						Total delay (PCU hours)		
Overall junction performance			-8%	-8%	-				28	28	-
Junction of Blackfriars Bridge Road (A201), New Bridge Street (A201) / Queen Victoria Street											
Blackfriars Bridge Road (A201) - northbound	Ahead (nearside lane)	730	66%	66%	-	10	10	-	10	10	-
	Ahead (offside lane)	704	63%	63%	-	15	15	-	12	12	-
	Right	471	83%	83%	-	12	12	-	43	43	-
New Bridge Street (A201)	Ahead	478	95%	95%	-	18	18	-	80	82	+2
	Ahead	442	88%	88%	-	14	14	-	59	59	-
Queen Victoria Street	Left	286	92%	92%	-	12	12	-	78	78	-
	Left / right	200	64%	64%	-	6	6	-	46	46	-
			PRC						Total delay (PCU hours)		
Overall junction performance			-5%	-6	-1				38	37	-1
Junction of Queen Victoria Street / Puddle Dock											

Approach	Arm	Sensitivity test Flow (PCU)	Weekday								
			AM peak hour (08:00-09:00)								
			DoS			MMQ (PCU)			Delay (seconds per PCU)		
			EIA	Sensitivity test	Change	EIA	Sensitivity test	Change	EIA	Sensitivity test	Change
Queen Victoria Street - eastbound	Ahead	229	38%	38%	-	4	4	-	12	12	-
	Ahead / right	242	41%	41%	-	4	4	-	12	12	-
Queen Victoria Street - westbound	Ahead	140	38%	38%	-	4	4	-	40	40	-
	Ahead / left	161	43%	43%	-	4	4	-	41	41	-
Puddle Dock	Right / left	440	52%	52%	-	6	6	-	32	32	-
	Right	264	51%	51%	-	7	7	-	35	35	-
			PRC						Total delay (PCU hours)		
Overall junction performance			72	72	-				12	11	-1
Junction of Upper Thames Street (A3211) / Puddle Dock / Blackfriars Passage											
Upper Thames Street (A3211) - eastbound	Ahead / left	731	30%	61%	+31	1	6	+5	1	7	+6
	Ahead	873	39%	69%	+30	1	9	+8	2	7	+5
Upper Thames	Right	328	77%	77%	-	10	10	-	50	50	-

Approach	Arm	Sensitivity test Flow (PCU)	Weekday								
			AM peak hour (08:00-09:00)								
			DoS			MMQ (PCU)			Delay (seconds per PCU)		
			EIA	Sensitivity test	Change	EIA	Sensitivity test	Change	EIA	Sensitivity test	Change
Street (A3211) - westbound											
Blackfriars Passage	Ahead	236	40%	41%	+1	1	1	-	5	5	-
			PRC						Total delay (PCU hours)		
Overall junction performance			16%	16%	-				8	8	-

Notes: 1. DoS represents Degree of Saturation; the ratio of flow to capacity. MMQ represents Mean Maximum Queue for the busiest-case 15 minute modelled period (in vehicle lengths). Delay represents the mean delay per PCU. PRC represents Practical Reserve Capacity; measure of how much additional traffic could pass through a junction whilst maintaining a maximum DoS of 90% on all lanes. PCU value for a car is one PCU. Vans and three-axle vehicles are 1.5 PCUs, vehicles with four or more axles are 2.3 PCUs. Buses and coaches are two PCUs. Motorcycles are 0.4 PCUs and pedal cycles are 0.2 PCUs. Thames Tideway Tunnel construction vehicles would be a mixture of three- and four-axle vehicles and have therefore been given a PCU value of two.

2. Assessment has assumed that traffic signal optimisation has been undertaken as detailed in Volume 2 of the ES.

Table 18.5.11 Construction development case LinSig model outputs, All By Road (PM peak) – phase 3

Approach	Arm	Sensitivity test flow (PCU)	Weekday								
			PM peak hour (17:00 - 18:00)								
			DoS			MMQ (PCU)			Delay (seconds per PCU)		
			EIA	sensitivity test	Change	EIA	sensitivity test	Change	EIA	sensitivity test	Change
Junction of Blackfriars Bridge Road (A201) / Victoria Embankment (A3211) westbound slip road											
Blackfriars Bridge Road (A201) - northbound	Ahead / left	543	53%	58%	+5	10	11	+1	18	22	+4
Blackfriars Bridge Road (A201) - northbound	Ahead	342	33%	36%	+3	6	6	-	15	18	+3
Blackfriars Bridge Road (A201) southbound, to Victoria Embankment (A3211)	Right	645	33%	33%	-	1	1	-	2	2	-
Victoria Embankment (A3211) - eastbound slip-road	Ahead (nearside lane)	314	65%	61%	-4	8	8	-	38	32	-6
	Ahead (offside	133	31%	26%	-5	3	3	-	30	25	-5

Approach	Arm	Sensitivity test flow (PCU)	Weekday								
			PM peak hour (17:00 - 18:00)								
			DoS			MMQ (PCU)			Delay (seconds per PCU)		
			EIA	sensitivity test	Change	EIA	sensitivity test	Change	EIA	sensitivity test	Change
	lane)										
			PRC						Total delay (PCU hours)		
Overall junction performance			39%	47%	+8				10	9	-1
Junction of Victoria Embankment (A3211) / Temple Avenue											
Victoria Embankment (A3211) - eastbound	Ahead (nearside lane)	1065	92%	92%	-	28	28	-	30	30	-
	Ahead (offside lane)	787	68%	68%	-	13	13	-	14	14	-
Victoria Embankment (A3211) - westbound	Ahead (nearside lane)	0	0%	0%	-	0	0	-	0	0	-
	Ahead (offside lane)	783	64%	66%	-	13	13	-	13	13	-
	Ahead (offside lane)	860	73%	73%	-	16	16	-	16	16	-
Temple Avenue	Right	136	32%	32%	-	3	3	-	34	34	-

Approach	Arm	Sensitivity test flow (PCU)	Weekday								
			PM peak hour (17:00 - 18:00)								
			DoS			MMQ (PCU)			Delay (seconds per PCU)		
			EIA	sensitivity test	Change	EIA	sensitivity test	Change	EIA	sensitivity test	Change
			PRC						Total delay (PCU hours)		
Overall junction performance			-2%	-2%	-				21	20	-1
Junction of Blackfriars Bridge Road (A201), New Bridge Street (A201) / Queen Victoria Street											
Blackfriars Bridge Road (A201) - northbound	Ahead (nearside lane)	812	76%	79%	+3	14	14	-	16	15	-1
	Ahead (offside lane)	300	29%	29%	-	5	5	-	10	9	-1
	Right	240	88%	88%	-	10	9	-1	76	77	+1
New Bridge Street (A201)	Ahead	733	102 %	102%	-	35	36	+1	112	115	+3
	Ahead	609	85%	85%	-	17	17	-	42	42	-
Queen Victoria Street	Left	364	92%	92%	-	13	13	-	71	70	-1
	Left / right	263	67%	67%	-	8	8	-	3	40	+37
			PRC						Total delay (PCU hours)		
Overall junction performance			-12	-13	-1				50	50	-
Junction of Queen Victoria Street / Puddle Dock											

Approach	Arm	Sensitivity test flow (PCU)	Weekday								
			PM peak hour (17:00 - 18:00)								
			DoS			MMQ (PCU)			Delay (seconds per PCU)		
			EIA	sensitivity test	Change	EIA	sensitivity test	Change	EIA	sensitivity test	Change
Queen Victoria Street - eastbound	Ahead	228	36%	37%	+1	2	2	-	10	10	-
	Ahead / right	17	4%	5%	+1	1	1	-	11	12	+1
Queen Victoria Street - westbound	Ahead	166	43%	45%	+2	4	5	+1	40	41	+1
	Ahead / left	203	52%	55%	+3	5	6	+1	42	44	+2
Puddle Dock	Right / left	421	55%	54%	-1	11	11	-	36	36	-
	Right	172	35%	33%	-2	4	3	-1	28	25	-3
			PRC						Total delay (PCU hours)		
Overall junction performance			63%	65%	+2				10	10	-
Junction of Upper Thames Street (A3211) / Puddle Dock / Blackfriars Passage											
Upper Thames Street (A3211) - eastbound	Ahead / left	706	57%	57%	-	5	5	-	6	6	-
	Ahead	787	60%	60%	-	7	7	-	6	6	-
Upper Thames Street (A3211) - westbound	Right	251	65%	65%	-	7	7	-	45	45	-

Approach	Arm	Sensitivity test flow (PCU)	Weekday								
			PM peak hour (17:00 - 18:00)								
			DoS			MMQ (PCU)			Delay (seconds per PCU)		
			EIA	sensitivity test	Change	EIA	sensitivity test	Change	EIA	sensitivity test	Change
Blackfriars Passage	Ahead	272	45%	46%	+1	1	1	-	6	6	-
			PRC						Total delay (PCU hours)		
Overall junction performance			40%	38%	-2				7	5	-2

Notes: 1. DoS represents Degree of Saturation; the ratio of flow to capacity. MMQ represents Mean Maximum Queue for the busiest-case 15 minute modelled period (in vehicle lengths). Delay represents the mean delay per PCU. PRC represents Practical Reserve Capacity; measure of how much additional traffic could pass through a junction whilst maintaining a maximum DoS of 90% on all lanes. PCU value for a car is one PCU. Vans and three-axle vehicles are 1.5 PCUs, vehicles with four or more axles are 2.3 PCUs. Buses and coaches are two PCUs. Motorcycles are 0.4 PCUs and pedal cycles are 0.2 PCUs. Thames Tideway Tunnel construction vehicles would be a mixture of three- and four-axle vehicles and have therefore been given a PCU value of two.

2. Assessment has assumed that traffic signal optimisation has been undertaken as detailed in Volume 2 of the ES.

18.5.98 The assessment results show that the sensitivity test leads to a modest modelled change to the DoS, queuing and delay. The key arms are New Bridge Street (A201), Queen Victoria Street and Victoria Embankment (A3211) as for the EIA scenario.

18.5.99 Notably the junction approaches identified as being above the practical reserve capacity threshold in the EIA scenario are also identified in the sensitivity test. No new junction approaches are demonstrated as being overcapacity due to the increase in traffic flow due to the sensitivity test scenario.

18.5.100 It must be recognised that this analysis represents a maximum sensitivity test and that the *Transport Strategy* envisages the use of the river to transport some of the construction materials required at this site. If the sensitivity test did occur over a prolonged period, which is unlikely for the reasons given in Section 18.3, the design measures which have been embedded directly in the design of the project and are listed in Table 18.5.7 would remain and there would be no need for further mitigation measures.

18.5.101 The LinSig junction model outputs shows that in phase 1 the total junction delay for the junction of Blackfriars Bridge (A201) / Victoria Embankment (A3211) ramp would be 23 PCU hours in the AM peak period assessed and 15 PCU hours in the PM peak period assessed. These equate to 18 seconds per PCU in the AM and 17 seconds per PCU in the PM peak period assessed.

18.5.102 The LinSig junction model outputs shows that total junction delay for the junction of Victoria Embankment (A3211) / Temple Avenue would be 26 PCU hours in the AM peak period assessed and 20 PCU hours in the PM peak period assessed. These equate to 30 seconds per PCU in the AM and 34 seconds per PCU in the PM peak period assessed.

18.5.103 The LinSig junction model outputs shows that total junction delay for the junction of Blackfriars Bridge Road (A201) / New Bridge Street (A201) would be 87 PCU hours in the AM peak period assessed and 167 PCU hours in the PM peak period assessed. These equate to 6 seconds per PCU in the AM and 5 seconds per PCU in the PM peak period assessed.

18.5.104 The LinSig junction model outputs shows that total junction delay for the junction of Queen Victoria Street / Puddle Dock is 12 PCU hours in the AM peak period assessed and 9 PCU hours in the PM peak period assessed. These equate to 10 seconds per PCU in the AM and 8 seconds per PCU in the PM peak period assessed.

18.5.105 The LinSig junction model outputs shows that total junction delay for the junction of Upper Thames Street (A3211) / Puddle Dock would be 8 PCU hours in the AM peak period assessed and 9 PCU hours in the PM peak period assessed. These equate to 32 seconds per PCU in the AM and 20 seconds per PCU in the PM peak period assessed.

18.5.106 The LinSig junction model outputs shows that in phase 3 the total junction delay for the junction of Blackfriars Bridge (A201) / Victoria Embankment (A3211) ramp would be 16 PCU hours in the AM peak period assessed and 18 PCU hours in the PM peak period assessed. These equate to 11 seconds per PCU in the AM and 20 seconds per PCU in the PM peak period assessed.

18.5.107 The LinSig junction model outputs shows that total junction delay for the junction of Victoria Embankment (A3211) / Temple Avenue would be 27 PCU hours in the AM peak period assessed and 20 PCU hours in the PM peak period assessed. These equate to 30 seconds per PCU in the AM and 33 seconds per PCU in the PM peak period assessed.

18.5.108 The LinSig junction model outputs shows that total junction delay for the junction of Blackfriars Bridge Road (A201) / New Bridge Street (A201) would be 37 PCU hours in the AM peak period assessed and 50 PCU hours in the PM peak period assessed. These equate to 10 seconds per PCU in the AM and 10 seconds per PCU in the PM peak period assessed.

18.5.109 The LinSig junction model outputs shows that total junction delay for the junction of Queen Victoria Street / Puddle Dock is 11 PCU hours in the AM peak period assessed and 10 PCU hours in the PM peak period assessed. These equate to 8 seconds per PCU in the AM and 8 seconds per PCU in the PM peak period assessed.

18.5.110 The LinSig junction model outputs shows that total junction delay for the junction of Upper Thames Street (A3211) / Puddle Dock would be 8 PCU hours in the AM peak period assessed and 5 PCU hours in the PM peak period assessed. These equate to 31 seconds per PCU in the AM and 32 seconds per PCU in the PM peak period assessed.

18.6 Operational assessment

18.6.1 This section summarises the findings of the assessment undertaken for Year 1 of operation at the Blackfriars Bridge Foreshore site.

18.6.2 The assessment of the operational phase is limited to the physical issues associated with accessing the site from the highway and river network as outlined in Section 18.2. This has been discussed with the City of London Corporation and TfL.

Operational base case

18.6.3 The operational assessment year for transport is Year 1 of operation.

18.6.4 As explained in para. 18.2.45, the elements of the transport network considered in the operational assessment are highway layout and operation, pedestrians and river usage. For the purposes of the operational base case, it is anticipated that the highway layout and parking will be as indicated in the construction base case.

Operational development case

18.6.5 The operational development case for the site includes any permanent changes in the vicinity of the Blackfriars Bridge Foreshore site as a result of the Thames Tideway Tunnel project and takes into consideration the occasional maintenance activities required at the site.

18.6.6 Once the construction works at the Blackfriars Bridge Foreshore site have been completed, there would be a new structure built out onto the foreshore. This would form part of the public realm although access would be restricted periodically for inspection and maintenance purposes into the shaft and tunnel.

18.6.7 In addition to the new foreshore area the Blackfriars Millennium Pier would remain located east of Blackfriars Bridge as in the construction phases. Also a pedestrian step free access route would be maintained, from Paul's Walk to Blackfriars Bridge, as in the construction phase.

18.6.8 The transport demands created by the development in the operational phase would be extremely low and limited to occasional maintenance visits every three to six months, and larger cranes required for access to the shaft and tunnel every ten years.

18.6.9 The operational assessment has taken into consideration those elements that would be affected, which comprise the short-term changes to coach parking and on the highway layout and operation when maintenance visits are made to the site.

18.6.10 The permanent highway layout plan in the Blackfriars Bridge Foreshore *Transport Assessment* figures shows the highway layout during the operational phase.

18.6.11 When regular maintenance activity takes place during the operational phase, pedestrians would not be diverted away from the Thames Path but would be managed in the location of the site access point. When large maintenance vehicles are required to access the site, pedestrian movements could be assisted by a banksman in order to ensure pedestrian safety. During the ten-yearly maintenance inspections, it may be necessary to divert the Thames Path.

Pedestrians

18.6.12 Changes as a result of the scheme and their effects on river service passengers and pedestrians using Paul's Walk are discussed in paras. 18.6.9 to 18.6.10. With the pier retained in the new location for the operational phase, the issues would be similar to those which have been identified for the construction development case.

River Services

18.6.13 The permanent relocation of the Blackfriars Millennium Pier would not have a significant effect on river service passengers. Only pedestrians coming from the Victoria Embankment (A3211) footway heading east would have a longer journey, by approximately 250m as a result of retaining the pier in its relocated position. The effect on other pedestrians using Paul's Walk would be no different to the current situation. The interchange distance between Blackfriars station and the pier would be maintained by the retention of the lift in the operational phase.

River Vessels

18.6.14 A separate *Navigational Issues and Preliminary Risk Assessment* that has been undertaken for the permanent structures and temporary construction works and barges to be used at the Blackfriars Bridge Foreshore site. There would be no construction barges in the operational phase.

Highway layout and operation

18.6.15 As a result of the highway layout changes during the operational phase (detailed in section 18.2) an assessment has been undertaken to ensure that the highway layout provided is adequate for the large vehicles required to access the site during the operational phase. Swept paths have been undertaken for the largest vehicles including 11.36m mobile cranes, 10m rigid articulated vehicle and 10.7m articulated vehicle and an 11.36m mobile crane. The permanent highway layout vehicle swept path analysis plan in the Blackfriars Bridge Foreshore *Transport Assessment* figures demonstrates that the maintenance vehicles would be able to safely enter and leave the site.

18.6.16 When larger vehicles are required to service the site, there may also be some temporary, short-term delay to other road users while manoeuvres are made. However it is anticipated that the arrival of large vehicles would normally be scheduled to take place outside of the peak hours to minimise the effect on the local highway network.

18.6.17 Due to the infrequent nature of maintenance trips there is anticipated to be no significant change to the surrounding highway network during the operational phase at Blackfriars Bridge Foreshore.

Operational mitigation

18.6.18 Table 18.6.1 summarises the measures which have been embedded in the design of the project in order to limit, as far as possible, the issues arising on transport networks.

Table 18.6.1 Blackfriars Bridge Foreshore design measures

Phase	Issues	Design measures
Operation	Creating access point	• Provision of new mountable kerb/reinforced vehicle crossing for maintenance access • To accommodate ten yearly maintenance vehicles

18.7 Summary of Transport Assessment findings

18.7.1 The outcomes of this TA demonstrate the key findings indicated in Table 18.7.1.

Table 18.7.1 Blackfriars Bridge Foreshore transport assessment results

Phase	Mode of transport	Key Findings
Construction	Pedestrians	Approx. three minute delay to pedestrian journeys due to 70m diversion including four additional road crossings. Pedestrian Level of Service would be maintained at LoS B along Paul's Walk footway, the same level as the construction base case despite diversions.
	Cyclists	Minimal delay (approximately 31 seconds) experienced by cyclists using Blackfriars Bridge junction as a result of the highway network delay during phase 1 and 2 of the construction works. In phase 3 there would be a journey time increase of approximately six minutes for cyclists using an alternative route to access Victoria Embankment (A3211) from Blackfriars Bridge (A201). For all other cyclists the journey time delay would be approximately 31 seconds.
	Bus patronage and operators	Approximately five worker trips would be made by bus. Minimal delay (max. of approximately 31 seconds) experienced by buses using Blackfriars Bridge junction as a result of the highway network delay during phase 1 and 2 of the construction works.
	London Underground and National Rail patronage	Approximately 27 worker trips would be made by LUL and 34 by National Rail. The change to patronage on LUL or National Rail services would be less than one additional passenger per hour on both LUL and National Rail services.
	River passenger services and patronage	The loading bay used by the Blackfriars Millennium Pier and President would be suspended during construction. Approximately one worker trip would be made by river. River services would be relocated to a new pier location to the east of Blackfriars Bridge opposite Puddle Dock. Passengers would experience approx. three minute delay to pedestrian journeys due to 70m diversion including four additional road crossings.
	River navigation	There would be approximately six barge movements a day during Site Year 4 of

Phase	Mode of transport	Key Findings
		construction which is not anticipated to impact on existing river navigation.
	Parking	For all phases of the construction works two coach parking bays along the Victoria Embankment (A3211) westbound on-slip road would be suspended. The bays would be relocated on Blackfriars Road approximately 450m to the south. A loading bay would also be suspended on the Victoria Embankment (A3211) westbound on-slip road. An alternative loading bay would be provided on White Lion Hill 300m to the east close to the relocated Blackfriars Millennium Pier.
	Highway network and operation	During phases 1 and 2 of the construction works, to accommodate the construction works, the width of the eastbound carriageway of the Victoria Embankment (A3211) westbound on-slip road would be reduced to minimum width of 3.25m. During phase 3 of the construction works the Victoria Embankment (A3211) westbound on-slip road would be closed to all vehicles. Approximately 128 additional daily movements would be produced by the construction works at Blackfriars Bridge Foreshore. The Blackfriars Bridge (A201) junction with Victoria Embankment (A3211) would be operating at capacity in the construction base case. The addition of the Thames Tideway Tunnel traffic, anticipated to be ten two-way vehicle movements during the peak hours would result in an increase of a maximum of 31 (AM) or 58 (PM) seconds delay to vehicles using the junction in both phases 1 and 2. In phase 3, with the Victoria Embankment (A3211) westbound on-slip road closed the maximum increase to vehicle delay or journey time would be approximately five to six minutes for vehicles that want to access Victoria Embankment (A3211). For vehicles moving through the junction the general increase to delay would be approximately 31 seconds.
Operation	Highway layout and operation	Some network delay may be experienced by other road users when large vehicles are accessing the site, however this would be infrequent and temporary.

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Thames Tideway Tunnel
Thames Water Utilities Limited

Application for Development Consent

Application Reference Number: WWO10001

Transport Assessment

Doc Ref: **7.10.15**

Blackfriars Bridge Foreshore

Appendices

APFP Regulations 2009: Regulation **5(2)(q)**

Hard copy available in

Box **52** Folder **A**
January 2013

Thames Tideway Tunnel
Creating a cleaner, healthier River Thames

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Thames Tideway Tunnel

Transport Assessment

Section 18 Appendices: Blackfriars Bridge Foreshore

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Appendix A: Policy review

A.1 Introduction

A.1.1 There are a number of documents containing planning policies that are relevant to transport matters for the proposed development at Blackfriars Bridge Foreshore. This includes national, regional and local policies relevant to the site.

A.1.2 This section reviews current documents relevant to the proposed development which is situated within the City of London.

A.2 National Policy

National Planning Policy Framework (March 2012)

A.2.1 The Department for Communities and Local Government published the National Planning Policy Framework (NPPF) in March 2012. The NPPF replaces a variety of existing planning guidance, most notable the following document, Planning Policy Guidance 13: Transport (November 2010).

A.2.2 The key objective of the NPPF is to create a policy context to support economic growth. The principle of the guidance is to place an emphasis on sustainable development, where environmental conditions should be considered alongside economical and social matters.

A.2.3 It outlines the importance of local development plans and notes that where development accords with an up to date development plan then the proposals should be approved. Moreover, it suggests that local authorities should follow the approach of the presumption in favour of sustainable development.

A.2.4 With particular reference to transport matters the documents states:

"*In preparing local plans, local planning authorities should therefore support a pattern of development which, where reasonable to do so, and facilitates the use of sustainable modes of transport."*

A.2.5 The guidance goes on to advise at paragraph 32:

"All developments that generate significant amounts of movement should be supported by a Transport Statement or Transport Assessment. Plans and decisions should take account of whether:

a. the opportunities for sustainable transport modes have been taken up depending on the nature and location of the site, to reduce the need for major transport infrastructure;

b. safe and suitable access to the site can be achieved for all people; and

c. improvements can be undertaken within the transport network that cost effectively limit the significant impacts of the development. Development should only be prevented or refused on transport *grounds where the residual cumulative impacts of development are severe."*

A.2.6 The document also states that:

"Plans should protect and exploit opportunities for the use of sustainable transport modes for the movement of goods or people". Therefore:

"A key tool to facilitate this would be a Travel Pan. *All developments which generate significant amounts of movement should be required to provide a Travel Plan".*

National Policy Statement for Waste Water (March 2012)

A.2.7 The National Policy Statement for Waste Water (NPS) was published by the Department of Environment, Food and Rural Affairs in March 2012. This NPS sets out Government policy for the provision of major waste water infrastructures. The NPS does not recognise the Thames Tideway Tunnel project within the original thresholds which is contained within the Planning Act. However the document indicates that *"the Government has already stated its intention that the project should be considered at a national level"*.

A.2.8 The Secretary of State announced that development consent for the Thames Tideway Tunnel project should also be dealt with under the regime for nationally significant infrastructure projects under the Planning Act 2008.

A.2.9 The NPS for Waste Water seeks a sustainable long term solution to address the untreated sewage discharged into the river Thames and Thames Tideway Tunnel has been considered as the preferred solution.

A.2.10 With particular reference to transport matters the document states:

"The ES should include a transport assessment, using the NATA/WebTAG methodology stipulated in Department for Transport (DfT), or any successor to such methodology. Applicants should consult the Highways Agency and/or the relevant highway authority, as appropriate, on the assessment and on mitigation measures. The assessment should distinguish between the construction, operation and decommissioning project stages as appropriate".

A.2.11 The document states that the impacts on the surrounding transport infrastructure should be mitigated and where the mitigation measures are not sufficient the requirements to mitigate adverse impacts on transport networks should be considered.

A.2.12 Therefore it is advised to prepare a *Travel Plan* which includes demand management measures to mitigate transport impacts, and *"to provide details of proposed measures to improve access by public transport, walking and cycling, to reduce the need for parking associated with the proposal and to mitigate transport impacts".*

A.2.13 The NPS prefers water-borne or rail transport over road transport and where there is likely to be substantial HGV traffic, the following measures should be looked:

a. *"control numbers of HGV movements to and from the site in a specified period during its construction and possibly on the routing of such movements;*

b. *make sufficient provision for HGV parking, either on the site or at dedicated facilities elsewhere, to avoid 'overspill' parking on public roads, prolonged queuing on approach roads and uncontrolled on-street HGV parking in normal operating conditions; and*

c. *ensure satisfactory arrangements for reasonably foreseeable abnormal disruption, in consultation with network providers and the responsible police force".*

A.2.14 The proposed development is located at a excellent accessible transport hub and the proposed location has a Public Transport Accessibility Level (PTAL) rating of 6b, rated as 'excellent'. It is assumed that construction workers would not travel by car to and from the site on the basis that there would be no worker parking on site; on-street parking in the area is restricted; and site-specific *Travel Plan* measures will discourage workers from travelling by car.

A.3 Regional policy

The London Plan (July 2011)

A.3.1 The London Plan 2011 is produced by the Greater London Authority (GLA) and sets out the strategic planning guidance for London planning authorities. The Mayor of London is responsible for strategic planning and the production of a Spatial Development Strategy called The London Plan. The London plan sets out the integrated economic, environmental, transport and social framework for the development of London over the next 20-25 years. The Plan takes the year 2031 as its formal end date and its over-arching vision is supported by six detailed objectives for London:

a. A city that meets the challenges of economic and population growth;

b. An internationally competitive and successful city;

c. A city of diverse, strong, secure and accessible neighbourhoods;

d. A city that delights the senses;

e. A city that becomes a world leader in improving the environment; and

f. A city where it is easy, safe and convenient for everyone to access jobs, opportunities and facilities.

A.3.2 The last objective of the plan relates specifically to transport. Policies within the London Plan of relevance to the proposed development are outlined as follows:

A.3.3 **Policy 6.1 – Strategic Approach** advises that the mayor will work with all relevant partners to encourage the closer integration of transport and development by:

a. Encouraging patterns and nodes of development that reduce the need to travel, especially by car;

b. Seeking to improve the capacity and accessibility of public transport, walking and cycling, particularly in areas of greater demand;

c. Supporting development that generates high levels of trips at locations with high public transport accessibility and/or capacity, either currently or via committed, funded improvement;

d. Seeking to increase the use of the Blue Ribbon Network, especially the Thames, for passenger and freight use;

e. Facilitating the efficient distribution of freight whilst minimising its impacts on the transport network;

f. Supporting measures that encourage shifts to mode sustainable modes and appropriate demand management; and

g. Promoting greater use of low carbon technology so that carbon dioxide and other contributors to global warming are reduced.

A.3.4 **Policy 6.2 – Providing public transport capacity and safeguarding land for transport** which notes that development proposals that do not provide adequate safeguarding for the schemes should be refused.

A.3.5 **Policy 6.3 – Assessing effects of development on transport capacity** outlines that development proposals should ensure that impacts on transport capacity and the transport network, at both a corridor and local level, are fully assessed. Development should not adversely affect safety on the transport network. Where existing transport capacity is insufficient for the travel generated by proposed developments, and no firm plans exist for an increase in capacity, boroughs should ensure that the development proposals are phased until it is known that these requirements can be met. The policy notes that the use of *Travel Plans* and addressing freight issues can help reduce the impact of development on the transport network.

A.3.6 **Policy 6.7 – Better streets and surface transport** notes that high levels of priority should be provided to bus routes and there should be direct, secure, accessible and pleasant walking routes to stops. The development would include provision of transport to and from public transport nodes where sites are at a distance from public transport services.

A.3.7 **Policy 6.9 – Cycling** presents measures to increase cycling mode share in London to 5 percent by 2026. Measures include completing the Cycle Super Highways and expanding the London cycle hire scheme. To support this, developments should provide cycle parking to at least the minimum standards, provide showers and changing facilities and facilitate the major cycling schemes in London (Super Highways / Cycle Hire).

A.3.8 **Policy 6.10 – Walking** recommends the use of shared space principles with simplified streetscape, de-cluttering and access for all. Developments should therefore ensure high quality pedestrian environments and emphasise the quality of pedestrian and street space. It points to the

'Legible London' pedestrian wayfinding system as a successful measure to support walking journeys.

A.3.9 **Policy 6.13 – Parking** outlines the need to seek an appropriate balance between promoting new development and preventing excessive car parking provision that can undermine cycling, walking and public transport use. As such, car parking should reduce as public transport accessibility (measured by PTAL) increases. The policy advises that *Transport Assessments* and *Travel Plans* for major developments should give details of proposed measures to improve non-car based access, reduce parking and mitigate adverse transport impacts.

A.3.10 **Policy 6.14 – Freight** notes that freight distribution should be improved and movement of freight by rail and waterway should be promoted. To support this, developments that generate high number of freight movements should be located close to major transport routes. In addition, the Freight Operators Recognition Scheme, construction logistics plans and delivery and servicing plans should be promoted. The policy also advises the increase in the use of the Blue Ribbon Network for freight transport.

The Mayors Transport Strategy (GLA, 2010)

A.3.11 In addition to the London Plan, the Mayor has prepared a number of strategies that are essentially an extension of the London Plan. Published by the GLA in 2010, the Mayor's Transport Strategy (MTS) (Greater London Authority, May 2010) envisages *"London's Transport system excelling among that of global cities, providing access to opportunities for all people and enterprises while achieving the highest environmental standards and leading the world in its move towards tackling the urban transport challenges of the 21st century"*.

A.3.12 The MTS sets out a number of policy commitments or requirements which have implications for TfL and a range of other delivery partners including the GLA and the London boroughs. The policies that are relevant to the proposed development are:

a. **Policy 4** indicating that the Mayor will seek "to improve people's access to jobs, business' access to employment markets, business to business access, and freight access by seeking to ensure appropriate transport capacity and connectivity is provided on radial corridors into central London";

b. **Policy 5** seeks "to ensure efficient and effective access for people and goods within central London";

c. **Policy 8** supports "a range of transport improvements within metropolitan town centres for people and freight that help improve connectivity and promote the vitality and viability of town centres, and that provide enhanced travel facilities for pedestrians and cyclists";

d. **Policy 9** states that the Mayor "will use the local and strategic development control processes";

e. **Policy 11** specifies that the Mayor will "encourage the use of more sustainable, less congesting modes of transport, set appropriate parking standards, and aim to increase public transport, walking and cycling mode share";

f. **Policy 12** states that the Mayor "will seek to improve the distribution of freight through the provision of better access to/from Strategic Industrial Locations, delivery and servicing plans, and other efficiency measures across London"; and

g. **Policy 15** and **Policy 16** indicate that the Mayor will seek to reduce emissions of air pollutants and noise impacts from transport respectively.

A.3.13 The *London Freight Plan, Sustainable Freight Distribution: a Plan for London* (TfL, June 2008) sets out the steps that have to be taken over the next five to ten years to identify and begin to address the challenge of delivering freight sustainably in the capital. Principles set in that document are expected to be relevant to the consideration of the construction logistics strategy for the proposed development.

A.4 Local policy

A.4.1 The city of London has several policies relevant to transport within the Local Development Framework (LDF), Unitary Development Plan (UDP), and Supplementary Planning Guidance (SPG) Riverside Appraisal of the River Thames Policy Area in the City of London.

Local Development Framework – Core Strategy (City of London, 2011)

A.4.2 The Local Development Framework (LDF) – Core Strategy was adopted in September 2011. It forms the key planning document that manages development and regeneration in the borough until 2026.

A.4.3 Transport policies within this document are concerned with ensuring improvements are made to the environment, and encouraging the use of sustainable transport.

A.4.4 **Policy CS2 – Utilities and Infrastructure** sets out the City's requirement for infrastructure to be maintained and developed, in order to preserve its status as a leading financial centre. It is also noted that disruption to highways caused by infrastructure works should be minimised.

A.4.5 **Policy CS3 – Security and Safety** aims *"to ensure that the City is secure from crime, disorder and terrorism, has safe systems of transport and is designed and managed to satisfactorily accommodate large numbers of people"*. This will be achieved by:

a. Applying security measures to broad areas such as the Traffic and the Environmental Zone;

b. Ensuring that transport systems help resolve conflicts between the high and growing volume of pedestrians and other road users; and

c. By considering safety within the design of routes, stops, stations and interchanges and creating more traffic-free and traffic-calmed areas for pedestrians and cyclists.

A.4.6 **Policy CS4 – Planning Contributions** states that the City will require planning conditions and/or developer contributions to secure the best use of land and to safeguard the environment. Contributions for transport infrastructure and service improvements may include:

a. On/ off site;

b. In kind; or

c. Financial contributions.

A.4.7 In addition, qualifying developments will be asked to pay an extra contribution towards the cost of Crossrail.

A.4.8 **Policy CS9 – Thames and the Riverside** there is a wish to maintain the river's function for transport, recreation and navigation. The council aims to achieve this by:

a. Securing completion of the riverside walkway at Queenhithe;

b. Improving access to the river and riverside walk from the City and the Thames Bridges;

c. Supporting the construction of the Thames Tideway Tunnel;

d. Retaining Walbrook Wharf, Blackfriars Pier, Swan Lane Pier and access to Tower Pier, and encouraging use of these facilities for river transport;

e. Resisting development on or over the River, including permanently moored vessels, except for structures which specifically require a waterside location for river-related uses; and

f. Encouraging the use of the River Thames for the transport of construction and demolition materials and waste.

A.4.9 **Policy CS15 – Sustainable Development and Climate Change** intends to address three issues affecting the City:

a. Energy consumption;

b. Air quality; and

c. Urban heat island and climate change.

A.4.10 To aid the City and all its residents in making sustainable choices, the following transport requirements will be made of new developments:

a. To positively address air quality in particular nitrogen dioxide and particles PM10;

b. Protect quiet areas and quiet times of the day for residents and business; and

c. To incorporate climate change adaptation measures into development and the City's infrastructure, including street scene and transport.

A.4.11 **Policy CS16 – Public Transport, Streets and Walkways** details a number of measures that are designed to improve access to public transport and remove barriers to walking and cycling within the city. These include:

a. Improving access routes and the streetscape around stations;

b. Designing and implementing environmental enhancement strategies that encourage pedestrian and cycle travel, taking account of the needs of disabled people;

c. Directing traffic onto appropriate routes, taking into account the road hierarchy;

d. Facilitating coaches, car clubs, taxis and private hire vehicles. Essential motorised traffic to serve the needs of servicing and the disabled will also be accommodated; and

e. Requiring developers to demonstrate, through transport assessments, construction logistics plans, travel plans and delivery/servicing plans, how the environmental impacts of travel and servicing will be minimised, including through the use of river transport.

A.4.12 **Policy CS17 – Waste** is intended to support the City's residents and business in making sustainable waste disposal choices. Thames Tideway Tunnel construction is identified as being a major future waste producer. Sustainable waste management will be secured by:

a. Safeguarding Walbrook Wharf so that waste can be transported by water; and

b. Exploring increased use of waterways to transport waste and construction materials. Whilst taking into account any impact on Natura 2000 sites.

Unitary Development Plan (City of London, 2002)

A.4.13 The Unitary Development Plan (UDP) was adopted by the City of London in 2002. It acts as a land use strategy document and also sets out policies that planning applications will be considered against. It has now been replaced by the LDF, but a number of policies have been saved and remain current.

A.4.14 The transport related policies are mainly focused on environmental protection including reducing levels of congestion and pollution within the city. It is envisaged that by mitigating these factors, improvements can be made to the local economy, as well as the health and quality of life of local residents. This will be achieved by a number of measures such as: integrating development with public transport; and encouraging walking and cycling.

A.4.15 **Policy TRANS 4 – To Assist Taxi Movements, Where Appropriate and Practicable.** Where possible taxi movements should be facilitated within traffic management schemes, steps should also be taken to reduce their environmental impact.

A.4.16 **Policy TRANS 7 – Retention of Pedestrian Routs** seeks to support the retention and improvement of pedestrian routes and crossings, public rights of way and the City Walkway network.

A.4.17 **Policy TRANS 9 – Highway Hierarchy** sets out the highway hierarchy within the City; it is intended to assist in the management and circulation of traffic and to protect the environment. The hierarchy is:

a. Strategic Roads (Tier 1);

b. London Distributor Roads (Tier 2); and

c. Borough Distributor Roads (Tier 3)

A.4.18 **Policy TRANS 12 – Cycles and Traffic Management**. All traffic management schemes should pay due regard to the needs of cyclists, for safety and environmental reasons.

A.4.19 **Policy TRANS 13 – Heavy Goods Vehicles** outlines the council's wish to minimise adverse impacts of HGV movements within the City.

A.4.20 **Policy TRANS 15 – Provision of Off-Street Servicing** outlines the council's wish for servicing to take place off-street. This is because servicing vehicles that are parked on street can cause an obstruction and safety issues. Off-street servicing should be provided in a way that:

a. Minimises the adverse effects on the adjoining highway and pays due regard to the environment and the convenience and safety of pedestrians;

b. Ensures that servicing is avoided on or with access onto Tier 1-3 roads, except where a practical alternative cannot be provided; and

c. Enables vehicles to enter and leave premises in a forward gear.

A.4.21 **Policy TRANS 21 – Parking for Disabled People** states that on-street and off-street parking provision must be provided for disabled people within the City.

A.4.22 **Policy TRANS 23 – Parking for Motorcycles** aims to provide parking for motorcycles by three means:

a. Requiring the provision of private parking spaces for motorcycles in development schemes;

b. Maintaining an adequate number of spaces for motorcycles in public off-street car parks; and

c. Seeking to maintain on-street motorcycle parking at current levels.

A.4.23 **Policy TRANS 24 – Coach Parking** wishes to improve the management of coach parking within the City. Coaches can have a negative effect on congestion especially at peak times when all on-street parking spaces are occupied.

Supplementary Planning Guidance Riverside Appraisal of the River Thames Policy Area in the City of London (City of London, 2004)

A.4.24 Adopted April 2002. To be superseded by a Riverside Appraisal of the Thames Policy Area SPD.

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Appendix B: PTAL analysis

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PTAI Study Report File Summary

PTAI Run Parameters

PTAI Run Parameters
PTAI Run: 20122109165252
Description: 20122109165252
Run by user: PTAL web application
Date and time: 21/09/2012 16:52

Walk File Parameters

Walk File: PLSQLTest
Day of Week: M-F
Time Period: AM Peak
Walk Speed: 4.8 kph
BUS Walk Access Time (mins): 8
BUS Reliability Factor: 2.0
LU LRT Walk Access Time (mins): 12
LU LRT Reliability Factor: 0.75
NATIONAL_RAIL Walk Access Time (mins): 12
NATIONAL_RAIL Reliability Factor: 0.75
Coordinates: 531479, 180806

Mode	Stop	Route	Distance (metres)	Frequency (vph)	Weight	Walk time (mins)	SWT (mins)	TAT (mins)	EDF	AI
BUS	EMBANKMENT HMS PRESIDENT	388	195.33	6.0	0.5	2.44	7.0	9.44	3.18	1.59
BUS	NEW BRIDGE STREET	100	355.44	8.0	0.5	4.44	5.75	10.19	2.94	1.47
BUS	NEW BRIDGE STREET	45	355.44	7.5	0.5	4.44	6.0	10.44	2.87	1.44
BUS	NEW BRIDGE STREET	63	355.44	12.0	1.0	4.44	4.5	8.94	3.35	3.35
BUS	FLEET STREET FETTER LANE	23	495.34	9.0	0.5	6.19	5.33	11.53	2.6	1.3
BUS	FLEET ST CHANCERY LANE	341	637.53	6.0	0.5	7.97	7.0	14.97	2.0	1.0
BUS	FLEET STREET FETTER LANE	4	495.34	6.0	0.5	6.19	7.0	13.19	2.27	1.14
BUS	FLEET STREET FETTER LANE	11	495.34	8.0	0.5	6.19	5.75	11.94	2.51	1.26
BUS	FLEET STREET FETTER LANE	26	495.34	7.5	0.5	6.19	6.0	12.19	2.46	1.23
BUS	FLEET STREET FETTER LANE	76	495.34	8.0	0.5	6.19	5.75	11.94	2.51	1.26
BUS	FLEET STREET FETTER LANE	172	495.34	6.0	0.5	6.19	7.0	13.19	2.27	1.14
BUS	FLEET STREET FETTER LANE	15	495.34	7.5	0.5	6.19	6.0	12.19	2.46	1.23
BUS	LUDGATE HILL	17	588.01	7.5	0.5	7.35	6.0	13.35	2.25	1.12
BUS	DOGGETTS COAT AND BADGE	RV1	466.09	6.0	0.5	5.83	7.0	12.83	2.34	1.17

Mode	Stop	Route	Distance (metres)	Frequency (vph)	Weight	Walk time (mins)	SWT (mins)	TAT (mins)	EDF	AI
LU LRT	Blackfriars	District Line Tower Hill to Ealing Broadway	303.55	0.3	0.5	3.79	100.75	104.54	0.29	0.14
LU LRT	Blackfriars	District Line Wimbledon to Tower Hill	303.55	2.0	0.5	3.79	15.75	19.54	1.53	0.77
LU LRT	Blackfriars	District Line Upminster to Ealing Broadway	303.55	6.7	1.0	3.79	5.23	9.02	3.33	3.33
LU LRT	Blackfriars	District Line Richmond to Upminster	303.55	6.3	0.5	3.79	5.51	9.31	3.22	1.61
LU LRT	Blackfriars	District Line Tower Hill to Richmond	303.55	0.7	0.5	3.79	43.61	47.4	0.63	0.32
LU LRT	Blackfriars	District Line Upminster to Wimbledon	303.55	3.3	0.5	3.79	9.84	13.64	2.2	1.1
LU LRT	Blackfriars	District Line Barking to Ealing Broadway	303.55	0.3	0.5	3.79	100.75	104.54	0.29	0.14
LU LRT	Blackfriars	District Line Barking to Richmond	303.55	0.3	0.5	3.79	100.75	104.54	0.29	0.14
LU LRT	Blackfriars	District Line Richmond to Dagenham East	303.55	0.3	0.5	3.79	100.75	104.54	0.29	0.14
LU LRT	Blackfriars	District Line Wimbledon to	303.55	1.7	0.5	3.79	18.4	22.19	1.35	0.68

Mode	Stop	Route	Distance (metres)	Frequency (vph)	Weight	Walk time (mins)	SWT (mins)	TAT (mins)	EDF	AI
		Barking								
LU LRT	Blackfriars	District Line Dagenham East to Ealing Broadway	303.55	0.7	0.5	3.79	43.61	47.4	0.63	0.32
LU LRT	Blackfriars	District Line Wimbledon to Dagenham East	303.55	1.3	0.5	3.79	23.83	27.62	1.09	0.54
LU LRT	Blackfriars	Circle Line Hammersmith (H&C Line) to Edgware Road (Circle Line)	303.55	6.0	0.5	3.79	5.75	9.54	3.14	1.57
LU LRT	Southwark	Jubilee Line Stratford to Willesden Green	956.28	4.4	0.5	11.95	7.57	19.52	1.54	0.77
LU LRT	Southwark	Jubilee Line Stratford to Stanmore	956.28	17.8	0.5	11.95	2.44	14.39	2.08	1.04
LU LRT	Southwark	Jubilee Line Stratford to Wembley Park	956.28	4.4	0.5	11.95	7.57	19.52	1.54	0.77
NATIONAL_RAIL	LONDON BLACKFRIARS	ORPINGTON to LONDON BLACKFRIARS	303.55	0.33	0.5	3.79	91.66	95.45	0.31	0.16
NATIONAL_RAIL	LONDON BLACKFRIARS	BROMLEY SOUTH to LONDON BLACKFRIARS	303.55	0.33	0.5	3.79	91.66	95.45	0.31	0.16
NATIONAL_RAIL	LONDON BLACKFRIARS	ASHFORD (KENT) to LONDON BLACKFRIARS	303.55	0.33	0.5	3.79	91.66	95.45	0.31	0.16

Mode	Stop	Route	Distance (metres)	Frequency (vph)	Weight	Walk time (mins)	SWT (mins)	TAT (mins)	EDF	AI
NATIONAL_RAIL	LONDON BLACKFRIARS	LONDON BLACKFRIARS to TONBRIDGE	303.55	0.33	0.5	3.79	91.66	95.45	0.31	0.16
NATIONAL_RAIL	LONDON BLACKFRIARS	SELHURST to ST ALBANS BR	303.55	0.33	0.5	3.79	91.66	95.45	0.31	0.16
NATIONAL_RAIL	LONDON BLACKFRIARS	BEDFORD MIDLAND to LONDON BLACKFRIARS	303.55	0.33	0.5	3.79	91.66	95.45	0.31	0.16
NATIONAL_RAIL	LONDON BLACKFRIARS	ORPINGTON to LONDON BLACKFRIARS	303.55	0.33	0.5	3.79	91.66	95.45	0.31	0.16
NATIONAL_RAIL	LONDON BLACKFRIARS	BEARSTED to LONDON BLACKFRIARS	303.55	0.33	0.5	3.79	91.66	95.45	0.31	0.16
NATIONAL_RAIL	LONDON BLACKFRIARS	SEVENOAKS to LONDON CITY THAMESLINK	303.55	0.33	0.5	3.79	91.66	95.45	0.31	0.16
NATIONAL_RAIL	LONDON BLACKFRIARS	BEDFORD MIDLAND to SUTTON (SURREY)	303.55	0.33	0.5	3.79	91.66	95.45	0.31	0.16
NATIONAL_RAIL	LONDON BLACKFRIARS	BROMLEY SOUTH to LONDON BLACKFRIARS	303.55	0.33	0.5	3.79	91.66	95.45	0.31	0.16
NATIONAL_RAIL	LONDON BLACKFRIARS	LONDON BLACKFRIARS to SEVENOAKS	303.55	2.0	1.0	3.79	15.75	19.54	1.53	1.53

Mode	Stop	Route	Distance (metres)	Frequency (vph)	Weight	Walk time (mins)	SWT (mins)	TAT (mins)	EDF	AI
NATIONAL_RAIL	LONDON BLACKFRIARS	WIMBLEDON BR to BEDFORD MIDLAND	303.55	0.33	0.5	3.79	91.66	95.45	0.31	0.16
NATIONAL_RAIL	LONDON BLACKFRIARS	WIMBLEDON BR to LUTON	303.55	0.33	0.5	3.79	91.66	95.45	0.31	0.16
NATIONAL_RAIL	LONDON BLACKFRIARS	SUTTON (SURREY) to ST ALBANS BR	303.55	0.33	0.5	3.79	91.66	95.45	0.31	0.16
NATIONAL_RAIL	LONDON BLACKFRIARS	BEDFORD MIDLAND to BRIGHTON	303.55	2.0	0.5	3.79	15.75	19.54	1.53	0.77
NATIONAL_RAIL	LONDON BLACKFRIARS	ST ALBANS BR to WEST NORWOOD BR	303.55	0.33	0.5	3.79	91.66	95.45	0.31	0.16
NATIONAL_RAIL	LONDON BLACKFRIARS	ORPINGTON to LONDON BLACKFRIARS	303.55	0.67	0.5	3.79	45.53	49.32	0.61	0.3
NATIONAL_RAIL	LONDON BLACKFRIARS	BECKENHAM JUNCTION BR to LONDON BLACKFRIARS	303.55	0.33	0.5	3.79	91.66	95.45	0.31	0.16
NATIONAL_RAIL	LONDON BLACKFRIARS	ST ALBANS BR to SUTTON (SURREY)	303.55	0.67	0.5	3.79	45.53	49.32	0.61	0.3
NATIONAL_R	LONDON BLACKFRIARS	SEVENOAKS to LONDON CITY	303.55	0.33	0.5	3.79	91.66	95.45	0.31	0.16

Mode	Stop	Route	Distance (metres)	Frequency (vph)	Weight	Walk time (mins)	SWT (mins)	TAT (mins)	EDF	AI
AIL		THAMESLINK								
NATIONAL_RAIL	LONDON BLACKFRIARS	SEVENOAKS to LONDON BLACKFRIARS	303.55	0.33	0.5	3.79	91.66	95.45	0.31	0.16
NATIONAL_RAIL	LONDON BLACKFRIARS	KENT HOUSE to LONDON BLACKFRIARS	303.55	0.33	0.5	3.79	91.66	95.45	0.31	0.16
NATIONAL_RAIL	LONDON BLACKFRIARS	WIMBLEDON BR to BEDFORD MIDLAND	303.55	0.33	0.5	3.79	91.66	95.45	0.31	0.16
NATIONAL_RAIL	LONDON BLACKFRIARS	WIMBLEDON BR to ST ALBANS BR	303.55	1.33	0.5	3.79	23.31	27.1	1.11	0.55
NATIONAL_RAIL	LONDON BLACKFRIARS	ROCHESTER to LONDON BLACKFRIARS	303.55	0.33	0.5	3.79	91.66	95.45	0.31	0.16
NATIONAL_RAIL	LONDON BLACKFRIARS	SEVENOAKS to LONDON BLACKFRIARS	303.55	0.33	0.5	3.79	91.66	95.45	0.31	0.16

Total AI for this POI is 40.05.
PTAL Rating is 6b.

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Appendix C: Pedestrian Level of Service (LoS)

C.1 Paul's Walk, baseline, AM peak hour

Peak 15 minute:

←	V_1=	51 ped/15min
→	V_2=	29 ped/15min

		W_{B1} (kerb)	=	1.6 ft	0.50 m
		W_{B2} (street furn.)	=	1.6 ft	0.50 m
W_T =	1.2 ft	W_E (effective width)	=	6.6 ft	2.00 m
	4 m	W_{B3} (window shop)	=	0.0 ft	0.00 m
		W_{B4} (bldg protrusions)	=	1.6 ft	0.50 m
		W_{B5} (inside clearance)	=	1.6 ft	0.50 m

Pedestrian volume:

V_1	=	51 ped/15min	
V_2	=	29 ped/15min	
$V_p=V_1+V_2$	=	80.0 ped/15min	

Walkway width:

W_T	=	13.1 ft	4.0 m
$W_B=W_{B1}+W_{B2}+W_{B3}+W_{B4}+W_{B5}$	=	6.6 ft	2.0 m
$W_E=W_T - W_B$	=	6.6 ft	2.0 m

Average walkway LOS:

$v=V_p$ / $15W_E$	=	0.8 ped/min/ft	2.7 ped/min/m

Average LOS **A**

Platoon walkway LOS:

$v_p=v+4$	=	4.8 ped/min/ft	6.7 ped/min/m

Platoon LOS **B**

C.2 Paul's Walk, baseline, PM peak hour

Peak 15 minute:

←	V_1=	80 ped/15min
→	V_2=	62 ped/15min

		W_{B1} (kerb)	=	1.6 ft	0.50 m
		W_{B2} (street furn.)	=	1.6 ft	0.50 m
W_T =	1.2 ft	W_E (effective width)	=	6.6 ft	2.00 m
	4 m	W_{B3} (window shop)	=	0.0 ft	0.00 m
		W_{B4} (bldg protrusions)	=	1.6 ft	0.50 m
		W_{B5} (inside clearance)	=	1.6 ft	0.50 m

Pedestrian volume:

V_1	=	80 ped/15min
V_2	=	62 ped/15min
$V_p=V_1+V_2$	=	142.0 ped/15min

Walkway width:

W_T	=	13.1 ft	4.0 m
$W_B=W_{B1}+W_{B2}+W_{B3}+W_{B4}+W_{B5}$	=	6.6 ft	2.0 m
$W_E=W_T - W_B$	=	6.6 ft	2.0 m

Average walkway LOS:

$v=V_p\ /\ 15W_E$	=	1.4 ped/min/ft	4.7 ped/min/m

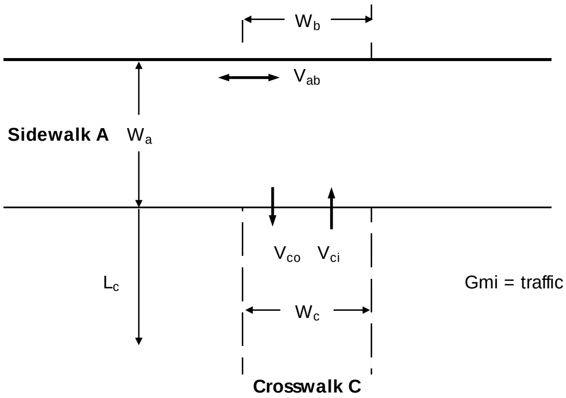
Average LOS **A**

Platoon walkway LOS:

$v_p=v+4$	=	5.4 ped/min/ft	8.7 ped/min/m

Platoon LOS **B**

C.3 Victoria Embankment (A3211) crossing – eastbound slip road, baseline, AM peak hour



Gmi = traffic green

Signal Timing (sec)

C=	88		
G_{mj}=	58	R_{mj}=	30
G_{mi}=	30	R_{mi}=	58

Pedestrian Volumes

Flow	Ped/min		Ped/Cyc
v_{ci}	29		42.5
v_{co}	2		2.9
v_{ab}	2		2.9
v_{tot}	33.0		48.4
W_a =	18.4 ft	5.6 m	
W_b =	9.8 ft	3 m	
W_c =	9.8 ft	3 m	
L_c =	25.3 ft	7.7 m	

Net Corner Area:

$A = W_aW_b$ = 180.8 sq ft 16.8 sq m

Available Time Space:

TS = A x C/60 = 265.2 sq ft min 24.6 sq m min

Hold Area Waiting Times: (use ped/cycle)

$Q_{tco} = [(v_{co})((R_{mj})/C)((R_{mj})/2)]/60$ = 0.3 ped min

Hold Area Time Space:

$TS_h = 5(Q_{tco})$, or $0.4645(Q_{tco})$ 1.3 sq ft min 0.1 sq m min

Circulation Time Space:

$TS_c = TS - TS_h$ = 264.0 sq ft min 24.5 sq m min

Total Circulation Volume:

$v_c = v_{ci} + v_{co} + v_{ab}$ = 48.4 ped (per cycle)

Total Circulation Time:

$t_c = v_c \times 4/60$ = 3.2 ped min

Pedestrian Space and LOS:

$M = TS_c / t_c$ = 81.8 sq ft / ped 7.6 sq m / ped **LOS** **B**

Crosswalk Areas:

$A_c = L_cW_c$ = 248.7 sq ft 23.1 sq m

Crosswalk Time-Space:

$TS_c = A_c (G_{mj} - 3)/60$ = 227.9 sq ft min 21.2 sq m min

Crossing Times:

$t_{wc} = L_c / 1.2$ = 6.4 sec

Crosswalk Occupancy Time: (use ped/cycle)

$T_{wc} = (v_{ci}+v_{co})(t_{wc}/60)$ = 4.9 ped/min

Average Pedestrian Space:

$M_c = TS_c / T_{wc}$ = 46.9 sq ft / ped 4.4 sq m / ped **LOS** **B**

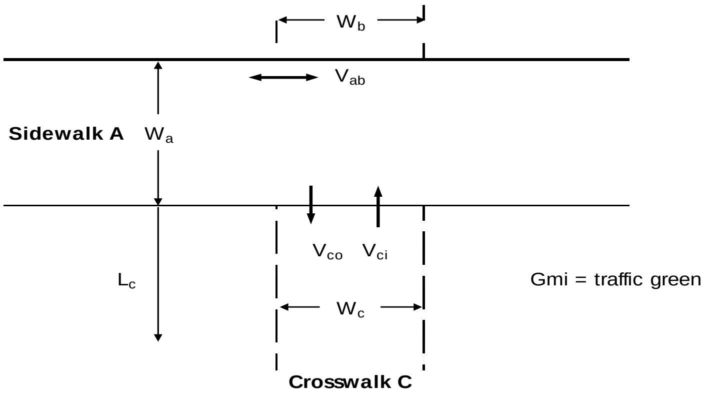
Maximum surge: (use ped/min)

$V_{mc} = (v_{ci}+v_{co})(R_{mj} + 3 + t_{wc})/60$ = 20.4 ped

Surge Pedestrian Space:

$M_c(max) = A_c / V_{mc}$ = 12.2 sq ft / ped 1.1 sq m / ped **LOS** **E**

C.4 Victoria Embankment (A3211) crossing – eastbound slip road, baseline, PM peak hour



Signal Timing (sec)

C=	88		
G_{mj}=	58	R_{mj}=	30
G_{mi}=	30	R_{mi}=	58

Pedestrian Volumes

Flow	Ped/min	Ped/Cyc
v_{ci}	4	5.9
v_{co}	17	24.9
v_{ab}	3	4.4
v_{tot}	24.0	35.2
W_a =	18.4 ft	5.6 m
W_b =	9.8 ft	3 m
W_c =	9.8 ft	3 m
L_c =	25.3 ft	7.7 m

Net Corner Area:
$A = W_aW_b$ = 180.8 sq ft 16.8 sq m

Available Time Space:
TS = A x C/60 = 265.2 sq ft min 24.6 sq m min

Hold Area Waiting Times: (use ped/cycle)
$Q_{tco} = [(v_{co})((R_{mj})/C)((R_{mj})/2)]/60$ = 2.1 ped min

Hold Area Time Space:
$TS_h = 5(Q_{tco})$, or $0.4645(Q_{tco})$ 10.6 sq ft min 1.0 sq m min

Circulation Time Space:
$TS_c = TS - TS_h$ = 254.6 sq ft min 23.7 sq m min

Total Circulation Volume:
$v_c = v_{ci} + v_{co} + v_{ab}$ = 35.2 ped (per cycle)

Total Circulation Time:
$t_c = v_c \times 4/60$ = 2.3 ped min

Pedestrian Space and LOS:
$M = TS_c / t_c$ = 108.5 sq ft / ped 10.1 sq m / ped **LOS** B

Crosswalk Areas:
$A_c = L_cW_c$ = 248.7 sq ft 23.1 sq m

Crosswalk Time-Space:
$TS_c = A_c (G_{mj} - 3)/60$ = 227.9 sq ft min 21.2 sq m min

Crossing Times:
$t_{wc} = L_c / 1.2$ = 6.4 sec

Crosswalk Occupancy Time: (use ped/cycle)
$T_{wc} = (v_{ci}+v_{co})(t_{wc}/60)$ = 3.3 ped/min

Average Pedestrian Space:
$M_c = TS_c / T_{wc}$ = 69.2 sq ft / ped 6.4 sq m / ped **LOS** B

Maximum surge: (use ped/min)
$V_{mc} = (v_{ci}+v_{co})(R_{mj} + 3 + t_{wc})/60$ = 13.8 ped

Surge Pedestrian Space:
$M_c(max) = A_c / V_{mc}$ = 18.0 sq ft / ped 1.7 sq m / ped **LOS** D

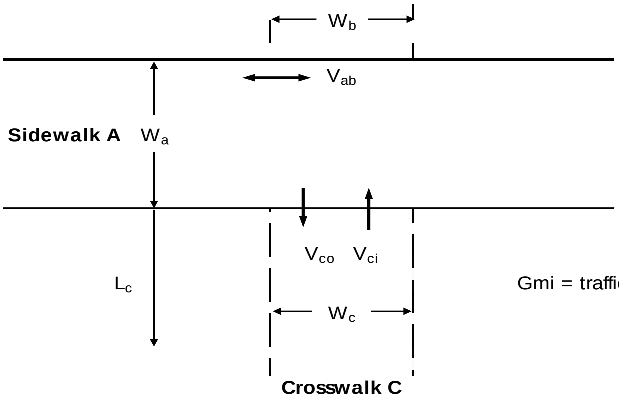
C.5 Victoria Embankment (A3211) crossing – westbound slip road, baseline, AM peak hour

Signal Timing (sec)

C=	88		
G_{mj}=	33	R_{mj}=	55
G_{mi}=	55	R_{mi}=	33

Pedestrian Volumes

Flow	Ped/min		Ped/Cyc
v_{ci}	29		42.5
v_{co}	2		2.9
v_{ab}	2		2.9
v_{tot}	33.0		48.4
W_a =	9.8 ft	3 m	
W_b =	9.8 ft	3 m	
W_c =	9.8 ft	3 m	
L_c =	22.0 ft	6.7 m	



Gmi = traffic green

Net Corner Area:
$A = W_aW_b =$ 96.9 sq ft 9.0 sq m

Available Time Space:
$TS = A \times C/60 =$ 142.1 sq ft min 13.2 sq m min

Hold Area Waiting Times: (use ped/cycle)
$Q_{tco} = [(v_{co})((R_{mj})/C)((R_{mj})/2)]/60 =$ 0.8 ped min

Hold Area Time Space:
$TS_h = 5(Q_{tco})$, or $0.4645(Q_{tco})$ 4.2 sq ft min 0.4 sq m min

Circulation Time Space:
$TS_c = TS - TS_h =$ 137.9 sq ft min 12.8 sq m min

Total Circulation Volume:
$v_c = v_{ci} + v_{co} + v_{ab} =$ 48.4 ped (per cycle)

Total Circulation Time:
$t_c = v_c \times 4/60 =$ 3.2 ped min

Pedestrian Space and LOS:
$M = TS_c / t_c =$ 42.7 sq ft / ped 4.0 sq m / ped **LOS** **B**

Crosswalk Areas:
$A_c = L_cW_c =$ 216.4 sq ft 20.1 sq m

Crosswalk Time-Space:
$TS_c = A_c (G_{mj} - 3)/60 =$ 108.2 sq ft min 10.1 sq m min

Crossing Times:
$t_{wc} = L_c / 1.2 =$ 5.6 sec

Crosswalk Occupancy Time: (use ped/cycle)
$T_{wc} = (v_{ci}+v_{co})(t_{wc}/60) =$ 4.2 ped/min

Average Pedestrian Space:
$M_c = TS_c / T_{wc} =$ 25.6 sq ft / ped 2.4 sq m / ped **LOS** **C**

Maximum surge: (use ped/min)
$V_{mc} = (v_{ci}+v_{co})(R_{mj} + 3 + t_{wc})/60 =$ 32.9 ped

Surge Pedestrian Space:
$M_c(max) = A_c / V_{mc} =$ 6.6 sq ft / ped 0.6 sq m / ped **LOS** **E**

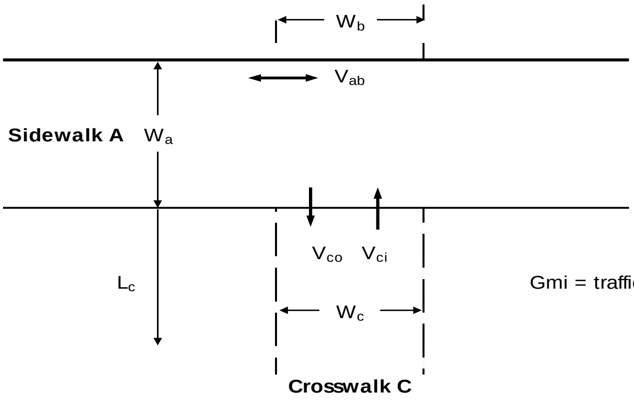
C.6 Victoria Embankment (A3211) crossing – westbound slip road, baseline, PM peak hour

Signal Timing (sec)

C=	88		
G_{mj}=	33	R_{mj}=	55
G_{mi}=	55	R_{mi}=	33

Pedestrian Volumes

Flow	Ped/min		Ped/Cyc
v_{ci}	4		5.9
v_{co}	17		24.9
v_{ab}	3		4.4
v_{tot}	24.0		35.2
W_a =	9.8 ft		3 m
W_b =	9.8 ft		3 m
W_c =	9.8 ft		3 m
L_c =	22.0 ft		6.7 m



Gmi = traffic green

Net Corner Area:
$A = W_aW_b =$ 96.9 sq ft 9.0 sq m

Available Time Space:
$TS = A \times C/60 =$ 142.1 sq ft min 13.2 sq m min

Hold Area Waiting Times: (use ped/cycle)
$Q_{tco} = [(v_{co})((R_{mj})/C)((R_{mj})/2)]/60 =$ 7.1 ped min

Hold Area Time Space:
$TS_h = 5(Q_{tco})$, or $0.4645(Q_{tco})$ 35.7 sq ft min 3.3 sq m min

Circulation Time Space:
$TS_c = TS - TS_h =$ 106.4 sq ft min 9.9 sq m min

Total Circulation Volume:
$v_c = v_{ci} + v_{co} + v_{ab} =$ 35.2 ped (per cycle)

Total Circulation Time:
$t_c = v_c \times 4/60 =$ 2.3 ped min

Pedestrian Space and LOS:
$M = TS_c / t_c =$ 45.3 sq ft / ped 4.2 sq m / ped **LOS** $\boxed{B}$

Crosswalk Areas:
$A_c = L_cW_c =$ 216.4 sq ft 20.1 sq m

Crosswalk Time-Space:
$TS_c = A_c (G_{mj} - 3)/60 =$ 108.2 sq ft min 10.1 sq m min

Crossing Times:
$t_{wc} = L_c / 1.2 =$ 5.6 sec

Crosswalk Occupancy Time: (use ped/cycle)
$T_{wc} = (v_{ci}+v_{co})(t_{wc}/60) =$ 2.9 ped/min

Average Pedestrian Space:
$M_c = TS_c / T_{wc} =$ 37.7 sq ft / ped 3.5 sq m / ped **LOS** $\boxed{C}$

Maximum surge: (use ped/min)
$V_{mc} = (v_{ci}+v_{co})(R_{mj} + 3 + t_{wc})/60 =$ 22.3 ped

Surge Pedestrian Space:
$M_c(max) = A_c / V_{mc} =$ 9.7 sq ft / ped 0.9 sq m / ped **LOS** $\boxed{E}$

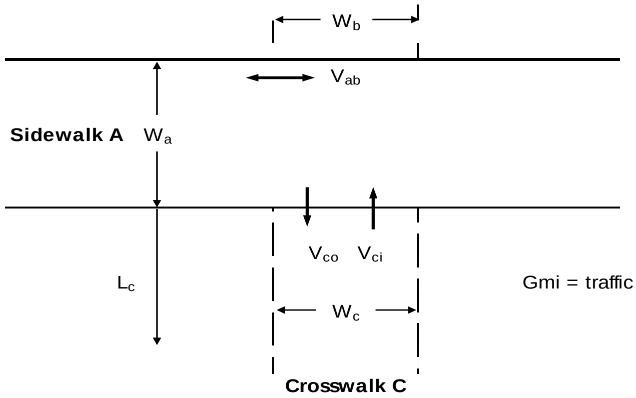
C.7 Blackfriars Bridge (A201) crossing at junction with Victoria Embankment (A3211), baseline, AM peak hour

Signal Timing (sec)

C=	88		
G_{mj}=	19	R_{mj}=	69
G_{mi}=	69	R_{mi}=	19

Pedestrian Volumes

Flow	Ped/min	Ped/Cyc
v_{ci}	5	7.3
v_{co}	4	5.9
v_{ab}	3	4.4
v_{tot}	12.0	17.6
W_a =	14.8 ft	4.5 m
W_b =	9.8 ft	3 m
W_c =	9.8 ft	3 m
L_c =	82.0 ft	25 m



Gmi = traffic green

Net Corner Area:

$A = W_aW_b$ =	145.3 sq ft	13.5 sq m

Available Time Space:

TS = A x C/60 =	213.1 sq ft min	19.8 sq m min

Hold Area Waiting Times: (use ped/cycle)

$Q_{tco} = [(v_{co})((R_{mj})/C)((R_{mj})/2)]/60$ =	2.6 ped min

Hold Area Time Space:

$TS_h = 5(Q_{tco})$, or $0.4645(Q_{tco})$	13.2 sq ft min	1.2 sq m min

Circulation Time Space:

$TS_c = TS - TS_h$ =	199.9 sq ft min	18.6 sq m min

Total Circulation Volume:

$v_c = v_{ci} + v_{co} + v_{ab}$ =	17.6 ped (per cycle)

Total Circulation Time:

$t_c = v_c \times 4/60$ =	1.2 ped min

Pedestrian Space and LOS:

$M = TS_c / t_c$ =	170.4 sq ft / ped	15.8 sq m / ped	LOS	A

Crosswalk Areas:

$A_c = L_cW_c$ =	807.3 sq ft	75.0 sq m

Crosswalk Time-Space:

$TS_c = A_c (G_{mj} - 3)/60$ =	215.3 sq ft min	20.0 sq m min

Crossing Times:

$t_{wc} = L_c / 1.2$ =	20.8 sec

Crosswalk Occupancy Time: (use ped/cycle)

$T_{wc} = (v_{ci}+v_{co})(t_{wc}/60)$ =	4.6 ped/min

Average Pedestrian Space:

$M_c = TS_c / T_{wc}$ =	47.0 sq ft / ped	4.4 sq m / ped	LOS	B

Maximum surge: (use ped/min)

$V_{mc} = (v_{ci}+v_{co})(R_{mj} + 3 + t_{wc})/60$ =	13.9 ped

Surge Pedestrian Space:

$M_c(max) = A_c / V_{mc}$ =	58.0 sq ft / ped	5.4 sq m / ped	LOS	B

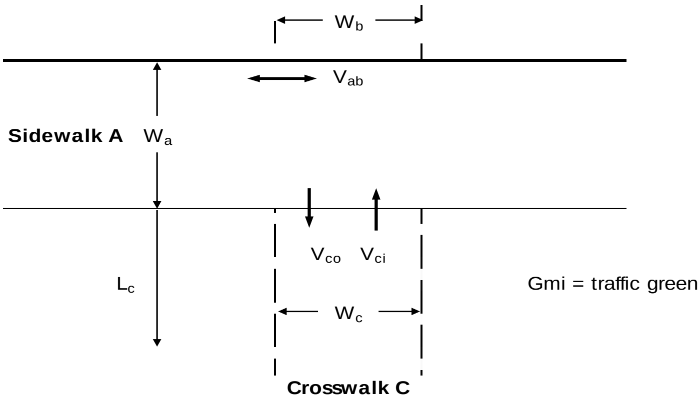
C.8 Blackfriars Bridge (A201) crossing at junction with Victoria Embankment (A3211), baseline, PM peak hour

Signal Timing (sec)

C=	88		
G_{mj}=	19	R_{mj}=	69
G_{mi}=	69	R_{mi}=	19

Pedestrian Volumes

Flow	Ped/min	Ped/Cyc
v_{ci}	4	5.9
v_{co}	5	7.3
v_{ab}	3	4.4
v_{tot}	12.0	17.6
W_a =	14.8 ft	4.5 m
W_b =	9.8 ft	3 m
W_c =	9.8 ft	3 m
L_c =	82.0 ft	25 m



Net Corner Area:
$A = W_aW_b =$ 145.3 sq ft 13.5 sq m

Available Time Space:
$TS = A \times C/60 =$ 213.1 sq ft min 19.8 sq m min

Hold Area Waiting Times: (use ped/cycle)
$Q_{tco} = [(v_{co})((R_{mj}) /C)((R_{mj}) /2)]/60 =$ 3.3 ped min

Hold Area Time Space:
$TS_h = 5(Q_{tco})$, or $0.4645(Q_{tco})$ 16.5 sq ft min 1.5 sq m min

Circulation Time Space:
$TS_c = TS - TS_h =$ 196.6 sq ft min 18.3 sq m min

Total Circulation Volume:
$v_c = v_{ci} + v_{co} + v_{ab} =$ 17.6 ped (per cycle)

Total Circulation Time:
$t_c = v_c \times 4/60 =$ 1.2 ped min

Pedestrian Space and LOS:
$M = TS_c / t_c =$ 167.6 sq ft / ped 15.6 sq m / ped **LOS** A

Crosswalk Areas:
$A_c = L_cW_c =$ 807.3 sq ft 75.0 sq m

Crosswalk Time-Space:
$TS_c = A_c (G_{mj} - 3)/60 =$ 215.3 sq ft min 20.0 sq m min

Crossing Times:
$t_{wc} = L_c / 1.2 =$ 20.8 sec

Crosswalk Occupancy Time: (use ped/cycle)
$T_{wc} = (v_{ci}+v_{co})(t_{wc} /60) =$ 4.6 ped/min

Average Pedestrian Space:
$M_c = TS_c / T_{wc} =$ 47.0 sq ft / ped 4.4 sq m / ped **LOS** B

Maximum surge: (use ped/min)
$V_{mc} = (v_{ci}+v_{co})(R_{mj} + 3 + t_{wc})/60 =$ 13.9 ped

Surge Pedestrian Space:
$M_c(max) = A_c / V_{mc} =$ 58.0 sq ft / ped 5.4 sq m / ped **LOS** B

C.9 Paul's Walk, construction development case, AM peak hour

Peak 15 minute:		
←	V_1=	44 ped/15min
→	V_2=	53 ped/15min

		W_{B1} (kerb)	=	1.6 ft	0.50 m
		W_{B2} (street furn.)	=	1.6 ft	0.50 m
W_T =	1.2 ft	W_E (effective width)	=	6.6 ft	2.00 m
	4 m	W_{B3} (window shop)	=	0.0 ft	0.00 m
		W_{B4} (bldg protrusions)	=	1.6 ft	0.50 m
		W_{B5} (inside clearance)	=	1.6 ft	0.50 m

Pedestrian volume:

V_1	=	44 ped/15min	
V_2	=	53 ped/15min	
$V_p=V_1+V_2$	=	97.0 ped/15min	

Walkway width:

W_T	=	13.1 ft	4.0 m
$W_B=W_{B1}+W_{B2}+W_{B3}+W_{B4}+W_{B5}$	=	6.6 ft	2.0 m
$W_E=W_T - W_B$	=	6.6 ft	2.0 m

Average walkway LOS:

$v=V_p$ / $15W_E$	=	1.0 ped/min/ft	3.2 ped/min/m
Average LOS		**A**	

Platoon walkway LOS:

$v_p=v+4$	=	5.0 ped/min/ft	7.2 ped/min/m
Platoon LOS		**B**	

C.10 Paul's Walk, construction development case, PM peak hour

Peak 15 minute:

←	V_1=	77 ped/15min
→	V_2=	82 ped/15min

		W_{B1} (kerb)	=	1.6 ft	0.50 m
		W_{B2} (street furn.)	=	1.6 ft	0.50 m
W_T =	1.2 ft	W_E (effective width)	=	6.6 ft	2.00 m
	4 m	W_{B3} (window shop)	=	0.0 ft	0.00 m
		W_{B4} (bldg protrusions)	=	1.6 ft	0.50 m
		W_{B5} (inside clearance)	=	1.6 ft	0.50 m

Pedestrian volume:

V_1	=	77 ped/15min	
V_2	=	82 ped/15min	
V_p=V_1+V_2	=	159.0 ped/15min	

Walkway width:

W_T	=	13.1 ft	4.0 m
W_B=W_{B1}+W_{B2}+W_{B3}+W_{B4}+W_{B5}	=	6.6 ft	2.0 m
W_E=W_T - W_B	=	6.6 ft	2.0 m

Average walkway LOS:

v=V_p / 15W_E	=	1.6 ped/min/ft	5.3 ped/min/m

Average LOS **A**

Platoon walkway LOS:

v_p=v+4	=	5.6 ped/min/ft	9.3 ped/min/m

Platoon LOS **B**

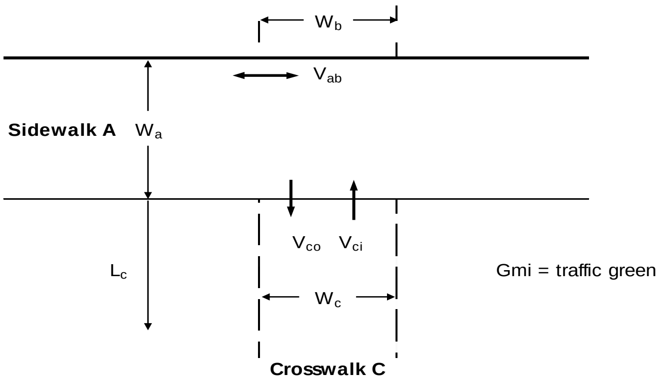
C.11 Victoria Embankment (A3211) crossing – eastbound slip road, construction development case, AM peak hour

Signal Timing (sec)

C=	88		
G_{mj}=	58	R_{mj}=	30
G_{mi}=	30	R_{mi}=	58

Pedestrian Volumes

Flow	Ped/min		Ped/Cyc
v_{ci}	32		46.9
v_{co}	4		5.9
v_{ab}	7		10.3
v_{tot}	43.0		63.1
W_a =	18.4 ft	5.6 m	
W_b =	9.8 ft	3 m	
W_c =	9.8 ft	3 m	
L_c =	25.3 ft	7.7 m	



Net Corner Area:
$A = W_aW_b$ = 180.8 sq ft 16.8 sq m

Available Time Space:
$TS = A \times C/60$ = 265.2 sq ft min 24.6 sq m min

Hold Area Waiting Times: (use ped/cycle)
$Q_{tco} = [(v_{co})((R_{mj})/C)((R_{mj})/2)]/60$ = 0.5 ped min

Hold Area Time Space:
$TS_h = 5(Q_{tco})$, or $0.4645(Q_{tco})$ 2.5 sq ft min 0.2 sq m min

Circulation Time Space:
$TS_c = TS - TS_h$ = 262.7 sq ft min 24.4 sq m min

Total Circulation Volume:
$v_c = v_{ci} + v_{co} + v_{ab}$ = 63.1 ped (per cycle)

Total Circulation Time:
$t_c = v_c \times 4/60$ = 4.2 ped min

Pedestrian Space and LOS:
$M = TS_c / t_c$ = 62.5 sq ft / ped 5.8 sq m / ped **LOS** **B**

Crosswalk Areas:
$A_c = L_cW_c$ = 248.7 sq ft 23.1 sq m

Crosswalk Time-Space:
$TS_c = A_c (G_{mj} - 3)/60$ = 227.9 sq ft min 21.2 sq m min

Crossing Times:
$t_{wc} = L_c / 1.2$ = 6.4 sec

Crosswalk Occupancy Time: (use ped/cycle)
$T_{wc} = (v_{ci}+v_{co})(t_{wc}/60)$ = 5.6 ped/min

Average Pedestrian Space:
$M_c = TS_c / T_{wc}$ = 40.4 sq ft / ped 3.8 sq m / ped **LOS** **B**

Maximum surge: (use ped/min)
$V_{mc} = (v_{ci}+v_{co})(R_{mj} + 3 + t_{wc})/60$ = 23.7 ped

Surge Pedestrian Space:
$M_c(max) = A_c / V_{mc}$ = 10.5 sq ft / ped 1.0 sq m / ped **LOS** **E**

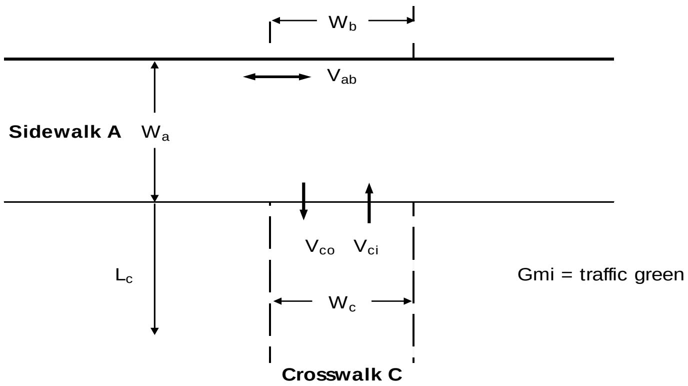
C.12 Victoria Embankment (A3211) crossing – eastbound slip road, construction development case, PM peak hour

Signal Timing (sec)

C=	88		
G_{mj}=	58	R_{mj}=	30
G_{mi}=	30	R_{mi}=	58

Pedestrian Volumes

Flow	Ped/min	Ped/Cyc
v_{ci}	9	13.2
v_{co}	21	30.8
v_{ab}	11	16.1
v_{tot}	41.0	60.1
W_a =	18.4 ft	5.6 m
W_b =	9.8 ft	3 m
W_c =	9.8 ft	3 m
L_c =	25.3 ft	7.7 m



Net Corner Area:
$A = W_aW_b =$ 180.8 sq ft 16.8 sq m

Available Time Space:
$TS = A \times C/60 =$ 265.2 sq ft min 24.6 sq m min

Hold Area Waiting Times: (use ped/cycle)
$Q_{tco} = [(v_{co})((R_{mj})/C)((R_{mj})/2)]/60 =$ 2.6 ped min

Hold Area Time Space:
$TS_h = 5(Q_{tco})$, or $0.4645(Q_{tco})$ 13.1 sq ft min 1.2 sq m min

Circulation Time Space:
$TS_c = TS - TS_h =$ 252.1 sq ft min 23.4 sq m min

Total Circulation Volume:
$v_c = v_{ci} + v_{co} + v_{ab} =$ 60.1 ped (per cycle)

Total Circulation Time:
$t_c = v_c \times 4/60 =$ 4.0 ped min

Pedestrian Space and LOS:
$M = TS_c / t_c =$ 62.9 sq ft / ped 5.8 sq m / ped **LOS** B

Crosswalk Areas:
$A_c = L_cW_c =$ 248.7 sq ft 23.1 sq m

Crosswalk Time-Space:
$TS_c = A_c (G_{mj} - 3)/60 =$ 227.9 sq ft min 21.2 sq m min

Crossing Times:
$t_{wc} = L_c / 1.2 =$ 6.4 sec

Crosswalk Occupancy Time: (use ped/cycle)
$T_{wc} = (v_{ci}+v_{co})(t_{wc}/60) =$ 4.7 ped/min

Average Pedestrian Space:
$M_c = TS_c / T_{wc} =$ 48.4 sq ft / ped 4.5 sq m / ped **LOS** B

Maximum surge: (use ped/min)
$V_{mc} = (v_{ci}+v_{co})(R_{mj} + 3 + t_{wc})/60 =$ 19.7 ped

Surge Pedestrian Space:
$M_c(max) = A_c / V_{mc} =$ 12.6 sq ft / ped 1.2 sq m / ped **LOS** E

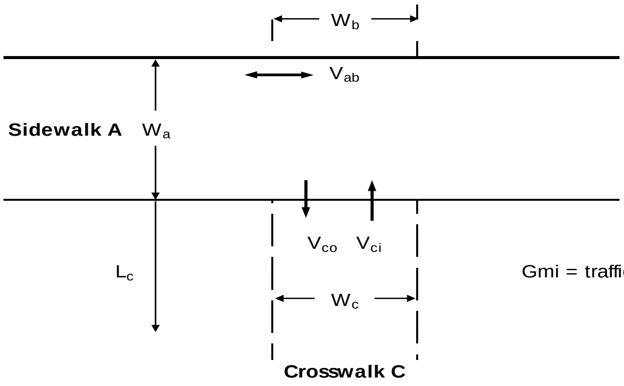
C.13 Victoria Embankment (A3211) crossing – westbound slip road, construction development case, AM peak hour

Signal Timing (sec)

C=	88		
G_{mj}=	33	R_{mj}=	55
G_{mi}=	55	R_{mi}=	33

Pedestrian Volumes

Flow	Ped/min	Ped/Cyc
v_{ci}	32	46.9
v_{co}	4	5.9
v_{ab}	7	10.3
v_{tot}	43.0	63.1
W_a =	9.8 ft	3 m
W_b =	9.8 ft	3 m
W_c =	9.8 ft	3 m
L_c =	22.0 ft	6.7 m



Gmi = traffic green

Net Corner Area:
$A = W_aW_b =$ 96.9 sq ft 9.0 sq m

Available Time Space:
$TS = A \times C/60 =$ 142.1 sq ft min 13.2 sq m min

Hold Area Waiting Times: (use ped/cycle)
$Q_{tco} = [(v_{co})((R_{mj})/C)((R_{mj})/2)]/60 =$ 1.7 ped min

Hold Area Time Space:
$TS_h = 5(Q_{tco})$, or $0.4645(Q_{tco})$ 8.4 sq ft min 0.8 sq m min

Circulation Time Space:
$TS_c = TS - TS_h =$ 133.7 sq ft min 12.4 sq m min

Total Circulation Volume:
$v_c = v_{ci} + v_{co} + v_{ab} =$ 63.1 ped (per cycle)

Total Circulation Time:
$t_c = v_c \times 4/60 =$ 4.2 ped min

Pedestrian Space and LOS:
$M = TS_c / t_c =$ 31.8 sq ft / ped 3.0 sq m / ped **LOS** C

Crosswalk Areas:
$A_c = L_cW_c =$ 216.4 sq ft 20.1 sq m

Crosswalk Time-Space:
$TS_c = A_c (G_{mj} - 3)/60 =$ 108.2 sq ft min 10.1 sq m min

Crossing Times:
$t_{wc} = L_c / 1.2 =$ 5.6 sec

Crosswalk Occupancy Time: (use ped/cycle)
$T_{wc} = (v_{ci}+v_{co})(t_{wc}/60) =$ 4.9 ped/min

Average Pedestrian Space:
$M_c = TS_c / T_{wc} =$ 22.0 sq ft / ped 2.0 sq m / ped **LOS** D

Maximum surge: (use ped/min)
$V_{mc} = (v_{ci}+v_{co})(R_{mj} + 3 + t_{wc})/60 =$ 38.2 ped

Surge Pedestrian Space:
$M_c(max) = A_c / V_{mc} =$ 5.7 sq ft / ped 0.5 sq m / ped **LOS** F

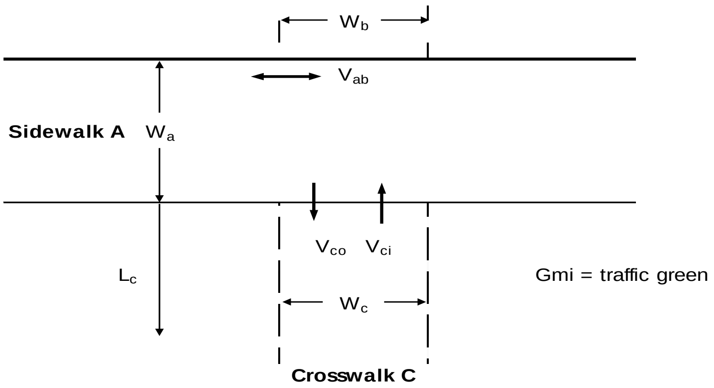
C.14 Victoria Embankment (A3211) crossing – westbound slip road, construction development case, PM peak hour

Signal Timing (sec)

C=	88		
G_{mj}=	33	R_{mj}=	55
G_{mi}=	55	R_{mi}=	33

Pedestrian Volumes

Flow	Ped/min	Ped/Cyc
v_{ci}	9	13.2
v_{co}	21	30.8
v_{ab}	11	16.1
v_{tot}	41.0	60.1
W_a =	9.8 ft	3 m
W_b =	9.8 ft	3 m
W_c =	9.8 ft	3 m
L_c =	22.0 ft	6.7 m



Net Corner Area:
$A = W_a W_b$ = 96.9 sq ft 9.0 sq m

Available Time Space:
TS = A x C/60 = 142.1 sq ft min 13.2 sq m min

Hold Area Waiting Times: (use ped/cycle)
$Q_{tco} = [(v_{co})((R_{mj})/C)((R_{mj})/2)]/60$ = 8.8 ped min

Hold Area Time Space:
$TS_h = 5(Q_{tco})$, or $0.4645(Q_{tco})$ 44.1 sq ft min 4.1 sq m min

Circulation Time Space:
$TS_c = TS - TS_h$ = 98.0 sq ft min 9.1 sq m min

Total Circulation Volume:
$v_c = v_{ci} + v_{co} + v_{ab}$ = 60.1 ped (per cycle)

Total Circulation Time:
$t_c = v_c \times 4/60$ = 4.0 ped min

Pedestrian Space and LOS:
$M = TS_c / t_c$ = 24.4 sq ft / ped 2.3 sq m / ped **LOS** C

Crosswalk Areas:
$A_c = L_c W_c$ = 216.4 sq ft 20.1 sq m

Crosswalk Time-Space:
$TS_c = A_c (G_{mj} - 3)/60$ = 108.2 sq ft min 10.1 sq m min

Crossing Times:
$t_{wc} = L_c / 1.2$ = 5.6 sec

Crosswalk Occupancy Time: (use ped/cycle)
$T_{wc} = (v_{ci}+v_{co})(t_{wc}/60)$ = 4.1 ped/min

Average Pedestrian Space:
$M_c = TS_c / T_{wc}$ = 26.4 sq ft / ped 2.5 sq m / ped **LOS** C

Maximum surge: (use ped/min)
$V_{mc} = (v_{ci}+v_{co})(R_{mj} + 3 + t_{wc})/60$ = 31.8 ped

Surge Pedestrian Space:
$M_c(max) = A_c / V_{mc}$ = 6.8 sq ft / ped 0.6 sq m / ped **LOS** E

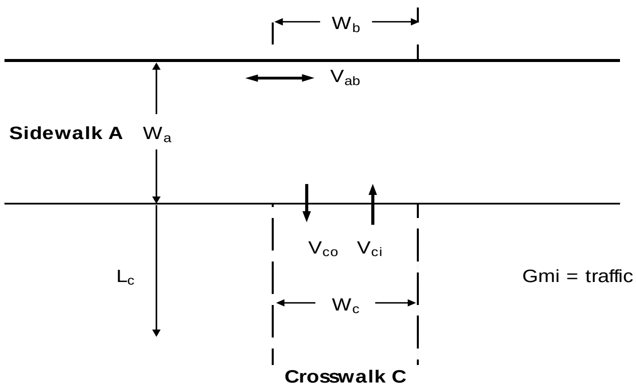
C.15 Blackfriars Bridge (A201) crossing at junction with Victoria Embankment (A3211), construction development case, AM peak hour

Signal Timing (sec)

C=	88		
G_{mj}=	19	R_{mj}=	69
G_{mi}=	69	R_{mi}=	19

Pedestrian Volumes

Flow	Ped/min		Ped/Cyc
v_{ci}	7		10.3
v_{co}	7		10.3
v_{ab}	3		4.4
v_{tot}	17.0		24.9
W_a =	14.8 ft	4.5 m	
W_b =	9.8 ft	3 m	
W_c =	9.8 ft	3 m	
L_c =	82.0 ft	25 m	



Gmi = traffic green

Net Corner Area:
$A = W_aW_b$ = 145.3 sq ft 13.5 sq m

Available Time Space:
$TS = A \times C/60$ = 213.1 sq ft min 19.8 sq m min

Hold Area Waiting Times: (use ped/cycle)
$Q_{tco} = [(v_{co})((R_{mj})/C)((R_{mj})/2)]/60$ = 4.6 ped min

Hold Area Time Space:
$TS_h = 5(Q_{tco})$, or $0.4645(Q_{tco})$ 23.1 sq ft min 2.2 sq m min

Circulation Time Space:
$TS_c = TS - TS_h$ = 190.0 sq ft min 17.6 sq m min

Total Circulation Volume:
$v_c = v_{ci} + v_{co} + v_{ab}$ = 24.9 ped (per cycle)

Total Circulation Time:
$t_c = v_c \times 4/60$ = 1.7 ped min

Pedestrian Space and LOS:
$M = TS_c / t_c$ = 114.3 sq ft / ped 10.6 sq m / ped **LOS** B

Crosswalk Areas:
$A_c = L_cW_c$ = 807.3 sq ft 75.0 sq m

Crosswalk Time-Space:
$TS_c = A_c (G_{mj} - 3)/60$ = 215.3 sq ft min 20.0 sq m min

Crossing Times:
$t_{wc} = L_c / 1.2$ = 20.8 sec

Crosswalk Occupancy Time: (use ped/cycle)
$T_{wc} = (v_{ci}+v_{co})(t_{wc}/60)$ = 7.1 ped/min

Average Pedestrian Space:
$M_c = TS_c / T_{wc}$ = 30.2 sq ft / ped 2.8 sq m / ped **LOS** C

Maximum surge: (use ped/min)
$V_{mc} = (v_{ci}+v_{co})(R_{mj} + 3 + t_{wc})/60$ = 21.7 ped

Surge Pedestrian Space:
$M_c(\max) = A_c / V_{mc}$ = 37.3 sq ft / ped 3.5 sq m / ped **LOS** C

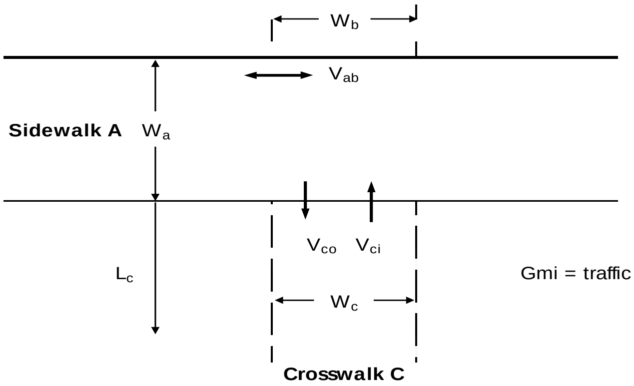
C.16 Blackfriars Bridge (A201) crossing at junction with Victoria Embankment (A3211), construction development case, PM peak hour

Signal Timing (sec)

C=	88		
G_{mj}=	19	R_{mj}=	69
G_{mi}=	69	R_{mi}=	19

Pedestrian Volumes

Flow	Ped/min	Ped/Cyc
v_{ci}	11	16.1
v_{co}	10	14.7
v_{ab}	3	4.4
v_{tot}	11.0	35.2
W_a =	14.8 ft	4.5 m
W_b =	9.8 ft	3 m
W_c =	9.8 ft	3 m
L_c =	82.0 ft	25 m



Gmi = traffic green

Net Corner Area:
$A = W_aW_b$ = 145.3 sq ft 13.5 sq m

Available Time Space:
TS = A x C/60 = 213.1 sq ft min 19.8 sq m min

Hold Area Waiting Times: (use ped/cycle)
$Q_{tco} = [(v_{co})((R_{mj})/C)((R_{mj})/2)]/60$ = 6.6 ped min

Hold Area Time Space:
$TS_h = 5(Q_{tco})$, or $0.4645(Q_{tco})$ 33.1 sq ft min 3.1 sq m min

Circulation Time Space:
$TS_c = TS - TS_h$ = 180.1 sq ft min 16.7 sq m min

Total Circulation Volume:
$v_c = v_{ci} + v_{co} + v_{ab}$ = 35.2 ped (per cycle)

Total Circulation Time:
$t_c = v_c \times 4/60$ = 2.3 ped min

Pedestrian Space and LOS:
$M = TS_c / t_c$ = 76.7 sq ft / ped 7.1 sq m / ped **LOS** B

Crosswalk Areas:
$A_c = L_cW_c$ = 807.3 sq ft 75.0 sq m

Crosswalk Time-Space:
$TS_c = A_c (G_{mj} - 3)/60$ = 215.3 sq ft min 20.0 sq m min

Crossing Times:
$t_{wc} = L_c / 1.2$ = 20.8 sec

Crosswalk Occupancy Time: (use ped/cycle)
$T_{wc} = (v_{ci}+v_{co})(t_{wc}/60)$ = 10.7 ped/min

Average Pedestrian Space:
$M_c = TS_c / T_{wc}$ = 20.1 sq ft / ped 1.9 sq m / ped **LOS** D

Maximum surge: (use ped/min)
$V_{mc} = (v_{ci}+v_{co})(R_{mj} + 3 + t_{wc})/60$ = 32.5 ped

Surge Pedestrian Space:
$M_c(\max) = A_c / V_{mc}$ = 24.8 sq ft / ped 2.3 sq m / ped **LOS** C

Appendix D: Local modelling outputs

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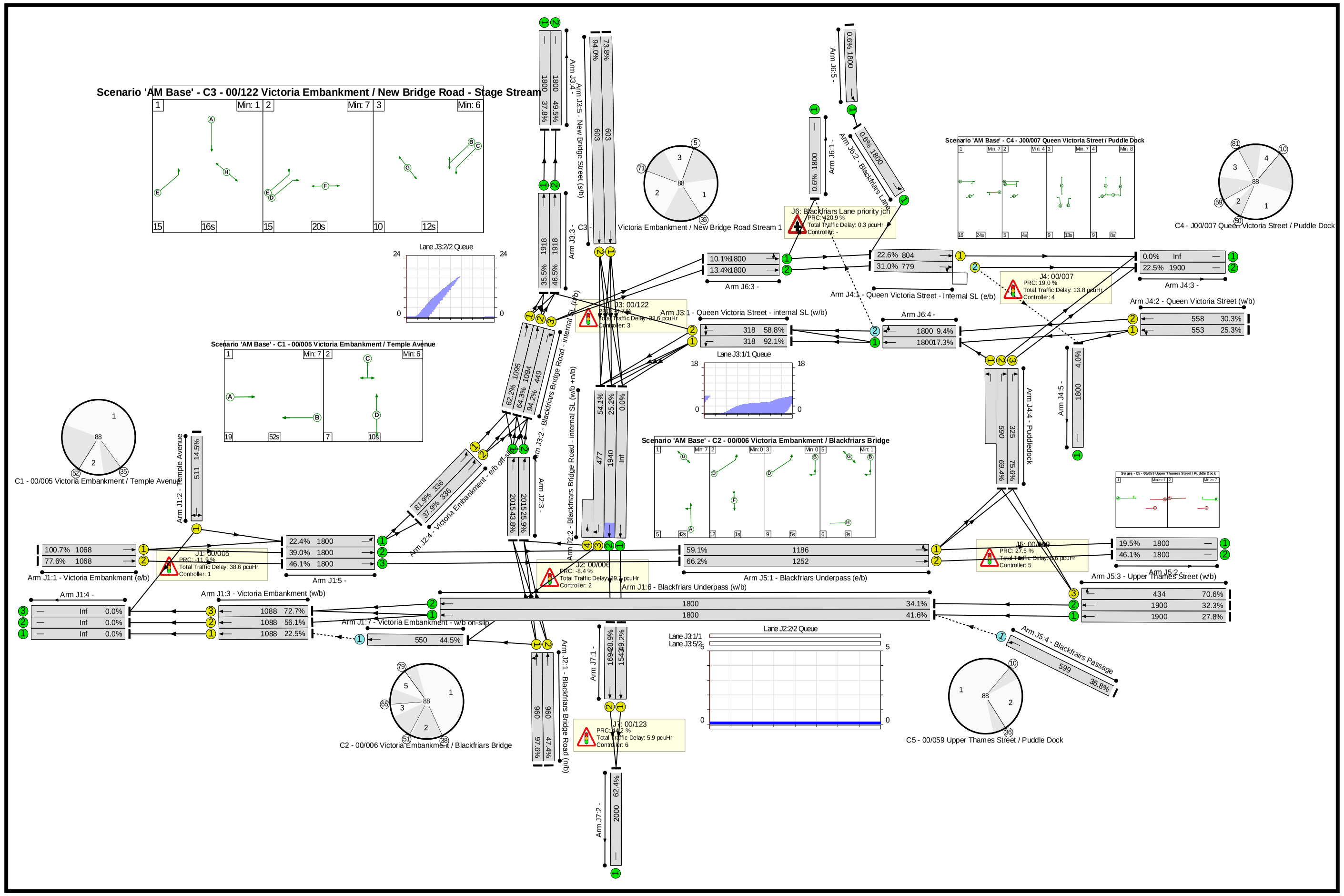
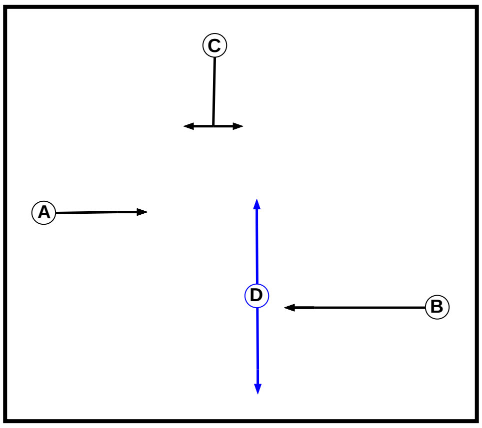
D.1 Baseline results, AM peak hour

Network Layout Diagram

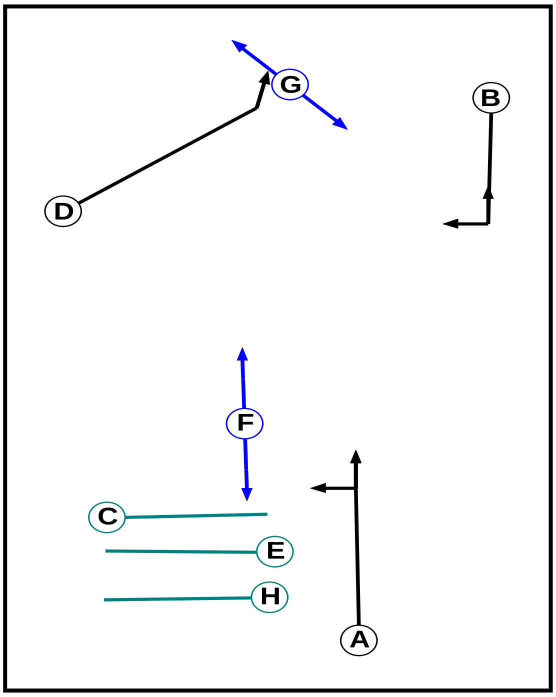


Phase Diagram

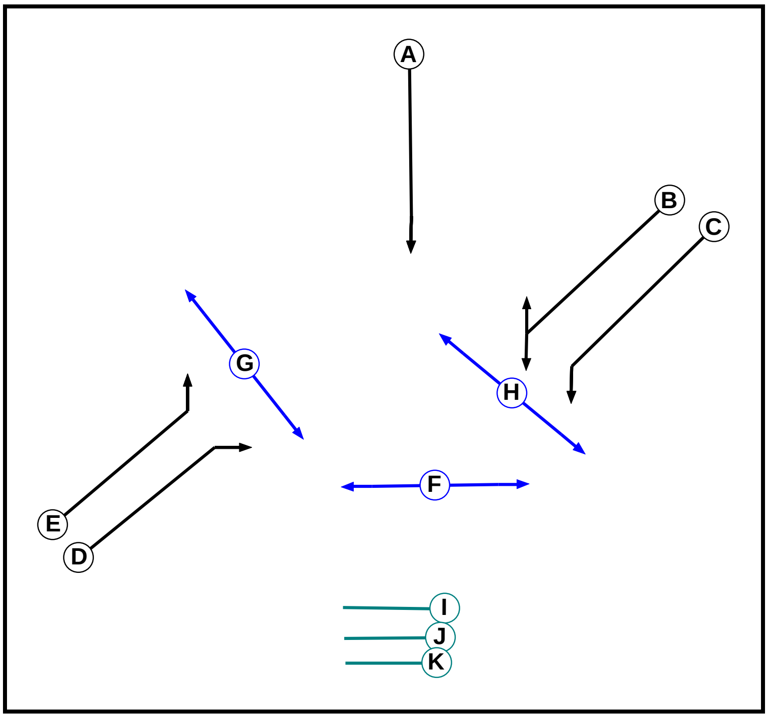
C1 - 00/005 Victoria Embankment / Temple Avenue



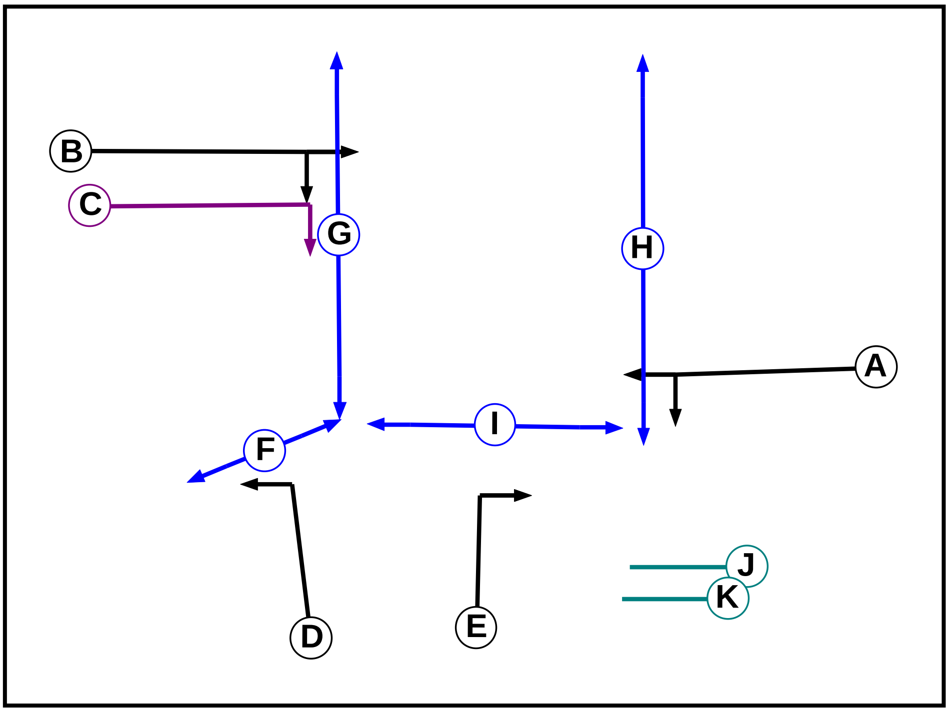
C2 - 00/006 Victoria Embankment / Blackfriars Bridge



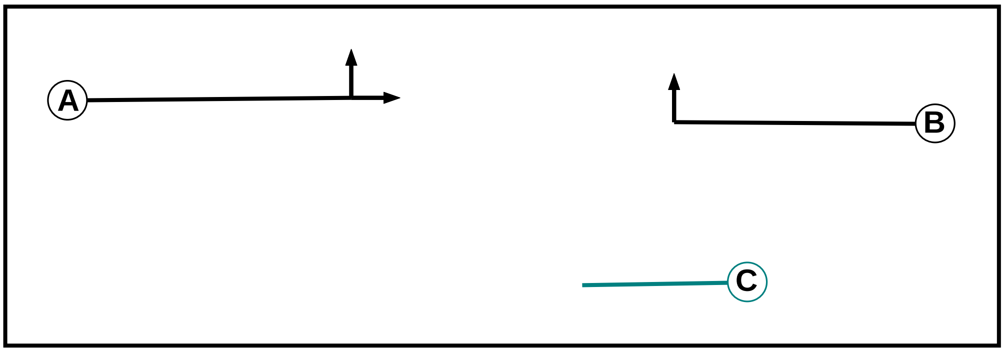
C3 - 00/122 Victoria Embankment / New Bridge Road



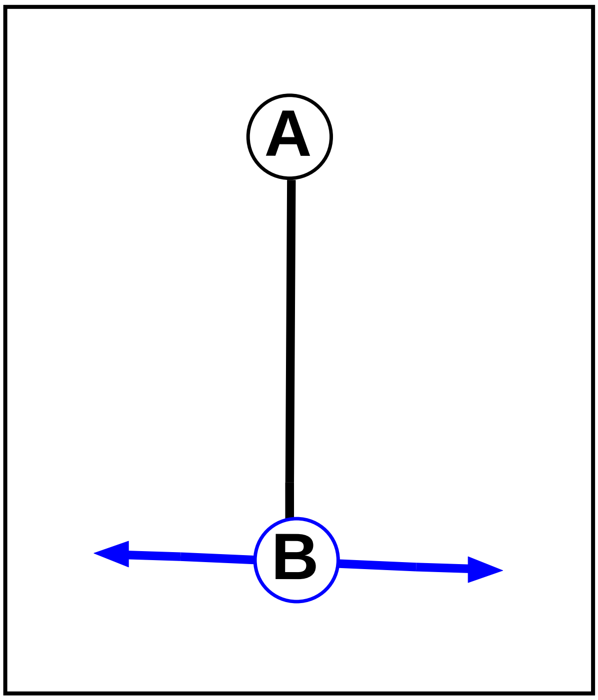
C4 - J00/007 Queen Victoria Street / Puddle Dock



C5 - 00/059 Upper Thames Street / Puddle Dock

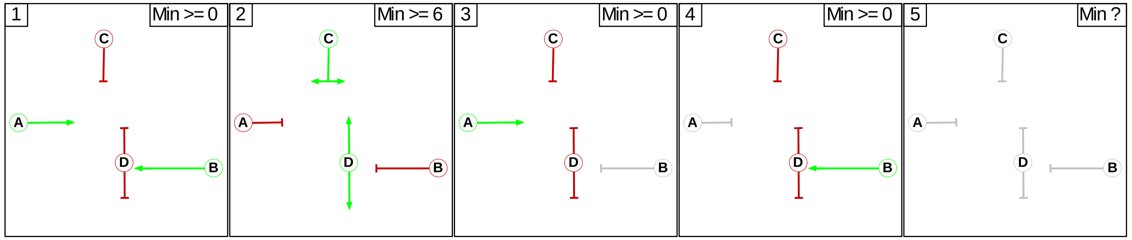


C6 - 00/123 Blackfriars Bridge ped crossing

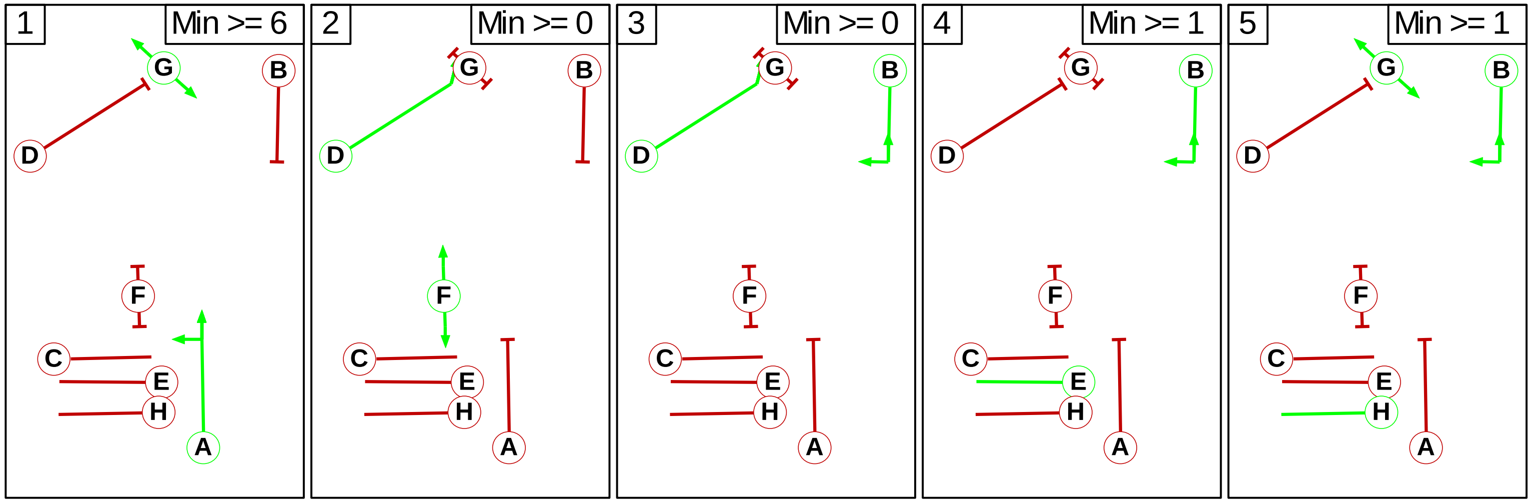


Stage Diagram

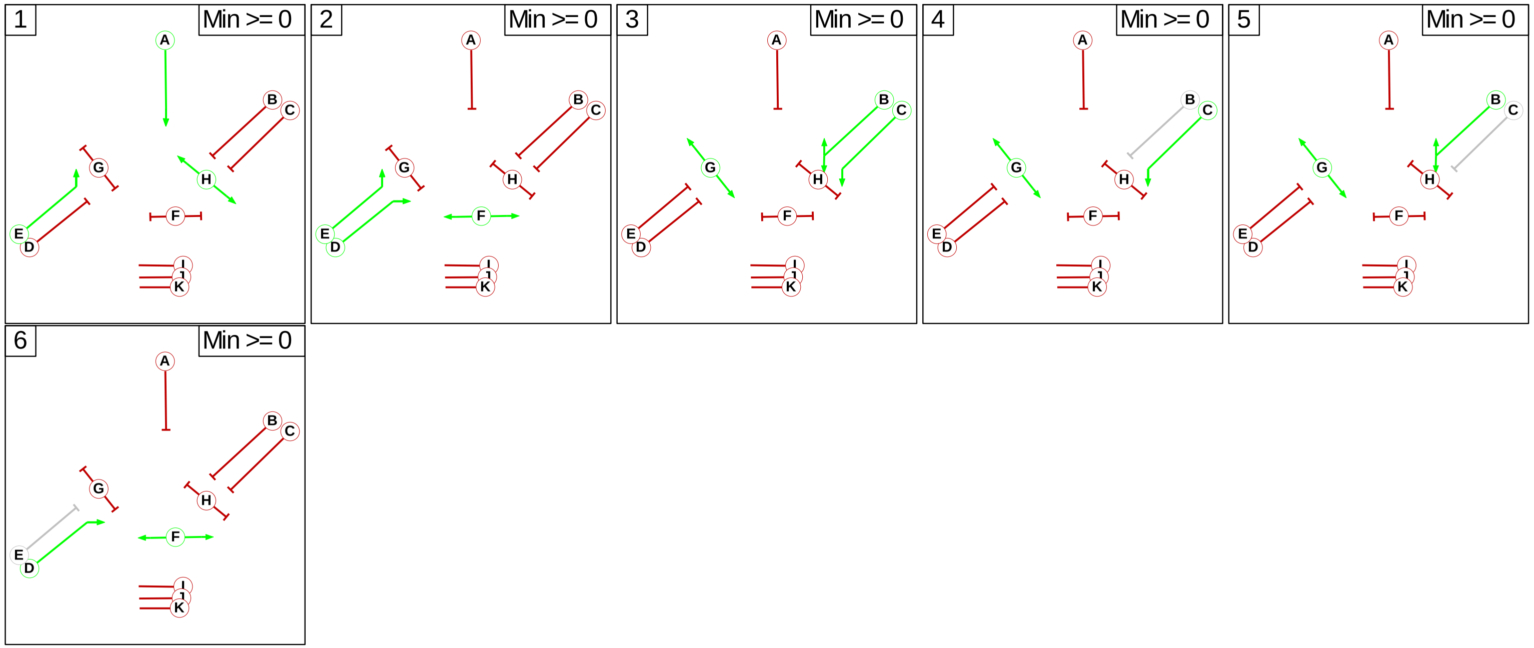
C1 - 01/094 Victoria Embankment / Temple Avenue



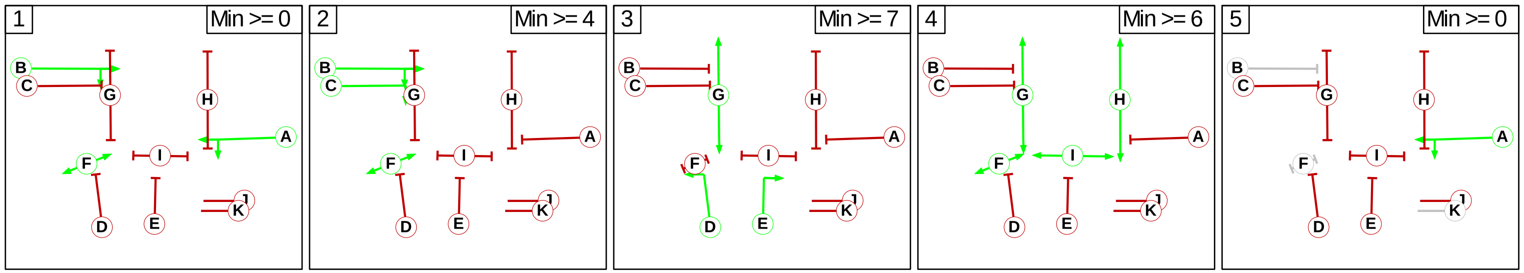
C2 - 00/006 Victoria Embankment / Blackfriars Bridge



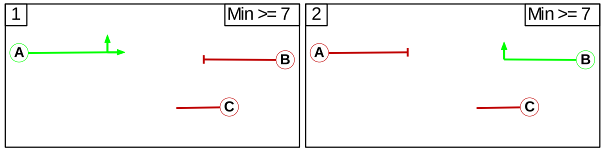
C3 - 00/122 Victoria Embankment / New Bridge Road
Stage Stream: 1



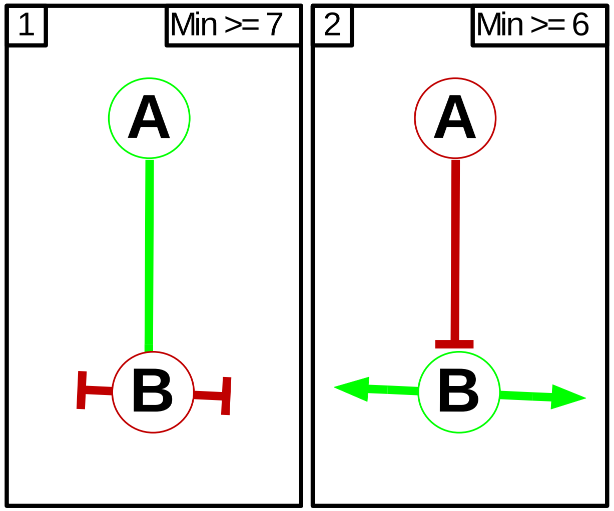
C4 - J00/007 Queen Victoria Street / Puddle Dock



C5 - 00/059 Upper Thames Street / Puddle Dock



C6 - 00/123 Blackfriars Bridge ped crossing



Phases in Stage

C1 - 01/094 Victoria Embankment / Temple Avenue

Stage No.	Phases in Stage
1	A B
2	C D
3	A
4	B
5	

C2 - 00/006 Victoria Embankment / Blackfriars Bridge

Stage No.	Phases in Stage
1	A G
2	D F
3	B D
4	B E
5	B G H

C3 - 00/122 Victoria Embankment / New Bridge Road

Stream	Stage No.	Phases in Stage
1	1	A E H
1	2	D E F
1	3	B C G
1	4	C G
1	5	B G
1	6	D F

C4 - J00/007 Queen Victoria Street / Puddle Dock

Stage No.	Phases in Stage
1	A B F
2	B C F
3	D E G
4	F G H I
5	A

C5 - 00/059 Upper Thames Street / Puddle Dock

Stage No.	Phases in Stage
1	A
2	B

C6 - 00/123 Blackfriars Bridge ped crossing

Stage No.	Phases in Stage
1	A
2	B

Phase Intergreens Matrix

C1 - 01/094 Victoria Embankment / Temple Avenue

	Starting Phase				
Terminating Phase		A	B	C	D
	A		-	5	7
	B	-		5	5
	C	5	5		-
	D	19	19	-	

C2 - 00/006 Victoria Embankment / Blackfriars Bridge

	Starting Phase								
Terminating Phase		A	B	C	D	E	F	G	H
	A		5	3	12	5	7	-	5
	B	5		3	-	-	8	-	-
	C	2	2		2	2	2	2	2
	D	5	-	3		3	-	6	6
	E	5	-	3	2		8	2	2
	F	9	9	4	-	9		-	9
	G	-	-	3	8	3	-		-
	H	5	-	3	8	3	8	-	

C3 - 00/122 Victoria Embankment / New Bridge Road

		Starting Phase										
		A	B	C	D	E	F	G	H	I	J	K
Terminating Phase	A		9	9	9	-	8	-	-	9	9	3
	B	5		-	5	5	7	-	6	5	5	3
	C	5	-		-	-	7	-	10	5	5	3
	D	5	5	-		-	-	6	8	3	3	3
	E	-	5	-	-		-	10	-	-	-	3
	F	8	8	8	-	-		-	-	-	-	3
	G	-	-	-	15	15	-		-	-	-	4
	H	-	15	15	15	-	-	-		5	4	4
	I	9	5	2	2	-	-	-	9		9	4
	J	5	5	2	2	-	-	-	2	5		3
	K	2	2	2	2	2	2	2	2	2	2	

C4 - J00/007 Queen Victoria Street / Puddle Dock

		Starting Phase										
		A	B	C	D	E	F	G	H	I	J	K
Terminating Phase	A		-	5	8	6	-	8	5	6	3	-
	B	-		-	-	5	-	5	8	8	3	3
	C	5	-		-	5	-	5	8	8	3	5
	D	5	-	-		-	5	-	-	-	3	5
	E	5	5	5	-		-	-	9	5	3	5
	F	-	-	-	9	-		-	-	-	4	4
	G	14	14	14	-	-	-		-	-	7	14
	H	15	15	15	-	15	-	-		-	8	15
	I	16	16	16	-	16	-	-	-		8	16
	J	2	2	2	2	2	2	2	2	2		2
	K	-	2	5	8	6	2	8	5	6	3	

C5 - 00/059 Upper Thames Street / Puddle Dock

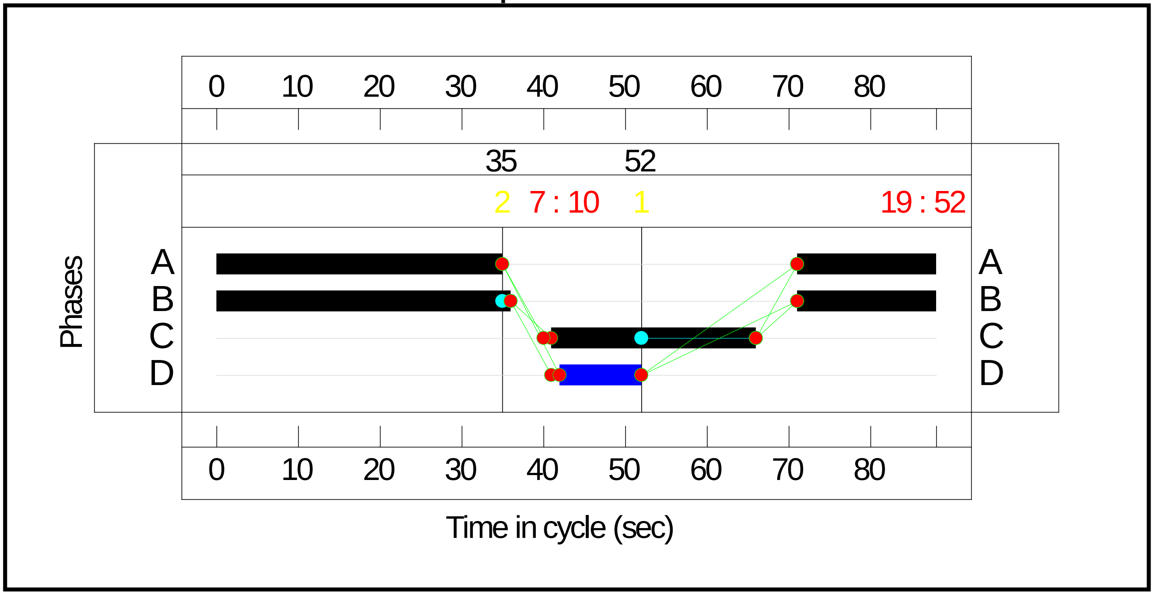
	Starting Phase			
Terminating Phase		A	B	C
	A		5	3
	B	5		3
	C	2	2	

C6 - 00/123 Blackfriars Bridge ped crossing

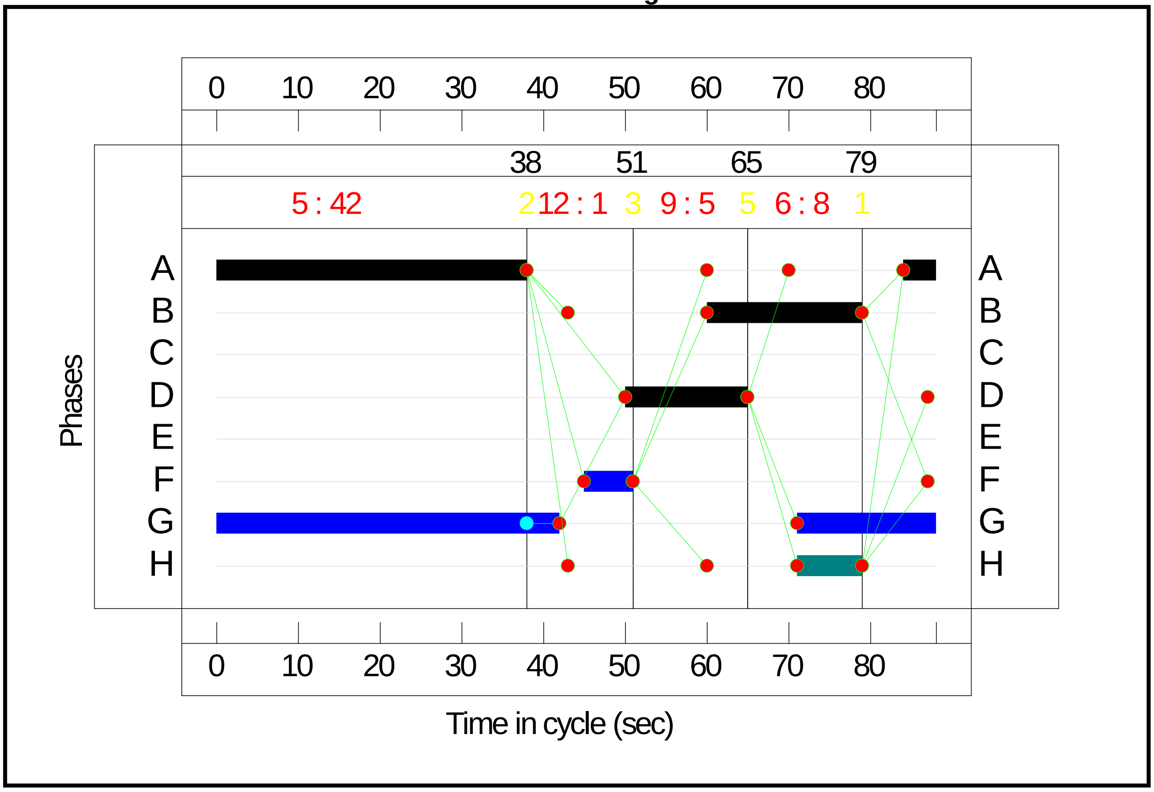
	Starting Phase		
Terminating Phase		A	B
	A		5
	B	8	

Signal Timings Diagram

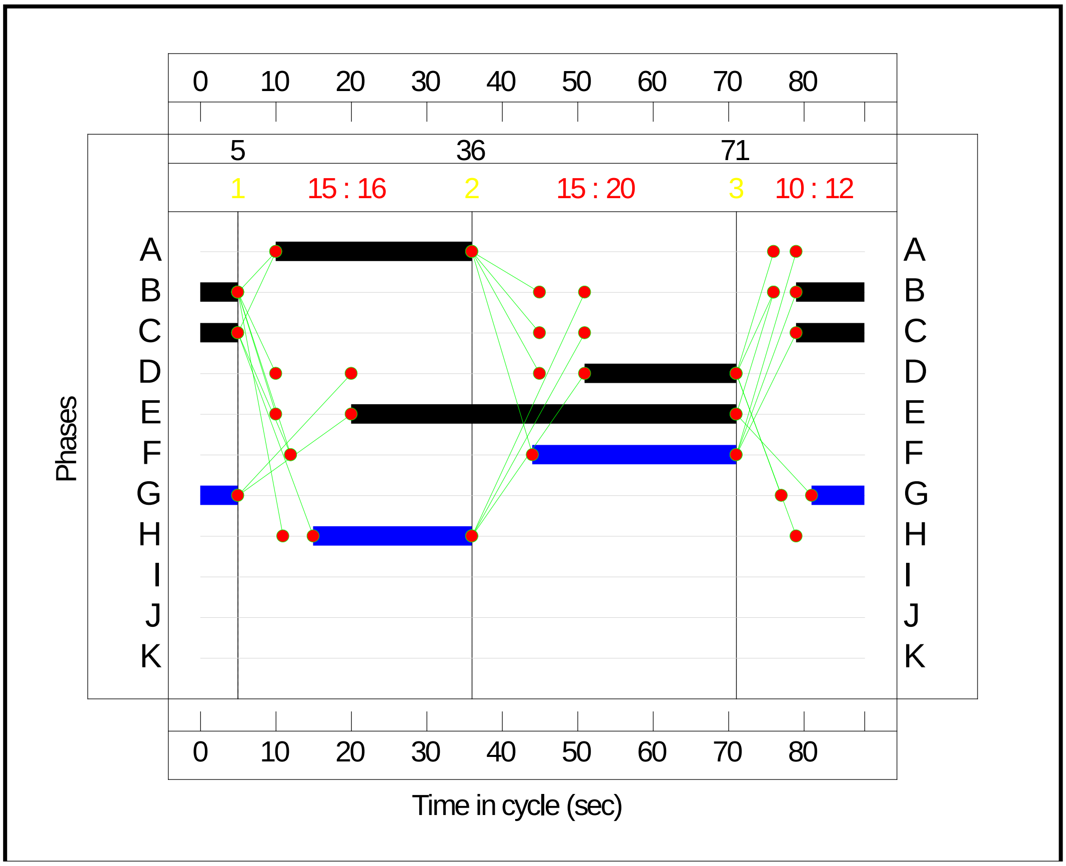
C1 - 00/005 Victoria Embankment / Temple Avenue



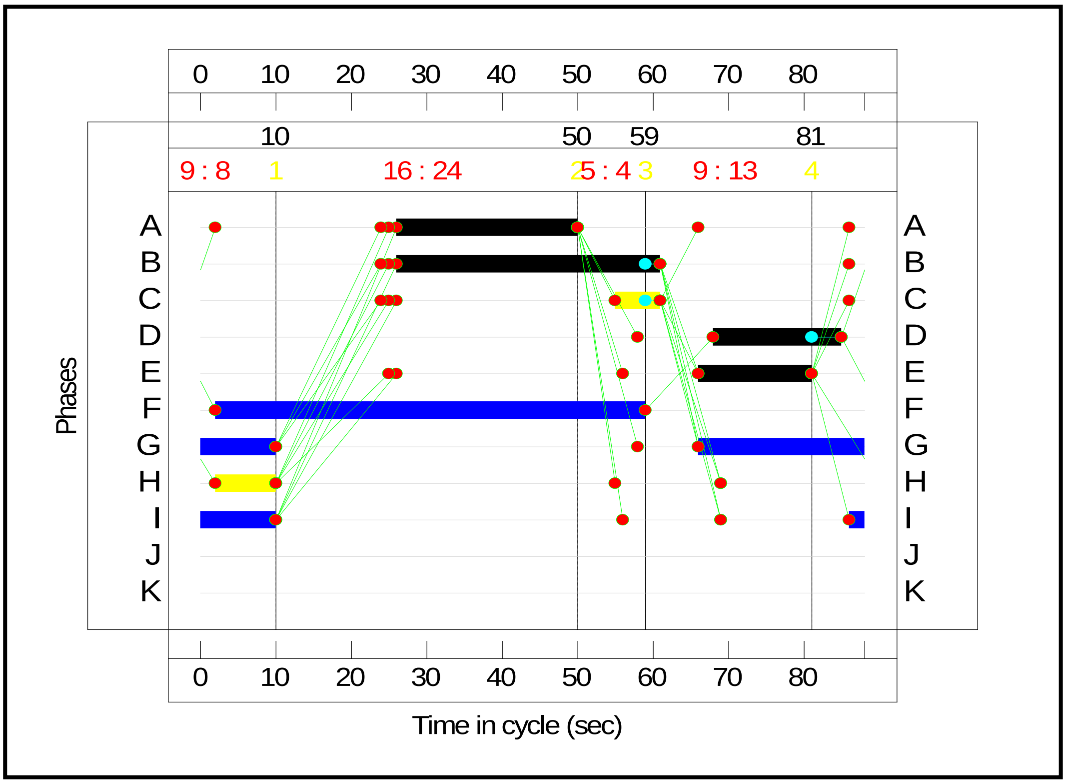
C2 - 00/006 Victoria Embankment / Blackfriars Bridge



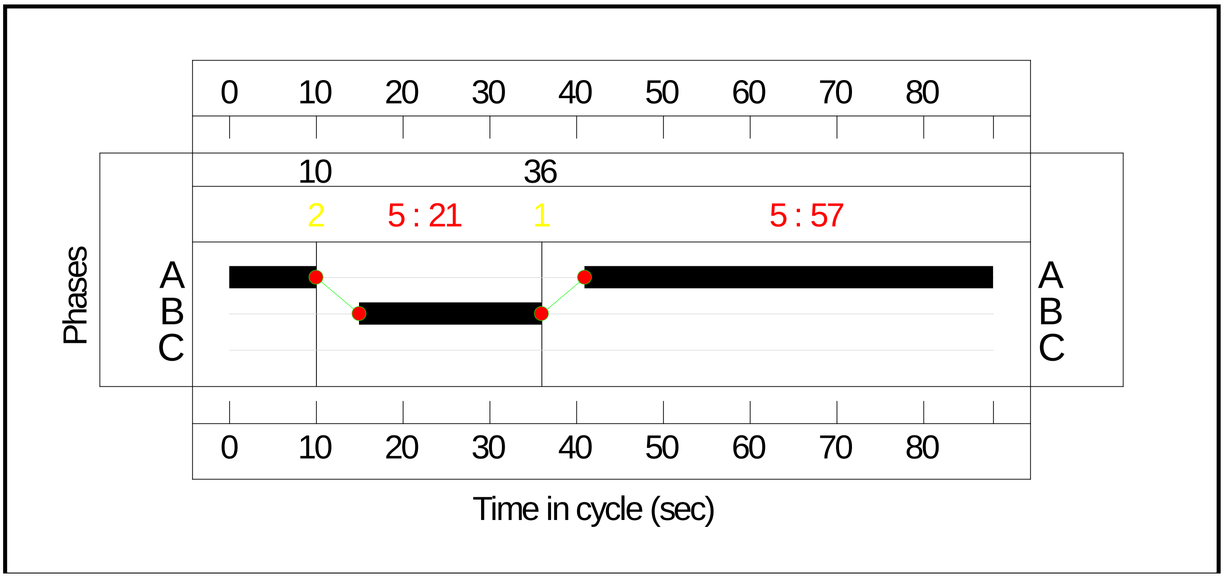
C3 - 00/122 Victoria Embankment / New Bridge Road



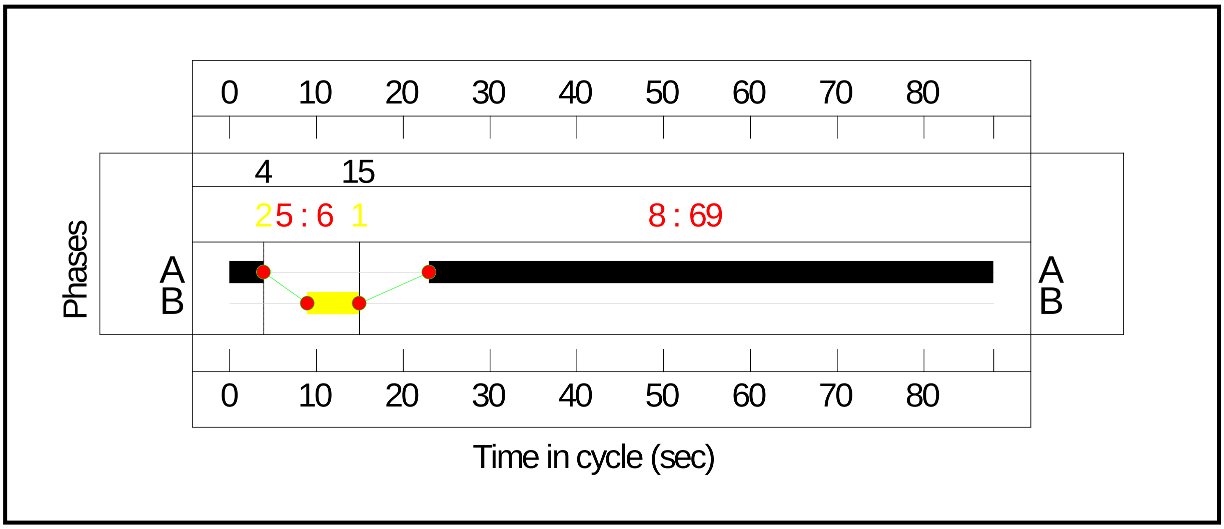
C4 - J00/007 Queen Victoria Street / Puddle Dock



C5 - 00/059 Upper Thames Street / Puddle Dock



C6 - 00/123 Blackfriars Bridge ped crossing



Network Results

Item	Lane Description	Lane Type	Total Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: Blackfriars Bridge Junction	**-**	**-**	**-**	**-**	**-**	**-**	**100.7%**	**135.5**	**-**	**-**
J1: 00/005	**-**	**-**	**-**	**-**	**-**	**-**	**100.7%**	**38.6**	**-**	**-**
1/1	Victoria Embankment (e/b) Ahead	U	52	1075	1773	1068	100.7%	23.8	79.8	44.7
1/2	Victoria Embankment (e/b) Ahead	U	52	829	1773	1068	77.6%	4.7	20.5	16.7
2/1	Temple Avenue Right Left	U	25	74	1729	511	14.5%	0.6	27.0	1.4
3/1	Victoria Embankment (w/b) Ahead	U	53	245	1773	1088	22.5%	1.0	14.5	3.3
3/2	Victoria Embankment (w/b) Ahead	U	53	610	1773	1088	56.1%	2.3	13.8	9.3
3/3	Victoria Embankment (w/b) Ahead	U	53	791	1773	1088	72.7%	3.9	17.9	14.7
4/1		U	-	245	Inf	Inf	0.0%	0.0	0.0	0.0
4/2		U	-	610	Inf	Inf	0.0%	0.0	0.0	0.0
4/3		U	-	831	Inf	Inf	0.0%	0.0	0.0	0.0
5/1	Left	U	-	405	1800	1800	22.4%	0.1	1.3	0.1
5/2	Ahead	U	-	706	1800	1800	39.0%	0.3	1.6	0.3
5/3	Ahead	U	-	829	1800	1800	46.1%	0.4	1.9	0.4
6/1	Blackfriars Underpass (w/b) Ahead	U	-	749	1800	1800	41.6%	0.4	1.7	0.4
6/2	Blackfriars Underpass (w/b) Ahead	U	-	614	1800	1800	34.1%	0.3	1.5	0.3
7/1	Victoria Embankment - w/b on-slip Ahead	O	-	245	1800	550	44.5%	0.7	10.7	5.0
J2: 00/006	**-**	**-**	**-**	**-**	**-**	**-**	**97.6%**	**29.7**	**-**	**-**
1/1	Blackfriars Bridge Road (n/b) Ahead Left	U	42	932	1965	960	97.6%	16.3	62.6	33.0
1/2	Blackfriars Bridge Road (n/b) Ahead	U	42	455	1965	960	47.4%	2.3	18.5	7.8
2/1	Blackfriars Bridge Road - internal SL (w/b +n/b) Ahead	U	-	558	Inf	Inf	0.0%	0.0	0.0	0.0

2/2	Blackfriars Bridge Road - internal SL (w/b +n/b) Ahead	U	-	489	1940	1940	25.2%	0.2	1.2	0.2
2/3+2/4	Blackfriars Bridge Road - internal SL (w/b +n/b) U-Turn Right	U	19	258	1853:1550	477	54.1%	3.4	47.9	5.3
3/1	Ahead	U	-	883	2015	2015	43.8%	0.4	1.6	0.4
3/2	Ahead	U	-	522	2015	2015	25.9%	0.2	1.2	0.2
4/1	Victoria Embankment - e/b off-slip Ahead	U	15	277	1848	336	81.9%	5.3	68.7	8.5
4/2	Victoria Embankment - e/b off-slip Ahead	U	15	128	1848	336	37.9%	1.6	46.6	3.0
J3: 00/122	**-**	**-**	**-**	**-**	**-**	**-**	**94.2%**	**38.6**	**-**	**-**
1/1	Queen Victoria Street - internal SL (w/b) Left	U	14	293	1866	318	92.1%	7.6	93.0	11.4
1/2	Queen Victoria Street - internal SL (w/b) Left Right	U	14	187	1866	318	58.8%	1.6	30.4	4.9
2/1	Blackfriars Bridge Road - internal SL (n/b) Ahead	U	51	682	1853	1095	62.2%	1.1	5.9	5.6
2/2	Blackfriars Bridge Road - internal SL (n/b) Ahead	U	51	704	1852	1094	64.3%	2.6	13.5	17.4
2/3	Blackfriars Bridge Road - internal SL (n/b) Right	U	20	424	1882	449	94.2%	8.8	75.0	15.7
3/1	Ahead	U	-	682	1918	1918	35.5%	0.3	1.5	0.3
3/2	Ahead	U	-	891	1918	1918	46.5%	0.4	1.8	0.4
4/1		U	-	682	1800	1800	37.8%	0.3	1.6	0.3
4/2		U	-	891	1800	1800	49.5%	0.5	2.0	0.5
5/1	New Bridge Street (s/b) Ahead	U	26	445	1965	603	73.8%	4.8	38.5	11.0
5/2	New Bridge Street (s/b) Ahead	U	26	567	1965	603	94.0%	10.6	67.4	19.3
J4: 00/007	**-**	**-**	**-**	**-**	**-**	**-**	**75.6%**	**13.8**	**-**	**-**
1/1	Queen Victoria Street - Internal SL (e/b) Ahead	U	35	182	1965	804	22.6%	0.8	15.8	4.1

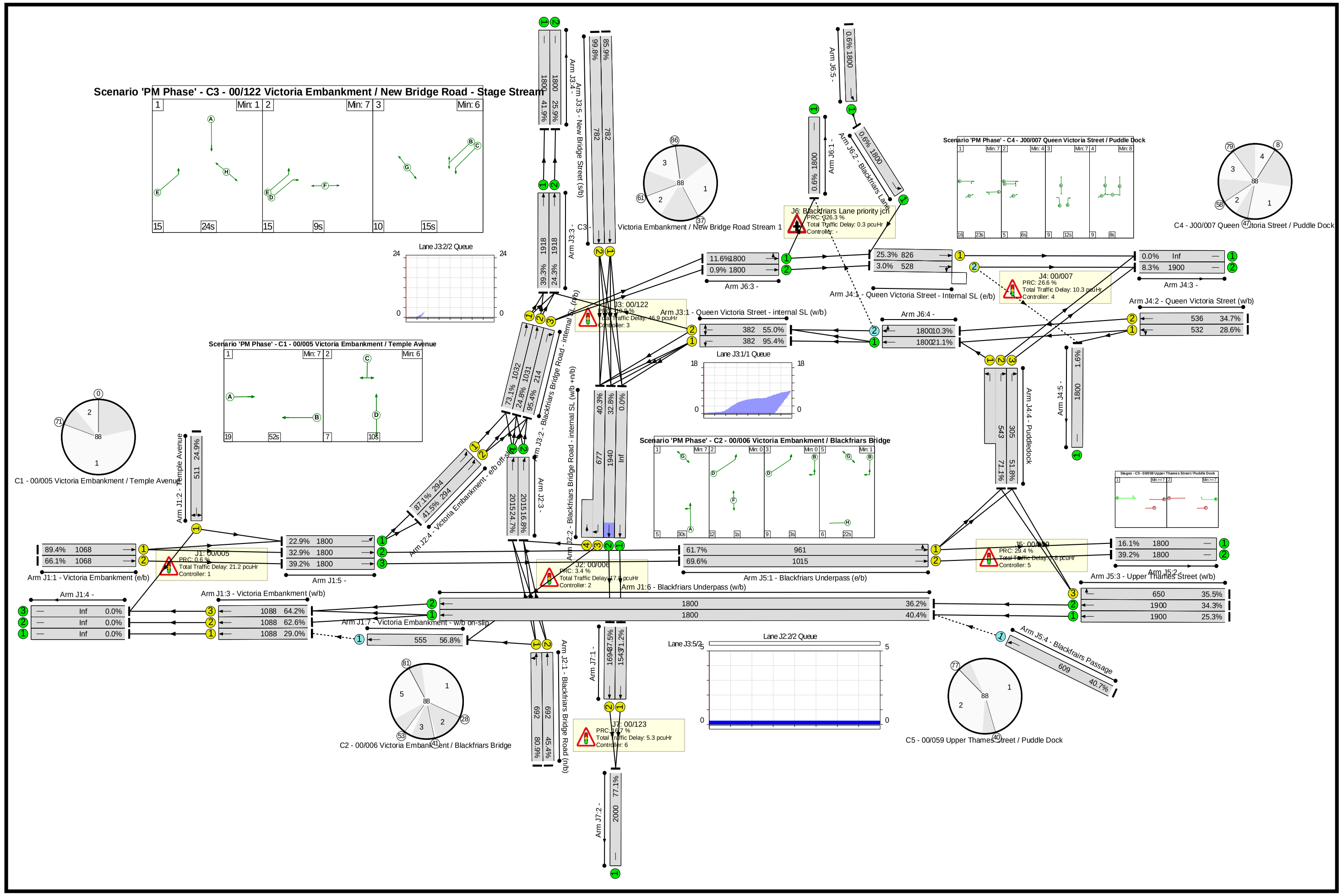
1/2	Queen Victoria Street - Internal SL (e/b) Ahead Right	O	35	242	1905	779	31.0%	1.2	17.7	5.7
2/1	Queen Victoria Street (w/b) Left Ahead	U	24	140	1948	553	25.3%	1.1	28.7	2.8
2/2	Queen Victoria Street (w/b) Ahead	U	24	169	1965	558	30.3%	1.4	29.3	3.4
3/1		U	-	410	Inf	Inf	0.0%	0.0	0.0	0.0
3/2		U	-	429	1900	1900	22.5%	0.1	1.2	0.1
4/2+4/1	Puddledock Right Left	U	15:17	411	1800:1748	590	69.4%	5.2	45.9	6.2
4/3	Puddledock Right	U	15	247	1789	325	75.6%	4.0	58.1	7.2
5/1		U	-	72	1800	1800	4.0%	0.0	1.0	0.0
J5: 00/059	**-**	**-**	**-**	**-**	**-**	**-**	**70.6%**	**8.6**	**-**	**-**
1/1	Blackfriars Underpass (e/b) Left Ahead	U	57	706	1800	1186	59.1%	1.7	8.9	5.1
1/2	Blackfriars Underpass (e/b) Ahead	U	57	829	1900	1252	66.2%	1.8	8.0	4.9
2/1		U	-	354	1800	1800	19.5%	0.1	1.2	0.1
2/2		U	-	829	1800	1800	46.1%	0.4	1.9	0.4
3/1	Upper Thames Street (w/b) Ahead	U	-	529	1900	1900	27.8%	0.2	1.3	0.2
3/2	Upper Thames Street (w/b) Ahead	U	-	614	1900	1900	32.3%	0.2	1.4	0.2
3/3	Upper Thames Street (w/b) Right	U	21	306	1734	434	70.6%	3.7	43.9	8.0
4/1	Blackfrairs Passage Ahead	O	-	220	1940	599	36.8%	0.3	4.7	0.3
J6: Blackfriars Lane priority jcn	**-**	**-**	**-**	**-**	**-**	**-**	**17.3%**	**0.3**	**-**	**-**
1/1		U	-	10	1800	1800	0.6%	0.0	1.0	0.0
2/1	Blackfriars Lane Left	U	-	10	1800	1800	0.6%	0.0	1.0	0.0
3/1	Ahead Left	U	-	182	1800	1800	10.1%	0.1	1.1	0.1
3/2	Ahead	U	-	242	1800	1800	13.4%	0.1	1.2	0.1
4/1	Ahead	U	-	311	1800	1800	17.3%	0.1	1.2	0.1
4/2	Ahead Right	O	-	169	1800	1800	9.4%	0.1	1.1	0.1

5/1	Ahead	U	-	10	1800	1800	0.6%	0.0	1.0	0.0
J7: 00/123	**-**	**-**	**-**	**-**	**-**	**-**	**62.4%**	**5.9**	**-**	**-**
1/1	Ahead	U	69	759	1940	1543	49.2%	2.7	12.7	18.4
1/2	Ahead	U	69	489	2130	1694	28.9%	0.7	5.0	6.8
2/1		U	-	1248	2000	2000	62.4%	2.6	7.4	27.5

C1 - 00/005 Victoria Embankment / Temple Avenue	PRC for Signalled Lanes (%):	-11.9	Total Delay for Signalled Lanes (pcuHr):	36.36	Cycle Time (s):	88
C2 - 00/006 Victoria Embankment / Blackfriars Bridge	PRC for Signalled Lanes (%):	-8.4	Total Delay for Signalled Lanes (pcuHr):	28.97	Cycle Time (s):	88
C3 - 00/122 Victoria Embankment / New Bridge RoadStream: 1	PRC for Signalled Lanes (%):	-4.7	Total Delay for Signalled Lanes (pcuHr):	37.10	Cycle Time (s):	88
C4 - J00/007 Queen Victoria Street / Puddle Dock	PRC for Signalled Lanes (%):	19.0	Total Delay for Signalled Lanes (pcuHr):	13.66	Cycle Time (s):	88
C5 - 00/059 Upper Thames Street / Puddle Dock	PRC for Signalled Lanes (%):	27.5	Total Delay for Signalled Lanes (pcuHr):	7.29	Cycle Time (s):	88
C6 - 00/123 Blackfriars Bridge ped crossing	PRC for Signalled Lanes (%):	83.0	Total Delay for Signalled Lanes (pcuHr):	3.36	Cycle Time (s):	88
	PRC Over All Lanes (%):	-11.9	Total Delay Over All Lanes(pcuHr):	135.53		

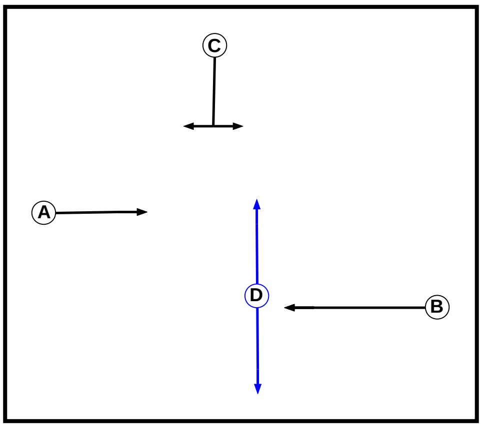
D.2 Baseline results, PM peak hour

Network Layout Diagram

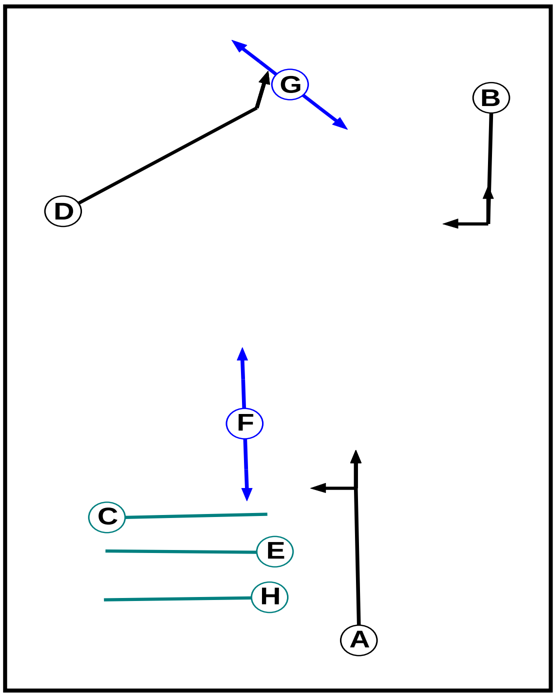


Phase Diagram

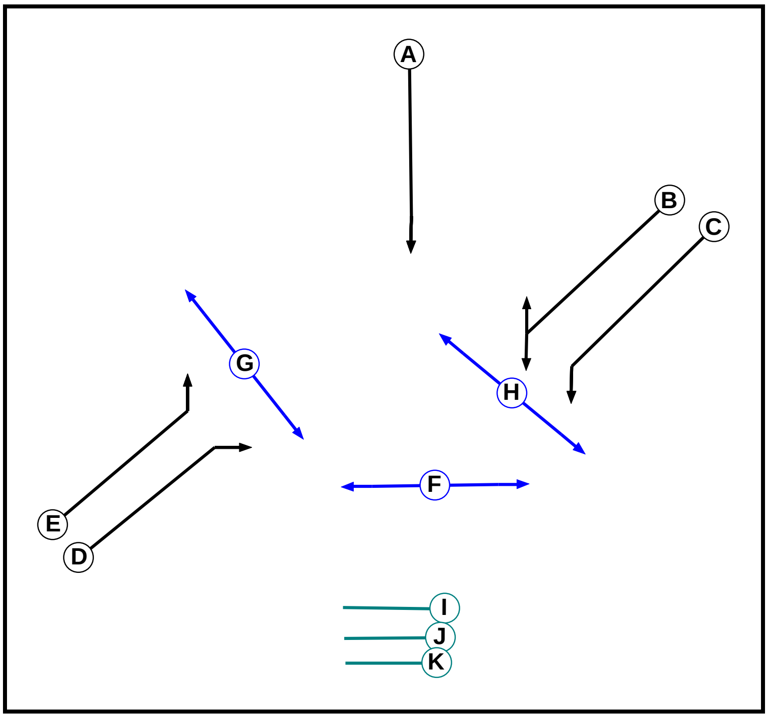
C1 - 00/005 Victoria Embankment / Temple Avenue



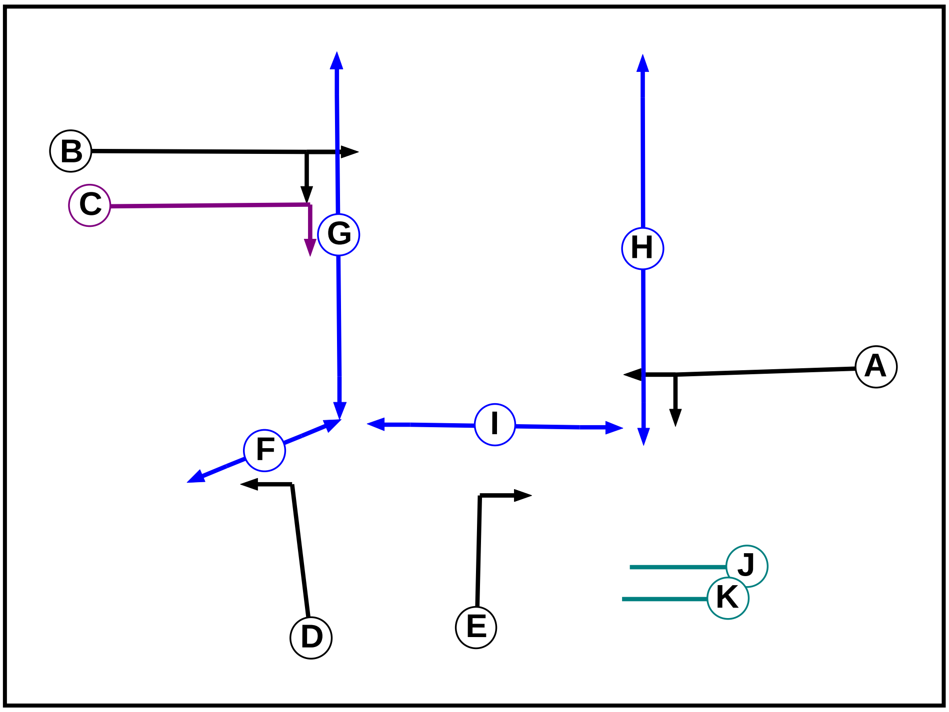
C2 - 00/006 Victoria Embankment / Blackfriars Bridge



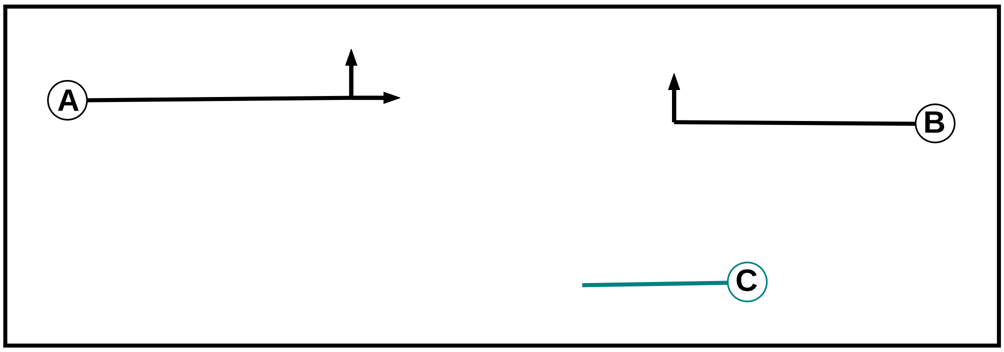
C3 - 00/122 Victoria Embankment / New Bridge Road



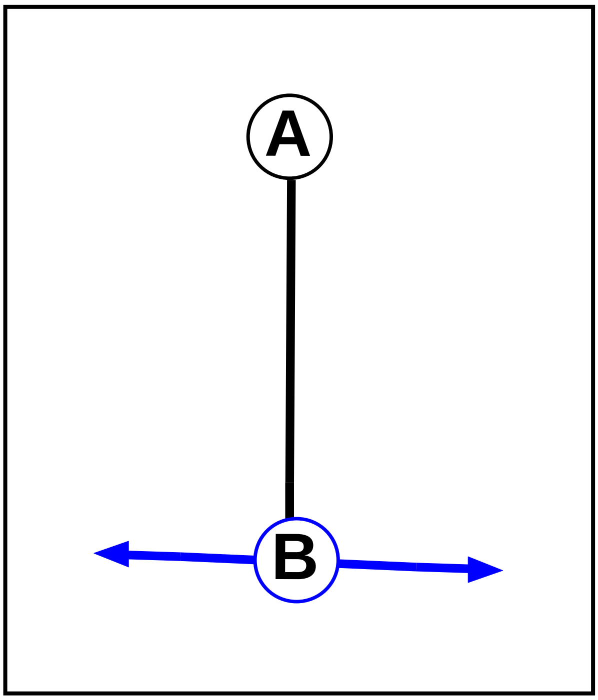
C4 - J00/007 Queen Victoria Street / Puddle Dock



C5 - 00/059 Upper Thames Street / Puddle Dock

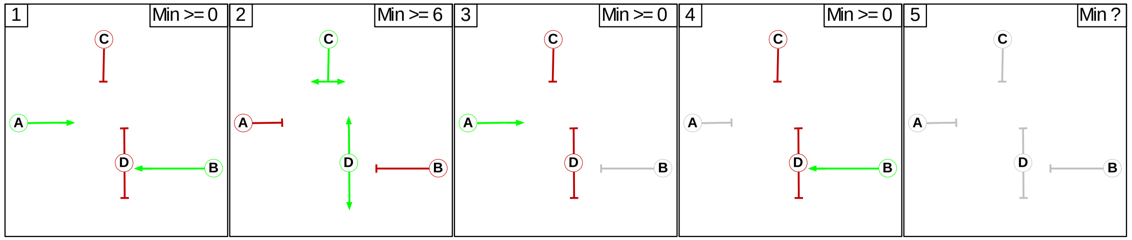


C6 - 00/123 Blackfriars Bridge ped crossing

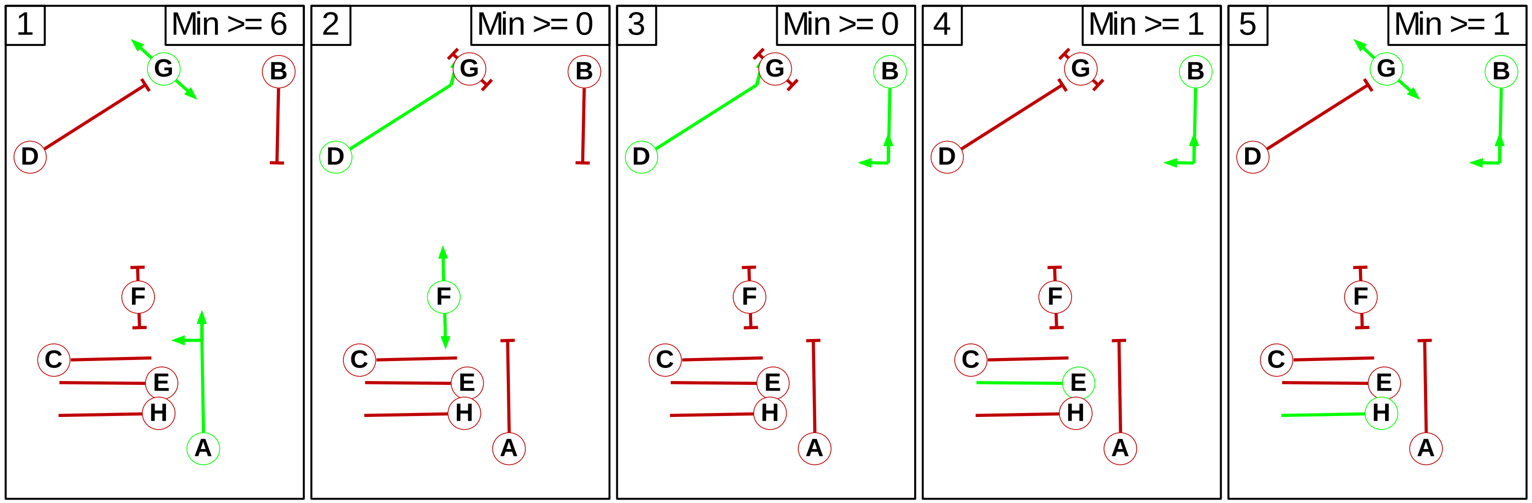


Stage Diagram

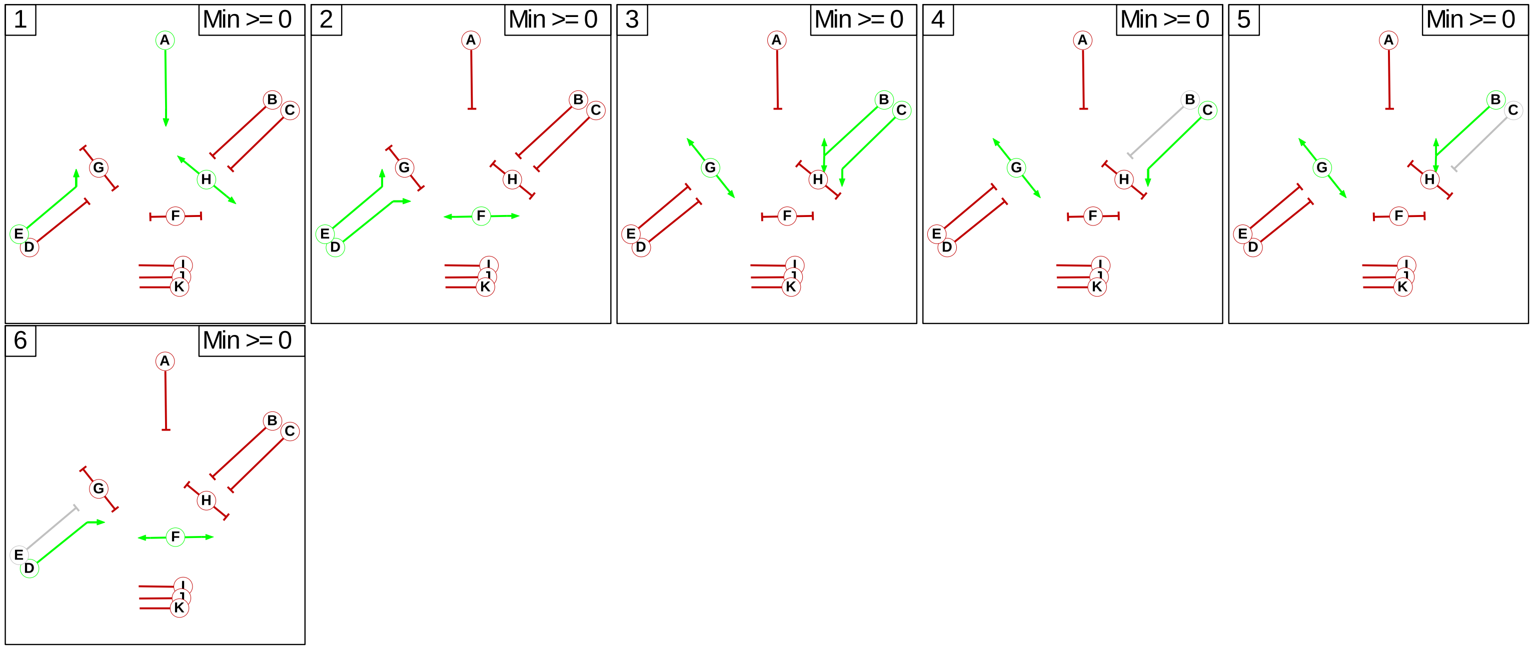
C1 - 01/094 Victoria Embankment / Temple Avenue



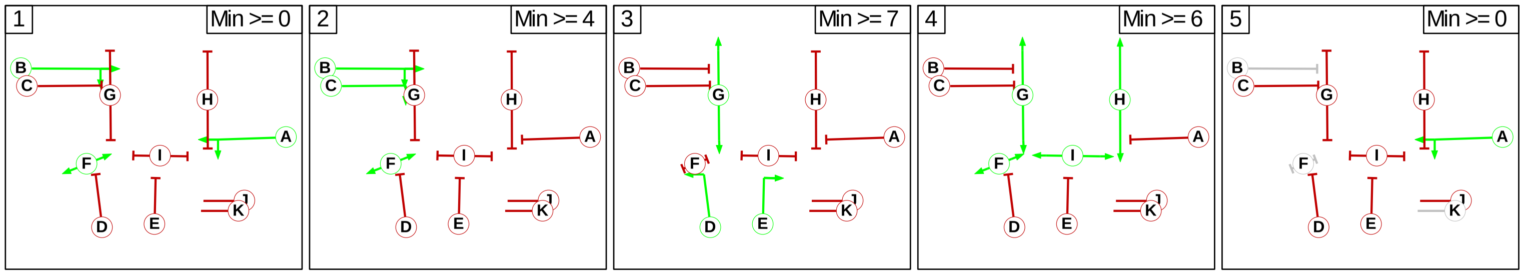
C2 - 00/006 Victoria Embankment / Blackfriars Bridge



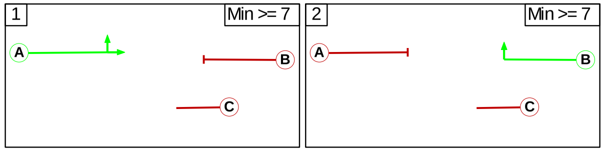
C3 - 00/122 Victoria Embankment / New Bridge Road
Stage Stream: 1



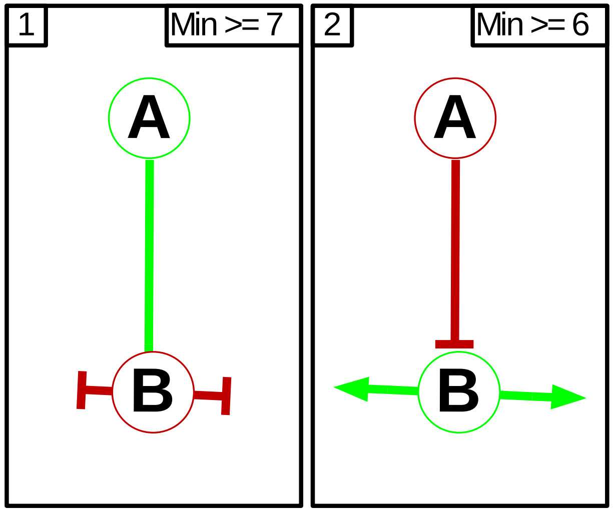
C4 - J00/007 Queen Victoria Street / Puddle Dock



C5 - 00/059 Upper Thames Street / Puddle Dock



C6 - 00/123 Blackfriars Bridge ped crossing



Phases in Stage

C1 - 01/094 Victoria Embankment / Temple Avenue

Stage No.	Phases in Stage
1	A B
2	C D
3	A
4	B
5	

C2 - 00/006 Victoria Embankment / Blackfriars Bridge

Stage No.	Phases in Stage
1	A G
2	D F
3	B D
4	B E
5	B G H

C3 - 00/122 Victoria Embankment / New Bridge Road

Stream	Stage No.	Phases in Stage
1	1	A E H
1	2	D E F
1	3	B C G
1	4	C G
1	5	B G
1	6	D F

C4 - J00/007 Queen Victoria Street / Puddle Dock

Stage No.	Phases in Stage
1	A B F
2	B C F
3	D E G
4	F G H I
5	A

C5 - 00/059 Upper Thames Street / Puddle Dock

Stage No.	Phases in Stage
1	A
2	B

C6 - 00/123 Blackfriars Bridge ped crossing

Stage No.	Phases in Stage
1	A
2	B

Phase Intergreens Matrix

C1 - 01/094 Victoria Embankment / Temple Avenue

	Starting Phase				
Terminating Phase		A	B	C	D
	A		-	5	7
	B	-		5	5
	C	5	5		-
	D	19	19	-	

C2 - 00/006 Victoria Embankment / Blackfriars Bridge

	Starting Phase								
Terminating Phase		A	B	C	D	E	F	G	H
	A		5	3	12	5	7	-	5
	B	5		3	-	-	8	-	-
	C	2	2		2	2	2	2	2
	D	5	-	3		3	-	6	6
	E	5	-	3	2		8	2	2
	F	9	9	4	-	9		-	9
	G	-	-	3	8	3	-		-
	H	5	-	3	8	3	8	-	

C3 - 00/122 Victoria Embankment / New Bridge Road

		Starting Phase										
		A	B	C	D	E	F	G	H	I	J	K
Terminating Phase	A		9	9	9	-	8	-	-	9	9	3
	B	5		-	5	5	7	-	6	5	5	3
	C	5	-		-	-	7	-	10	5	5	3
	D	5	5	-		-	-	6	8	3	3	3
	E	-	5	-	-		-	10	-	-	-	3
	F	8	8	8	-	-		-	-	-	-	3
	G	-	-	-	15	15	-		-	-	-	4
	H	-	15	15	15	-	-	-		5	4	4
	I	9	5	2	2	-	-	-	9		9	4
	J	5	5	2	2	-	-	-	2	5		3
	K	2	2	2	2	2	2	2	2	2	2	

C4 - J00/007 Queen Victoria Street / Puddle Dock

		Starting Phase										
		A	B	C	D	E	F	G	H	I	J	K
Terminating Phase	A		-	5	8	6	-	8	5	6	3	-
	B	-		-	-	5	-	5	8	8	3	3
	C	5	-		-	5	-	5	8	8	3	5
	D	5	-	-		-	5	-	-	-	3	5
	E	5	5	5	-		-	-	9	5	3	5
	F	-	-	-	9	-		-	-	-	4	4
	G	14	14	14	-	-	-		-	-	7	14
	H	15	15	15	-	15	-	-		-	8	15
	I	16	16	16	-	16	-	-	-		8	16
	J	2	2	2	2	2	2	2	2	2		2
	K	-	2	5	8	6	2	8	5	6	3	

C5 - 00/059 Upper Thames Street / Puddle Dock

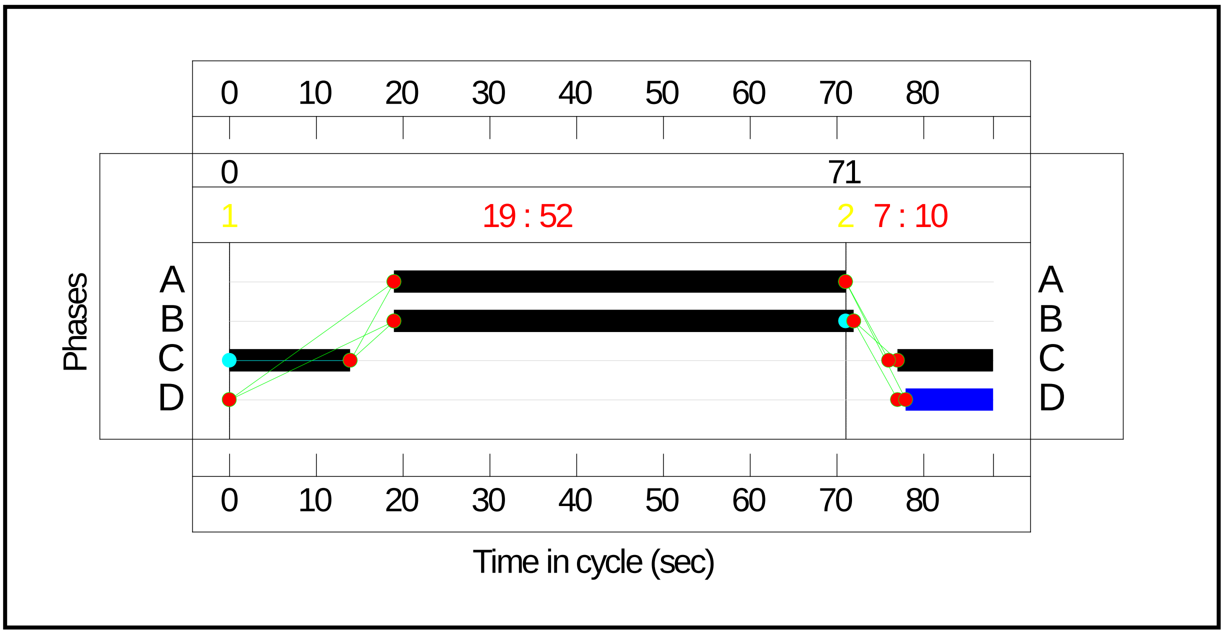
	Starting Phase			
Terminating Phase		A	B	C
	A		5	3
	B	5		3
	C	2	2	

C6 - 00/123 Blackfriars Bridge ped crossing

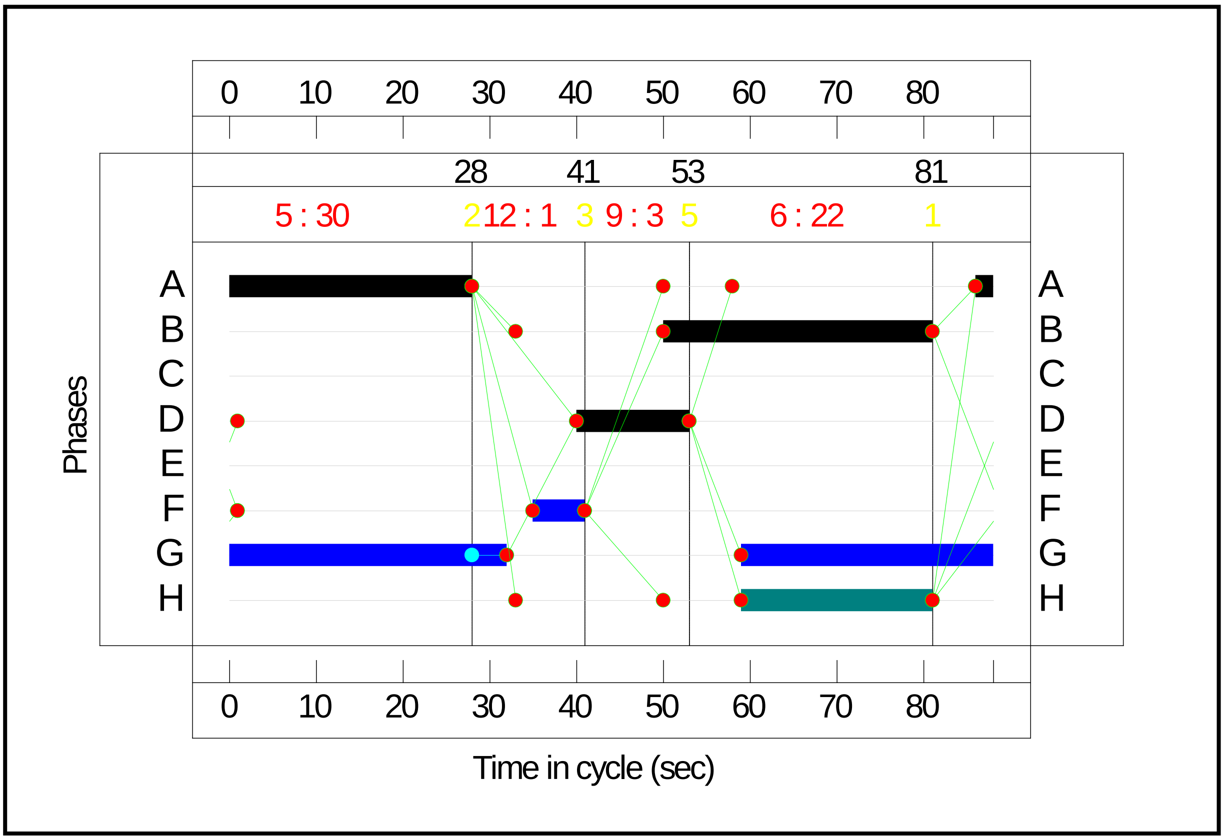
	Starting Phase		
Terminating Phase		A	B
	A		5
	B	8	

Signal Timings Diagram

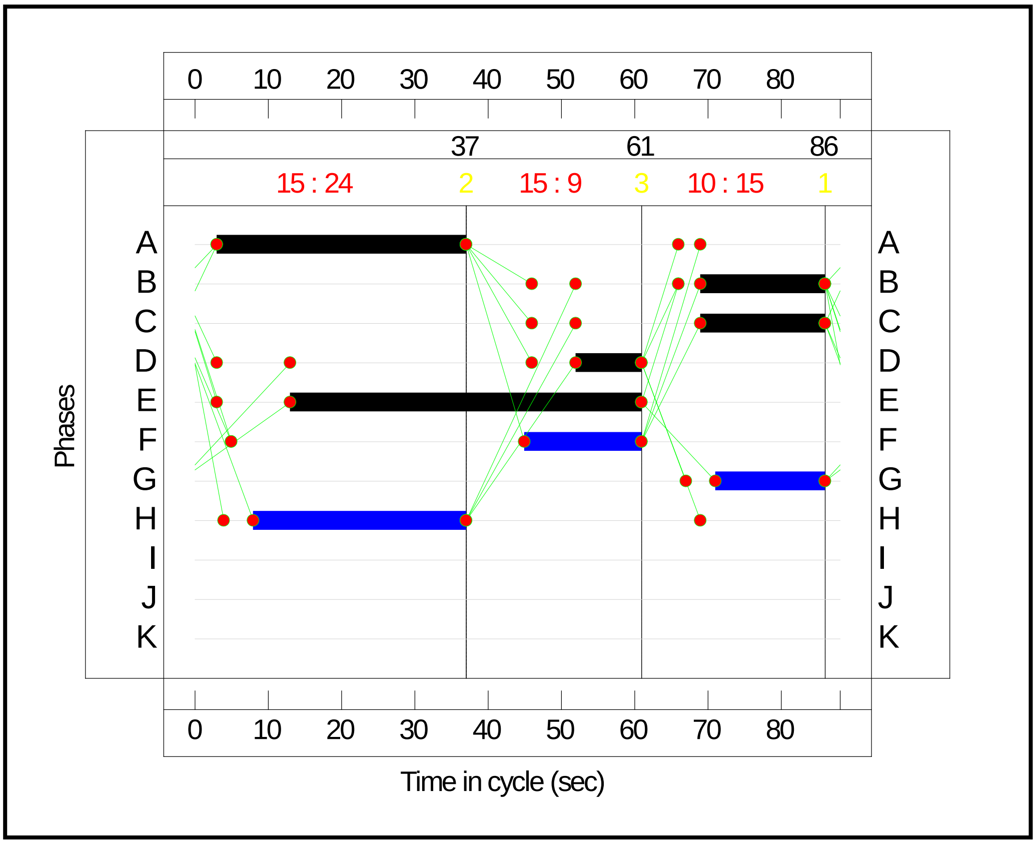
C1 - 00/005 Victoria Embankment / Temple Avenue



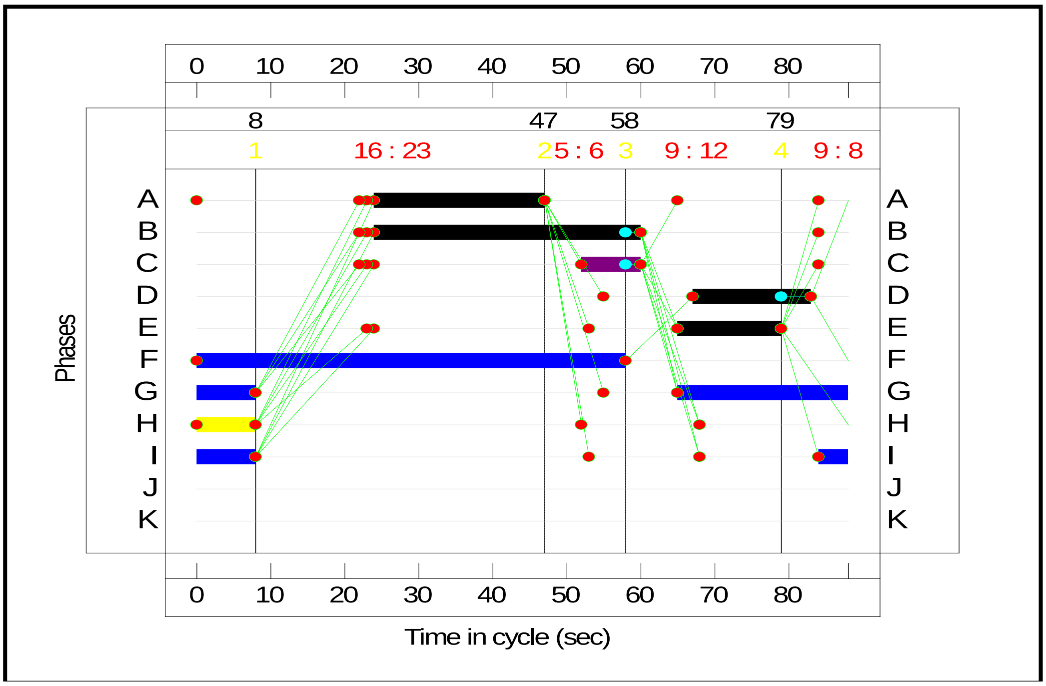
C2 - 00/006 Victoria Embankment / Blackfriars Bridge



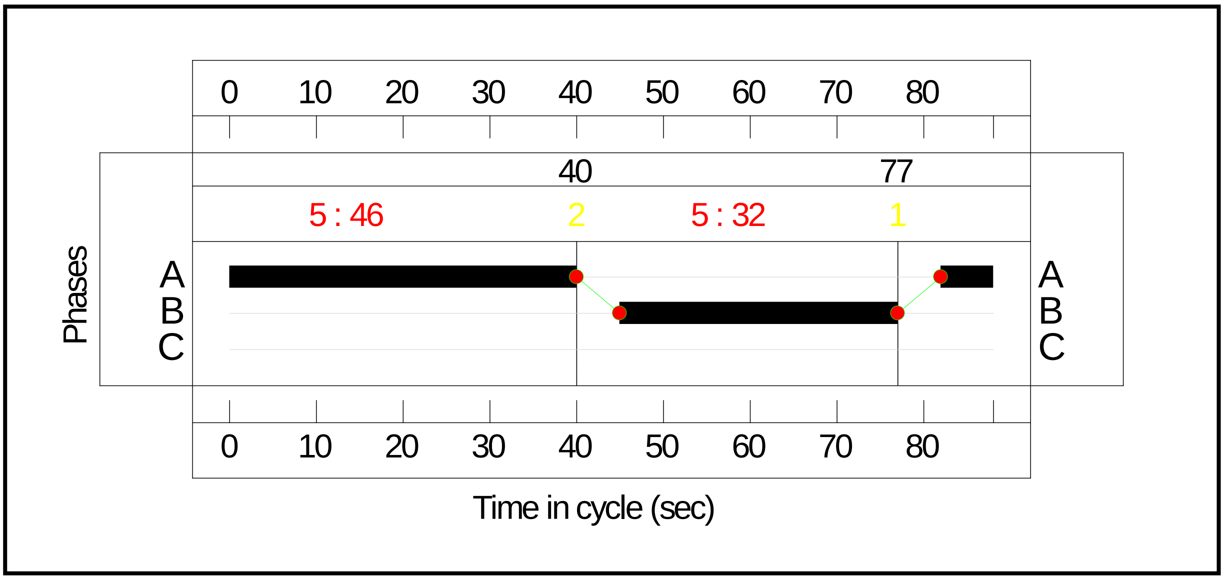
C3 - 00/122 Victoria Embankment / New Bridge Road



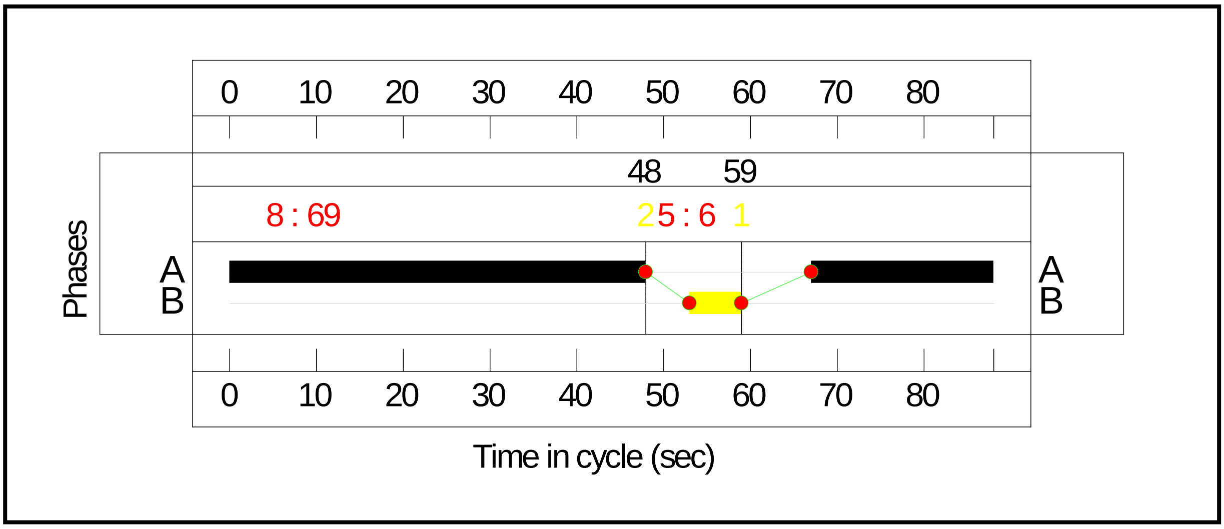
C4 - J00/007 Queen Victoria Street / Puddle Dock



C5 - 00/059 Upper Thames Street / Puddle Dock



C6 - 00/123 Blackfriars Bridge ped crossing



Network Results

Item	Lane Description	Lane Type	Total Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: Blackfriars Bridge Junction	**-**	**-**	**-**	**-**	**-**	**-**	**99.8%**	**109.6**	**-**	**-**
J1: 00/005	**-**	**-**	**-**	**-**	**-**	**-**	**89.4%**	**21.2**	**-**	**-**
1/1	Victoria Embankment (e/b) Ahead	U	52	955	1773	1068	89.4%	8.0	30.0	23.9
1/2	Victoria Embankment (e/b) Ahead	U	52	706	1773	1068	66.1%	3.2	16.5	12.3
2/1	Temple Avenue Right Left	U	25	127	1729	511	24.9%	1.0	28.3	2.5
3/1	Victoria Embankment (w/b) Ahead	U	53	315	1773	1088	29.0%	0.6	6.6	2.8
3/2	Victoria Embankment (w/b) Ahead	U	53	681	1773	1088	62.6%	2.9	15.1	11.2
3/3	Victoria Embankment (w/b) Ahead	U	53	699	1773	1088	64.2%	3.0	15.5	11.8
4/1		U	-	315	Inf	Inf	0.0%	0.0	0.0	0.0
4/2		U	-	681	Inf	Inf	0.0%	0.0	0.0	0.0
4/3		U	-	786	Inf	Inf	0.0%	0.0	0.0	0.0
5/1	Left	U	-	412	1800	1800	22.9%	0.1	1.3	0.1
5/2	Ahead	U	-	593	1800	1800	32.9%	0.2	1.5	0.2
5/3	Ahead	U	-	706	1800	1800	39.2%	0.3	1.6	0.3
6/1	Blackfriars Underpass (w/b) Ahead	U	-	728	1800	1800	40.4%	0.3	1.7	0.3
6/2	Blackfriars Underpass (w/b) Ahead	U	-	652	1800	1800	36.2%	0.3	1.6	0.3
7/1	Victoria Embankment - w/b on-slip Ahead	O	-	315	1800	555	56.8%	1.2	14.2	6.8
J2: 00/006	**-**	**-**	**-**	**-**	**-**	**-**	**87.1%**	**17.8**	**-**	**-**
1/1	Blackfriars Bridge Road (n/b) Ahead Left	U	30	560	1965	692	80.9%	6.1	39.0	14.3
1/2	Blackfriars Bridge Road (n/b) Ahead	U	30	314	1965	692	45.4%	2.3	26.7	6.3
2/1	Blackfriars Bridge Road - internal SL (w/b +n/b) Ahead	U	-	1099	Inf	Inf	0.0%	0.0	0.0	0.0
2/2	Blackfriars Bridge Road - internal SL (w/b +n/b) Ahead	U	-	636	1940	1940	32.8%	0.2	1.4	0.2

2/3+2/4	Blackfriars Bridge Road - internal SL (w/b +n/b) U-Turn Right	U	31	273	1853:1550	677	40.3%	2.6	34.9	6.1
3/1	Ahead	U	-	498	2015	2015	24.7%	0.2	1.2	0.2
3/2	Ahead	U	-	338	2015	2015	16.8%	0.1	1.1	0.1
4/1	Victoria Embankment - e/b off-slip Ahead	U	13	256	1848	294	87.1%	5.0	70.7	9.0
4/2	Victoria Embankment - e/b off-slip Ahead	U	13	122	1848	294	41.5%	1.3	37.3	3.0
J3: 00/122	**-**	**-**	**-**	**-**	**-**	**-**	**99.8%**	**46.9**	**-**	**-**
1/1	Queen Victoria Street - internal SL (w/b) Left	U	17	364	1866	382	95.4%	9.6	95.4	14.9
1/2	Queen Victoria Street - internal SL (w/b) Left Right	U	17	210	1866	382	55.0%	1.4	24.4	4.6
2/1	Blackfriars Bridge Road - internal SL (n/b) Ahead	U	48	754	1853	1032	73.1%	1.4	6.6	4.4
2/2	Blackfriars Bridge Road - internal SL (n/b) Ahead	U	48	256	1852	1031	24.8%	0.2	3.5	2.3
2/3	Blackfriars Bridge Road - internal SL (n/b) Right	U	9	204	1882	214	95.4%	6.5	114.4	10.1
3/1	Ahead	U	-	754	1918	1918	39.3%	0.3	1.5	0.3
3/2	Ahead	U	-	466	1918	1918	24.3%	0.2	1.2	0.2
4/1		U	-	754	1800	1800	41.9%	0.4	1.7	0.4
4/2		U	-	466	1800	1800	25.9%	0.2	1.3	0.2
5/1	New Bridge Street (s/b) Ahead	U	34	671	1965	782	85.9%	7.4	39.7	17.8
5/2	New Bridge Street (s/b) Ahead	U	34	780	1965	782	99.8%	19.3	89.2	32.4
J4: 00/007	**-**	**-**	**-**	**-**	**-**	**-**	**71.1%**	**10.3**	**-**	**-**
1/1	Queen Victoria Street - Internal SL (e/b) Ahead	U	36	209	1965	826	25.3%	1.0	17.9	4.9
1/2	Queen Victoria Street - Internal SL (e/b) Ahead Right	O	36	16	1805	528	3.0%	0.1	20.1	0.3

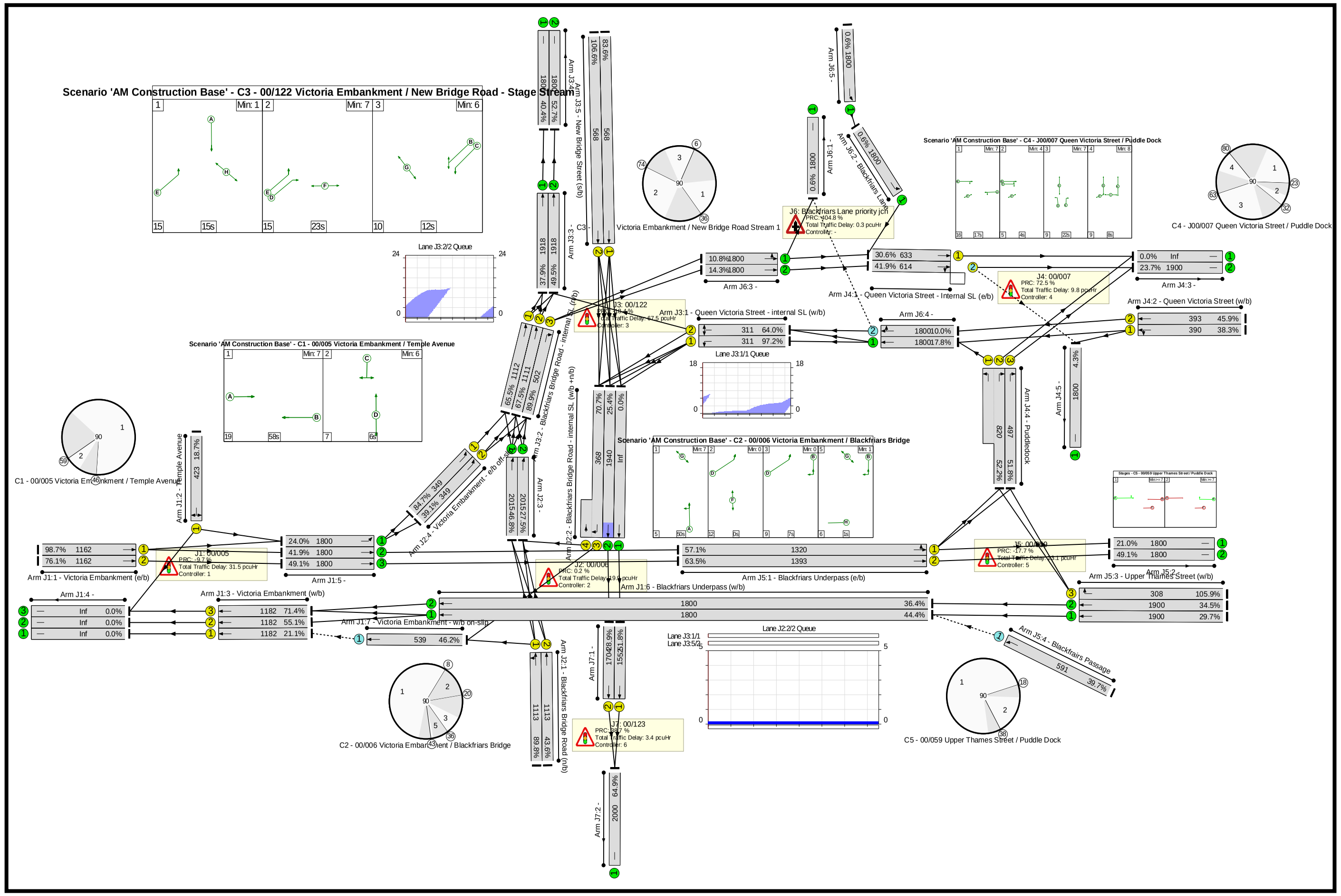
2/1	Queen Victoria Street (w/b) Left Ahead	U	23	152	1950	532	28.6%	1.3	30.0	3.1
2/2	Queen Victoria Street (w/b) Ahead	U	23	186	1965	536	34.7%	1.6	30.9	3.9
3/1		U	-	355	Inf	Inf	0.0%	0.0	0.0	0.0
3/2		U	-	158	1900	1900	8.3%	0.0	1.0	0.0
4/2+4/1	Puddledock Right Left	U	14:16	386	1800:1748	543	71.1%	3.8	35.2	11.3
4/3	Puddledock Right	U	14	158	1789	305	51.8%	2.4	55.7	4.4
5/1		U	-	28	1800	1800	1.6%	0.0	1.0	0.0
J5: 00/059	**-**	**-**	**-**	**-**	**-**	**-**	**69.6%**	**7.8**	**-**	**-**
1/1	Blackfriars Underpass (e/b) Left Ahead	U	46	593	1800	961	61.7%	2.3	14.2	6.3
1/2	Blackfriars Underpass (e/b) Ahead	U	46	706	1900	1015	69.6%	2.7	13.8	8.1
2/1		U	-	289	1800	1800	16.1%	0.1	1.2	0.1
2/2		U	-	706	1800	1800	39.2%	0.3	1.6	0.3
3/1	Upper Thames Street (w/b) Ahead	U	-	480	1900	1900	25.3%	0.2	1.3	0.2
3/2	Upper Thames Street (w/b) Ahead	U	-	652	1900	1900	34.3%	0.3	1.4	0.3
3/3	Upper Thames Street (w/b) Right	U	32	231	1734	650	35.5%	1.5	24.1	4.3
4/1	Blackfrairs Passage Ahead	O	-	248	1940	609	40.7%	0.3	5.0	0.3
J6: Blackfriars Lane priority jcn	**-**	**-**	**-**	**-**	**-**	**-**	**21.1%**	**0.3**	**-**	**-**
1/1		U	-	10	1800	1800	0.6%	0.0	1.0	0.0
2/1	Blackfriars Lane Left	U	-	10	1800	1800	0.6%	0.0	1.0	0.0
3/1	Ahead Left	U	-	209	1800	1800	11.6%	0.1	1.1	0.1
3/2	Ahead	U	-	16	1800	1800	0.9%	0.0	1.0	0.0
4/1	Ahead	U	-	380	1800	1800	21.1%	0.1	1.3	0.1
4/2	Ahead Right	O	-	186	1800	1800	10.3%	0.1	1.1	0.1
5/1	Ahead	U	-	10	1800	1800	0.6%	0.0	1.0	0.0
J7: 00/123	**-**	**-**	**-**	**-**	**-**	**-**	**77.1%**	**5.3**	**-**	**-**

1/1	Ahead	U	69	1099	1940	1543	71.2%	1.5	4.9	16.5
1/2	Ahead	U	69	636	2130	1694	37.5%	0.4	2.4	1.0
2/1		U	-	1542	2000	2000	77.1%	3.4	7.9	30.0

C1 - 00/005 Victoria Embankment / Temple Avenue	PRC for Signalled Lanes (%):	0.6	Total Delay for Signalled Lanes (pcuHr):	18.62	Cycle Time (s):	88
C2 - 00/006 Victoria Embankment / Blackfriars Bridge	PRC for Signalled Lanes (%):	3.4	Total Delay for Signalled Lanes (pcuHr):	17.33	Cycle Time (s):	88
C3 - 00/122 Victoria Embankment / New Bridge RoadStream: 1	PRC for Signalled Lanes (%):	-10.9	Total Delay for Signalled Lanes (pcuHr):	45.91	Cycle Time (s):	88
C4 - J00/007 Queen Victoria Street / Puddle Dock	PRC for Signalled Lanes (%):	26.6	Total Delay for Signalled Lanes (pcuHr):	10.21	Cycle Time (s):	88
C5 - 00/059 Upper Thames Street / Puddle Dock	PRC for Signalled Lanes (%):	29.4	Total Delay for Signalled Lanes (pcuHr):	6.60	Cycle Time (s):	88
C6 - 00/123 Blackfriars Bridge ped crossing	PRC for Signalled Lanes (%):	26.4	Total Delay for Signalled Lanes (pcuHr):	1.93	Cycle Time (s):	88
	PRC Over All Lanes (%):	-10.9	Total Delay Over All Lanes(pcuHr):	109.61		

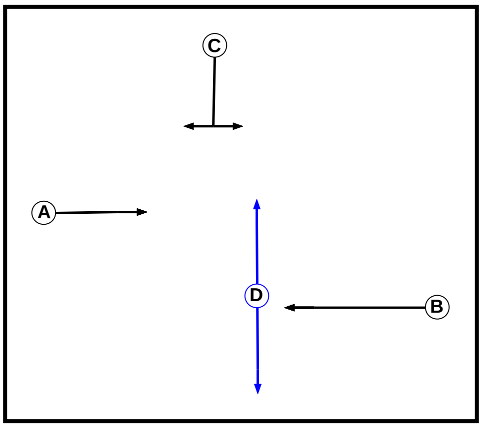
D.3 Construction base case results, AM peak hour

Network Layout Diagram

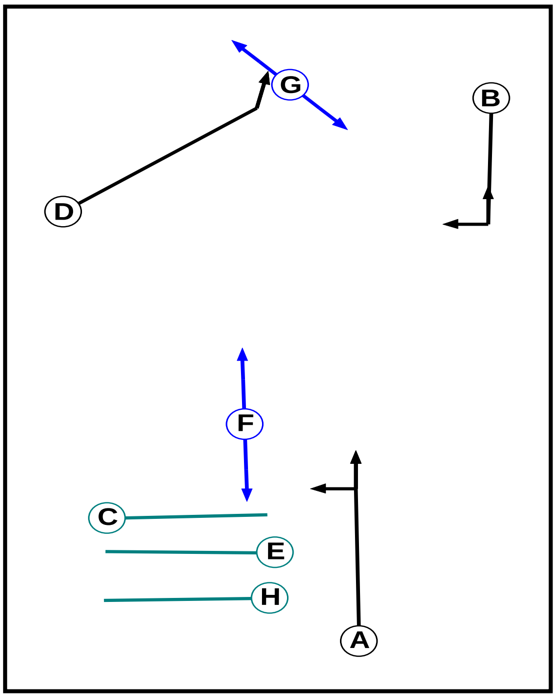


Phase Diagram

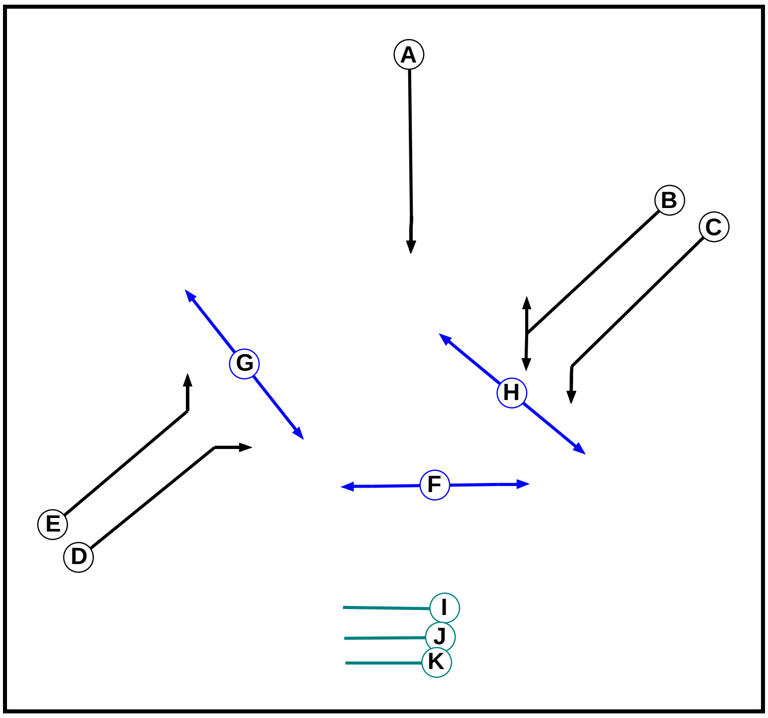
C1 - 00/005 Victoria Embankment / Temple Avenue



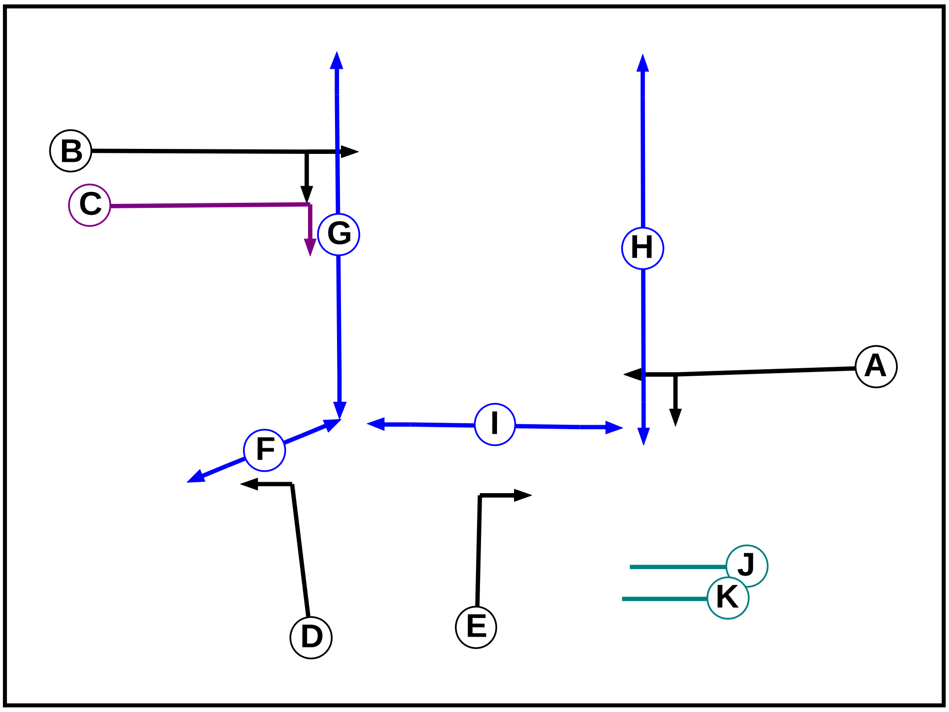
C2 - 00/006 Victoria Embankment / Blackfriars Bridge



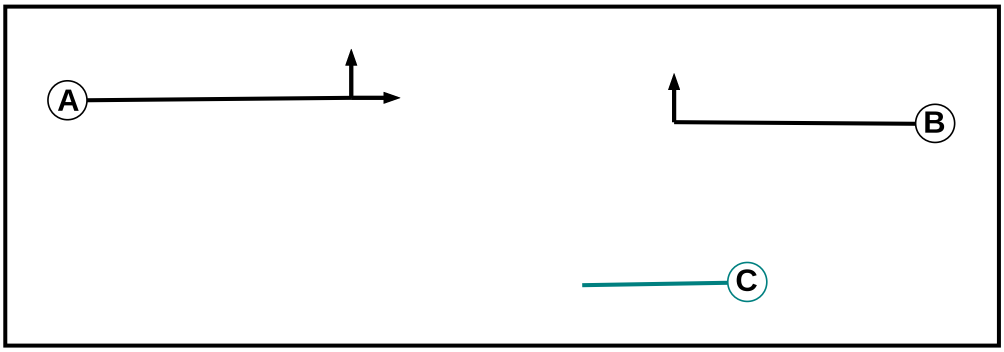
C3 - 00/122 Victoria Embankment / New Bridge Road



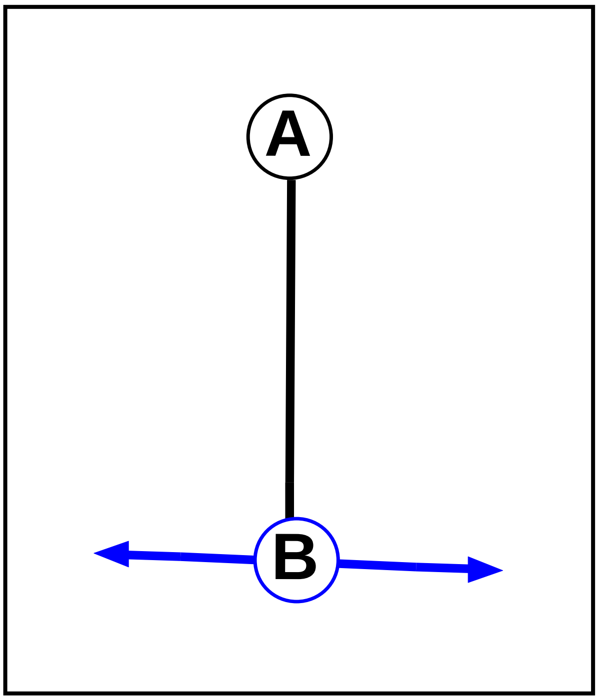
C4 - J00/007 Queen Victoria Street / Puddle Dock



C5 - 00/059 Upper Thames Street / Puddle Dock

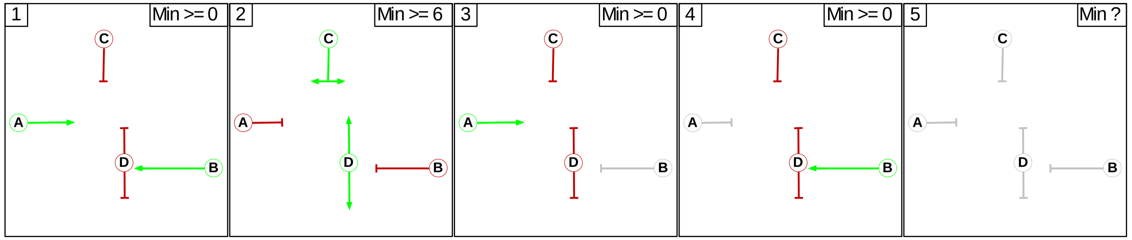


C6 - 00/123 Blackfriars Bridge ped crossing

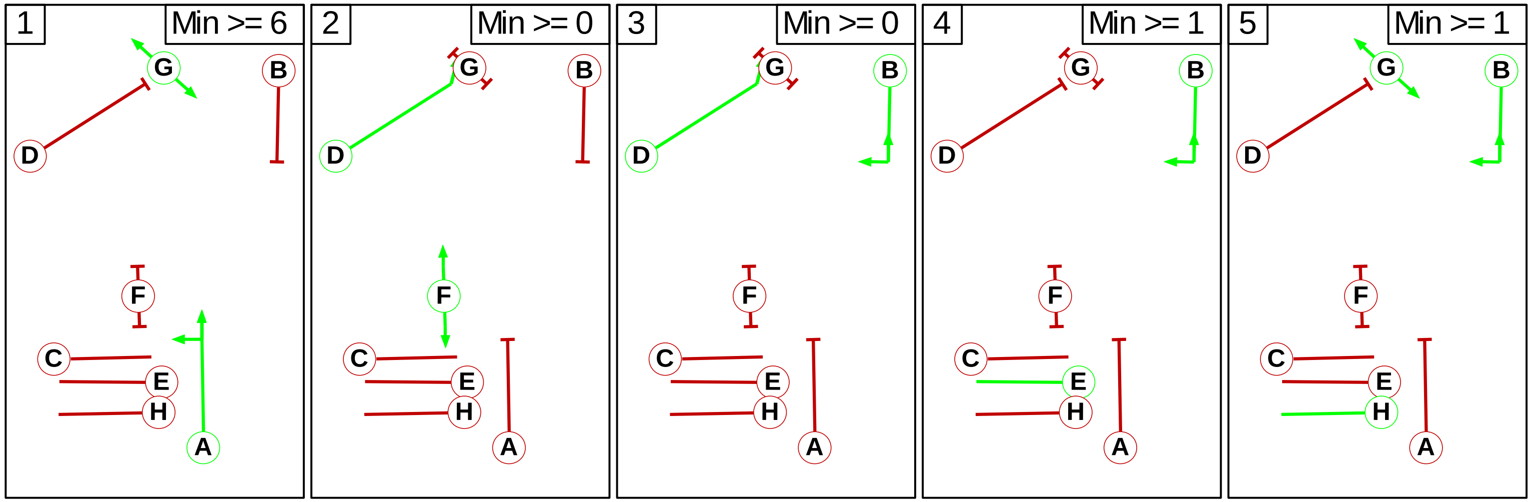


Stage Diagram

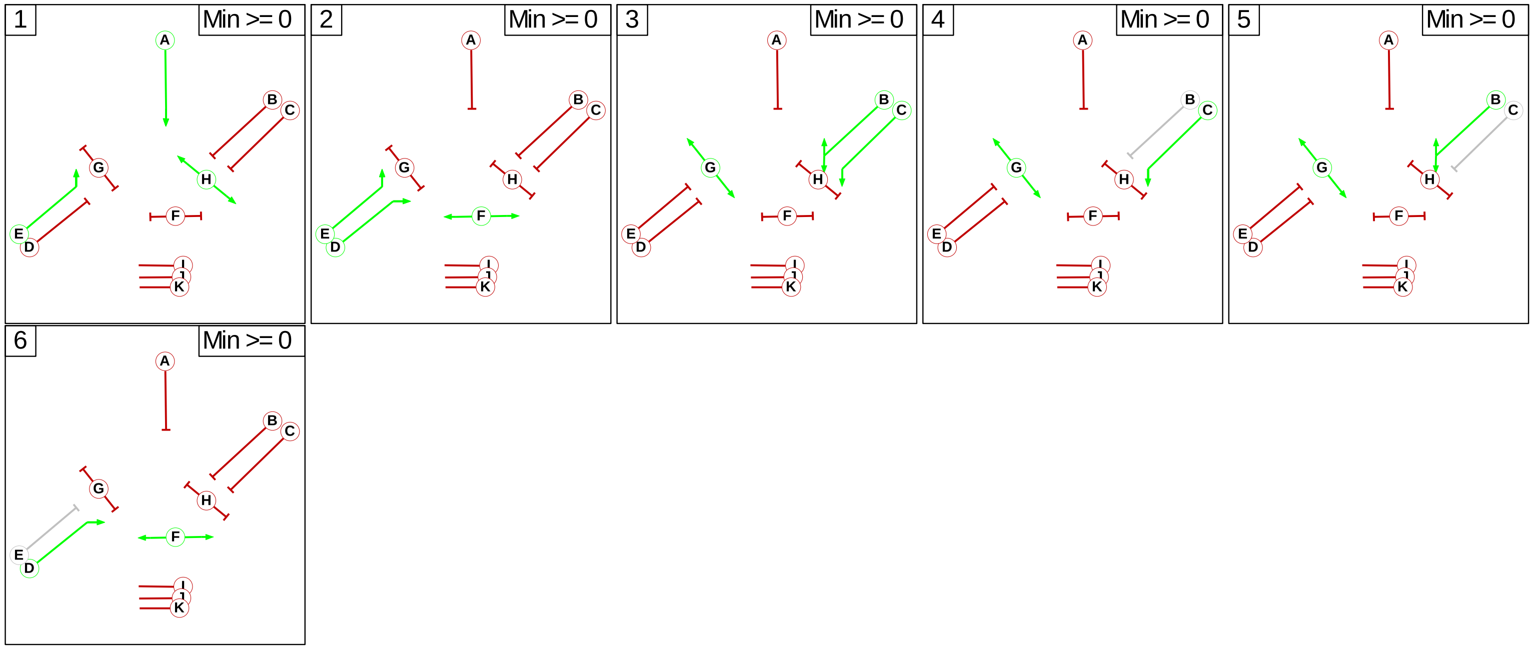
C1 - 01/094 Victoria Embankment / Temple Avenue



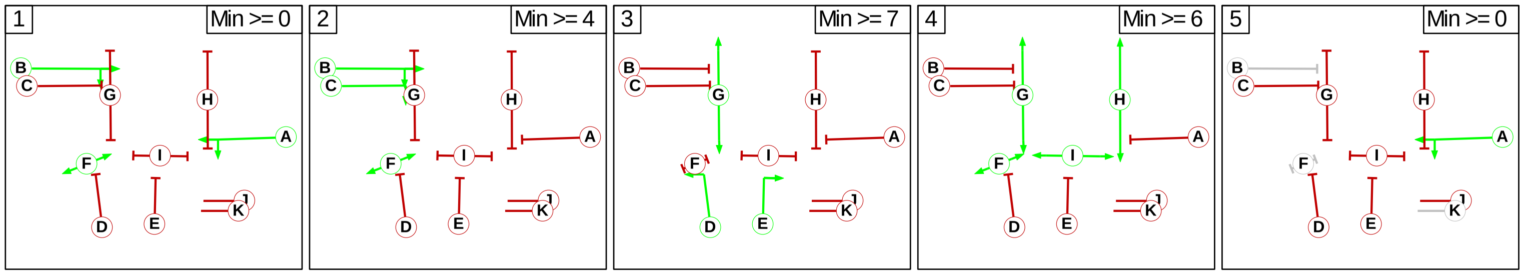
C2 - 00/006 Victoria Embankment / Blackfriars Bridge



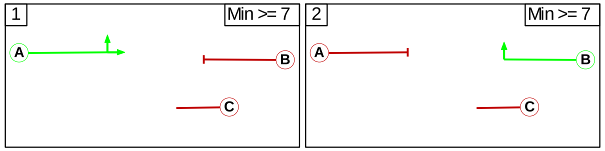
C3 - 00/122 Victoria Embankment / New Bridge Road
Stage Stream: 1



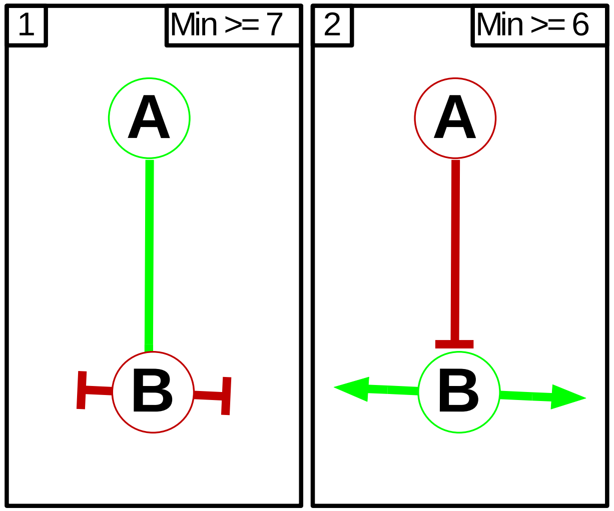
C4 - J00/007 Queen Victoria Street / Puddle Dock



C5 - 00/059 Upper Thames Street / Puddle Dock



C6 - 00/123 Blackfriars Bridge ped crossing



Phases in Stage

C1 - 01/094 Victoria Embankment / Temple Avenue

Stage No.	Phases in Stage
1	A B
2	C D
3	A
4	B
5	

C2 - 00/006 Victoria Embankment / Blackfriars Bridge

Stage No.	Phases in Stage
1	A G
2	D F
3	B D
4	B E
5	B G H

C3 - 00/122 Victoria Embankment / New Bridge Road

Stream	Stage No.	Phases in Stage
1	1	A E H
1	2	D E F
1	3	B C G
1	4	C G
1	5	B G
1	6	D F

C4 - J00/007 Queen Victoria Street / Puddle Dock

Stage No.	Phases in Stage
1	A B F
2	B C F
3	D E G
4	F G H I
5	A

C5 - 00/059 Upper Thames Street / Puddle Dock

Stage No.	Phases in Stage
1	A
2	B

C6 - 00/123 Blackfriars Bridge ped crossing

Stage No.	Phases in Stage
1	A
2	B

Phase Intergreens Matrix

C1 - 01/094 Victoria Embankment / Temple Avenue

		Starting Phase			
		A	B	C	D
Terminating Phase	A		-	5	7
	B	-		5	5
	C	5	5		-
	D	19	19	-	

C2 - 00/006 Victoria Embankment / Blackfriars Bridge

		Starting Phase							
		A	B	C	D	E	F	G	H
Terminating Phase	A		5	3	12	5	7	-	5
	B	5		3	-	-	8	-	-
	C	2	2		2	2	2	2	2
	D	5	-	3		3	-	6	6
	E	5	-	3	2		8	2	2
	F	9	9	4	-	9		-	9
	G	-	-	3	8	3	-		-
	H	5	-	3	8	3	8	-	

C3 - 00/122 Victoria Embankment / New Bridge Road

		Starting Phase										
		A	B	C	D	E	F	G	H	I	J	K
Terminating Phase	A		9	9	9	-	8	-	-	9	9	3
	B	5		-	5	5	7	-	6	5	5	3
	C	5	-		-	-	7	-	10	5	5	3
	D	5	5	-		-	-	6	8	3	3	3
	E	-	5	-	-		-	10	-	-	-	3
	F	8	8	8	-	-		-	-	-	-	3
	G	-	-	-	15	15	-		-	-	-	4
	H	-	15	15	15	-	-	-		5	4	4
	I	9	5	2	2	-	-	-	9		9	4
	J	5	5	2	2	-	-	-	2	5		3
	K	2	2	2	2	2	2	2	2	2	2	

C4 - J00/007 Queen Victoria Street / Puddle Dock

		Starting Phase										
		A	B	C	D	E	F	G	H	I	J	K
Terminating Phase	A		-	5	8	6	-	8	5	6	3	-
	B	-		-	-	5	-	5	8	8	3	3
	C	5	-		-	5	-	5	8	8	3	5
	D	5	-	-		-	5	-	-	-	3	5
	E	5	5	5	-		-	-	9	5	3	5
	F	-	-	-	9	-		-	-	-	4	4
	G	14	14	14	-	-	-		-	-	7	14
	H	15	15	15	-	15	-	-		-	8	15
	I	16	16	16	-	16	-	-	-		8	16
	J	2	2	2	2	2	2	2	2	2		2
	K	-	2	5	8	6	2	8	5	6	3	

C5 - 00/059 Upper Thames Street / Puddle Dock

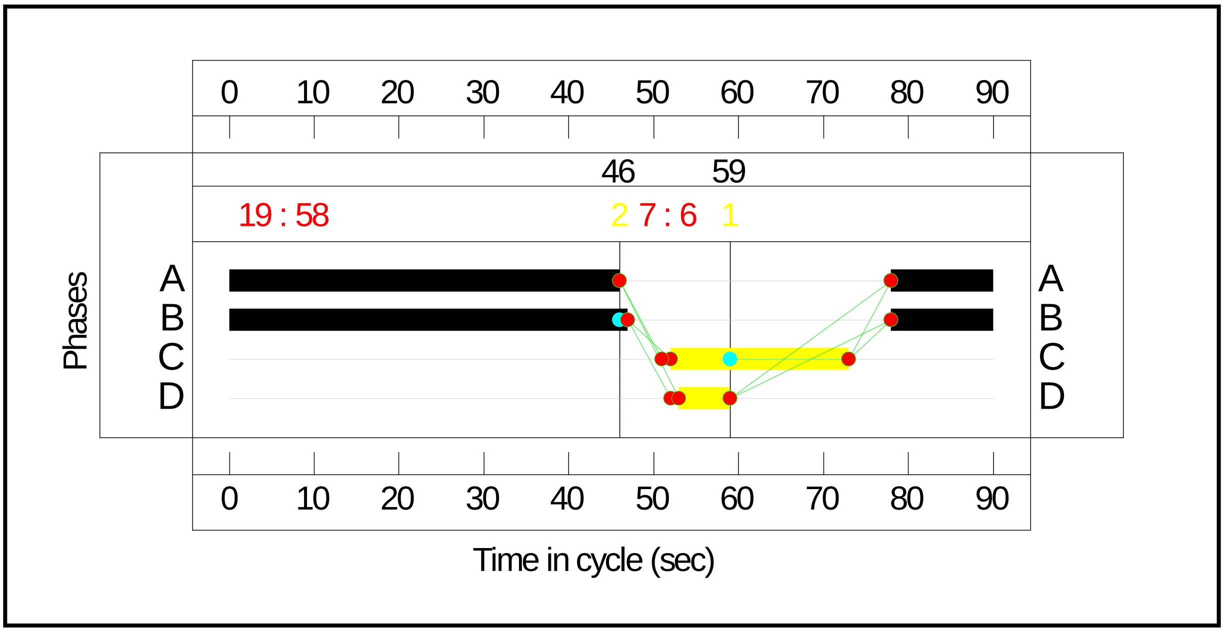
		Starting Phase		
Terminating Phase		A	B	C
	A		5	3
	B	5		3
	C	2	2	

C6 - 00/123 Blackfriars Bridge ped crossing

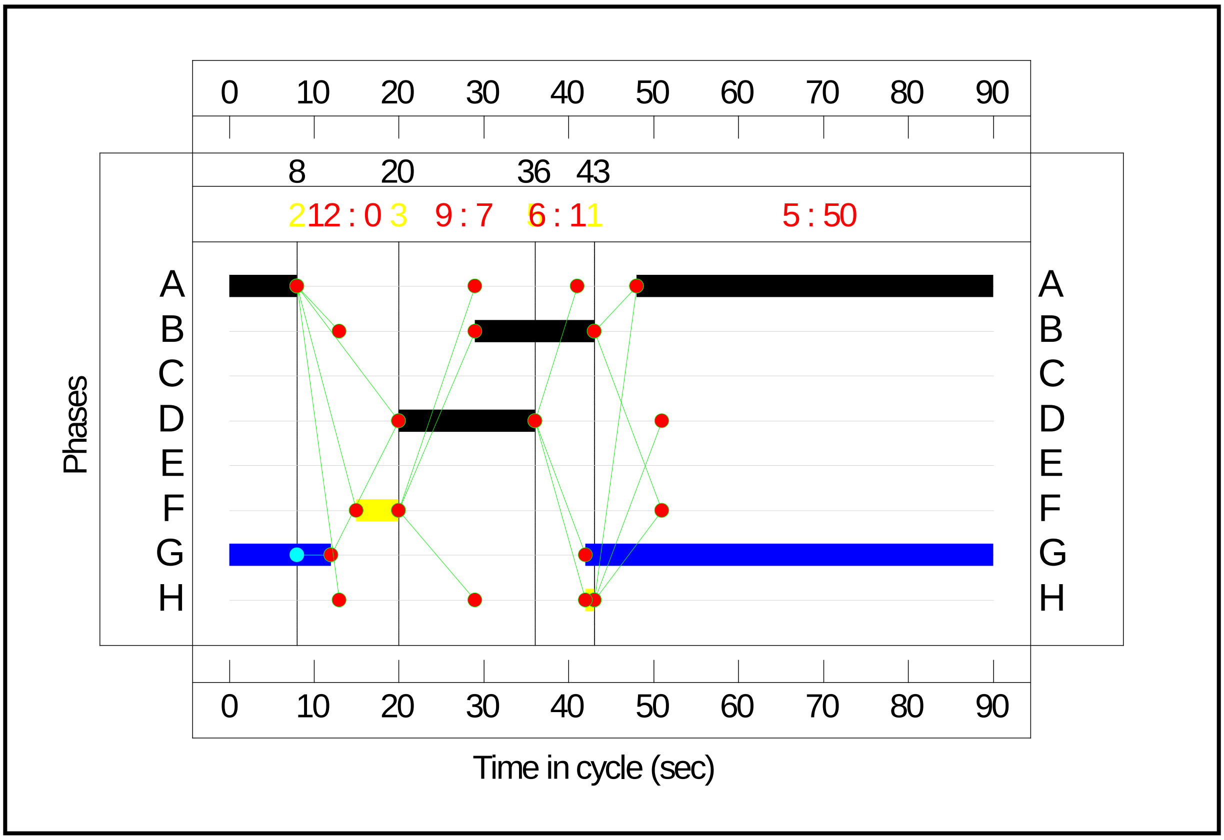
		Starting Phase	
Terminating Phase		A	B
	A		5
	B	8	

Signal Timings Diagram

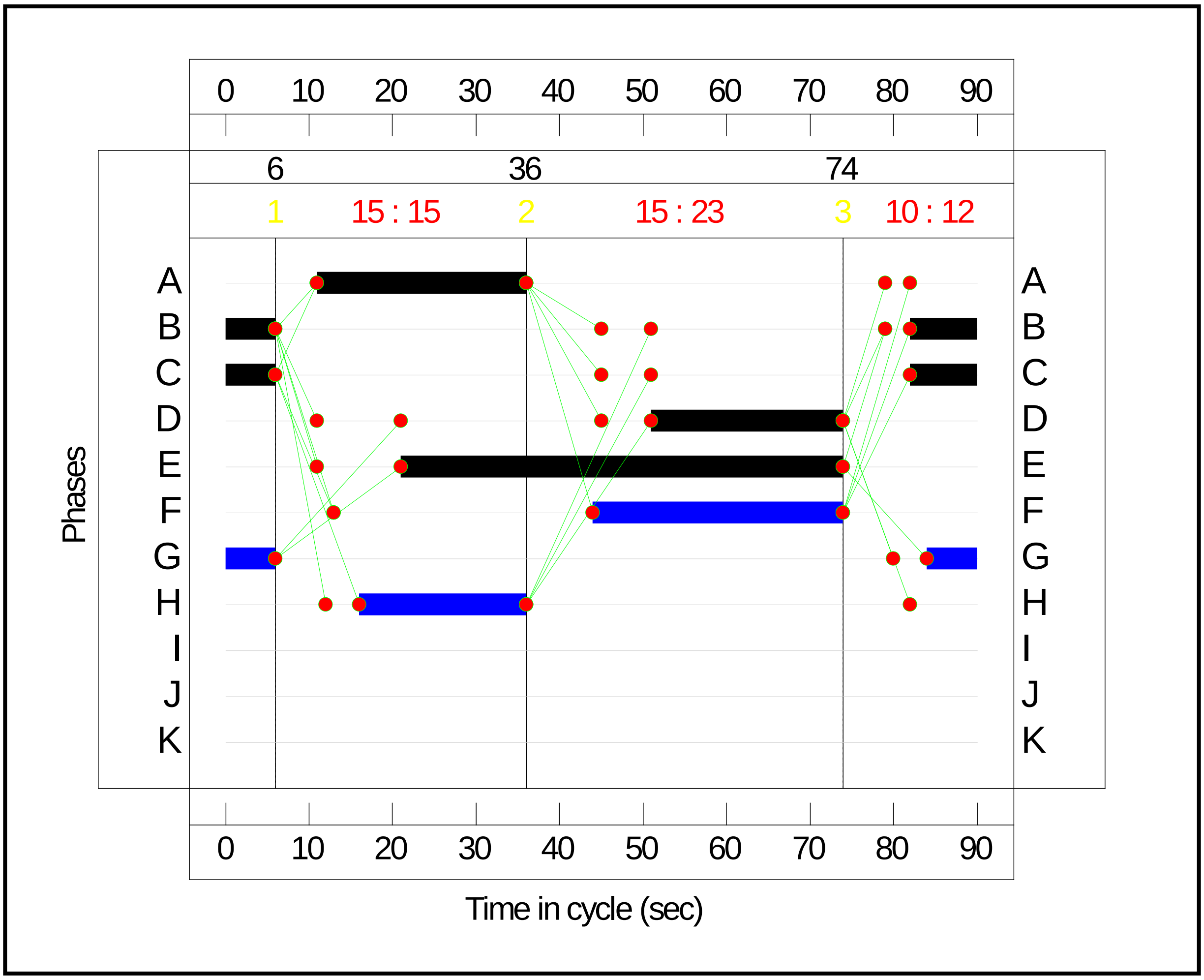
C1 - 00/005 Victoria Embankment / Temple Avenue



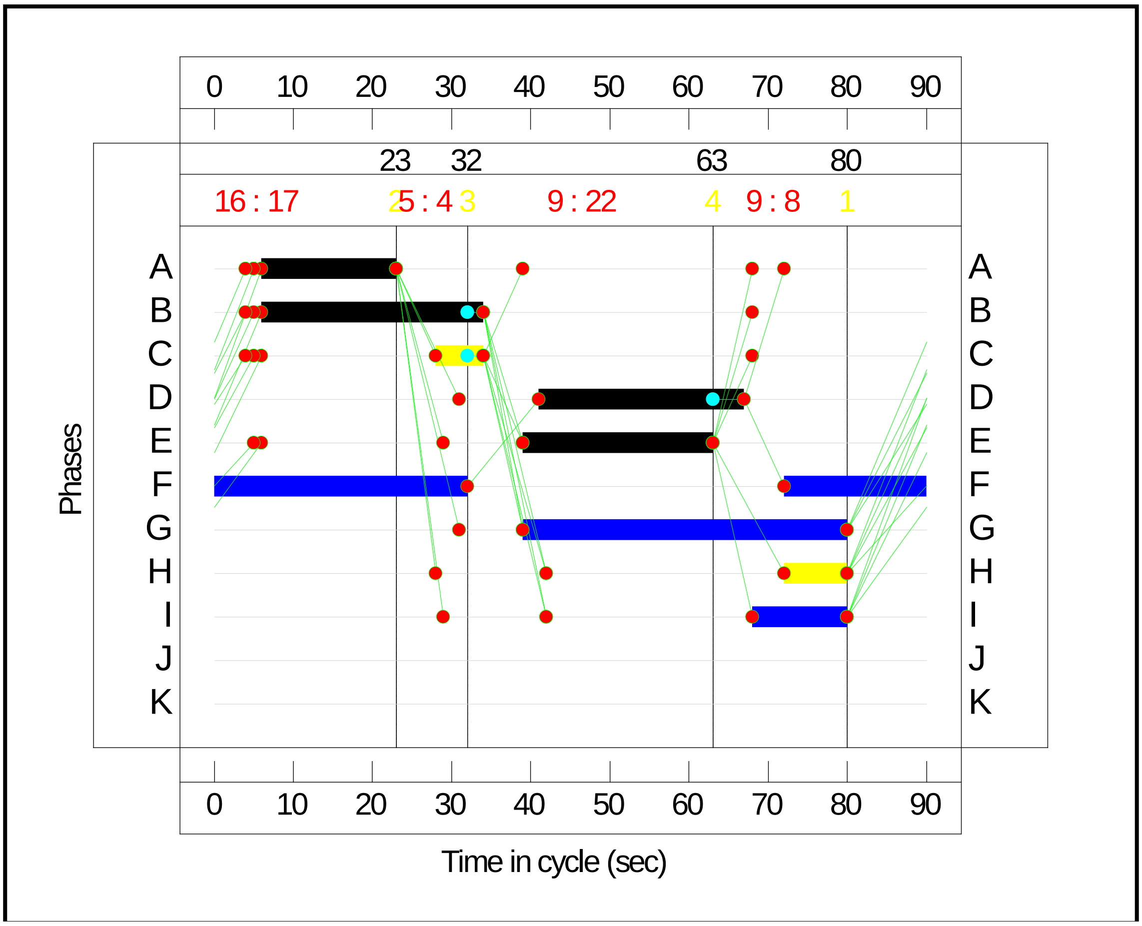
C2 - 00/006 Victoria Embankment / Blackfriars Bridge



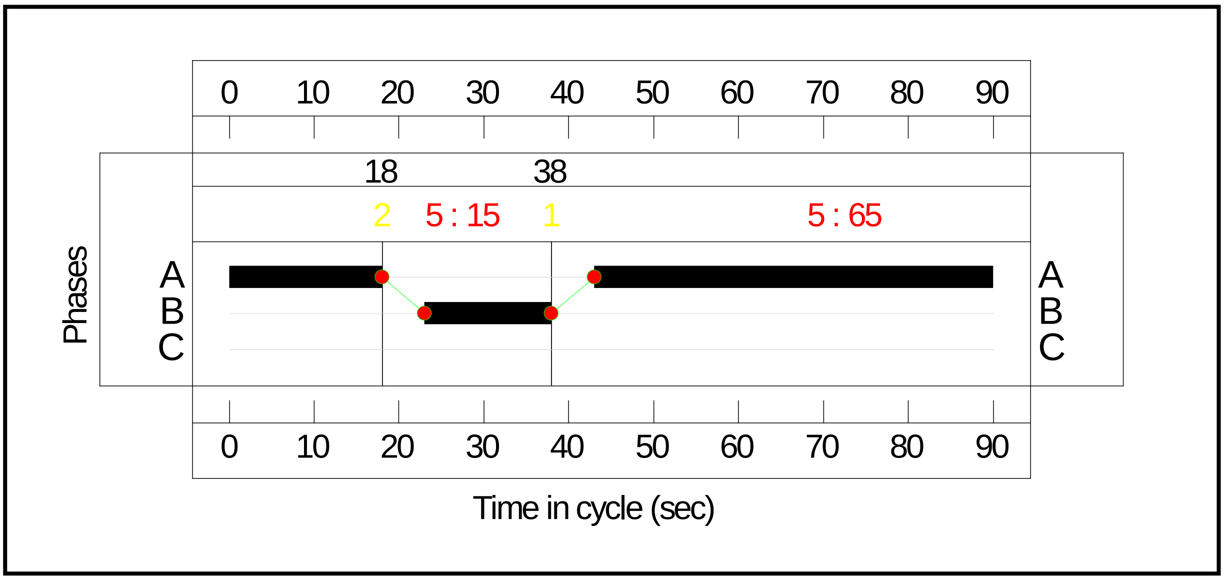
C3 - 00/122 Victoria Embankment / New Bridge Road



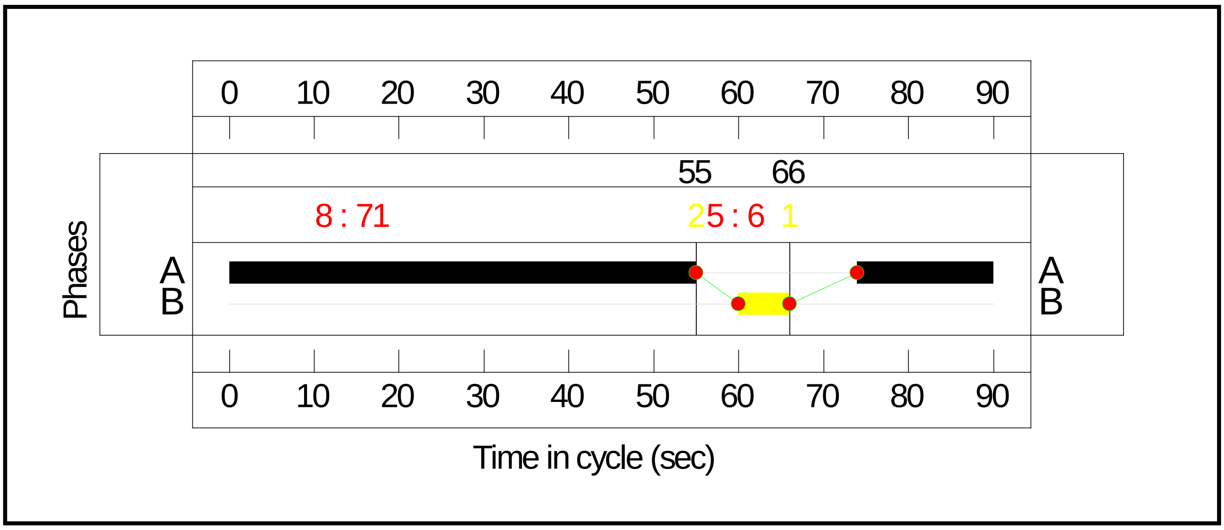
C4 - J00/007 Queen Victoria Street / Puddle Dock



C5 - 00/059 Upper Thames Street / Puddle Dock



C6 - 00/123 Blackfriars Bridge ped crossing



Network Results

Item	Lane Description	Lane Type	Total Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: Blackfriars Bridge Junction	-	-	-	-	-	-	**106.6%**	**155.5**	-	-
J1: 00/005	-	-	-	-	-	-	**98.7%**	**31.5**	-	-
1/1	Victoria Embankment (e/b) Ahead	U	58	1147	1773	1162	98.7%	18.4	57.6	41.3
1/2	Victoria Embankment (e/b) Ahead	U	58	885	1773	1162	76.1%	4.2	17.1	16.6
2/1	Temple Avenue Right Left	U	21	79	1729	423	18.7%	0.7	32.2	1.7
3/1	Victoria Embankment (w/b) Ahead	U	59	261	1773	1182	21.1%	0.3	4.3	1.2
3/2	Victoria Embankment (w/b) Ahead	U	59	651	1773	1182	55.1%	2.0	11.3	9.1
3/3	Victoria Embankment (w/b) Ahead	U	59	844	1773	1182	71.4%	3.5	14.8	14.6
4/1		U	-	261	Inf	Inf	0.0%	0.0	0.0	0.0
4/2		U	-	651	Inf	Inf	0.0%	0.0	0.0	0.0
4/3		U	-	887	Inf	Inf	0.0%	0.0	0.0	0.0
5/1	Left	U	-	432	1800	1800	24.0%	0.2	1.3	0.2
5/2	Ahead	U	-	753	1800	1800	41.9%	0.4	1.7	0.4
5/3	Ahead	U	-	885	1800	1800	49.1%	0.5	2.0	0.5
6/1	Blackfriars Underpass (w/b) Ahead	U	-	799	1800	1800	44.4%	0.4	1.8	0.4
6/2	Blackfriars Underpass (w/b) Ahead	U	-	655	1800	1800	36.4%	0.3	1.6	0.3
7/1	Victoria Embankment - w/b on-slip Ahead	O	-	261	1800	539	46.2%	0.7	10.6	5.1
J2: 00/006	-	-	-	-	-	-	**89.8%**	**19.9**	-	-
1/1	Blackfriars Bridge Road (n/b) Ahead Left	U	50	1000	1965	1113	89.8%	8.9	32.0	26.0
1/2	Blackfriars Bridge Road (n/b) Ahead	U	50	485	1965	1113	43.6%	1.9	14.1	7.3
2/1	Blackfriars Bridge Road - internal SL (w/b +n/b) Ahead	U	-	595	Inf	Inf	0.0%	0.0	0.0	0.0

2/2	Blackfriars Bridge Road - internal SL (w/b +n/b) Ahead	U	-	522	1940	1940	25.4%	0.2	1.2	0.2
2/3+2/4	Blackfriars Bridge Road - internal SL (w/b +n/b) U-Turn Right	U	14	275	1853:1550	368	70.7%	1.9	26.5	4.3
3/1	Ahead	U	-	942	2015	2015	46.8%	0.4	1.7	0.4
3/2	Ahead	U	-	557	2015	2015	27.5%	0.2	1.2	0.2
4/1	Victoria Embankment - e/b off-slip Ahead	U	16	296	1848	349	84.7%	5.0	61.4	9.7
4/2	Victoria Embankment - e/b off-slip Ahead	U	16	137	1848	349	39.1%	1.4	35.7	3.4
J3: 00/122	-	-	-	-	-	-	**106.6%**	**67.5**	-	-
1/1	Queen Victoria Street - internal SL (w/b) Left	U	14	313	1866	311	97.2%	8.9	106.2	14.3
1/2	Queen Victoria Street - internal SL (w/b) Left Right	U	14	200	1866	311	64.0%	2.5	46.0	5.8
2/1	Blackfriars Bridge Road - internal SL (n/b) Ahead	U	53	728	1853	1112	65.5%	4.4	21.5	16.0
2/2	Blackfriars Bridge Road - internal SL (n/b) Ahead	U	53	751	1852	1111	67.5%	4.8	23.0	12.9
2/3	Blackfriars Bridge Road - internal SL (n/b) Right	U	23	452	1882	502	89.9%	7.1	56.7	14.0
3/1	Ahead	U	-	728	1918	1918	37.9%	0.3	1.5	0.3
3/2	Ahead	U	-	951	1918	1918	49.5%	0.5	1.9	0.5
4/1		U	-	728	1800	1800	40.4%	0.3	1.7	0.3
4/2		U	-	951	1800	1800	52.7%	0.6	2.1	0.6
5/1	New Bridge Street (s/b) Ahead	U	25	475	1965	568	83.6%	6.4	48.4	13.5
5/2	New Bridge Street (s/b) Ahead	U	25	605	1965	568	106.6%	31.7	188.9	40.8
J4: 00/007	-	-	-	-	-	-	**52.2%**	**9.8**	-	-
1/1	Queen Victoria Street - Internal SL (e/b) Ahead	U	28	194	1965	633	30.6%	0.6	10.3	1.9

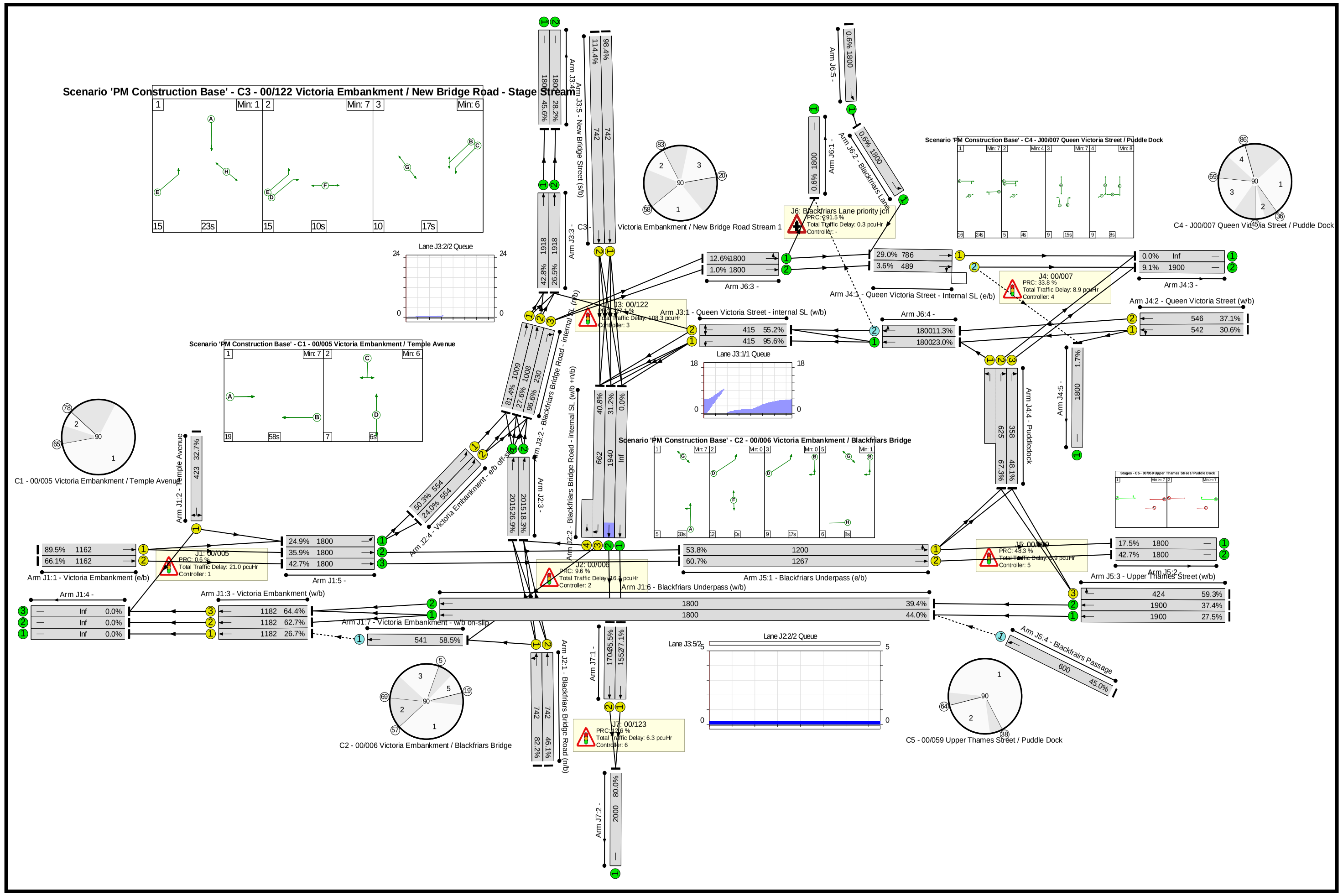
1/2	Queen Victoria Street - Internal SL (e/b) Ahead Right	O	28	258	1905	614	41.9%	0.8	11.0	2.7
2/1	Queen Victoria Street (w/b) Left Ahead	U	17	149	1948	390	38.3%	1.6	38.7	3.5
2/2	Queen Victoria Street (w/b) Ahead	U	17	180	1965	393	45.9%	2.0	40.2	4.4
3/1		U	-	437	Inf	Inf	0.0%	0.0	0.0	0.0
3/2		U	-	458	1900	1900	23.7%	0.2	1.2	0.2
4/2+4/1	Puddledock Right Left	U	24:26	439	1800:1748	820	52.2%	2.7	22.6	5.4
4/3	Puddledock Right	U	24	264	1789	497	51.8%	2.0	27.6	5.9
5/1		U	-	77	1800	1800	4.3%	0.0	1.0	0.0
J5: 00/059	**-**	**-**	**-**	**-**	**-**	**-**	**105.9%**	**23.1**	**-**	**-**
1/1	Blackfriars Underpass (e/b) Left Ahead	U	65	753	1800	1320	57.1%	1.4	6.7	4.7
1/2	Blackfriars Underpass (e/b) Ahead	U	65	885	1900	1393	63.5%	1.5	6.1	4.4
2/1		U	-	378	1800	1800	21.0%	0.1	1.3	0.1
2/2		U	-	885	1800	1800	49.1%	0.5	2.0	0.5
3/1	Upper Thames Street (w/b) Ahead	U	-	564	1900	1900	29.7%	0.2	1.3	0.2
3/2	Upper Thames Street (w/b) Ahead	U	-	655	1900	1900	34.5%	0.3	1.4	0.3
3/3	Upper Thames Street (w/b) Right	U	15	327	1734	308	105.9%	18.8	207.1	23.3
4/1	Blackfrairs Passage Ahead	O	-	235	1940	591	39.7%	0.3	5.0	0.3
J6: Blackfriars Lane priority jcn	**-**	**-**	**-**	**-**	**-**	**-**	**17.8%**	**0.3**	**-**	**-**
1/1		U	-	11	1800	1800	0.6%	0.0	1.0	0.0
2/1	Blackfriars Lane Left	U	-	11	1800	1800	0.6%	0.0	1.0	0.0
3/1	Ahead Left	U	-	194	1800	1800	10.8%	0.1	1.1	0.1
3/2	Ahead	U	-	258	1800	1800	14.3%	0.1	1.2	0.1
4/1	Ahead	U	-	332	1800	1800	17.8%	0.1	1.2	0.1
4/2	Ahead Right	O	-	180	1800	1800	10.0%	0.1	1.1	0.1

5/1	Ahead	U	-	11	1800	1800	0.6%	0.0	1.0	0.0
J7: 00/123	**-**	**-**	**-**	**-**	**-**	**-**	**64.9%**	**3.4**	**-**	**-**
1/1	Ahead	U	71	810	1940	1552	51.8%	1.0	4.5	15.4
1/2	Ahead	U	71	522	2130	1704	28.9%	0.2	1.5	0.2
2/1		U	-	1332	2000	2000	64.9%	2.1	6.0	25.3

C1 - 00/005 Victoria Embankment / Temple Avenue	PRC for Signalled Lanes (%):	-9.7	Total Delay for Signalled Lanes (pcuHr):	29.07	Cycle Time (s):	90
C2 - 00/006 Victoria Embankment / Blackfriars Bridge	PRC for Signalled Lanes (%):	0.2	Total Delay for Signalled Lanes (pcuHr):	19.09	Cycle Time (s):	90
C3 - 00/122 Victoria Embankment / New Bridge RoadStream: 1	PRC for Signalled Lanes (%):	-18.4	Total Delay for Signalled Lanes (pcuHr):	65.85	Cycle Time (s):	90
C4 - J00/007 Queen Victoria Street / Puddle Dock	PRC for Signalled Lanes (%):	72.5	Total Delay for Signalled Lanes (pcuHr):	9.62	Cycle Time (s):	90
C5 - 00/059 Upper Thames Street / Puddle Dock	PRC for Signalled Lanes (%):	-17.7	Total Delay for Signalled Lanes (pcuHr):	21.68	Cycle Time (s):	90
C6 - 00/123 Blackfriars Bridge ped crossing	PRC for Signalled Lanes (%):	73.6	Total Delay for Signalled Lanes (pcuHr):	1.22	Cycle Time (s):	90
	PRC Over All Lanes (%):	-18.4	Total Delay Over All Lanes(pcuHr):	155.50		

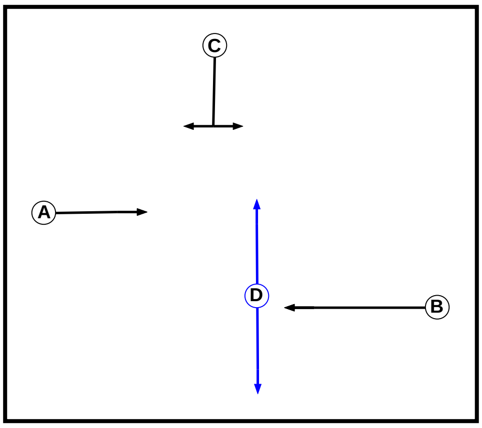
D.4 Construction base case results, PM peak hour

Network Layout Diagram

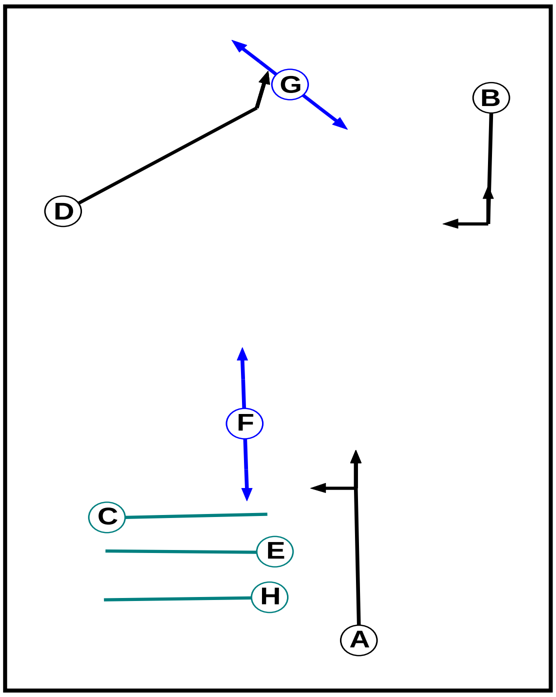


Phase Diagram

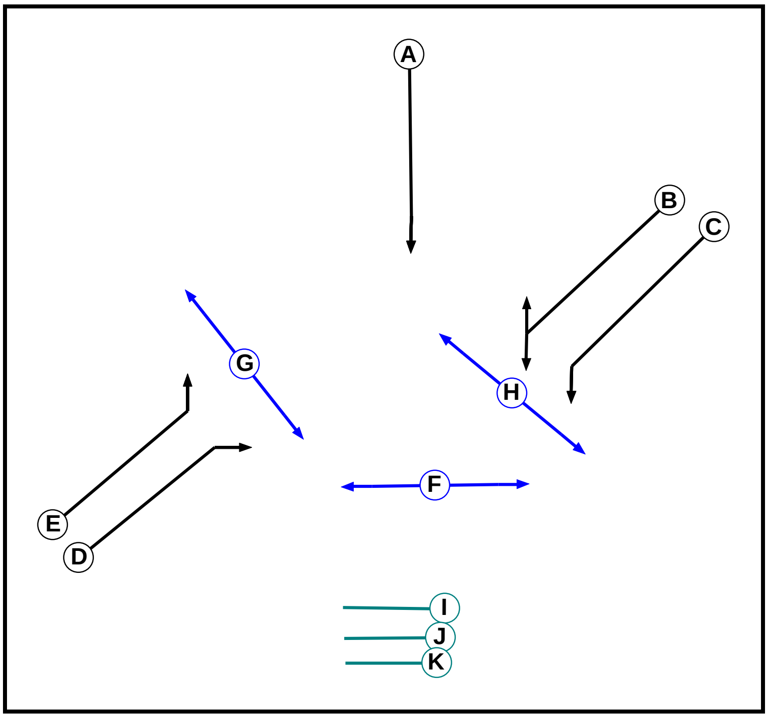
C1 - 00/005 Victoria Embankment / Temple Avenue



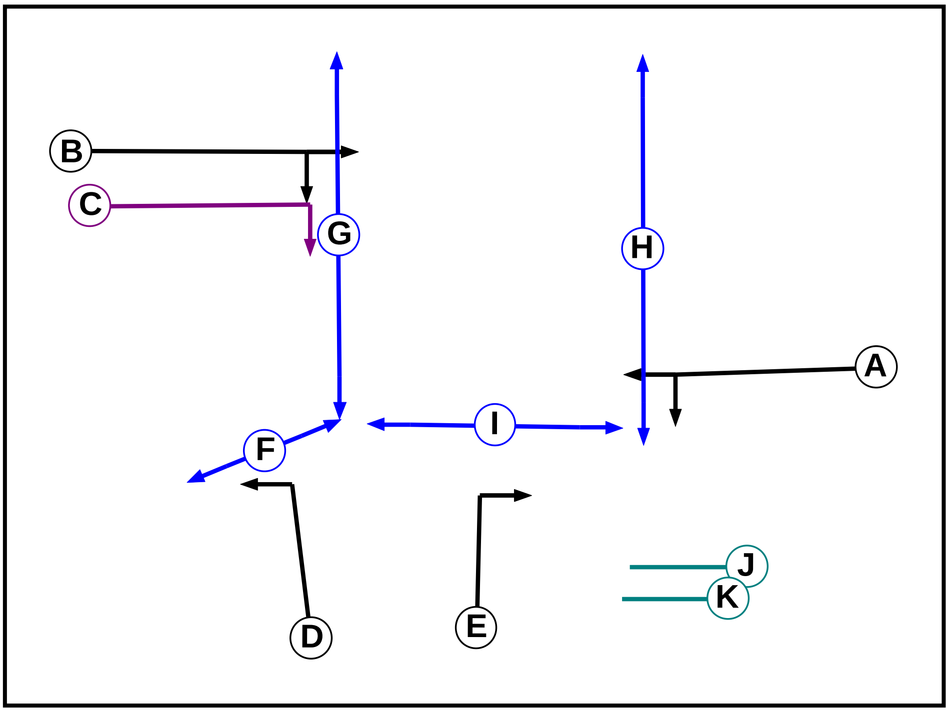
C2 - 00/006 Victoria Embankment / Blackfriars Bridge



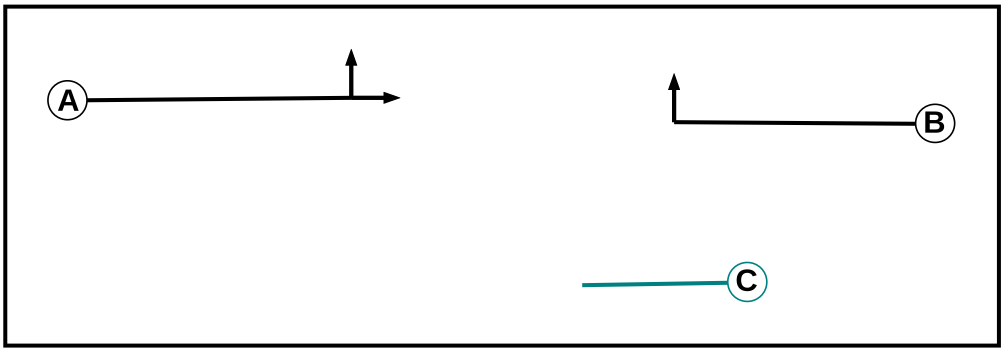
C3 - 00/122 Victoria Embankment / New Bridge Road



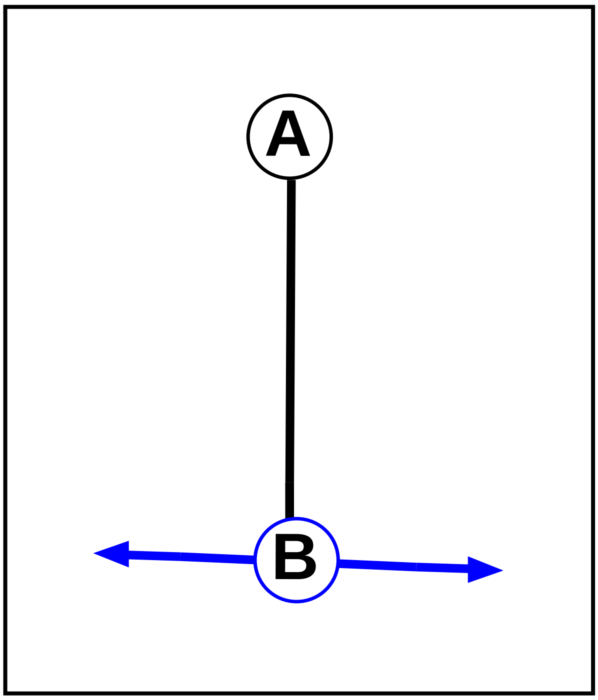
C4 - J00/007 Queen Victoria Street / Puddle Dock



C5 - 00/059 Upper Thames Street / Puddle Dock

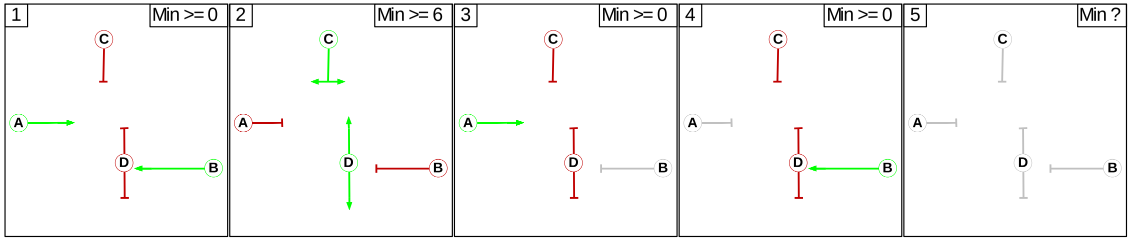


C6 - 00/123 Blackfriars Bridge ped crossing

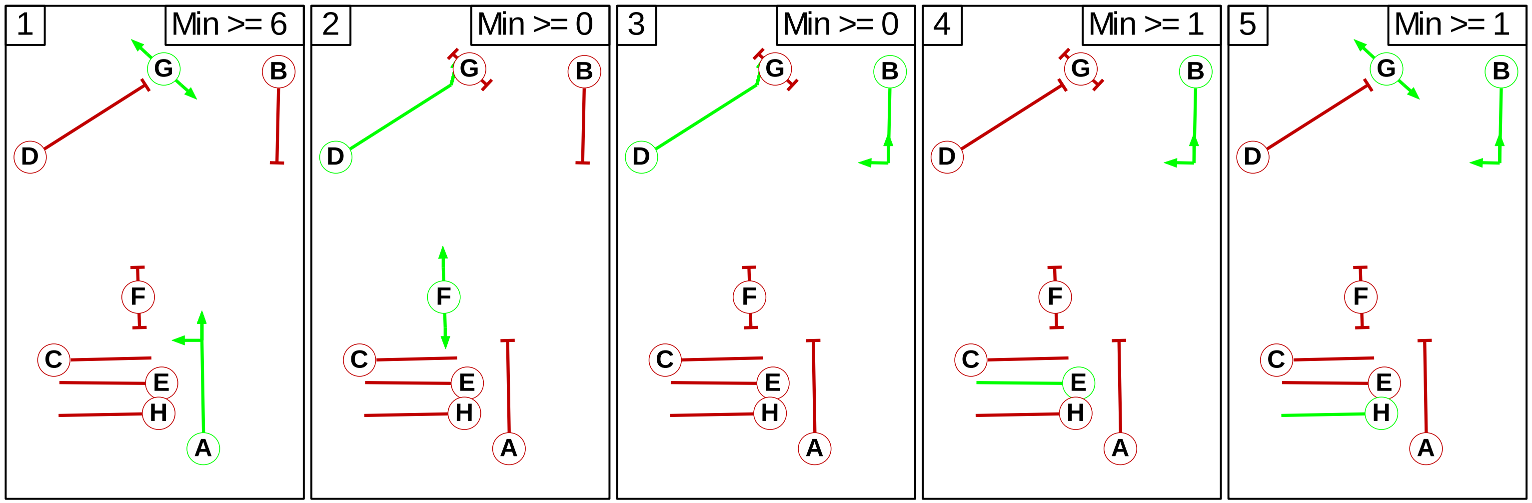


Stage Diagram

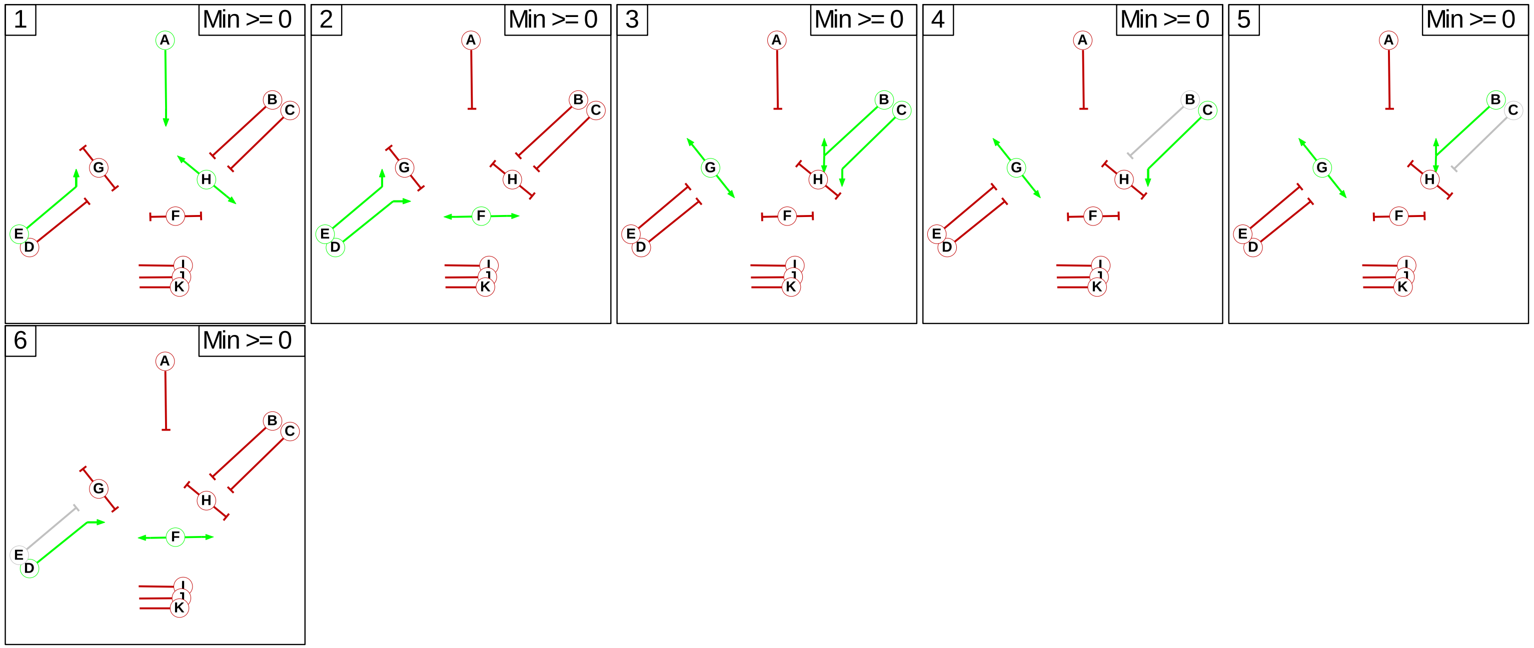
C1 - 01/094 Victoria Embankment / Temple Avenue



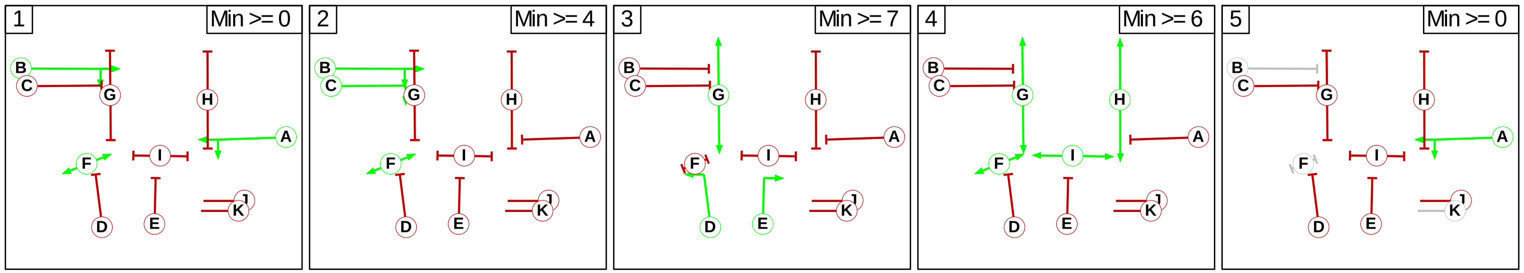
C2 - 00/006 Victoria Embankment / Blackfriars Bridge



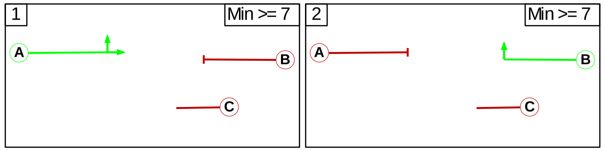
C3 - 00/122 Victoria Embankment / New Bridge Road
Stage Stream: 1



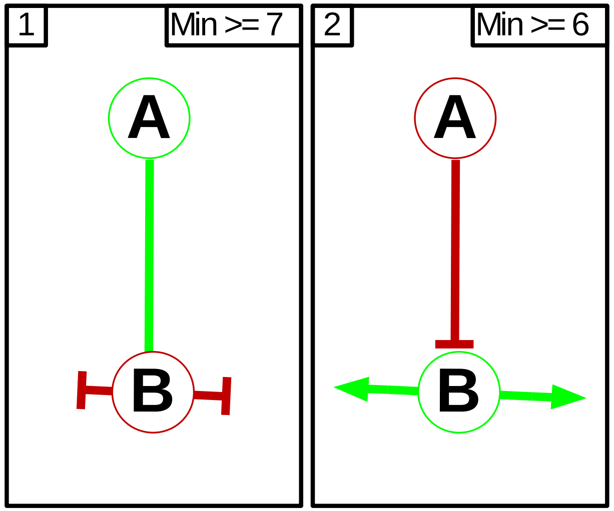
C4 - J00/007 Queen Victoria Street / Puddle Dock



C5 - 00/059 Upper Thames Street / Puddle Dock



C6 - 00/123 Blackfriars Bridge ped crossing



Phases in Stage

C1 - 01/094 Victoria Embankment / Temple Avenue

Stage No.	Phases in Stage
1	A B
2	C D
3	A
4	B
5	

C2 - 00/006 Victoria Embankment / Blackfriars Bridge

Stage No.	Phases in Stage
1	A G
2	D F
3	B D
4	B E
5	B G H

C3 - 00/122 Victoria Embankment / New Bridge Road

Stream	Stage No.	Phases in Stage
1	1	A E H
1	2	D E F
1	3	B C G
1	4	C G
1	5	B G
1	6	D F

C4 - J00/007 Queen Victoria Street / Puddle Dock

Stage No.	Phases in Stage
1	A B F
2	B C F
3	D E G
4	F G H I
5	A

C5 - 00/059 Upper Thames Street / Puddle Dock

Stage No.	Phases in Stage
1	A
2	B

C6 - 00/123 Blackfriars Bridge ped crossing

Stage No.	Phases in Stage
1	A
2	B

Phase Intergreens Matrix

C1 - 01/094 Victoria Embankment / Temple Avenue

	Starting Phase				
Terminating Phase		A	B	C	D
	A		-	5	7
	B	-		5	5
	C	5	5		-
	D	19	19	-	

C2 - 00/006 Victoria Embankment / Blackfriars Bridge

	Starting Phase								
Terminating Phase		A	B	C	D	E	F	G	H
	A		5	3	12	5	7	-	5
	B	5		3	-	-	8	-	-
	C	2	2		2	2	2	2	2
	D	5	-	3		3	-	6	6
	E	5	-	3	2		8	2	2
	F	9	9	4	-	9		-	9
	G	-	-	3	8	3	-		-
	H	5	-	3	8	3	8	-	

C3 - 00/122 Victoria Embankment / New Bridge Road

		Starting Phase										
		A	B	C	D	E	F	G	H	I	J	K
Terminating Phase	A		9	9	9	-	8	-	-	9	9	3
	B	5		-	5	5	7	-	6	5	5	3
	C	5	-		-	-	7	-	10	5	5	3
	D	5	5	-		-	-	6	8	3	3	3
	E	-	5	-	-		-	10	-	-	-	3
	F	8	8	8	-	-		-	-	-	-	3
	G	-	-	-	15	15	-		-	-	-	4
	H	-	15	15	15	-	-	-		5	4	4
	I	9	5	2	2	-	-	-	9		9	4
	J	5	5	2	2	-	-	-	2	5		3
	K	2	2	2	2	2	2	2	2	2	2	

C4 - J00/007 Queen Victoria Street / Puddle Dock

		Starting Phase										
		A	B	C	D	E	F	G	H	I	J	K
Terminating Phase	A		-	5	8	6	-	8	5	6	3	-
	B	-		-	-	5	-	5	8	8	3	3
	C	5	-		-	5	-	5	8	8	3	5
	D	5	-	-		-	5	-	-	-	3	5
	E	5	5	5	-		-	-	9	5	3	5
	F	-	-	-	9	-		-	-	-	4	4
	G	14	14	14	-	-	-		-	-	7	14
	H	15	15	15	-	15	-	-		-	8	15
	I	16	16	16	-	16	-	-	-		8	16
	J	2	2	2	2	2	2	2	2	2		2
	K	-	2	5	8	6	2	8	5	6	3	

C5 - 00/059 Upper Thames Street / Puddle Dock

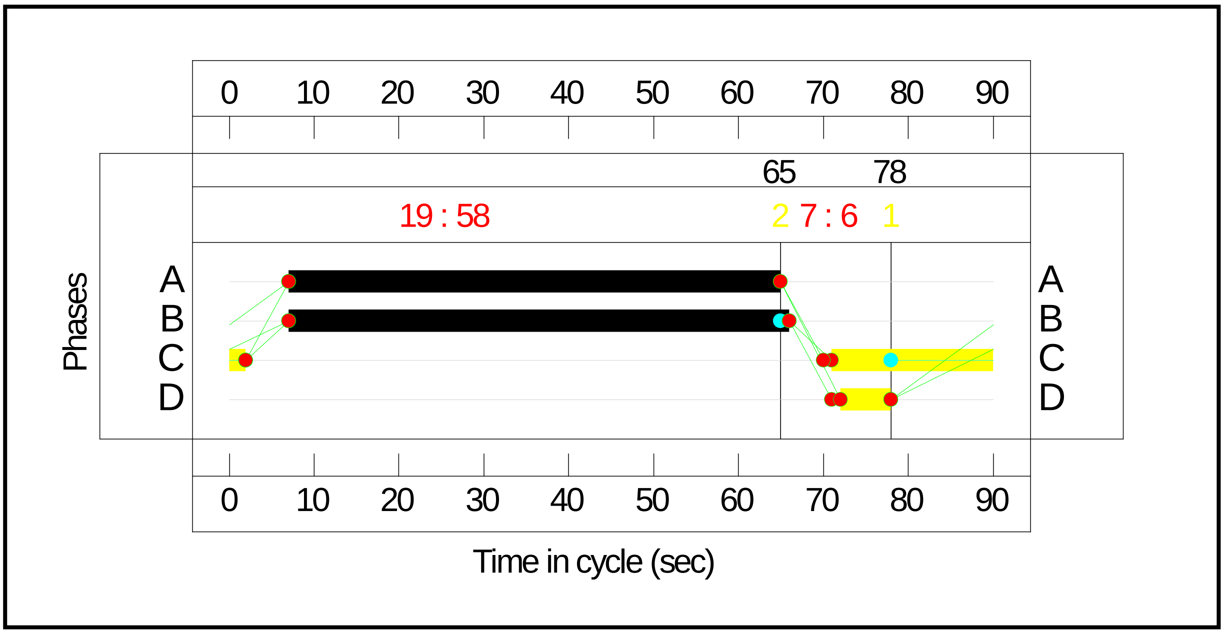
	Starting Phase			
Terminating Phase		A	B	C
	A		5	3
	B	5		3
	C	2	2	

C6 - 00/123 Blackfriars Bridge ped crossing

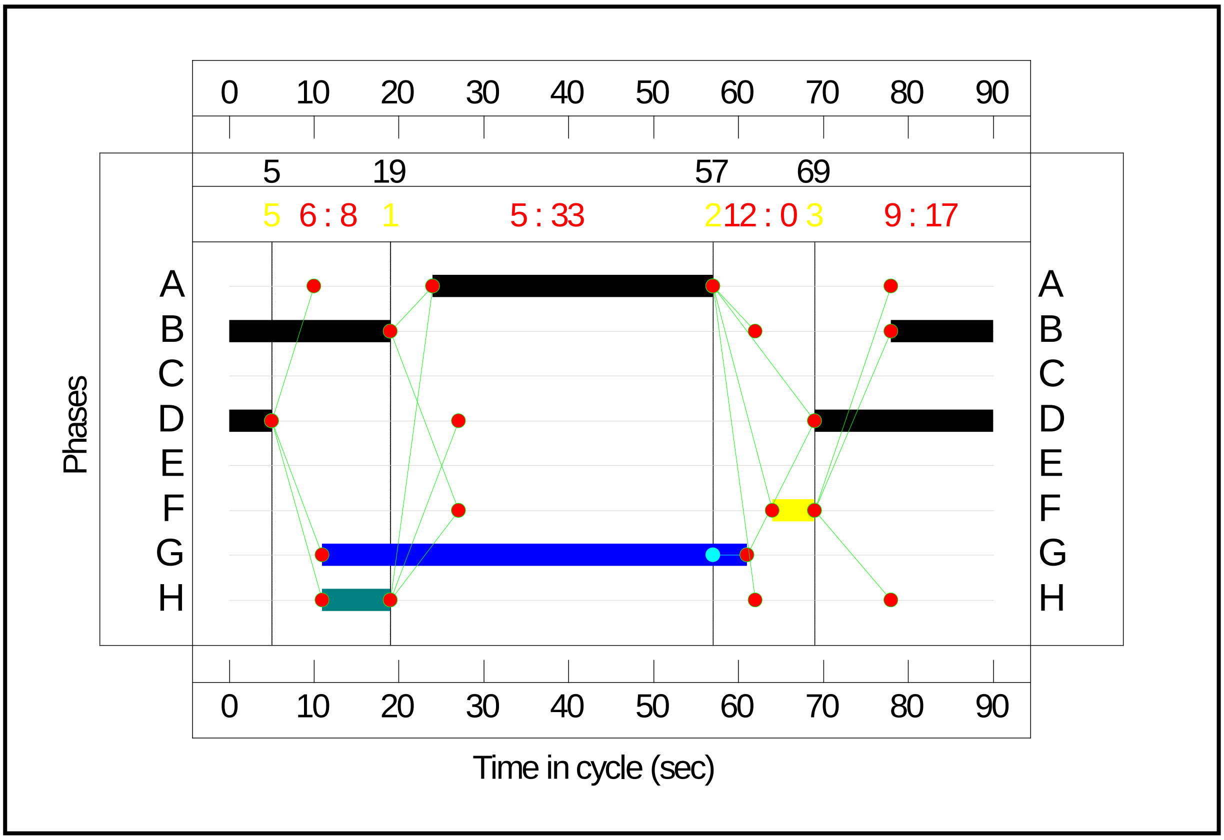
	Starting Phase		
Terminating Phase		A	B
	A		5
	B	8	

Signal Timing Diagrams

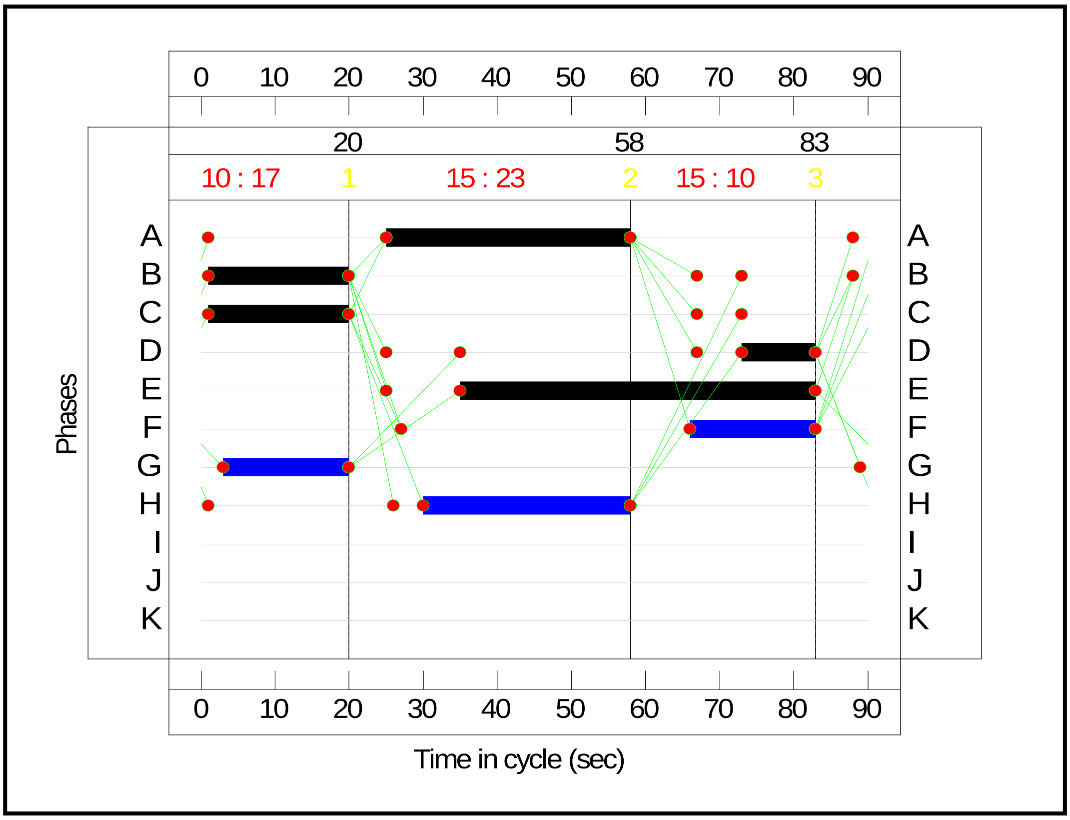
C1 - 00/005 Victoria Embankment / Temple Avenue



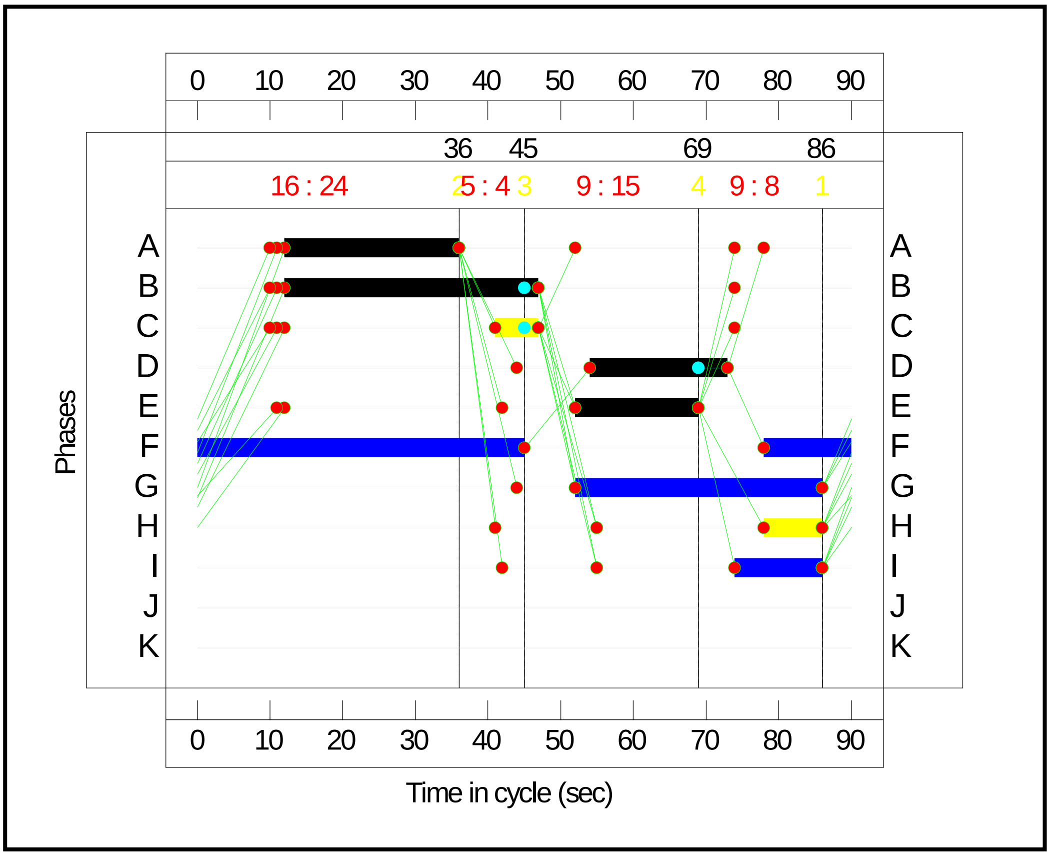
C2 - 00/006 Victoria Embankment / Blackfriars Bridge



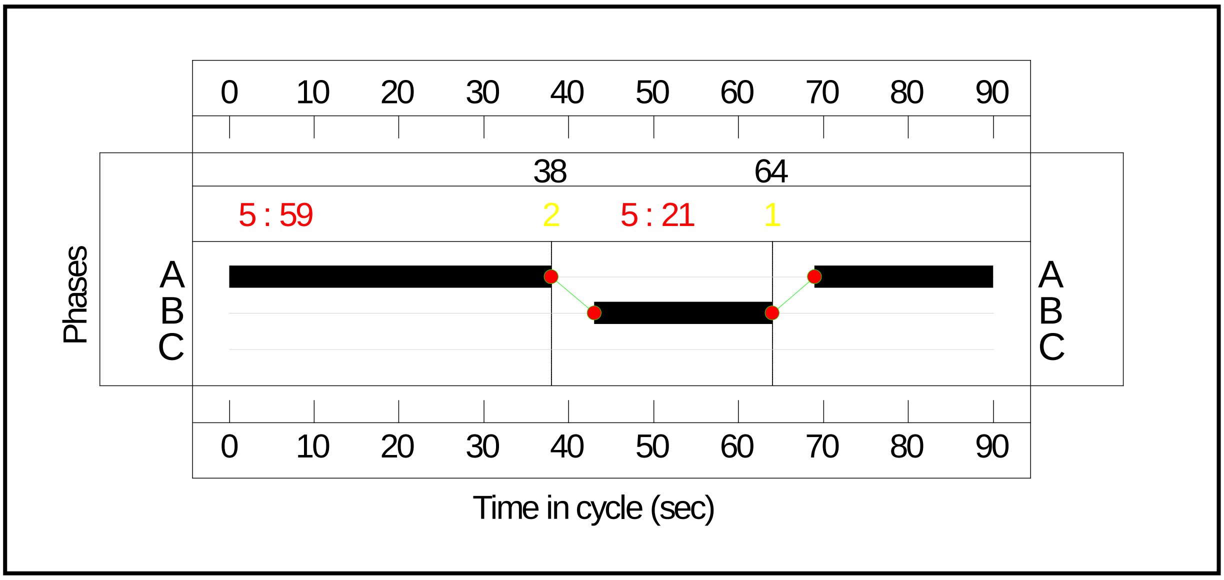
C3 - 00/122 Victoria Embankment / New Bridge Road



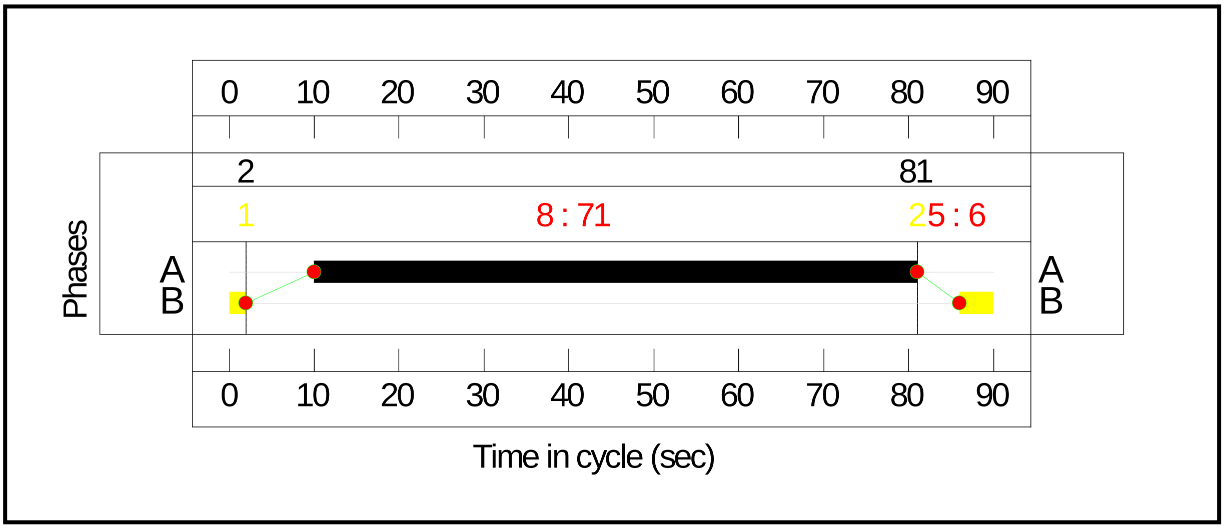
C4 - J00/007 Queen Victoria Street / Puddle Dock



C5 - 00/059 Upper Thames Street / Puddle Dock



C6 - 00/123 Blackfriars Bridge ped crossing



Network Results

Item	Lane Description	Lane Type	Total Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: Blackfriars Bridge Junction	-	-	-	-	-	-	**114.4%**	**167.9**	-	-
J1: 00/005	-	-	-	-	-	-	**89.5%**	**21.0**	-	-
1/1	Victoria Embankment (e/b) Ahead	U	58	1040	1773	1162	89.5%	7.7	26.7	25.4
1/2	Victoria Embankment (e/b) Ahead	U	58	769	1773	1162	66.1%	3.0	14.0	12.5
2/1	Temple Avenue Right Left	U	21	138	1729	423	32.7%	1.3	34.2	3.0
3/1	Victoria Embankment (w/b) Ahead	U	59	343	1773	1182	26.7%	0.8	9.4	3.1
3/2	Victoria Embankment (w/b) Ahead	U	59	742	1773	1182	62.7%	2.6	12.7	11.3
3/3	Victoria Embankment (w/b) Ahead	U	59	761	1773	1182	64.4%	2.8	13.0	11.9
4/1		U	-	343	Inf	Inf	0.0%	0.0	0.0	0.0
4/2		U	-	742	Inf	Inf	0.0%	0.0	0.0	0.0
4/3		U	-	856	Inf	Inf	0.0%	0.0	0.0	0.0
5/1	Left	U	-	449	1800	1800	24.9%	0.2	1.3	0.2
5/2	Ahead	U	-	646	1800	1800	35.9%	0.3	1.6	0.3
5/3	Ahead	U	-	769	1800	1800	42.7%	0.4	1.7	0.4
6/1	Blackfriars Underpass (w/b) Ahead	U	-	793	1800	1800	44.0%	0.4	1.8	0.4
6/2	Blackfriars Underpass (w/b) Ahead	U	-	710	1800	1800	39.4%	0.3	1.7	0.3
7/1	Victoria Embankment - w/b on-slip Ahead	O	-	343	1800	541	58.5%	1.3	14.3	6.9
J2: 00/006	-	-	-	-	-	-	**82.2%**	**16.1**	-	-
1/1	Blackfriars Bridge Road (n/b) Ahead Left	U	33	610	1965	742	82.2%	6.5	38.4	15.9
1/2	Blackfriars Bridge Road (n/b) Ahead	U	33	342	1965	742	46.1%	2.4	25.6	6.8
2/1	Blackfriars Bridge Road - internal SL (w/b +n/b) Ahead	U	-	1197	Inf	Inf	0.0%	0.0	0.0	0.0
2/2	Blackfriars Bridge Road - internal SL (w/b +n/b) Ahead	U	-	693	1940	1940	31.2%	0.2	1.3	0.2

2/3+2/4	Blackfriars Bridge Road - internal SL (w/b +n/b) U-Turn Right	U	31	297	1853:1550	662	40.8%	2.6	35.2	5.7
3/1	Ahead	U	-	542	2015	2015	26.9%	0.2	1.2	0.2
3/2	Ahead	U	-	368	2015	2015	18.3%	0.1	1.1	0.1
4/1	Victoria Embankment - e/b off-slip Ahead	U	26	279	1848	554	50.3%	2.8	36.6	6.0
4/2	Victoria Embankment - e/b off-slip Ahead	U	26	133	1848	554	24.0%	1.2	32.3	2.6
J3: 00/122	**-**	**-**	**-**	**-**	**-**	**-**	**114.4%**	**108.3**	**-**	**-**
1/1	Queen Victoria Street - internal SL (w/b) Left	U	19	396	1866	415	95.6%	9.3	84.3	15.9
1/2	Queen Victoria Street - internal SL (w/b) Left Right	U	19	229	1866	415	55.2%	2.7	41.8	6.2
2/1	Blackfriars Bridge Road - internal SL (n/b) Ahead	U	48	821	1853	1009	81.4%	3.0	13.1	6.8
2/2	Blackfriars Bridge Road - internal SL (n/b) Ahead	U	48	279	1852	1008	27.6%	0.4	4.7	0.9
2/3	Blackfriars Bridge Road - internal SL (n/b) Right	U	10	222	1882	230	96.6%	7.4	119.6	11.3
3/1	Ahead	U	-	821	1918	1918	42.8%	0.4	1.6	0.4
3/2	Ahead	U	-	507	1918	1918	26.5%	0.2	1.3	0.2
4/1		U	-	821	1800	1800	45.6%	0.4	1.8	0.4
4/2		U	-	507	1800	1800	28.2%	0.2	1.4	0.2
5/1	New Bridge Street (s/b) Ahead	U	33	731	1965	742	98.4%	16.6	81.5	29.0
5/2	New Bridge Street (s/b) Ahead	U	33	849	1965	742	114.4%	67.9	287.9	81.2
J4: 00/007	**-**	**-**	**-**	**-**	**-**	**-**	**67.3%**	**8.9**	**-**	**-**
1/1	Queen Victoria Street - Internal SL (e/b) Ahead	U	35	228	1965	786	29.0%	0.5	8.4	0.9
1/2	Queen Victoria Street - Internal SL (e/b) Ahead Right	O	35	17	1805	489	3.6%	0.0	9.1	0.1

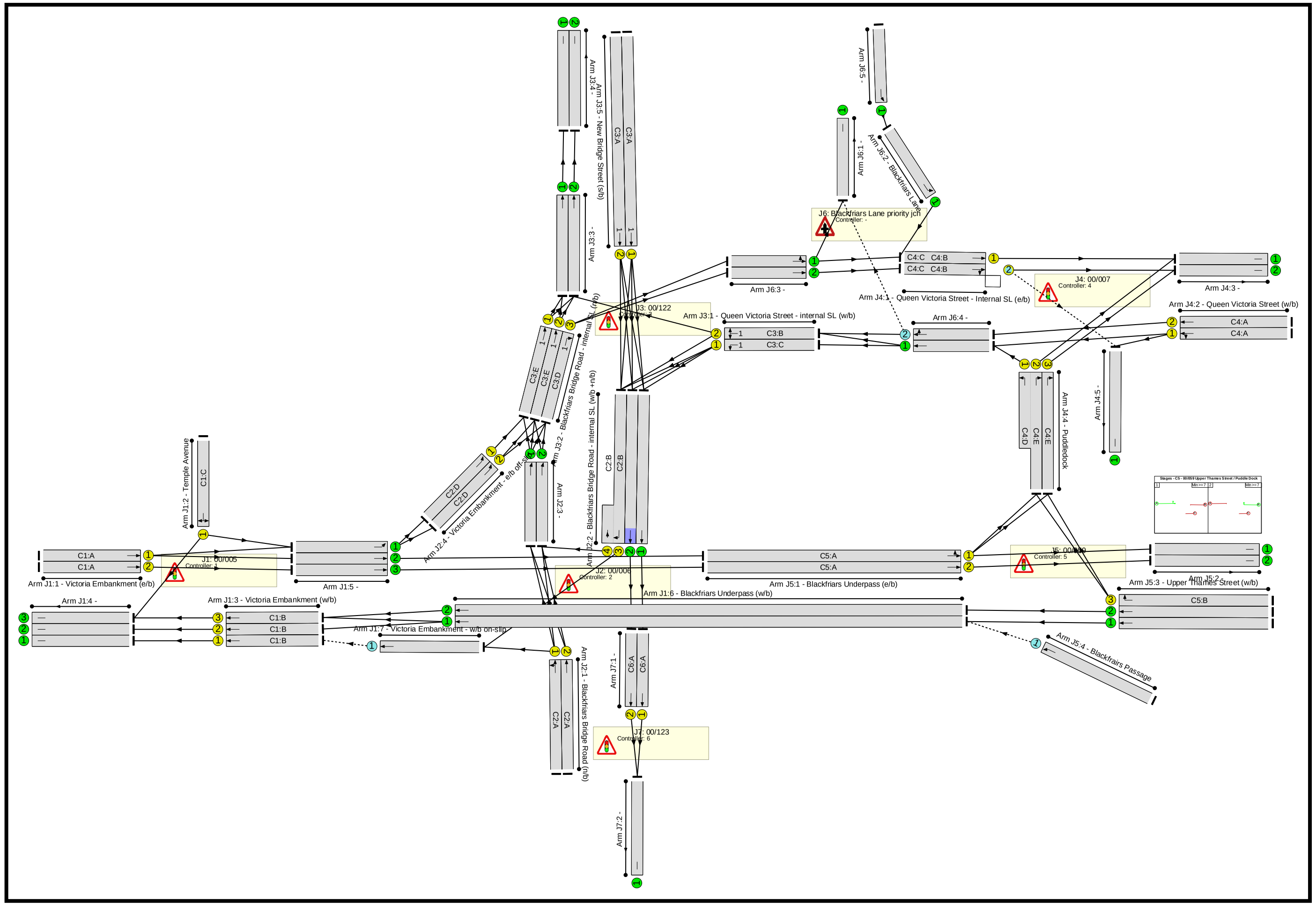
2/1	Queen Victoria Street (w/b) Left Ahead	U	24	166	1950	542	30.6%	1.4	30.4	3.5
2/2	Queen Victoria Street (w/b) Ahead	U	24	203	1965	546	37.1%	1.8	31.4	4.3
3/1		U	-	387	Inf	Inf	0.0%	0.0	0.0	0.0
3/2		U	-	172	1900	1900	9.1%	0.0	1.0	0.0
4/2+4/1	Puddledock Right Left	U	17:19	420	1800:1748	625	67.3%	2.8	24.1	12.6
4/3	Puddledock Right	U	17	172	1789	358	48.1%	2.3	48.2	4.8
5/1		U	-	30	1800	1800	1.7%	0.0	1.0	0.0
J5: 00/059	**-**	**-**	**-**	**-**	**-**	**-**	**60.7%**	**6.9**	**-**	**-**
1/1	Blackfriars Underpass (e/b) Left Ahead	U	59	646	1800	1200	53.8%	1.3	7.0	3.9
1/2	Blackfriars Underpass (e/b) Ahead	U	59	769	1900	1267	60.7%	1.5	6.9	4.7
2/1		U	-	315	1800	1800	17.5%	0.1	1.2	0.1
2/2		U	-	769	1800	1800	42.7%	0.4	1.7	0.4
3/1	Upper Thames Street (w/b) Ahead	U	-	523	1900	1900	27.5%	0.2	1.3	0.2
3/2	Upper Thames Street (w/b) Ahead	U	-	710	1900	1900	37.4%	0.3	1.5	0.3
3/3	Upper Thames Street (w/b) Right	U	21	252	1734	424	59.3%	2.8	40.4	6.2
4/1	Blackfrairs Passage Ahead	O	-	270	1940	600	45.0%	0.4	5.4	0.4
J6: Blackfriars Lane priority jcn	**-**	**-**	**-**	**-**	**-**	**-**	**23.0%**	**0.3**	**-**	**-**
1/1		U	-	11	1800	1800	0.6%	0.0	1.0	0.0
2/1	Blackfriars Lane Left	U	-	11	1800	1800	0.6%	0.0	1.0	0.0
3/1	Ahead Left	U	-	228	1800	1800	12.6%	0.1	1.1	0.1
3/2	Ahead	U	-	17	1800	1800	1.0%	0.0	1.0	0.0
4/1	Ahead	U	-	414	1800	1800	23.0%	0.1	1.3	0.1
4/2	Ahead Right	O	-	203	1800	1800	11.3%	0.1	1.1	0.1
5/1	Ahead	U	-	11	1800	1800	0.6%	0.0	1.0	0.0
J7: 00/123	**-**	**-**	**-**	**-**	**-**	**-**	**80.0%**	**6.3**	**-**	**-**

1/1	Ahead	U	71	1197	1940	1552	77.1%	2.0	5.9	19.8
1/2	Ahead	U	71	693	2130	1704	35.5%	0.3	1.6	0.3
2/1		U	-	1679	2000	2000	80.0%	4.0	9.1	32.4

C1 - 00/005 Victoria Embankment / Temple Avenue	PRC for Signalled Lanes (%):	0.6	Total Delay for Signalled Lanes (pcuHr):	18.21	Cycle Time (s):	90
C2 - 00/006 Victoria Embankment / Blackfriars Bridge	PRC for Signalled Lanes (%):	9.6	Total Delay for Signalled Lanes (pcuHr):	15.61	Cycle Time (s):	90
C3 - 00/122 Victoria Embankment / New Bridge RoadStream: 1	PRC for Signalled Lanes (%):	-27.1	Total Delay for Signalled Lanes (pcuHr):	107.15	Cycle Time (s):	90
C4 - J00/007 Queen Victoria Street / Puddle Dock	PRC for Signalled Lanes (%):	33.8	Total Delay for Signalled Lanes (pcuHr):	8.86	Cycle Time (s):	90
C5 - 00/059 Upper Thames Street / Puddle Dock	PRC for Signalled Lanes (%):	48.3	Total Delay for Signalled Lanes (pcuHr):	5.55	Cycle Time (s):	90
C6 - 00/123 Blackfriars Bridge ped crossing	PRC for Signalled Lanes (%):	16.7	Total Delay for Signalled Lanes (pcuHr):	2.25	Cycle Time (s):	90
	PRC Over All Lanes (%):	-27.1	Total Delay Over All Lanes(pcuHr):	167.88		

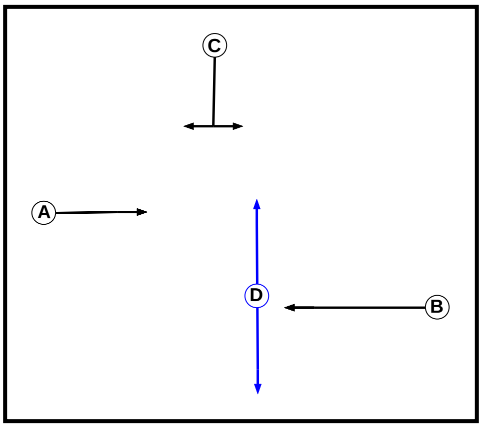
D.5 Construction development case results (phases 1 and 2), AM peak hour

Network Layout Diagram

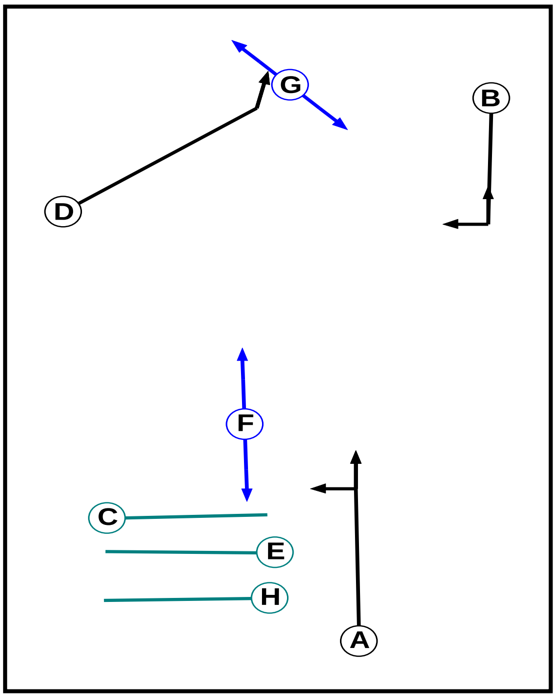


Phase Diagram

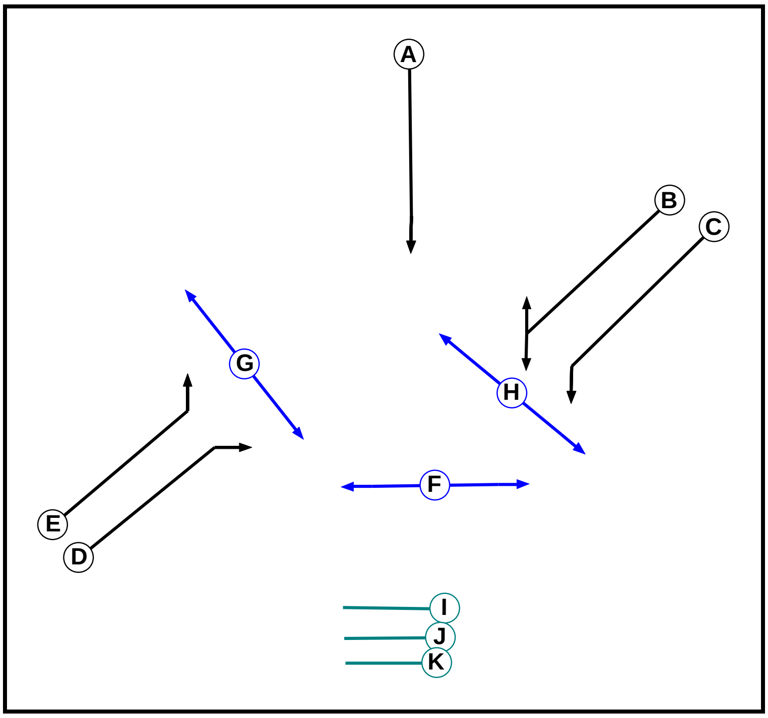
C1 - 00/005 Victoria Embankment / Temple Avenue



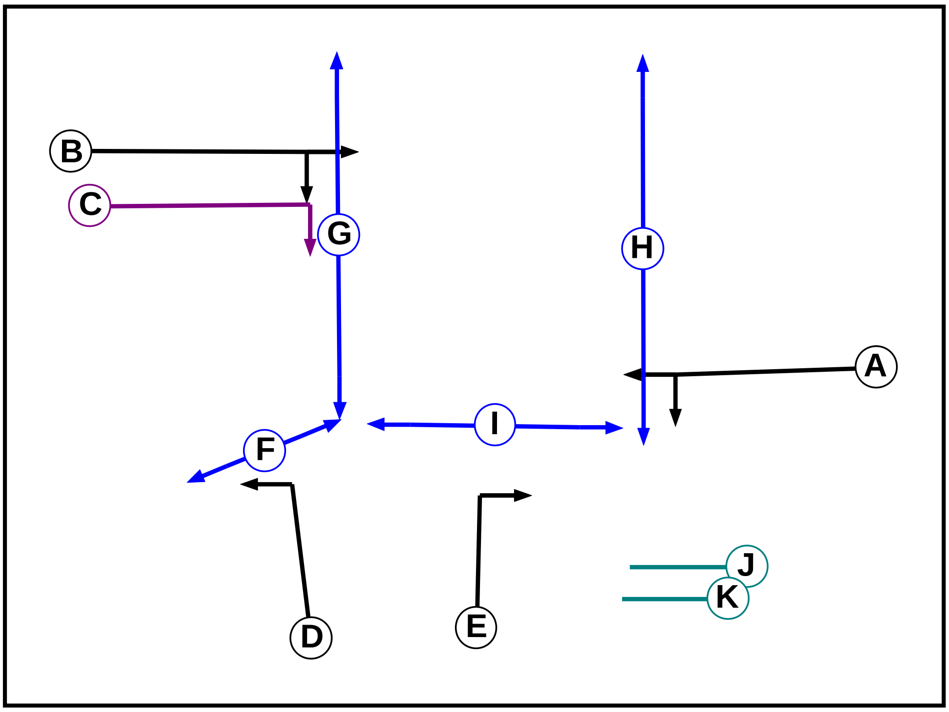
C2 - 00/006 Victoria Embankment / Blackfriars Bridge



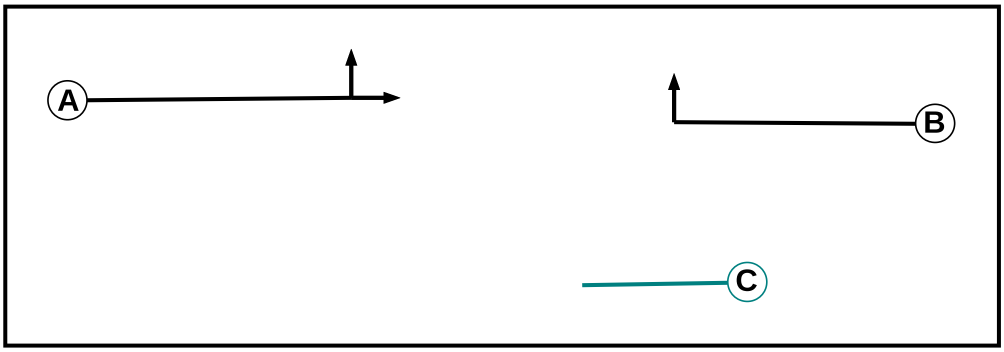
C3 - 00/122 Victoria Embankment / New Bridge Road



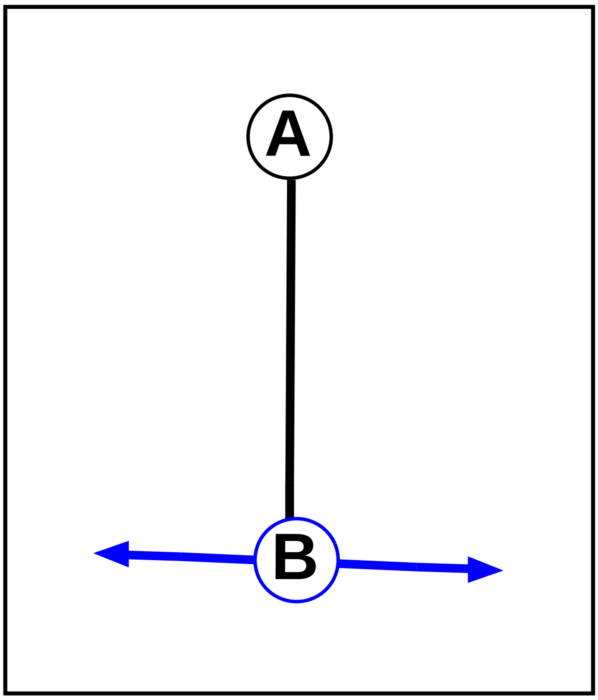
C4 - J00/007 Queen Victoria Street / Puddle Dock



C5 - 00/059 Upper Thames Street / Puddle Dock

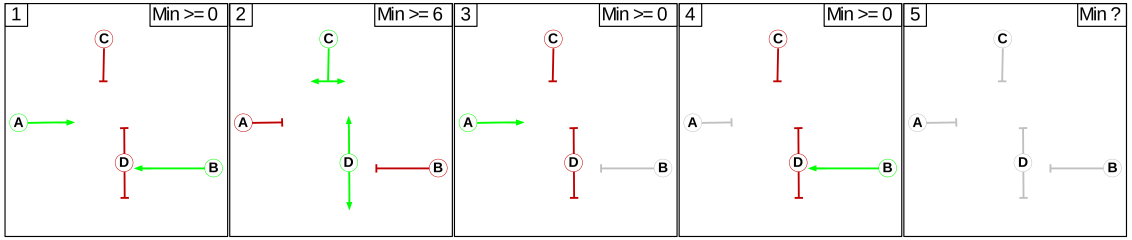


C6 - 00/123 Blackfriars Bridge ped crossing

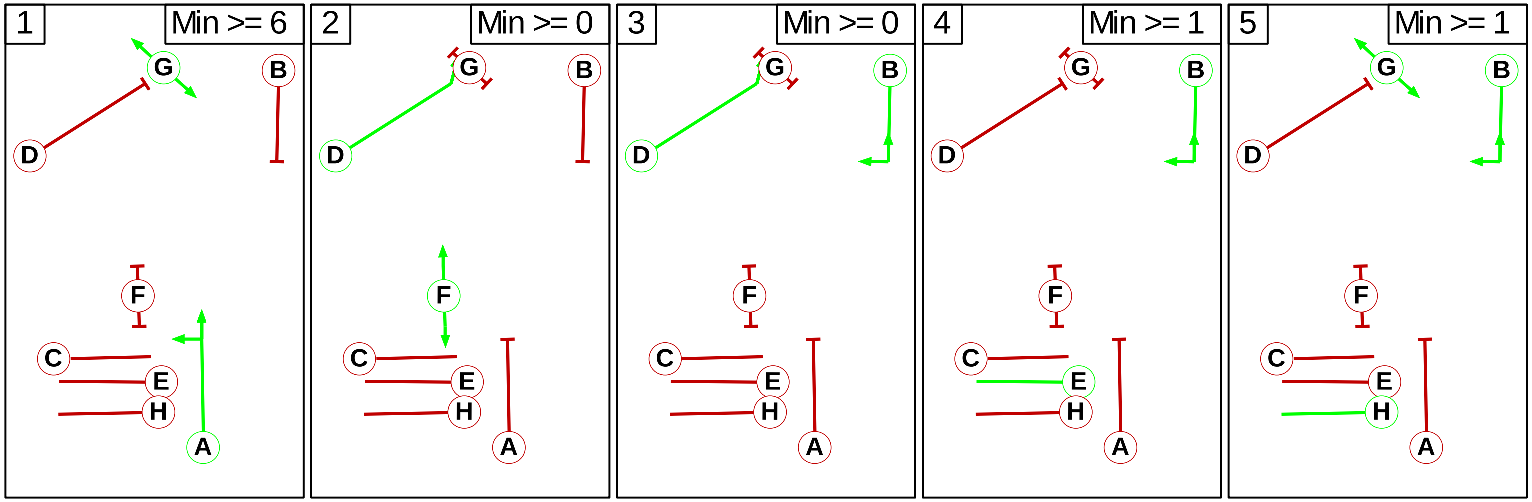


Stage Diagram

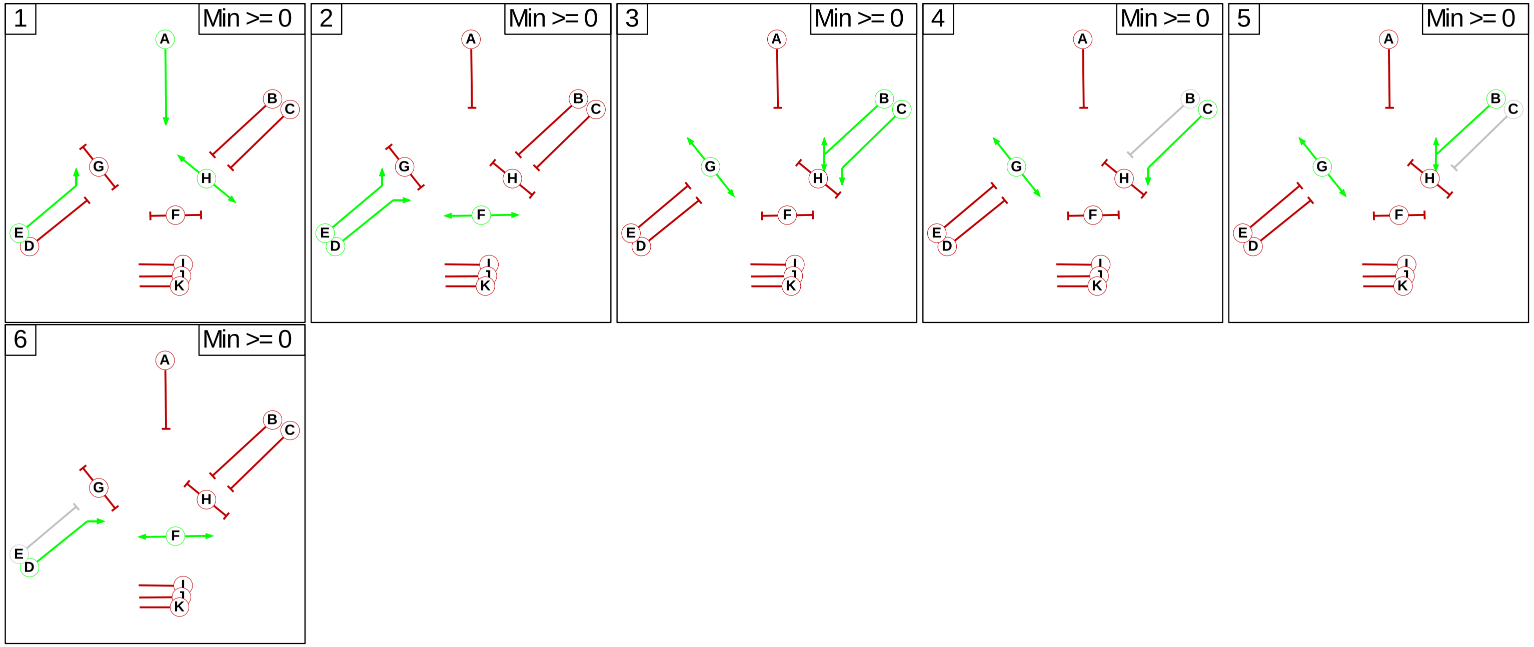
C1 - 01/094 Victoria Embankment / Temple Avenue



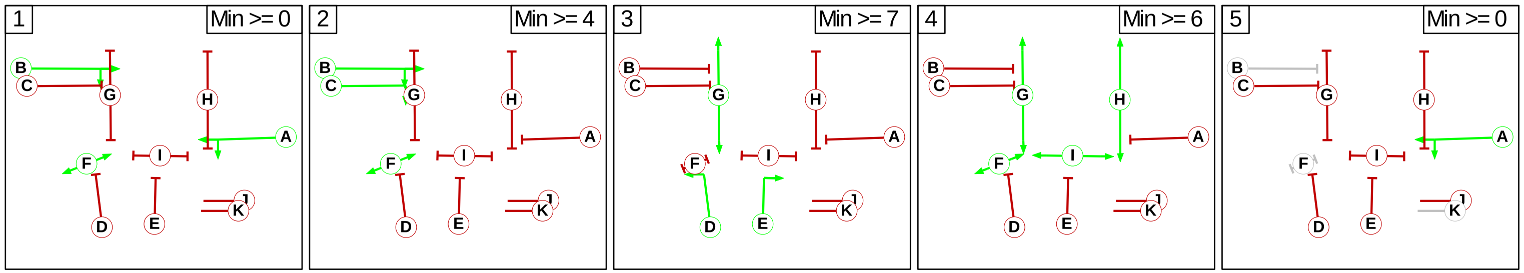
C2 - 00/006 Victoria Embankment / Blackfriars Bridge



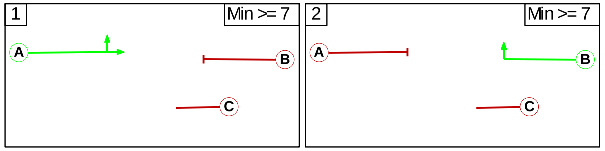
C3 - 00/122 Victoria Embankment / New Bridge Road
Stage Stream: 1



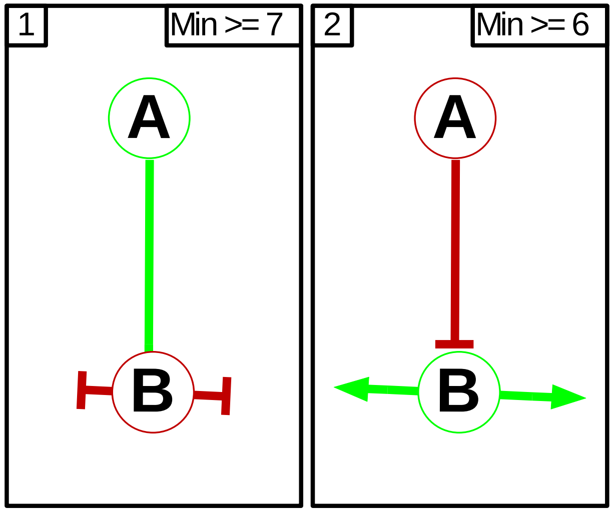
C4 - J00/007 Queen Victoria Street / Puddle Dock



C5 - 00/059 Upper Thames Street / Puddle Dock



C6 - 00/123 Blackfriars Bridge ped crossing



Phases in Stage

C1 - 01/094 Victoria Embankment / Temple Avenue

Stage No.	Phases in Stage
1	A B
2	C D
3	A
4	B
5	

C2 - 00/006 Victoria Embankment / Blackfriars Bridge

Stage No.	Phases in Stage
1	A G
2	D F
3	B D
4	B E
5	B G H

C3 - 00/122 Victoria Embankment / New Bridge Road

Stream	Stage No.	Phases in Stage
1	1	A E H
1	2	D E F
1	3	B C G
1	4	C G
1	5	B G
1	6	D F

C4 - J00/007 Queen Victoria Street / Puddle Dock

Stage No.	Phases in Stage
1	A B F
2	B C F
3	D E G
4	F G H I
5	A

C5 - 00/059 Upper Thames Street / Puddle Dock

Stage No.	Phases in Stage
1	A
2	B

C6 - 00/123 Blackfriars Bridge ped crossing

Stage No.	Phases in Stage
1	A
2	B

Phase Intergreens Matrix

C1 - 01/094 Victoria Embankment / Temple Avenue

		Starting Phase			
		A	B	C	D
Terminating Phase	A		-	5	7
	B	-		5	5
	C	5	5		-
	D	19	19	-	

C2 - 00/006 Victoria Embankment / Blackfriars Bridge

		Starting Phase							
		A	B	C	D	E	F	G	H
Terminating Phase	A		5	3	12	5	7	-	5
	B	5		3	-	-	8	-	-
	C	2	2		2	2	2	2	2
	D	5	-	3		3	-	6	6
	E	5	-	3	2		8	2	2
	F	9	9	4	-	9		-	9
	G	-	-	3	8	3	-		-
	H	5	-	3	8	3	8	-	

C3 - 00/122 Victoria Embankment / New Bridge Road

		Starting Phase										
		A	B	C	D	E	F	G	H	I	J	K
Terminating Phase	A		9	9	9	-	8	-	-	9	9	3
	B	5		-	5	5	7	-	6	5	5	3
	C	5	-		-	-	7	-	10	5	5	3
	D	5	5	-		-	-	6	8	3	3	3
	E	-	5	-	-		-	10	-	-	-	3
	F	8	8	8	-	-		-	-	-	-	3
	G	-	-	-	15	15	-		-	-	-	4
	H	-	15	15	15	-	-	-		5	4	4
	I	9	5	2	2	-	-	-	9		9	4
	J	5	5	2	2	-	-	-	2	5		3
	K	2	2	2	2	2	2	2	2	2	2	

C4 - J00/007 Queen Victoria Street / Puddle Dock

	Starting Phase											
Terminating Phase		A	B	C	D	E	F	G	H	I	J	K
	A		-	5	8	6	-	8	5	6	3	-
	B	-		-	-	5	-	5	8	8	3	3
	C	5	-		-	5	-	5	8	8	3	5
	D	5	-	-		-	5	-	-	-	3	5
	E	5	5	5	-		-	-	9	5	3	5
	F	-	-	-	9	-		-	-	-	4	4
	G	14	14	14	-	-	-		-	-	7	14
	H	15	15	15	-	15	-	-		-	8	15
	I	16	16	16	-	16	-	-	-		8	16
	J	2	2	2	2	2	2	2	2	2		2
	K	-	2	5	8	6	2	8	5	6	3	

C5 - 00/059 Upper Thames Street / Puddle Dock

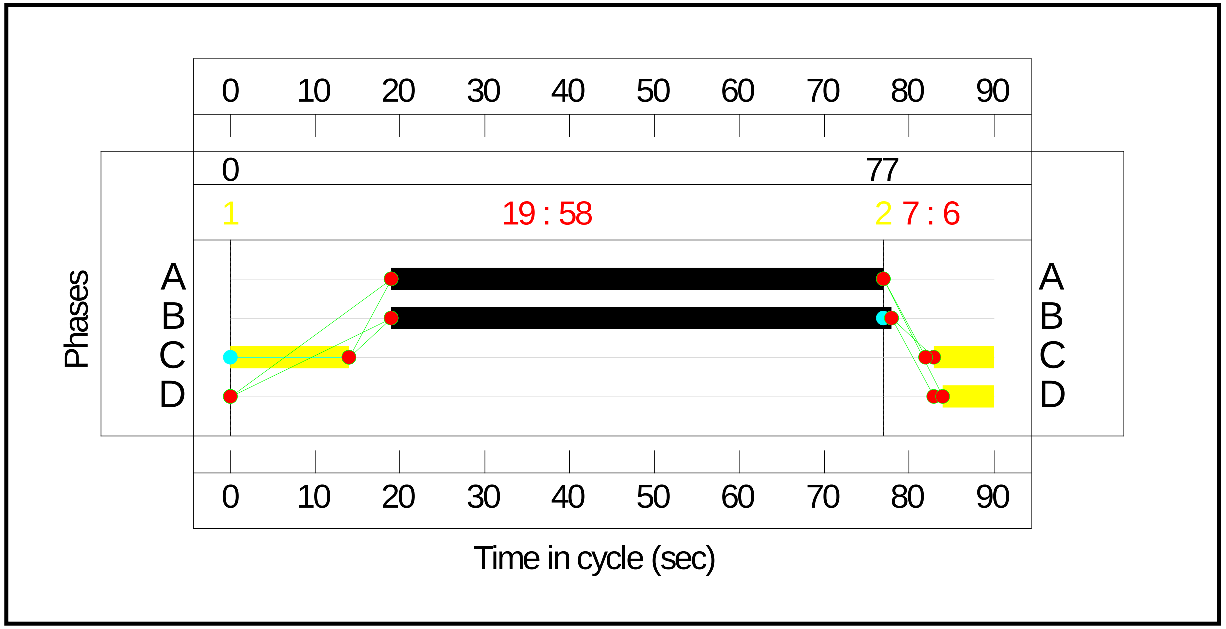
		Starting Phase		
		A	B	C
Terminating Phase	A		5	3
	B	5		3
	C	2	2	

C6 - 00/123 Blackfriars Bridge ped crossing

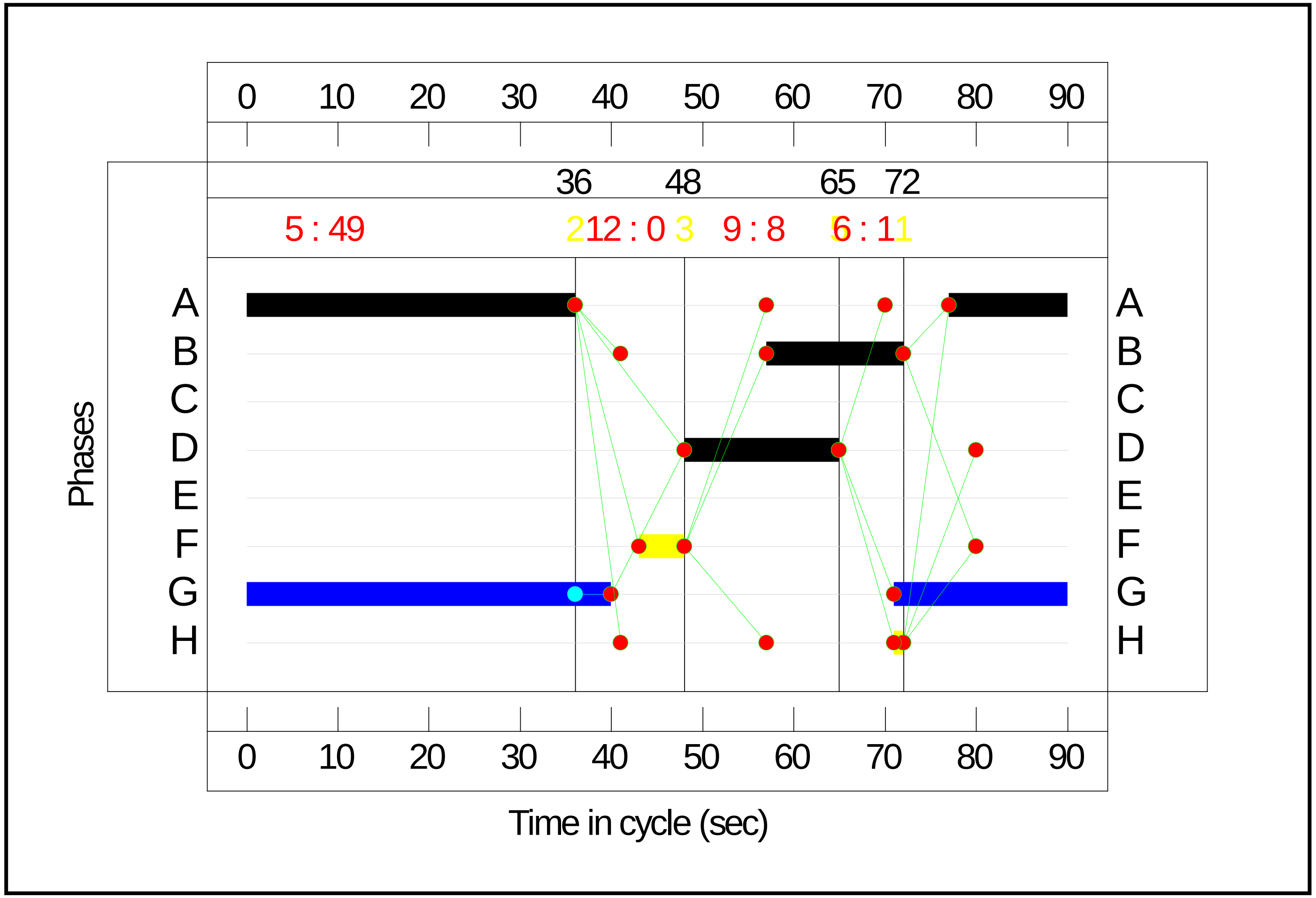
		Starting Phase	
		A	B
Terminating Phase	A		5
	B	8	

Traffic Signal Diagram

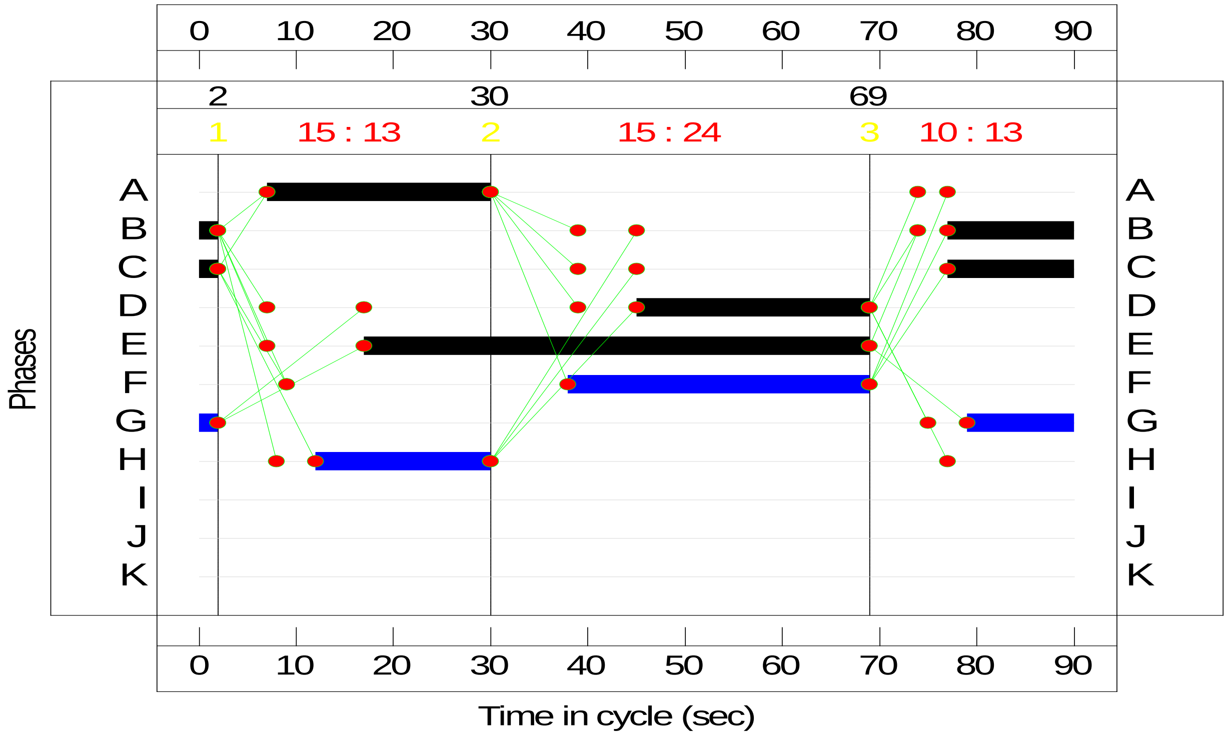
C1 - 00/005 Victoria Embankment / Temple Avenue



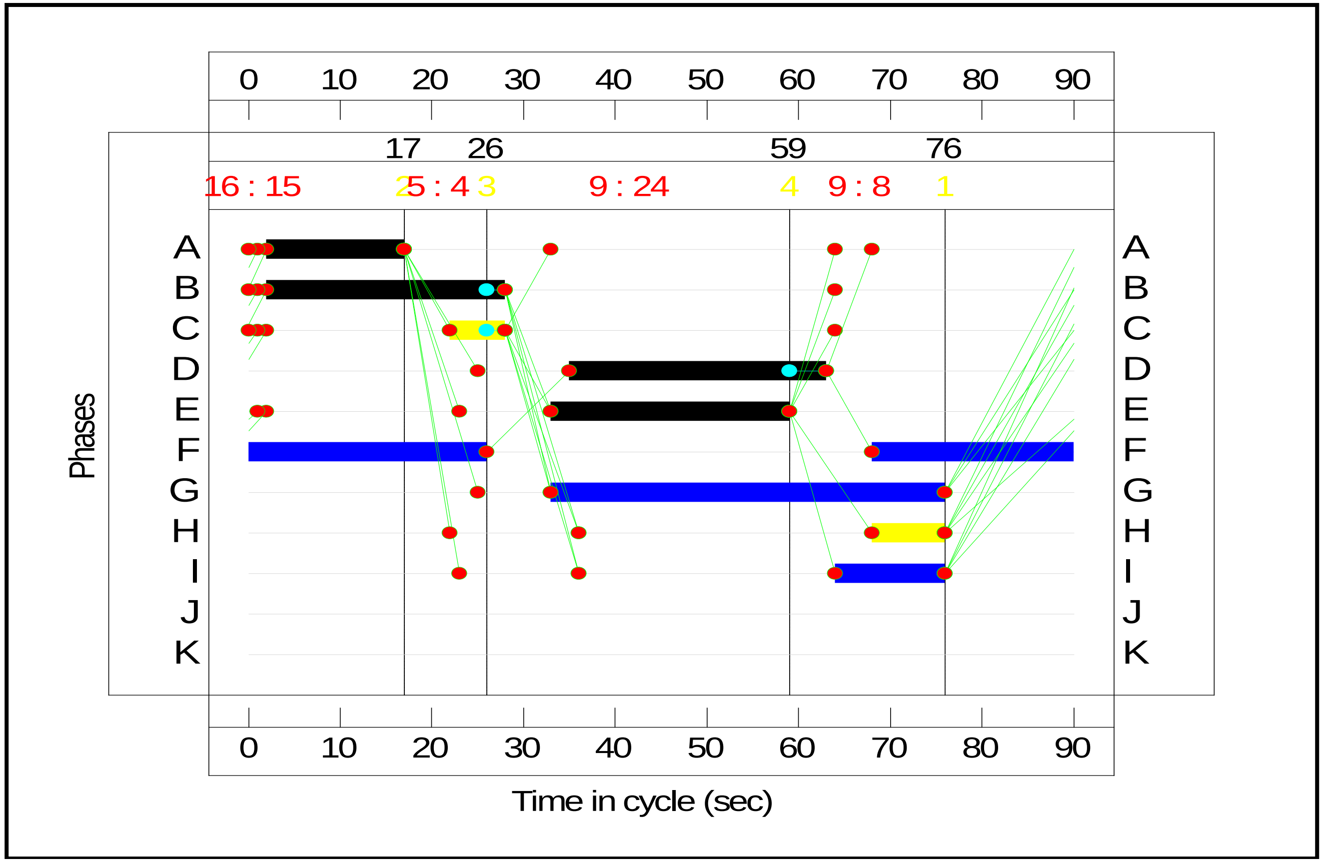
C2 - 00/006 Victoria Embankment / Blackfriars Bridge



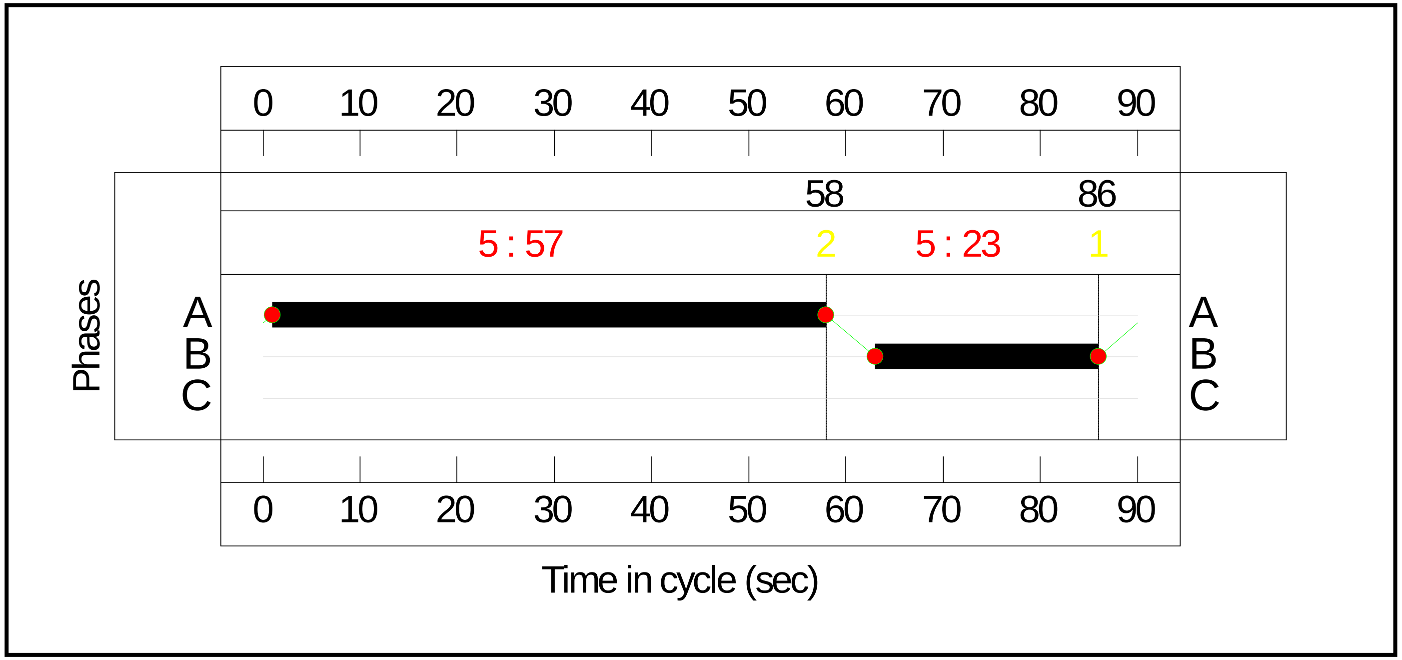
C3 - 00/122 Victoria Embankment / New Bridge Road



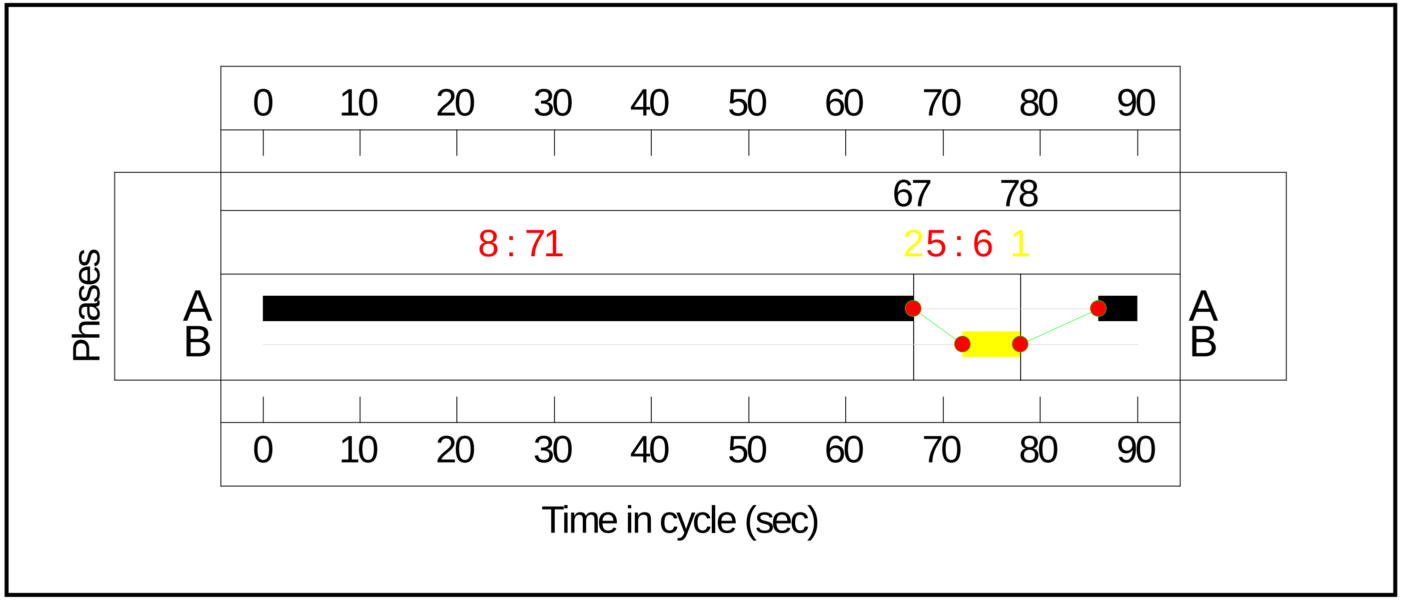
C4 - J00/007 Queen Victoria Street / Puddle Dock



C5 - 00/059 Upper Thames Street / Puddle Dock



C6 - 00/123 Blackfriars Bridge ped crossing



Network Results

Item	Lane Description	Lane Type	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: Blackfriars Bridge Junction	-	-	-	-	-	**116.0%**	**587**	**9**	**1**	**165.5**	-	-
J1: 00/005	-	-	-	-	-	**97.1%**	**301**	**0**	**0**	**28.6**	-	-
1/1	Victoria Embankment (e/b) Ahead	U	1129	1773	1162	97.1%	-	-	-	15.0	47.9	37.1
1/2	Victoria Embankment (e/b) Ahead	U	873	1773	1162	75.1%	-	-	-	4.0	16.7	16.3
2/1	Temple Avenue Right Left	U	78	1729	423	18.5%	-	-	-	0.7	32.1	1.7
3/1	Victoria Embankment (w/b) Ahead	U	330	1773	1182	25.5%	-	-	-	0.4	4.3	1.5
3/2	Victoria Embankment (w/b) Ahead	U	672	1773	1182	56.9%	-	-	-	2.2	11.6	9.6
3/3	Victoria Embankment (w/b) Ahead	U	833	1773	1182	70.5%	-	-	-	3.4	14.6	14.1
4/1		U	330	Inf	Inf	0.0%	-	-	-	0.0	0.0	0.0
4/2		U	672	Inf	Inf	0.0%	-	-	-	0.0	0.0	0.0
4/3		U	877	Inf	Inf	0.0%	-	-	-	0.0	0.0	0.0
5/1	Left	U	434	1800	1800	24.1%	-	-	-	0.2	1.3	0.2
5/2	Ahead	U	731	1800	1800	40.6%	-	-	-	0.3	1.7	0.3
5/3	Ahead	U	873	1800	1800	48.5%	-	-	-	0.5	1.9	0.5
6/1	Blackfriars Underpass (w/b) Ahead	U	811	1800	1800	45.1%	-	-	-	0.4	1.8	0.4
6/2	Blackfriars Underpass (w/b) Ahead	U	656	1800	1800	36.4%	-	-	-	0.3	1.6	0.3
7/1	Victoria Embankment - w/b on-slip Ahead	O	330	1800	537	56.2%	301	0	0	1.3	15.6	6.8
J2: 00/006	-	-	-	-	-	**92.0%**	**0**	**0**	**0**	**24.0**	-	-
1/1	Blackfriars Bridge Road (n/b) Ahead Left	U	1004	1965	1092	92.0%	-	-	-	10.2	36.6	27.7
1/2	Blackfriars Bridge Road (n/b) Ahead	U	487	1965	1092	44.6%	-	-	-	2.0	14.8	7.6
2/1	Blackfriars Bridge Road - internal SL (w/b +n/b) Ahead	U	691	Inf	Inf	0.0%	-	-	-	0.0	0.0	0.0

2/2	Blackfriars Bridge Road - internal SL (w/b +n/b) Ahead	U	409	1940	1940	18.9%	-	-	-	0.1	1.1	0.1
2/3+2/4	Blackfriars Bridge Road - internal SL (w/b +n/b) U-Turn Right	U	339	1853:1550	368	84.3%	-	-	-	6.2	71.8	8.6
3/1	Ahead	U	931	2015	2015	46.2%	-	-	-	0.4	1.7	0.4
3/2	Ahead	U	569	2015	2015	28.2%	-	-	-	0.2	1.2	0.2
4/1	Victoria Embankment - e/b off-slip Ahead	U	257	1848	370	69.5%	-	-	-	3.1	43.9	7.1
4/2	Victoria Embankment - e/b off-slip Ahead	U	177	1848	370	47.9%	-	-	-	1.8	35.9	4.4
J3: 00/122	**-**	**-**	**-**	**-**	**-**	**116.0%**	**0**	**0**	**0**	**88.8**	**-**	**-**
1/1	Queen Victoria Street - internal SL (w/b) Left	U	324	1866	332	97.7%	-	-	-	9.4	104.5	15.3
1/2	Queen Victoria Street - internal SL (w/b) Left Right	U	207	1866	332	62.4%	-	-	-	2.5	43.6	5.9
2/1	Blackfriars Bridge Road - internal SL (n/b) Ahead	U	730	1853	1091	66.9%	-	-	-	1.8	8.7	9.0
2/2	Blackfriars Bridge Road - internal SL (n/b) Ahead	U	704	1852	1091	64.6%	-	-	-	3.0	15.5	16.5
2/3	Blackfriars Bridge Road - internal SL (n/b) Right	U	471	1882	523	90.1%	-	-	-	7.3	56.1	15.0
3/1	Ahead	U	682	1918	1918	35.6%	-	-	-	0.3	1.5	0.3
3/2	Ahead	U	904	1918	1918	47.1%	-	-	-	0.4	1.8	0.4
4/1		U	682	1800	1800	37.9%	-	-	-	0.3	1.6	0.3
4/2		U	904	1800	1800	50.2%	-	-	-	0.5	2.0	0.5
5/1	New Bridge Street (s/b) Ahead	U	478	1965	524	91.2%	-	-	-	8.6	64.9	15.9
5/2	New Bridge Street (s/b) Ahead	U	608	1965	524	116.0%	-	-	-	54.6	197.6	43.7
J4: 00/007	**-**	**-**	**-**	**-**	**-**	**51.6%**	**50**	**9**	**1**	**12.3**	**-**	**-**
1/1	Queen Victoria Street - Internal SL (e/b) Ahead	U	229	1965	590	38.8%	-	-	-	0.8	12.2	2.8
1/2	Queen Victoria Street - Internal SL (e/b) Ahead Right	O	242	1905	572	42.3%	50	9	1	0.8	12.5	3.1

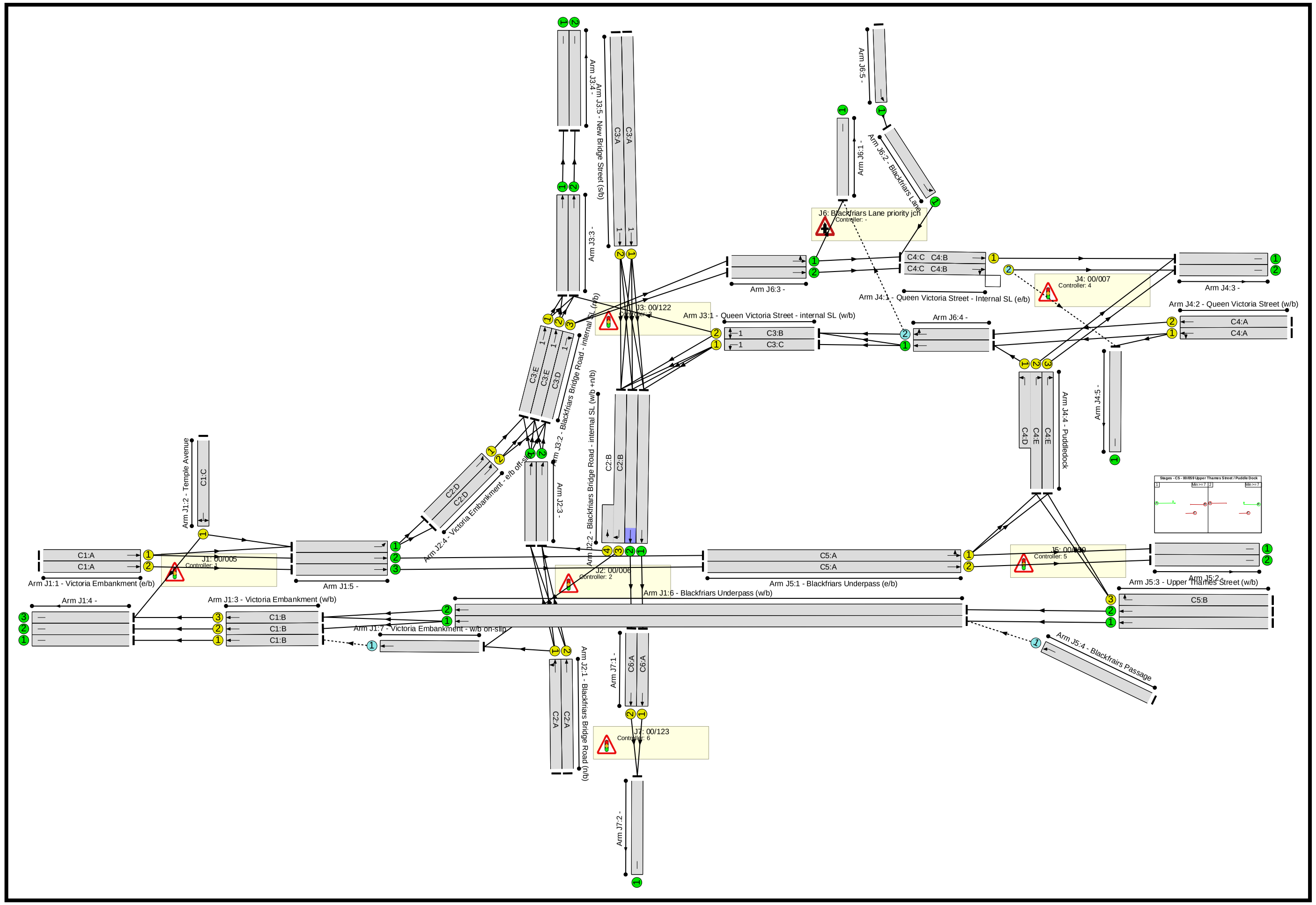
2/1	Queen Victoria Street (w/b) Left Ahead	U	140	1948	346	40.4%	-	-	-	1.6	41.5	3.4
2/2	Queen Victoria Street (w/b) Ahead	U	169	1965	349	48.4%	-	-	-	2.0	43.2	4.2
3/1		U	410	Inf	Inf	0.0%	-	-	-	0.0	0.0	0.0
3/2		U	429	1900	1900	22.6%	-	-	-	0.1	1.2	0.1
4/2+4/1	Puddledock Right Left	U	465	1800:1748	900	51.6%	-	-	-	4.3	33.2	6.0
4/3	Puddledock Right	U	264	1789	537	49.2%	-	-	-	2.6	35.3	6.1
5/1		U	72	1800	1800	4.0%	-	-	-	0.0	1.0	0.0
J5: 00/059	**-**	**-**	**-**	**-**	**-**	**76.3%**	**236**	**0**	**0**	**9.7**	**-**	**-**
1/1	Blackfriars Underpass (e/b) Left Ahead	U	731	1800	1160	63.0%	-	-	-	1.6	7.8	6.3
1/2	Blackfriars Underpass (e/b) Ahead	U	873	1900	1224	71.3%	-	-	-	2.2	8.9	12.4
2/1		U	382	1800	1800	21.2%	-	-	-	0.1	1.3	0.1
2/2		U	873	1800	1800	48.5%	-	-	-	0.5	1.9	0.5
3/1	Upper Thames Street (w/b) Ahead	U	575	1900	1900	30.3%	-	-	-	0.2	1.4	0.2
3/2	Upper Thames Street (w/b) Ahead	U	656	1900	1900	34.5%	-	-	-	0.3	1.4	0.3
3/3	Upper Thames Street (w/b) Right	U	353	1734	462	76.3%	-	-	-	4.5	46.4	9.6
4/1	Blackfrairs Passage Ahead	O	236	1940	588	40.1%	236	0	0	0.3	5.1	0.3
J6: Blackfriars Lane priority jcn	**-**	**-**	**-**	**-**	**-**	**19.4%**	**0**	**0**	**0**	**0.3**	**-**	**-**
1/1		U	10	1800	1800	0.6%	-	-	-	0.0	1.0	0.0
2/1	Blackfriars Lane Left	U	10	1800	1800	0.6%	-	-	-	0.0	1.0	0.0
3/1	Ahead Left	U	229	1800	1800	12.7%	-	-	-	0.1	1.1	0.1
3/2	Ahead	U	242	1800	1800	13.4%	-	-	-	0.1	1.2	0.1
4/1	Ahead	U	349	1800	1800	19.4%	-	-	-	0.1	1.2	0.1
4/2	Ahead Right	O	169	1800	1800	9.4%	0	0	0	0.1	1.1	0.1
5/1	Ahead	U	10	1800	1800	0.6%	-	-	-	0.0	1.0	0.0
J7: 00/123	**-**	**-**	**-**	**-**	**-**	**52.6%**	**0**	**0**	**0**	**1.6**	**-**	**-**

1/1	Ahead	U	691	1940	1552	44.5%	-	-	-	0.5	2.8	11.8
1/2	Ahead	U	403	2130	1704	21.2%	-	-	-	0.1	1.3	0.1
2/1		U	1094	2000	2000	52.6%	-	-	-	0.9	3.2	17.3

C1 - 00/005 Victoria Embankment / Temple Avenue	PRC for Signalled Lanes (%):	-7.9	Total Delay for Signalled Lanes (pcuHr):	25.66	Cycle Time (s):	90
C2 - 00/006 Victoria Embankment / Blackfriars Bridge	PRC for Signalled Lanes (%):	-2.2	Total Delay for Signalled Lanes (pcuHr):	23.29	Cycle Time (s):	90
C3 - 00/122 Victoria Embankment / New Bridge RoadStream: 1	PRC for Signalled Lanes (%):	-28.9	Total Delay for Signalled Lanes (pcuHr):	87.30	Cycle Time (s):	90
C4 - J00/007 Queen Victoria Street / Puddle Dock	PRC for Signalled Lanes (%):	74.3	Total Delay for Signalled Lanes (pcuHr):	12.14	Cycle Time (s):	90
C5 - 00/059 Upper Thames Street / Puddle Dock	PRC for Signalled Lanes (%):	17.9	Total Delay for Signalled Lanes (pcuHr):	8.29	Cycle Time (s):	90
C6 - 00/123 Blackfriars Bridge ped crossing	PRC for Signalled Lanes (%):	102.1	Total Delay for Signalled Lanes (pcuHr):	0.68	Cycle Time (s):	90
	PRC Over All Lanes (%):	-28.9	Total Delay Over All Lanes(pcuHr):	165.46		

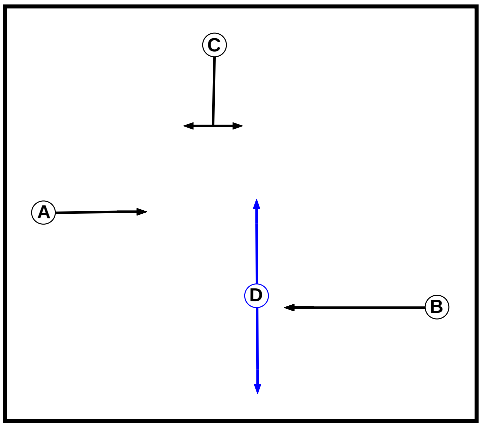
D.6 Construction development case results (phases 1 and 2), PM peak hour

Network Layout Diagram

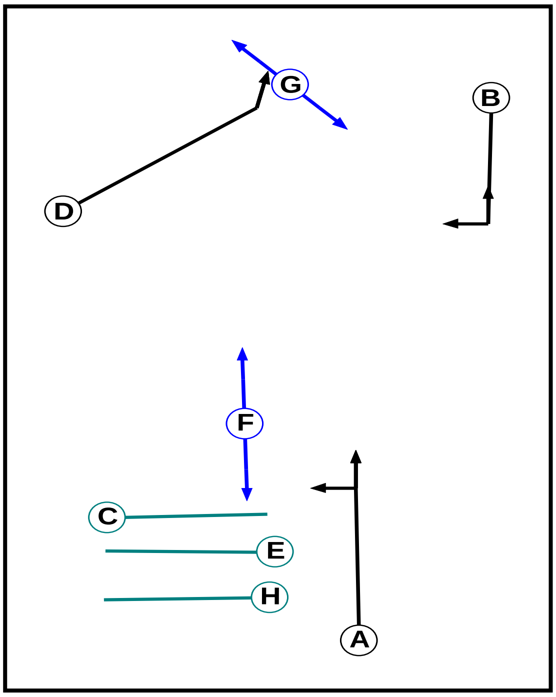


Phase Diagrams

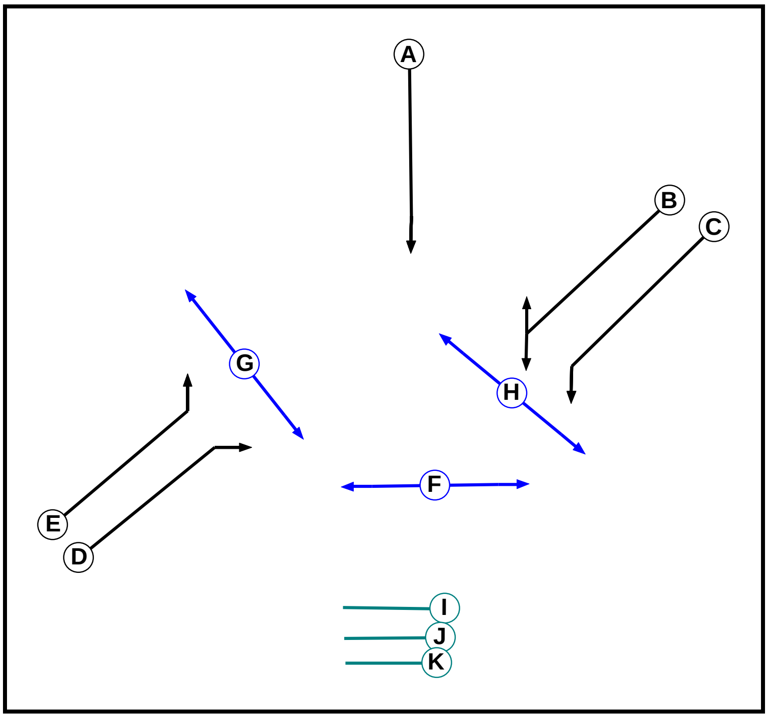
C1 - 00/005 Victoria Embankment / Temple Avenue



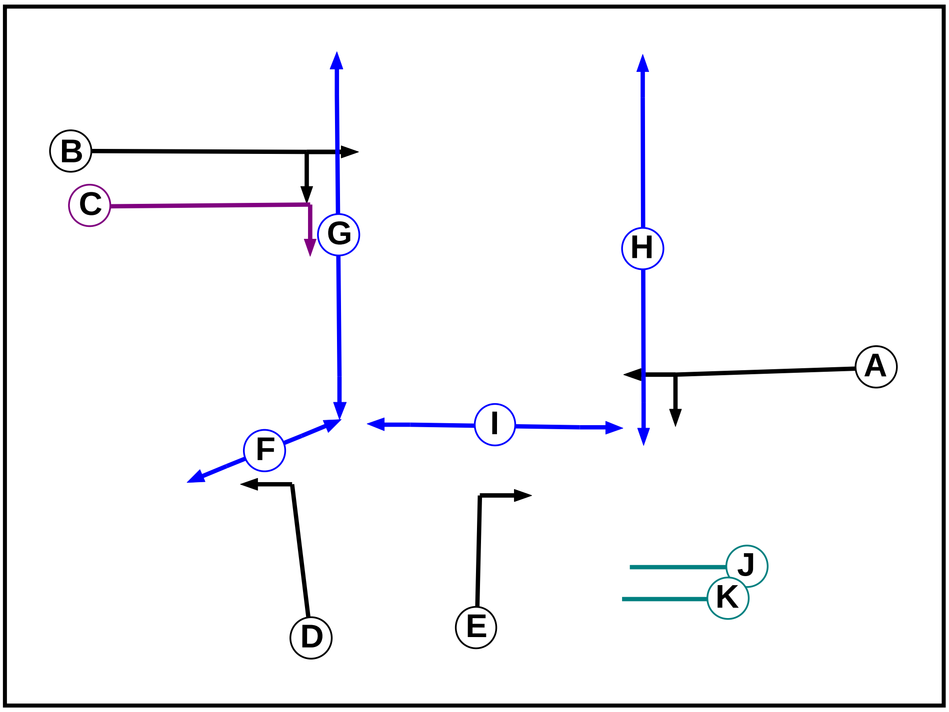
C2 - 00/006 Victoria Embankment / Blackfriars Bridge



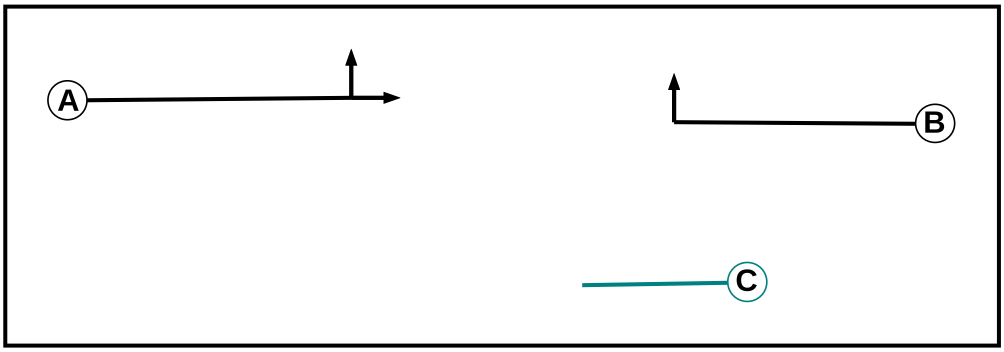
C3 - 00/122 Victoria Embankment / New Bridge Road



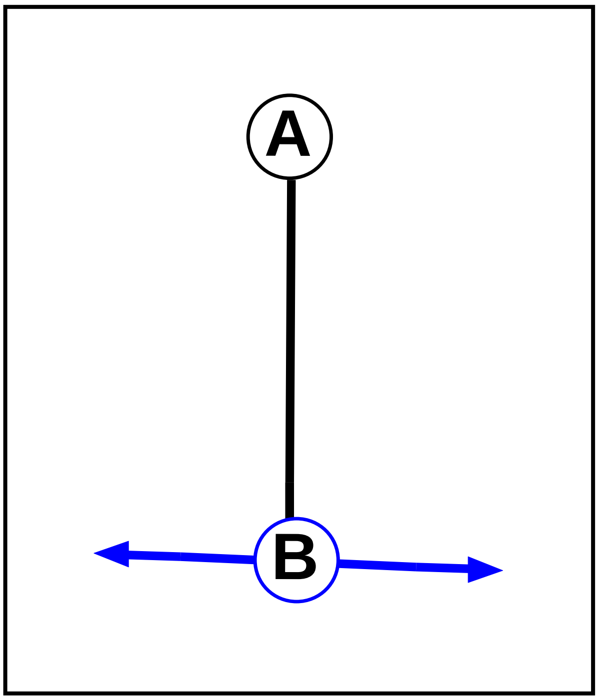
C4 - J00/007 Queen Victoria Street / Puddle Dock



C5 - 00/059 Upper Thames Street / Puddle Dock

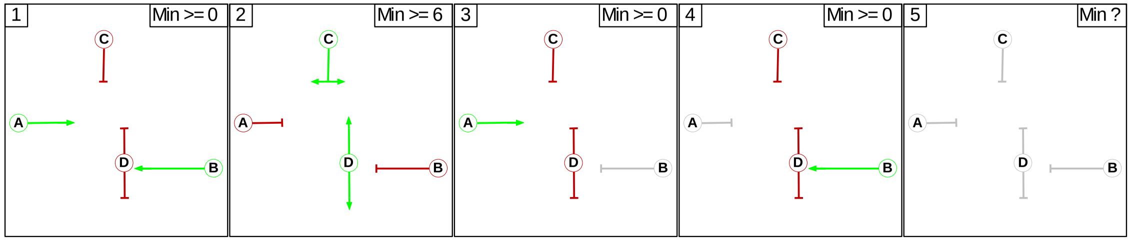


C6 - 00/123 Blackfriars Bridge ped crossing

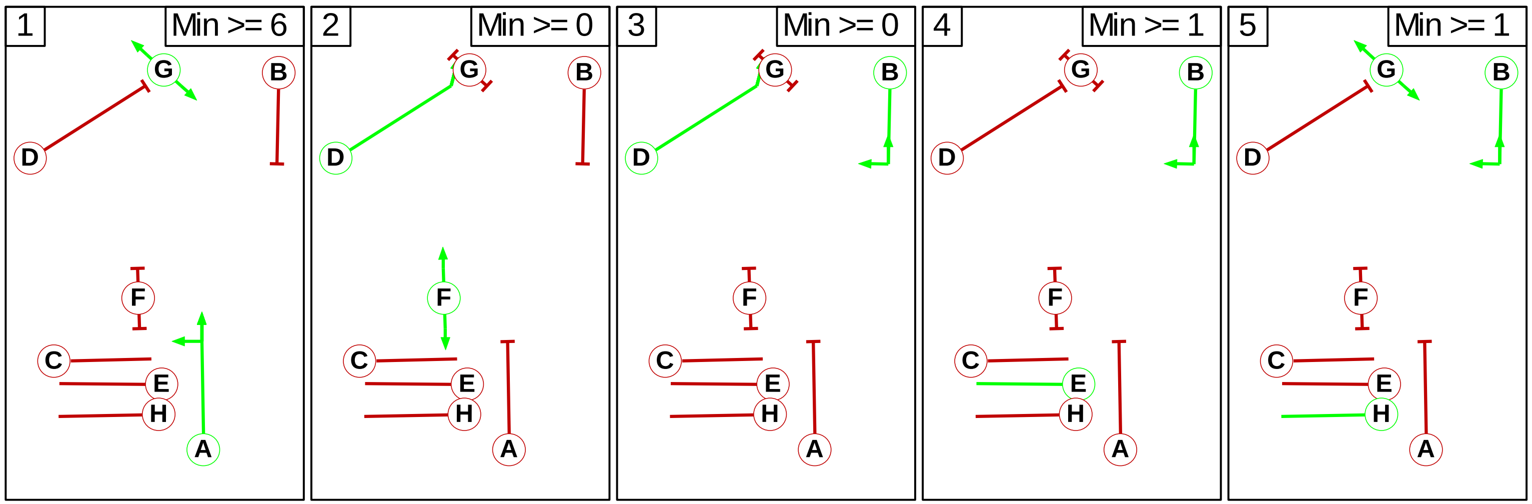


Stage Diagram

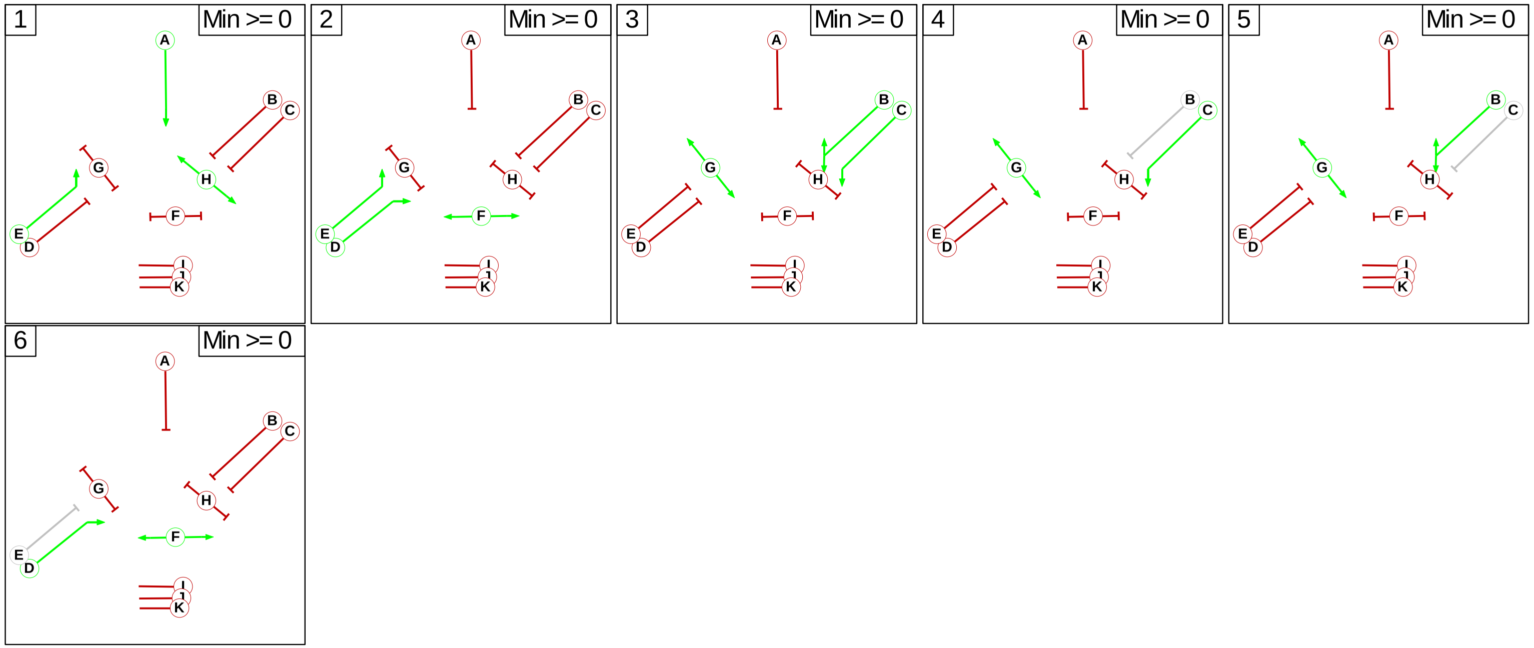
C1 - 01/094 Victoria Embankment / Temple Avenue



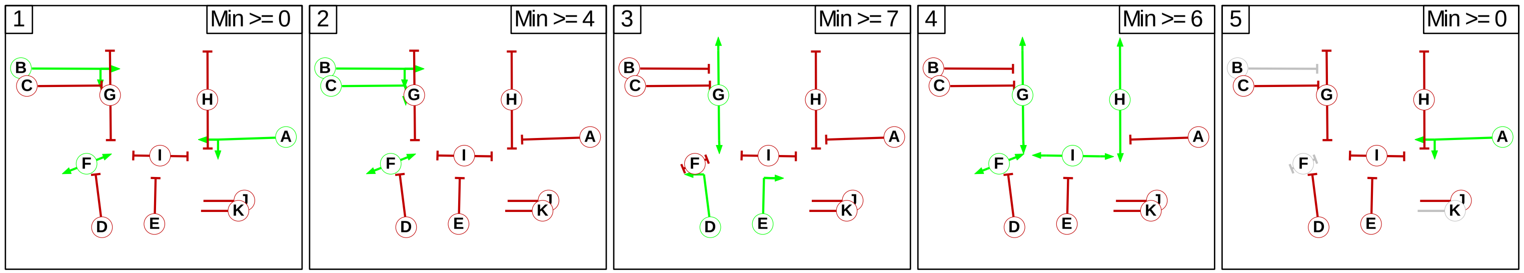
C2 - 00/006 Victoria Embankment / Blackfriars Bridge



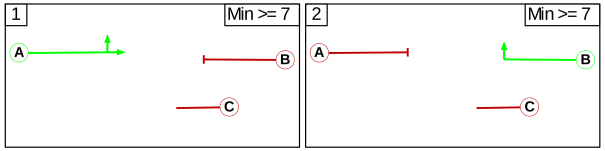
C3 - 00/122 Victoria Embankment / New Bridge Road
Stage Stream: 1



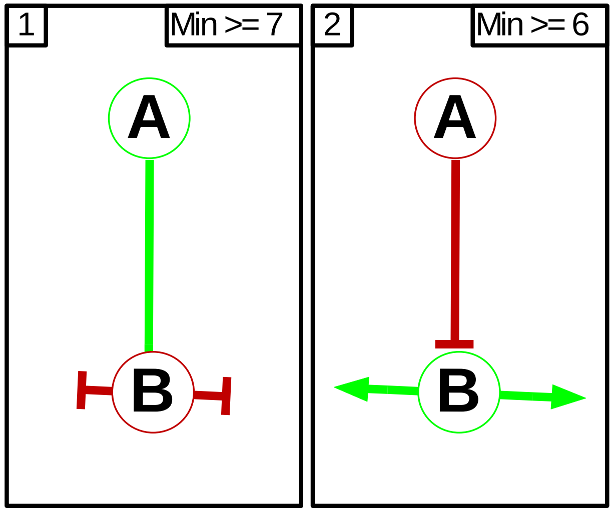
C4 - J00/007 Queen Victoria Street / Puddle Dock



C5 - 00/059 Upper Thames Street / Puddle Dock



C6 - 00/123 Blackfriars Bridge ped crossing



Phases in Stage

C1 - 01/094 Victoria Embankment / Temple Avenue

Stage No.	Phases in Stage
1	A B
2	C D
3	A
4	B
5	

C2 - 00/006 Victoria Embankment / Blackfriars Bridge

Stage No.	Phases in Stage
1	A G
2	D F
3	B D
4	B E
5	B G H

C3 - 00/122 Victoria Embankment / New Bridge Road

Stream	Stage No.	Phases in Stage
1	1	A E H
1	2	D E F
1	3	B C G
1	4	C G
1	5	B G
1	6	D F

C4 - J00/007 Queen Victoria Street / Puddle Dock

Stage No.	Phases in Stage
1	A B F
2	B C F
3	D E G
4	F G H I
5	A

C5 - 00/059 Upper Thames Street / Puddle Dock

Stage No.	Phases in Stage
1	A
2	B

C6 - 00/123 Blackfriars Bridge ped crossing

Stage No.	Phases in Stage
1	A
2	B

Phase Intergreens Matrix

C1 - 01/094 Victoria Embankment / Temple Avenue

		Starting Phase			
		A	B	C	D
Terminating Phase	A		-	5	7
	B	-		5	5
	C	5	5		-
	D	19	19	-	

C2 - 00/006 Victoria Embankment / Blackfriars Bridge

		Starting Phase							
		A	B	C	D	E	F	G	H
Terminating Phase	A		5	3	12	5	7	-	5
	B	5		3	-	-	8	-	-
	C	2	2		2	2	2	2	2
	D	5	-	3		3	-	6	6
	E	5	-	3	2		8	2	2
	F	9	9	4	-	9		-	9
	G	-	-	3	8	3	-		-
	H	5	-	3	8	3	8	-	

C3 - 00/122 Victoria Embankment / New Bridge Road

		Starting Phase										
		A	B	C	D	E	F	G	H	I	J	K
	A		9	9	9	-	8	-	-	9	9	3
	B	5		-	5	5	7	-	6	5	5	3
	C	5	-		-	-	7	-	10	5	5	3
	D	5	5	-		-	-	6	8	3	3	3
Terminating Phase	E	-	5	-	-		-	10	-	-	-	3
	F	8	8	8	-	-		-	-	-	-	3
	G	-	-	-	15	15	-		-	-	-	4
	H	-	15	15	15	-	-	-		5	4	4
	I	9	5	2	2	-	-	-	9		9	4
	J	5	5	2	2	-	-	-	2	5		3
	K	2	2	2	2	2	2	2	2	2	2	

C4 - J00/007 Queen Victoria Street / Puddle Dock

		Starting Phase										
		A	B	C	D	E	F	G	H	I	J	K
	A		-	5	8	6	-	8	5	6	3	-
	B	-		-	-	5	-	5	8	8	3	3
	C	5	-		-	5	-	5	8	8	3	5
	D	5	-	-		-	5	-	-	-	3	5
Terminating Phase	E	5	5	5	-		-	-	9	5	3	5
	F	-	-	-	9	-		-	-	-	4	4
	G	14	14	14	-	-	-		-	-	7	14
	H	15	15	15	-	15	-	-		-	8	15
	I	16	16	16	-	16	-	-	-		8	16
	J	2	2	2	2	2	2	2	2	2		2
	K	-	2	5	8	6	2	8	5	6	3	

C5 - 00/059 Upper Thames Street / Puddle Dock

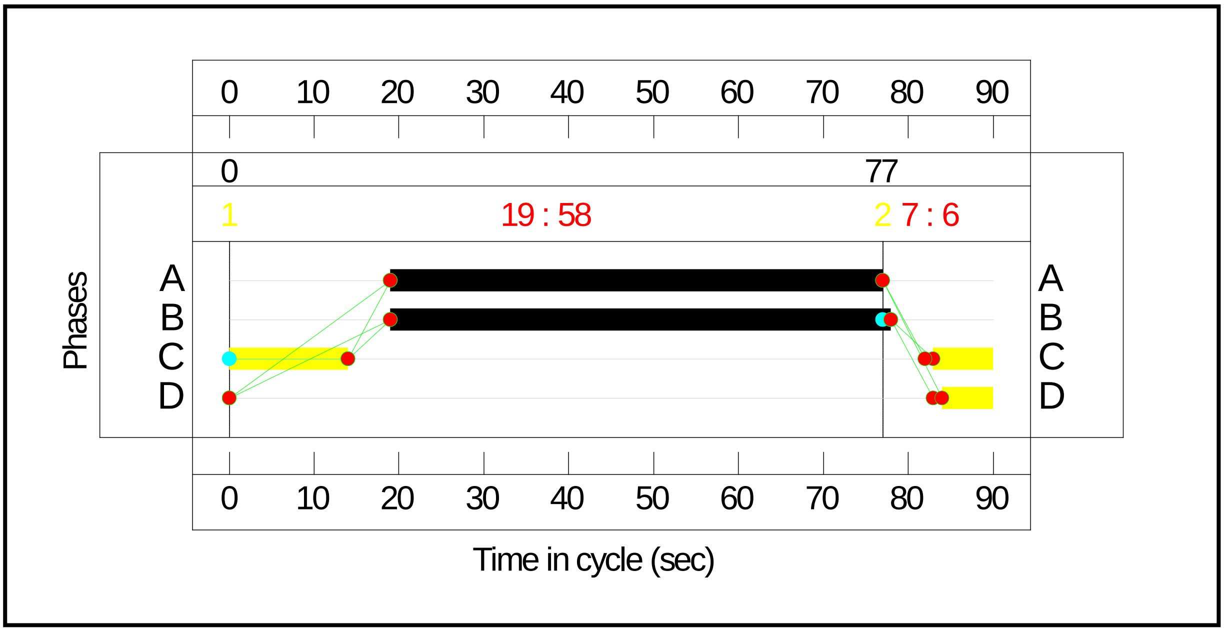
	Starting Phase			
Terminating Phase		A	B	C
	A		5	3
	B	5		3
	C	2	2	

C6 - 00/123 Blackfriars Bridge ped crossing

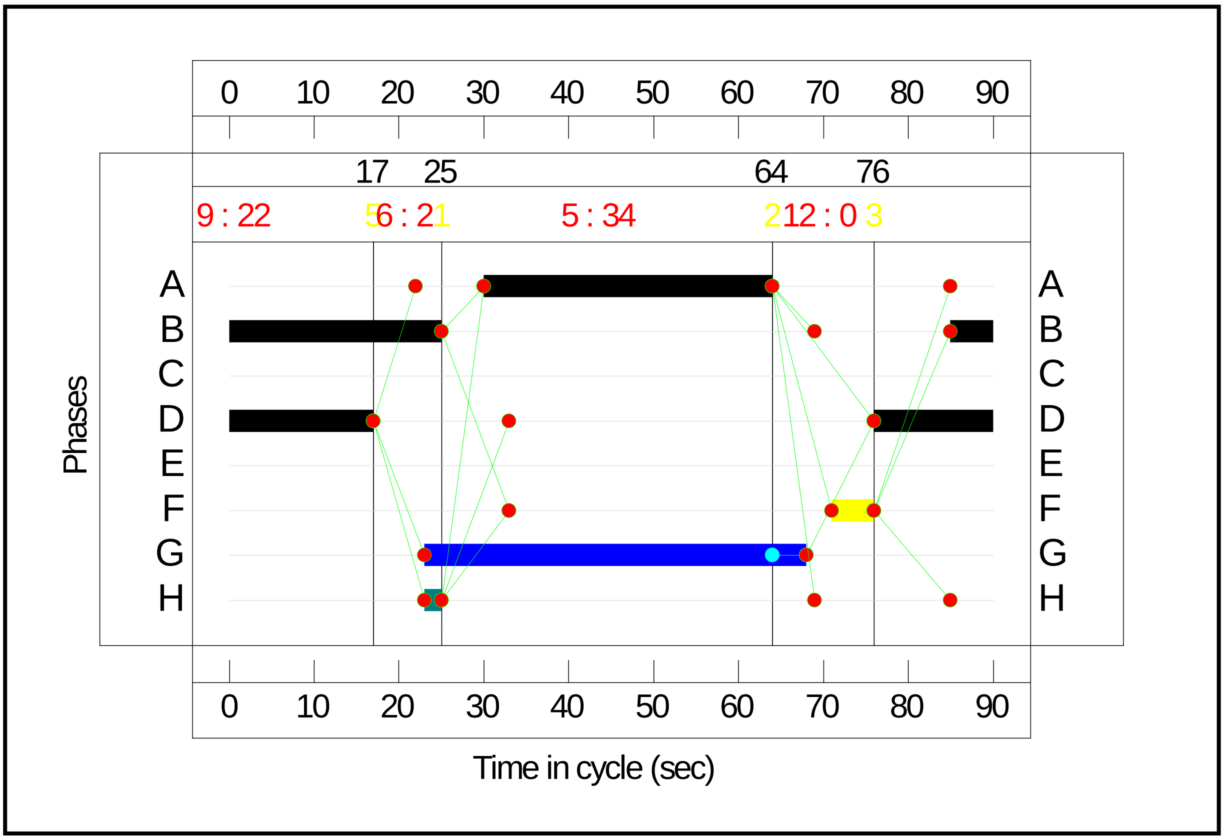
	Starting Phase		
Terminating Phase		A	B
	A		5
	B	8	

Stage Diagrams

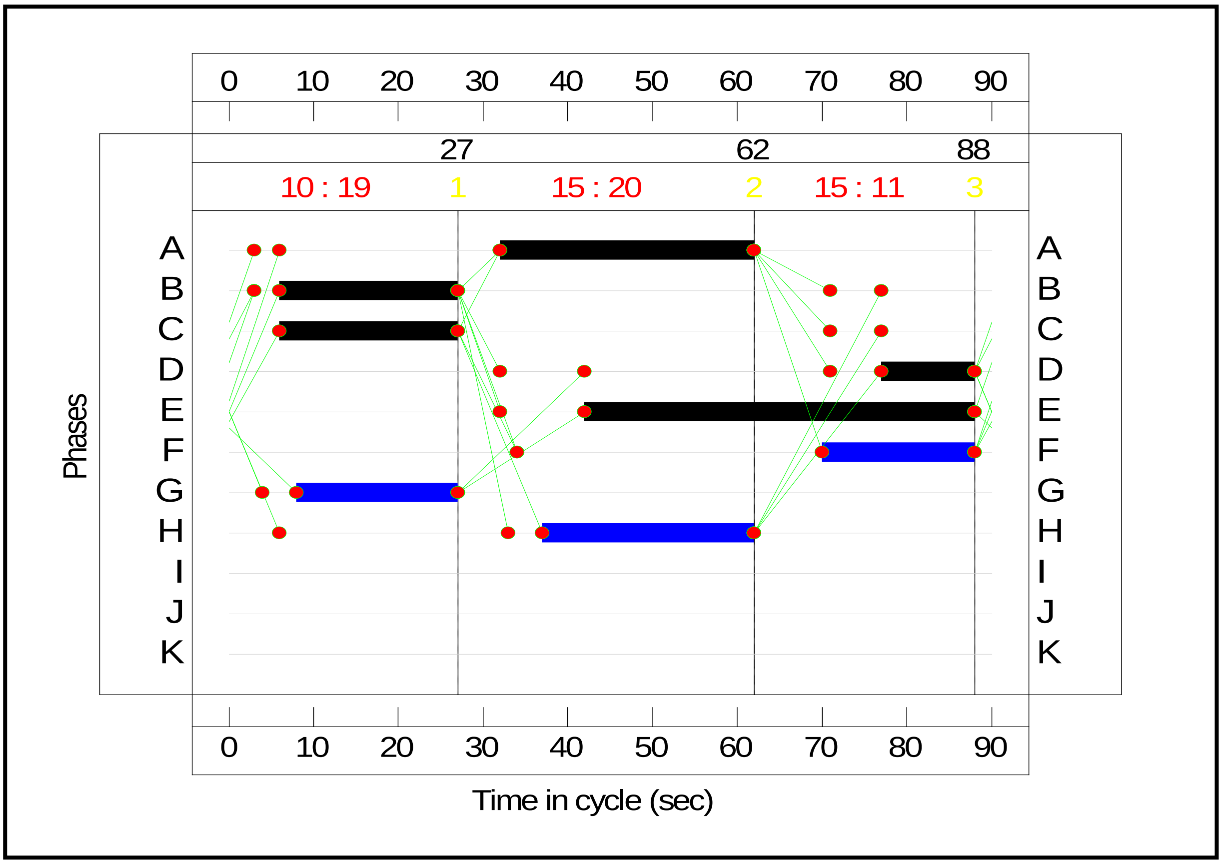
C1 - 00/005 Victoria Embankment / Temple Avenue



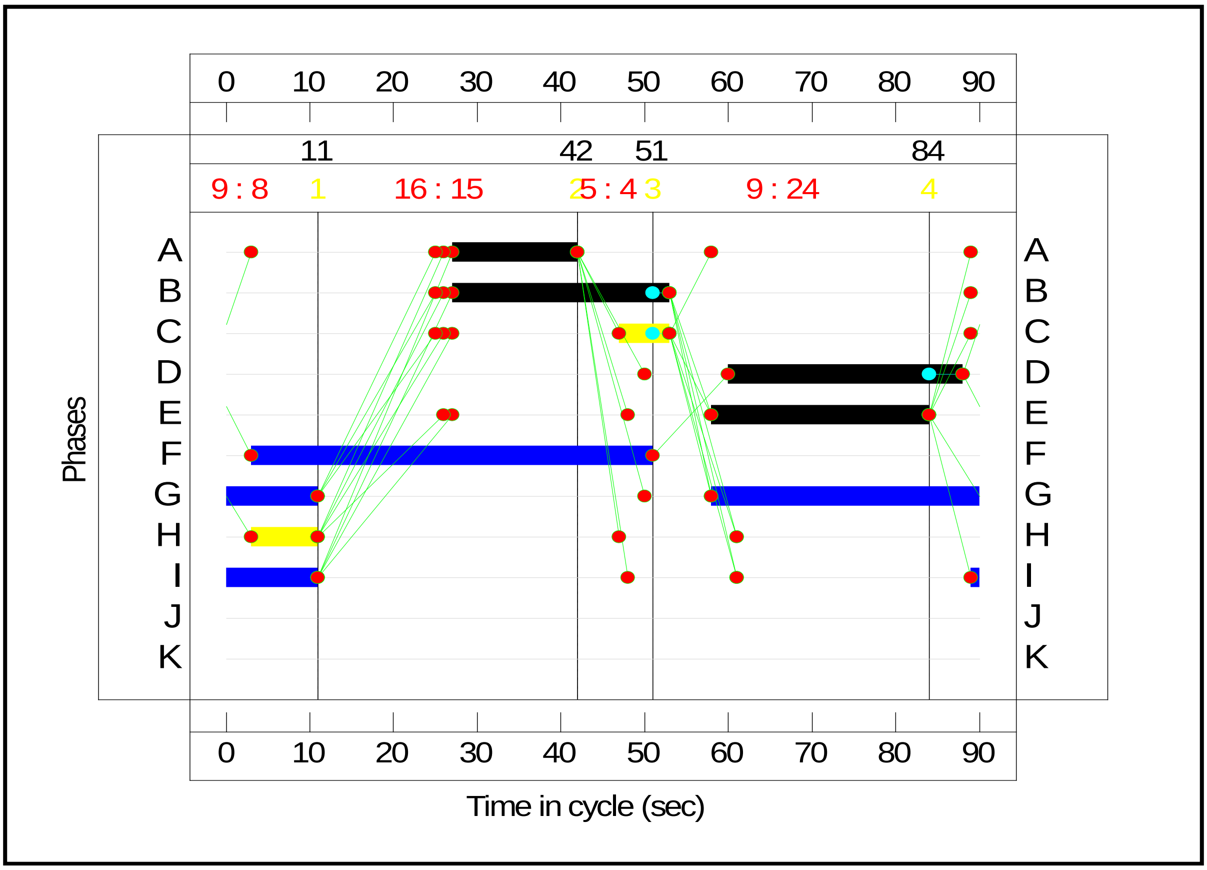
C2 - 00/006 Victoria Embankment / Blackfriars Bridge



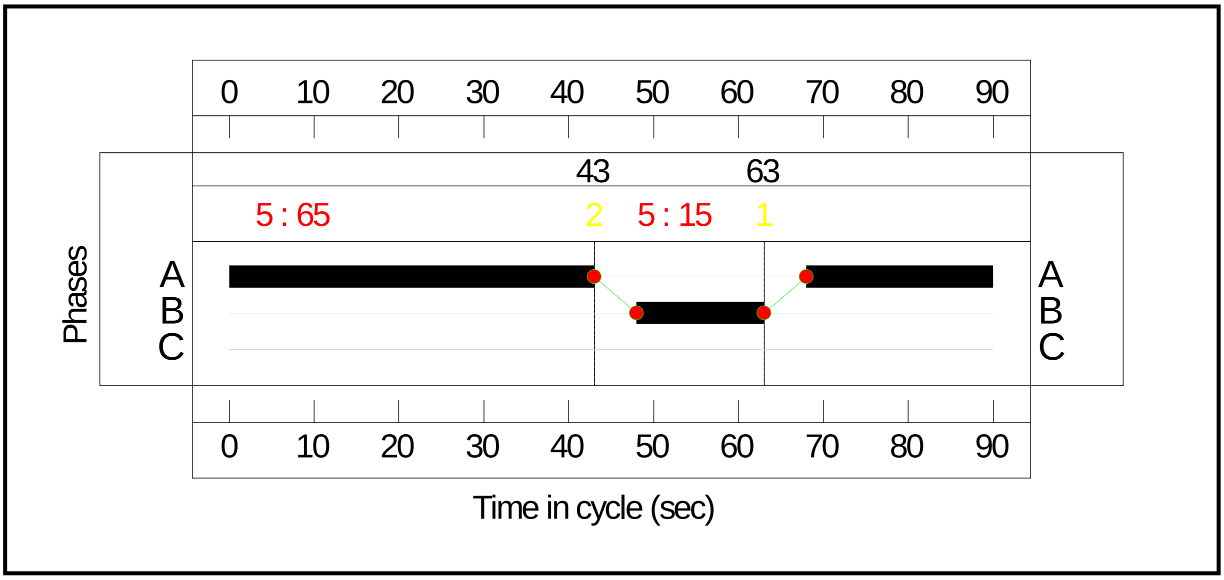
C3 - 00/122 Victoria Embankment / New Bridge Road



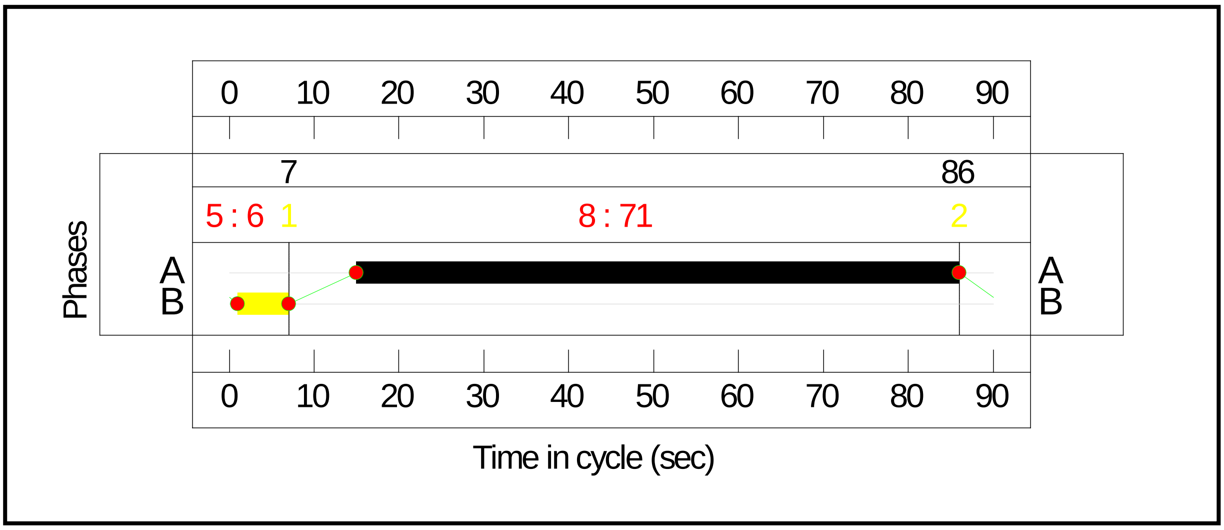
C4 - J00/007 Queen Victoria Street / Puddle Dock



C5 - 00/059 Upper Thames Street / Puddle Dock



C6 - 00/123 Blackfriars Bridge ped crossing



Network Results

Item	Lane Description	Lane Type	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: Blackfriars Bridge Junction	-	-	-	-	-	**125.9%**	**629**	**3**	**0**	**230.8**	-	-
J1: 00/005	-	-	-	-	-	**91.6%**	**344**	**0**	**0**	**22.7**	-	-
1/1	Victoria Embankment (e/b) Ahead	U	1065	1773	1162	91.6%	-	-	-	8.9	30.2	27.7
1/2	Victoria Embankment (e/b) Ahead	U	787	1773	1162	67.7%	-	-	-	3.1	14.4	13.1
2/1	Temple Avenue Right Left	U	136	1729	423	32.2%	-	-	-	1.3	34.2	3.0
3/1	Victoria Embankment (w/b) Ahead	U	382	1773	1182	28.9%	-	-	-	0.9	9.1	3.4
3/2	Victoria Embankment (w/b) Ahead	U	757	1773	1182	64.0%	-	-	-	2.7	12.9	11.8
3/3	Victoria Embankment (w/b) Ahead	U	758	1773	1182	64.1%	-	-	-	2.7	13.0	11.8
4/1		U	382	Inf	Inf	0.0%	-	-	-	0.0	0.0	0.0
4/2		U	757	Inf	Inf	0.0%	-	-	-	0.0	0.0	0.0
4/3		U	840	Inf	Inf	0.0%	-	-	-	0.0	0.0	0.0
5/1	Left	U	413	1800	1800	22.9%	-	-	-	0.1	1.3	0.1
5/2	Ahead	U	706	1800	1800	39.2%	-	-	-	0.3	1.6	0.3
5/3	Ahead	U	787	1800	1800	43.7%	-	-	-	0.4	1.8	0.4
6/1	Blackfriars Underpass (w/b) Ahead	U	804	1800	1800	44.7%	-	-	-	0.4	1.8	0.4
6/2	Blackfriars Underpass (w/b) Ahead	U	711	1800	1800	39.5%	-	-	-	0.3	1.7	0.3
7/1	Victoria Embankment - w/b on-slip Ahead	O	385	1800	538	64.0%	344	0	0	1.5	15.5	7.7
J2: 00/006	-	-	-	-	-	**80.0%**	**0**	**0**	**0**	**15.3**	-	-

1/1	Blackfriars Bridge Road (n/b) Ahead Left	U	611	1965	764	80.0%	-	-	-	6.1	35.9	15.4
1/2	Blackfriars Bridge Road (n/b) Ahead	U	342	1965	764	44.8%	-	-	-	2.3	24.6	6.7
2/1	Blackfriars Bridge Road - internal SL (w/b +n/b) Ahead	U	1065	Inf	Inf	0.0%	-	-	-	0.0	0.0	0.0
2/2	Blackfriars Bridge Road - internal SL (w/b +n/b) Ahead	U	643	1940	1940	26.7%	-	-	-	0.2	1.3	0.2
2/3+2/4	Blackfriars Bridge Road - internal SL (w/b +n/b) U-Turn Right	U	334	1853:1550	640	45.8%	-	-	-	2.6	32.4	5.2
3/1	Ahead	U	540	2015	2015	26.8%	-	-	-	0.2	1.2	0.2
3/2	Ahead	U	362	2015	2015	18.0%	-	-	-	0.1	1.1	0.1
4/1	Victoria Embankment - e/b off-slip Ahead	U	314	1848	657	47.8%	-	-	-	2.8	31.9	6.4
4/2	Victoria Embankment - e/b off-slip Ahead	U	133	1848	657	20.2%	-	-	-	1.0	27.8	2.5
J3: 00/122	**-**	**-**	**-**	**-**	**-**	**125.9%**	**0**	**0**	**0**	**168.3**	**-**	**-**
1/1	Queen Victoria Street - internal SL (w/b) Left	U	423	1866	456	92.7%	-	-	-	7.4	63.3	14.9
1/2	Queen Victoria Street - internal SL (w/b) Left Right	U	263	1866	456	57.7%	-	-	-	2.5	34.0	7.0
2/1	Blackfriars Bridge Road - internal SL (n/b) Ahead	U	812	1853	968	83.9%	-	-	-	4.6	20.5	17.2
2/2	Blackfriars Bridge Road - internal SL (n/b) Ahead	U	300	1852	967	31.0%	-	-	-	0.4	4.9	1.4
2/3	Blackfriars Bridge Road - internal SL (n/b) Right	U	240	1882	251	95.6%	-	-	-	7.3	108.8	11.4
3/1	Ahead	U	812	1918	1918	42.3%	-	-	-	0.4	1.6	0.4
3/2	Ahead	U	529	1918	1918	27.6%	-	-	-	0.2	1.3	0.2
4/1		U	812	1800	1800	45.1%	-	-	-	0.4	1.8	0.4

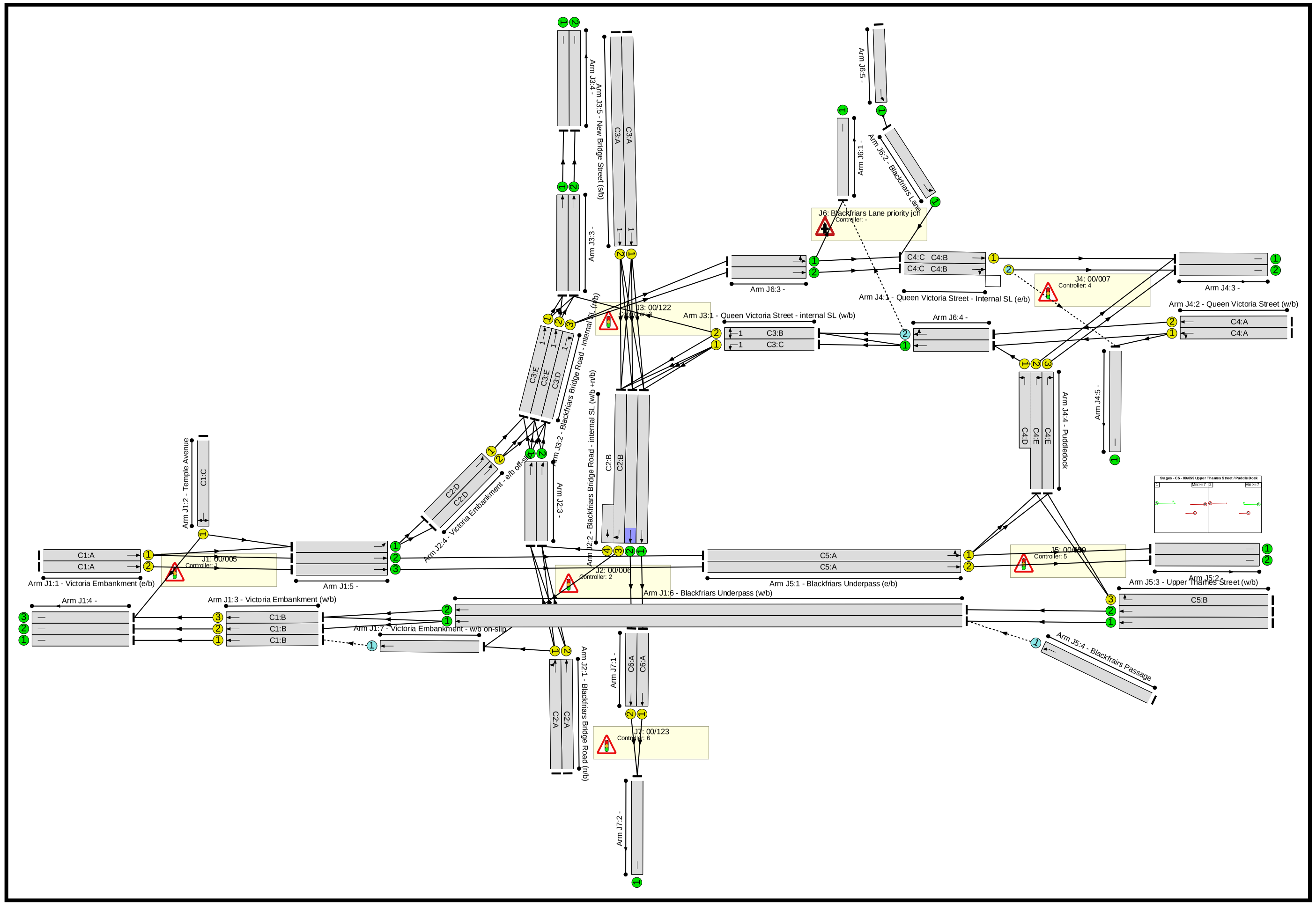
4/2		U	529	1800	1800	29.4%	-	-	-	0.2	1.4	0.2
5/1	New Bridge Street (s/b) Ahead	U	733	1965	677	108.3%	-	-	-	41.6	204.3	53.3
5/2	New Bridge Street (s/b) Ahead	U	852	1965	677	125.9%	-	-	-	103.3	436.5	115.6
J4: 00/007	**-**	**-**	**-**	**-**	**-**	**58.1%**	**14**	**3**	**0**	**8.9**	**-**	**-**
1/1	Queen Victoria Street - Internal SL (e/b) Ahead	U	228	1965	590	38.7%	-	-	-	0.7	11.0	2.1
1/2	Queen Victoria Street - Internal SL (e/b) Ahead Right	O	17	1805	354	4.8%	14	3	0	0.1	12.8	0.1
2/1	Queen Victoria Street (w/b) Left Ahead	U	166	1950	347	47.9%	-	-	-	2.0	43.2	4.1
2/2	Queen Victoria Street (w/b) Ahead	U	203	1965	349	58.1%	-	-	-	2.6	46.1	5.3
3/1		U	387	Inf	Inf	0.0%	-	-	-	0.0	0.0	0.0
3/2		U	172	1900	1900	9.1%	-	-	-	0.0	1.0	0.0
4/2+4/1	Puddledock Right Left	U	446	1800:1748	779	57.3%	-	-	-	2.0	16.0	13.3
4/3	Puddledock Right	U	172	1789	537	32.0%	-	-	-	1.5	32.1	3.8
5/1		U	29	1800	1800	1.6%	-	-	-	0.0	1.0	0.0
J5: 00/059	**-**	**-**	**-**	**-**	**-**	**89.5%**	**271**	**0**	**0**	**10.5**	**-**	**-**
1/1	Blackfriars Underpass (e/b) Left Ahead	U	706	1800	1320	53.5%	-	-	-	1.4	7.2	5.1
1/2	Blackfriars Underpass (e/b) Ahead	U	787	1900	1393	56.5%	-	-	-	1.4	6.5	4.8
2/1		U	375	1800	1800	20.8%	-	-	-	0.1	1.3	0.1
2/2		U	787	1800	1800	43.7%	-	-	-	0.4	1.8	0.4
3/1	Upper Thames Street (w/b) Ahead	U	533	1900	1900	28.1%	-	-	-	0.2	1.3	0.2
3/2	Upper Thames Street (w/b) Ahead	U	711	1900	1900	37.4%	-	-	-	0.3	1.5	0.3

3/3	Upper Thames Street (w/b) Right	U	276	1734	308	89.5%	-	-	-	6.3	82.0	10.3
4/1	Blackfrairs Passage Ahead	O	271	1940	598	45.3%	271	0	0	0.4	5.5	0.4
J6: Blackfriars Lane priority jcn	**-**	**-**	**-**	**-**	**-**	**24.4%**	**0**	**0**	**0**	**0.3**	**-**	**-**
1/1		U	10	1800	1800	0.6%	-	-	-	0.0	1.0	0.0
2/1	Blackfriars Lane Left	U	10	1800	1800	0.6%	-	-	-	0.0	1.0	0.0
3/1	Ahead Left	U	228	1800	1800	12.7%	-	-	-	0.1	1.1	0.1
3/2	Ahead	U	17	1800	1800	0.9%	-	-	-	0.0	1.0	0.0
4/1	Ahead	U	440	1800	1800	24.4%	-	-	-	0.2	1.3	0.2
4/2	Ahead Right	O	203	1800	1800	11.3%	0	0	0	0.1	1.1	0.1
5/1	Ahead	U	10	1800	1800	0.6%	-	-	-	0.0	1.0	0.0
J7: 00/123	**-**	**-**	**-**	**-**	**-**	**75.9%**	**0**	**0**	**0**	**4.7**	**-**	**-**
1/1	Ahead	U	1065	1940	1552	64.4%	-	-	-	0.9	3.3	11.7
1/2	Ahead	U	643	2130	1704	30.4%	-	-	-	0.2	1.5	0.2
2/1		U	1708	2000	2000	75.9%	-	-	-	3.6	8.5	30.1

C1 - 00/005 Victoria Embankment / Temple Avenue	PRC for Signalled Lanes (%):	-1.8	Total Delay for Signalled Lanes (pcuHr):	19.67	Cycle Time (s):	90
C2 - 00/006 Victoria Embankment / Blackfriars Bridge	PRC for Signalled Lanes (%):	12.6	Total Delay for Signalled Lanes (pcuHr):	14.87	Cycle Time (s):	90
C3 - 00/122 Victoria Embankment / New Bridge RoadStream: 1	PRC for Signalled Lanes (%):	-39.9	Total Delay for Signalled Lanes (pcuHr):	167.10	Cycle Time (s):	90
C4 - J00/007 Queen Victoria Street / Puddle Dock	PRC for Signalled Lanes (%):	54.9	Total Delay for Signalled Lanes (pcuHr):	8.86	Cycle Time (s):	90
C5 - 00/059 Upper Thames Street / Puddle Dock	PRC for Signalled Lanes (%):	0.5	Total Delay for Signalled Lanes (pcuHr):	9.12	Cycle Time (s):	90
C6 - 00/123 Blackfriars Bridge ped crossing	PRC for Signalled Lanes (%):	39.9	Total Delay for Signalled Lanes (pcuHr):	1.13	Cycle Time (s):	90
	PRC Over All Lanes (%):	-39.9	Total Delay Over All Lanes(pcuHr):	230.83		

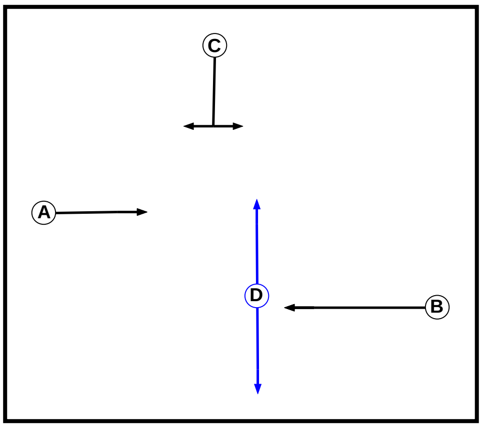
D.7 Construction development case results (phase 3), AM peak hour

Network Layout Diagram

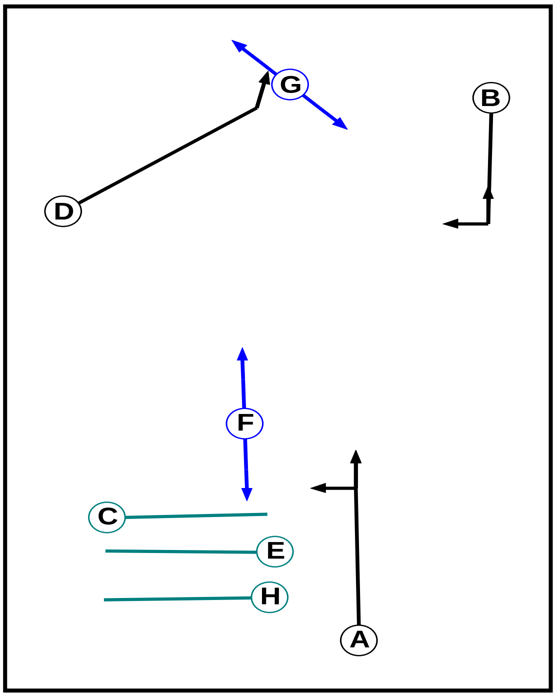


Phase Diagram

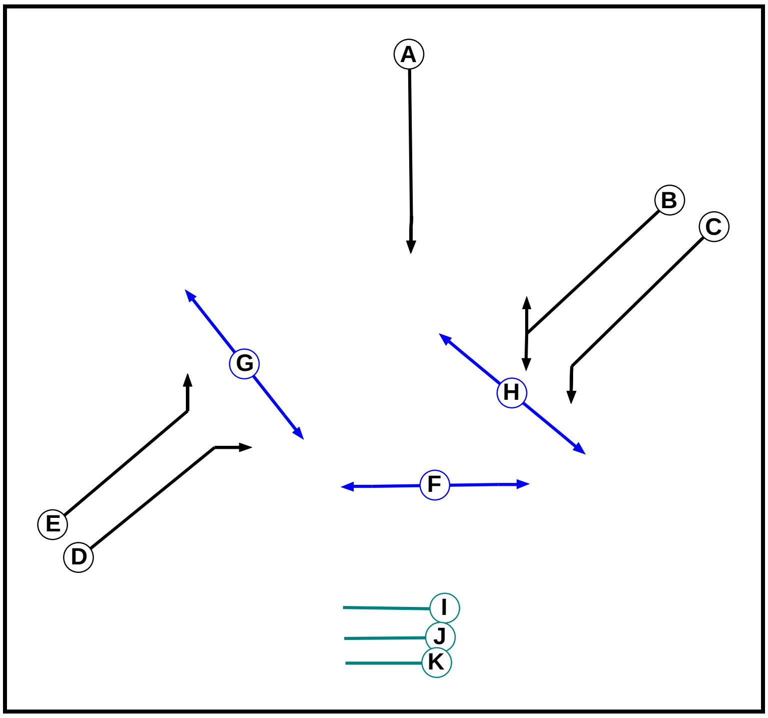
C1 - 00/005 Victoria Embankment / Temple Avenue



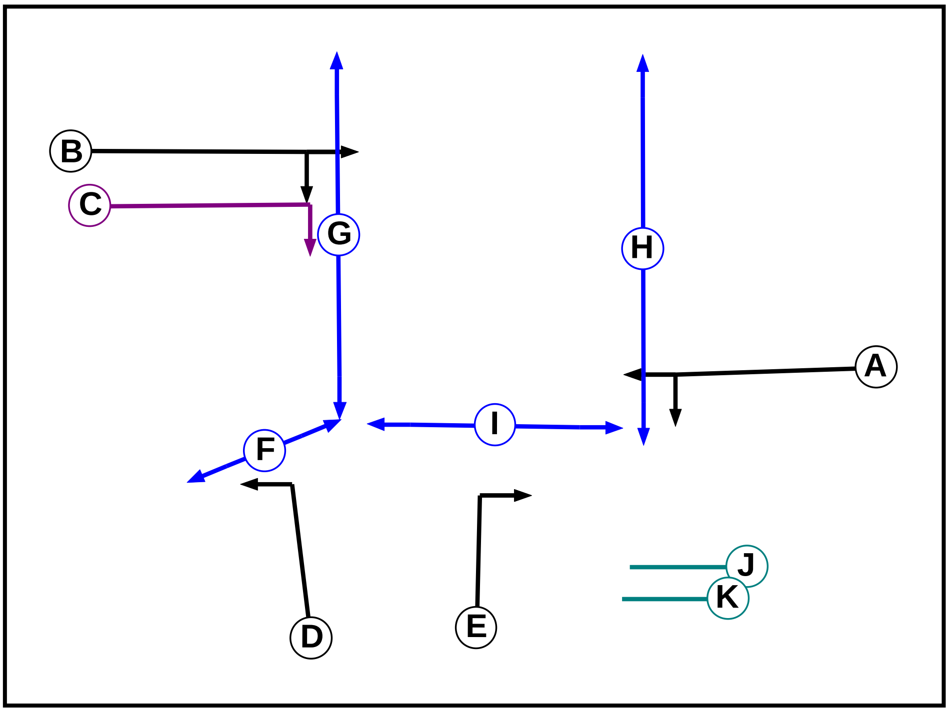
C2 - 00/006 Victoria Embankment / Blackfriars Bridge



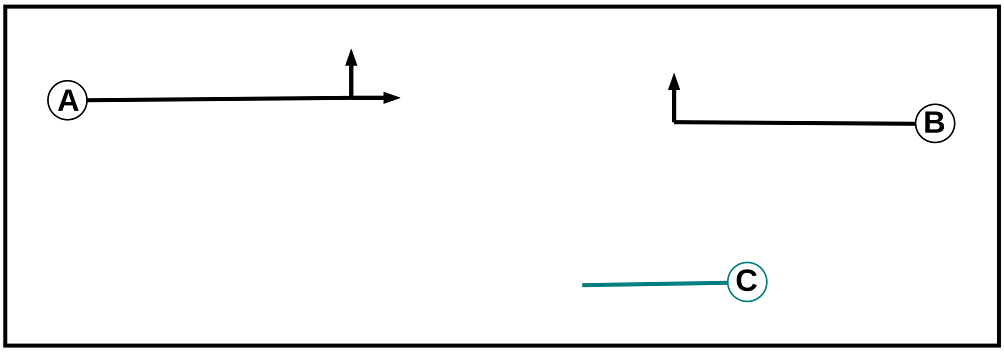
C3 - 00/122 Victoria Embankment / New Bridge Road



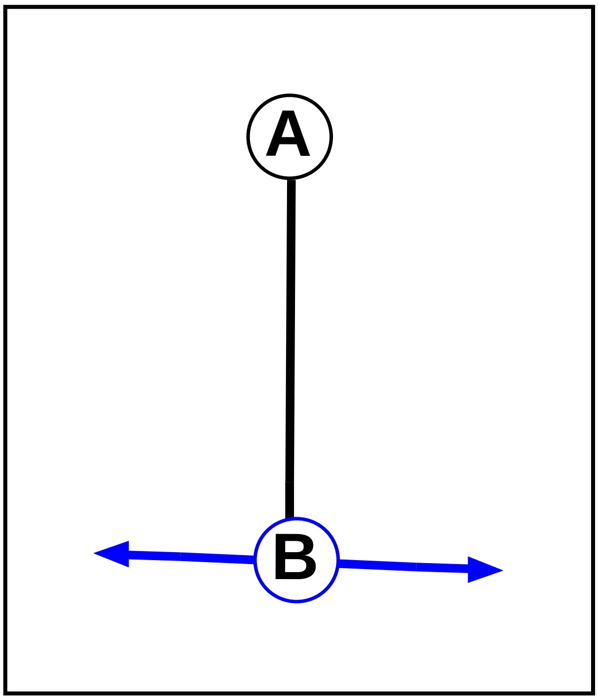
C4 - J00/007 Queen Victoria Street / Puddle Dock



C5 - 00/059 Upper Thames Street / Puddle Dock

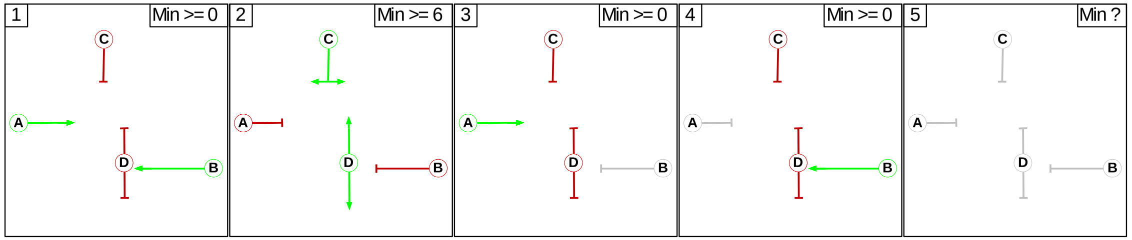


C6 - 00/123 Blackfriars Bridge ped crossing

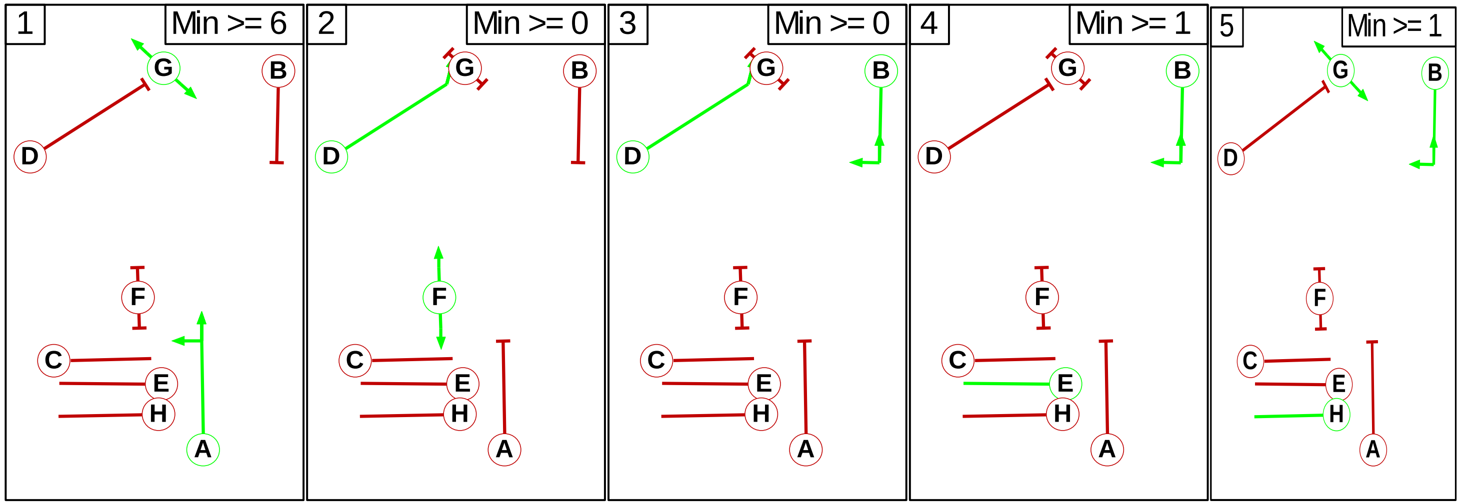


Stage Diagram

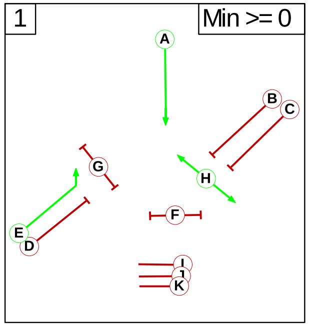
C1 - 01/094 Victoria Embankment / Temple Avenue

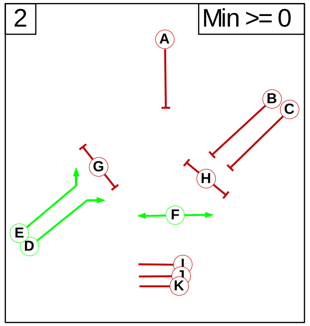


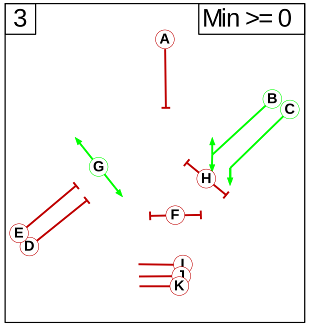
C2 - 00/006 Victoria Embankment / Blackfriars Bridge

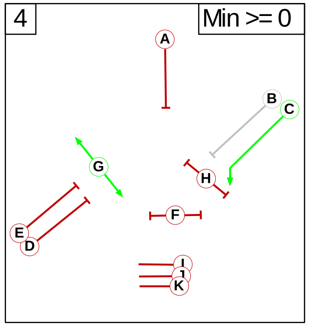


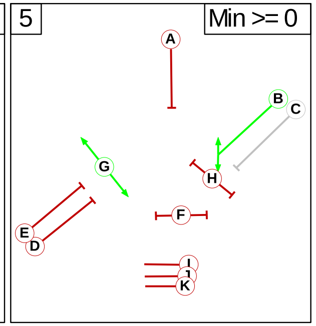
C3 - 00/122 Victoria Embankment / New Bridge Road
Stage Stream: 1

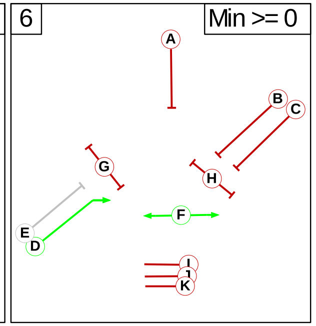




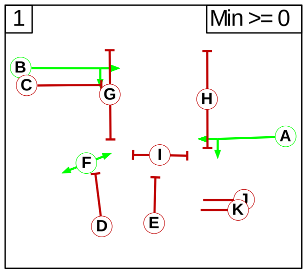


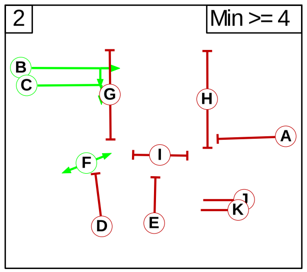


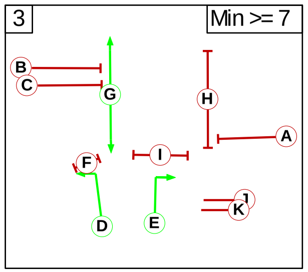


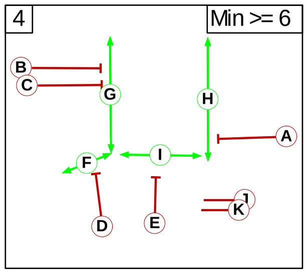


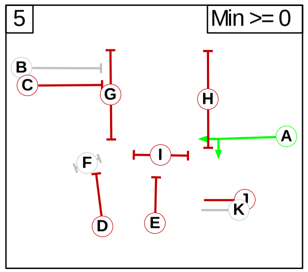
C4 - J00/007 Queen Victoria Street / Puddle Dock



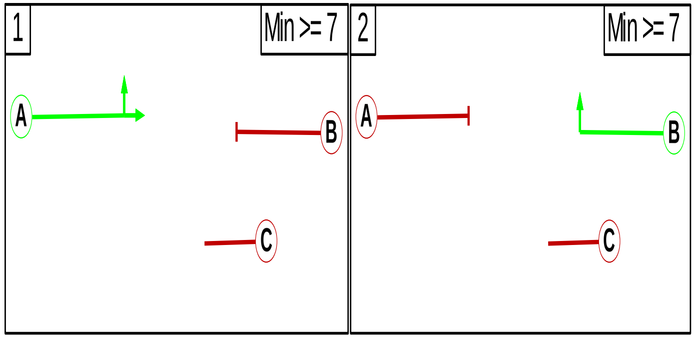




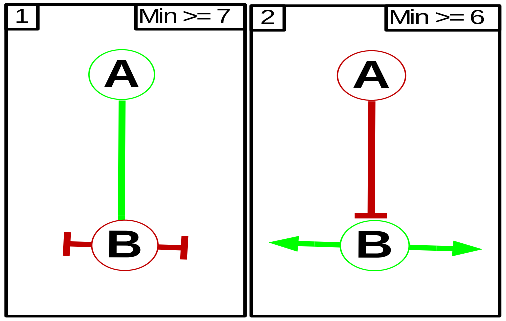




C5 - 00/059 Upper Thames Street / Puddle Dock



C6 - 00/123 Blackfriars Bridge ped crossing



Phases in Stage

C1 - 01/094 Victoria Embankment / Temple Avenue

Stage No.	Phases in Stage
1	A B
2	C D
3	A
4	B
5	

C2 - 00/006 Victoria Embankment / Blackfriars Bridge

Stage No.	Phases in Stage
1	A G
2	D F
3	B D
4	B E
5	B G H

C3 - 00/122 Victoria Embankment / New Bridge Road

Stream	Stage No.	Phases in Stage
1	1	A E H
1	2	D E F
1	3	B C G
1	4	C G
1	5	B G
1	6	D F

C4 - J00/007 Queen Victoria Street / Puddle Dock

Stage No.	Phases in Stage
1	A B F
2	B C F
3	D E G
4	F G H I
5	A

C5 - 00/059 Upper Thames Street / Puddle Dock

Stage No.	Phases in Stage
1	A
2	B

C6 - 00/123 Blackfriars Bridge ped crossing

Stage No.	Phases in Stage
1	A
2	B

Phase Intergreens Matrix

C1 - 01/094 Victoria Embankment / Temple Avenue

	Starting Phase				
Terminating Phase		A	B	C	D
	A		-	5	7
	B	-		5	5
	C	5	5		-
	D	19	19	-	

C2 - 00/006 Victoria Embankment / Blackfriars Bridge

	Starting Phase								
Terminating Phase		A	B	C	D	E	F	G	H
	A		5	3	12	5	7	-	5
	B	5		3	-	-	8	-	-
	C	2	2		2	2	2	2	2
	D	5	-	3		3	-	6	6
	E	5	-	3	2		8	2	2
	F	9	9	4	-	9		-	9
	G	-	-	3	8	3	-		-
	H	5	-	3	8	3	8	-	

C3 - 00/122 Victoria Embankment / New Bridge Road

	Starting Phase											
		A	B	C	D	E	F	G	H	I	J	K
Terminating Phase	A		9	9	9	-	8	-	-	9	9	3
	B	5		-	5	5	7	-	6	5	5	3
	C	5	-		-	-	7	-	10	5	5	3
	D	5	5	-		-	-	6	8	3	3	3
	E	-	5	-	-		-	10	-	-	-	3
	F	8	8	8	-	-		-	-	-	-	3
	G	-	-	-	15	15	-		-	-	-	4
	H	-	15	15	15	-	-	-		5	4	4
	I	9	5	2	2	-	-	-	9		9	4
	J	5	5	2	2	-	-	-	2	5		3
	K	2	2	2	2	2	2	2	2	2	2	

C4 - J00/007 Queen Victoria Street / Puddle Dock

	Starting Phase											
		A	B	C	D	E	F	G	H	I	J	K
Terminating Phase	A		-	5	8	6	-	8	5	6	3	-
	B	-		-	-	5	-	5	8	8	3	3
	C	5	-		-	5	-	5	8	8	3	5
	D	5	-	-		-	5	-	-	-	3	5
	E	5	5	5	-		-	-	9	5	3	5
	F	-	-	-	9	-		-	-	-	4	4
	G	14	14	14	-	-	-		-	-	7	14
	H	15	15	15	-	15	-	-		-	8	15
	I	16	16	16	-	16	-	-	-		8	16
	J	2	2	2	2	2	2	2	2	2		2
	K	-	2	5	8	6	2	8	5	6	3	

C5 - 00/059 Upper Thames Street / Puddle Dock

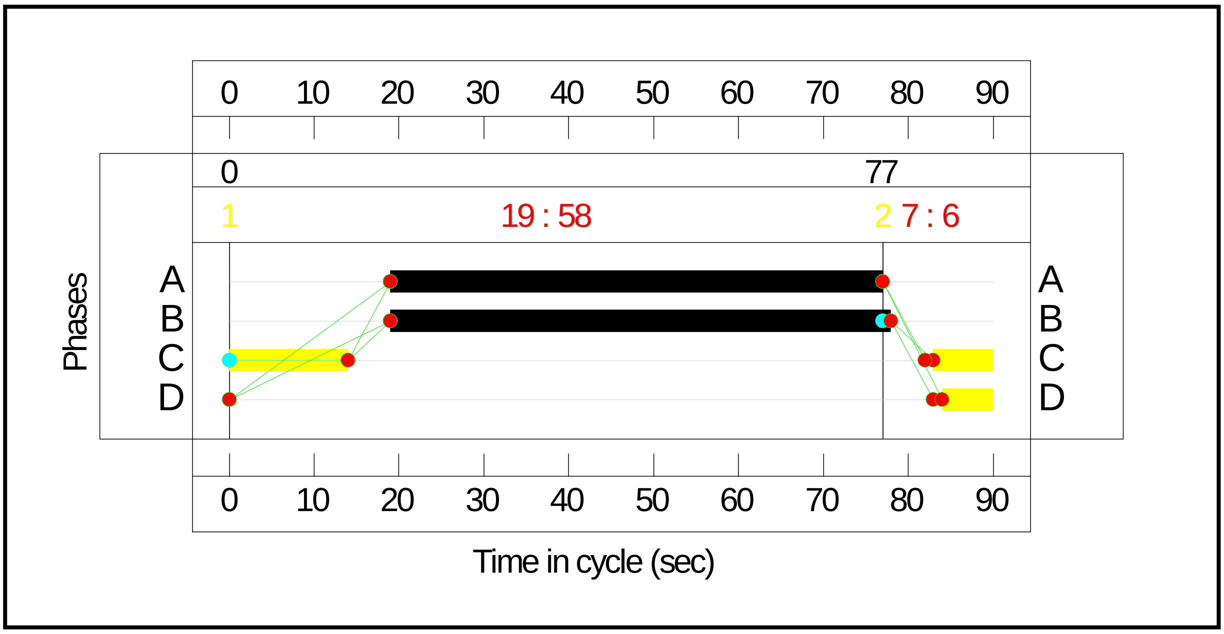
	Starting Phase			
Terminating Phase		A	B	C
	A		5	3
	B	5		3
	C	2	2	

C6 - 00/123 Blackfriars Bridge ped crossing

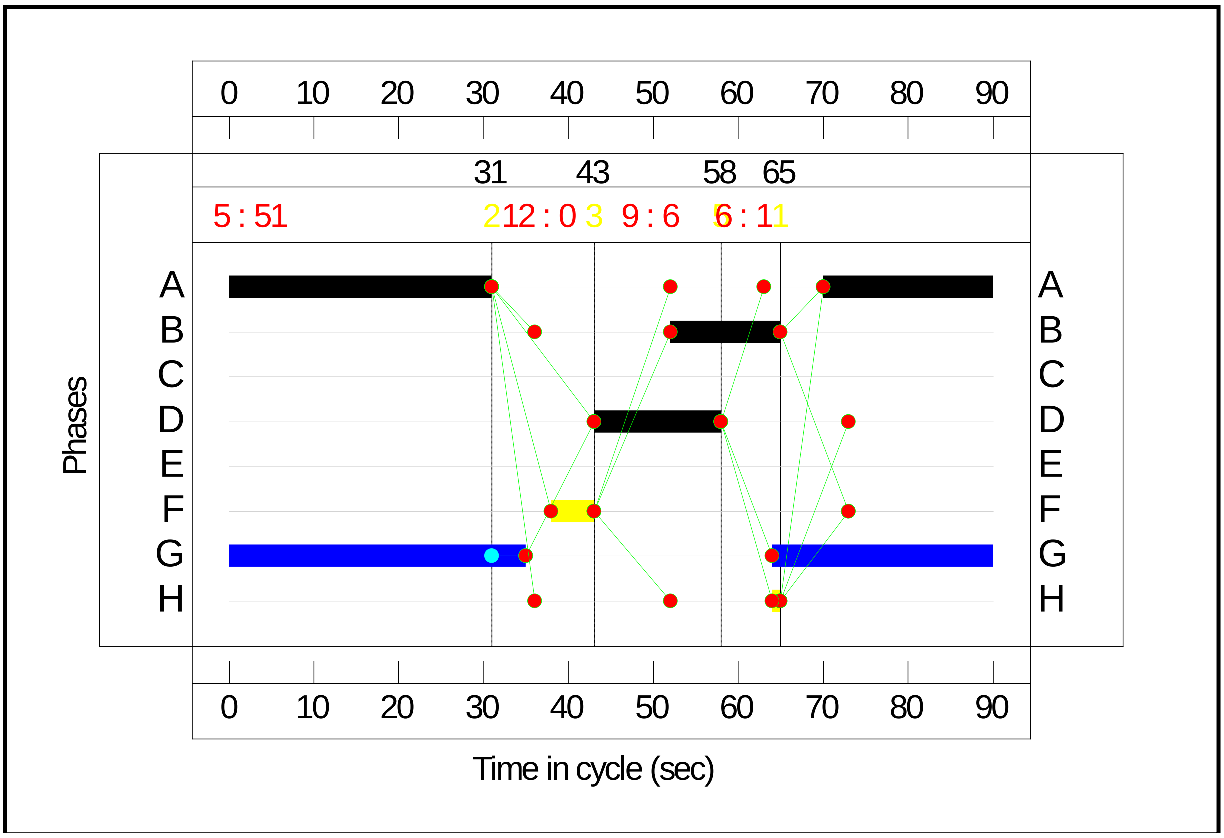
	Starting Phase		
Terminating Phase		A	B
	A		5
	B	8	

Signal Timing Diagrams

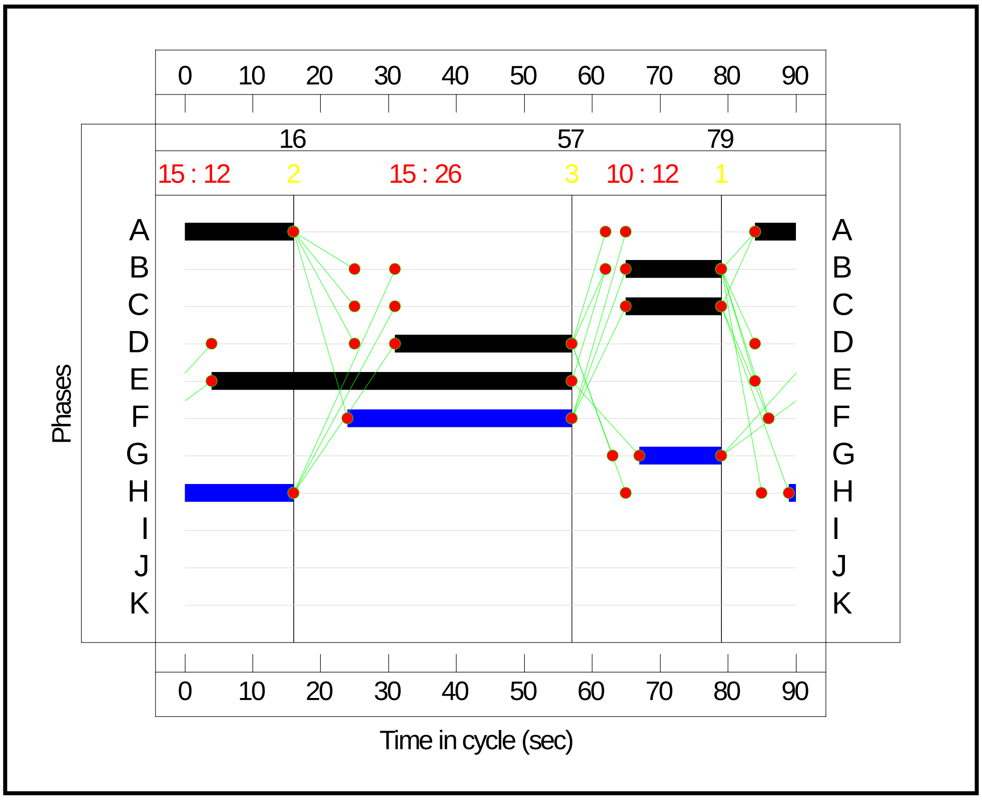
C1 - 00/005 Victoria Embankment / Temple Avenue



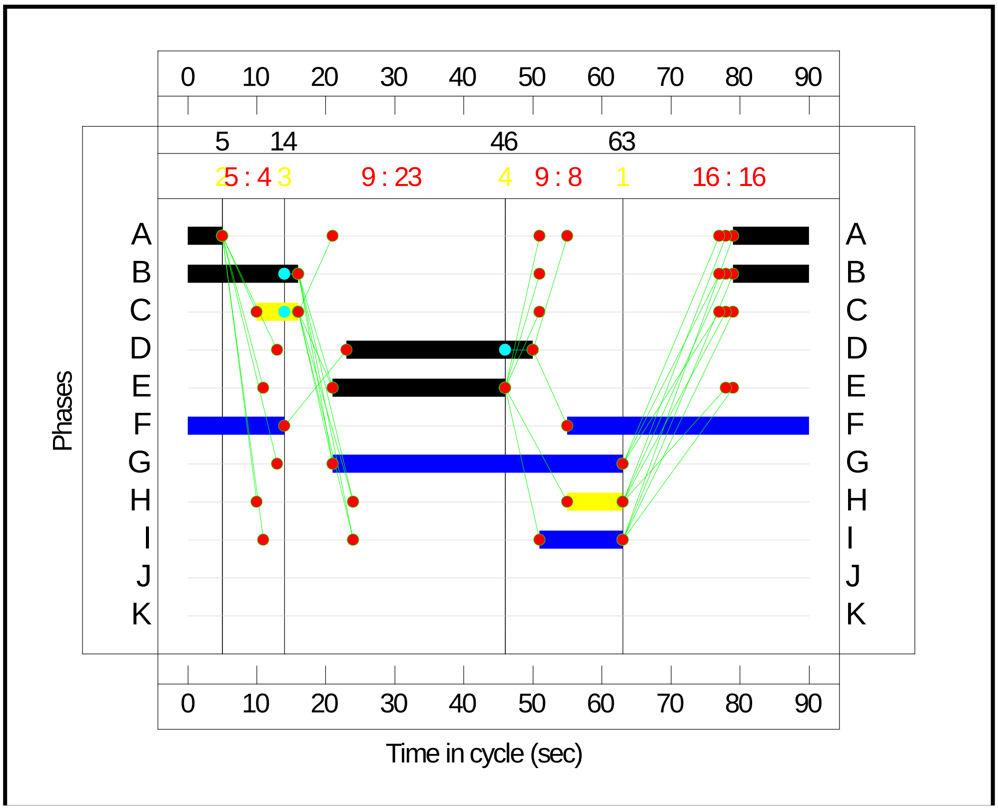
C2 - 00/006 Victoria Embankment / Blackfriars Bridge



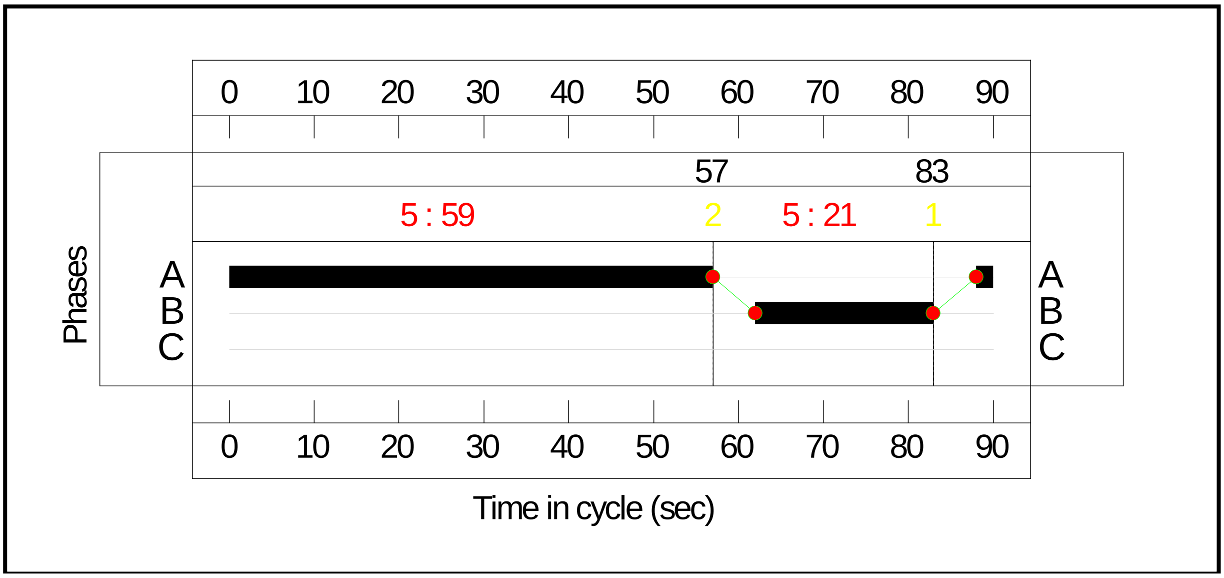
C3 - 00/122 Victoria Embankment / New Bridge Road



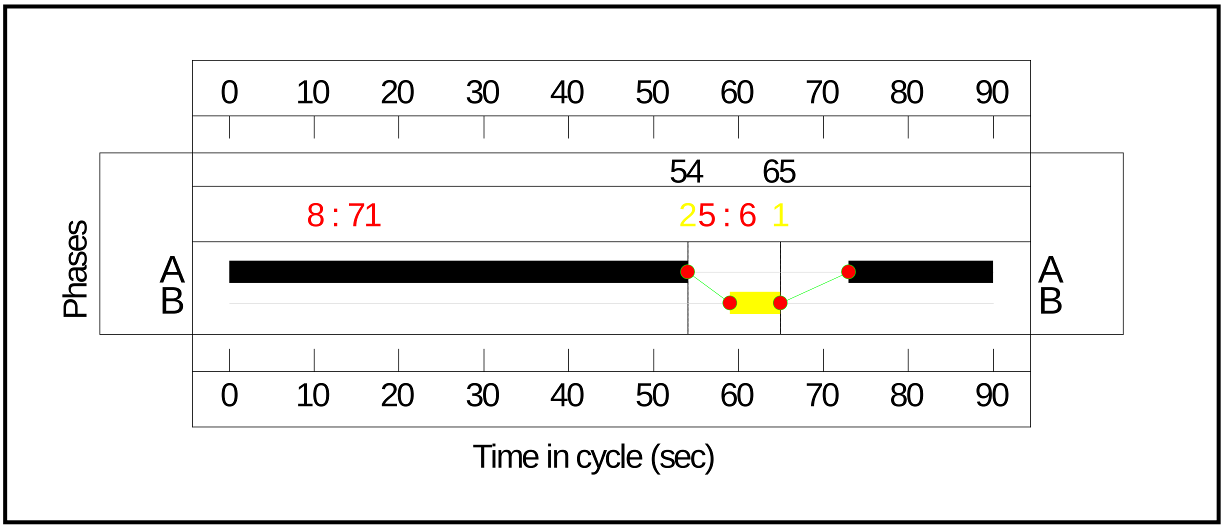
C4 - J00/007 Queen Victoria Street / Puddle Dock



C5 - 00/059 Upper Thames Street / Puddle Dock



C6 - 00/123 Blackfriars Bridge ped crossing



Network Results

Item	Lane Description	Lane Type	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: Blackfriars Bridge Junction	-	-	-	-	-	**97.1%**	**287**	**8**	**1**	**106.4**	-	-
J1: 00/005	-	-	-	-	-	**97.1%**	**0**	**0**	**0**	**28.1**	-	-
1/1	Victoria Embankment (e/b) Ahead	U	1129	1773	1162	97.1%	-	-	-	15.0	47.9	37.1
1/2	Victoria Embankment (e/b) Ahead	U	873	1773	1162	75.1%	-	-	-	4.0	16.7	16.3
2/1	Temple Avenue Right Left	U	78	1729	423	18.5%	-	-	-	0.7	32.1	1.7
3/1	Victoria Embankment (w/b) Ahead	U	0	1773	1182	0.0%	-	-	-	0.0	0.0	0.0
3/2	Victoria Embankment (w/b) Ahead	U	697	1773	1182	59.0%	-	-	-	2.3	11.9	10.2
3/3	Victoria Embankment (w/b) Ahead	U	912	1773	1182	77.2%	-	-	-	4.3	16.9	17.1
4/1		U	0	Inf	Inf	0.0%	-	-	-	0.0	0.0	0.0
4/2		U	697	Inf	Inf	0.0%	-	-	-	0.0	0.0	0.0
4/3		U	956	Inf	Inf	0.0%	-	-	-	0.0	0.0	0.0
5/1	Left	U	434	1800	1800	24.1%	-	-	-	0.2	1.3	0.2
5/2	Ahead	U	731	1800	1800	40.6%	-	-	-	0.3	1.7	0.3
5/3	Ahead	U	873	1800	1800	48.5%	-	-	-	0.5	1.9	0.5
6/1	Blackfriars Underpass (w/b) Ahead	U	836	1800	1800	46.4%	-	-	-	0.4	1.9	0.4
6/2	Blackfriars Underpass (w/b) Ahead	U	735	1800	1800	40.8%	-	-	-	0.3	1.7	0.3
7/1	Victoria Embankment - w/b on-slip Ahead	O	0	1800	1800	0.0%	0	0	0	0.0	0.0	0.0
J2: 00/006	-	-	-	-	-	**83.3%**	**0**	**0**	**0**	**16.2**	-	-

1/1	Blackfriars Bridge Road (n/b) Ahead Left	U	946	1965	1135	83.3%	-	-	-	6.5	24.7	21.6
1/2	Blackfriars Bridge Road (n/b) Ahead	U	487	1965	1135	42.9%	-	-	-	1.8	13.4	7.1
2/1	Blackfriars Bridge Road - internal SL (w/b +n/b) Ahead	U	722	Inf	Inf	0.0%	-	-	-	0.0	0.0	0.0
2/2	Blackfriars Bridge Road - internal SL (w/b +n/b) Ahead	U	444	1940	1940	22.9%	-	-	-	0.1	1.2	0.1
2/3+2/4	Blackfriars Bridge Road - internal SL (w/b +n/b) U-Turn Right	U	67	1853:1550	234	28.6%	-	-	-	1.4	74.4	1.9
3/1	Ahead	U	931	2015	2015	46.2%	-	-	-	0.4	1.7	0.4
3/2	Ahead	U	569	2015	2015	28.2%	-	-	-	0.2	1.2	0.2
4/1	Victoria Embankment - e/b off-slip Ahead	U	257	1848	329	78.2%	-	-	-	3.8	52.8	7.8
4/2	Victoria Embankment - e/b off-slip Ahead	U	177	1848	329	53.9%	-	-	-	1.9	38.9	4.5
J3: 00/122	**-**	**-**	**-**	**-**	**-**	**95.2%**	**0**	**0**	**0**	**38.5**	**-**	**-**
1/1	Queen Victoria Street - internal SL (w/b) Left	U	286	1866	311	92.0%	-	-	-	6.2	78.2	11.2
1/2	Queen Victoria Street - internal SL (w/b) Left Right	U	200	1866	311	64.3%	-	-	-	2.6	46.2	5.8
2/1	Blackfriars Bridge Road - internal SL (n/b) Ahead	U	730	1853	1112	65.7%	-	-	-	2.0	10.0	9.4
2/2	Blackfriars Bridge Road - internal SL (n/b) Ahead	U	704	1852	1111	63.4%	-	-	-	2.4	12.3	14.9
2/3	Blackfriars Bridge Road - internal SL (n/b) Right	U	471	1882	565	83.4%	-	-	-	5.7	43.3	11.1
3/1	Ahead	U	682	1918	1918	35.6%	-	-	-	0.3	1.5	0.3
3/2	Ahead	U	904	1918	1918	47.1%	-	-	-	0.4	1.8	0.4
4/1		U	682	1800	1800	37.9%	-	-	-	0.3	1.6	0.3
4/2		U	904	1800	1800	50.2%	-	-	-	0.5	2.0	0.5

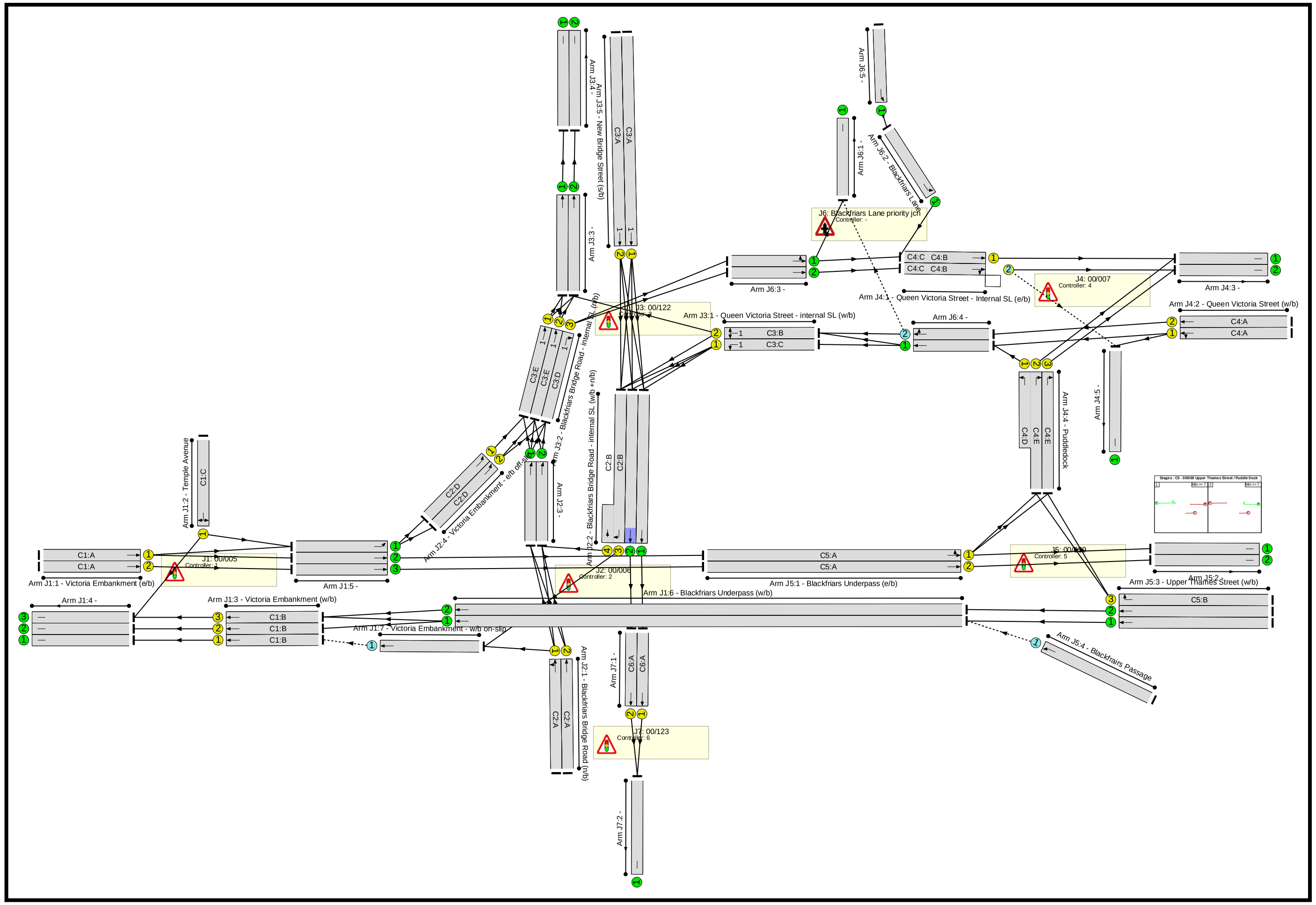
5/1	New Bridge Street (s/b) Ahead	U	478	1965	502	95.2%	-	-	-	10.8	81.5	18.1
5/2	New Bridge Street (s/b) Ahead	U	442	1965	502	88.0%	-	-	-	7.3	59.1	13.9
J4: 00/007	**-**	**-**	**-**	**-**	**-**	**52.4%**	**51**	**8**	**1**	**11.6**	**-**	**-**
1/1	Queen Victoria Street - Internal SL (e/b) Ahead	U	229	1965	611	37.5%	-	-	-	0.7	11.6	3.1
1/2	Queen Victoria Street - Internal SL (e/b) Ahead Right	O	242	1905	593	40.8%	51	8	1	0.8	11.9	3.3
2/1	Queen Victoria Street (w/b) Left Ahead	U	140	1948	368	38.0%	-	-	-	1.5	39.8	3.3
2/2	Queen Victoria Street (w/b) Ahead	U	161	1965	371	43.4%	-	-	-	1.8	40.8	3.9
3/1		U	410	Inf	Inf	0.0%	-	-	-	0.0	0.0	0.0
3/2		U	429	1900	1900	22.6%	-	-	-	0.1	1.2	0.1
4/2+4/1	Puddledock Right Left	U	440	1800:1748	840	52.4%	-	-	-	3.9	32.2	5.4
4/3	Puddledock Right	U	264	1789	517	51.1%	-	-	-	2.6	35.1	6.2
5/1		U	72	1800	1800	4.0%	-	-	-	0.0	1.0	0.0
J5: 00/059	**-**	**-**	**-**	**-**	**-**	**77.4%**	**236**	**0**	**0**	**9.2**	**-**	**-**
1/1	Blackfriars Underpass (e/b) Left Ahead	U	731	1800	1200	60.9%	-	-	-	1.4	7.0	5.1
1/2	Blackfriars Underpass (e/b) Ahead	U	873	1900	1267	68.9%	-	-	-	1.8	7.4	8.1
2/1		U	382	1800	1800	21.2%	-	-	-	0.1	1.3	0.1
2/2		U	873	1800	1800	48.5%	-	-	-	0.5	1.9	0.5
3/1	Upper Thames Street (w/b) Ahead	U	600	1900	1900	31.6%	-	-	-	0.2	1.4	0.2
3/2	Upper Thames Street (w/b) Ahead	U	735	1900	1900	38.7%	-	-	-	0.3	1.5	0.3
3/3	Upper Thames Street (w/b) Right	U	328	1734	424	77.4%	-	-	-	4.5	49.8	9.2
4/1	Blackfrairs Passage Ahead	O	236	1940	583	40.5%	236	0	0	0.3	5.2	0.3

J6: Blackfriars Lane priority jcn	**-**	**-**	**-**	**-**	**-**	**17.3%**	**0**	**0**	**0**	**0.3**	**-**	**-**
1/1		U	10	1800	1800	0.6%	-	-	-	0.0	1.0	0.0
2/1	Blackfriars Lane Left	U	10	1800	1800	0.6%	-	-	-	0.0	1.0	0.0
3/1	Ahead Left	U	229	1800	1800	12.7%	-	-	-	0.1	1.1	0.1
3/2	Ahead	U	242	1800	1800	13.4%	-	-	-	0.1	1.2	0.1
4/1	Ahead	U	311	1800	1800	17.3%	-	-	-	0.1	1.2	0.1
4/2	Ahead Right	O	161	1800	1800	8.9%	0	0	0	0.0	1.1	0.0
5/1	Ahead	U	10	1800	1800	0.6%	-	-	-	0.0	1.0	0.0
J7: 00/123	**-**	**-**	**-**	**-**	**-**	**58.3%**	**0**	**0**	**0**	**2.5**	**-**	**-**
1/1	Ahead	U	722	1940	1552	46.5%	-	-	-	0.7	3.4	13.2
1/2	Ahead	U	444	2130	1704	26.1%	-	-	-	0.2	1.4	0.2
2/1		U	1166	2000	2000	58.3%	-	-	-	1.7	5.2	21.9

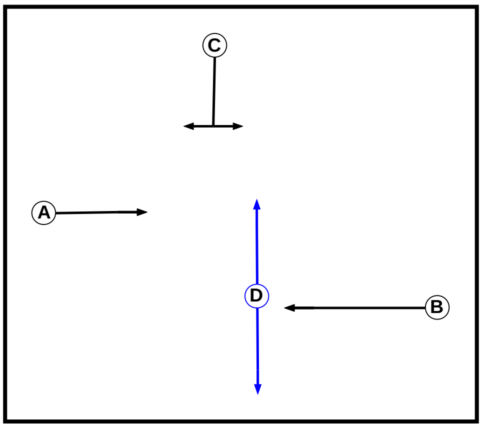
C1 - 00/005 Victoria Embankment / Temple Avenue	PRC for Signalled Lanes (%):	-7.9	Total Delay for Signalled Lanes (pcuHr):	26.36	Cycle Time (s):	90
C2 - 00/006 Victoria Embankment / Blackfriars Bridge	PRC for Signalled Lanes (%):	8.0	Total Delay for Signalled Lanes (pcuHr):	15.38	Cycle Time (s):	90
C3 - 00/122 Victoria Embankment / New Bridge RoadStream: 1	PRC for Signalled Lanes (%):	-5.8	Total Delay for Signalled Lanes (pcuHr):	36.95	Cycle Time (s):	90
C4 - J00/007 Queen Victoria Street / Puddle Dock	PRC for Signalled Lanes (%):	71.8	Total Delay for Signalled Lanes (pcuHr):	11.43	Cycle Time (s):	90
C5 - 00/059 Upper Thames Street / Puddle Dock	PRC for Signalled Lanes (%):	16.3	Total Delay for Signalled Lanes (pcuHr):	7.76	Cycle Time (s):	90
C6 - 00/123 Blackfriars Bridge ped crossing	PRC for Signalled Lanes (%):	93.5	Total Delay for Signalled Lanes (pcuHr):	0.85	Cycle Time (s):	90
	PRC Over All Lanes (%):	-7.9	Total Delay Over All Lanes(pcuHr):	106.43		

D.8 Construction development case results (phase 3), PM peak hour

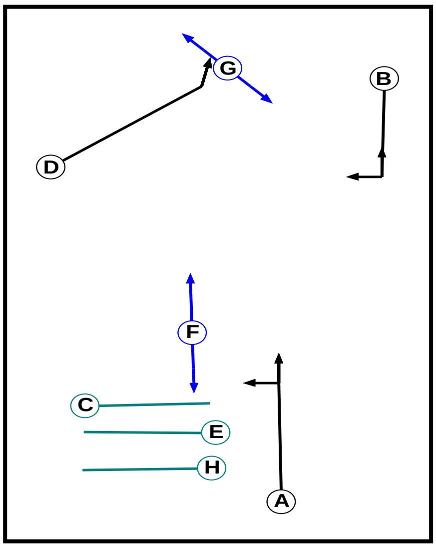
Network Layout Diagram



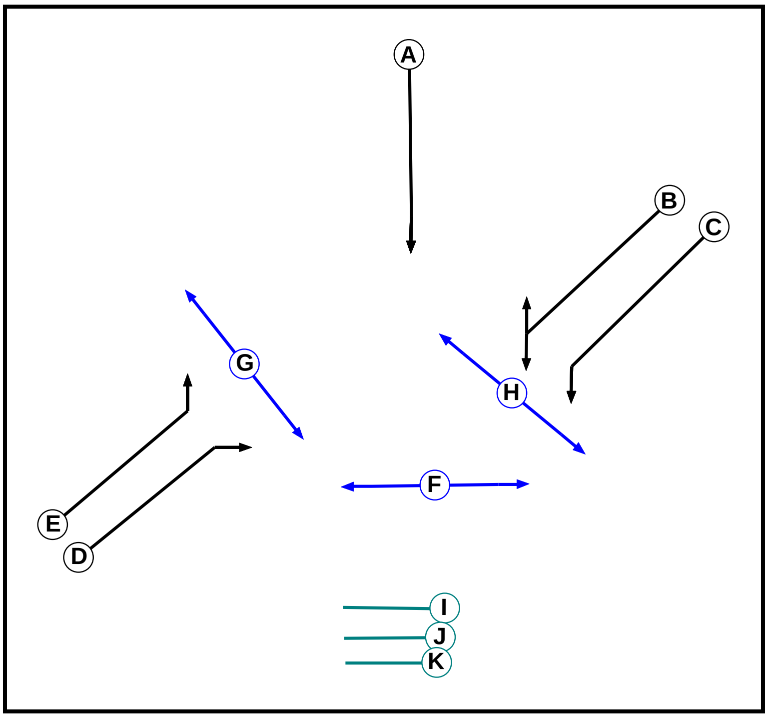
C1 - 00/005 Victoria Embankment / Temple Avenue



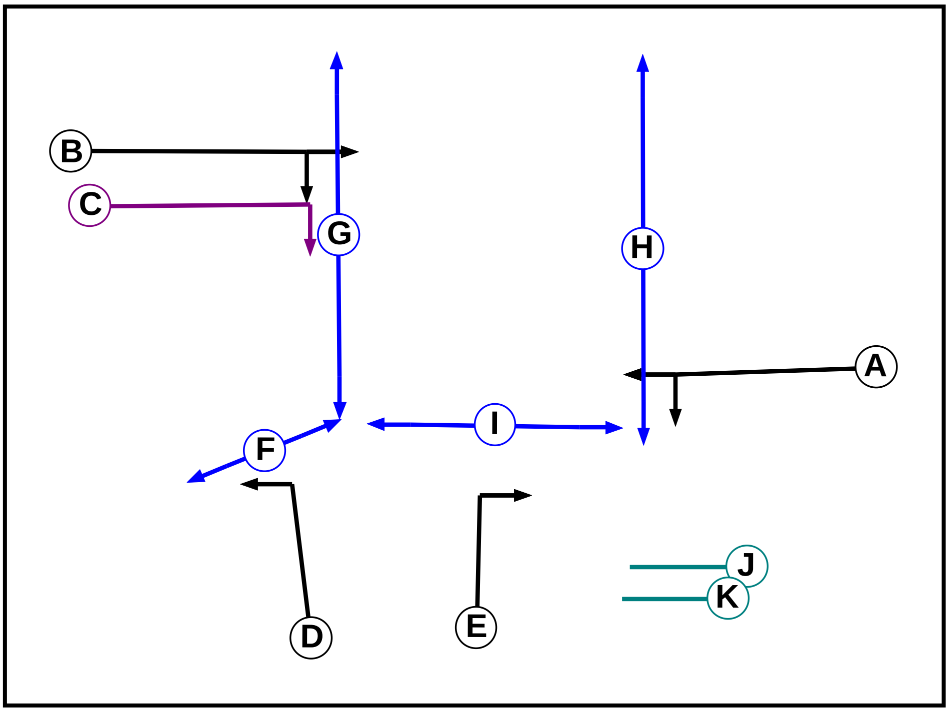
C2 - 00/006 Victoria Embankment / Blackfriars Bridge



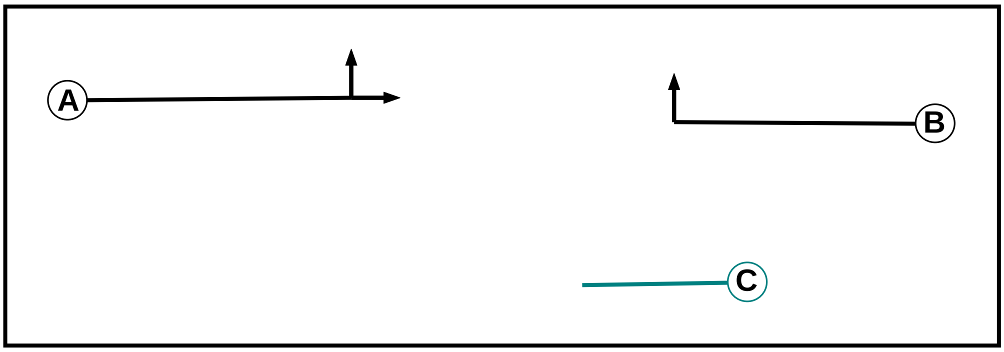
C3 - 00/122 Victoria Embankment / New Bridge Road



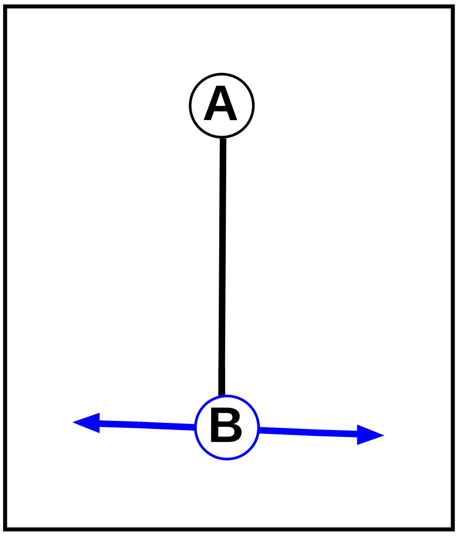
C4 - J00/007 Queen Victoria Street / Puddle Dock



C5 - 00/059 Upper Thames Street / Puddle Dock

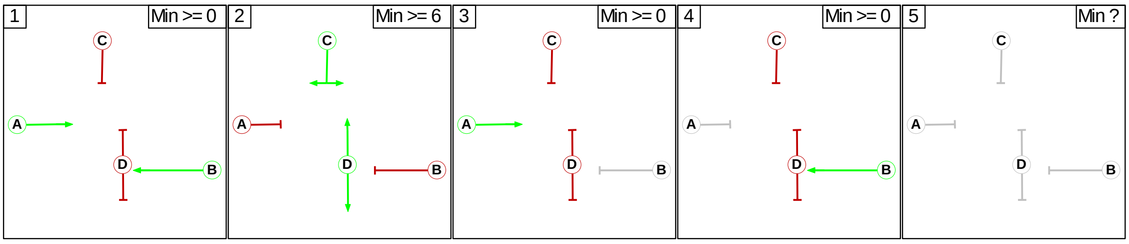


C6 - 00/123 Blackfriars Bridge ped crossing

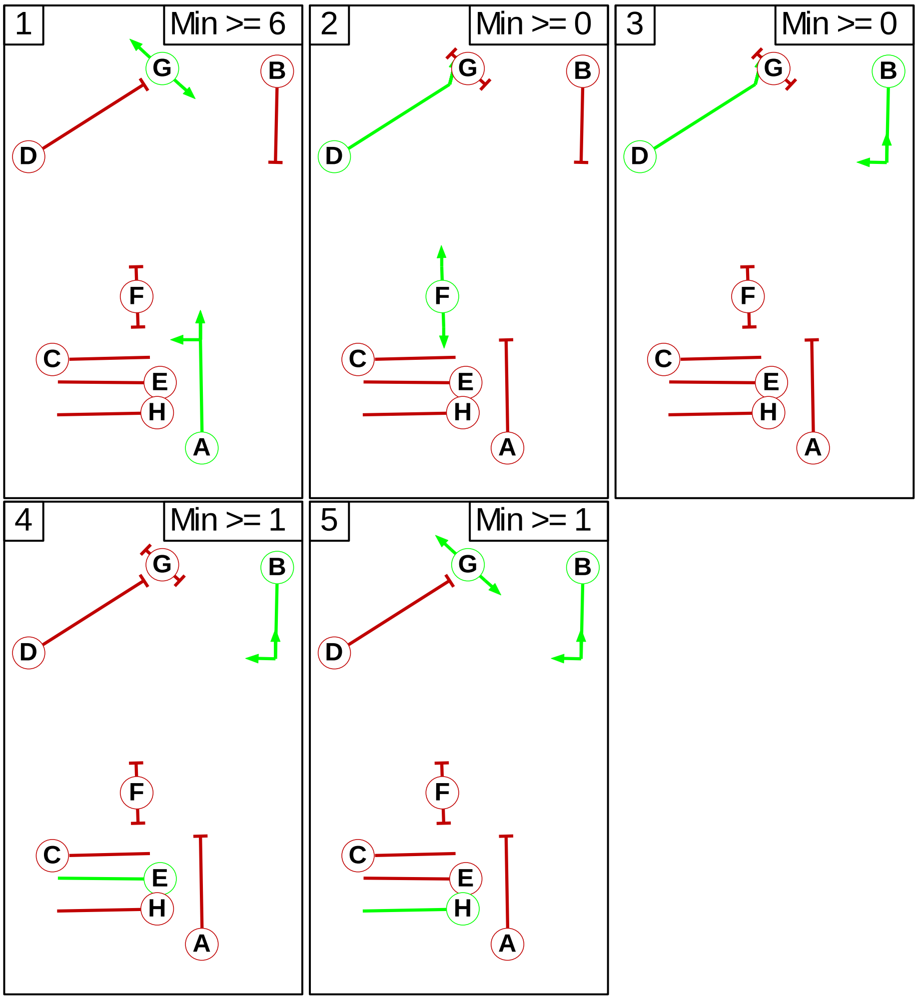


Stage Diagram

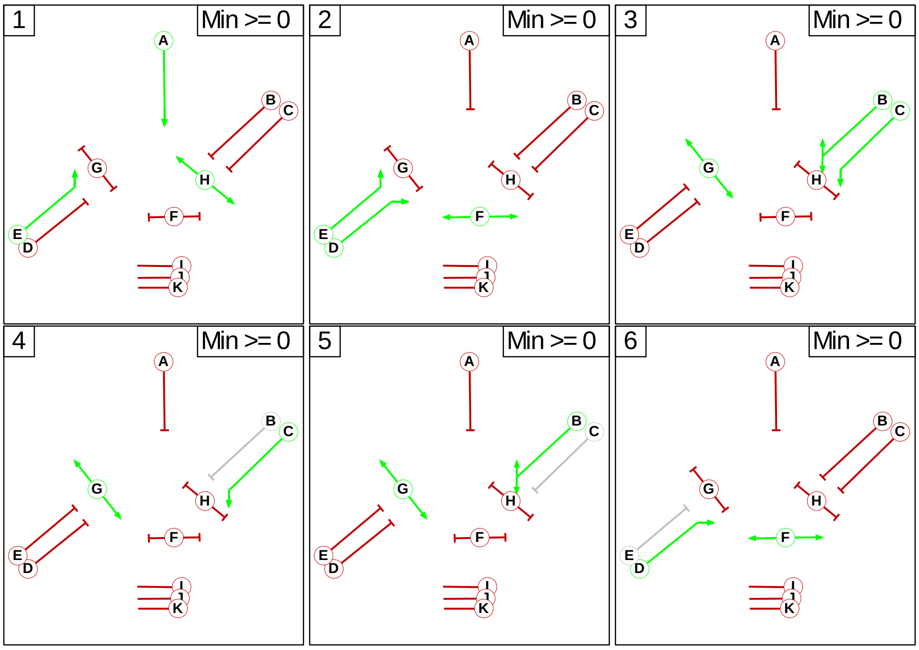
C1 - 01/094 Victoria Embankment / Temple Avenue



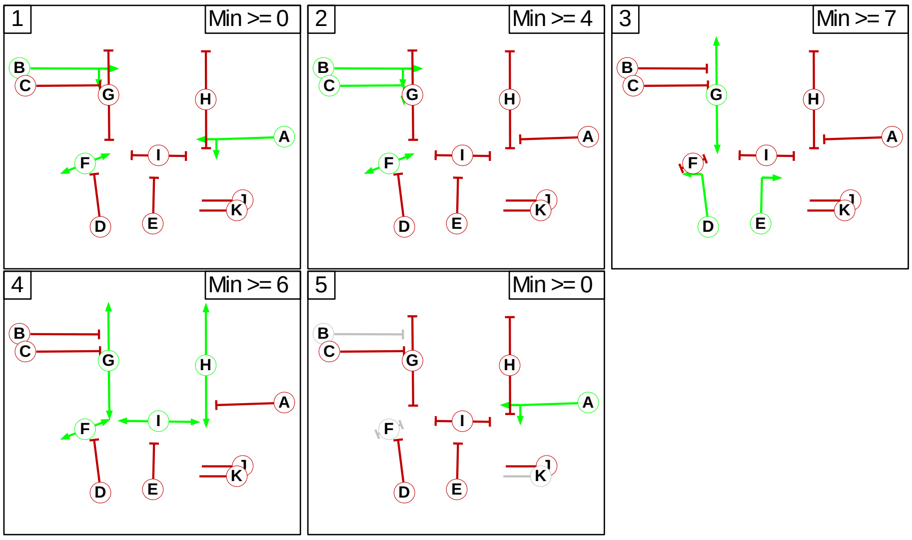
C2 - 00/006 Victoria Embankment / Blackfriars Bridge



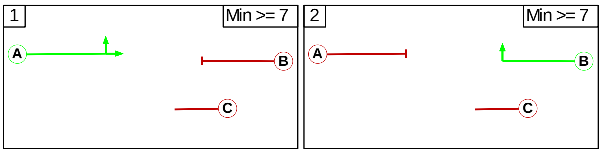
C3 - 00/122 Victoria Embankment / New Bridge Road
Stage Stream: 1



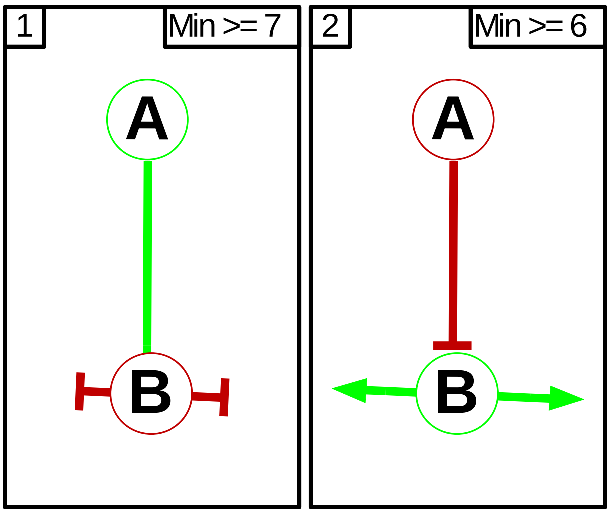
C4 - J00/007 Queen Victoria Street / Puddle Dock



C5 - 00/059 Upper Thames Street / Puddle Dock



C6 - 00/123 Blackfriars Bridge ped crossing



Phases in Stage

C1 - 01/094 Victoria Embankment / Temple Avenue

Stage No.	Phases in Stage
1	A B
2	C D
3	A
4	B
5	

C2 - 00/006 Victoria Embankment / Blackfriars Bridge

Stage No.	Phases in Stage
1	A G
2	D F
3	B D
4	B E
5	B G H

C3 - 00/122 Victoria Embankment / New Bridge Road

Stream	Stage No.	Phases in Stage
1	1	A E H
1	2	D E F
1	3	B C G
1	4	C G
1	5	B G
1	6	D F

C4 - J00/007 Queen Victoria Street / Puddle Dock

Stage No.	Phases in Stage
1	A B F
2	B C F
3	D E G
4	F G H I
5	A

C5 - 00/059 Upper Thames Street / Puddle Dock

Stage No.	Phases in Stage
1	A
2	B

C6 - 00/123 Blackfriars Bridge ped crossing

Stage No.	Phases in Stage
1	A
2	B

Phase Intergreens Matrix

C1 - 01/094 Victoria Embankment / Temple Avenue

		Starting Phase			
		A	B	C	D
Terminating Phase	A		-	5	7
	B	-		5	5
	C	5	5		-
	D	19	19	-	

C2 - 00/006 Victoria Embankment / Blackfriars Bridge

		Starting Phase							
		A	B	C	D	E	F	G	H
Terminating Phase	A		5	3	12	5	7	-	5
	B	5		3	-	-	8	-	-
	C	2	2		2	2	2	2	2
	D	5	-	3		3	-	6	6
	E	5	-	3	2		8	2	2
	F	9	9	4	-	9		-	9
	G	-	-	3	8	3	-		-
	H	5	-	3	8	3	8	-	

C3 - 00/122 Victoria Embankment / New Bridge Road

	Starting Phase											
		A	B	C	D	E	F	G	H	I	J	K
Terminating Phase	A		9	9	9	-	8	-	-	9	9	3
	B	5		-	5	5	7	-	6	5	5	3
	C	5	-		-	-	7	-	10	5	5	3
	D	5	5	-		-	-	6	8	3	3	3
	E	-	5	-	-		-	10	-	-	-	3
	F	8	8	8	-	-		-	-	-	-	3
	G	-	-	-	15	15	-		-	-	-	4
	H	-	15	15	15	-	-	-		5	4	4
	I	9	5	2	2	-	-	-	9		9	4
	J	5	5	2	2	-	-	-	2	5		3
	K	2	2	2	2	2	2	2	2	2	2	

C4 - J00/007 Queen Victoria Street / Puddle Dock

	Starting Phase											
		A	B	C	D	E	F	G	H	I	J	K
Terminating Phase	A		-	5	8	6	-	8	5	6	3	-
	B	-		-	-	5	-	5	8	8	3	3
	C	5	-		-	5	-	5	8	8	3	5
	D	5	-	-		-	5	-	-	-	3	5
	E	5	5	5	-		-	-	9	5	3	5
	F	-	-	-	9	-		-	-	-	4	4
	G	14	14	14	-	-	-		-	-	7	14
	H	15	15	15	-	15	-	-		-	8	15
	I	16	16	16	-	16	-	-	-		8	16
	J	2	2	2	2	2	2	2	2	2		2
	K	-	2	5	8	6	2	8	5	6	3	

C5 - 00/059 Upper Thames Street / Puddle Dock

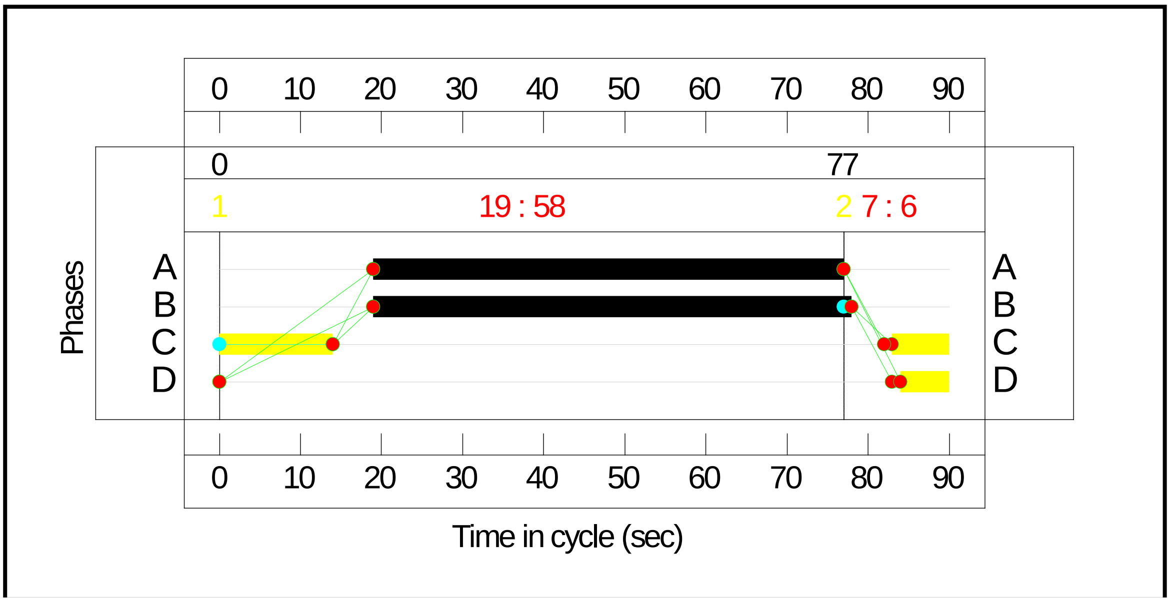
	Starting Phase			
Terminating Phase		A	B	C
	A		5	3
	B	5		3
	C	2	2	

C6 - 00/123 Blackfriars Bridge ped crossing

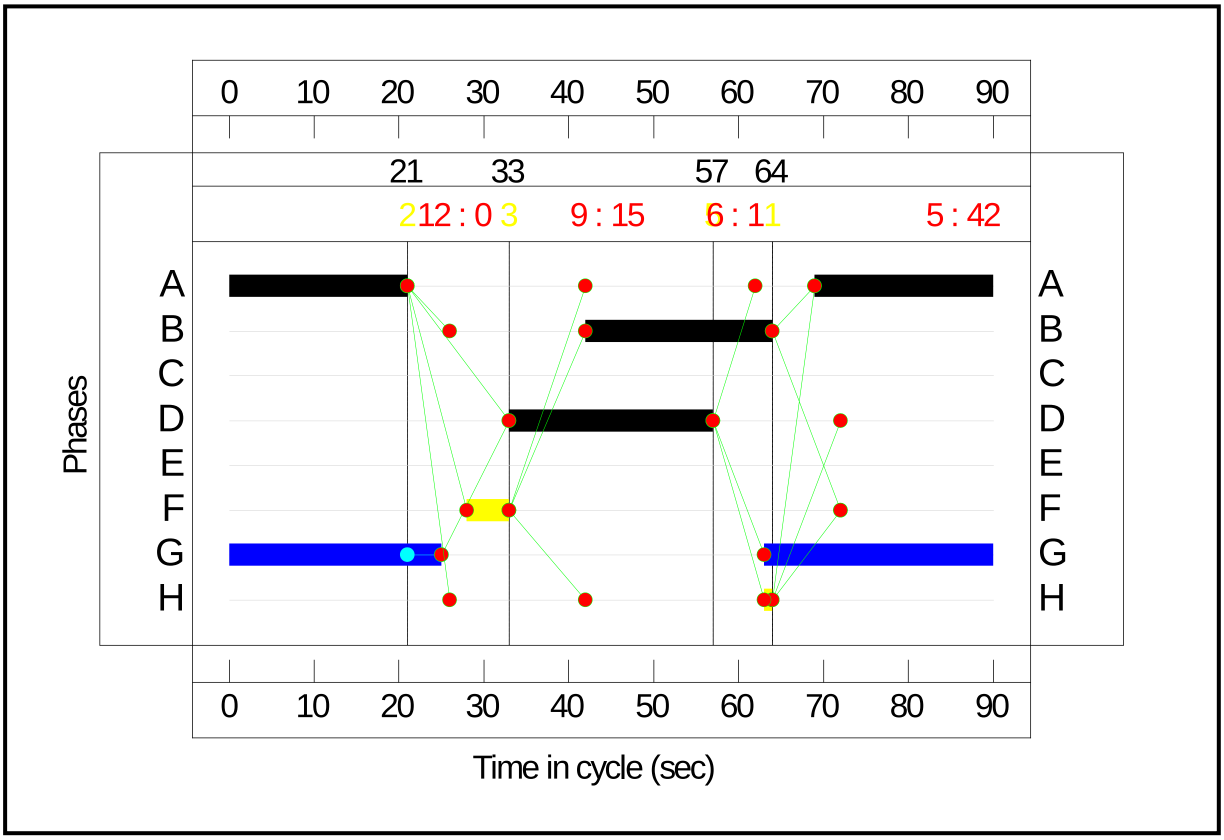
	Starting Phase		
Terminating Phase		A	B
	A		5
	B	8	

Staging Diagrams

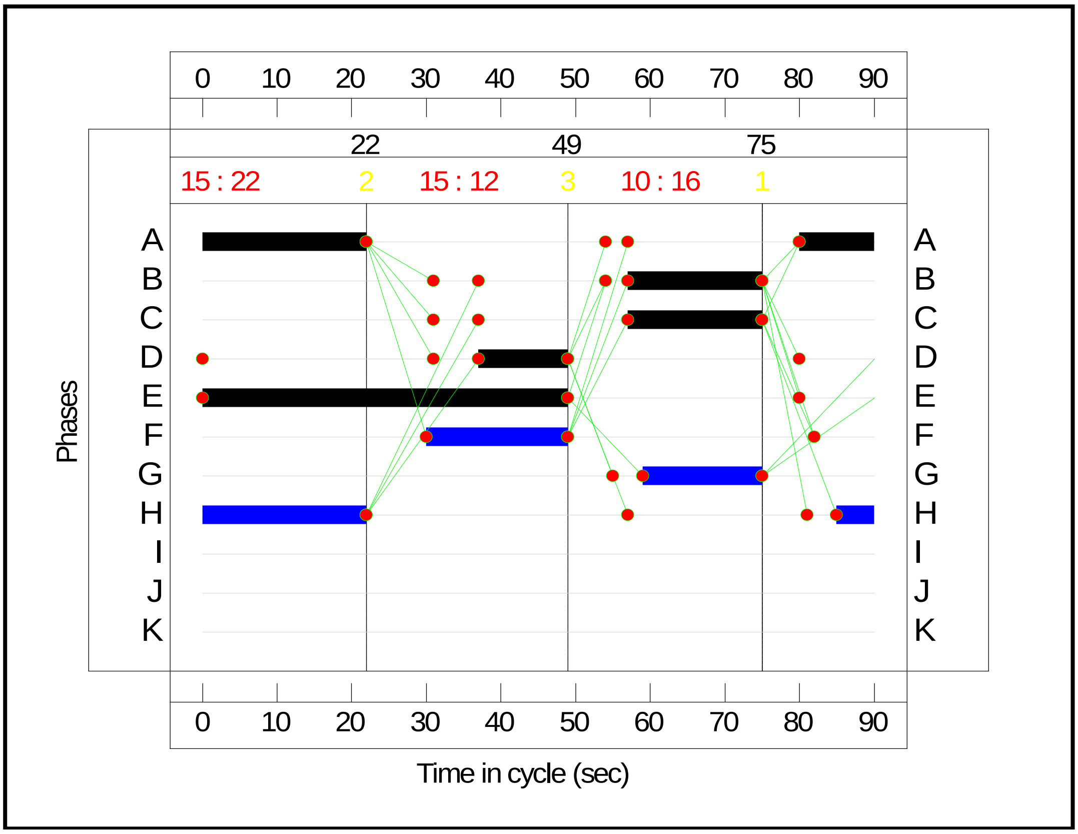
C1 - 00/005 Victoria Embankment / Temple Avenue



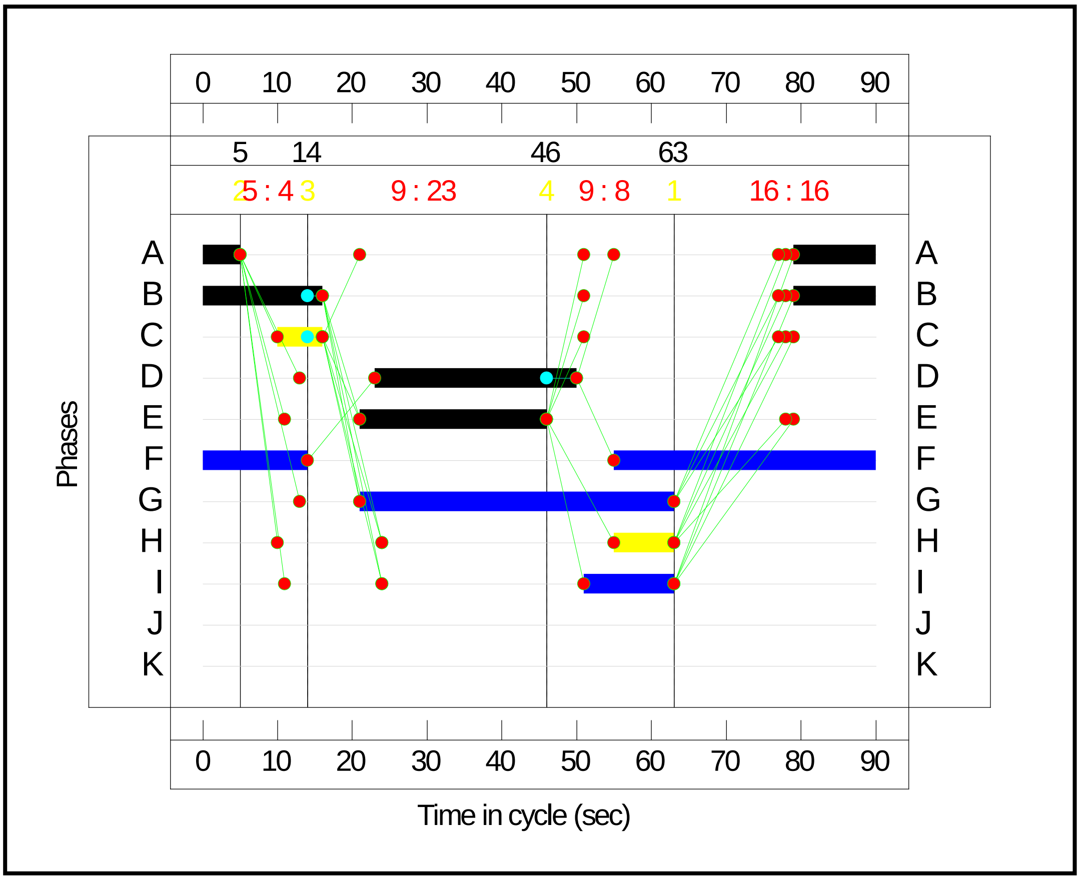
C2 - 00/006 Victoria Embankment / Blackfriars Bridge



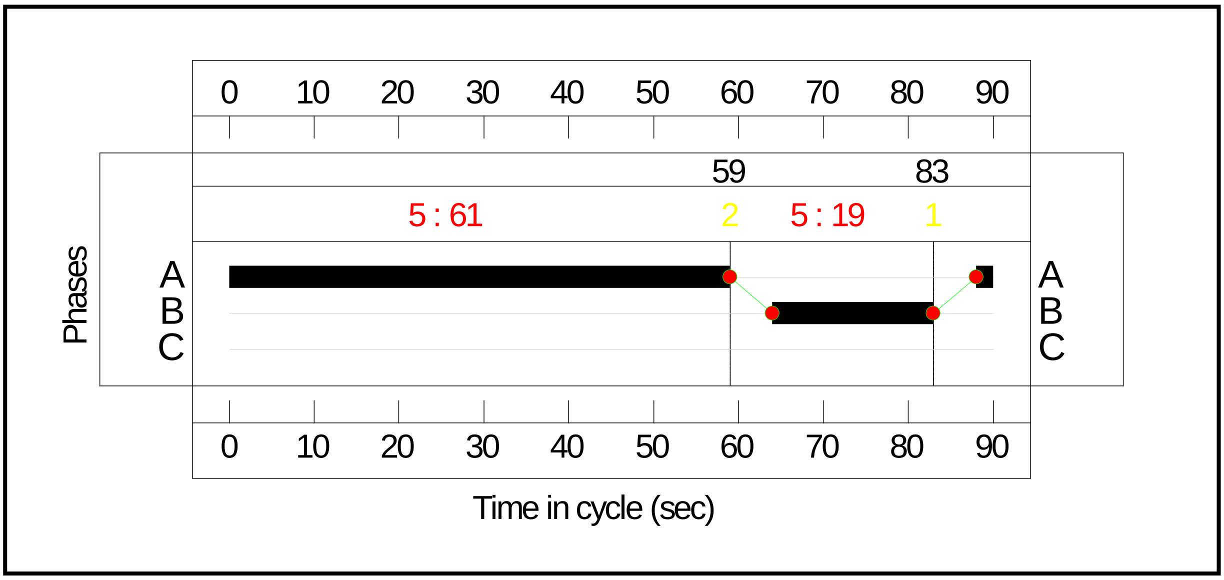
C3 - 00/122 Victoria Embankment / New Bridge Road



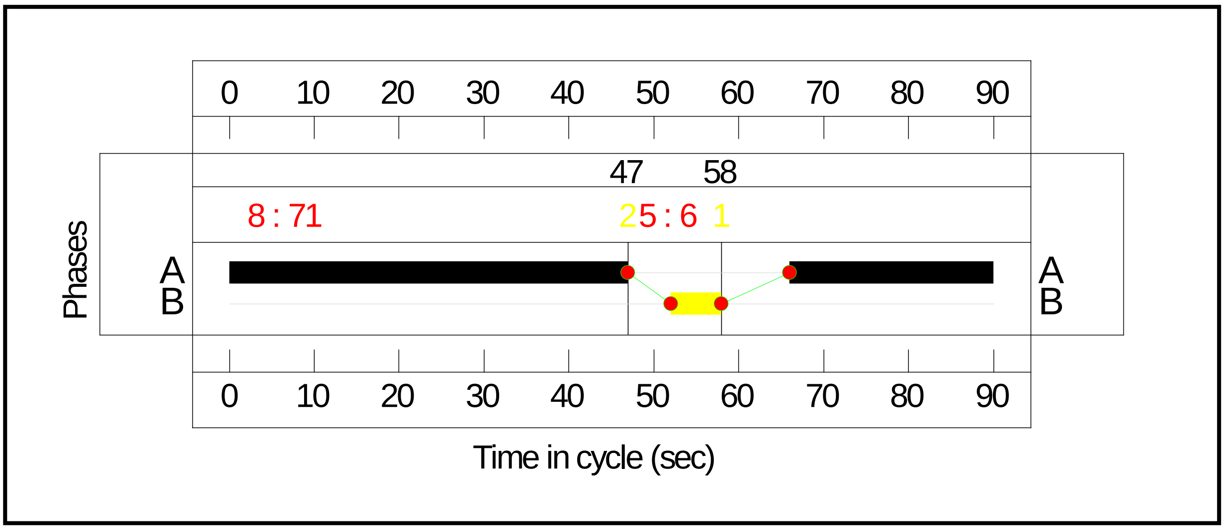
C4 - J00/007 Queen Victoria Street / Puddle Dock



C5 - 00/059 Upper Thames Street / Puddle Dock



C6 - 00/123 Blackfriars Bridge ped crossing



Network Results

Item	Lane Description	Lane Type	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: Blackfriars Bridge Junction	-	-	-	-	-	**101.7%**	**286**	**2**	**0**	**107.8**	-	-
J1: 00/005	-	-	-	-	-	**91.6%**	**0**	**0**	**0**	**21.6**	-	-
1/1	Victoria Embankment (e/b) Ahead	U	1065	1773	1162	91.6%	-	-	-	8.9	30.2	27.7
1/2	Victoria Embankment (e/b) Ahead	U	787	1773	1162	67.7%	-	-	-	3.1	14.4	13.1
2/1	Temple Avenue Right Left	U	136	1729	423	32.2%	-	-	-	1.3	34.2	3.0
3/1	Victoria Embankment (w/b) Ahead	U	0	1773	1182	0.0%	-	-	-	0.0	0.0	0.0
3/2	Victoria Embankment (w/b) Ahead	U	783	1773	1182	66.2%	-	-	-	2.9	13.4	12.5
3/3	Victoria Embankment (w/b) Ahead	U	860	1773	1182	72.8%	-	-	-	3.6	15.3	15.2
4/1		U	0	Inf	Inf	0.0%	-	-	-	0.0	0.0	0.0
4/2		U	783	Inf	Inf	0.0%	-	-	-	0.0	0.0	0.0
4/3		U	942	Inf	Inf	0.0%	-	-	-	0.0	0.0	0.0
5/1	Left	U	413	1800	1800	22.9%	-	-	-	0.1	1.3	0.1
5/2	Ahead	U	706	1800	1800	39.2%	-	-	-	0.3	1.6	0.3
5/3	Ahead	U	787	1800	1800	43.7%	-	-	-	0.4	1.8	0.4
6/1	Blackfriars Underpass (w/b) Ahead	U	830	1800	1800	46.1%	-	-	-	0.4	1.9	0.4
6/2	Blackfriars Underpass (w/b) Ahead	U	813	1800	1800	45.2%	-	-	-	0.4	1.8	0.4
7/1	Victoria Embankment - w/b on-slip Ahead	O	0	1800	1800	0.0%	0	0	0	0.0	0.0	0.0
J2: 00/006	-	-	-	-	-	**61.2%**	**0**	**0**	**0**	**9.6**	-	-
1/1	Blackfriars Bridge Road (n/b) Ahead Left	U	543	1965	939	57.8%	-	-	-	3.2	21.5	10.3

1/2	Blackfriars Bridge Road (n/b) Ahead	U	342	1965	939	36.4%	-	-	-	1.7	17.9	5.6
2/1	Blackfriars Bridge Road - internal SL (w/b +n/b) Ahead	U	1065	Inf	Inf	0.0%	-	-	-	0.0	0.0	0.0
2/2	Blackfriars Bridge Road - internal SL (w/b +n/b) Ahead	U	645	1940	1940	33.2%	-	-	-	0.3	1.7	0.7
2/3+2/4	Blackfriars Bridge Road - internal SL (w/b +n/b) U-Turn Right	U	20	1853:1550	389	5.1%	-	-	-	0.3	61.3	0.5
3/1	Ahead	U	540	2015	2015	26.8%	-	-	-	0.2	1.2	0.2
3/2	Ahead	U	362	2015	2015	18.0%	-	-	-	0.1	1.1	0.1
4/1	Victoria Embankment - e/b off-slip Ahead	U	314	1848	513	61.2%	-	-	-	2.8	32.2	7.6
4/2	Victoria Embankment - e/b off-slip Ahead	U	133	1848	513	25.9%	-	-	-	0.9	25.1	2.6
J3: 00/122	**-**	**-**	**-**	**-**	**-**	**101.7%**	**0**	**0**	**0**	**50.9**	**-**	**-**
1/1	Queen Victoria Street - internal SL (w/b) Left	U	364	1866	394	92.4%	-	-	-	7.1	70.2	13.1
1/2	Queen Victoria Street - internal SL (w/b) Left Right	U	263	1866	394	66.8%	-	-	-	2.9	39.6	7.4
2/1	Blackfriars Bridge Road - internal SL (n/b) Ahead	U	812	1853	1029	78.9%	-	-	-	3.5	15.4	13.9
2/2	Blackfriars Bridge Road - internal SL (n/b) Ahead	U	300	1852	1029	29.2%	-	-	-	0.7	8.8	5.0
2/3	Blackfriars Bridge Road - internal SL (n/b) Right	U	240	1882	272	88.3%	-	-	-	5.1	76.7	9.0
3/1	Ahead	U	777	1918	1918	40.5%	-	-	-	0.3	1.6	0.3
3/2	Ahead	U	564	1918	1918	29.4%	-	-	-	0.2	1.3	0.2
4/1		U	777	1800	1800	43.2%	-	-	-	0.4	1.8	0.4
4/2		U	564	1800	1800	31.3%	-	-	-	0.2	1.5	0.2

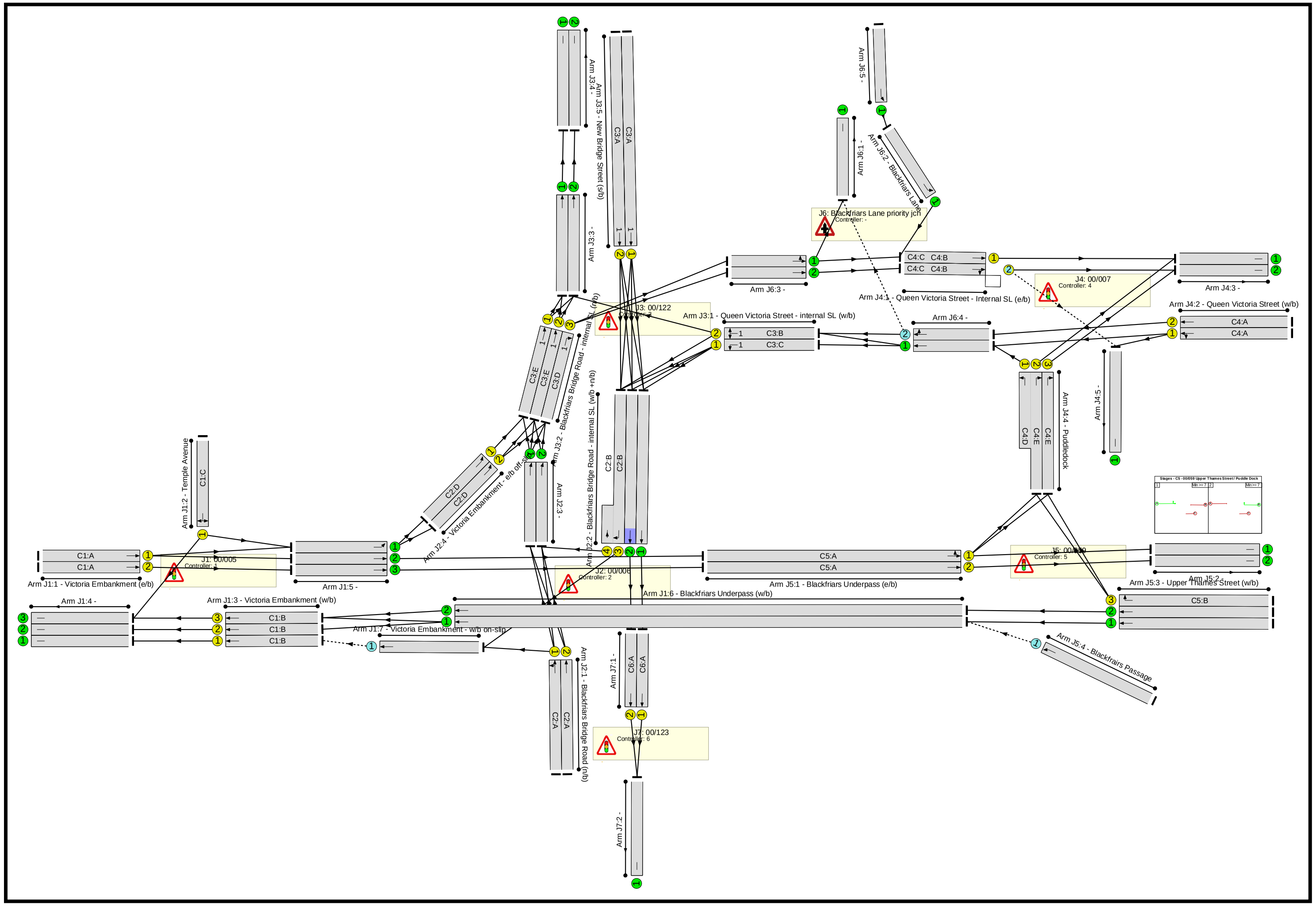
5/1	New Bridge Street (s/b) Ahead	U	733	1965	721	101.7%	-	-	-	23.4	115.0	35.7
5/2	New Bridge Street (s/b) Ahead	U	609	1965	721	84.5%	-	-	-	7.0	41.6	16.5
J4: 00/007	**-**	**-**	**-**	**-**	**-**	**54.7%**	**14**	**2**	**0**	**10.5**	**-**	**-**
1/1	Queen Victoria Street - Internal SL (e/b) Ahead	U	228	1965	611	37.3%	-	-	-	0.6	10.2	2.0
1/2	Queen Victoria Street - Internal SL (e/b) Ahead Right	O	17	1805	368	4.6%	14	2	0	0.1	12.0	0.1
2/1	Queen Victoria Street (w/b) Left Ahead	U	166	1950	368	45.1%	-	-	-	1.9	41.2	4.1
2/2	Queen Victoria Street (w/b) Ahead	U	203	1965	371	54.7%	-	-	-	2.5	43.7	5.2
3/1		U	387	Inf	Inf	0.0%	-	-	-	0.0	0.0	0.0
3/2		U	172	1900	1900	9.1%	-	-	-	0.0	1.0	0.0
4/2+4/1	Puddledock Right Left	U	421	1800:1748	780	54.0%	-	-	-	4.2	35.7	10.7
4/3	Puddledock Right	U	172	1789	517	33.3%	-	-	-	1.2	25.4	3.0
5/1		U	29	1800	1800	1.6%	-	-	-	0.0	1.0	0.0
J5: 00/059	**-**	**-**	**-**	**-**	**-**	**65.1%**	**272**	**0**	**0**	**7.0**	**-**	**-**
1/1	Blackfriars Underpass (e/b) Left Ahead	U	706	1800	1240	56.9%	-	-	-	1.1	5.6	4.2
1/2	Blackfriars Underpass (e/b) Ahead	U	787	1900	1309	60.1%	-	-	-	1.2	5.7	6.2
2/1		U	375	1800	1800	20.8%	-	-	-	0.1	1.3	0.1
2/2		U	787	1800	1800	43.7%	-	-	-	0.4	1.8	0.4
3/1	Upper Thames Street (w/b) Ahead	U	558	1900	1900	29.4%	-	-	-	0.2	1.3	0.2
3/2	Upper Thames Street (w/b) Ahead	U	813	1900	1900	42.8%	-	-	-	0.4	1.7	0.4
3/3	Upper Thames Street (w/b) Right	U	251	1734	385	65.1%	-	-	-	3.1	45.1	6.6

4/1	Blackfrairs Passage Ahead	O	272	1940	592	45.9%	272	0	0	0.4	5.6	0.4
J6: Blackfriars Lane priority jcn	**-**	**-**	**-**	**-**	**-**	**23.1%**	**0**	**0**	**0**	**0.3**	**-**	**-**
1/1		U	10	1800	1800	0.6%	-	-	-	0.0	1.0	0.0
2/1	Blackfriars Lane Left	U	10	1800	1800	0.6%	-	-	-	0.0	1.0	0.0
3/1	Ahead Left	U	228	1800	1800	12.7%	-	-	-	0.1	1.1	0.1
3/2	Ahead	U	17	1800	1800	0.9%	-	-	-	0.0	1.0	0.0
4/1	Ahead	U	415	1800	1800	23.1%	-	-	-	0.1	1.3	0.1
4/2	Ahead Right	O	203	1800	1800	11.3%	0	0	0	0.1	1.1	0.1
5/1	Ahead	U	10	1800	1800	0.6%	-	-	-	0.0	1.0	0.0
J7: 00/123	**-**	**-**	**-**	**-**	**-**	**84.9%**	**0**	**0**	**0**	**7.8**	**-**	**-**
1/1	Ahead	U	1065	1940	1552	67.9%	-	-	-	1.1	3.8	15.1
1/2	Ahead	U	645	2130	1704	37.8%	-	-	-	0.3	1.7	0.3
2/1		U	1710	2000	2000	84.9%	-	-	-	6.4	13.6	37.1

C1 - 00/005 Victoria Embankment / Temple Avenue	PRC for Signalled Lanes (%):	-1.8	Total Delay for Signalled Lanes (pcuHr):	19.92	Cycle Time (s):	90
C2 - 00/006 Victoria Embankment / Blackfriars Bridge	PRC for Signalled Lanes (%):	47.1	Total Delay for Signalled Lanes (pcuHr):	9.01	Cycle Time (s):	90
C3 - 00/122 Victoria Embankment / New Bridge RoadStream: 1	PRC for Signalled Lanes (%):	-13.0	Total Delay for Signalled Lanes (pcuHr):	49.76	Cycle Time (s):	90
C4 - J00/007 Queen Victoria Street / Puddle Dock	PRC for Signalled Lanes (%):	64.6	Total Delay for Signalled Lanes (pcuHr):	10.45	Cycle Time (s):	90
C5 - 00/059 Upper Thames Street / Puddle Dock	PRC for Signalled Lanes (%):	38.2	Total Delay for Signalled Lanes (pcuHr):	5.49	Cycle Time (s):	90
C6 - 00/123 Blackfriars Bridge ped crossing	PRC for Signalled Lanes (%):	32.6	Total Delay for Signalled Lanes (pcuHr):	1.42	Cycle Time (s):	90
	PRC Over All Lanes (%):	-13.0	Total Delay Over All Lanes(pcuHr):	107.82		

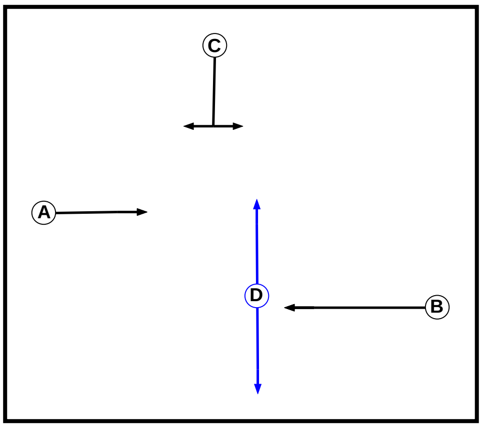
D.9 Construction development case results (phases 1 and 2), sensitivity test, AM peak hour

Network Layout Diagram

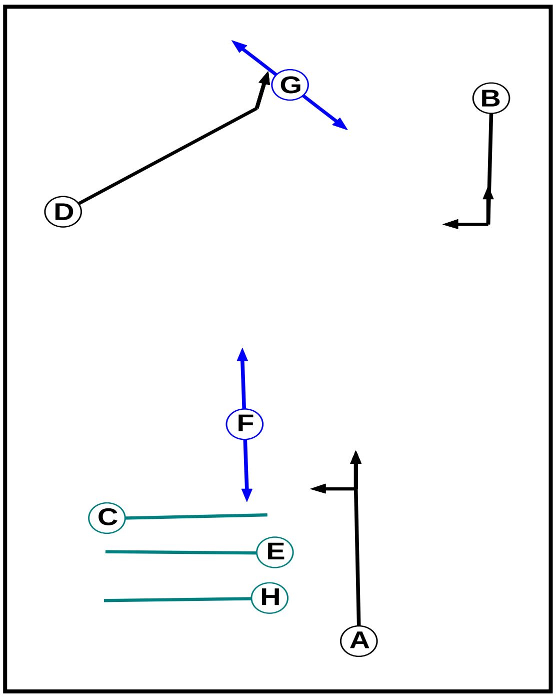


Phase Diagram

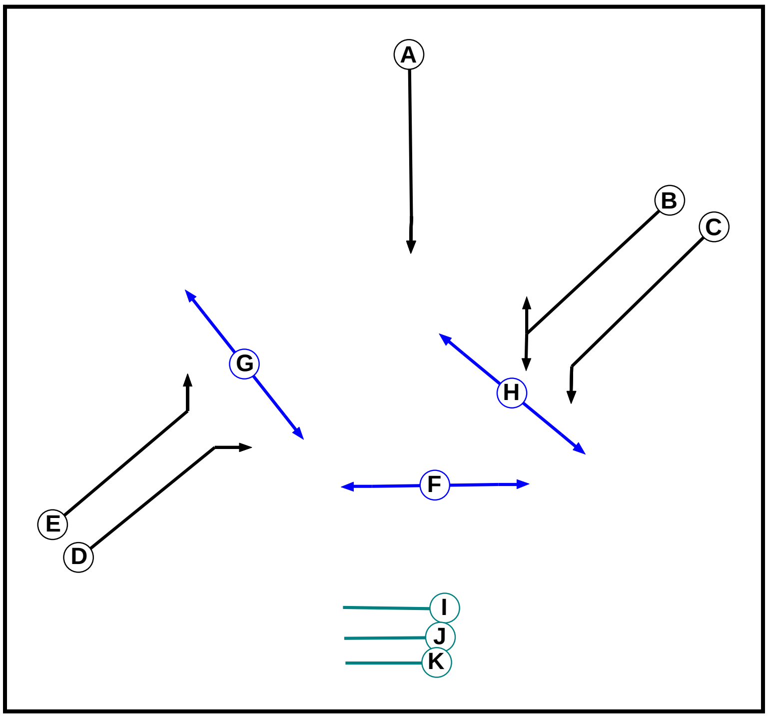
C1 - 00/005 Victoria Embankment / Temple Avenue



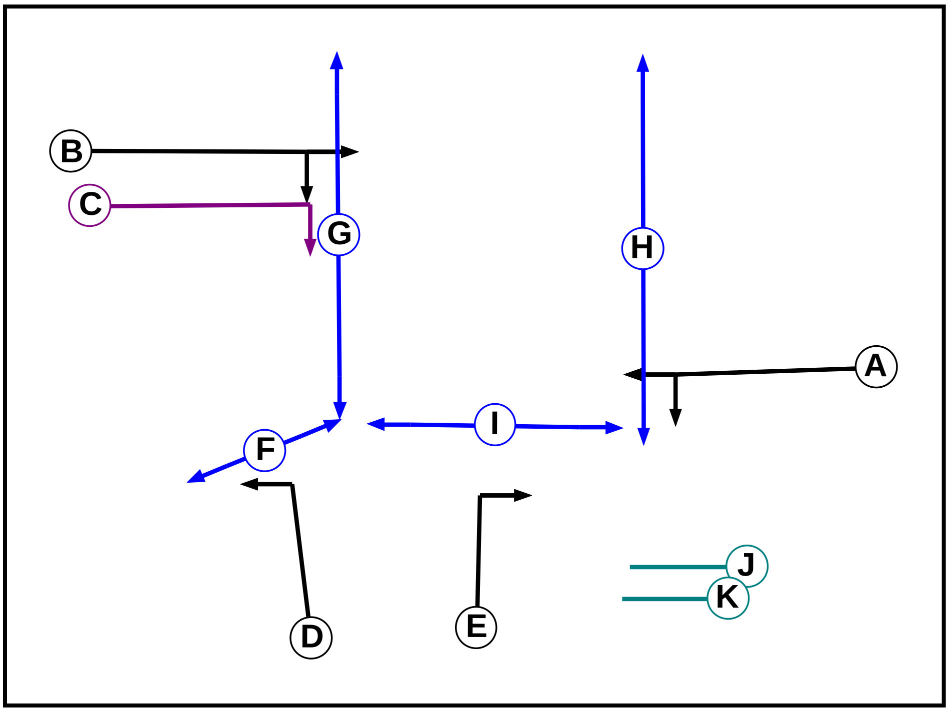
C2 - 00/006 Victoria Embankment / Blackfriars Bridge



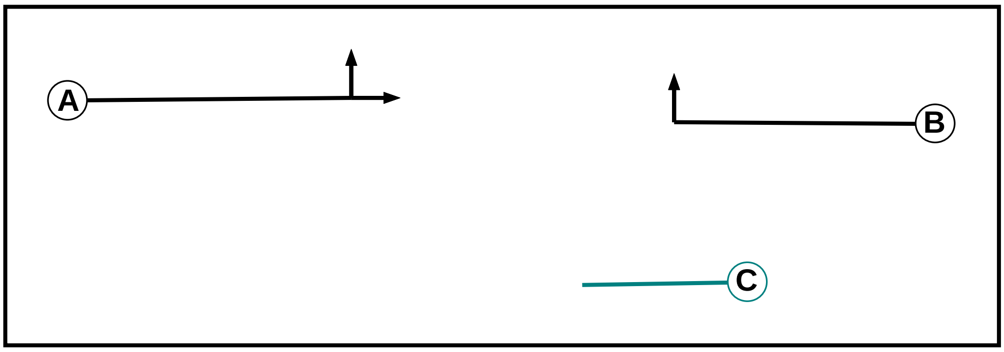
C3 - 00/122 Victoria Embankment / New Bridge Road



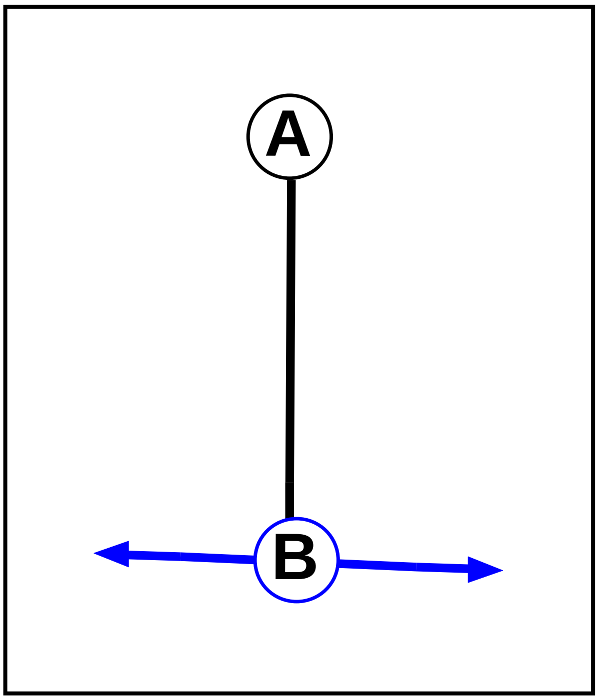
C4 - J00/007 Queen Victoria Street / Puddle Dock



C5 - 00/059 Upper Thames Street / Puddle Dock

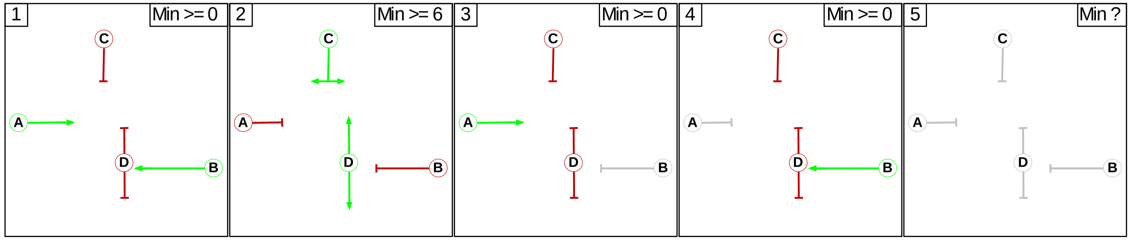


C6 - 00/123 Blackfriars Bridge ped crossing

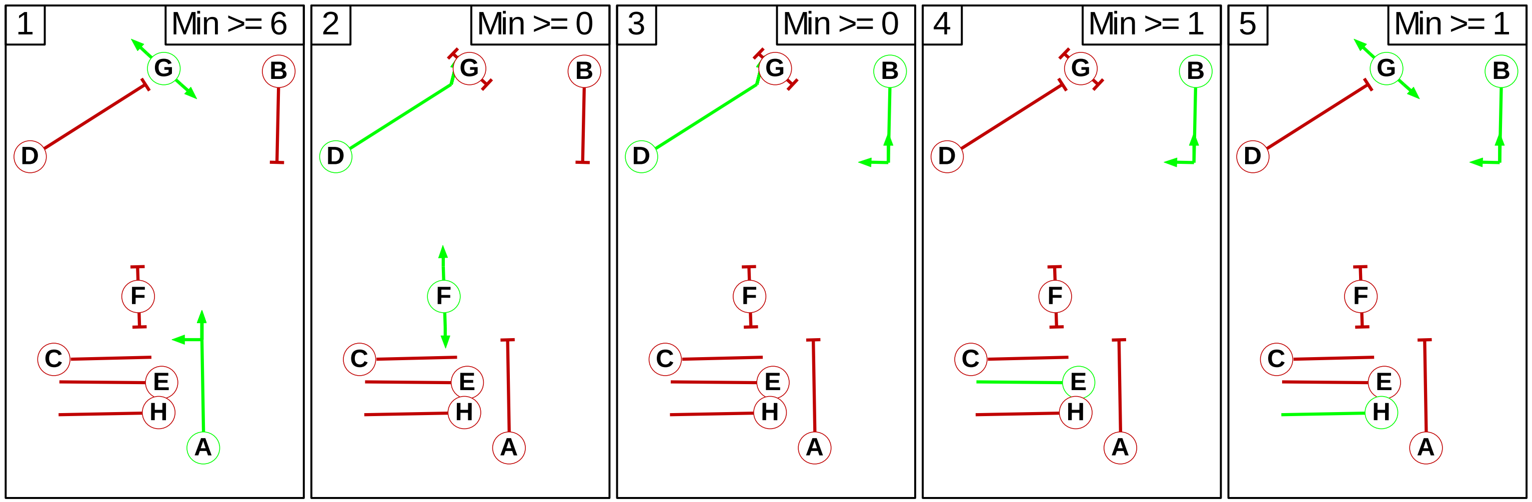


Stage Diagram

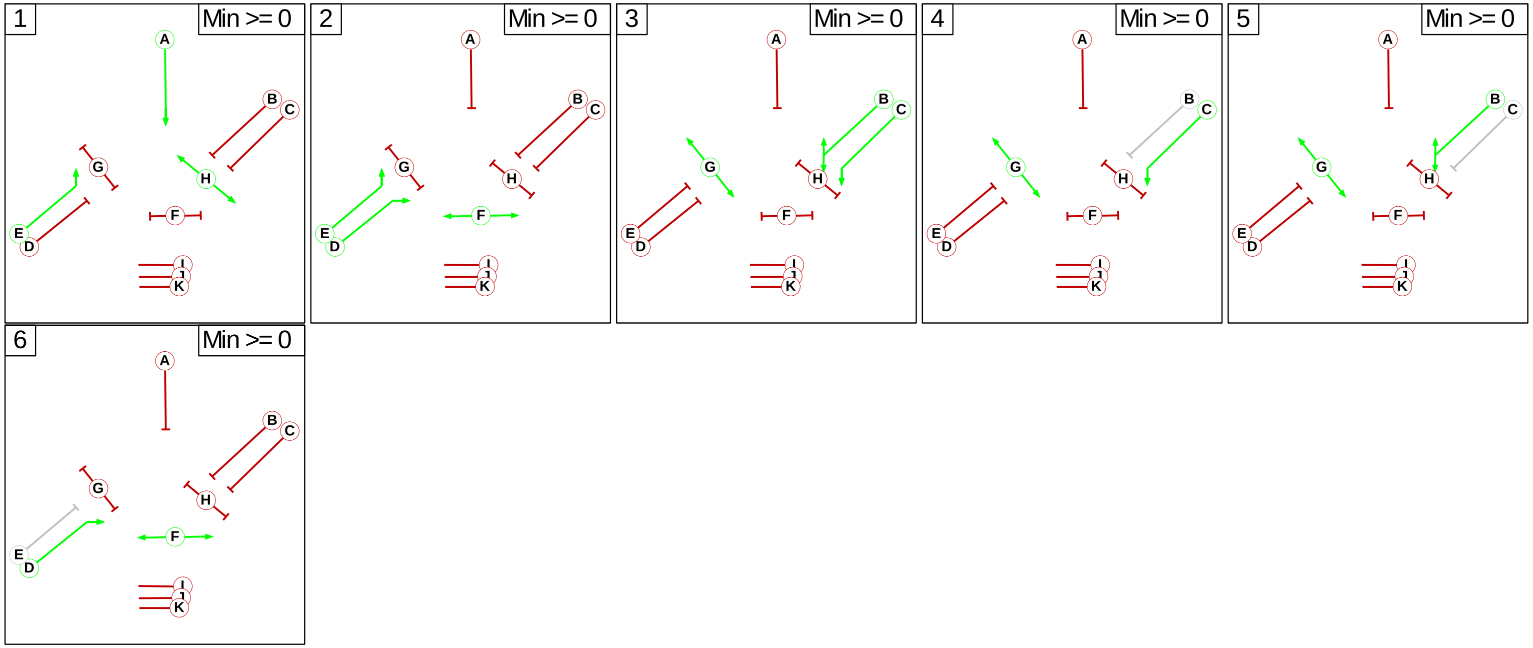
C1 - 01/094 Victoria Embankment / Temple Avenue



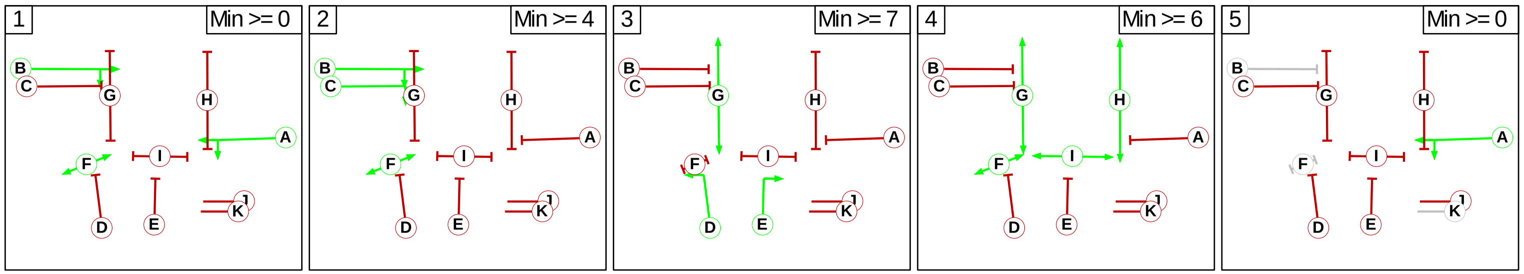
C2 - 00/006 Victoria Embankment / Blackfriars Bridge



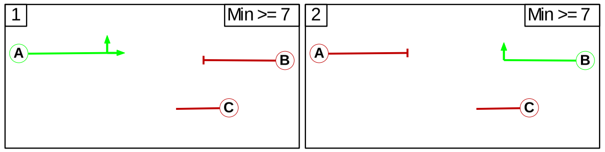
C3 - 00/122 Victoria Embankment / New Bridge Road
Stage Stream: 1



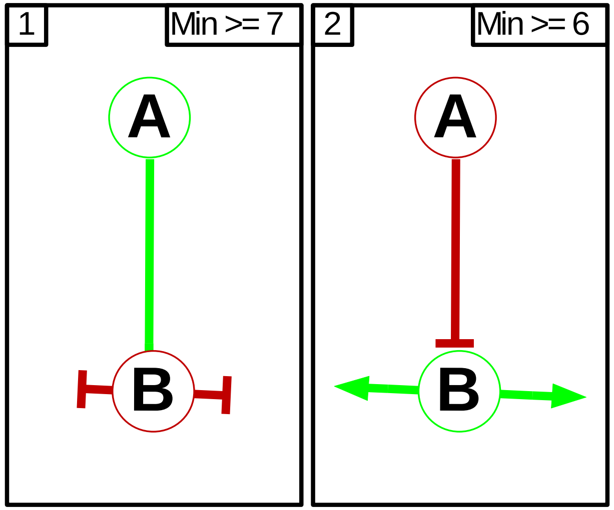
C4 - J00/007 Queen Victoria Street / Puddle Dock



C5 - 00/059 Upper Thames Street / Puddle Dock



C6 - 00/123 Blackfriars Bridge ped crossing



Phases in Stage

C1 - 01/094 Victoria Embankment / Temple Avenue

Stage No.	Phases in Stage
1	A B
2	C D
3	A
4	B
5	

C2 - 00/006 Victoria Embankment / Blackfriars Bridge

Stage No.	Phases in Stage
1	A G
2	D F
3	B D
4	B E
5	B G H

C3 - 00/122 Victoria Embankment / New Bridge Road

Stream	Stage No.	Phases in Stage
1	1	A E H
1	2	D E F
1	3	B C G
1	4	C G
1	5	B G
1	6	D F

C4 - J00/007 Queen Victoria Street / Puddle Dock

Stage No.	Phases in Stage
1	A B F
2	B C F
3	D E G
4	F G H I
5	A

C5 - 00/059 Upper Thames Street / Puddle Dock

Stage No.	Phases in Stage
1	A
2	B

C6 - 00/123 Blackfriars Bridge ped crossing

Stage No.	Phases in Stage
1	A
2	B

Phase Intergreens Matrix

C1 - 01/094 Victoria Embankment / Temple Avenue

		Starting Phase			
		A	B	C	D
Terminating Phase	A		-	5	7
	B	-		5	5
	C	5	5		-
	D	19	19	-	

C2 - 00/006 Victoria Embankment / Blackfriars Bridge

		Starting Phase							
		A	B	C	D	E	F	G	H
Terminating Phase	A		5	3	12	5	7	-	5
	B	5		3	-	-	8	-	-
	C	2	2		2	2	2	2	2
	D	5	-	3		3	-	6	6
	E	5	-	3	2		8	2	2
	F	9	9	4	-	9		-	9
	G	-	-	3	8	3	-		-
	H	5	-	3	8	3	8	-	

C3 - 00/122 Victoria Embankment / New Bridge Road

	Starting Phase											
		A	B	C	D	E	F	G	H	I	J	K
Terminating Phase	A		9	9	9	-	8	-	-	9	9	3
	B	5		-	5	5	7	-	6	5	5	3
	C	5	-		-	-	7	-	10	5	5	3
	D	5	5	-		-	-	6	8	3	3	3
	E	-	5	-	-		-	10	-	-	-	3
	F	8	8	8	-	-		-	-	-	-	3
	G	-	-	-	15	15	-		-	-	-	4
	H	-	15	15	15	-	-	-		5	4	4
	I	9	5	2	2	-	-	-	9		9	4
	J	5	5	2	2	-	-	-	2	5		3
	K	2	2	2	2	2	2	2	2	2	2	

C4 - J00/007 Queen Victoria Street / Puddle Dock

		Starting Phase										
		A	B	C	D	E	F	G	H	I	J	K
Terminating Phase	A		-	5	8	6	-	8	5	6	3	-
	B	-		-	-	5	-	5	8	8	3	3
	C	5	-		-	5	-	5	8	8	3	5
	D	5	-	-		-	5	-	-	-	3	5
	E	5	5	5	-		-	-	9	5	3	5
	F	-	-	-	9	-		-	-	-	4	4
	G	14	14	14	-	-	-		-	-	7	14
	H	15	15	15	-	15	-	-		-	8	15
	I	16	16	16	-	16	-	-	-		8	16
	J	2	2	2	2	2	2	2	2	2		2
	K	-	2	5	8	6	2	8	5	6	3	

C5 - 00/059 Upper Thames Street / Puddle Dock

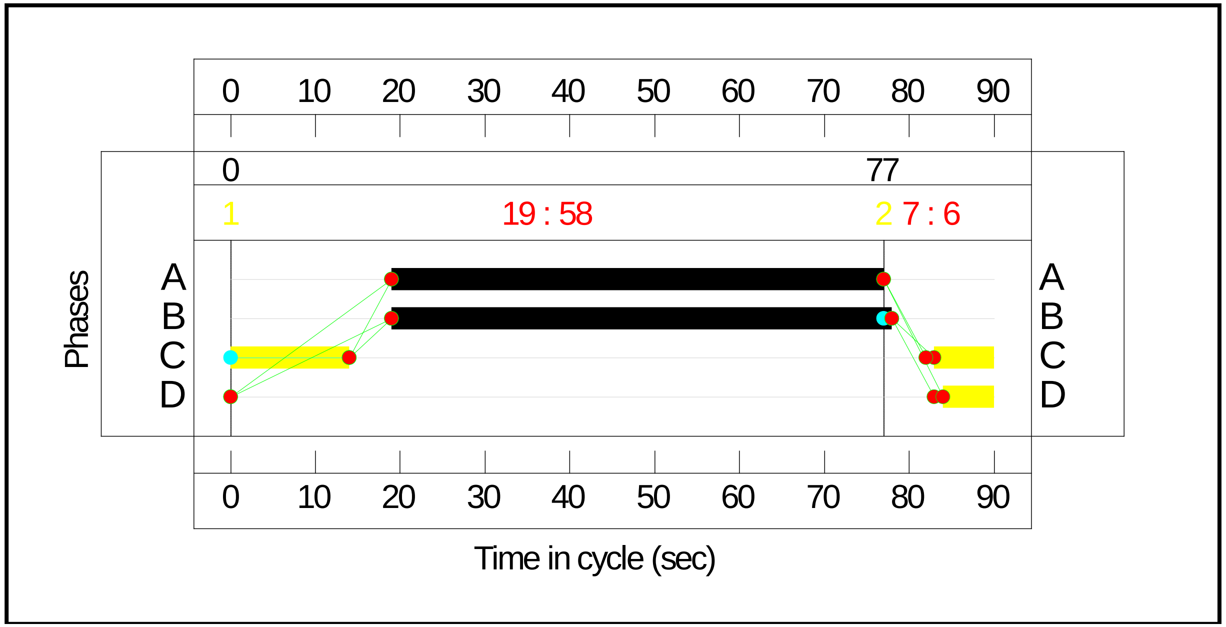
		Starting Phase		
		A	B	C
Terminating Phase	A		5	3
	B	5		3
	C	2	2	

C6 - 00/123 Blackfriars Bridge ped crossing

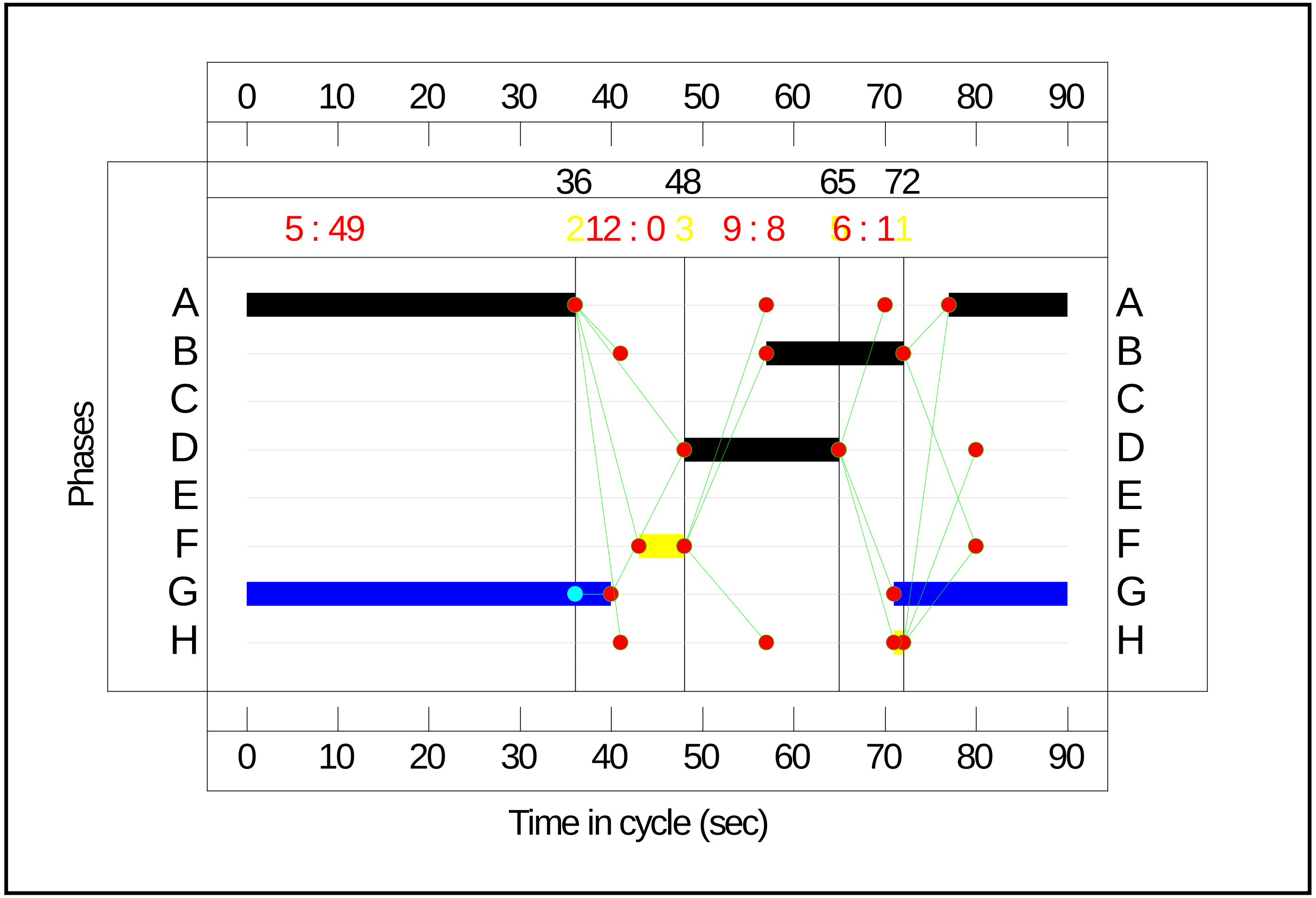
	Starting Phase		
Terminating Phase		A	B
	A		5
	B	8	

Traffic Signal Diagram

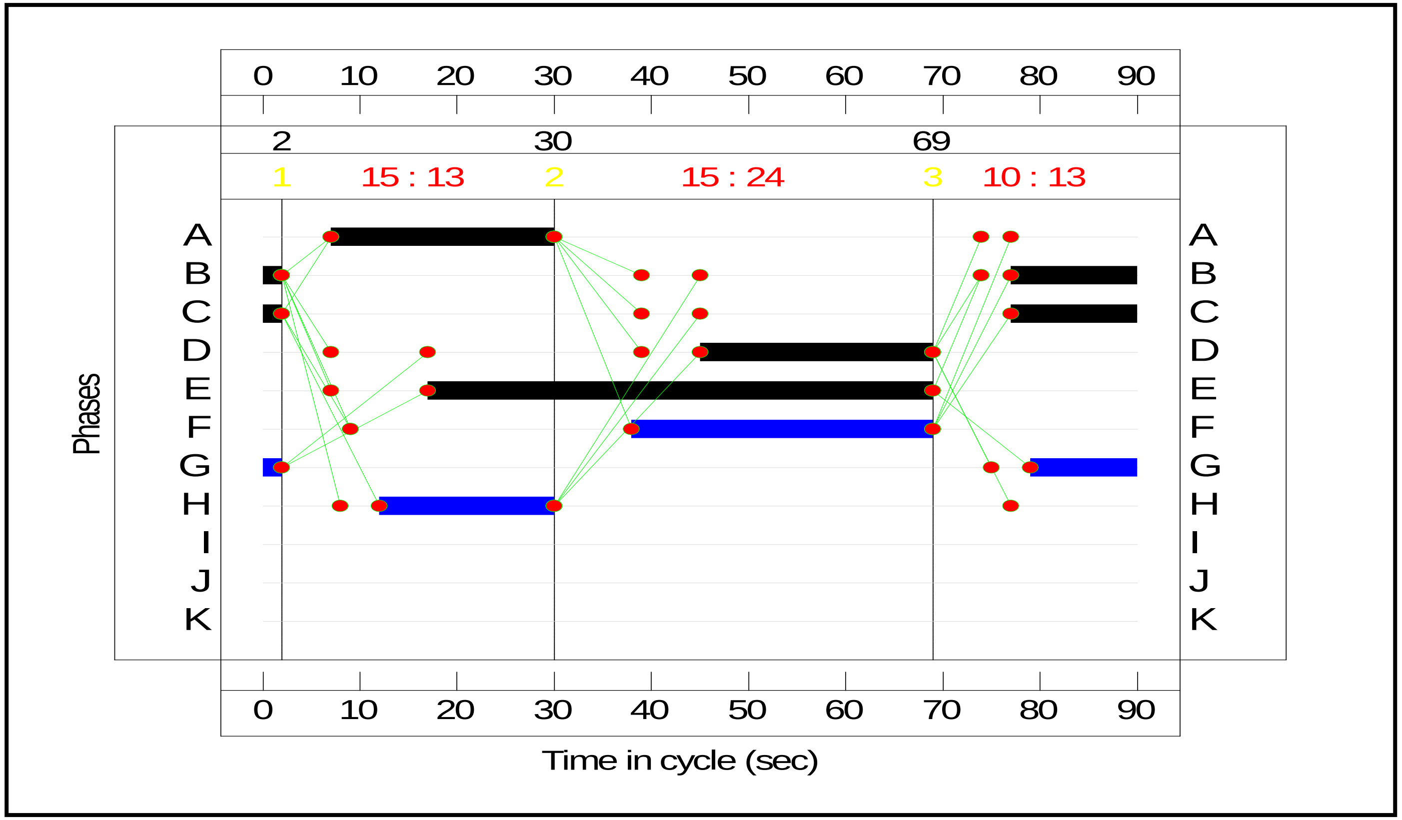
C1 - 00/005 Victoria Embankment / Temple Avenue



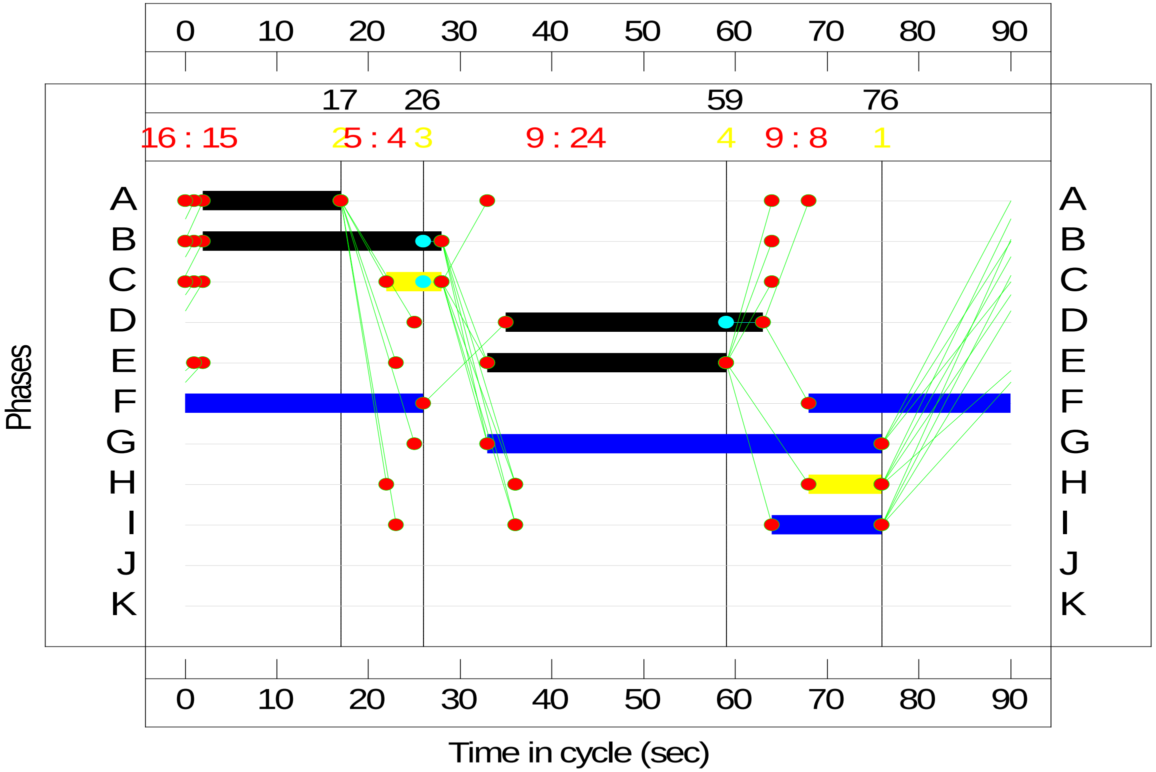
C2 - 00/006 Victoria Embankment / Blackfriars Bridge


0
10
20
30
40
50
60
70
80
90
36
48
65
72
5 : 49
212 : 0 3
9 : 8
6 : 11
A
B
C
D
E
F
G
H
Phases
Time in cycle (sec)

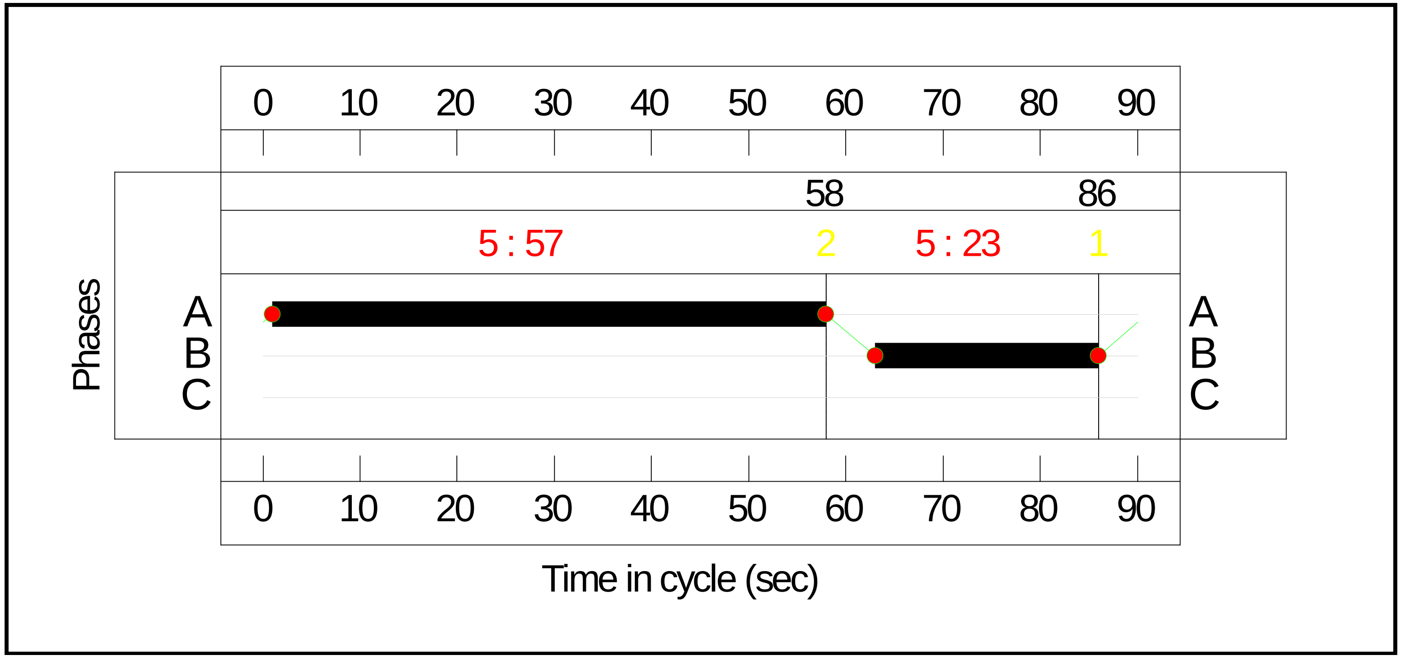
C3 - 00/122 Victoria Embankment / New Bridge Road



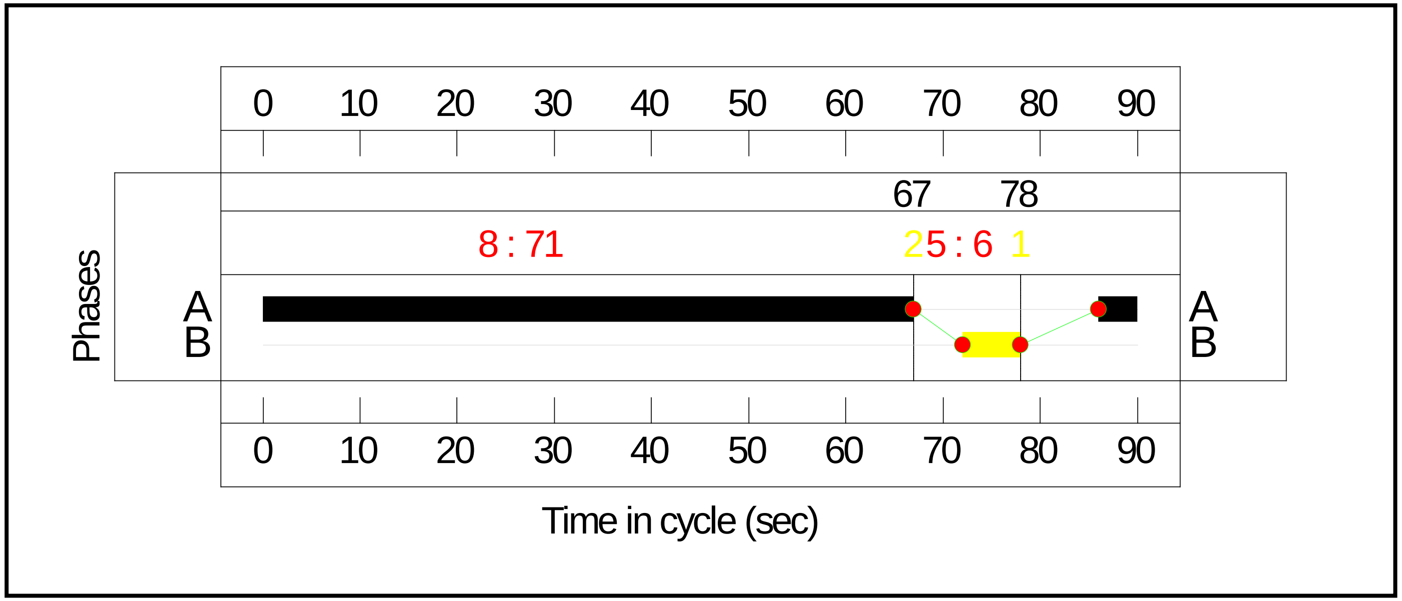
C4 - J00/007 Queen Victoria Street / Puddle Dock



C5 - 00/059 Upper Thames Street / Puddle Dock



C6 - 00/123 Blackfriars Bridge ped crossing



Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: Blackfriars Bridge Junction	-	-	-		-	-	-	-	-	-	**116.0%**	**587**	**9**	**1**	**165.5**	-	-
J1: 00/005	-	-	-		-	-	-	-	-	-	**97.1%**	**301**	**0**	**0**	**28.6**	-	-
1/1	Victoria Embankment (e/b) Ahead	U	C1:A		1	58	-	1129	1773	1162	97.1%	-	-	-	15.0	47.9	37.1
1/2	Victoria Embankment (e/b) Ahead	U	C1:A		1	58	-	873	1773	1162	75.1%	-	-	-	4.0	16.7	16.3
2/1	Temple Avenue Right Left	U	C1:C		1	21	-	78	1729	423	18.5%	-	-	-	0.7	32.1	1.7
3/1	Victoria Embankment (w/b) Ahead	U	C1:B		1	59	-	330	1773	1182	25.5%	-	-	-	0.4	4.3	1.5
3/2	Victoria Embankment (w/b) Ahead	U	C1:B		1	59	-	672	1773	1182	56.9%	-	-	-	2.2	11.6	9.6
3/3	Victoria Embankment (w/b) Ahead	U	C1:B		1	59	-	833	1773	1182	70.5%	-	-	-	3.4	14.6	14.1
5/1	Left	U	-		-	-	-	434	1800	1800	24.1%	-	-	-	0.2	1.3	0.2
5/2	Ahead	U	-		-	-	-	731	1800	1800	40.6%	-	-	-	0.3	1.7	0.3
5/3	Ahead	U	-		-	-	-	873	1800	1800	48.5%	-	-	-	0.5	1.9	0.5
6/1	Blackfriars Underpass (w/b) Ahead	U	-		-	-	-	811	1800	1800	45.1%	-	-	-	0.4	1.8	0.4
6/2	Blackfriars Underpass (w/b) Ahead	U	-		-	-	-	656	1800	1800	36.4%	-	-	-	0.3	1.6	0.3

7/1	Victoria Embankment - w/b on-slip Ahead	O	-		-	-	-	330	1800	537	56.2%	301	0	0	1.3	15.6	6.8
J2: 00/006	**-**	**-**	**-**		**-**	**-**	**-**	**-**	**-**	**-**	**92.0%**	**0**	**0**	**0**	**24.0**	**-**	**-**
1/1	Blackfriars Bridge Road (n/b) Ahead Left	U	C2:A		1	49	-	1004	1965	1092	92.0%	-	-	-	10.2	36.6	27.7
1/2	Blackfriars Bridge Road (n/b) Ahead	U	C2:A		1	49	-	487	1965	1092	44.6%	-	-	-	2.0	14.8	7.6
2/2	Blackfriars Bridge Road - internal SL (w/b +n/b) Ahead	U	-		-	-	-	409	1940	1940	18.9%	-	-	-	0.1	1.1	0.1
2/3+2/4	Blackfriars Bridge Road - internal SL (w/b +n/b) U-Turn Right	U	C2:B		1	15	-	339	1853:1550	368	84.3%	-	-	-	6.2	71.8	8.6
3/1	Ahead	U	-		-	-	-	931	2015	2015	46.2%	-	-	-	0.4	1.7	0.4
3/2	Ahead	U	-		-	-	-	569	2015	2015	28.2%	-	-	-	0.2	1.2	0.2
4/1	Victoria Embankment - e/b off-slip Ahead	U	C2:D		1	17	-	257	1848	370	69.5%	-	-	-	3.1	43.9	7.1
4/2	Victoria Embankment - e/b off-slip Ahead	U	C2:D		1	17	-	177	1848	370	47.9%	-	-	-	1.8	35.9	4.4
J3: 00/122	**-**	**-**	**-**		**-**	**-**	**-**	**-**	**-**	**-**	**116.0%**	**0**	**0**	**0**	**88.8**	**-**	**-**
1/1	Queen Victoria Street - internal SL (w/b) Left	U	C3:C		1	15	-	324	1866	332	97.7%	-	-	-	9.4	104.5	15.3

1/2	Queen Victoria Street - internal SL (w/b) Left Right	U	C3:B		1	15	-	207	1866	332	62.4%	-	-	-	2.5	43.6	5.9
2/1	Blackfriars Bridge Road - internal SL (n/b) Ahead	U	C3:E		1	52	-	730	1853	1091	66.9%	-	-	-	1.8	8.7	9.0
2/2	Blackfriars Bridge Road - internal SL (n/b) Ahead	U	C3:E		1	52	-	704	1852	1091	64.6%	-	-	-	3.0	15.5	16.5
2/3	Blackfriars Bridge Road - internal SL (n/b) Right	U	C3:D		1	24	-	471	1882	523	90.1%	-	-	-	7.3	56.1	15.0
3/1	Ahead	U	-		-	-	-	682	1918	1918	35.6%	-	-	-	0.3	1.5	0.3
3/2	Ahead	U	-		-	-	-	904	1918	1918	47.1%	-	-	-	0.4	1.8	0.4
4/1		U	-		-	-	-	682	1800	1800	37.9%	-	-	-	0.3	1.6	0.3
4/2		U	-		-	-	-	904	1800	1800	50.2%	-	-	-	0.5	2.0	0.5
5/1	New Bridge Street (s/b) Ahead	U	C3:A		1	23	-	478	1965	524	91.2%	-	-	-	8.6	64.9	15.9
5/2	New Bridge Street (s/b) Ahead	U	C3:A		1	23	-	608	1965	524	116.0%	-	-	-	54.6	323.6	62.7
J4: 00/007	**-**	**-**	**-**		**-**	**-**	**-**	**-**	**-**	**-**	**51.6%**	**50**	**9**	**1**	**12.3**	**-**	**-**
1/1	Queen Victoria Street - Internal SL (e/b) Ahead	U	C4:B	C4:C	1	26	6	229	1965	590	38.8%	-	-	-	0.8	12.2	2.8
1/2	Queen Victoria Street - Internal SL (e/b) Ahead Right	O	C4:B	C4:C	1	26	6	242	1905	572	42.3%	50	9	1	0.8	12.5	3.1

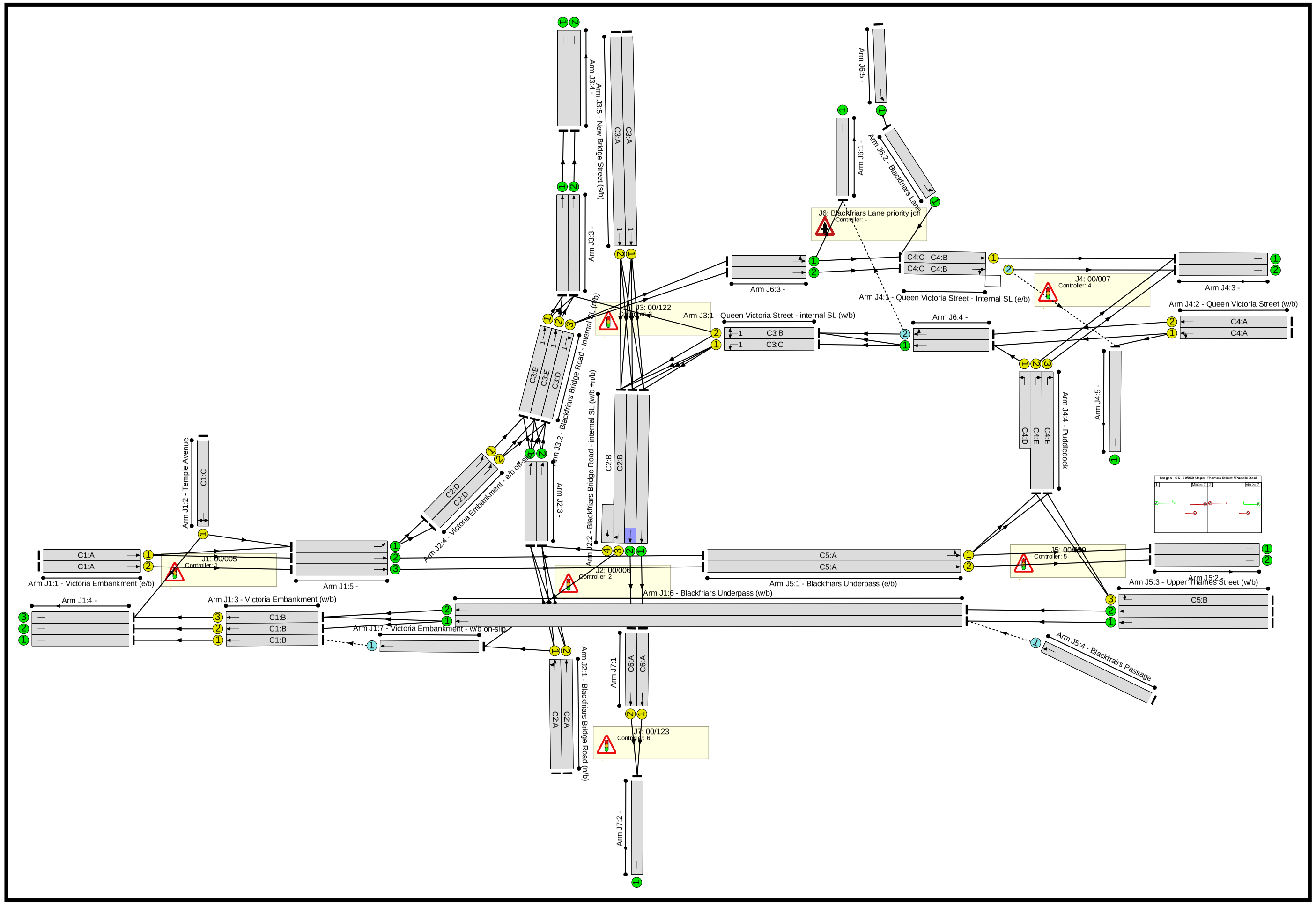
2/1	Queen Victoria Street (w/b) Left Ahead	U	C4:A		1	15	-	140	1948	346	40.4%	-	-	-	1.6	41.5	3.4
2/2	Queen Victoria Street (w/b) Ahead	U	C4:A		1	15	-	169	1965	349	48.4%	-	-	-	2.0	43.2	4.2
3/2		U	-		-	-	-	429	1900	1900	22.6%	-	-	-	0.1	1.2	0.1
4/2+4/1	Puddledock Right Left	U	C4:E C4:D		1	26:28	-	465	1800:1748	900	51.6%	-	-	-	4.3	33.2	6.0
4/3	Puddledock Right	U	C4:E		1	26	-	264	1789	537	49.2%	-	-	-	2.6	35.3	6.1
5/1		U	-		-	-	-	72	1800	1800	4.0%	-	-	-	0.0	1.0	0.0
J5: 00/059	**-**	**-**	**-**		**-**	**-**	**-**	**-**	**-**	**-**	**76.3%**	**236**	**0**	**0**	**9.7**	**-**	**-**
1/1	Blackfriars Underpass (e/b) Left Ahead	U	C5:A		1	57	-	731	1800	1160	63.0%	-	-	-	1.6	7.8	6.3
1/2	Blackfriars Underpass (e/b) Ahead	U	C5:A		1	57	-	873	1900	1224	71.3%	-	-	-	2.2	8.9	12.4
2/1		U	-		-	-	-	382	1800	1800	21.2%	-	-	-	0.1	1.3	0.1
2/2		U	-		-	-	-	873	1800	1800	48.5%	-	-	-	0.5	1.9	0.5
3/1	Upper Thames Street (w/b) Ahead	U	-		-	-	-	575	1900	1900	30.3%	-	-	-	0.2	1.4	0.2
3/2	Upper Thames Street (w/b) Ahead	U	-		-	-	-	656	1900	1900	34.5%	-	-	-	0.3	1.4	0.3
3/3	Upper Thames Street (w/b) Right	U	C5:B		1	23	-	353	1734	462	76.3%	-	-	-	4.5	46.4	9.6

4/1	Blackfriars Passage Ahead	O	-		-	-	-	236	1940	588	40.1%	236	0	0	0.3	5.1	0.3
J6: Blackfriars Lane priority jcn	**-**	**-**	**-**		**-**	**-**	**-**	**-**	**-**	**-**	**19.4%**	**0**	**0**	**0**	**0.3**	**-**	**-**
1/1		U	-		-	-	-	10	1800	1800	0.6%	-	-	-	0.0	1.0	0.0
2/1	Blackfriars Lane Left	U	-		-	-	-	10	1800	1800	0.6%	-	-	-	0.0	1.0	0.0
3/1	Ahead Left	U	-		-	-	-	229	1800	1800	12.7%	-	-	-	0.1	1.1	0.1
3/2	Ahead	U	-		-	-	-	242	1800	1800	13.4%	-	-	-	0.1	1.2	0.1
4/1	Ahead	U	-		-	-	-	349	1800	1800	19.4%	-	-	-	0.1	1.2	0.1
4/2	Ahead Right	O	-		-	-	-	169	1800	1800	9.4%	0	0	0	0.1	1.1	0.1
5/1	Ahead	U	-		-	-	-	10	1800	1800	0.6%	-	-	-	0.0	1.0	0.0
J7: 00/123	**-**	**-**	**-**		**-**	**-**	**-**	**-**	**-**	**-**	**52.6%**	**0**	**0**	**0**	**1.6**	**-**	**-**
1/1	Ahead	U	C6:A		1	71	-	691	1940	1552	44.5%	-	-	-	0.5	2.8	11.8
1/2	Ahead	U	C6:A		1	71	-	403	2130	1704	21.2%	-	-	-	0.1	1.3	0.1
2/1		U	-		-	-	-	1094	2000	2000	52.6%	-	-	-	0.9	3.2	17.3

C1 - 00/005 Victoria Embankment / Temple Avenue	PRC for Signalled Lanes (%):	-7.9	Total Delay for Signalled Lanes (pcuHr):	25.66	Cycle Time (s):	90
C2 - 00/006 Victoria Embankment / Blackfriars Bridge	PRC for Signalled Lanes (%):	-2.2	Total Delay for Signalled Lanes (pcuHr):	23.29	Cycle Time (s):	90
C3 - 00/122 Victoria Embankment / New Bridge RoadStream: 1	PRC for Signalled Lanes (%):	-28.9	Total Delay for Signalled Lanes (pcuHr):	87.30	Cycle Time (s):	90
C4 - J00/007 Queen Victoria Street / Puddle Dock	PRC for Signalled Lanes (%):	74.3	Total Delay for Signalled Lanes (pcuHr):	12.14	Cycle Time (s):	90
C5 - 00/059 Upper Thames Street / Puddle Dock	PRC for Signalled Lanes (%):	17.9	Total Delay for Signalled Lanes (pcuHr):	8.29	Cycle Time (s):	90
C6 - 00/123 Blackfriars Bridge ped crossing	PRC for Signalled Lanes (%):	102.1	Total Delay for Signalled Lanes (pcuHr):	0.68	Cycle Time (s):	90
	PRC Over All Lanes (%):	-28.9	Total Delay Over All Lanes(pcuHr):	165.46		

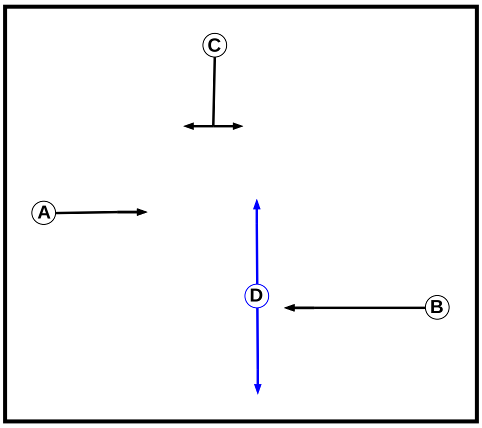
D.10 Construction development case results (phases 1 and 2), sensitivity test, PM peak hour

Network Layout Diagram

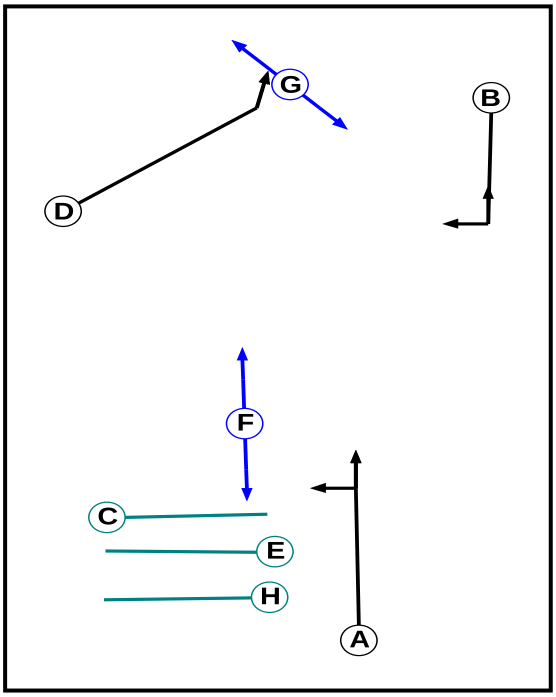


Phase Diagrams

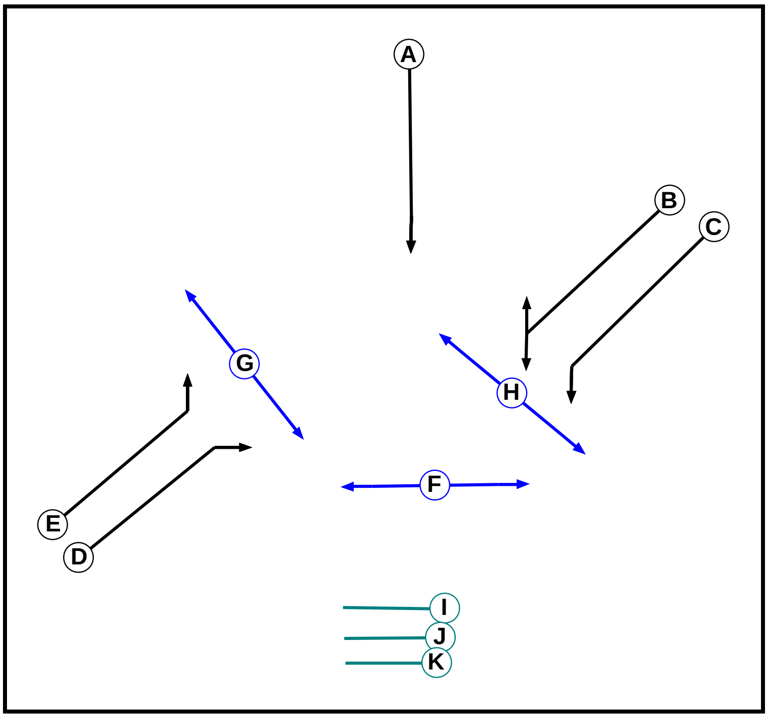
C1 - 00/005 Victoria Embankment / Temple Avenue



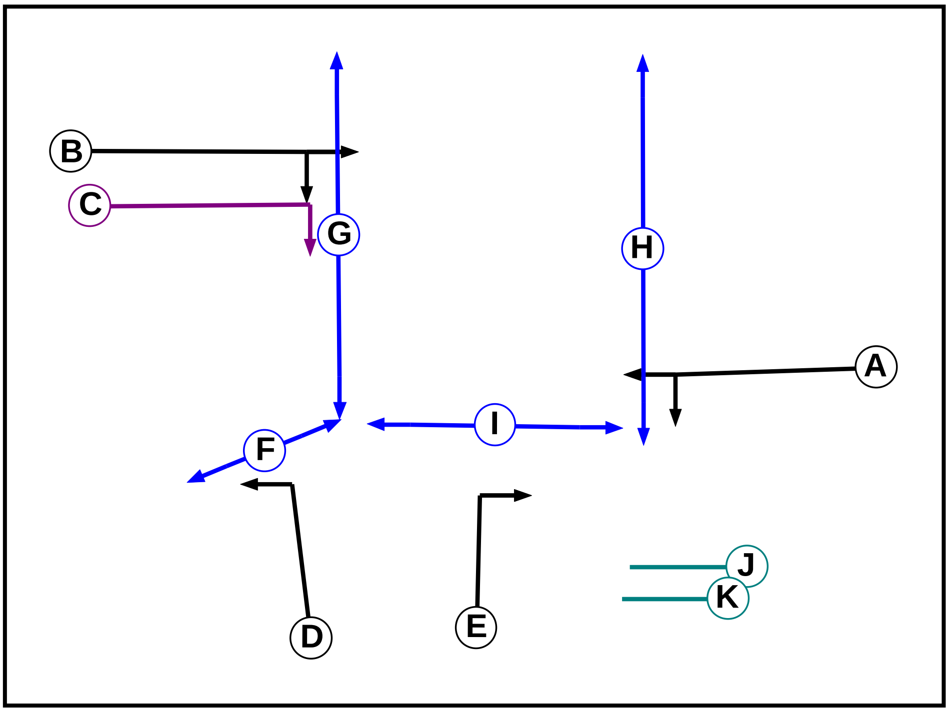
C2 - 00/006 Victoria Embankment / Blackfriars Bridge



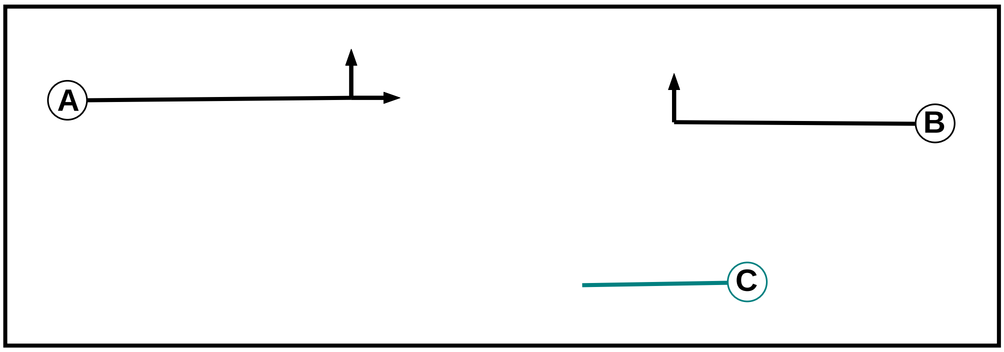
C3 - 00/122 Victoria Embankment / New Bridge Road



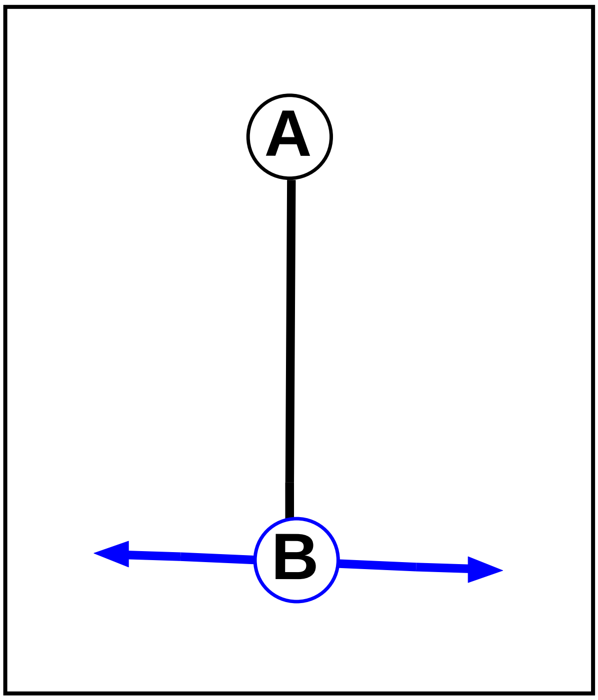
C4 - J00/007 Queen Victoria Street / Puddle Dock



C5 - 00/059 Upper Thames Street / Puddle Dock

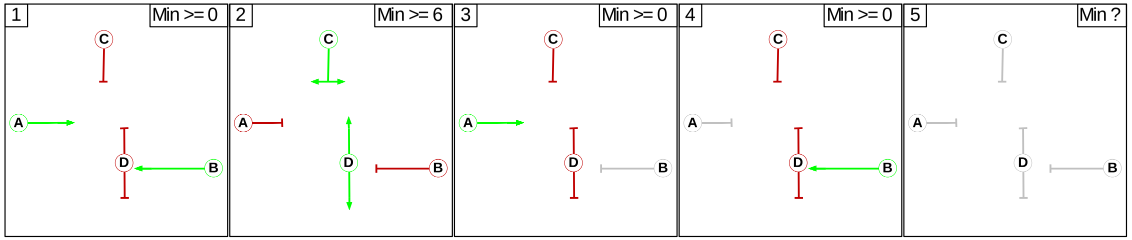


C6 - 00/123 Blackfriars Bridge ped crossing

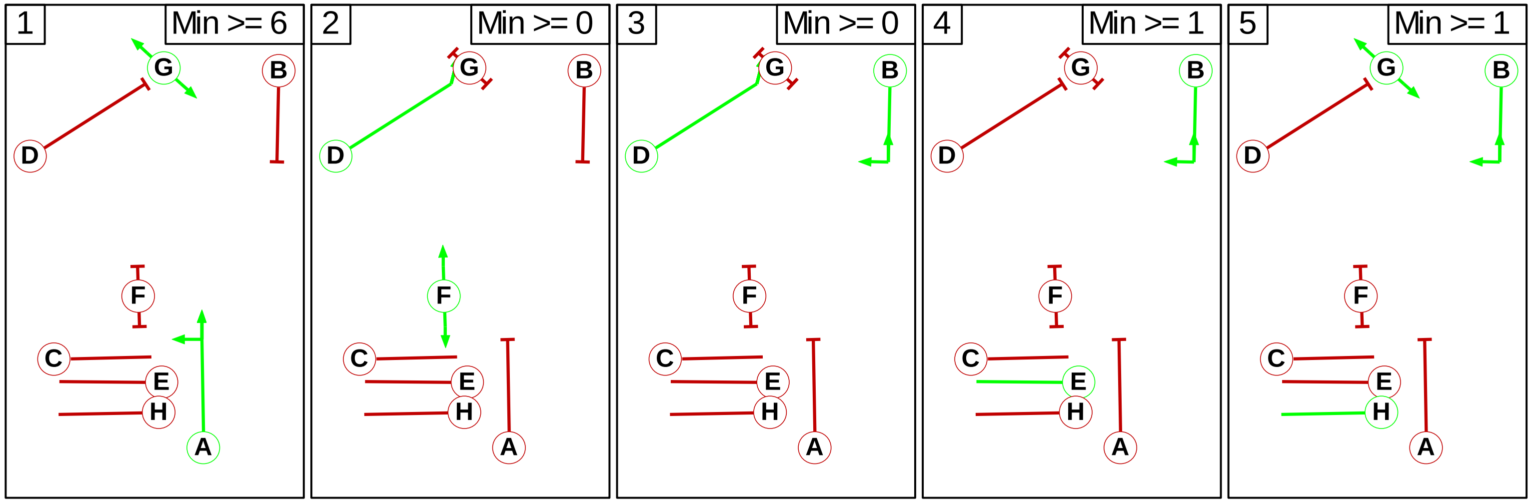


Stage Diagram

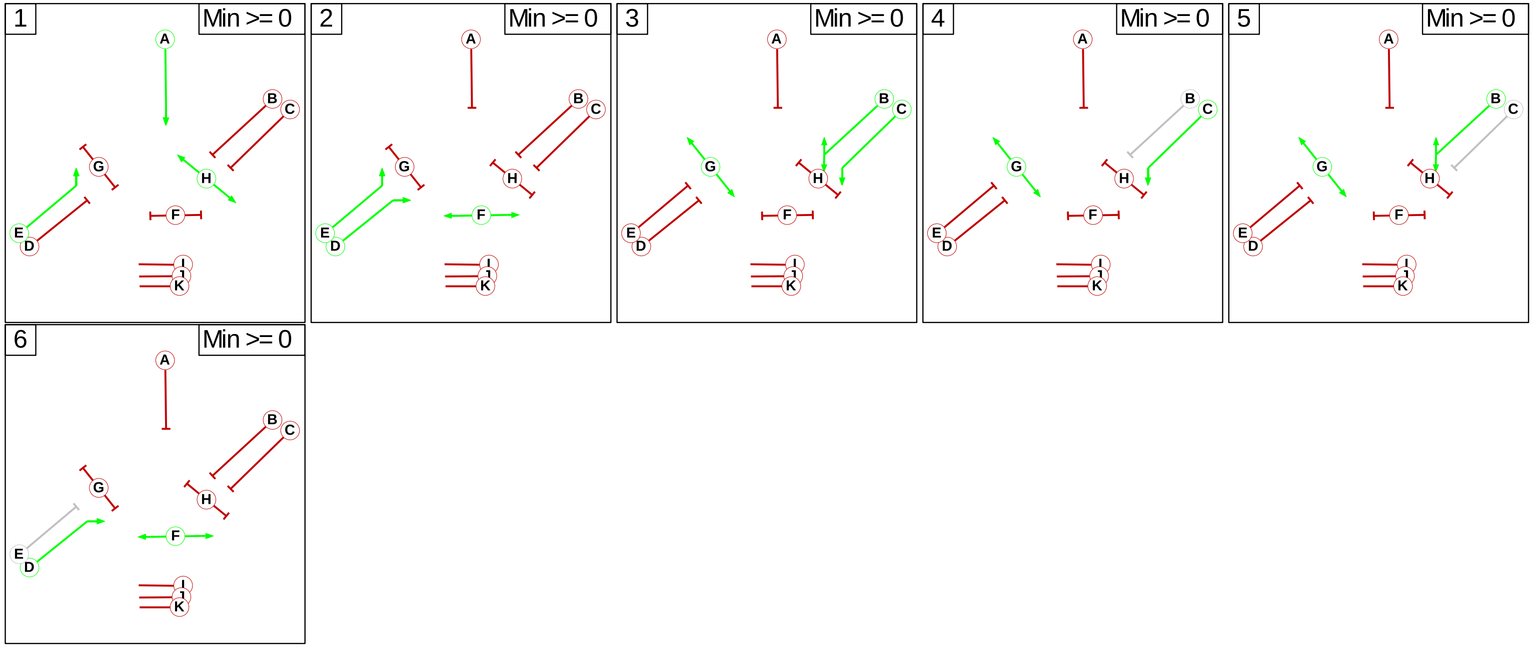
C1 - 01/094 Victoria Embankment / Temple Avenue



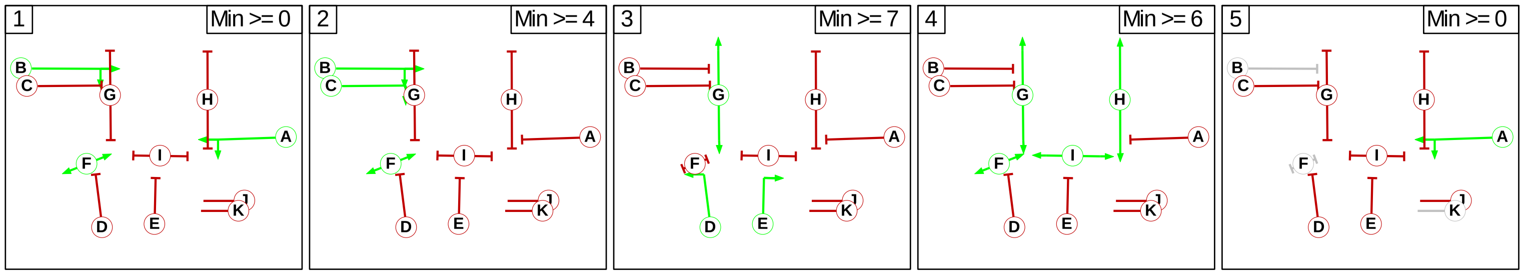
C2 - 00/006 Victoria Embankment / Blackfriars Bridge



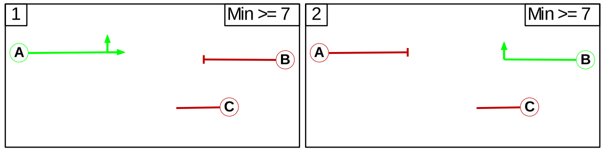
C3 - 00/122 Victoria Embankment / New Bridge Road
Stage Stream: 1



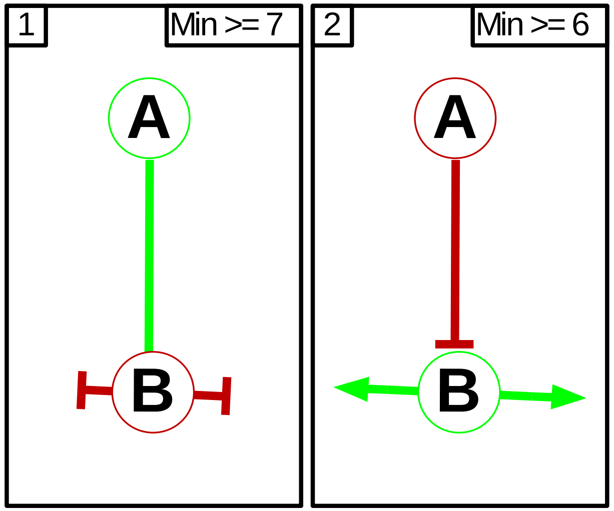
C4 - J00/007 Queen Victoria Street / Puddle Dock



C5 - 00/059 Upper Thames Street / Puddle Dock



C6 - 00/123 Blackfriars Bridge ped crossing



Phases in Stage

C1 - 01/094 Victoria Embankment / Temple Avenue

Stage No.	Phases in Stage
1	A B
2	C D
3	A
4	B
5	

C2 - 00/006 Victoria Embankment / Blackfriars Bridge

Stage No.	Phases in Stage
1	A G
2	D F
3	B D
4	B E
5	B G H

C3 - 00/122 Victoria Embankment / New Bridge Road

Stream	Stage No.	Phases in Stage
1	1	A E H
1	2	D E F
1	3	B C G
1	4	C G
1	5	B G
1	6	D F

C4 - J00/007 Queen Victoria Street / Puddle Dock

Stage No.	Phases in Stage
1	A B F
2	B C F
3	D E G
4	F G H I
5	A

C5 - 00/059 Upper Thames Street / Puddle Dock

Stage No.	Phases in Stage
1	A
2	B

C6 - 00/123 Blackfriars Bridge ped crossing

Stage No.	Phases in Stage
1	A
2	B

Phase Intergreens Matrix

C1 - 01/094 Victoria Embankment / Temple Avenue

	Starting Phase				
Terminating Phase		A	B	C	D
	A		-	5	7
	B	-		5	5
	C	5	5		-
	D	19	19	-	

C2 - 00/006 Victoria Embankment / Blackfriars Bridge

	Starting Phase								
Terminating Phase		A	B	C	D	E	F	G	H
	A		5	3	12	5	7	-	5
	B	5		3	-	-	8	-	-
	C	2	2		2	2	2	2	2
	D	5	-	3		3	-	6	6
	E	5	-	3	2		8	2	2
	F	9	9	4	-	9		-	9
	G	-	-	3	8	3	-		-
	H	5	-	3	8	3	8	-	

C3 - 00/122 Victoria Embankment / New Bridge Road

		Starting Phase										
		A	B	C	D	E	F	G	H	I	J	K
Terminating Phase	A		9	9	9	-	8	-	-	9	9	3
	B	5		-	5	5	7	-	6	5	5	3
	C	5	-		-	-	7	-	10	5	5	3
	D	5	5	-		-	-	6	8	3	3	3
	E	-	5	-	-		-	10	-	-	-	3
	F	8	8	8	-	-		-	-	-	-	3
	G	-	-	-	15	15	-		-	-	-	4
	H	-	15	15	15	-	-	-		5	4	4
	I	9	5	2	2	-	-	-	9		9	4
	J	5	5	2	2	-	-	-	2	5		3
	K	2	2	2	2	2	2	2	2	2	2	

C4 - J00/007 Queen Victoria Street / Puddle Dock

		Starting Phase										
		A	B	C	D	E	F	G	H	I	J	K
Terminating Phase	A		-	5	8	6	-	8	5	6	3	-
	B	-		-	-	5	-	5	8	8	3	3
	C	5	-		-	5	-	5	8	8	3	5
	D	5	-	-		-	5	-	-	-	3	5
	E	5	5	5	-		-	-	9	5	3	5
	F	-	-	-	9	-		-	-	-	4	4
	G	14	14	14	-	-	-		-	-	7	14
	H	15	15	15	-	15	-	-		-	8	15
	I	16	16	16	-	16	-	-	-		8	16
	J	2	2	2	2	2	2	2	2	2		2
	K	-	2	5	8	6	2	8	5	6	3	

C5 - 00/059 Upper Thames Street / Puddle Dock

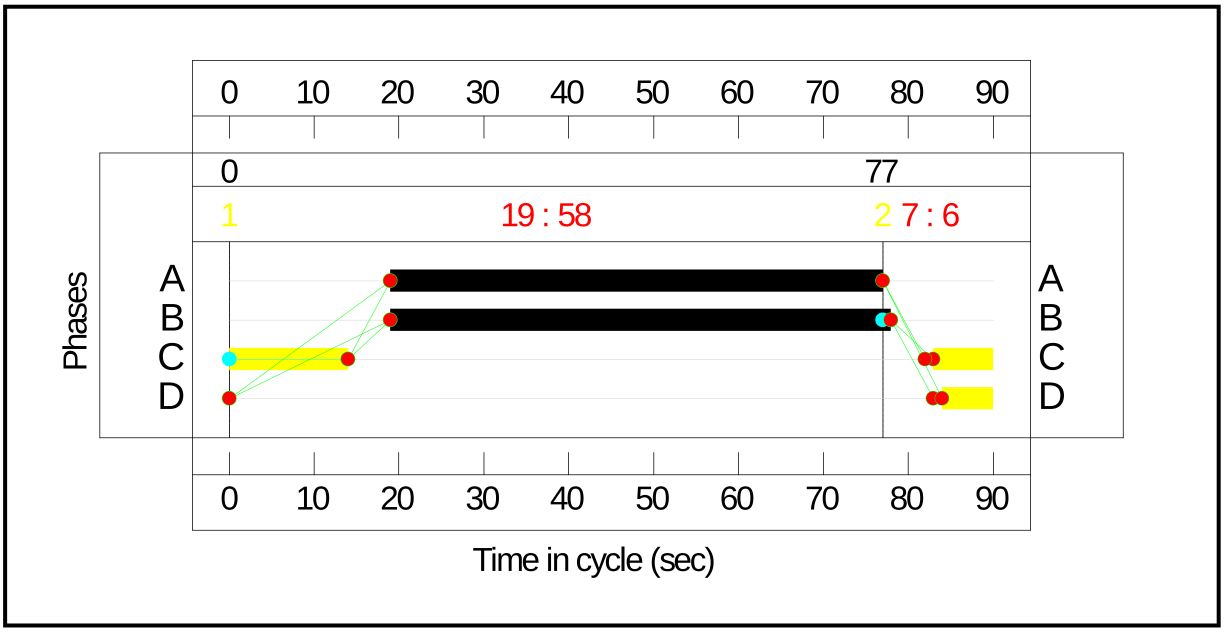
		Starting Phase		
		A	B	C
Terminating Phase	A		5	3
	B	5		3
	C	2	2	

C6 - 00/123 Blackfriars Bridge ped crossing

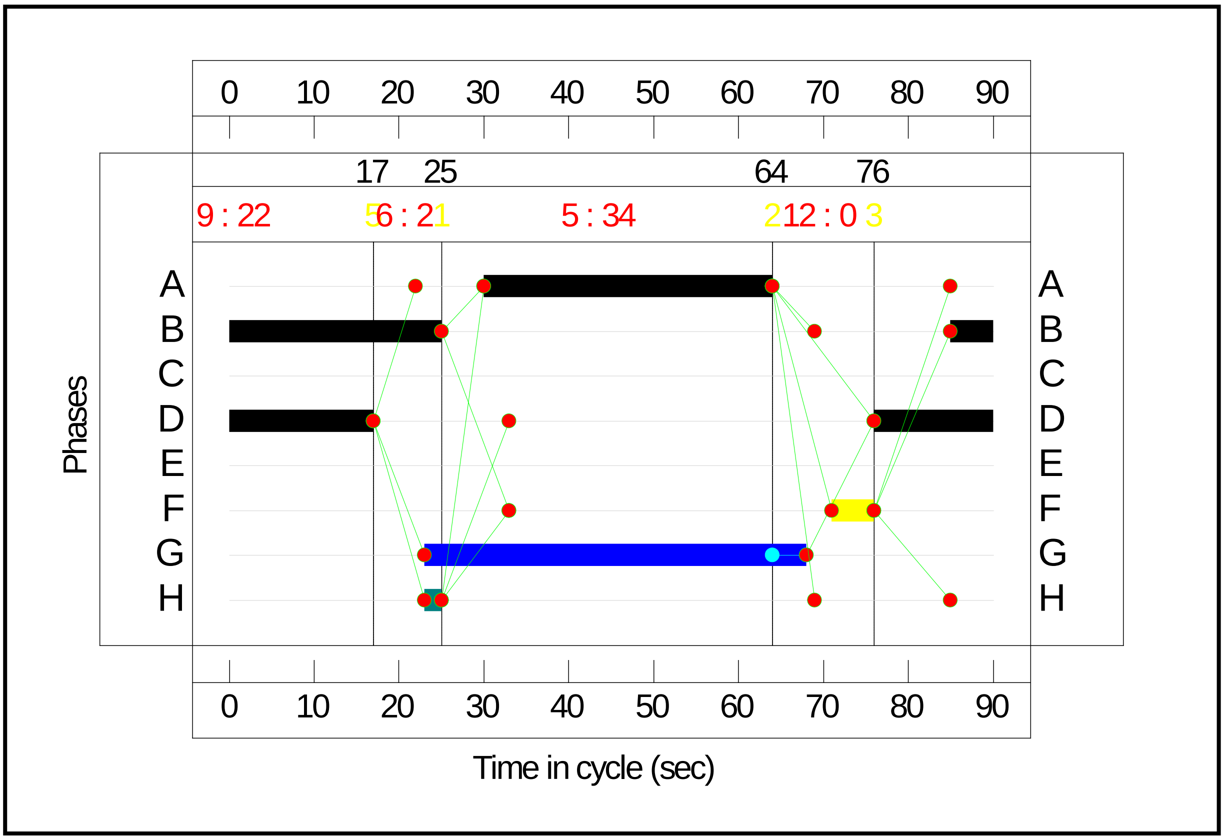
		Starting Phase	
		A	B
Terminating Phase	A		5
	B	8	

Stage Diagrams

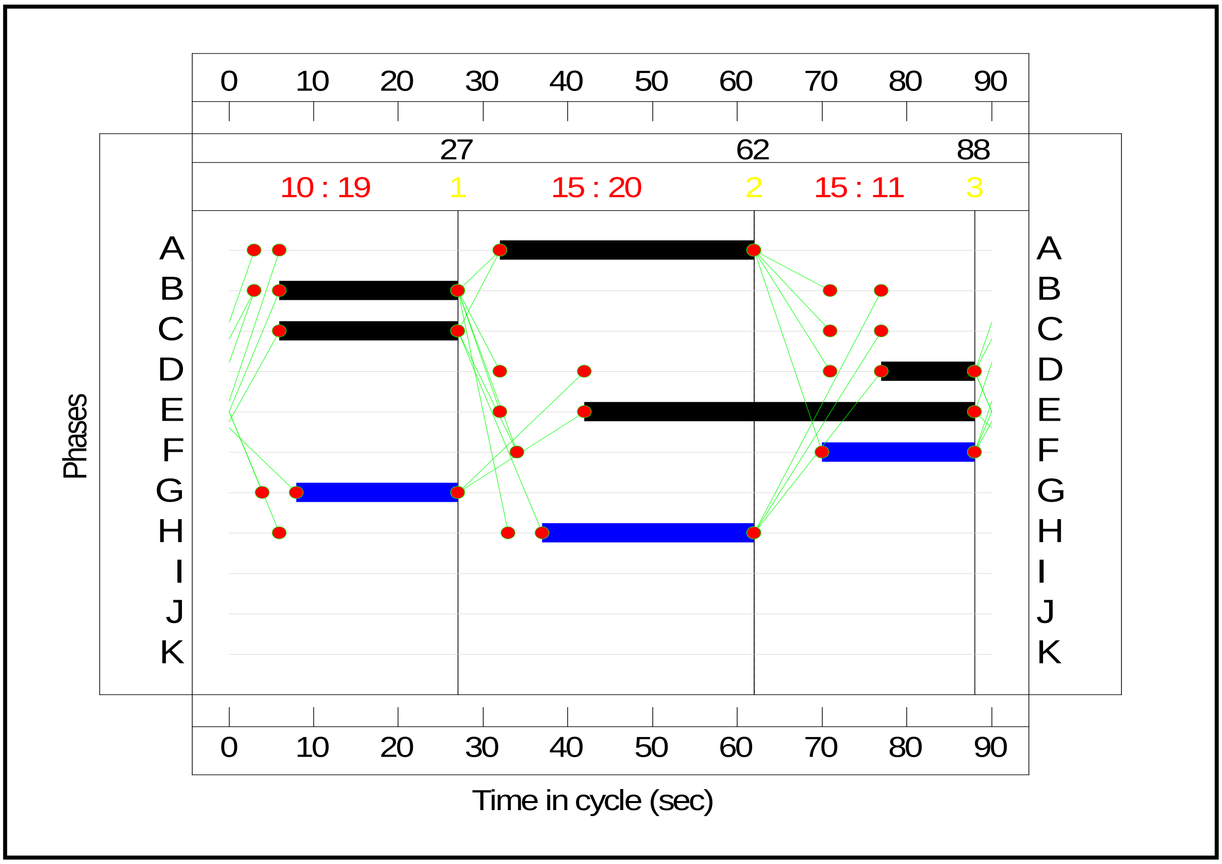
C1 - 00/005 Victoria Embankment / Temple Avenue



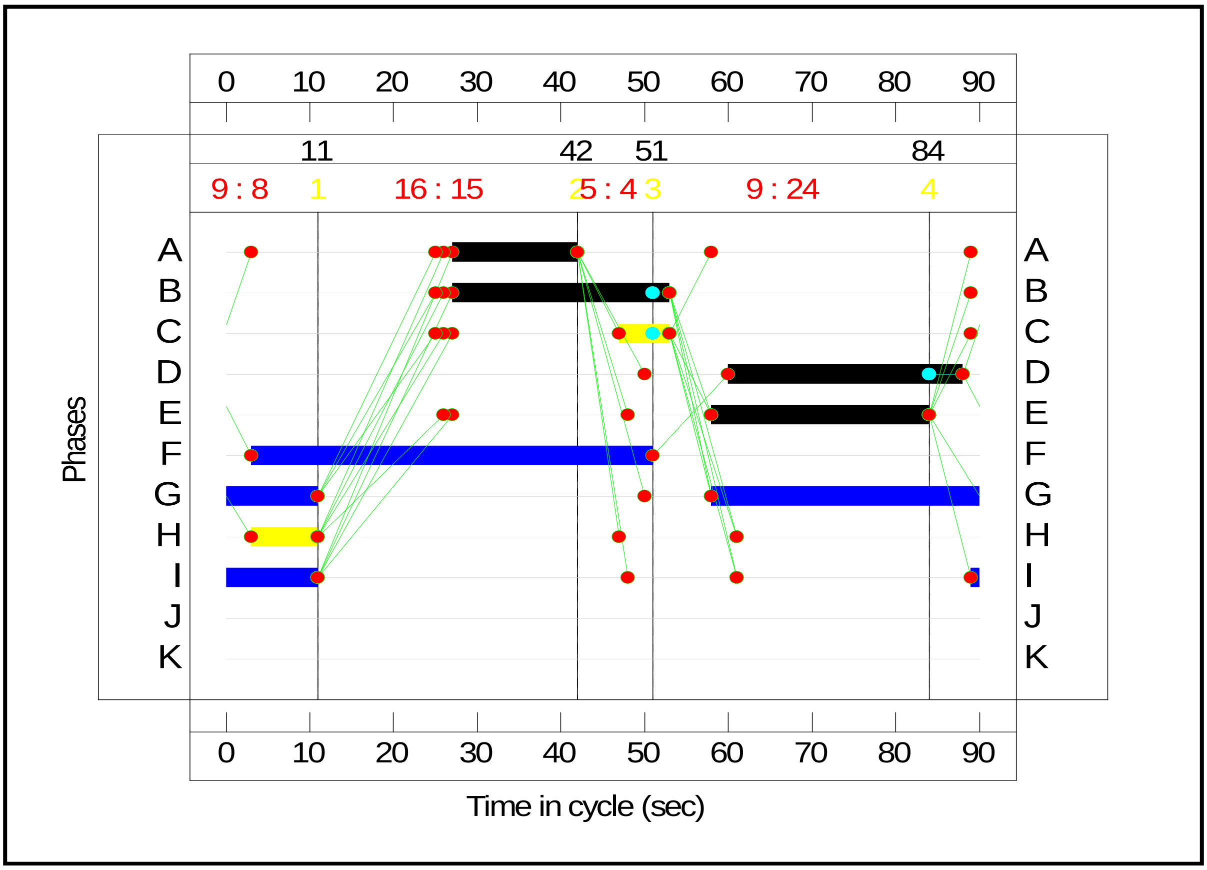
C2 - 00/006 Victoria Embankment / Blackfriars Bridge



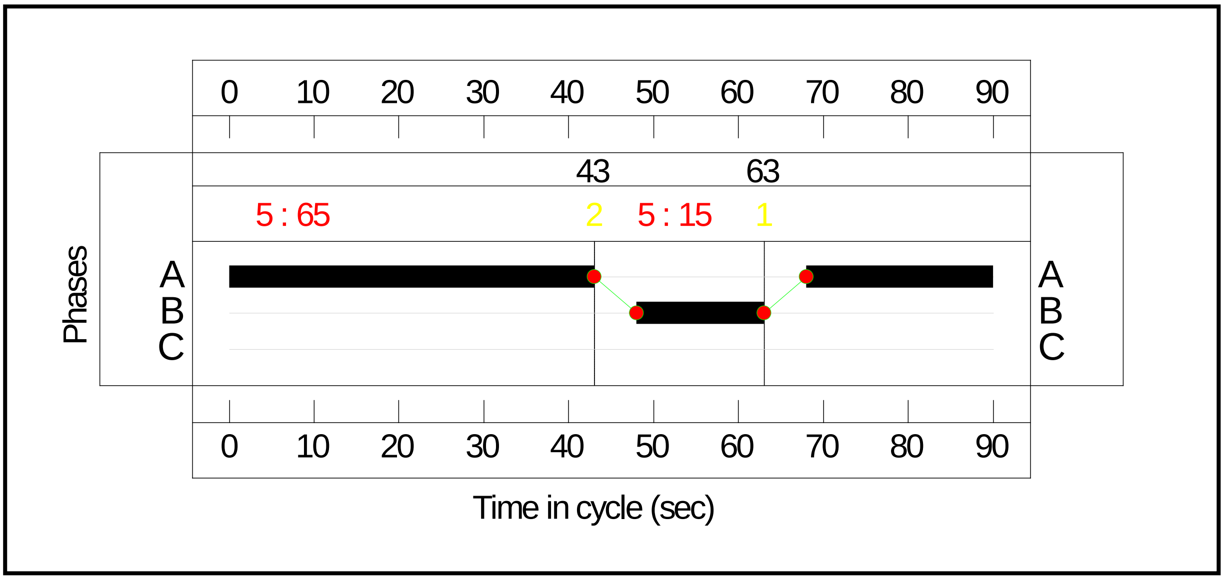
C3 - 00/122 Victoria Embankment / New Bridge Road



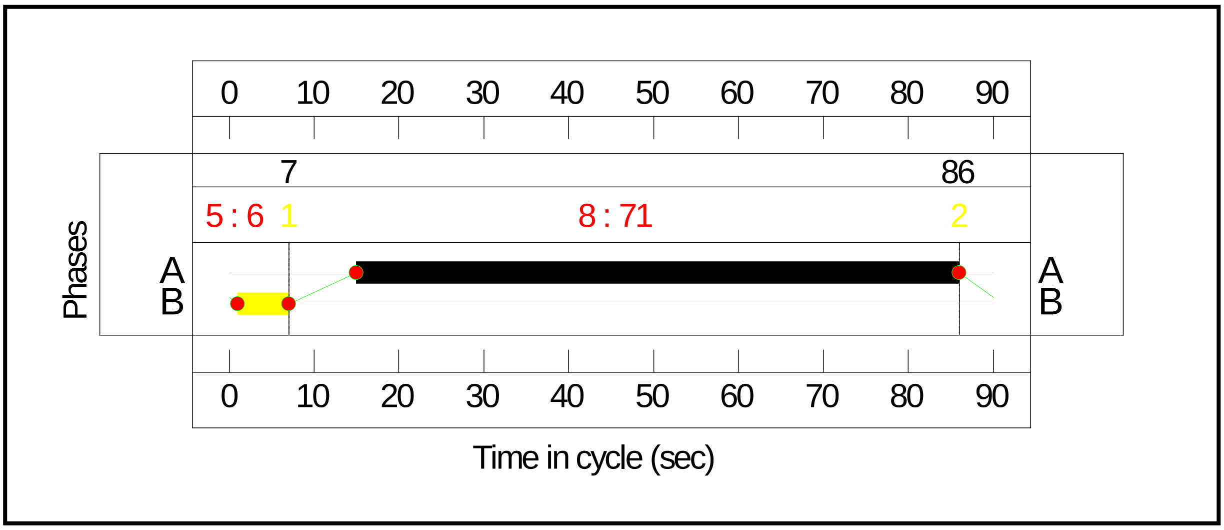
C4 - J00/007 Queen Victoria Street / Puddle Dock



C5 - 00/059 Upper Thames Street / Puddle Dock



C6 - 00/123 Blackfriars Bridge ped crossing



Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: Blackfriars Bridge Junction	-	-	-		-	-	-	-	-	-	**125.9%**	**629**	**3**	**0**	**230.8**	-	-
J1: 00/005	-	-	-		-	-	-	-	-	-	**91.6%**	**344**	**0**	**0**	**22.7**	-	-
1/1	Victoria Embankment (e/b) Ahead	U	C1:A		1	58	-	1065	1773	1162	91.6%	-	-	-	8.9	30.2	27.7
1/2	Victoria Embankment (e/b) Ahead	U	C1:A		1	58	-	787	1773	1162	67.7%	-	-	-	3.1	14.4	13.1
2/1	Temple Avenue Right Left	U	C1:C		1	21	-	136	1729	423	32.2%	-	-	-	1.3	34.2	3.0
3/1	Victoria Embankment (w/b) Ahead	U	C1:B		1	59	-	382	1773	1182	28.9%	-	-	-	0.9	9.1	3.4
3/2	Victoria Embankment (w/b) Ahead	U	C1:B		1	59	-	757	1773	1182	64.0%	-	-	-	2.7	12.9	11.8
3/3	Victoria Embankment (w/b) Ahead	U	C1:B		1	59	-	758	1773	1182	64.1%	-	-	-	2.7	13.0	11.8
5/1	Left	U	-		-	-	-	413	1800	1800	22.9%	-	-	-	0.1	1.3	0.1
5/2	Ahead	U	-		-	-	-	706	1800	1800	39.2%	-	-	-	0.3	1.6	0.3
5/3	Ahead	U	-		-	-	-	787	1800	1800	43.7%	-	-	-	0.4	1.8	0.4
6/1	Blackfriars Underpass (w/b) Ahead	U	-		-	-	-	804	1800	1800	44.7%	-	-	-	0.4	1.8	0.4
6/2	Blackfriars Underpass (w/b) Ahead	U	-		-	-	-	711	1800	1800	39.5%	-	-	-	0.3	1.7	0.3

7/1	Victoria Embankment - w/b on-slip Ahead	O	-		-	-	-	385	1800	538	64.0%	344	0	0	1.5	15.5	7.7
J2: 00/006	**-**	**-**	**-**		**-**	**-**	**-**	**-**	**-**	**-**	**80.0%**	**0**	**0**	**0**	**15.3**	**-**	**-**
1/1	Blackfriars Bridge Road (n/b) Ahead Left	U	C2:A		1	34	-	611	1965	764	80.0%	-	-	-	6.1	35.9	15.4
1/2	Blackfriars Bridge Road (n/b) Ahead	U	C2:A		1	34	-	342	1965	764	44.8%	-	-	-	2.3	24.6	6.7
2/2	Blackfriars Bridge Road - internal SL (w/b +n/b) Ahead	U	-		-	-	-	643	1940	1940	26.7%	-	-	-	0.2	1.3	0.2
2/3+2/4	Blackfriars Bridge Road - internal SL (w/b +n/b) U-Turn Right	U	C2:B		1	30	-	334	1853:1550	640	45.8%	-	-	-	2.6	32.4	5.2
3/1	Ahead	U	-		-	-	-	540	2015	2015	26.8%	-	-	-	0.2	1.2	0.2
3/2	Ahead	U	-		-	-	-	362	2015	2015	18.0%	-	-	-	0.1	1.1	0.1
4/1	Victoria Embankment - e/b off-slip Ahead	U	C2:D		1	31	-	314	1848	657	47.8%	-	-	-	2.8	31.9	6.4
4/2	Victoria Embankment - e/b off-slip Ahead	U	C2:D		1	31	-	133	1848	657	20.2%	-	-	-	1.0	27.8	2.5
J3: 00/122	**-**	**-**	**-**		**-**	**-**	**-**	**-**	**-**	**-**	**125.9%**	**0**	**0**	**0**	**168.3**	**-**	**-**
1/1	Queen Victoria Street - internal SL (w/b) Left	U	C3:C		1	21	-	423	1866	456	92.7%	-	-	-	7.4	63.3	14.9

1/2	Queen Victoria Street - internal SL (w/b) Left Right	U	C3:B		1	21	-	263	1866	456	57.7%	-	-	-	2.5	34.0	7.0
2/1	Blackfriars Bridge Road - internal SL (n/b) Ahead	U	C3:E		1	46	-	812	1853	968	83.9%	-	-	-	4.6	20.5	17.2
2/2	Blackfriars Bridge Road - internal SL (n/b) Ahead	U	C3:E		1	46	-	300	1852	967	31.0%	-	-	-	0.4	4.9	1.4
2/3	Blackfriars Bridge Road - internal SL (n/b) Right	U	C3:D		1	11	-	240	1882	251	95.6%	-	-	-	7.3	108.8	11.4
3/1	Ahead	U	-		-	-	-	812	1918	1918	42.3%	-	-	-	0.4	1.6	0.4
3/2	Ahead	U	-		-	-	-	529	1918	1918	27.6%	-	-	-	0.2	1.3	0.2
4/1		U	-		-	-	-	812	1800	1800	45.1%	-	-	-	0.4	1.8	0.4
4/2		U	-		-	-	-	529	1800	1800	29.4%	-	-	-	0.2	1.4	0.2
5/1	New Bridge Street (s/b) Ahead	U	C3:A		1	30	-	733	1965	677	108.3%	-	-	-	41.6	204.3	53.3
5/2	New Bridge Street (s/b) Ahead	U	C3:A		1	30	-	852	1965	677	125.9%	-	-	-	103.3	436.5	115.6
J4: 00/007	**-**	**-**	**-**		**-**	**-**	**-**	**-**	**-**	**-**	**58.1%**	**14**	**3**	**0**	**8.9**	**-**	**-**
1/1	Queen Victoria Street - Internal SL (e/b) Ahead	U	C4:B	C4:C	1	26	6	228	1965	590	38.7%	-	-	-	0.7	11.0	2.1
1/2	Queen Victoria Street - Internal SL (e/b) Ahead Right	O	C4:B	C4:C	1	26	6	17	1805	354	4.8%	14	3	0	0.1	12.8	0.1

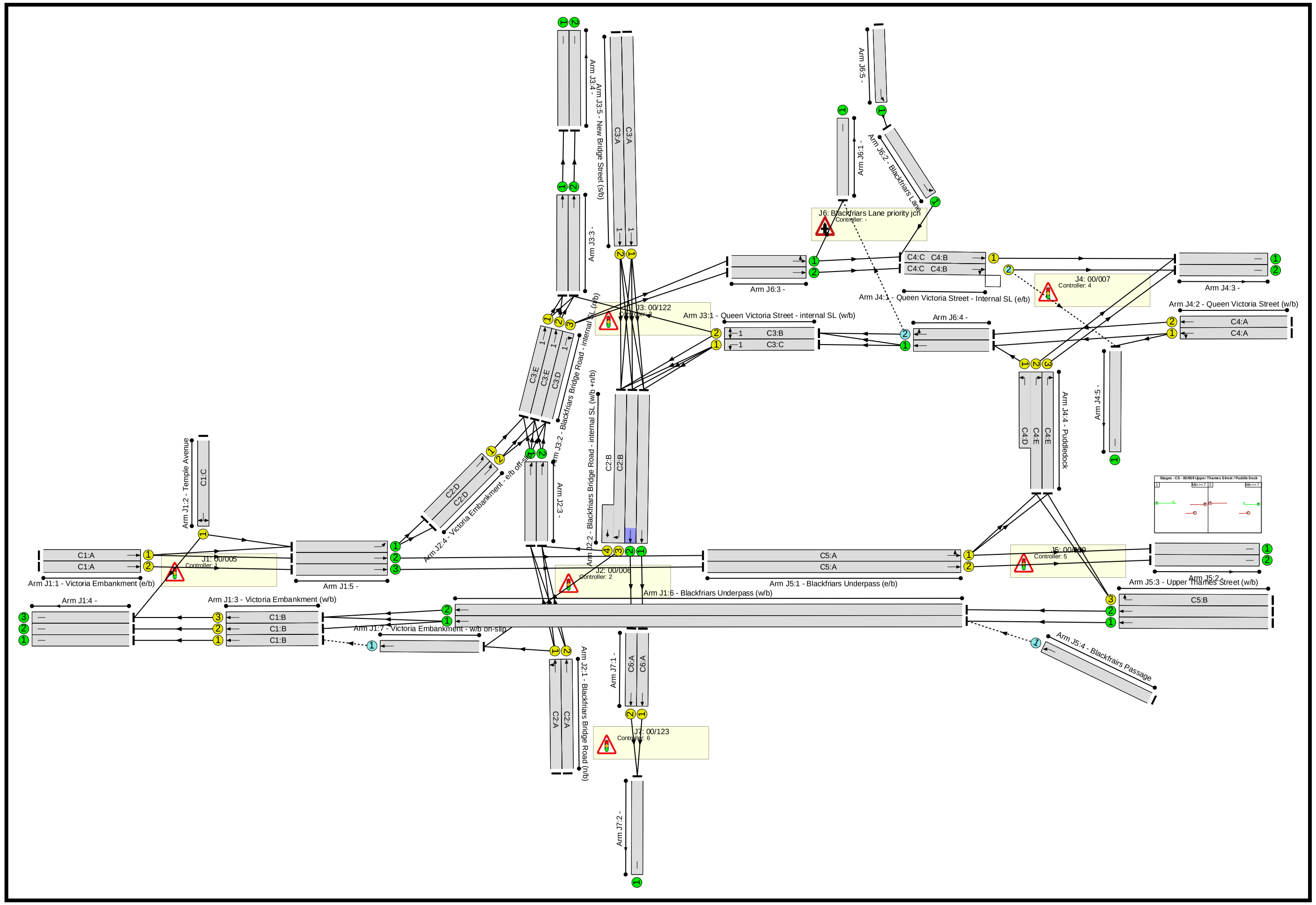
2/1	Queen Victoria Street (w/b) Left Ahead	U	C4:A		1	15	-	166	1950	347	47.9%	-	-	-	2.0	43.2	4.1
2/2	Queen Victoria Street (w/b) Ahead	U	C4:A		1	15	-	203	1965	349	58.1%	-	-	-	2.6	46.1	5.3
3/2		U	-		-	-	-	172	1900	1900	9.1%	-	-	-	0.0	1.0	0.0
4/2+4/1	Puddledock Right Left	U	C4:E C4:D		1	26:28	-	446	1800:1748	779	57.3%	-	-	-	2.0	16.0	13.3
4/3	Puddledock Right	U	C4:E		1	26	-	172	1789	537	32.0%	-	-	-	1.5	32.1	3.8
5/1		U	-		-	-	-	29	1800	1800	1.6%	-	-	-	0.0	1.0	0.0
J5: 00/059	**-**	**-**	**-**		**-**	**-**	**-**	**-**	**-**	**-**	**89.5%**	**271**	**0**	**0**	**10.5**	**-**	**-**
1/1	Blackfriars Underpass (e/b) Left Ahead	U	C5:A		1	65	-	706	1800	1320	53.5%	-	-	-	1.4	7.2	5.1
1/2	Blackfriars Underpass (e/b) Ahead	U	C5:A		1	65	-	787	1900	1393	56.5%	-	-	-	1.4	6.5	4.8
2/1		U	-		-	-	-	375	1800	1800	20.8%	-	-	-	0.1	1.3	0.1
2/2		U	-		-	-	-	787	1800	1800	43.7%	-	-	-	0.4	1.8	0.4
3/1	Upper Thames Street (w/b) Ahead	U	-		-	-	-	533	1900	1900	28.1%	-	-	-	0.2	1.3	0.2
3/2	Upper Thames Street (w/b) Ahead	U	-		-	-	-	711	1900	1900	37.4%	-	-	-	0.3	1.5	0.3
3/3	Upper Thames Street (w/b) Right	U	C5:B		1	15	-	276	1734	308	89.5%	-	-	-	6.3	82.0	10.3

4/1	Blackfriars Passage Ahead	O	-		-	-	-	271	1940	598	45.3%	271	0	0	0.4	5.5	0.4
J6: Blackfriars Lane priority jcn	**-**	**-**	**-**		**-**	**-**	**-**	**-**	**-**	**-**	**24.4%**	**0**	**0**	**0**	**0.3**	**-**	**-**
1/1		U	-		-	-	-	10	1800	1800	0.6%	-	-	-	0.0	1.0	0.0
2/1	Blackfriars Lane Left	U	-		-	-	-	10	1800	1800	0.6%	-	-	-	0.0	1.0	0.0
3/1	Ahead Left	U	-		-	-	-	228	1800	1800	12.7%	-	-	-	0.1	1.1	0.1
3/2	Ahead	U	-		-	-	-	17	1800	1800	0.9%	-	-	-	0.0	1.0	0.0
4/1	Ahead	U	-		-	-	-	440	1800	1800	24.4%	-	-	-	0.2	1.3	0.2
4/2	Ahead Right	O	-		-	-	-	203	1800	1800	11.3%	0	0	0	0.1	1.1	0.1
5/1	Ahead	U	-		-	-	-	10	1800	1800	0.6%	-	-	-	0.0	1.0	0.0
J7: 00/123	**-**	**-**	**-**		**-**	**-**	**-**	**-**	**-**	**-**	**75.9%**	**0**	**0**	**0**	**4.7**	**-**	**-**
1/1	Ahead	U	C6:A		1	71	-	1065	1940	1552	64.4%	-	-	-	0.9	3.3	11.7
1/2	Ahead	U	C6:A		1	71	-	643	2130	1704	30.4%	-	-	-	0.2	1.5	0.2
2/1		U	-		-	-	-	1708	2000	2000	75.9%	-	-	-	3.6	8.5	30.1

C1 - 00/005 Victoria Embankment / Temple Avenue	PRC for Signalled Lanes (%):	-1.8	Total Delay for Signalled Lanes (pcuHr):	19.67	Cycle Time (s):	90
C2 - 00/006 Victoria Embankment / Blackfriars Bridge	PRC for Signalled Lanes (%):	12.6	Total Delay for Signalled Lanes (pcuHr):	14.87	Cycle Time (s):	90
C3 - 00/122 Victoria Embankment / New Bridge RoadStream: 1	PRC for Signalled Lanes (%):	-39.9	Total Delay for Signalled Lanes (pcuHr):	167.10	Cycle Time (s):	90
C4 - J00/007 Queen Victoria Street / Puddle Dock	PRC for Signalled Lanes (%):	54.9	Total Delay for Signalled Lanes (pcuHr):	8.86	Cycle Time (s):	90
C5 - 00/059 Upper Thames Street / Puddle Dock	PRC for Signalled Lanes (%):	0.5	Total Delay for Signalled Lanes (pcuHr):	9.12	Cycle Time (s):	90
C6 - 00/123 Blackfriars Bridge ped crossing	PRC for Signalled Lanes (%):	39.9	Total Delay for Signalled Lanes (pcuHr):	1.13	Cycle Time (s):	90
	PRC Over All Lanes (%):	-39.9	Total Delay Over All Lanes(pcuHr):	230.83		

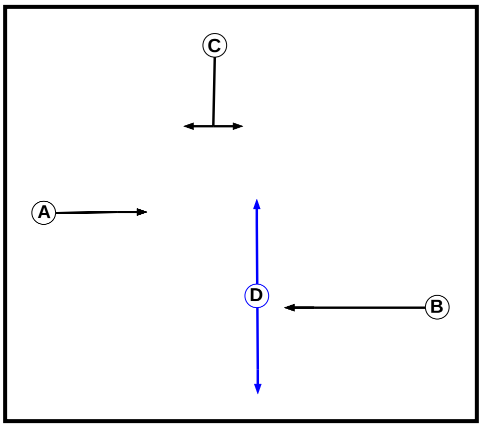
D.11 Construction development case results (phase 3), sensitivity test, AM peak hour

Network Layout Diagram

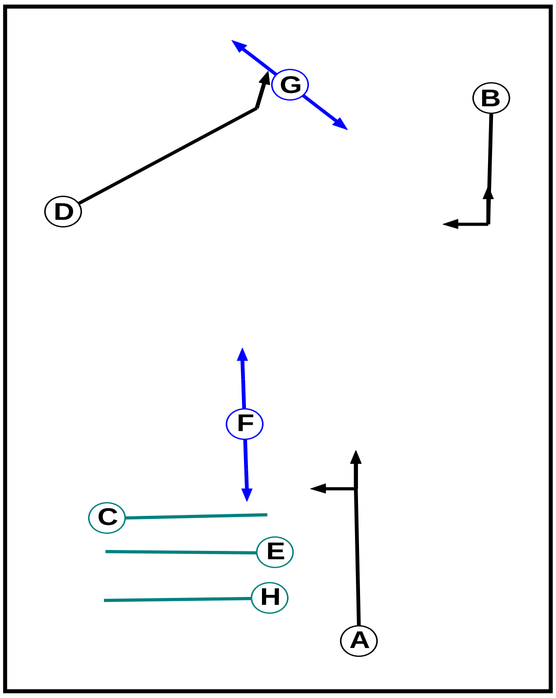


Phase Diagram

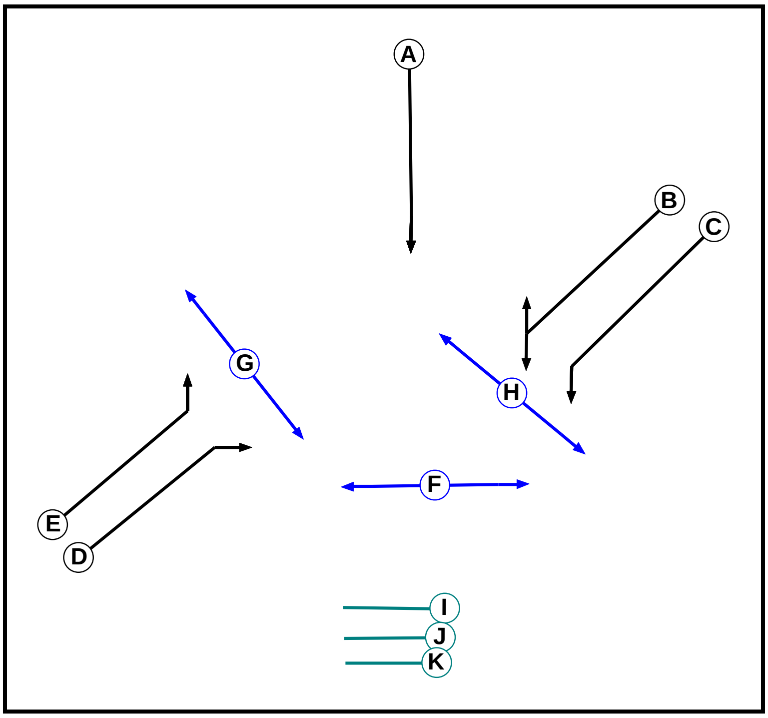
C1 - 00/005 Victoria Embankment / Temple Avenue



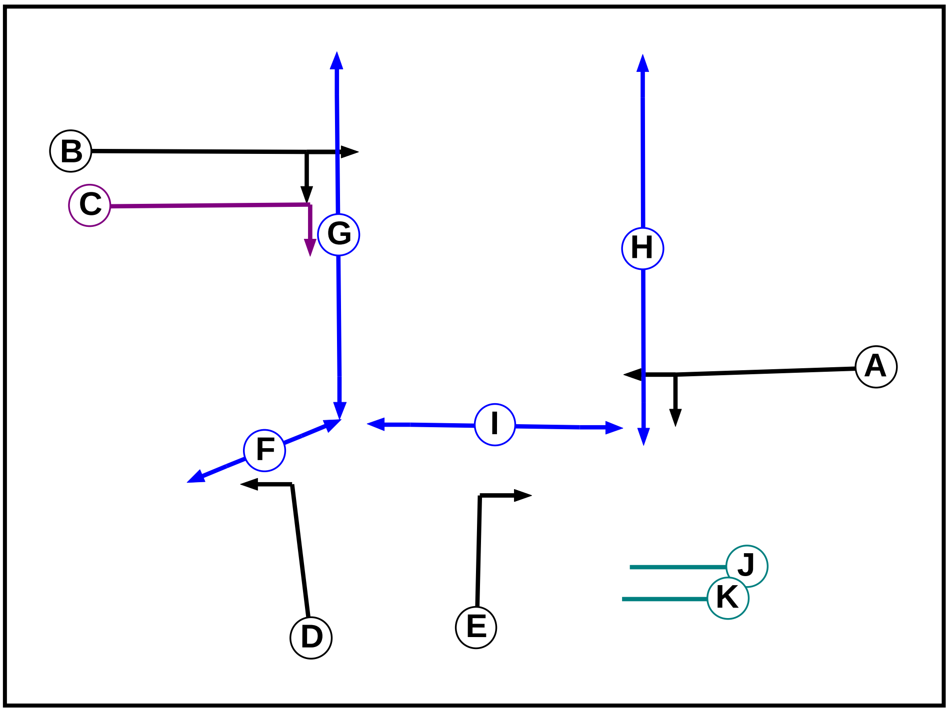
C2 - 00/006 Victoria Embankment / Blackfriars Bridge



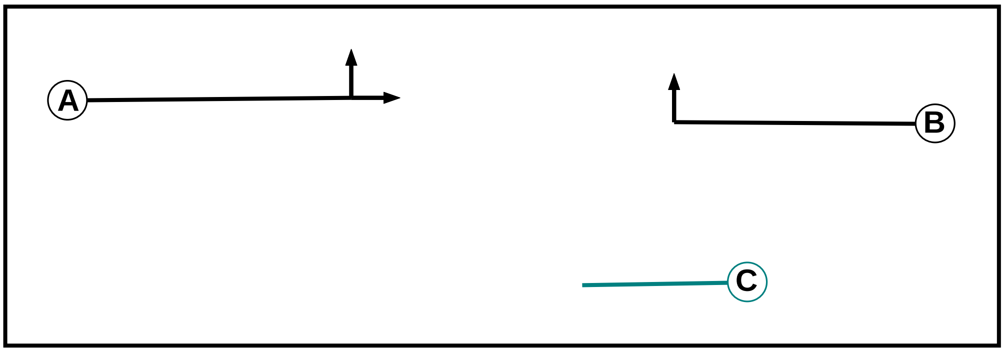
C3 - 00/122 Victoria Embankment / New Bridge Road



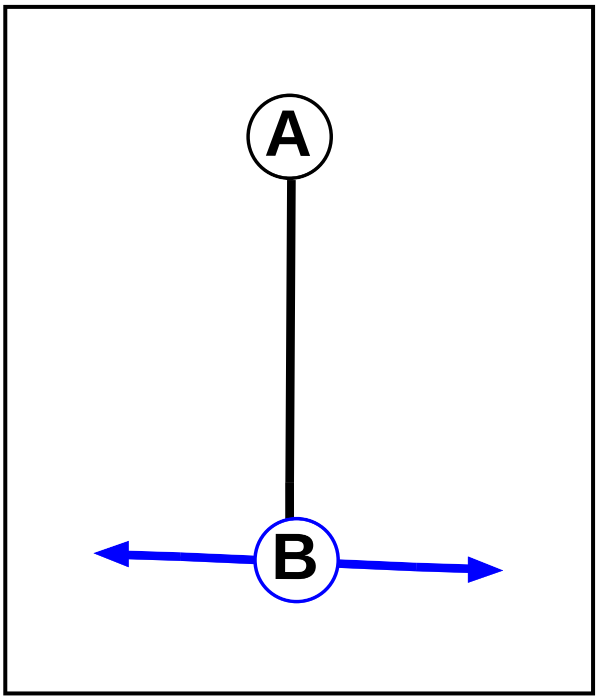
C4 - J00/007 Queen Victoria Street / Puddle Dock



C5 - 00/059 Upper Thames Street / Puddle Dock

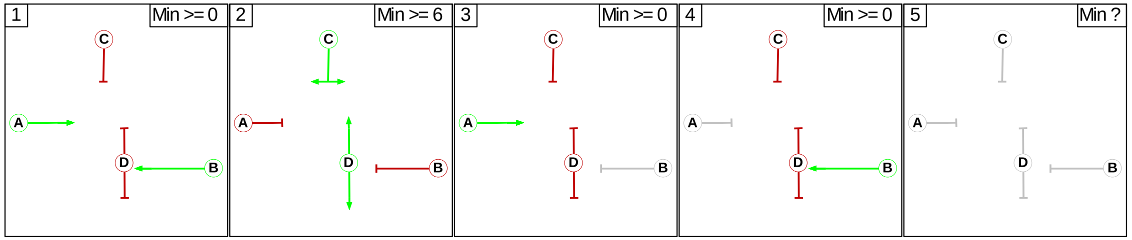


C6 - 00/123 Blackfriars Bridge ped crossing

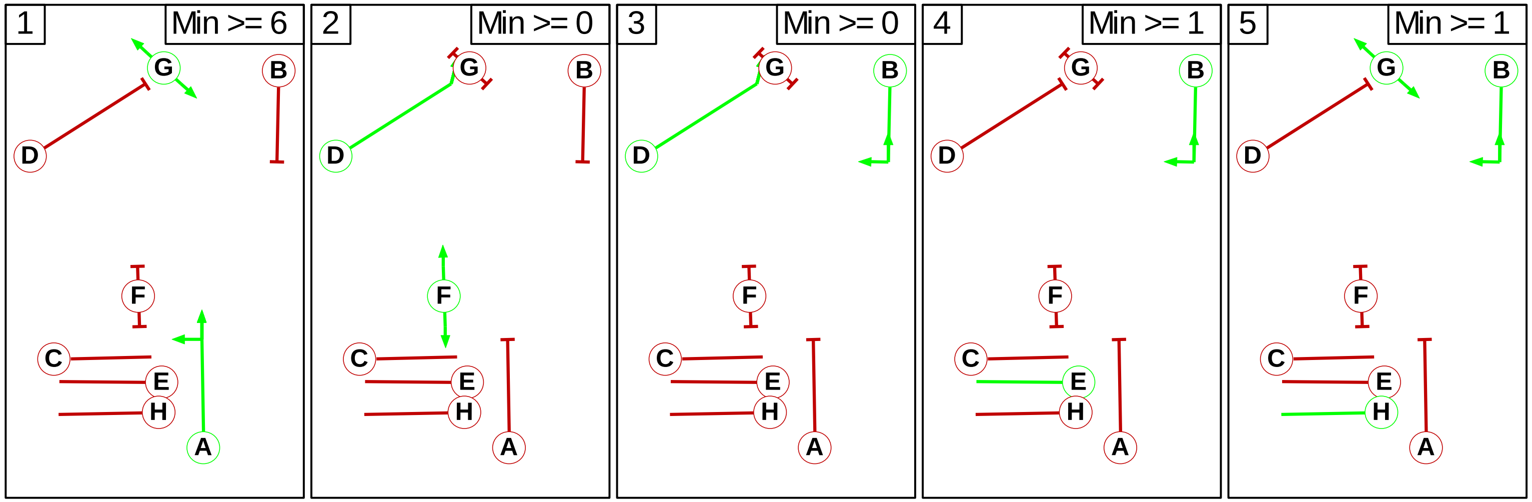


Stage Diagram

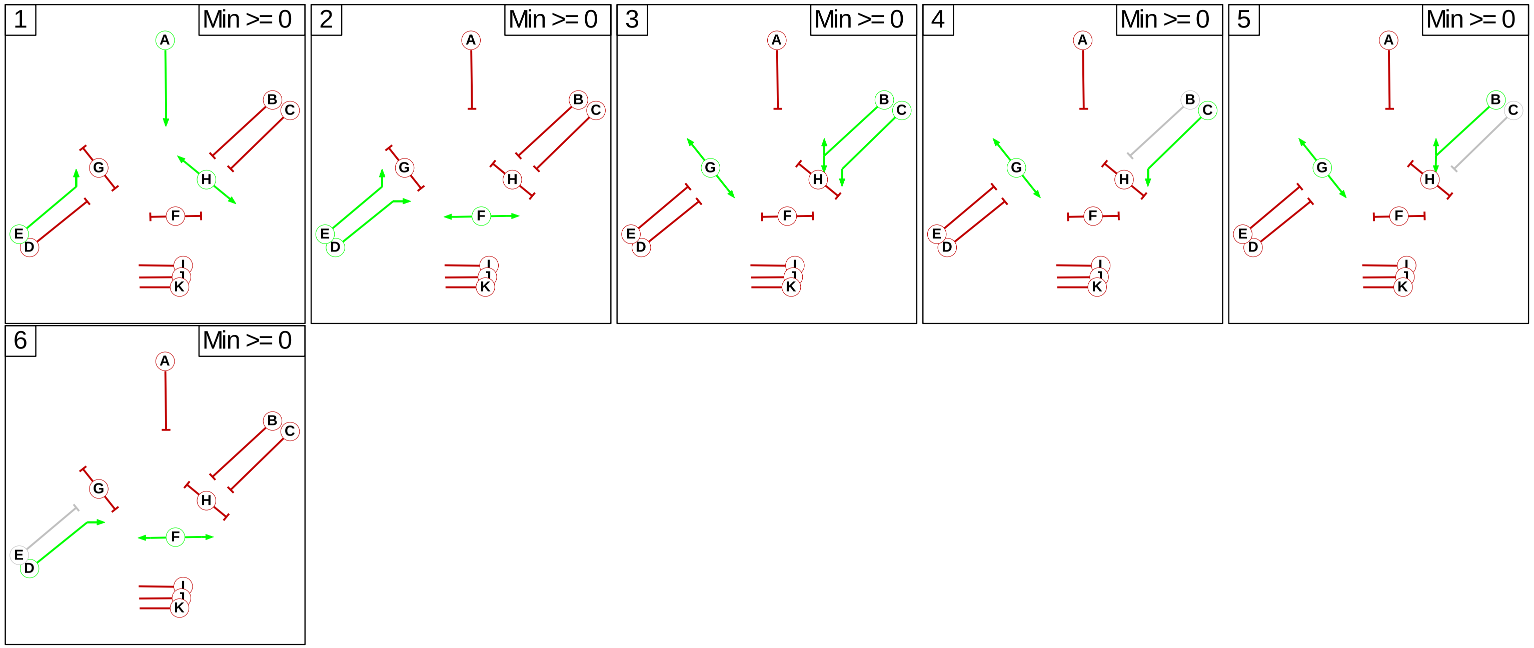
C1 - 01/094 Victoria Embankment / Temple Avenue



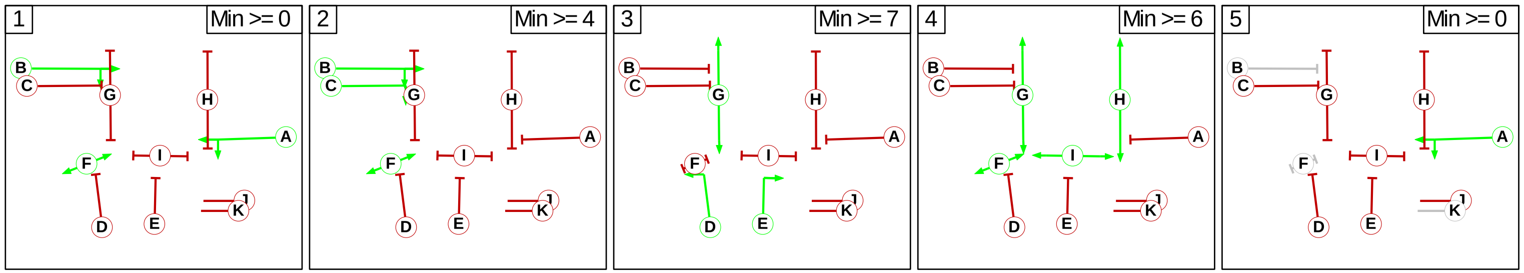
C2 - 00/006 Victoria Embankment / Blackfriars Bridge



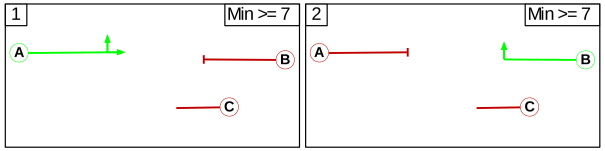
C3 - 00/122 Victoria Embankment / New Bridge Road
Stage Stream: 1



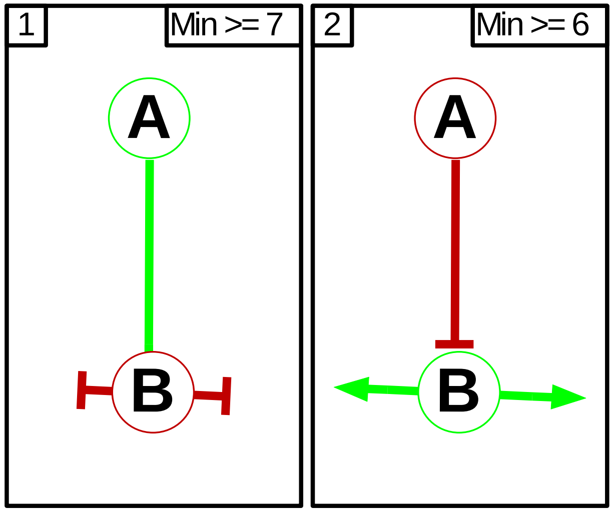
C4 - J00/007 Queen Victoria Street / Puddle Dock



C5 - 00/059 Upper Thames Street / Puddle Dock



C6 - 00/123 Blackfriars Bridge ped crossing



Phases in Stage

C1 - 01/094 Victoria Embankment / Temple Avenue

Stage No.	Phases in Stage
1	A B
2	C D
3	A
4	B
5	

C2 - 00/006 Victoria Embankment / Blackfriars Bridge

Stage No.	Phases in Stage
1	A G
2	D F
3	B D
4	B E
5	B G H

C3 - 00/122 Victoria Embankment / New Bridge Road

Stream	Stage No.	Phases in Stage
1	1	A E H
1	2	D E F
1	3	B C G
1	4	C G
1	5	B G
1	6	D F

C4 - J00/007 Queen Victoria Street / Puddle Dock

Stage No.	Phases in Stage
1	A B F
2	B C F
3	D E G
4	F G H I
5	A

C5 - 00/059 Upper Thames Street / Puddle Dock

Stage No.	Phases in Stage
1	A
2	B

C6 - 00/123 Blackfriars Bridge ped crossing

Stage No.	Phases in Stage
1	A
2	B

Phase Intergreens Matrix

C1 - 01/094 Victoria Embankment / Temple Avenue

		Starting Phase			
		A	B	C	D
Terminating Phase	A		-	5	7
	B	-		5	5
	C	5	5		-
	D	19	19	-	

C2 - 00/006 Victoria Embankment / Blackfriars Bridge

		Starting Phase							
		A	B	C	D	E	F	G	H
Terminating Phase	A		5	3	12	5	7	-	5
	B	5		3	-	-	8	-	-
	C	2	2		2	2	2	2	2
	D	5	-	3		3	-	6	6
	E	5	-	3	2		8	2	2
	F	9	9	4	-	9		-	9
	G	-	-	3	8	3	-		-
	H	5	-	3	8	3	8	-	

C3 - 00/122 Victoria Embankment / New Bridge Road

		Starting Phase										
Terminating Phase		A	B	C	D	E	F	G	H	I	J	K
	A		9	9	9	-	8	-	-	9	9	3
	B	5		-	5	5	7	-	6	5	5	3
	C	5	-		-	-	7	-	10	5	5	3
	D	5	5	-		-	-	6	8	3	3	3
	E	-	5	-	-		-	10	-	-	-	3
	F	8	8	8	-	-		-	-	-	-	3
	G	-	-	-	15	15	-		-	-	-	4
	H	-	15	15	15	-	-	-		5	4	4
	I	9	5	2	2	-	-	-	9		9	4
	J	5	5	2	2	-	-	-	2	5		3
	K	2	2	2	2	2	2	2	2	2	2	

C4 - J00/007 Queen Victoria Street / Puddle Dock

		Starting Phase										
		A	B	C	D	E	F	G	H	I	J	K
Terminating Phase	A		-	5	8	6	-	8	5	6	3	-
	B	-		-	-	5	-	5	8	8	3	3
	C	5	-		-	5	-	5	8	8	3	5
	D	5	-	-		-	5	-	-	-	3	5
	E	5	5	5	-		-	-	9	5	3	5
	F	-	-	-	9	-		-	-	-	4	4
	G	14	14	14	-	-	-		-	-	7	14
	H	15	15	15	-	15	-	-		-	8	15
	I	16	16	16	-	16	-	-	-		8	16
	J	2	2	2	2	2	2	2	2	2		2
	K	-	2	5	8	6	2	8	5	6	3	

C5 - 00/059 Upper Thames Street / Puddle Dock

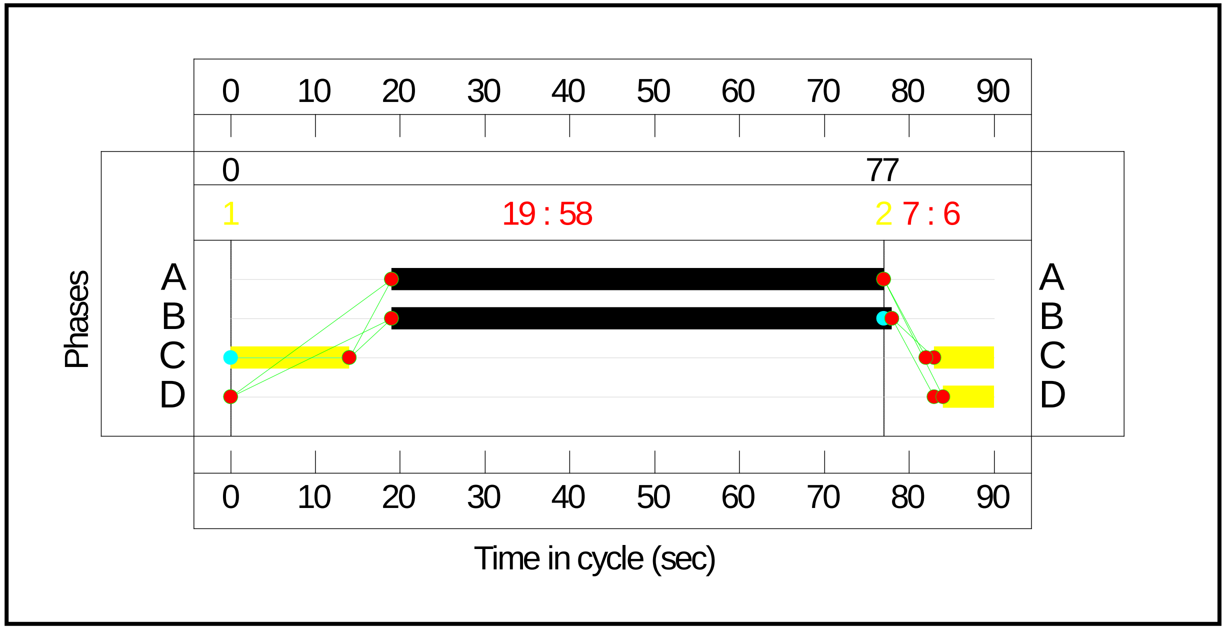
	Starting Phase			
Terminating Phase		A	B	C
	A		5	3
	B	5		3
	C	2	2	

C6 - 00/123 Blackfriars Bridge ped crossing

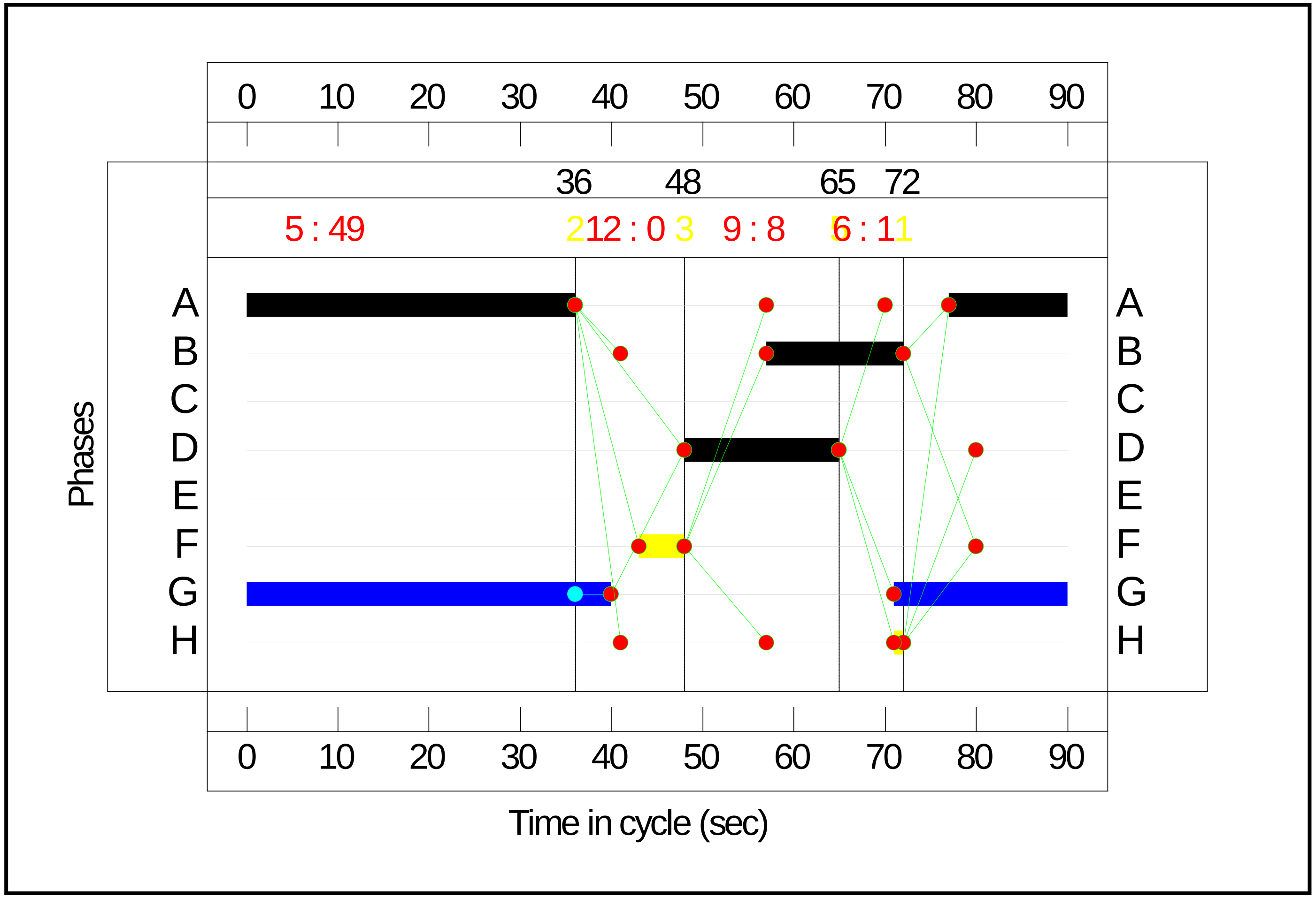
	Starting Phase		
Terminating Phase		A	B
	A		5
	B	8	

Traffic Signal Diagram

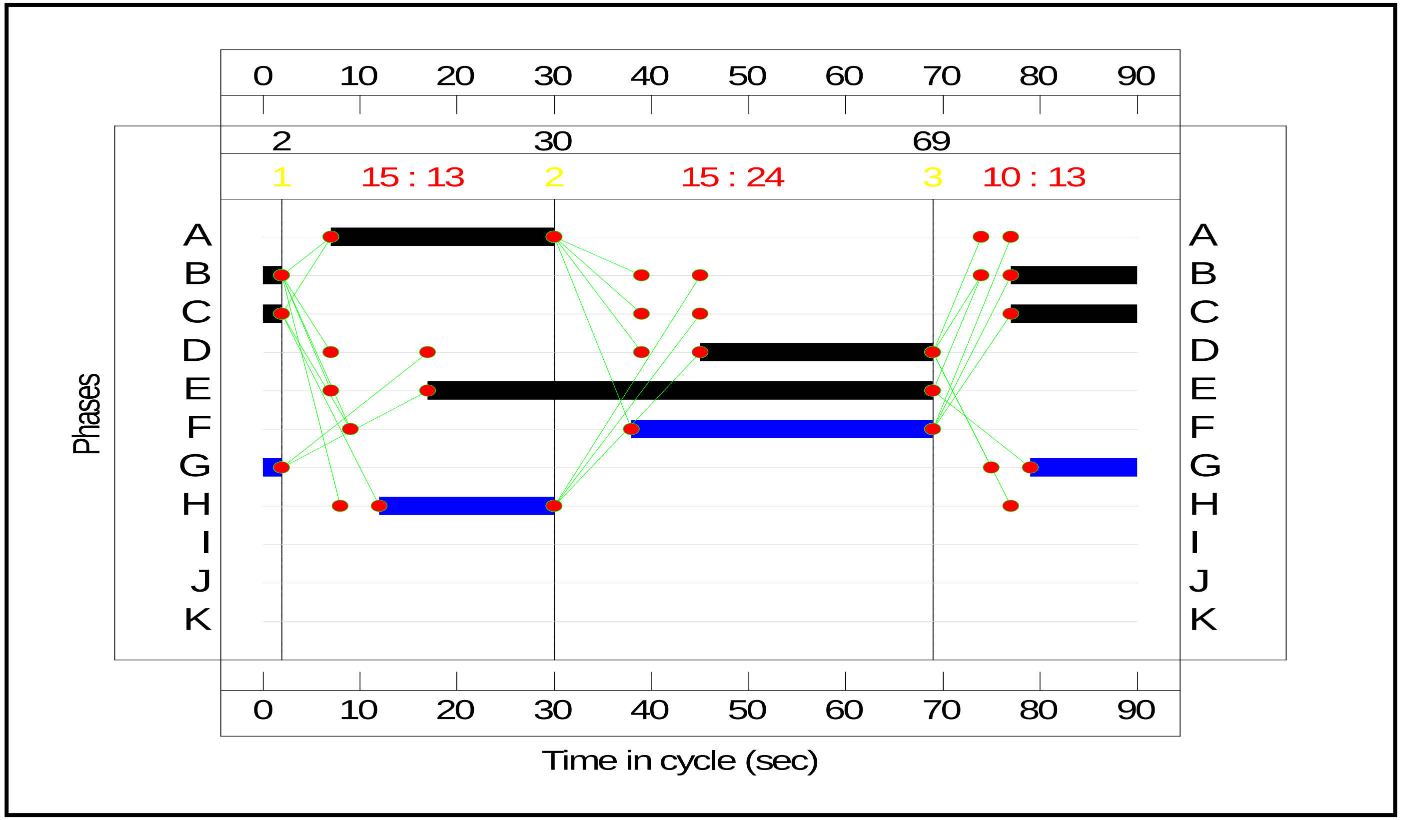
C1 - 00/005 Victoria Embankment / Temple Avenue



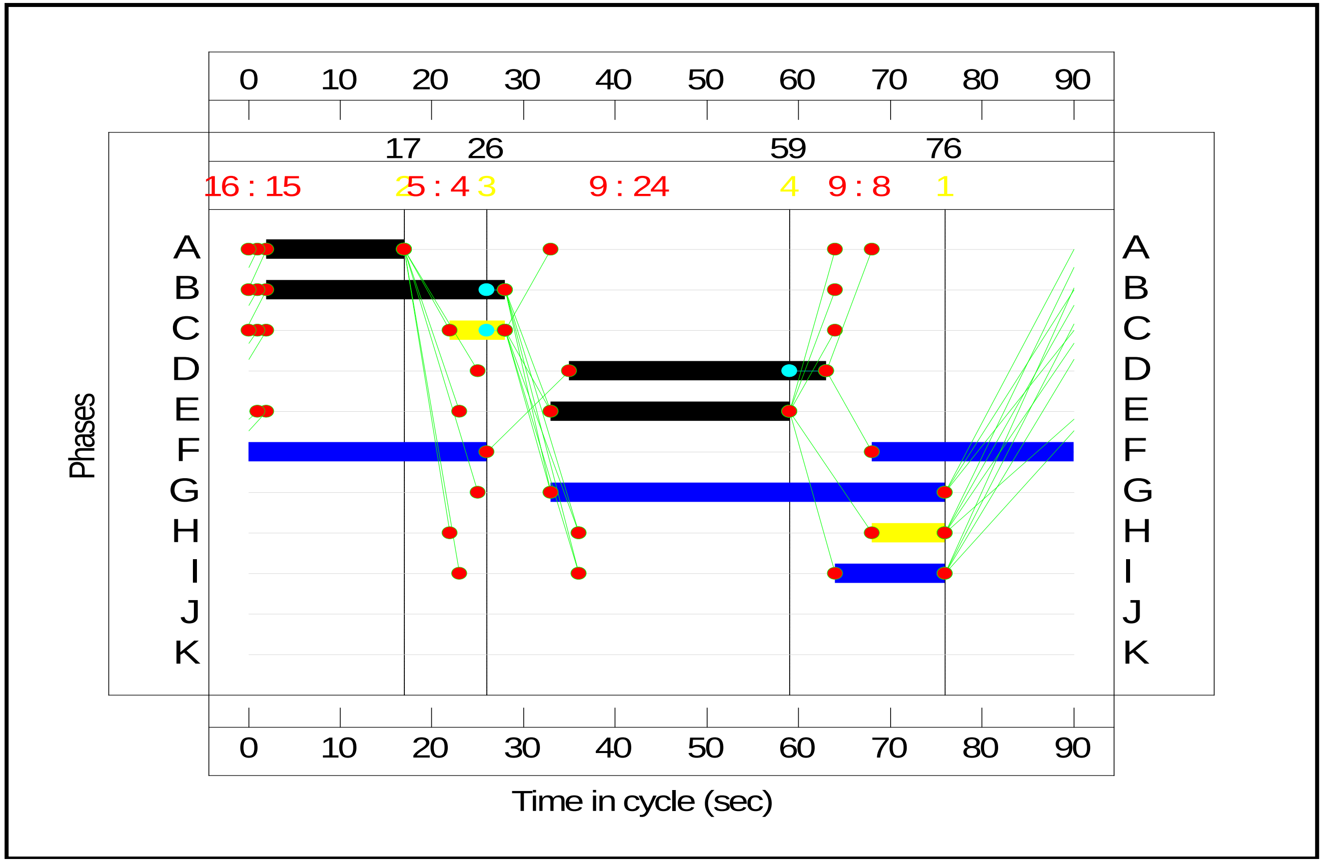
C2 - 00/006 Victoria Embankment / Blackfriars Bridge



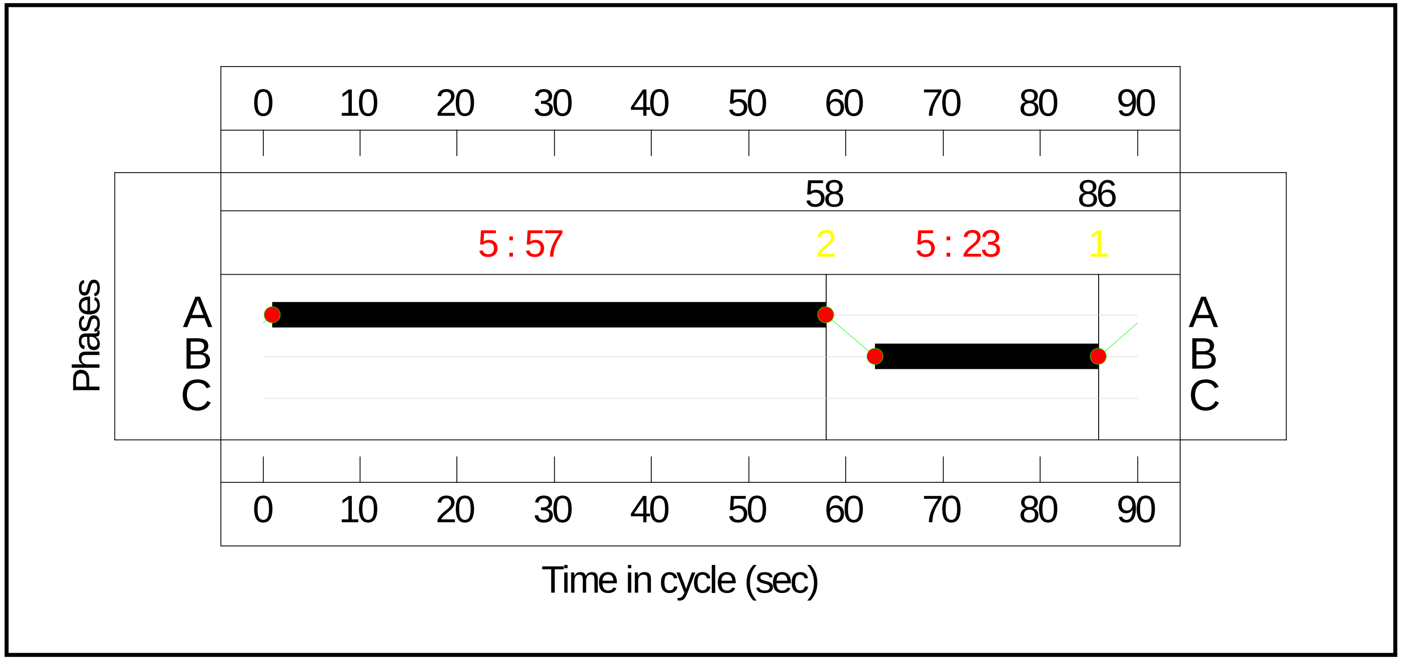
C3 - 00/122 Victoria Embankment / New Bridge Road



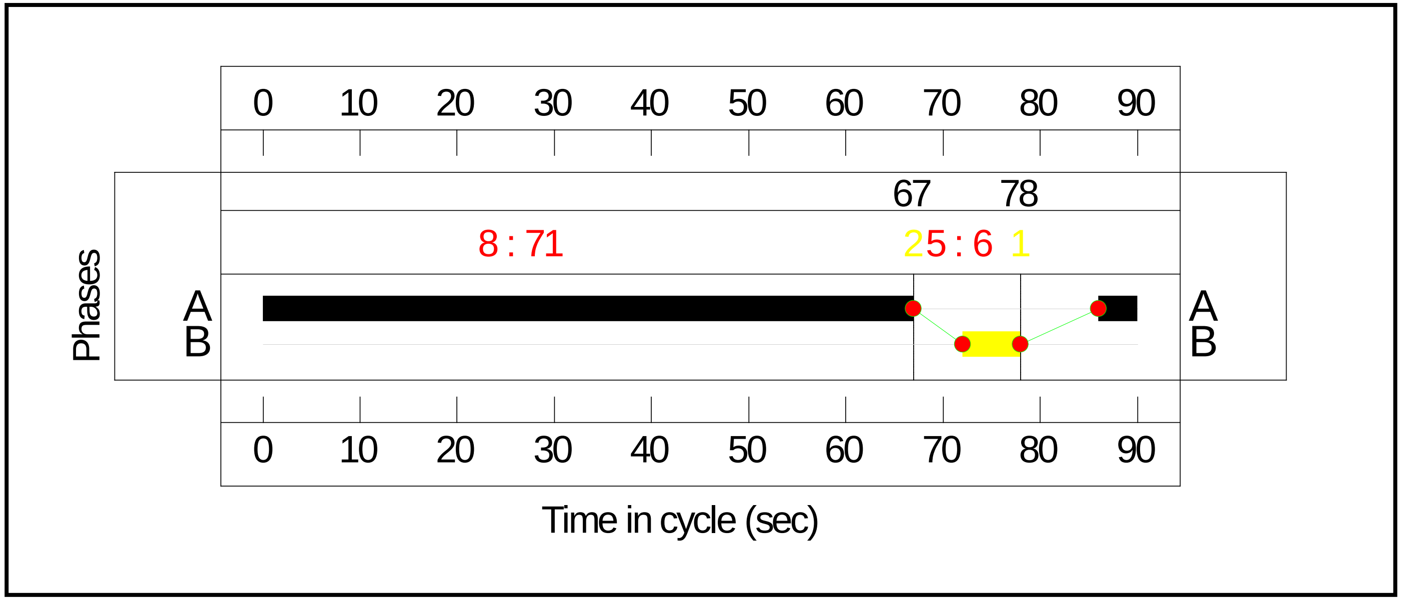
C4 - J00/007 Queen Victoria Street / Puddle Dock



C5 - 00/059 Upper Thames Street / Puddle Dock



C6 - 00/123 Blackfriars Bridge ped crossing



Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: Blackfriars Bridge Junction	-	-	-		-	-	-	-	-	-	**97.1%**	**287**	**8**	**1**	**106.4**	-	-
J1: 00/005	-	-	-		-	-	-	-	-	-	**97.1%**	**0**	**0**	**0**	**28.1**	-	-
1/1	Victoria Embankment (e/b) Ahead	U	C1:A		1	58	-	1129	1773	1162	97.1%	-	-	-	15.0	47.9	37.1
1/2	Victoria Embankment (e/b) Ahead	U	C1:A		1	58	-	873	1773	1162	75.1%	-	-	-	4.0	16.7	16.3
2/1	Temple Avenue Right Left	U	C1:C		1	21	-	78	1729	423	18.5%	-	-	-	0.7	32.1	1.7
3/1	Victoria Embankment (w/b) Ahead	U	C1:B		1	59	-	0	1773	1182	0.0%	-	-	-	0.0	0.0	0.0
3/2	Victoria Embankment (w/b) Ahead	U	C1:B		1	59	-	697	1773	1182	59.0%	-	-	-	2.3	11.9	10.2
3/3	Victoria Embankment (w/b) Ahead	U	C1:B		1	59	-	912	1773	1182	77.2%	-	-	-	4.3	16.9	17.1
5/1	Left	U	-		-	-	-	434	1800	1800	24.1%	-	-	-	0.2	1.3	0.2
5/2	Ahead	U	-		-	-	-	731	1800	1800	40.6%	-	-	-	0.3	1.7	0.3
5/3	Ahead	U	-		-	-	-	873	1800	1800	48.5%	-	-	-	0.5	1.9	0.5
6/1	Blackfriars Underpass (w/b) Ahead	U	-		-	-	-	836	1800	1800	46.4%	-	-	-	0.4	1.9	0.4
6/2	Blackfriars Underpass (w/b) Ahead	U	-		-	-	-	735	1800	1800	40.8%	-	-	-	0.3	1.7	0.3

7/1	Victoria Embankment - w/b on-slip Ahead	O	-		-	-	-	0	1800	1800	0.0%	0	0	0	0.0	0.0	0.0
J2: 00/006	**-**	**-**	**-**		**-**	**-**	**-**	**-**	**-**	**-**	**83.3%**	**0**	**0**	**0**	**16.2**	**-**	**-**
1/1	Blackfriars Bridge Road (n/b) Ahead Left	U	C2:A		1	51	-	946	1965	1135	83.3%	-	-	-	6.5	24.7	21.6
1/2	Blackfriars Bridge Road (n/b) Ahead	U	C2:A		1	51	-	487	1965	1135	42.9%	-	-	-	1.8	13.4	7.1
2/2	Blackfriars Bridge Road - internal SL (w/b +n/b) Ahead	U	-		-	-	-	444	1940	1940	22.9%	-	-	-	0.1	1.2	0.1
2/3+2/4	Blackfriars Bridge Road - internal SL (w/b +n/b) U-Turn Right	U	C2:B		1	13	-	67	1853:1550	234	28.6%	-	-	-	1.4	74.4	1.9
3/1	Ahead	U	-		-	-	-	931	2015	2015	46.2%	-	-	-	0.4	1.7	0.4
3/2	Ahead	U	-		-	-	-	569	2015	2015	28.2%	-	-	-	0.2	1.2	0.2
4/1	Victoria Embankment - e/b off-slip Ahead	U	C2:D		1	15	-	257	1848	329	78.2%	-	-	-	3.8	52.8	7.8
4/2	Victoria Embankment - e/b off-slip Ahead	U	C2:D		1	15	-	177	1848	329	53.9%	-	-	-	1.9	38.9	4.5
J3: 00/122	**-**	**-**	**-**		**-**	**-**	**-**	**-**	**-**	**-**	**95.2%**	**0**	**0**	**0**	**38.5**	**-**	**-**
1/1	Queen Victoria Street - internal SL (w/b) Left	U	C3:C		1	14	-	286	1866	311	92.0%	-	-	-	6.2	78.2	11.2

1/2	Queen Victoria Street - internal SL (w/b) Left Right	U	C3:B		1	14	-	200	1866	311	64.3%	-	-	-	2.6	46.2	5.8
2/1	Blackfriars Bridge Road - internal SL (n/b) Ahead	U	C3:E		1	53	-	730	1853	1112	65.7%	-	-	-	2.0	10.0	9.4
2/2	Blackfriars Bridge Road - internal SL (n/b) Ahead	U	C3:E		1	53	-	704	1852	1111	63.4%	-	-	-	2.4	12.3	14.9
2/3	Blackfriars Bridge Road - internal SL (n/b) Right	U	C3:D		1	26	-	471	1882	565	83.4%	-	-	-	5.7	43.3	11.1
3/1	Ahead	U	-		-	-	-	682	1918	1918	35.6%	-	-	-	0.3	1.5	0.3
3/2	Ahead	U	-		-	-	-	904	1918	1918	47.1%	-	-	-	0.4	1.8	0.4
4/1		U	-		-	-	-	682	1800	1800	37.9%	-	-	-	0.3	1.6	0.3
4/2		U	-		-	-	-	904	1800	1800	50.2%	-	-	-	0.5	2.0	0.5
5/1	New Bridge Street (s/b) Ahead	U	C3:A		1	22	-	478	1965	502	95.2%	-	-	-	10.8	81.5	18.1
5/2	New Bridge Street (s/b) Ahead	U	C3:A		1	22	-	442	1965	502	88.0%	-	-	-	7.3	59.1	13.9
J4: 00/007	**-**	**-**	**-**		**-**	**-**	**-**	**-**	**-**	**-**	**52.4%**	**51**	**8**	**1**	**11.6**	**-**	**-**
1/1	Queen Victoria Street - Internal SL (e/b) Ahead	U	C4:B	C4:C	1	27	6	229	1965	611	37.5%	-	-	-	0.7	11.6	3.1
1/2	Queen Victoria Street - Internal SL (e/b) Ahead Right	O	C4:B	C4:C	1	27	6	242	1905	593	40.8%	51	8	1	0.8	11.9	3.3

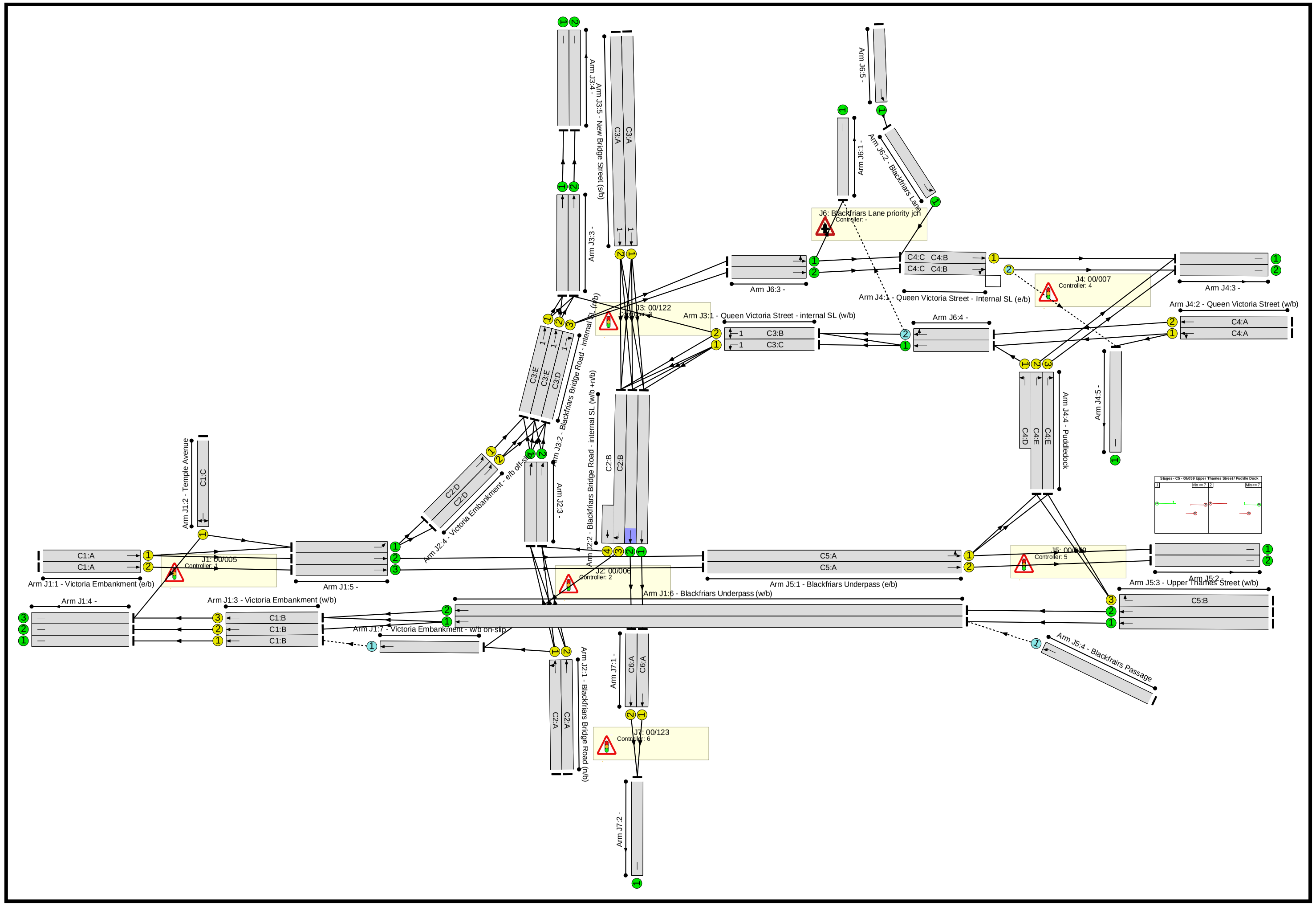
2/1	Queen Victoria Street (w/b) Left Ahead	U	C4:A		1	16	-	140	1948	368	38.0%	-	-	-	1.5	39.8	3.3
2/2	Queen Victoria Street (w/b) Ahead	U	C4:A		1	16	-	161	1965	371	43.4%	-	-	-	1.8	40.8	3.9
3/2		U	-		-	-	-	429	1900	1900	22.6%	-	-	-	0.1	1.2	0.1
4/2+4/1	Puddledock Right Left	U	C4:E C4:D		1	25:27	-	440	1800:1748	840	52.4%	-	-	-	3.9	32.2	5.4
4/3	Puddledock Right	U	C4:E		1	25	-	264	1789	517	51.1%	-	-	-	2.6	35.1	6.2
5/1		U	-		-	-	-	72	1800	1800	4.0%	-	-	-	0.0	1.0	0.0
J5: 00/059	**-**	**-**	**-**		**-**	**-**	**-**	**-**	**-**	**-**	**77.4%**	**236**	**0**	**0**	**9.2**	**-**	**-**
1/1	Blackfriars Underpass (e/b) Left Ahead	U	C5:A		1	59	-	731	1800	1200	60.9%	-	-	-	1.4	7.0	5.1
1/2	Blackfriars Underpass (e/b) Ahead	U	C5:A		1	59	-	873	1900	1267	68.9%	-	-	-	1.8	7.4	8.1
2/1		U	-		-	-	-	382	1800	1800	21.2%	-	-	-	0.1	1.3	0.1
2/2		U	-		-	-	-	873	1800	1800	48.5%	-	-	-	0.5	1.9	0.5
3/1	Upper Thames Street (w/b) Ahead	U	-		-	-	-	600	1900	1900	31.6%	-	-	-	0.2	1.4	0.2
3/2	Upper Thames Street (w/b) Ahead	U	-		-	-	-	735	1900	1900	38.7%	-	-	-	0.3	1.5	0.3
3/3	Upper Thames Street (w/b) Right	U	C5:B		1	21	-	328	1734	424	77.4%	-	-	-	4.5	49.8	9.2

4/1	Blackfriars Passage Ahead	O	-		-	-	-	236	1940	583	40.5%	236	0	0	0.3	5.2	0.3
J6: Blackfriars Lane priority jcn	**-**	**-**	**-**		**-**	**-**	**-**	**-**	**-**	**-**	**17.3%**	**0**	**0**	**0**	**0.3**	**-**	**-**
1/1		U	-		-	-	-	10	1800	1800	0.6%	-	-	-	0.0	1.0	0.0
2/1	Blackfriars Lane Left	U	-		-	-	-	10	1800	1800	0.6%	-	-	-	0.0	1.0	0.0
3/1	Ahead Left	U	-		-	-	-	229	1800	1800	12.7%	-	-	-	0.1	1.1	0.1
3/2	Ahead	U	-		-	-	-	242	1800	1800	13.4%	-	-	-	0.1	1.2	0.1
4/1	Ahead	U	-		-	-	-	311	1800	1800	17.3%	-	-	-	0.1	1.2	0.1
4/2	Ahead Right	O	-		-	-	-	161	1800	1800	8.9%	0	0	0	0.0	1.1	0.0
5/1	Ahead	U	-		-	-	-	10	1800	1800	0.6%	-	-	-	0.0	1.0	0.0
J7: 00/123	**-**	**-**	**-**		**-**	**-**	**-**	**-**	**-**	**-**	**58.3%**	**0**	**0**	**0**	**2.5**	**-**	**-**
1/1	Ahead	U	C6:A		1	71	-	722	1940	1552	46.5%	-	-	-	0.7	3.4	13.2
1/2	Ahead	U	C6:A		1	71	-	444	2130	1704	26.1%	-	-	-	0.2	1.4	0.2
2/1		U	-		-	-	-	1166	2000	2000	58.3%	-	-	-	1.7	5.2	21.9

C1 - 00/005 Victoria Embankment / Temple Avenue	PRC for Signalled Lanes (%):	-7.9	Total Delay for Signalled Lanes (pcuHr):	26.36	Cycle Time (s):	90
C2 - 00/006 Victoria Embankment / Blackfriars Bridge	PRC for Signalled Lanes (%):	8.0	Total Delay for Signalled Lanes (pcuHr):	15.38	Cycle Time (s):	90
C3 - 00/122 Victoria Embankment / New Bridge RoadStream: 1	PRC for Signalled Lanes (%):	-5.8	Total Delay for Signalled Lanes (pcuHr):	36.95	Cycle Time (s):	90
C4 - J00/007 Queen Victoria Street / Puddle Dock	PRC for Signalled Lanes (%):	71.8	Total Delay for Signalled Lanes (pcuHr):	11.43	Cycle Time (s):	90
C5 - 00/059 Upper Thames Street / Puddle Dock	PRC for Signalled Lanes (%):	16.3	Total Delay for Signalled Lanes (pcuHr):	7.76	Cycle Time (s):	90
C6 - 00/123 Blackfriars Bridge ped crossing	PRC for Signalled Lanes (%):	93.5	Total Delay for Signalled Lanes (pcuHr):	0.85	Cycle Time (s):	90
	PRC Over All Lanes (%):	-7.9	Total Delay Over All Lanes(pcuHr):	106.43		

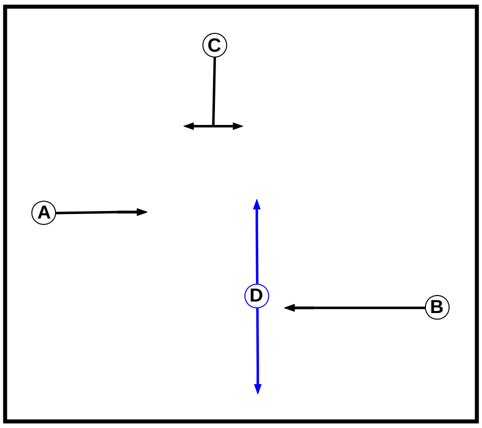
D.12 Construction development case results (phase 3), sensitivity test, PM peak hour

Network Layout Diagram

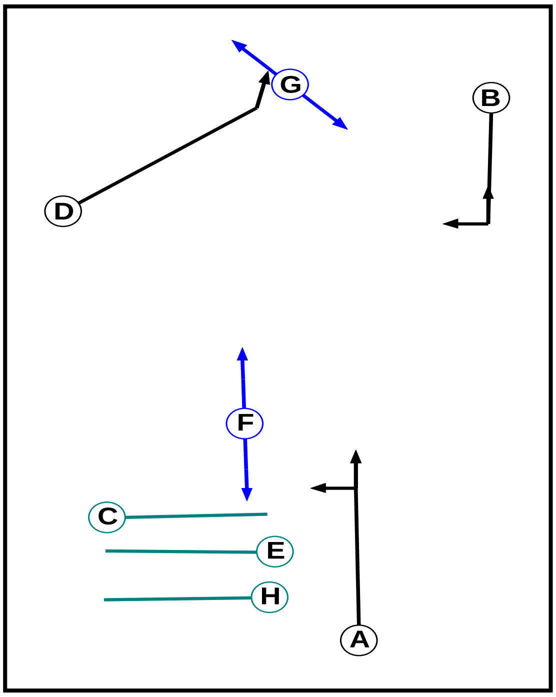


Phase Diagrams

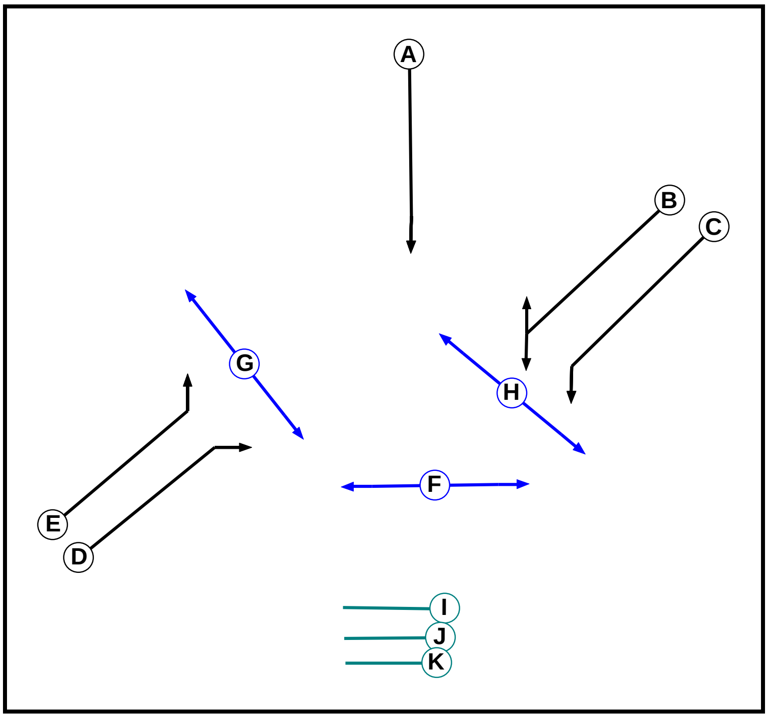
C1 - 00/005 Victoria Embankment / Temple Avenue



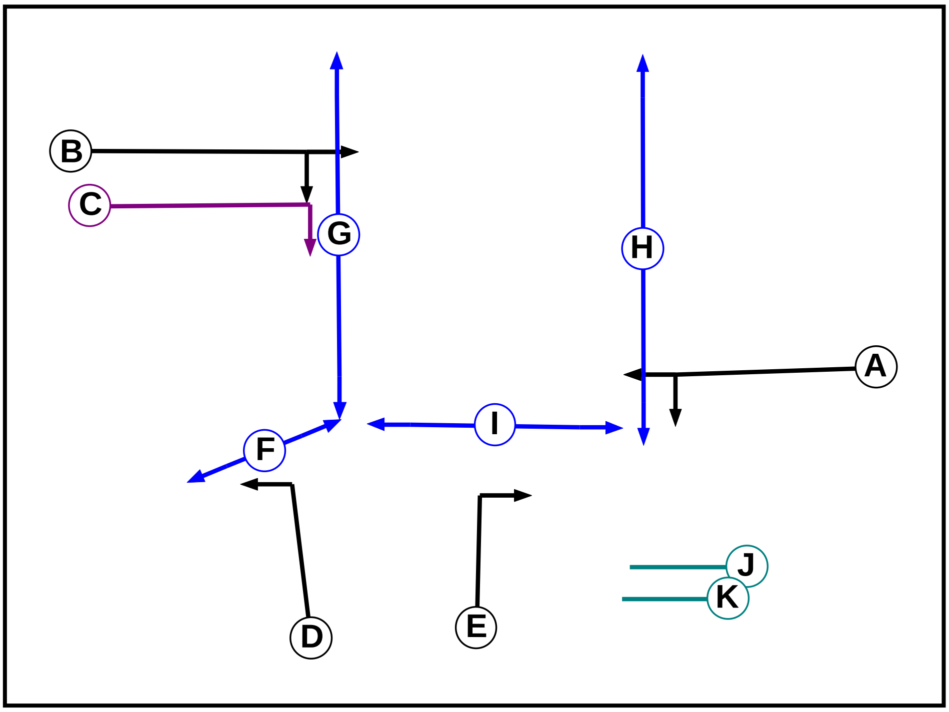
C2 - 00/006 Victoria Embankment / Blackfriars Bridge



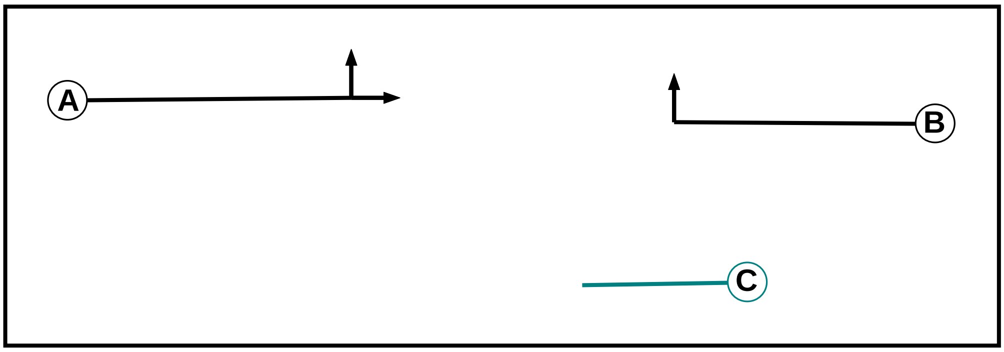
C3 - 00/122 Victoria Embankment / New Bridge Road



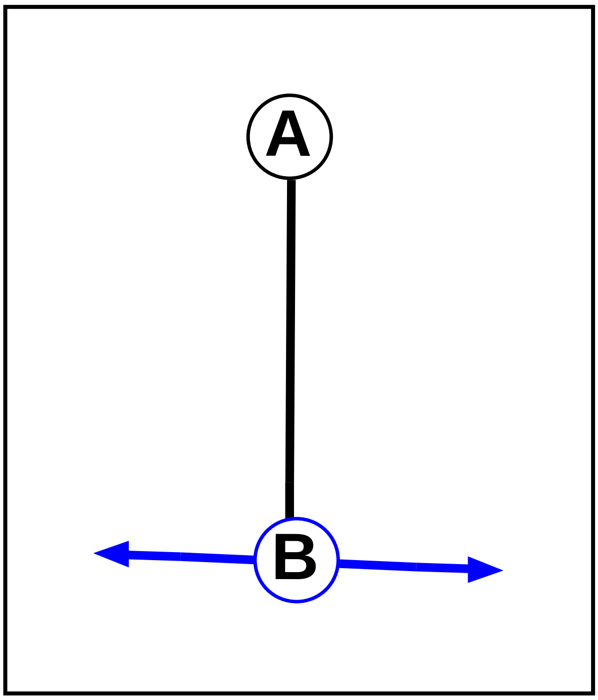
C4 - J00/007 Queen Victoria Street / Puddle Dock



C5 - 00/059 Upper Thames Street / Puddle Dock

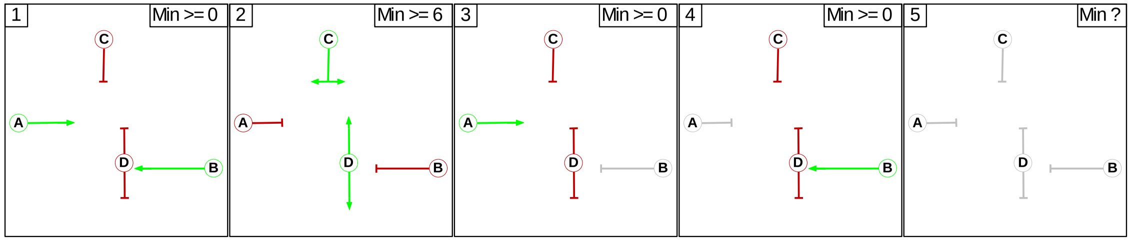


C6 - 00/123 Blackfriars Bridge ped crossing

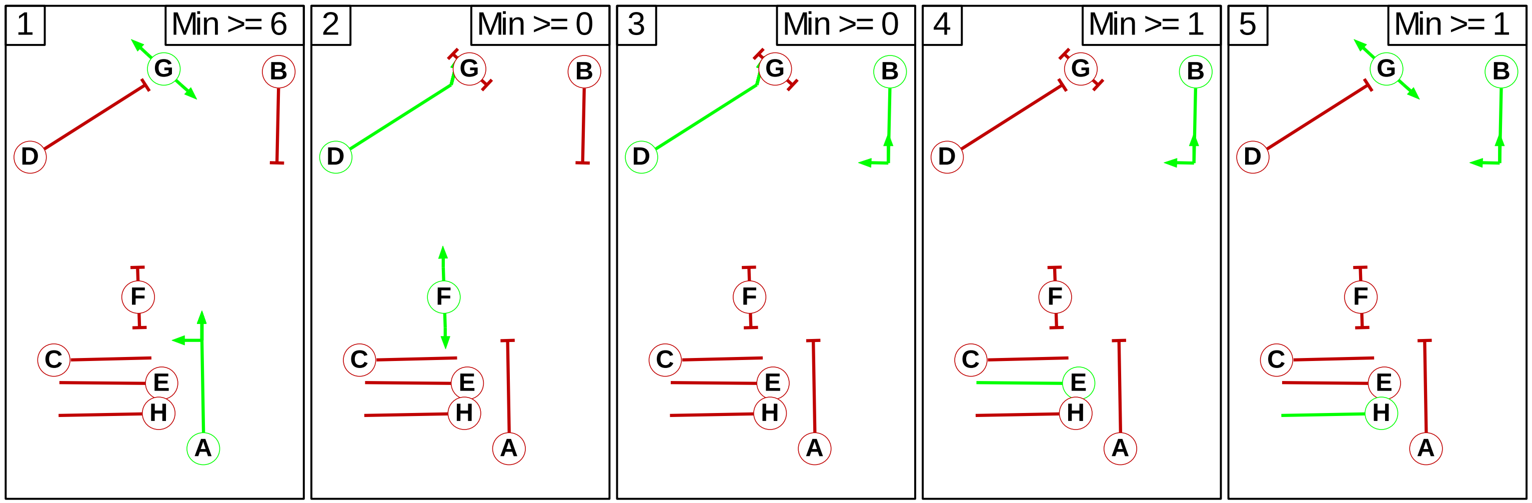


Stage Diagram

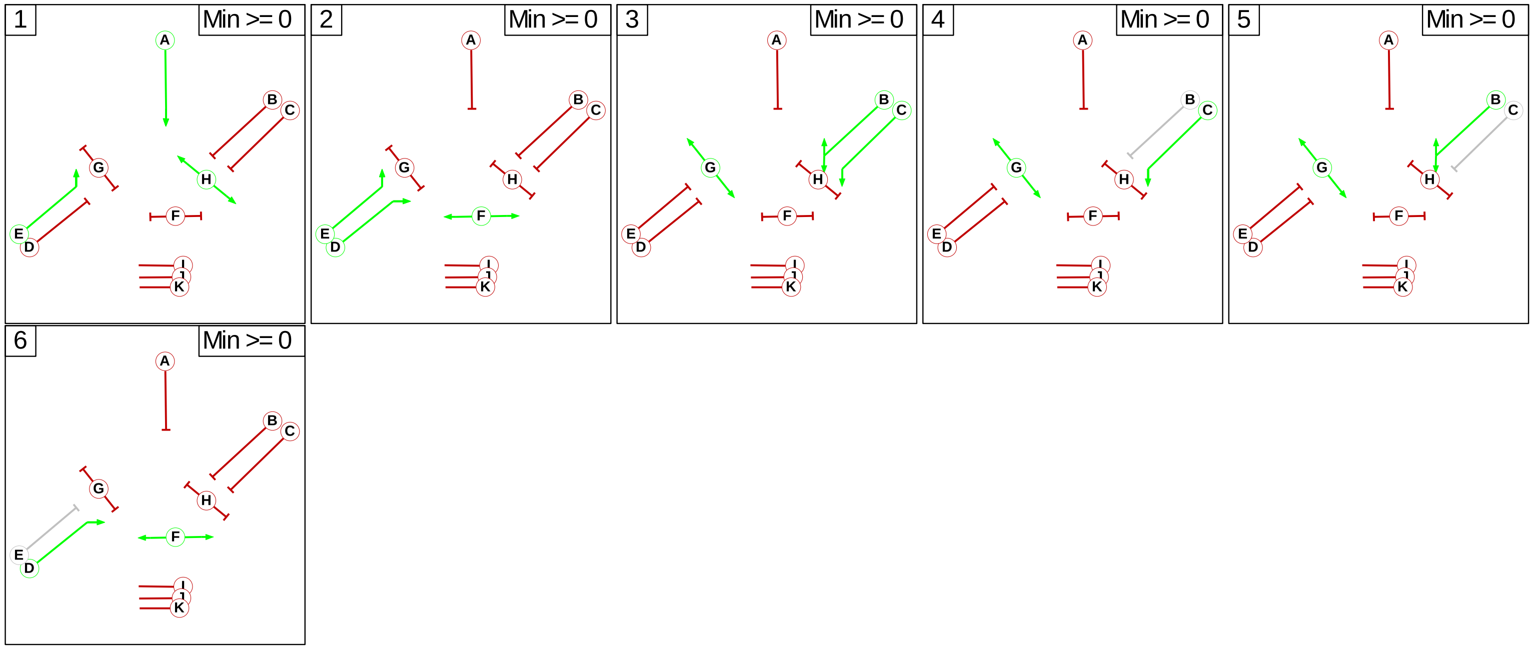
C1 - 01/094 Victoria Embankment / Temple Avenue



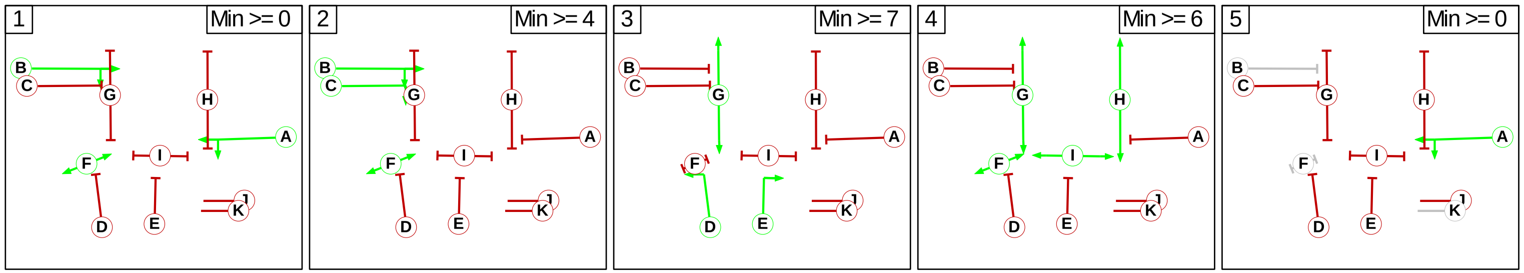
C2 - 00/006 Victoria Embankment / Blackfriars Bridge



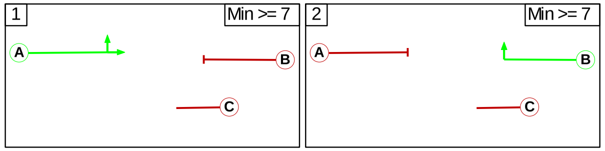
C3 - 00/122 Victoria Embankment / New Bridge Road
Stage Stream: 1



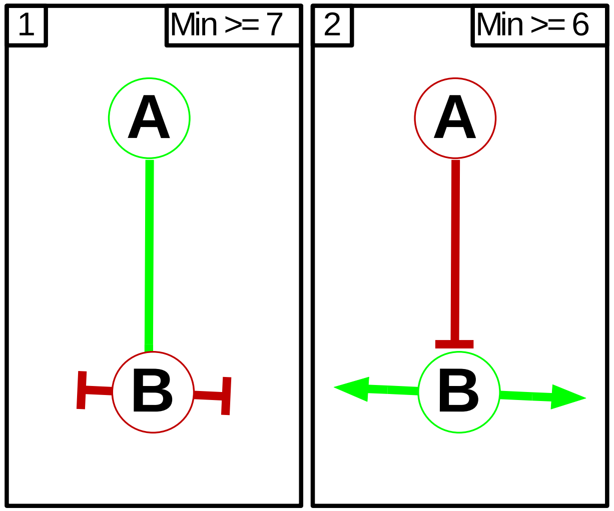
C4 - J00/007 Queen Victoria Street / Puddle Dock



C5 - 00/059 Upper Thames Street / Puddle Dock



C6 - 00/123 Blackfriars Bridge ped crossing



Phases in Stage

C1 - 01/094 Victoria Embankment / Temple Avenue

Stage No.	Phases in Stage
1	A B
2	C D
3	A
4	B
5	

C2 - 00/006 Victoria Embankment / Blackfriars Bridge

Stage No.	Phases in Stage
1	A G
2	D F
3	B D
4	B E
5	B G H

C3 - 00/122 Victoria Embankment / New Bridge Road

Stream	Stage No.	Phases in Stage
1	1	A E H
1	2	D E F
1	3	B C G
1	4	C G
1	5	B G
1	6	D F

C4 - J00/007 Queen Victoria Street / Puddle Dock

Stage No.	Phases in Stage
1	A B F
2	B C F
3	D E G
4	F G H I
5	A

C5 - 00/059 Upper Thames Street / Puddle Dock

Stage No.	Phases in Stage
1	A
2	B

C6 - 00/123 Blackfriars Bridge ped crossing

Stage No.	Phases in Stage
1	A
2	B

Phase Intergreens Matrix

C1 - 01/094 Victoria Embankment / Temple Avenue

	Starting Phase				
Terminating Phase		A	B	C	D
	A		-	5	7
	B	-		5	5
	C	5	5		-
	D	19	19	-	

C2 - 00/006 Victoria Embankment / Blackfriars Bridge

	Starting Phase								
Terminating Phase		A	B	C	D	E	F	G	H
	A		5	3	12	5	7	-	5
	B	5		3	-	-	8	-	-
	C	2	2		2	2	2	2	2
	D	5	-	3		3	-	6	6
	E	5	-	3	2		8	2	2
	F	9	9	4	-	9		-	9
	G	-	-	3	8	3	-		-
	H	5	-	3	8	3	8	-	

C3 - 00/122 Victoria Embankment / New Bridge Road

		Starting Phase										
		A	B	C	D	E	F	G	H	I	J	K
Terminating Phase	A		9	9	9	-	8	-	-	9	9	3
	B	5		-	5	5	7	-	6	5	5	3
	C	5	-		-	-	7	-	10	5	5	3
	D	5	5	-		-	-	6	8	3	3	3
	E	-	5	-	-		-	10	-	-	-	3
	F	8	8	8	-	-		-	-	-	-	3
	G	-	-	-	15	15	-		-	-	-	4
	H	-	15	15	15	-	-	-		5	4	4
	I	9	5	2	2	-	-	-	9		9	4
	J	5	5	2	2	-	-	-	2	5		3
	K	2	2	2	2	2	2	2	2	2	2	

C4 - J00/007 Queen Victoria Street / Puddle Dock

		Starting Phase										
		A	B	C	D	E	F	G	H	I	J	K
Terminating Phase	A		-	5	8	6	-	8	5	6	3	-
	B	-		-	-	5	-	5	8	8	3	3
	C	5	-		-	5	-	5	8	8	3	5
	D	5	-	-		-	5	-	-	-	3	5
	E	5	5	5	-		-	-	9	5	3	5
	F	-	-	-	9	-		-	-	-	4	4
	G	14	14	14	-	-	-		-	-	7	14
	H	15	15	15	-	15	-	-		-	8	15
	I	16	16	16	-	16	-	-	-		8	16
	J	2	2	2	2	2	2	2	2	2		2
	K	-	2	5	8	6	2	8	5	6	3	

C5 - 00/059 Upper Thames Street / Puddle Dock

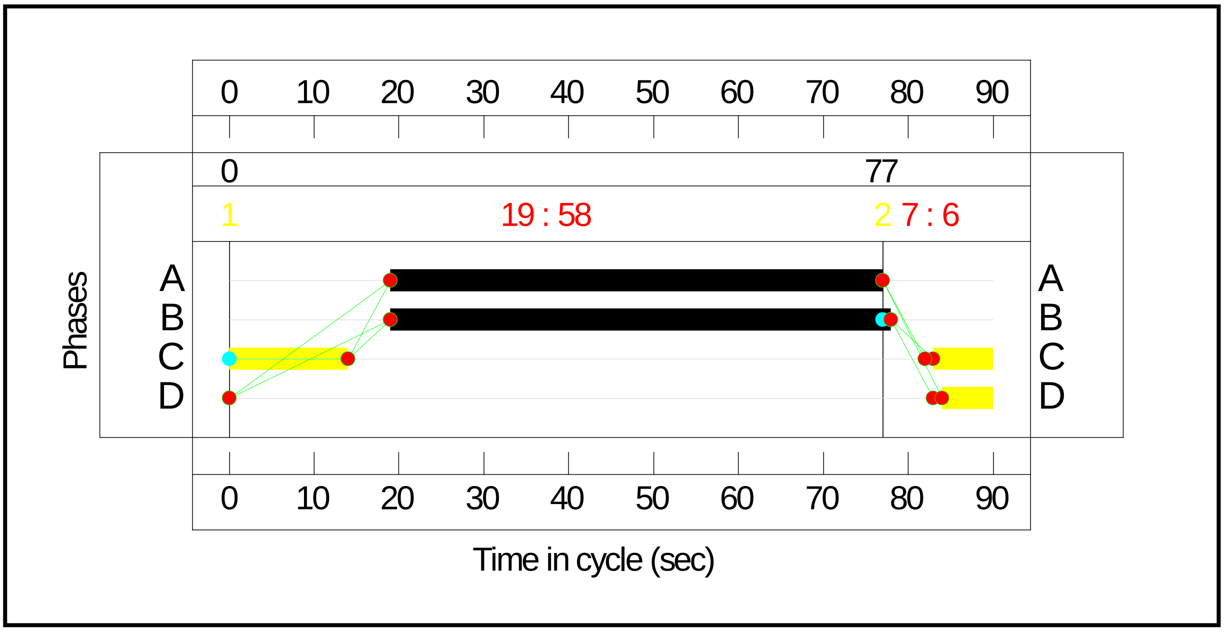
	Starting Phase			
		A	B	C
Terminating Phase	A		5	3
	B	5		3
	C	2	2	

C6 - 00/123 Blackfriars Bridge ped crossing

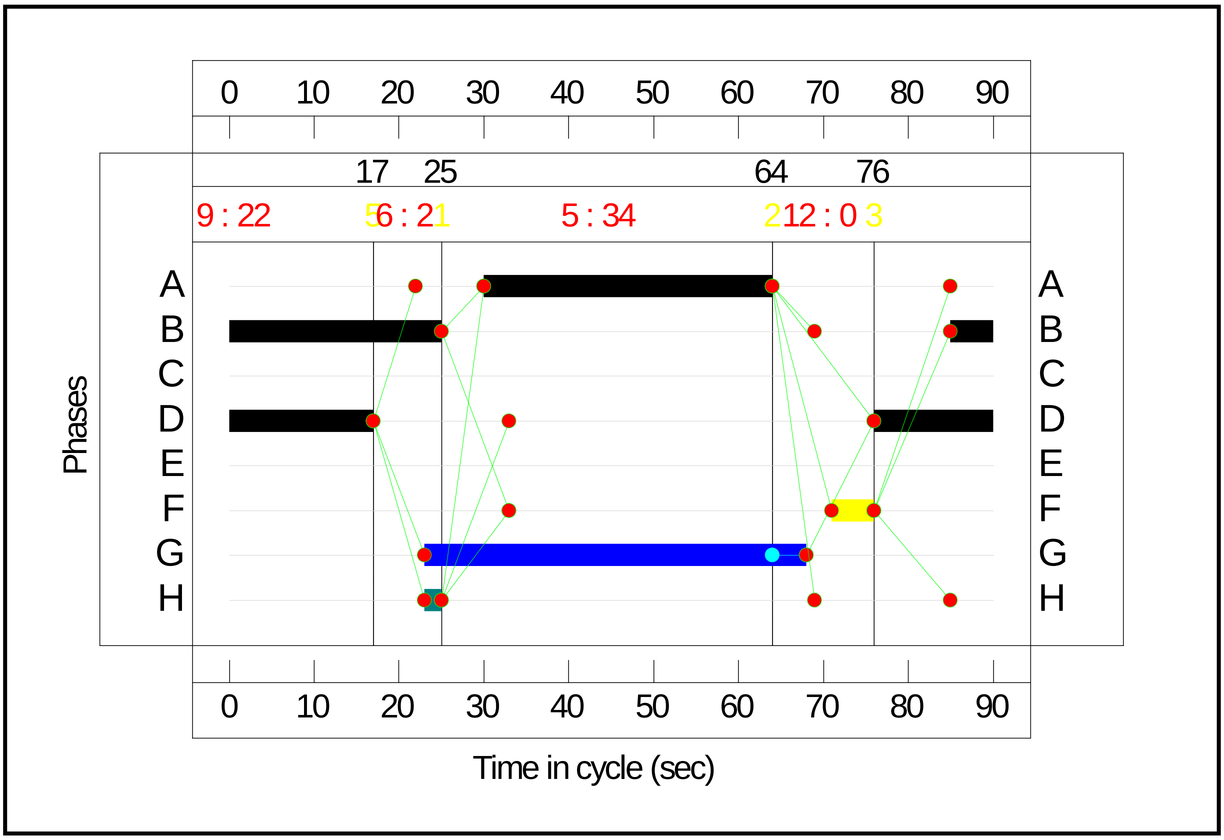
	Starting Phase		
		A	B
Terminating Phase	A		5
	B	8	

Stage Diagrams

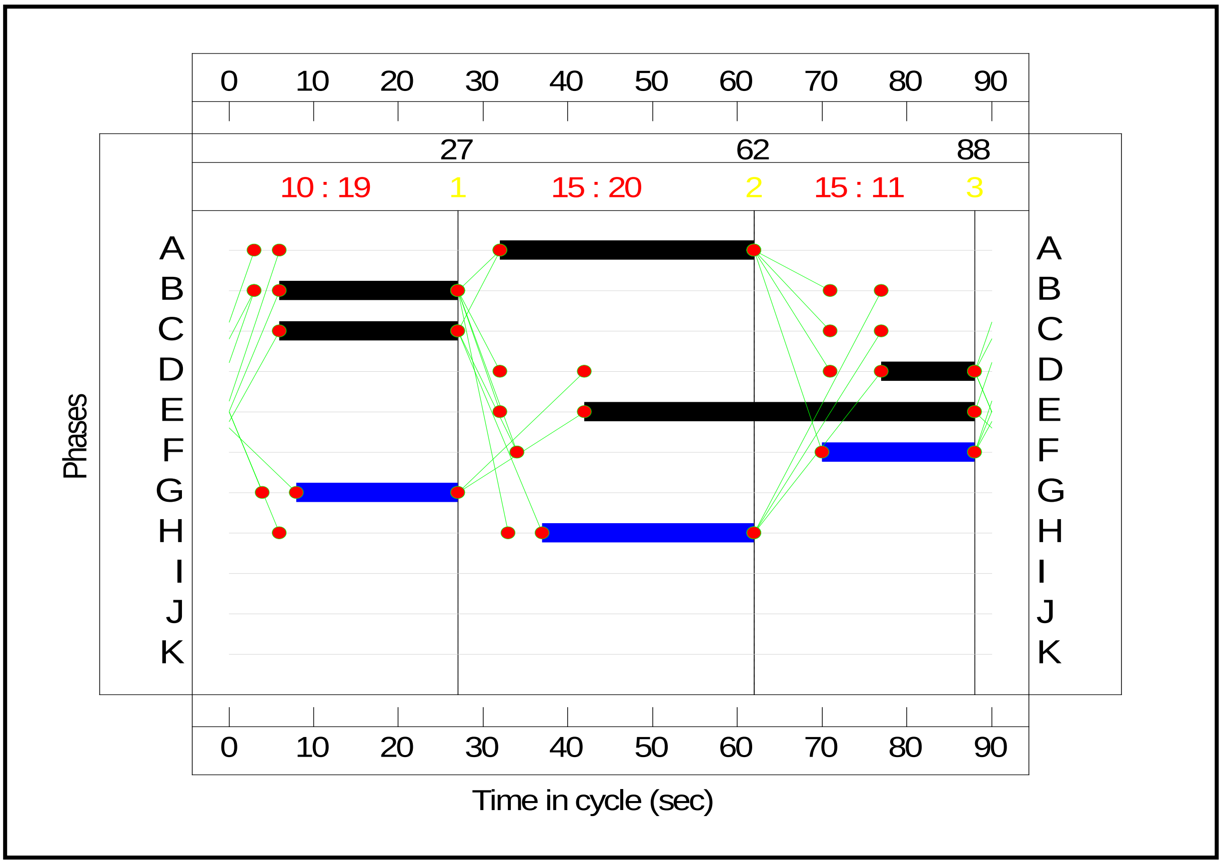
C1 - 00/005 Victoria Embankment / Temple Avenue



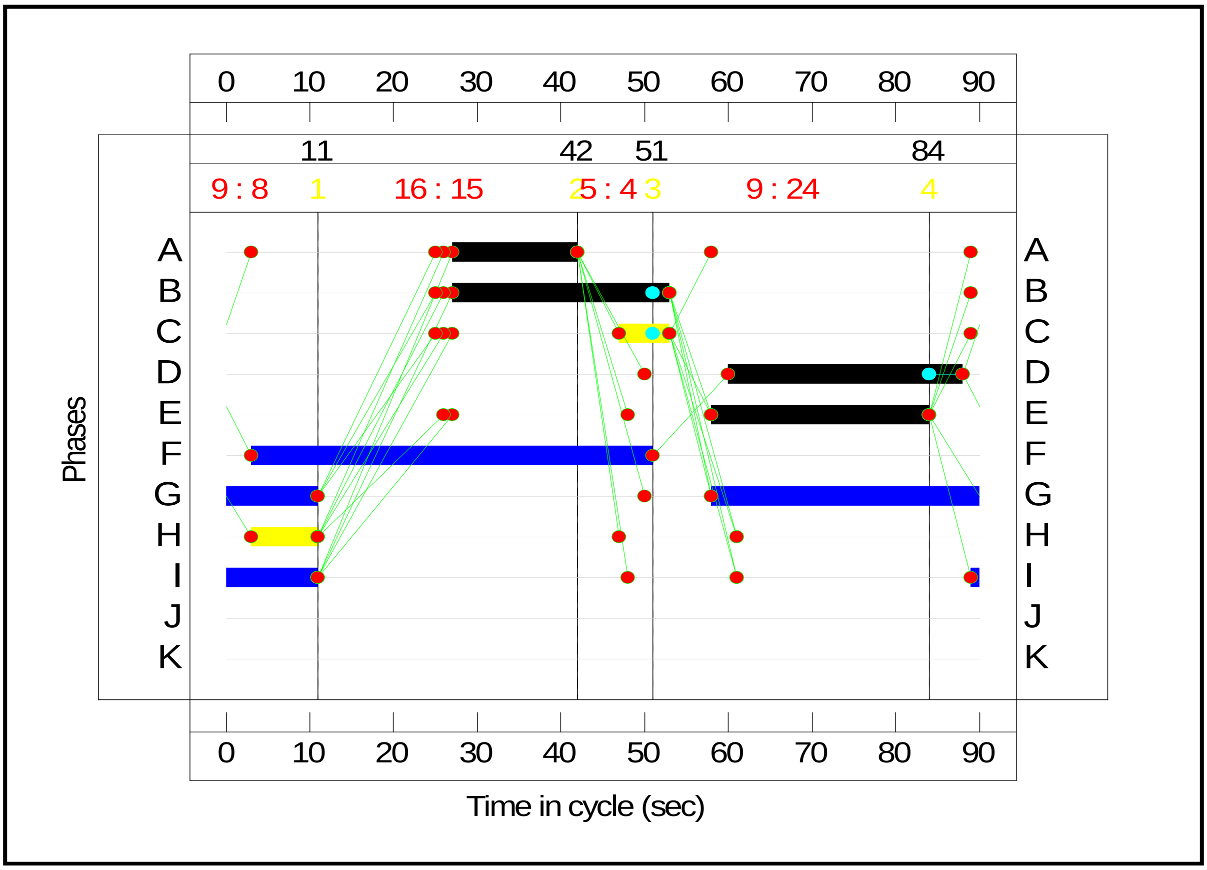
C2 - 00/006 Victoria Embankment / Blackfriars Bridge



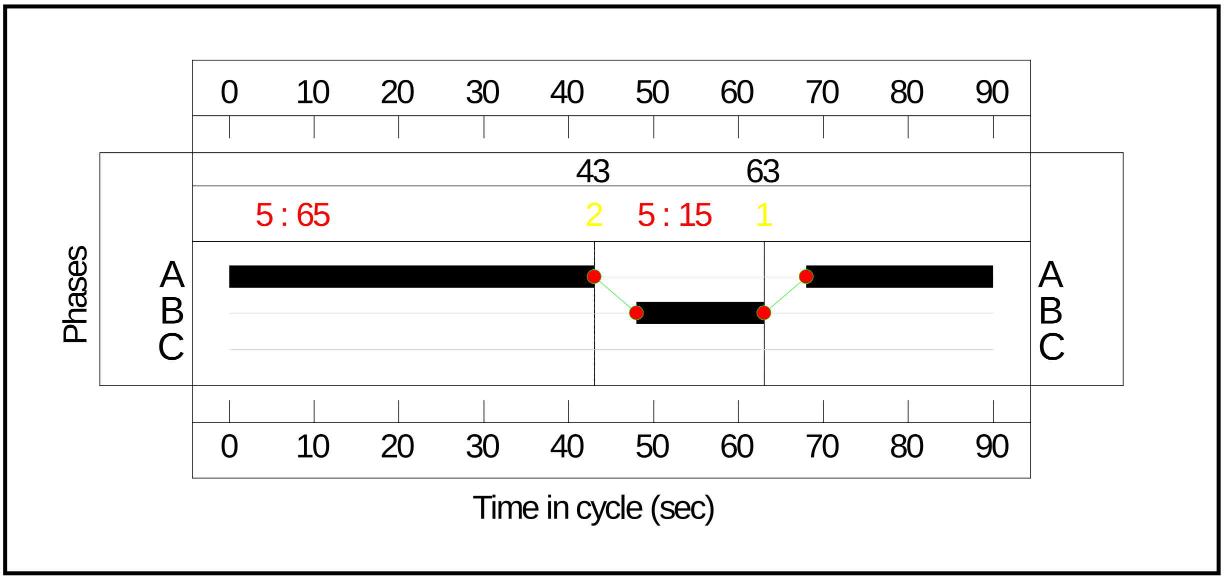
C3 - 00/122 Victoria Embankment / New Bridge Road



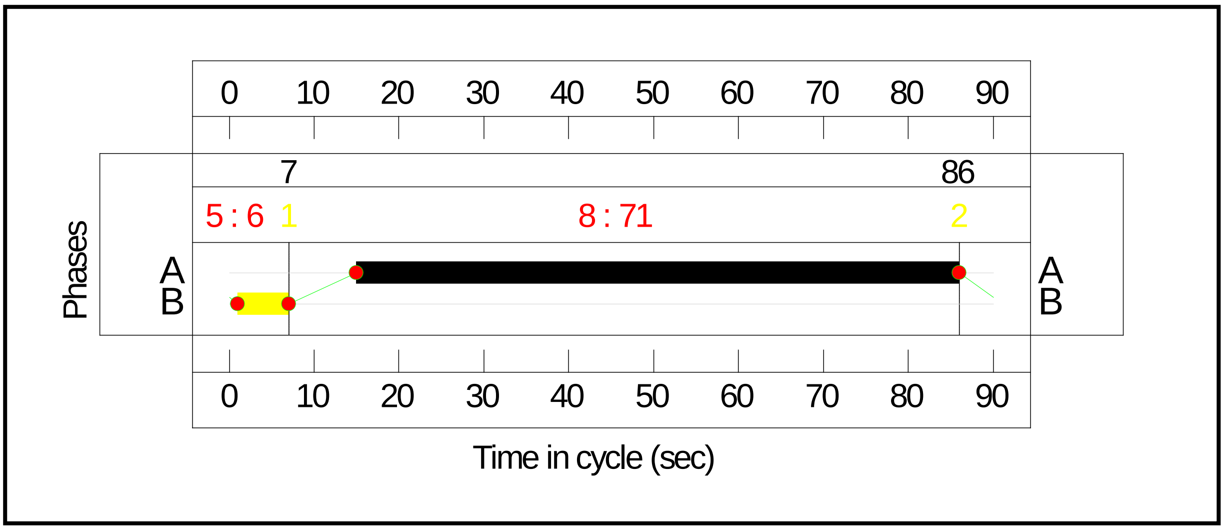
C4 - J00/007 Queen Victoria Street / Puddle Dock



C5 - 00/059 Upper Thames Street / Puddle Dock



C6 - 00/123 Blackfriars Bridge ped crossing



Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: Blackfriars Bridge Junction	-	-	-		-	-	-	-	-	-	**101.7%**	**286**	**2**	**0**	**107.8**	-	-
J1: 00/005	-	-	-		-	-	-	-	-	-	**91.6%**	**0**	**0**	**0**	**21.6**	-	-
1/1	Victoria Embankment (e/b) Ahead	U	C1:A		1	58	-	1065	1773	1162	91.6%	-	-	-	8.9	30.2	27.7
1/2	Victoria Embankment (e/b) Ahead	U	C1:A		1	58	-	787	1773	1162	67.7%	-	-	-	3.1	14.4	13.1
2/1	Temple Avenue Right Left	U	C1:C		1	21	-	136	1729	423	32.2%	-	-	-	1.3	34.2	3.0
3/1	Victoria Embankment (w/b) Ahead	U	C1:B		1	59	-	0	1773	1182	0.0%	-	-	-	0.0	0.0	0.0
3/2	Victoria Embankment (w/b) Ahead	U	C1:B		1	59	-	783	1773	1182	66.2%	-	-	-	2.9	13.4	12.5
3/3	Victoria Embankment (w/b) Ahead	U	C1:B		1	59	-	860	1773	1182	72.8%	-	-	-	3.6	15.3	15.2
5/1	Left	U	-		-	-	-	413	1800	1800	22.9%	-	-	-	0.1	1.3	0.1
5/2	Ahead	U	-		-	-	-	706	1800	1800	39.2%	-	-	-	0.3	1.6	0.3
5/3	Ahead	U	-		-	-	-	787	1800	1800	43.7%	-	-	-	0.4	1.8	0.4
6/1	Blackfriars Underpass (w/b) Ahead	U	-		-	-	-	830	1800	1800	46.1%	-	-	-	0.4	1.9	0.4
6/2	Blackfriars Underpass (w/b) Ahead	U	-		-	-	-	813	1800	1800	45.2%	-	-	-	0.4	1.8	0.4

7/1	Victoria Embankment - w/b on-slip Ahead	O	-		-	-	-	0	1800	1800	0.0%	0	0	0	0.0	0.0	0.0
J2: 00/006	**-**	**-**	**-**		**-**	**-**	**-**	**-**	**-**	**-**	**61.2%**	**0**	**0**	**0**	**9.6**	**-**	**-**
1/1	Blackfriars Bridge Road (n/b) Ahead Left	U	C2:A		1	42	-	543	1965	939	57.8%	-	-	-	3.2	21.5	10.3
1/2	Blackfriars Bridge Road (n/b) Ahead	U	C2:A		1	42	-	342	1965	939	36.4%	-	-	-	1.7	17.9	5.6
2/2	Blackfriars Bridge Road - internal SL (w/b +n/b) Ahead	U	-		-	-	-	645	1940	1940	33.2%	-	-	-	0.3	1.7	0.7
2/3+2/4	Blackfriars Bridge Road - internal SL (w/b +n/b) U-Turn Right	U	C2:B		1	22	-	20	1853:1550	389	5.1%	-	-	-	0.3	61.3	0.5
3/1	Ahead	U	-		-	-	-	540	2015	2015	26.8%	-	-	-	0.2	1.2	0.2
3/2	Ahead	U	-		-	-	-	362	2015	2015	18.0%	-	-	-	0.1	1.1	0.1
4/1	Victoria Embankment - e/b off-slip Ahead	U	C2:D		1	24	-	314	1848	513	61.2%	-	-	-	2.8	32.2	7.6
4/2	Victoria Embankment - e/b off-slip Ahead	U	C2:D		1	24	-	133	1848	513	25.9%	-	-	-	0.9	25.1	2.6
J3: 00/122	**-**	**-**	**-**		**-**	**-**	**-**	**-**	**-**	**-**	**101.7%**	**0**	**0**	**0**	**50.9**	**-**	**-**
1/1	Queen Victoria Street - internal SL (w/b) Left	U	C3:C		1	18	-	364	1866	394	92.4%	-	-	-	7.1	70.2	13.1

1/2	Queen Victoria Street - internal SL (w/b) Left Right	U	C3:B		1	18	-	263	1866	394	66.8%	-	-	-	2.9	39.6	7.4
2/1	Blackfriars Bridge Road - internal SL (n/b) Ahead	U	C3:E		1	49	-	812	1853	1029	78.9%	-	-	-	3.5	15.4	13.9
2/2	Blackfriars Bridge Road - internal SL (n/b) Ahead	U	C3:E		1	49	-	300	1852	1029	29.2%	-	-	-	0.7	8.8	5.0
2/3	Blackfriars Bridge Road - internal SL (n/b) Right	U	C3:D		1	12	-	240	1882	272	88.3%	-	-	-	5.1	76.7	9.0
3/1	Ahead	U	-		-	-	-	777	1918	1918	40.5%	-	-	-	0.3	1.6	0.3
3/2	Ahead	U	-		-	-	-	564	1918	1918	29.4%	-	-	-	0.2	1.3	0.2
4/1		U	-		-	-	-	777	1800	1800	43.2%	-	-	-	0.4	1.8	0.4
4/2		U	-		-	-	-	564	1800	1800	31.3%	-	-	-	0.2	1.5	0.2
5/1	New Bridge Street (s/b) Ahead	U	C3:A		1	32	-	733	1965	721	101.7%	-	-	-	23.4	115.0	35.7
5/2	New Bridge Street (s/b) Ahead	U	C3:A		1	32	-	609	1965	721	84.5%	-	-	-	7.0	41.6	16.5
J4: 00/007	**-**	**-**	**-**		**-**	**-**	**-**	**-**	**-**	**-**	**54.7%**	**14**	**2**	**0**	**10.5**	**-**	**-**
1/1	Queen Victoria Street - Internal SL (e/b) Ahead	U	C4:B	C4:C	1	27	6	228	1965	611	37.3%	-	-	-	0.6	10.2	2.0
1/2	Queen Victoria Street - Internal SL (e/b) Ahead Right	O	C4:B	C4:C	1	27	6	17	1805	368	4.6%	14	2	0	0.1	12.0	0.1

2/1	Queen Victoria Street (w/b) Left Ahead	U	C4:A		1	16	-	166	1950	368	45.1%	-	-	-	1.9	41.2	4.1
2/2	Queen Victoria Street (w/b) Ahead	U	C4:A		1	16	-	203	1965	371	54.7%	-	-	-	2.5	43.7	5.2
3/2		U	-		-	-	-	172	1900	1900	9.1%	-	-	-	0.0	1.0	0.0
4/2+4/1	Puddledock Right Left	U	C4:E C4:D		1	25:27	-	421	1800:1748	780	54.0%	-	-	-	4.2	35.7	10.7
4/3	Puddledock Right	U	C4:E		1	25	-	172	1789	517	33.3%	-	-	-	1.2	25.4	3.0
5/1		U	-		-	-	-	29	1800	1800	1.6%	-	-	-	0.0	1.0	0.0
J5: 00/059	**-**	**-**	**-**		**-**	**-**	**-**	**-**	**-**	**-**	**65.1%**	**272**	**0**	**0**	**7.0**	**-**	**-**
1/1	Blackfriars Underpass (e/b) Left Ahead	U	C5:A		1	61	-	706	1800	1240	56.9%	-	-	-	1.1	5.6	4.2
1/2	Blackfriars Underpass (e/b) Ahead	U	C5:A		1	61	-	787	1900	1309	60.1%	-	-	-	1.2	5.7	6.2
2/1		U	-		-	-	-	375	1800	1800	20.8%	-	-	-	0.1	1.3	0.1
2/2		U	-		-	-	-	787	1800	1800	43.7%	-	-	-	0.4	1.8	0.4
3/1	Upper Thames Street (w/b) Ahead	U	-		-	-	-	558	1900	1900	29.4%	-	-	-	0.2	1.3	0.2
3/2	Upper Thames Street (w/b) Ahead	U	-		-	-	-	813	1900	1900	42.8%	-	-	-	0.4	1.7	0.4
3/3	Upper Thames Street (w/b) Right	U	C5:B		1	19	-	251	1734	385	65.1%	-	-	-	3.1	45.1	6.6

4/1	Blackfriars Passage Ahead	O	-		-	-	-	272	1940	592	45.9%	272	0	0	0.4	5.6	0.4
J6: Blackfriars Lane priority jcn	**-**	**-**	**-**		**-**	**-**	**-**	**-**	**-**	**-**	**23.1%**	**0**	**0**	**0**	**0.3**	**-**	**-**
1/1		U	-		-	-	-	10	1800	1800	0.6%	-	-	-	0.0	1.0	0.0
2/1	Blackfriars Lane Left	U	-		-	-	-	10	1800	1800	0.6%	-	-	-	0.0	1.0	0.0
3/1	Ahead Left	U	-		-	-	-	228	1800	1800	12.7%	-	-	-	0.1	1.1	0.1
3/2	Ahead	U	-		-	-	-	17	1800	1800	0.9%	-	-	-	0.0	1.0	0.0
4/1	Ahead	U	-		-	-	-	415	1800	1800	23.1%	-	-	-	0.1	1.3	0.1
4/2	Ahead Right	O	-		-	-	-	203	1800	1800	11.3%	0	0	0	0.1	1.1	0.1
5/1	Ahead	U	-		-	-	-	10	1800	1800	0.6%	-	-	-	0.0	1.0	0.0
J7: 00/123	**-**	**-**	**-**		**-**	**-**	**-**	**-**	**-**	**-**	**84.9%**	**0**	**0**	**0**	**7.8**	**-**	**-**
1/1	Ahead	U	C6:A		1	71	-	1065	1940	1552	67.9%	-	-	-	1.1	3.8	15.1
1/2	Ahead	U	C6:A		1	71	-	645	2130	1704	37.8%	-	-	-	0.3	1.7	0.3
2/1		U	-		-	-	-	1710	2000	2000	84.9%	-	-	-	6.4	13.6	37.1

C1 - 00/005 Victoria Embankment / Temple Avenue	PRC for Signalled Lanes (%):	-1.8	Total Delay for Signalled Lanes (pcuHr):	19.92	Cycle Time (s):	90
C2 - 00/006 Victoria Embankment / Blackfriars Bridge	PRC for Signalled Lanes (%):	47.1	Total Delay for Signalled Lanes (pcuHr):	9.01	Cycle Time (s):	90
C3 - 00/122 Victoria Embankment / New Bridge RoadStream: 1	PRC for Signalled Lanes (%):	-13.0	Total Delay for Signalled Lanes (pcuHr):	49.76	Cycle Time (s):	90
C4 - J00/007 Queen Victoria Street / Puddle Dock	PRC for Signalled Lanes (%):	64.6	Total Delay for Signalled Lanes (pcuHr):	10.45	Cycle Time (s):	90
C5 - 00/059 Upper Thames Street / Puddle Dock	PRC for Signalled Lanes (%):	38.2	Total Delay for Signalled Lanes (pcuHr):	5.49	Cycle Time (s):	90
C6 - 00/123 Blackfriars Bridge ped crossing	PRC for Signalled Lanes (%):	32.6	Total Delay for Signalled Lanes (pcuHr):	1.42	Cycle Time (s):	90
	PRC Over All Lanes (%):	-13.0	Total Delay Over All Lanes(pcuHr):	107.82		

Appendix E: Accident analysis

E.1 Existing highway safety analysis

E.1.1 Details of road traffic accident within the vicinity of the site have been obtained from Transport for London (TfL) and have been reviewed to determine whether there are particular problems or trends on the local highway network.

E.1.2 Data on accidents for the most recent five-year period from April 2006 until March 2011 has been analysed for the following junctions and surrounding roads:

a. Victoria Embankment (A3211) between the junction with Puddle Dock and the junction with Temple Avenue;

b. Victoria Embankment (A3211) – on-slip road;

c. Victoria Embankment (A3211) – off-slip road;

d. Blackfriars Underpass (A3211);

e. Blackfriars Bridge (A201);

f. Victoria Embankment (A3211) / Blackfriars Bridge (A201) junction;

g. Victoria Embankment (A3211) / New Bridge Street (A201) junction;

h. Victoria Embankment (A3211) / Queen Victoria Street junction;

i. Victoria Embankment (A3211) / Temple Avenue junction;

j. Blackfriars Underpass (A201) / White Lion Hill junction;

k. Blackfriars Underpass (A201) / Puddle Dock junction;

l. New Bridge Street (A201) / Watergate junction;

m. New Bridge Street (A201) / Queen Victoria Street junction;

n. New Bridge Street (A201) / Tudor Street junction; and

o. Queen Victoria Street / Black Friars Lane junction.

E.1.3 Based on the DfT Design Manual for Roads and Bridges, Volume 13 Economic Assessment of Road Schemes, accidents have been analysed according to the method outlined in this guidance which states that accidents that have occurred within 20m of each junction are associated with that specific junction, and the remaining accidents are grouped to the relevant links.

E.1.4 The area of interest together with the locations of the recorded road traffic accidents and the severity of the accidents are indicated in Table D.1.

Table E.1 Accident severity 2006 to 2011

Location	Slight	Serious	Fatal	Total
Victoria Embankment (A3211)*	0	1	0	1

Location	Slight	Serious	Fatal	Total
Victoria Embankment (A3211) – on-slip road	1	1	0	2
Victoria Embankment (A3211) – off-slip road	1	0	0	1
Blackfriars Underpass (A3211)	8	2	0	10
Blackfriars Bridge (A201)	2	1	0	3
Victoria Embankment (A3211) / Blackfriars Bridge (A201) junction	17	3	0	20
Victoria Embankment (A3211) / New Bridge Street (A201) junction	6	1	0	7
Victoria Embankment (A3211) / Queen Victoria Street junction	12	2	0	14
Victoria Embankment (A3211) / Temple Avenue junction	2	2	1	5
Blackfriars Underpass (A201) / White Lion Hill junction	4	0	0	4
Blackfriars Underpass (A201) / Puddle Dock junction	12	1	0	13
New Bridge Street (A201) / Watergate junction	1	0	0	1
New Bridge Street (A201) / Queen Victoria Street junction	2	1	0	3
New Bridge Street (A201) / Tudor Street junction	9	2	0	11
Queen Victoria Street / Black Friars Lane junction	3	0	0	3
Total	**80**	**17**	**1**	**98**

** Victoria Embankment (A3211) between the junction with Puddle Dock and the junction with Temple Avenue.*

E.1.5 A total of 98 road traffic accidents have occurred in the area f interest. Of these accidents, 80 were classified as slight, 17 as serious and one as fatal.

E.1.6 Road traffic accident analysis for individual junctions and roads within the vicinity of the site is discussed below.

Victoria Embankment (A3211)

E.1.7 Victoria Embankment (A3211) runs to the north of the site. The road is a wide dual carriageway with a 30mph speed limit. Victoria Embankment (A3211) links to New Bridge Street (A201), Blackfriars Bridge (A201) and Upper Thames Street (A3211) in the east, and Bridge Street (A302) and Westminster Bridge Road (A302) in the west.

E.1.8 To the east of the junction with Temple Avenue, Victoria Embankment (A3211) divides. The Blackfriars underpass continues under Blackfriars Bridge (A201), whilst slip roads to and from Victoria Embankment (A3211) connect to the junction with New Bridge Street (A201), Queen Victoria Street, and Blackfriars Bridge (A201).

E.1.9 Victoria Embankment (A3211) within the assessment area is between the junction with Puddle Dock to the east and the junction with Temple Avenue to the west.

E.1.10 In total 50 accidents occurred along Victoria Embankment (A3211) in the local area and the junctions associated with this stretch of highway. Those junctions included within this analysis are as follow:

a. Victoria Embankment (A3211) / Blackfriars Bridge (A201) junction;

b. Victoria Embankment (A3211) / New Bridge Street (A201) junction;

c. Victoria Embankment (A3211) / Queen Victoria Street junction; and

d. Victoria Embankment (A3211) / Temple Avenue junction.

E.1.11 Of the five year accident data analysed, one fatal accident occurred along Victoria Embankment (A3211) in the local area which happened at the junction with Temple Avenue. The accident involved a motorcycle and a bicycle and resulted from motorcyclist passing too close to cyclist.

E.1.12 Of the total 50 accidents, ten accidents were classified as serious with the majority occurring at junctions. One of the serious accidents involved two motorcycles colliding at the junction of Victoria Embankment (A3211) and Queen Victoria Street. The accident was caused by not looking properly, failing to signal and failing to judge other person’s path or speed.

E.1.13 Two of the serious accidents involved pedestrians, one occurred at the junction of Victoria Embankment (A3211) and Temple Avenue where the pedestrian was hit by a motorcycle. The other serious accident happened along Victoria Embankment (A3211) away from junctions and involved a pedestrian being hit by a car. In both accidents the pedestrians did not look properly and one was impaired by alcohol.

E.1.14 All the remaining seven serious accidents involved bicycles colliding with other vehicles including cars and two LGVs. The accidents mainly happened at the junctions associated with Victoria Embankment (A3211) with one happening on Victoria Embankment (A3211) westbound slip road. The two accidents which involved goods vehicles occurred at the junction of Victoria Embankment (A3211) and Blackfriars Bridge (A201) and the major contributory factors for these accidents were failing to look properly, reckless riding/driving; and the driver’s vision being affected.

E.1.15 The remaining 39 accidents were recorded as slight. Three of these accidents involved pedestrians, one was hit by a motorcycle at the junction of Victoria Embankment (A3211) and Temple Avenue, the accident happened due to the rider disobeying the traffic signals and the pedestrian failing to judge the motorcycles path or speed. The other two pedestrians were hit by taxis at the junction of Victoria Embankment (A3211) and

Blackfriars Bridge (A201). Not looking properly and the wrong use of pedestrian crossing facilities were the main causes of these accidents.

E.1.16 14 of the slight accidents involved collisions of bicycles with other vehicles including LGVs, cars, taxis, motorcycles and a bus/coach. The majority of these accidents happened at the junction of Victoria Embankment (A3211) and Blackfriars Bridge (A201). These accidents predominately happened as a result of not looking properly, driving recklessly and failing to judge the other persons path or speed.

E.1.17 Seven of the slight accidents involved collision of LGVs with other vehicles including cars and motorcycles which all occurred at the junctions associated with Victoria Embankment (A3211) in the local area.

E.1.18 There were two accidents which involved HGVs and motorcycles, both happened at the junction of Victoria Embankment (A3211) and Queen Victoria Street. Failing to look properly and sudden braking were the main contributory factors to these accidents.

E.1.19 The remaining 14 slight accidents involved cars, taxis and motorcycles. Two of these accidents occurred along Victoria Embankment, one on the westbound slip road and one on the eastbound slip road. Not looking properly, failing to judge another person’s path or speed and following too close were the causes of these two accidents. The remaining of these accidents occurred at the junctions associated with Victoria Embankment (A3211) and predominately happened as a result of not looking properly, driving recklessly and making poor manoeuvres.

E.1.20 The accidents that occurred along Victoria Embankment (A3211) and the associated junctions did not occur as a result of the road geometry.

Blackfriars underpass (A3211)

E.1.21 At the lower level, the Blackfriars underpass is a dual carriageway which provides an east-west link between Victoria Embankment to the west and Upper Thames Street (A3211) to the east.

E.1.22 In total, 27 accidents occurred along Blackfriars Underpass (A3211) and the associated junctions. Of the total accidents, four accidents happened at the junction of Blackfriars Underpass (A3211) and White Lion Hill and 13 accidents at the junction of Blackfriars Underpass (A3211) and Puddle Dock. The remaining 10 accidents occurred along the underpass away from junctions.

E.1.23 Of the total accidents, 24 were recorded as slight and three as serious. One of the serious accidents happened at the junction of Blackfriars Underpass (A3211) and Puddle Dock. The accident involved two HGVs, an LGV and a car in which one of the HGVs failed to stop in time and collided with the car, consequently led to a collision with other vehicles which involved in the accident.

E.1.24 The other two serious accidents happened along Blackfriars Underpass (A3211) to the west of the junction with Puddle Dock. One of the serious accidents involved two cars and a bicycle and was caused by poor manoeuvre and illegal turning. The other serious accident involved a motorcycle and happened due to temporary road layout and the rider suddenly brake. None of the serious accidents were influenced by the road geometry.

E.1.25 Of the total 24 slight accidents, one accident involved a pedestrian hit by a bicycle along Blackfriars Underpass (A3211) to the west of the junction with White Lion Hill. The accident happened because the pedestrian did not look properly.

E.1.26 Seven of the slight accidents involved bicycles colliding with taxis, a car, an LGV, and an MGV. The accidents which involved bicycles and Goods Vehicles occurred along the underpass away from junctions and the remaining accidents involving cyclists occurred at the junctions associated with the underpass. These accidents were predominately caused by failing to judge another person's path or speed, failing to look properly and passing too close to cyclists.

E.1.27 Of the total slight accidents, three involved collisions of LGVs with other motor vehicles including motorcycles, a car and a taxi and there were two accidents which involved MGVs, both colliding with cars. Not looking properly and disobeying the traffic signals were the main causes of these accidents.

E.1.28 Two of the slight accidents which involved goods vehicles colliding with other motor vehicles happened along Blackfriars Underpass (A3211) away from junctions. One accident occurred at the junction of Blackfriars Underpass (A3211) and White Lion Hill and two accidents at the junction of Blackfriars Underpass (A3211) and Puddle Dock.

E.1.29 The remaining 11 slight accidents involved cars, motorcycles, buses/coaches and a taxi. The accidents mainly caused by not looking properly, sudden braking and reckless driving.

E.1.30 Of the slight accidents that occurred along Blackfriars Underpass (A3211) and the junctions associated, none happened as a result of the road geometry.

New Bridge Street (A201)

E.1.31 New Bridge Street (A201) provides a north-south link and is located to the north-east of the site. To the north, New Bridge Street leads to Farrington Street, Fleet Street, and Ludgate Hill, and to the south it leads to Queen Victoria Street, Victoria Embankment and Blackfriars Bridge. New Bridge Street is two-way single-carriageway and 30mph speed limit applies.

E.1.32 New Bridge Street (A201) within the study area is between the junction with Victoria Embankment (A3211) and Queen Victoria Street, and the junction with Tudor Street.

E.1.33 There have been a total of 15 accidents in this area and they have all occurred at the junctions associated with this road. Of the total accidents, 11 accidents occurred at the junction of New Bridge Street (A201) and Tudor Street, three at the junction of New Bridge Street (A201) and Queen Victoria Street and one at the junction of New Bridge Street (A201) and Watergate.

E.1.34 Of the total accidents, 12 were classified as slight and three as serious. One of the serious accidents involved a HGV which collided with a bicycle and it happened at the junction of New Bridge Street (A201) and Queen Victoria Street. The accident was caused by the cyclist entering the road from the footway and not looking properly and failing to judge the vehicles path or speed.

E.1.35 The remaining two serious accidents occurred at the junction of New Bridge Street (A201) and Tudor Street. One of the accidents involved two bicycles, one overtook the other cyclist at speed and they collided. The other serious accident involved an LGV and a pedestrian and was caused by not looking properly. None of the serious accidents were as a result of the road geometry.

E.1.36 Of the total 12 slight accidents, seven accidents happened as bicycles collided with motor vehicles including cars, a taxi, a bus/coach, an LGV, and an MGV. One of these accidents occurred at the junction of New Bridge Street (A201) and Queen Victoria Street, and the rest at the junction of Queen Victoria Street (A201) and Tudor Street. These accidents were mainly caused by not looking properly and poor manoeuvre.

E.1.37 Two of the slight accidents involved LGVs which collided with motorcycles, one of these accidents happened at the junction of New Bridge Street (A201) and Watergate and the other occurred at the junction of New Bridge Street (A201) and Tudor Street. Not looking properly and slippery roads due to weather conditions were the main cause of these accidents.

E.1.38 The remaining three slight accidents involved taxis, motorcycles, a car and a bus/coach, one happened at the junction of New Bridge Street (A201) and Queen Victoria Street and two at the junction of New Bridge Street (A201) and Tudor Street. Aggressive and reckless driving and following too close were the main contributory factors to these accidents.

E.1.39 Of the slight accidents that occurred along New Bridge Street (A201) and the junctions associated, none happened as a result of the road geometry.

Blackfriars Bridge (A201)

E.1.40 Blackfriars Bridge (A201) is a dual carriageway which crosses the River Thames into London Borough of Southwark providing a north-south link between Victoria Embankment (A3211) and New Bridge Street (A201) to the north of the river and Blackfriars Road (A201), Southwark Street and Stamford Street (both A3200) to the south of the river. Blackfriars Bridge (A201) within the study area is 100m from the junction with Victoria Embankment (A3211).

E.1.41 Of the five year accident data analysed, one serious accident happened along the bridge (100m from the junction with Victoria Embankment) which involved two motorcycles. The accident was caused by one motorcycle hitting the rear of the other motorcycle due to loss of control.

E.1.42 There have been a total of three accidents that have occurred along the bridge (100m from its junction with Victoria Embankment). Of these three accidents, two have been recorded as slight and they involved taxis and a car. The accidents happened mainly due to careless driving and not looking properly.

E.1.43 Of the accidents that occurred along Blackfriars Bridge (A201), none happened as a result of the road geometry.

Queen Victoria Street

E.1.44 Queen Victoria Street is a dual carriageway and is located to the north-east of the site. To the west it meets New Bridge Street (A201), Victoria Embankment (A3211) and Blackfriars Bridge (A201) at a signalised junction and to the east, it leads to Poultry, Prince's Street, Threadneedle Street, Cornhill and King William Street.

E.1.45 Queen Victoria Street within the study area is between the junction with New Bridge Street (A201) and the junction with Black Friars Lane. In total, three accidents occurred at the junction of Queen Victoria Street and New Bridge Street (A201) which were discussed under the New Bridge Street (A201) section.

E.1.46 Three accidents occurred at the junction of Queen Victoria Street and Black Friars Lane which all were classified as slight. One of the accidents involved an LGV and a motorcycle, the other two accidents involved bicycles and cars.

E.1.47 The accidents mainly resulted from poor manoeuvre, reckless driving and not looking properly and were not influenced by the road geometry.

E.2 Summary and conclusion

E.2.1 During the five year period, the largest number of road traffic accidents occurred at the junction of Victoria Embankment (A3211) / Blackfriars Bridge (A201), the junction of Victoria Embankment (A3211) / Queen Victoria Street, the junction of Blackfriars Underpass (A201) / Puddle Dock and the junction of New Bridge Street (A201) / Tudor Street. Most of the accidents which occurred at these four junctions were classified as slight, with eight serious accidents.

E.2.2 The one fatal accident that occurred within the study area happened at the junction of Victoria Embankment (A3211) and Temple Avenue and is attributed to the motorcyclist passing too close to the cyclist. The accident is not considered to be due to road geometry or failure of infrastructure.

E.2.3 In total, 17 serious accidents occurred in the study area with the majority happened at the junction of Victoria Embankment (A3211) and Blackfriars Bridge (A201). Not looking properly, reckless driving, and failing to judge other persons path or speed were the main causes of the serious accidents. Hence, the serious accidents which occurred within the study area did not happen as a result of the road geometry.

E.2.4 Of the total accidents, 28 accidents occurred in the study area which involved LGVs, MGVs, and HGVs. Of these accidents, 23 led to slight accidents and the remaining five accidents led to serious accidents.

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Appendix F: Options for connection to Low Level Sewer No.1

F.1 Introduction

F.1.1 The works proposed at the Blackfriars Bridge Foreshore site are required to:

a. Intercept the Fleet Main Storm Relief, which discharges underneath Blackfriars road bridge

b. Connect to the Low Level Sewer No. 1, which runs parallel to the embankment, broadly under the footway

F.1.2 By making a connection to the low level sewer at this location, as well as at the Victoria Embankment Foreshore and Chelsea Embankment Foreshore sites, 10 other combined sewer overflows along the northern embankment would be indirectly controlled, avoiding the need for direct works to those CSOs.

F.1.3 There are two broad options for connection to the low level sewer at this location, which have different effects. This report considers the two options and their effects, primarily on traffic and pedestrians. Other options that have been considered are also outlined.

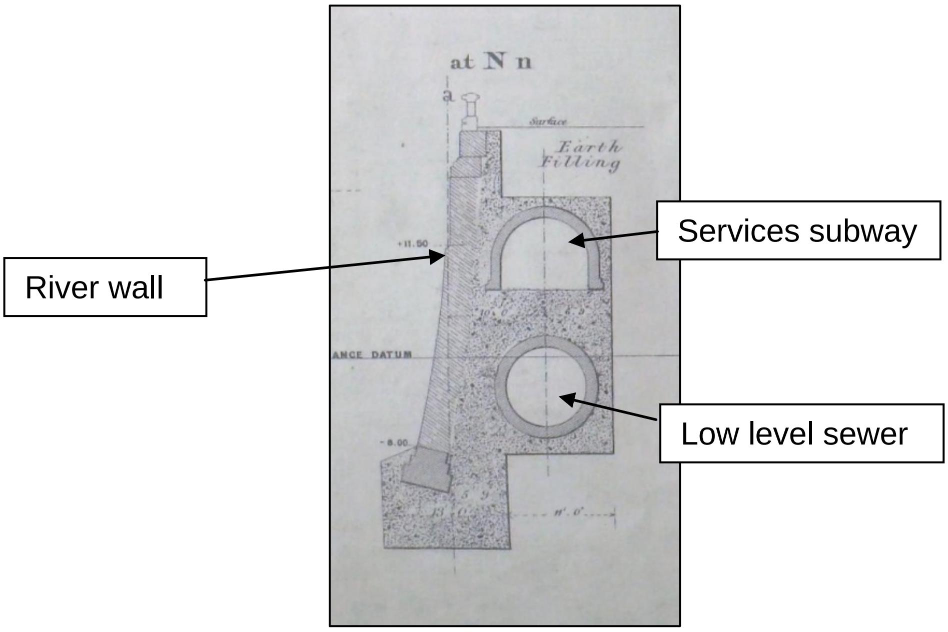
F.1.4 This report supports the transport assessment and explain why it is necessary to close the westbound off-ramp from Blackfriars Bridge.

F.2 Low Level Sewer Connection Options

Existing Infrastructure

F.2.1 The low level sewer runs along the embankment and was constructed by Sir Joseph Bazalgette as part of the Victoria Embankment. The sewer was constructed integral with the river walls and a service subway, as shown in the plate below.

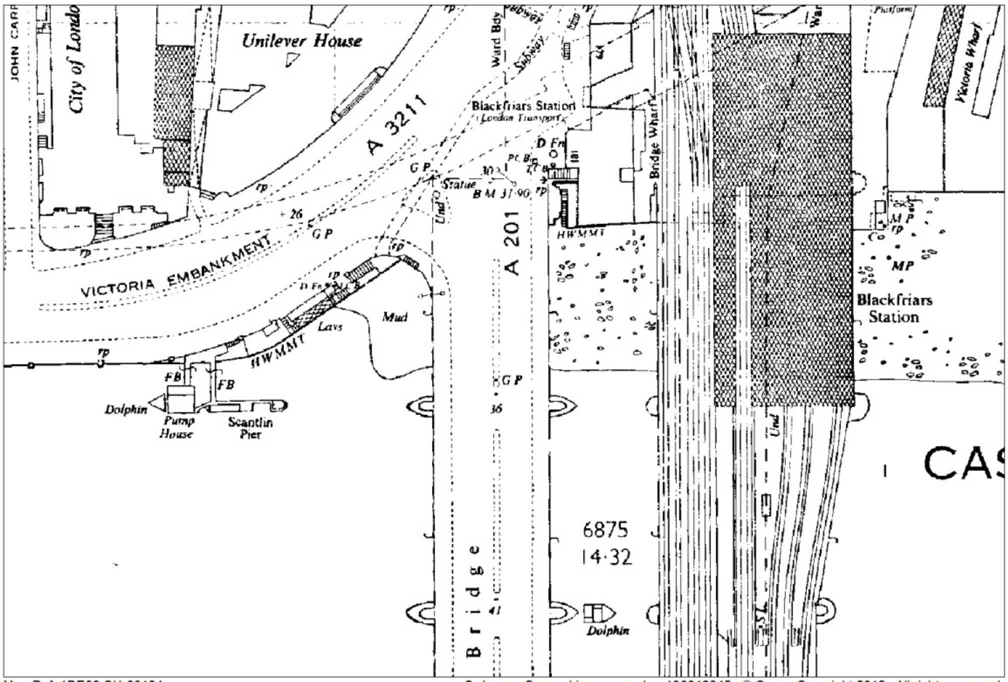
Plate F.1 Construction of low level sewer along Victoria Embankment



F.2.2 In this location, the service subway contains two gas mains (30" diameter low pressure and 36" diameter medium pressure) as well as an estimated 100 telecoms/fibre optic cables from various providers.

F.2.3 The original embankment was aligned further north at Blackfriars Bridge than it is today, as shown in Plate F.2, and the low level sewer and original utilities subway follow this alignment.

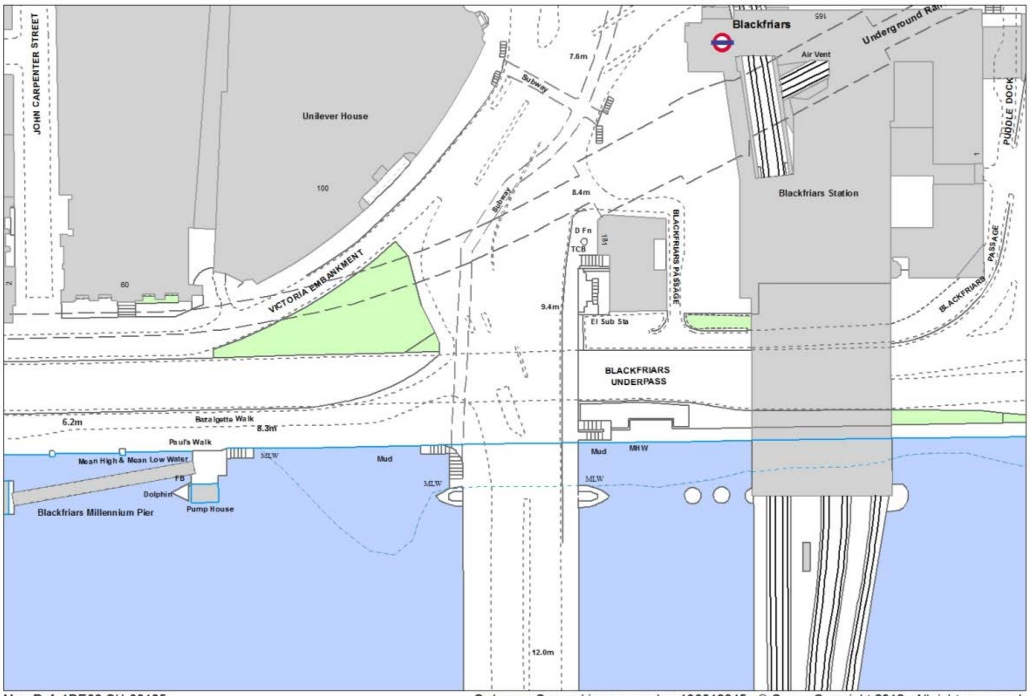
Plate F.2 Historic map of Victoria Embankment (c1965)



Map Ref: 1DE03-SH-00184 Ordnance Survey Licence number 100019345. © Crown Copyright 2012. All rights reserved.

F.2.4 In the 1960s, the Blackfriars underpass was constructed, which included an extension to the embankment and a new river wall under Blackfriars Bridge, forming what is now the riverside walk (see Plate F.2).

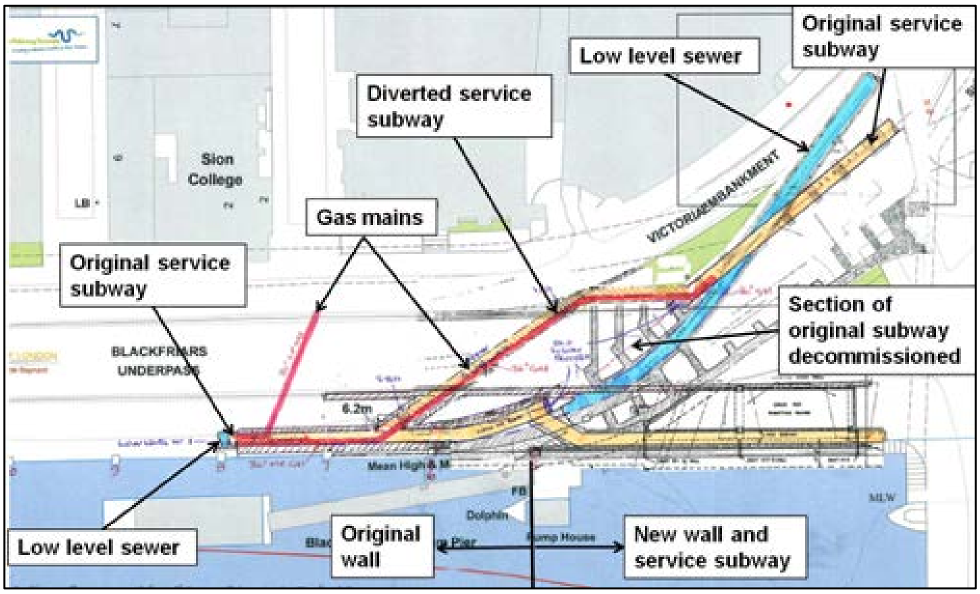
Plate F.3 Current map of Victoria Embankment



Map Ref: 1DE03-SH-00185

F.2.5 As part of these works, the gas mains were diverted for a short length, and a new service subway was constructed to follow the line of the new river wall. As a result, there is a short length of the sewer that does not have the gas mains over the top of it, located in the infilled section of the ramp (as shown on Plate F.4

Plate F.4 Sewer and utilities layout

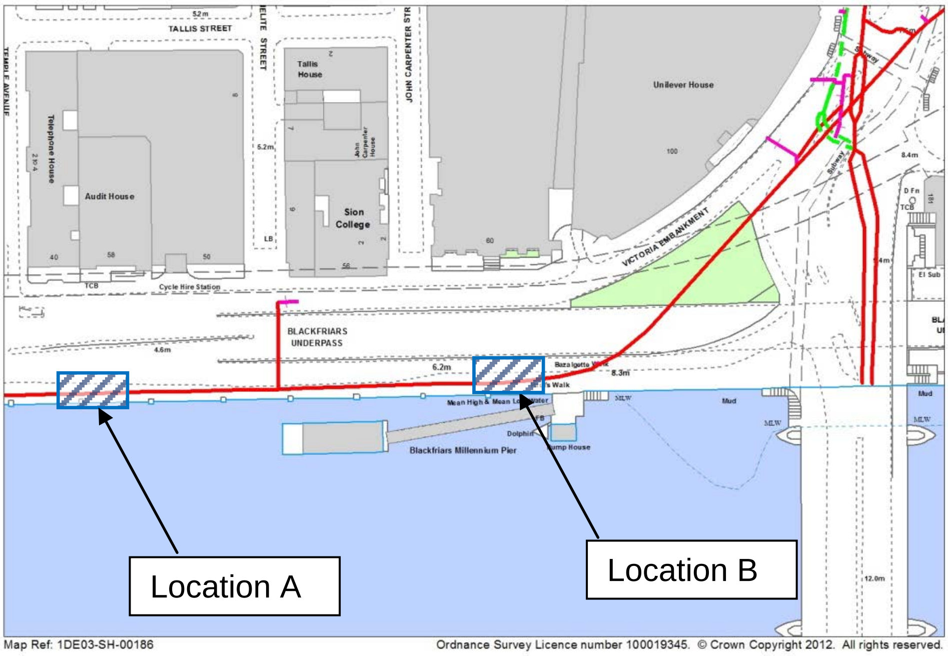


F.2.6 There are two options for making a connection to the low level sewer as illustrated in Plate F.5:

a. Location A: in the embankment, west of the off-ramp

b. Location B: in the off-ramp

Plate F.5 Options for location of connection to low level sewer



F.2.7 From a hydraulic point of view, it is likely that this connection could be made to the low level sewer as far west as Temple Stairs and still adequately control the CSOs, subject to detailed hydraulic modelling, ie 'Location A' could be moved westwards and meet the hydraulic criteria. A substantial part of the overflow weir chamber must be built to one side of the low level sewer (ie either to the north or to the south of it). In the proposed scheme, it would be built to the south of the low level sewer and incorporated into the proposed permanent structure in the foreshore. However, if the overflow weir chamber were located west of the proposed permanent structure in the foreshore at Blackfriars Bridge Foreshore, it would require either:

a. A new, separate, structure in the river in order to accommodate the overflow weir chamber to the south of the low level sewer, and all the works that this would entail, including construction of a temporary cofferdam and relocation of moorings. This would, in effect, be a separate worksite of a similar scale to the proposed Victoria Embankment Foreshore site.

b. Construction of the overflow weir chamber to the north of the low level sewer, ie into the carriageway of the road, which would increase the duration and extent of lane closures required along Victoria Embankment.

F.2.8 A separate drop shaft would likely be required for these alternatives, either to drop the flow to the depth of the main tunnel and connect to the main tunnel, or to drop the flow to a sufficient depth to allow a connection culvert back to the shaft at Blackfriars to be tunnelled under the foreshore.

F.2.9 Both of these alternatives would be expected to have significant effects, and therefore Location A (as show in Plate F.5) is considered to be the most efficient and least disruptive of any location in the embankment west of the off-ramp, and for this reason no further detailed hydraulic modelling was carried out of any alternative locations to the west of Location A.

Location A: In the embankment, west of the off-ramp

F.2.10 Connection to the sewer at this location requires diversion of the utilities in the services subway. As outlined above, and illustrated in Plate F.6, the services subway contains two major cast iron gas mains and numerous telecoms and fibre optic cables. With this option these would need to be diverted into the embankment carriageway in advance of the construction of the connection to the low level sewer.

Plate F.6 View of the services subway at location A.

F.2.11 The diversion works would be major works in their own right.

F.2.12 During the diversion works, the embankment would be reduced from two to one lane westbound.

Location B: In the off-ramp

F.2.13 Connection to the sewer at this location requires diversion of the utilities in the services subway. However, because of the diversions that were carried out as part of the 1960s work, there are very few utilities in the subway (as illustrated in Plate F.7), and diversion is expected to be relatively straight forward.

Plate F.7 View of the services subway at location B

F.2.14 During the construction of the connection to the low level sewer, the off-ramp would be closed.

F.3 Comparison of options

F.3.1 In this section the options are compared over a range of traffic and transportation issues.

F.3.2 The traffic assessment uses two scenarios to test the potential effects on the network, these are as follows:

F.3.3 **Construction Base Case.** This uses surveyed traffic flows taken in 2011 and applies a growth factor derived from the TfL Highway Assignment Models (HAMs) to uplift the traffic flows to the year 2021. 2021 has been selected as the Construction Base Case year for the transport assessment across the Thames Tideway Tunnel project. This is considered to be a conservative assumption as the peak traffic volumes at individual sites generally occur before 2021. The construction base case accounts for the major developments in London and provides a suitable increase in traffic volume for the assessment base year.

F.3.4 **Construction Development Case.** This uses the Construction Base Case and adds the peak proposed construction traffic from all the Thames Tideway Tunnel worksites. The project wide peak year is identified as 2019 as this has the highest volume of construction movements across the sites.

Impacts on the local road network

F.3.5 The impacts of the two options were compared at two locations selected as these locations would experience the greatest effects under the two different scenarios:

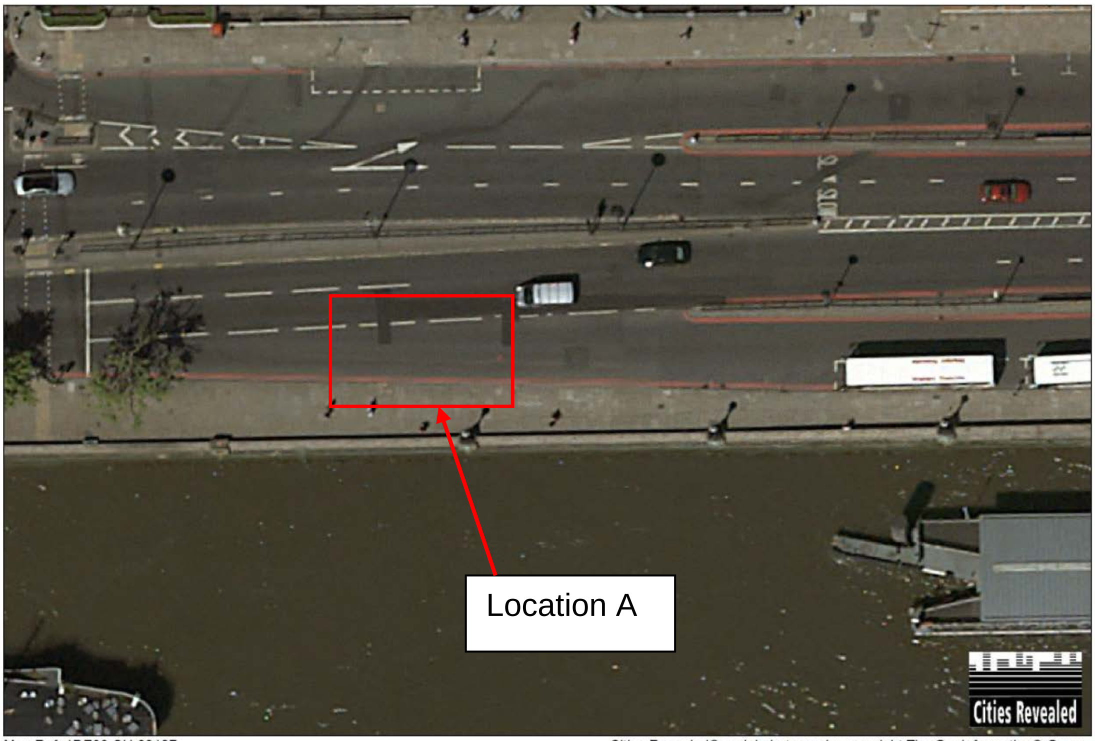
a. the westbound A3211 Blackfriars Underpass (at the Victoria Embankment junction with Temple Avenue)

b. the northbound A201 Blackfriars Bridge.

F.3.6 The westbound Embankment carries approximately 1600 vehicles per hour during the AM/PM peaks, with 1300 vehicles per hour during interpeak periods and Saturdays. New Bridge Street northbound carries approximately 1200 vehicles per hour in the AM/PM peaks, with 900 vehicles per hour during interpeak periods and Saturdays

Narrowing of Blackfriars Underpass (Location A)

Plate F.8 Aerial view of Location A



Map Ref: 1DE03-SH-00187 Cities Revealed® aerial photography copyright The GeoInformation® Group.

Capacity

F.3.7 This is measured by the degree of saturation (DoS) of the approach to a junction. An approach should typically be less than 90% DoS in order to cope with fluctuations in traffic levels. Between 90% and 100% DoS may be acceptable for very constrained or controlled networks. Above 100% DoS, traffic behaviour becomes difficult to predict due to volume exceeding capacity and should be viewed as a general indication of effect.

F.3.8 The local model (LinSig) gives a baseline capacity of the westbound Blackfriars Underpass of 72% DoS per lane during the AM peak and 65% during the PM peak. The impact of closing one lane of the underpass (ie the construction development case) is to increase the DoS to 142% during the AM peak and 152% during the PM peak.

F.3.9 The local model (LinSig) gives a baseline capacity of the northbound Blackfriars Bridge Road of 90% DoS per lane in the AM peak and 83% DoS per lane in the PM peak. The impact of closing one lane of the underpass is to decrease the DoS to 87% in the AM and 63% in the PM.

Queuing

F.3.10 Queuing in the modelling is defined per passenger car unit (PCU), which weights different size vehicles by length. For instance, 1 PCU equates to a car, 2 PCU's an HGV and 0.2 PCU a cyclist.

F.3.11 The modelled baseline queue level on the westbound Blackfriars Underpass is 15 PCUs per lane during the AM peak and 12 PCUs per lane during the PM peak. The impact of closing one lane of the underpass is to increase these figures to 311 PCUs in the AM and 377 in the PM.

F.3.12 The modelled baseline queue level on the northbound Blackfriars Bridge Road is 26 PCUs per lane during the AM peak and 16 PCUs per lane during the PM peak. The impact of closing one lane of the underpass is to decrease these figures to 24 PCUs in the AM and 12 PCUs in the PM.

F.3.13 It should be noted that, due to the DoS being over 100% on the capacity threshold for the construction development case, the figures stated here for Blackfriars Underpass should only be viewed as a general indication of queue level.

Delay

F.3.14 Delay in the model is defined as seconds per PCU. For simplicity this has been assumed as delay in seconds per vehicle.

F.3.15 The modelled baseline delay on the westbound Blackfriars Underpass is 15 seconds per vehicle during the AM peak and 13 seconds per vehicle during the PM peak. For the construction development case this increases to 10 minutes per vehicle for the AM peak and 11.5 minutes per vehicle for the PM peak.

F.3.16 The modelled baseline delay on the northbound Blackfriars Bridge Road is 32 seconds per vehicle during the AM peak and 38 seconds per vehicle during the PM peak. For the construction development case this decreases to approximately 27 seconds during the AM peak and 22 seconds in the PM peak period.

F.3.17 Again it should be noted that due to the DoS being over the 100% on the capacity threshold for the construction development case, the figures stated here should only be viewed as a general indication of delay on Blackfriars Underpass.

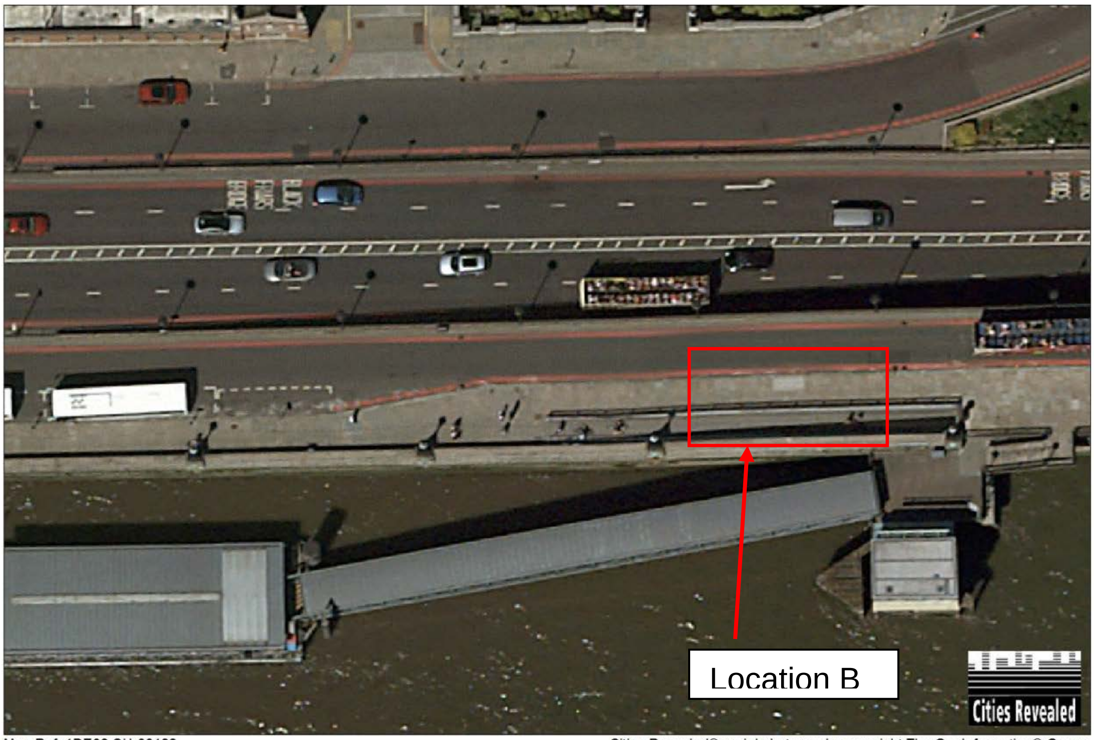
Journey time reliability

F.3.18 The modelled oversaturated traffic conditions at the Blackfriars Underpass/Temple Avenue junction indicate that there would be delay and queuing issues associated with narrowing the Blackfriars Underpass to enable the service diversion works. There is little network resilience to accommodate changes in traffic conditions.

F.3.19 Blackfriars Bridge Road traffic conditions are shown to be broadly similar to the base case.

Closure of westbound off-ramp (Location B)

Plate F.9 Aerial view of Location B



Map Ref: 1DE03-SH-00188

Cities Revealed® aerial photography copyright The GeoInformation® Group.

F.3.20 Potential diversion routes are summarised on Plate F.10 and include:

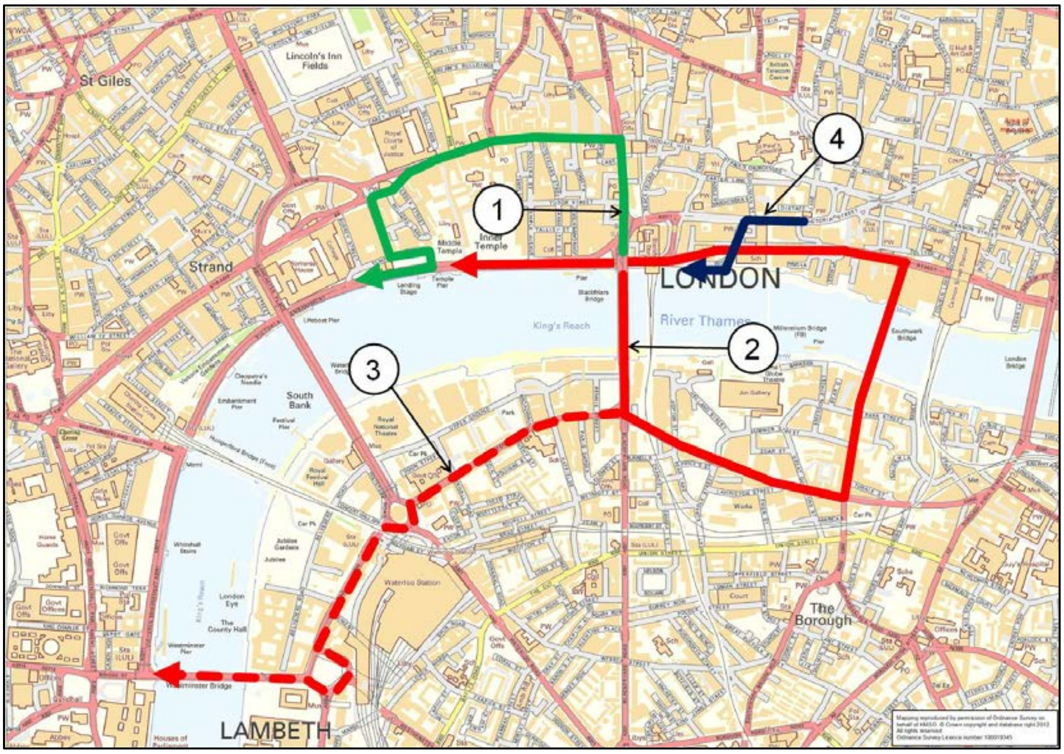
F.3.21 Northbound from Blackfriars Bridge - vehicles can continue along the A201 New Bridge Street and turn left onto Fleet Street/Strand, then head south onto Arundel Street and onto the A3211 Victoria Embankment via Temple Place.

F.3.22 Southbound from the A201 New Bridge Street – vehicles can continue over Blackfriars Bridge, head east along the A3200 Southwark Street, turn north on the A300 over Southwark Bridge and then west onto the A3211 Upper Thames Street.

F.3.23 Southbound form the A201 New Bridge Street – vehicles can continue over Blackfriars Bridge, turn west onto the A3200 Stamford Street A3200 and then cross back to Victoria Embankment via the A302 Westminster Bridge Road.

F.3.24 Westbound from Queen Victoria Street - vehicles can access Victoria Embankment via White Lion Hill and the Blackfriars Underpass.

Plate F.10 Potential Diversion Routes



Capacity

F.3.25 The baseline capacity of the westbound Blackfriars Underpass is 72% DoS per lane during the AM peak and 65% during the PM peak The effect of closing the westbound off-ramp would be to increase the DoS to 77% in the AM period and 73% in the PM peak period.

F.3.26 The baseline capacity of the northbound Blackfriars Bridge Road is 90% DoS per lane in the AM peak and 83% in the PM peak. Closing the westbound off-ramp would reduce the DoS in the AM peak to 83% and would reduce the PM peak to 53% DoS.

Queuing

F.3.27 The baseline queue level on the westbound Blackfriars Underpass is 15 PCUs per lane during the AM peak and 12 PCUs per lane during the PM peak. Closure of the off-ramp would have the effect of increasing these values to 17 PCUs during the AM peak and 15 PCUs during the PM peak.

F.3.28 The baseline queue level on the northbound Blackfriars Bridge is 26 PCUs during the AM peak and 16 PCUs during the PM peak. Closing the off-ramp would reduce the queue in the AM peak to 22 PCUs per lane. The closure would reduce the PM peak to 10 PCUs per lane.

Delay

F.3.29 The baseline delay on the westbound Blackfriars Underpass is 15 seconds per vehicle during the AM peak and 13 seconds per vehicle during the PM peak. For the construction development case this increases to 17 seconds per vehicle for the AM peak and 15 seconds for the PM peak period.

F.3.30 The baseline delay on the northbound Blackfriars Bridge Road is 32 seconds per vehicle during the AM peak and 38 seconds per vehicle during the PM peak. For the construction development case the AM peak decreases to 25 seconds per vehicle and the PM peak decreases to 18 seconds per vehicle.

Journey time reliability

F.3.31 Vehicles on Blackfriars Underpass would experience a similar level of queuing and delay to that currently with closure of the off-ramp.

F.3.32 Vehicles on the Blackfriars Bridge Road see a modelled improvement in DoS, queuing and delay. Primarily this is due to the right turn movement being removed from the junction, enabling more green time to be split over the remaining vehicle movements.

Summary of effects

F.3.33 It can be seen from the above results (summarised in Table F.1) that making the connection to the low level sewer at location B, within the westbound off-ramp, would result in significantly less disruption to local traffic.

Table F.1 Predicted traffic effects on westbound underpass

	Base Case		Development Case			
			Location A		Location B	
	AM	PM	AM	PM	AM	PM
Capacity	72%	65%	142%	152%	77%	73%
Queuing	15	12	311	377	17	15
Delay	15 secs	13 secs	10 mins	11mins 30secs	17 secs	15 secs

Table F.2 Predicted traffic effects on Blackfriars Bridge northbound

	Base Case		Development Case			
			Location A		Location B	
	AM	PM	AM	PM	AM	PM
Capacity	90%	83%	87%	63%	83%	53%
Queuing	26	16	24	12	22	10
Delay	32 secs	38 secs	27 secs	22 secs	25 secs	18 secs

Impacts on the wider road network

F.3.34 Strategic modelling is used as a tool to determine the effect over a wider area than the local modelling. This is used to highlight traffic displacement and general delays to vehicles over the network.

Narrowing of Blackfriars Underpass (Location A)

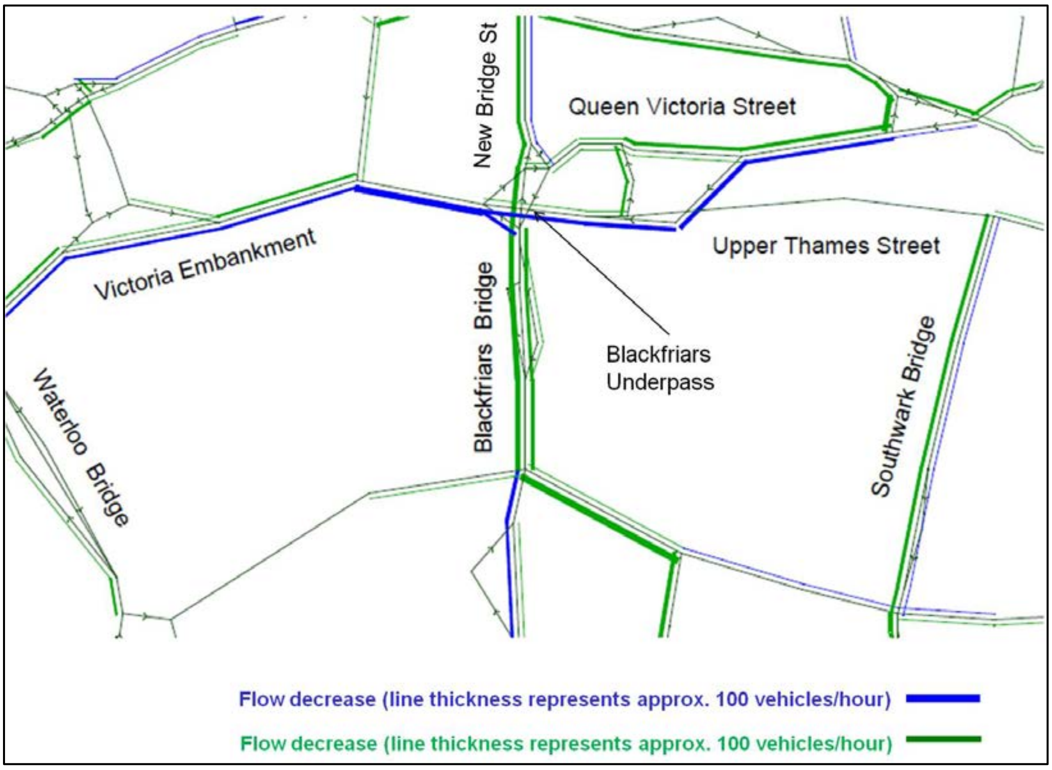
Capacity

F.3.35 Testing in the strategic (SATURN) model showed the changes in assignment were relatively small in each peak and effectively indistinguishable from model 'noise', despite the good degree of convergence achieved.

F.3.36 The reduction in flow on Upper Thames Street / Embankment in the AM peak model was 116 PCUs/hr and the conclusion from examining all three time periods (AM, interpeak and PM) was that the modelled impacts on general area are small compared to the total flows on affected links.

F.3.37 Plate F.11 summarises the change in flow due to the narrowing of Blackfriars Underpass. It shows the level of change by bandwidth, the wider the band the more the flow has changed on the link. Blue represents a decrease and green an increase.

Plate F.11 Narrowing of underpass - change in traffic flow



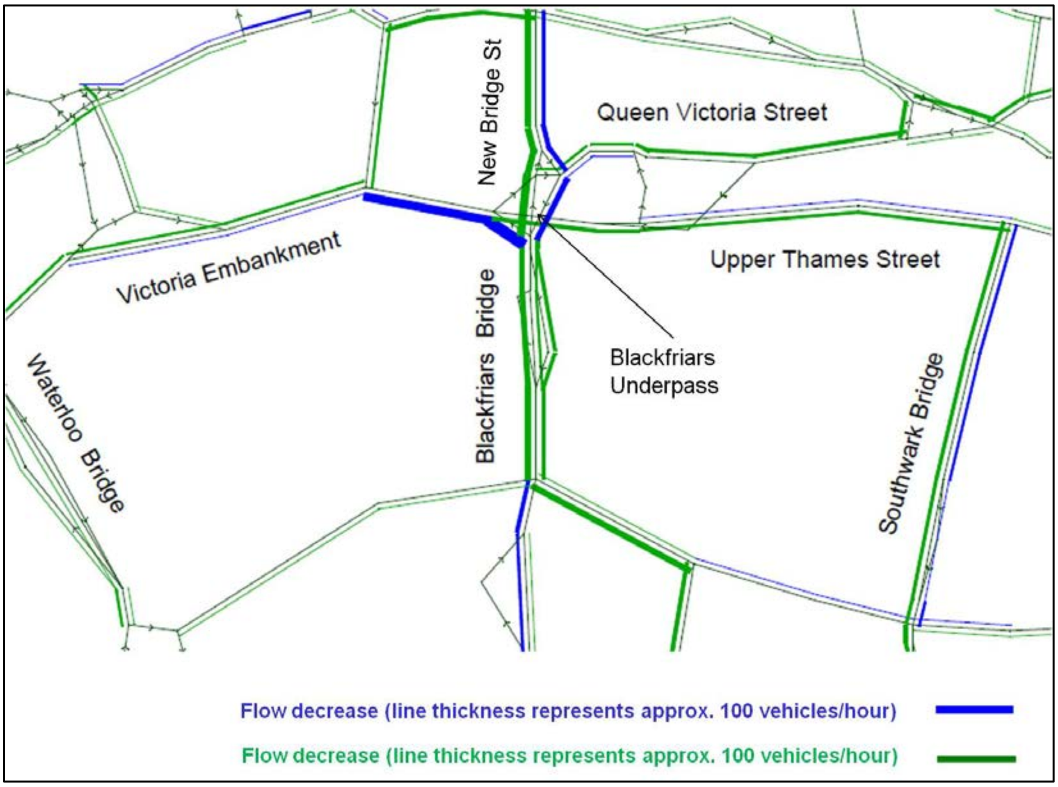
Closure of off-ramp (Location B)

Capacity

F.3.38 Testing the closure of the westbound off-ramp the model in the strategic (SATURN) model showed a reduction in the AM peak of 156 PCU/hr on the westbound Upper Thames Street/Embankment and an increase of 81 PCU/hr in northbound traffic north of Blackfriars Bridge (as traffic heads towards Fleet Street as an alternative to the embankment)

F.3.39 As with the narrowing of the Blackfriars Underpass, the modelled impacts on the general area are small compared to the total flows on affected links, as summarised on Plate F.12.

Plate F.12 Closure of off-ramp – change in traffic flow



F.3.40 Plate F.11 and Plate F.12 demonstrate that with either option the traffic does not redistribute widely throughout the traffic network.

Road safety

F.3.41 Works in the Embankment (location A) could raise road safety issues associated with:

a. road network delay and driver frustration

b. change in highway layout

c. increase on alternative side roads (‘rat running’)

d. cycle safety associated with increased delay/frustration.

F.3.42 Closure of the off-ramp (location B) could raise road safety issues associated with:

a. increased distance travelled / unusual route

b. cycle safety associated with increase distance travelled.

F.3.43 The pedestrian safety issues would be the same in either option. Pedestrians would be diverted to cross Blackfriars Bridge Road, Victoria Embankment on/off slip roads and Victoria Embankment.

Bus services

F.3.44 The only day service which has recently used Victoria Embankment is route 388, which operates between Hackney Wick and Blackfriars Station. The service was extended to Embankment station during the redevelopment of Blackfriars Station and therefore used the westbound off-ramp and Victoria Embankment. The service now terminates at Blackfriars again following the reopening of the underground station. This and some other bus routes ending at Blackfriars Station turn around at the u-turn facility provided on New Bridge Street in front of the station. Closure of the off-ramp would have no direct impact on these bus routes.

F.3.45 Following the curtailment of route 388, the only bus service to use Victoria Embankment is route N550. This is a night bus which operates every 30 minutes between Canning Town and Trafalgar Square. It approaches Blackfriars from the east along Queen Victoria Street and descends onto Victoria Embankment via the westbound off-ramp from Blackfriars Bridge.

F.3.46 Connection to the Low Level Sewer at Location A would have no significant impact on bus route N550 since, operating during off-peak periods, it is unlikely to be affected by the narrowing of the underpass. Connection to the Low Level Sewer at Location B, however, would close the off-ramp and require a diversion of the westbound route of the N550 bus service. The eastbound route would be unaffected.

Other impacts

Coaches

F.3.47 Two coach bays are provided on the westbound off-ramp, with a maximum 20 minute waiting time.

F.3.48 In both scenarios, with works at location A or B these bays would require suspension and relocation of the bays to provide access to the foreshore worksite.

On-street parking

F.3.49 A loading bay/disabled bay is provided adjacent to the coach parking bays on the westbound off-ramp.

F.3.50 In both scenarios, with works at location A or B, this bay would require suspension and relocation of the bay for the duration of the works.

Duration and Phasing of Works

F.3.51 It is estimated that the lane closure required for location A would be a minimum of 12 months, which includes construction of a secant piled wall adjacent to the existing sewer and the diversion works themselves. This estimate is approximate as the utility companies are unable to provide accurate programmes at this stage of design. Lane closure would not be required for the construction of the overflow weir chamber itself.

F.3.52 It is estimated that the ramp closure required for location B would also be approximately 12 months, which is based on the current construction programme, and allows for the minor utility diversions and construction of the civil works around the existing low level sewer.

Cost

F.3.53 The cost of the diversion works at Location A is estimated to be approximately £20m. This is made up of £8m for the British Telecom, £5m for the gas mains and the remainder from various telecoms suppliers.

F.3.54 The cost of the diversion works at Location B is estimated to be £0.5m.

F.3.55 Table F.3 summarises the services required to be diverted at each location, along with approximate costs and duration.

Table F.3 Service Diversion Summary

	Location A	Location B
Estimated Services	30” Low Pressure Gas Main 36” Medium pressure Gas Main Approx. 100 telecom cables from a number of different providers Low Voltage Power	Approx. 10 telecom cables Low Voltage Power
Cost of Diversion	Approximately £20m - made up of £8m from BT, £5m for the gas mains and the remainder from various telecoms suppliers.	Approximately £0.5m
Duration of Diversion	Gas: 17 months including lead in etc. BT: 18 months including lead in etc. Other telecoms: up to 6 month lead in and 6 months on site for each provider Unlikely that many diversions can be carried out concurrently.	6 month lead in and 6 months on site.
Duration of road closure	Minimum 12 months	12 months

F.4 Other options considered

Bridging road over works

F.4.1 Another option considered was a variation on Location B, where the connection to the Low Level Sewer is made in the off-ramp. In order to keep the off-ramp open for as long as possible and to minimise the traffic impact, the possibility of spanning the works with a temporary bridge structure was investigated.

F.4.2 The sketches in the Plate F.13 summarise the key elements of such a scheme. An estimated minimum headroom of 5m would be required between the top of the river wall and the underside of the bridge to facilitate construction of the interception works. In order to achieve this, the existing off-ramp would need to be filled either side of the bridge. The bridge itself would need to span approximately 28m.

F.4.3 This option was not considered practical for a number of reasons:

F.4.4 There is not sufficient space available to achieve the 5m minimum headroom requirement and the Department for Transport desirable maximum grade for single carriageways of 6%. The ramp off the temporary bridge would extend beyond the end of the existing ramp onto the Victoria Embankment.

F.4.5 The fill required would place significant additional load on the existing structures, in particular the retaining wall to Blackfriars Underpass (see Section A) and the suspended section of the existing ramp east of the temporary bridge. It is likely that extensive modifications would be required before the temporary bridge would be feasible.

F.4.6 The 5m headroom limit severely restricts the plant and, therefore, construction methods available.

F.4.7 The off-ramp would still need to be closed for a period of time in order to construct the bridge.

This option was therefore not considered any further.

F.5 Summary

F.5.1 A connection needs to be made to the Low Level Sewer No.1 at the Blackfriars Bridge Foreshore site in order to control CSO discharges along the tidal Thames to achieve compliance with the Urban Wastewater Treatment Directive.

F.5.2 There are two options for where this connection could be made:

F.5.3 In the embankment, west of the Blackfriars Bridge westbound off-ramp (Location A)

F.5.4 In the Blackfriars westbound off-ramp, resulting in closure of the off-ramp (Location B).

F.5.5 Making the connection in the embankment would require considerable service diversions - 36” diameter medium pressure gas main, 30” diameter low pressure gas main and an estimated 100 telecoms/fibre optic cables. This would result in a lane closure of the A3211 for approximately 12 months and cost approximately £20m. The interception works could only be commenced once these diversions have been made.

F.5.6 Making the connection in the westbound off-ramp requires significantly fewer services to be diverted – approximately 10 telecom cables and a low voltage supply (estimated cost £0.5m). A connection at this location would require the off-ramp to be closed for 12 months, although this would allow for the utility diversion works and the interception works to be completed.

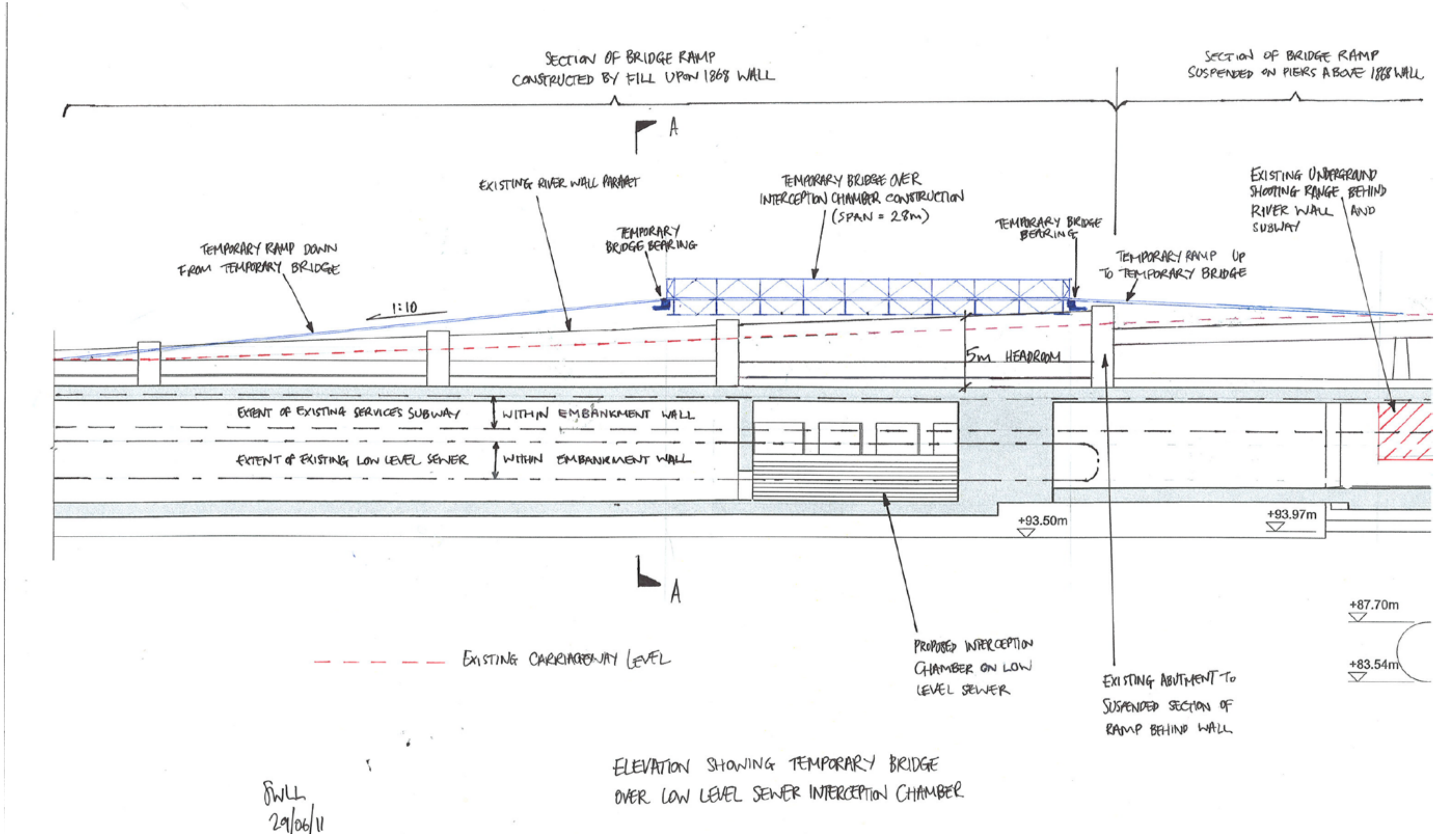
F.5.7 Traffic modelling has demonstrated that making the connection in the embankment would result in significantly more disruption to local traffic. For example, delays on the westbound A3211 during the morning peak would increase from 15 seconds to 10 minutes.

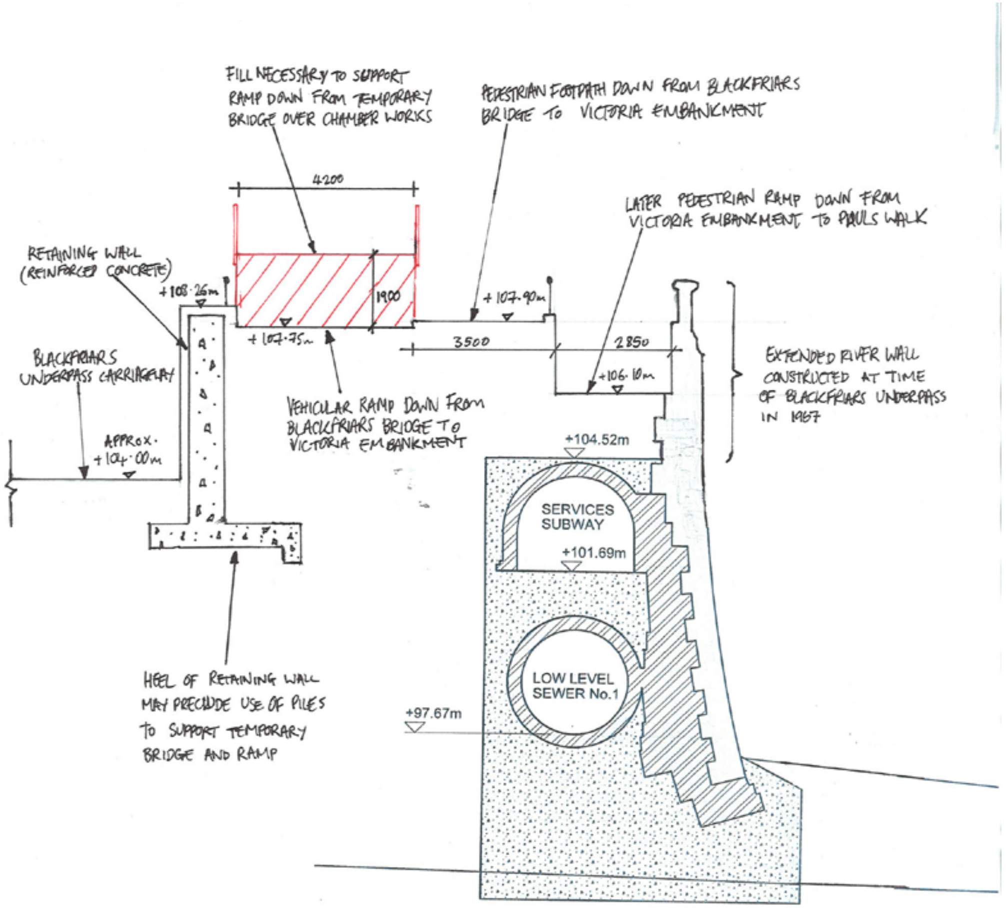
F.5.8 Neither option caused traffic to redistribute significantly throughout the wider traffic network.

F.5.9 An option of temporarily bridging the connection point in the off-ramp was considered in an effort to keep it open to traffic. However, this solution was not found to be practicable due to the size of structure required.

F.5.10 The preferred approach is to make the connection to the low level sewer in the westbound off- ramp, shown as Location B in Plate F.5.

Plate F.13 Temporary Bridge Structure





SECTION A-A THROUGH BLACKFRIARS BRIDGE DOWN RAMP, SHOWING TEMPORARY BRIDGE RAMP FROM BRIDGE OVER LOW LEVEL SEWER INTERCEPTION CHAMBER

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Appendix G: Road Safety Audits

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Thames Water Utilities Limited

Thames Tideway Tunnel - Blackfriars Bridge Foreshore

Stage 1 Road Safety Audit

Project Ref: 27016/033

Doc Ref: BF01

15th February 2013

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Document Control Sheet

Project Name: **Thames Tideway Tunnel - Blackfriars Bridge Foreshore**

Project Ref: **27016/033**

Report Title: **Stage 1 Road Safety Audit**

Doc Ref: **BF01**

Date: **15th February 2013**

	Name	Position	Signature	Date
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Approved by:	Alan Fry	Divisional Director		15th February 2013
For and on behalf of Peter Brett Associates LLP				

Revision	Date	Description	Prepared	Reviewed	Approved

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Contents

Appendices

1 Introduction

1.1 Peter Brett Associates LLP has been commissioned to undertake a series of Stage 1 Road Safety Audits on proposals associated with the construction of the Thames Tideway Tunnel project in London.

1.2 This Audit has been undertaken on the highway aspects of the proposal at Blackfriars Bridge Foreshore site and considers both the situation during the construction phase and post construction. At this location new temporary and permanent river walls will be created to retain a construction site platform and permanent maintenance site platform within the River Thames.

Extending east and west from the main highway aspects of this scheme, there are proposals to construct new ramps, steps and lifts etc. to facilitate pedestrian access to the relocated riverside attractions and realigned Thames Path etc. However, these details have not been considered in detail as part of this Audit.

1.3 This Audit also considers two associated remote locations; 1) in Blackfriars Road (south of the Thames) and 2) in White Lion Hill (north of the Thames), where the provision of temporary coach bays and the relocation of a loading bay, respectively, is proposed. Details of how these Coach Parking Bays and Loading Bays function in relation to their specific purpose, services, drop-off, pick-up, lay-up etc., and how this may influence both vehicle and pedestrian movements have not been provided to the Audit Team and as such our consideration of safety of this proposal has been limited.

1.4 At both the main Foreshore location and the Blackfriars Road (south) locations, the surrounding highway network is urban in nature, within a 30mph speed limit, is illuminated by a system of street lighting, with footways on both sides of the carriageway. The same characteristics exist at the White Lion Hill location, except that no footways are present.

1.5 The scheme proposals that affect the existing highway consist of the following phases:-

- Construction Phases:-
  - Phase 1 and Phase 2 where the carriageway of the westbound on slip in Victoria Embankment A3211 is narrowed with a give-way merge onto the lanes emerging from Blackfriars Underpass with associated traffic management to accommodate the passage of large delivery vehicles accessing the site;
  - Phase 3, Closure of the westbound slip onto Victoria Embankment A3211 with site access via Blackfriars underpass;
  - Closure of existing southern footway and signal controlled crossing with pedestrians diverted to the north footway on the A3211;
  - Closure of existing riverside footway and ramps/steps to boat access;
  - Temporary vehicle access across existing footway with opening formed in existing parapet of river wall;
  - Suspending of Coach Parking / Loading Bays / Disabled Bays with relocated provision on Blackfriars Road (Coach Parking), south of the Thames and White Lion Hill (Loading Bay), north of the Thames;
  - Higher construction vehicle flows expected, with 12hr working used during tunnel drive operations;

- Operational Phase:-
    - Highway layout to be returned to its current layout i.e. parking bays reinstated, existing pedestrian crossings and footways reopened;
    - New permanent vehicle access constructed across footway with opening formed in existing parapet of river wall;
    - 6 monthly maintenance access required by transit van;
    - 10 yearly maintenance required by rigid HGV / mobile crane.

- Coach Parking Relocation:-
    - Provision of inline coach parking bays in general vehicle lanes on approach to existing bus stops:
    - Loss of a short length of existing cycle lane provision;

- Loading Bay Relocation:-
    - Provision of on-street parking bay (loading only):
    - Realignment of central paved area and chevron hatch markings;
    - Provision of short length of footway:

1.6 The Audit Team Membership was as follows:-

Audit Team Leader:-

Simon Owen — Peter Brett Associates, Reading

Team member:-

Matthew Fleming — Peter Brett Associates, Taunton

The Audit Team are independent of the Design Team.

1.7 The Audit took place during December 2012 to February 2013. The Audit Team visited the site on 12th December 2012 between 08:30 and 09:45. The weather during the site visit was cold and dry. A subsequent visit was made by the Audit Team to the White Lion Hill Location only. This visit was made on the 14th February 2013 between 09:00 and 10:00; the weather was light cloud and dry. The Audit comprises of an examination of the documents listed in Appendix A.

1.8 The Audit Team have not been made aware of any Departure from Standards identified with this proposed scheme. The Audit Team have not been provided with a specific Audit Brief but have received a number of documents that are describing the proposed works.

1.9 The Audit Team have received a document summarising the recorded collision data within the surrounding highway network for a 5 year period (April 2006 to March 2011). The Audit Team have not been provided with the raw collision data, therefore, a full review and analysis of the recorded collisions cannot be undertaken as part of this Audit. Collision data was not provided for the highways in the vicinity of the replacement coach parking site.

1.10 The Terms of Reference of this Audit are as described in Transport for London (TfL) Procedure SQA-0170. The Audit Team has examined and reported only on the road safety implications of the scheme as presented and has not examined or verified the compliance of the designs to any other criteria. However, to clearly explain a safety problem or the recommendation to resolve a problem the Audit Team may, on occasion, have referred to a design standard without touching on technical Audit.

1.11 This Audit has a maximum shelf life of 2 years. Should the scheme not progress to the next stage in its development within this period it should be re-audited.

1.12 Problems identified in the report are indicated by location and are shown on the site reference plan in Appendix B.

2 Items Raised from this Stage 1 Road Safety Audit

Construction Phases

2.1 Problem

Location - General

Summary - Conflict through traffic management on westbound on-slip

The proposed arrangement of traffic management and the swept path analysis indicate that there may be insufficient space for vehicles to manoeuvre safely through the westbound on-slip. The high volume of large vehicles and cycles within the general traffic and generally high vehicle speeds observed during the site visit may give rise to the following potential problems when considered independently and/or in combination with the onerous swept path movements of the construction design vehicles:

- Conflict between vehicles and cyclists
- Conflict between construction traffic and general traffic, when accessing and egressing the public highway
- Conflict between all vehicles and temporary traffic management street furniture
- Conflict between all vehicles and site operatives

It is noted that the speed at which the swept path analysis has been carried out at is 5kph. This is a very slow speed and may not be realistic for construction vehicles accessing the site from the public highway or the general through traffic negotiation the traffic management. .

For example, the Phase 3 construction arrangement and swept path analysis, suggest that it is likely that large vehicles entering / exiting the site may pass into adjacent live vehicle lanes, may not clear the carriageway and may cause other vehicles to make injudicious manoeuvres to avoid collision.

Recommendation

Notwithstanding the fact that the swept path analysis has been undertaken using Ordnance Survey data (and not topographical survey data), the effect on the swept paths of both construction and general vehicles travelling at a more realistic speeds should be checked. Where necessary, the traffic management arrangement should be reviewed. The Design Team should also consider the following, with all findings presented for consideration at a supplementary Stage 1 RSA:

- Test all individual and vehicle combinations / simultaneous swept path movements through the temporary traffic management and site access/exit
- Safe passing width to temporary traffic management and both existing and temporary street furniture
- Safe passing width to construction working zones
- Completing manoeuvres in one movement to clear carriageway
- The effect of slowing / turning manoeuvres on other vehicles in carriageway
- Lane widths through the traffic management should be appropriate to accommodate cyclists safely.

2.2 Location - Junction between On-slip and Underpass and through General Traffic Management

Summary - All user conflict due to obstructed forward and inter visibility

The proposals indicate that vehicles from the west bound slip-on will be required to give-way to westbound vehicles from the underpass. The proposed give-way line is formed along the line of the existing lane markings, between these two carriageways, and as such is approximately parallel to the approach direction of vehicles from the on-slip and is unlikely to be easily / correctly interpreted by road users. This give way line is also in close proximity to the existing parapet and barrier retaining structure between both carriageways and is likely to obstruct intervisibility between road users. Individually or in combination, the above factors are likely to increase the risk of conflict between vehicles in this area.

Similarly, Phase 3 requires construction vehicles to access the site directly from the westbound underpass vehicle lanes, immediately after the point at which the existing parapet / retaining structure between the carriageways terminates. As such this is likely to obstruct forward visibility to this access, making it difficult to anticipate its location and may require vehicles to utilise the offside lane to complete the manoeuvre, increasing the risk of conflict with general westbound traffic on the underpass.

Furthermore, the temporary barrier used to isolate the general public vehicle movements and those of the construction vehicles, plus the proposed location of the site security office may restrict intervisibility between all users.

Recommendation

Review all proposed temporary traffic management layouts to ensure they afford all road users adequate forward / intervisibility and understanding of priority for the road ahead. The review should consider the following, with findings presented for consideration at a supplementary Stage 1 RSA:

- The proposed barrier type and its potential to become an obstruction to visibility
- The potential for all phases to be accessed from the slip-on road
- Swept path manoeuvres of construction traffic and general traffic
- Forward visibility and junction visibility
- Relocate the site security office out of the visibility splays
- Indicate appropriate visibility splays to/from junctions with construction accesses.

2.3 Location - General

Summary - Conflict between pedestrians and vehicles

The proposals indicate that the footway adjacent to the Thames along the westbound on-slip will be closed to a varying degree with pedestrians being diverted to the existing footway on the north side of the A3211 to continue their journey. The closure and diversion will have the following characteristics that may give rise to an increased risk for pedestrians, especially when considered in the context of the likely high pedestrian flows:

- The proposed diversion route is significantly longer than the closed route and utilises existing multi stage signal controlled crossings with potentially long wait times to cross the carriageway. This may encourage pedestrians to seek uncontrolled crossing opportunities and / or routes where no footway exists;
- The existing footway width is significantly reduced and in some locations significantly obstructed by trees and street furniture on the approach to signal controlled crossings. This may force pedestrians to use the carriageway to continue their journey;
- The proposed diversion route has significantly more conflict points with other users. Some of these conflicts are controlled but some are uncontrolled with undefined priority, especially between pedestrians and cyclists.
- The diversion route relies on a lift, (east side of bridge), for pedestrians with mobility impairment to continue their journey safely. Continuity of route may therefore have increased risks for this vulnerable road user group.

Recommendation

Review the proposed footway closures and diversions to ensure that the footway closures and diversion routes can be negotiated safely and provide an adequate level of service in the context of potentially high pedestrian flows. Ensure adequate space can be safeguarded for advance signage of diversion/restrictions without obstructing busy footways. Details to be prepared and submitted for consideration at a Stage 2 RSA.

2.4 Problem

Location - Construction access

Summary - Conflict for all users

Some of the proposed construction phase site access swept paths indicate vehicles entering and exiting the site but do not indicate the full turning manoeuvre on the site itself. It is therefore not clear if vehicles can exit the site in a forward gear. Should vehicles be required exit the site in a reverse gear the risk of conflict to all users will significantly increase.

Recommendation

The proposals must ensure that the largest anticipated vehicles can enter and exit the site in a forward gear.

2.5 Problem

Location - Junction between westbound on-slip and Blackfriars Bridge

Summary - Conflict for all users

The drawing titled ‘Construction Phases – Phase 3, Construction of other structures, Book of Plans – section 10’ (Drg No. DCO-PP-17X-BLABF-190050) indicates a construction access at the existing junction between the westbound on-slip and Blackfriars Bridge. This is inconsistent with other drawings showing the general construction accesses and associated vehicle movements etc. The drawings do not include details of its intended use and operation and therefore this limits the level of consideration within the context of road safety within this Audit. However, the Audit Team have the following general concerns:

- Vehicles entering the site may not clear the main carriageway in one movement
- Vehicles exiting the site will enter the signalised junction without being controlled by its own signal phase
- Increased risk of conflict between cyclist and large vehicles turning left
- Vehicles turning through a strong pedestrian desire line

Recommendation

The Audit Team recommends that the proposals for a potential vehicle access at this location are reviewed and that its intended function is clarified. Should a vehicle access be provided at this location, The Design Team should assess its suitability, with reference to 2.1 and 2.2 above, present their analysis for consideration at a supplementary RSA1.

2.6 Problem

Location - Westbound on-slip (Victoria Embankment)

Summary - Reduced ‘Disabled Vehicle’ Access

There are 3 existing parking bays on the westbound on-slip which are signed as exceptions, (for loading, disabled and buses), to the existing ‘No Stopping on Red Route’ parking restriction. The details include proposals for replacement Coach Parking and replacement Loading Bays, albeit that it is unclear that these replacements are directly related to those to be removed from the westbound on-slip. However, the proposals do not include for replacement of the existing ‘Disabled’ Parking Bays, that are removed during construction, which may result in increased risks for pedestrians with mobility impairment in this area.

Recommendation

The Audit Team recommends that the requirement to retain some provision for ‘Disabled’ Parking and access to this area is reviewed and, if necessary, provide suitable temporary replacements during construction.

Replacement Coach Parking

2.7 Location - Blackfriars Road – Replacement Coach Parking

Summary - Conflict for cyclists

The proposed on street coach parking bay extends north into the existing 2-lane southbound exit from the signalised cross roads, where the nearside lane includes a cycle lane provision. This reduction in the nearside lane length shortens the distance over which vehicles are required to merge, when the temporary coach bays are occupied by vehicles and may increase the risk of conflict between vehicles and cycles.

Recommendation

The proposals should include adequate distance, markings and signage to provide sufficient advanced warning and length to perform the merge safely.

2.8 Location - Blackfriars Road – Replacement Coach Parking

Summary - Obstructions to pedestrians

The proposed coach parking bays are adjacent to various items of street furniture close to the edge of the carriageway, which may obstruct the safe pedestrian access / egress to and from the coach.

Recommendation

The design team should consider the existing street furniture when determining the number and precise location of proposed parking bays. If necessary, street furniture should be relocated to avoid conflict.

2.9 Location - Blackfriars Road – Replacement Coach Parking

Summary - Vehicle conflict with all users

The proposed coach parking bays are located either side of an existing vehicle access to St. George's Health Service Centre where vehicles appear to both reverse into and out of Blackfriars Road. The presence of coaches in these bays is likely to severely obstruct the intervisibility between all road users when vehicles are manoeuvring at this location.

Recommendation

The proposed parking bays should be located to avoid obstructing visibility splays.

2.10 Location - Blackfriars Road – Replacement Coach Parking

Summary - Vehicle conflict

The proposed coach parking bays are located adjacent to directional signage that would be masked to other southbound drivers by the presence of large vehicles. This may lead to driver confusion and poor vehicle manoeuvres at downstream junctions, increasing the risk of vehicle conflict.

Recommendation

The proposed parking bays should be located to avoid obstructing forward visibility to all signage. If this cannot be avoided, relocated temporary signage should be provided.

Operational Phase

2.11 Problem

Location - Permanent Vehicle Access

Summary - Conflict for all users

The proposed permanent maintenance access is indicated as a vehicle footpath crossing between the westbound slip-on and the parapet river wall, leading to a proposed area incorporating a realigned/reinstated Thames Path. The proposals do not indicate how this access will be secured or how unauthorised vehicle access may be restricted, but if a gate or bollards is provided along the line of the existing parapet wall it will not provide adequate space for a vehicle to clear the carriageway and as such may obstruct westbound vehicles. Furthermore, pedestrians may be required to walk in the carriageway to continue their journey.

Recommendation

Provision of a gate or other vehicle restriction and this access arrangement in general should be such that all vehicles required to access the site can clear the highway and footway in one movement.

2.12 Problem

Location - Permanent Vehicle Access

Summary - Conflict for tall vehicles with electricity supply

An existing string of high level lighting runs between the feature piers on the line of the existing parapet wall. It is not clear if this electricity supply will be retained in the final instance but may present a hazard to tall vehicles accessing the site.

Recommendation

If retained, the lighting and electricity supply should be located at a height that provides safe clearance to the tallest vehicle anticipated to visit the site. It may also be necessary to install appropriate hazard warning and /or vehicle height restrictions. Alternatively, this section of lighting could be removed or relocated to a position that is not at risk of conflict with vehicles.

2.13 Problem

Location - Permanent Vehicle Access

Summary - Conflict for all users

The proposed site access location is adjacent to parking provision for large vehicles that are likely to obstruct intervisibility between all users and vehicles entering and exiting the site. Obstructed intervisibility may increase the risk of conflict due to difficulties anticipating the presence and movements of other users. This may be exacerbated by the potential for ad-hoc unscheduled use of this access as a pull-in / drop off outside of the scheduled movements of maintenance vehicles.

Recommendation

The permanent access arrangement should be designed to ensure that adequate intervisibility can be afforded for all users and vehicle movements associated with the proposed access.

2.14 Problem

Location - Permanent Vehicle Access

Summary - Conflict for all users

The proposed site access swept paths indicate vehicles entering and exiting the site but do not indicate the full turning manoeuvre on the site itself. It is therefore not clear if vehicles can exit the site in a forward gear. Should vehicles be required exit the site in a reverse gear the risk of conflict to all users will significantly increase.

Recommendation

The proposals must ensure that the largest anticipated vehicles can enter and exit the site in a forward gear.

Loading Bay Relocation

2.15 Location - White Lion Hill – Junction with Upper Thames Street (A3211)

Summary - Difficult observation to / from junction

The existing junction between White Lion Hill and Upper Thames Street is formed with a very acute approach angle from White Lion Hill, which makes observations from the give-way line difficult and may lead to poor judgement of the speed and path of vehicles in Upper Thames Street, when trying to find gaps to manoeuvre into. The proposals indicate a removal of what appears to be an existing remedial realignment of the kerblines at the approach from White Lion Hill, which may have been installed to address an existing accident problem at this junction, (see drawing titled ‘Transport - accident locations – Figure 18.4.9’ (Drg.No. 1PL03-TT-50753). This may be exacerbated by the following observations made by the Audit Team during the site visit:

- Relatively high speeds of vehicles in both roads
- Relatively high number of cyclists in both roads

- Potentially restricted junction visibility due to elevation, parapet wall and railing associated with White Lion Hill, and building structure over Upper Thames Street.
- Potentially restricted awareness of side road due to obstructions mentioned above
- Down Hill Approach from White Lion Hill
- Relatively high volume of large vehicles making slow turning manoeuvres onto Upper Thames Street

The Audit Team observed a left-hand-drive coach joining Upper Thames Street from White Lion Hill, with great difficulty. This resulted in westbound vehicles in Upper Thames Street coming to a stand-still to allow the coach to carry out its manoeuvre.

Recommendation

Review the suitability of providing an additional volume of large vehicles through this junction. The review should include consideration of the following:

- Achievable junction visibility
- Actual vehicle speeds
- Swept path analysis of largest vehicle anticipated through this junction
- The causation / type of accidents at this junction

The findings of this review should be presented for consideration at a supplementary Stage 1 Road Safety Audit.

2.16 Problem

Location - White Lion Hill

Summary - Conflict for all users

The proposed purpose, function, vehicle type and frequency of use associated with this loading bay are unclear within the details provided for this Audit. As such the Audit Teams consideration of potential problems and risks has been limited. However, the following is a summary of the Audit Teams general observations and concerns:

- Existing building and street furniture potentially obstructs forward visibility on inside of right hand bend
- Narrow / no off carriageway pavement alongside or to the rear of delivery bay
- No connecting footways or other access for onward journey of items off-loaded
- No tapers provided on exit from proposed delivery bay
- Details of change of requirement for vehicles to merge from left to right rather than the existing right to left not detailed.
- Activities and their frequency associated with loading bay are unclear – potential for increased risks associated with pedestrians or other vehicles in the carriageway
- Large vehicles at loading bay may obstruct forward visibility to existing hazard warning signage.
- Existing vehicle weight and length restrictions may conflict and or cause confusion with vehicles anticipated to use the proposed loading bay

Recommendation

Review the suitability of providing a loading bay at this location. The review should include consideration of the following:

- Achievable forward visibility to loading bay
- Actual vehicle speeds
- Swept path analysis of largest vehicle anticipated with this loading bay
- Clarify purpose, function, loading vehicles and associated activities
- Review existing vehicle weight and length parking restriction

The findings of this review should be presented for consideration at a supplementary Stage 1 Road Safety Audit.

2.17 Problem

Location - White Lion Hill – Thames Path

Summary - Conflict for pedestrians

The proposals indicate a 'Gate and emergency access for Blackfriars Pier' at the existing wall between the paved areas adjacent to White Lion Hill and the Thames Path. No other details have been provided for consideration at this stage and therefore determination of potential risks has been limited. However, the following is a summary of the Audit Teams general observations and concerns:

- Existing wall, potential level difference and current construction works may result in obstructions to the feasibility of this access.
- There are no connecting footways for onward journeys from the paved area adjacent to White Lion Hill.

Recommendation

Review the suitability of providing an emergency access at this location and clarify its purpose and function for consideration at a supplementary Stage 1 Road Safety Audit.

2.18 Problem

Location - Thames Path – Diversion Route

Summary - Conflict for pedestrians

The proposals indicate a short diversion route around the proposed hoarding associated with the access ramps to the new pier. The diversion route appears narrow in places and may be obstructed by the final form of the current construction works and the existing wall adjacent to White Lion Hill, mentioned in 2.17 above. This may increase the risks of obstruction to pedestrians. Furthermore, the adjacent access to the pier, within the hoarding, suggests construction activities may conflict with the public access.

Recommendation

Review the feasibility of providing a level, unobstructed footway of adequate width at this location. Also provide clarification of the intended use of the access to the pier for consideration at a supplementary Stage 1 Road Safety Audit.

3 Audit Team Statement

We certify that we have examined the drawings and documents listed in Appendix A to this Road Safety Audit Report. The Road Safety Audit has been carried out within the sole purpose of identifying any feature that could be removed or modified in order to improve the safety of the scheme. The problems identified have been noted in this report together with associated suggestions for safety improvements that we recommend should be studied for implementation.

No one on the Audit Team has been involved with the design of the measures.

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Appendix A

Appendix A

Information Utilised in this Stage 1 Road Safety Audit:-

- Figure 18.2.1 1PL03-TT-50657– Site Location Plan;
- Figure 18.2.2 1PL03-TT-50649– Construction Traffic Routes;
- Figure 18.4.9 1PL03-TT-50753– Accident Locations;

- DCO-PP-17X-BLABF-190057 – Existing Highway Layout;
- DCO-PP-17X-BLABF-190058 – Highway Layout During Construction – Phase 1;
- DCO-PP-17X-BLABF-190059 – Highway Layout During Construction – Phase 2;
- DCO-PP-17X-BLABF-190060 – Highway Layout During Construction – Phase 3;
- DCO-PP-17X-BLABF-190061 – Illustrative highway layout during Construction – temporary coach bays LB Southwark;
  DCO-PP-17X-BLABF-190062 – Illustrative highway layout during Construction – loading bay relocation;
- DCO-PP-17X-BLABF-190063 – Permanent Highway Layout;
- DCO-PP-17X-BLABF-190064 – Highway layout during construction Phases 1 & 2 – Vehicle swept path analysis;
- DCO-PP-17X-BLABF-190065 – Highway layout during construction phase 3 – Vehicle swept path analysis;
- DCO-PP-17X-BLABF-190066 – Permanent highway layout Vehicle swept path analysis;

- DCO-PP-17X-BLABF-190005 – Access plan;
- DCO-PP-17X-BLABF-190012 – Permanent Works Layout Sheet 1 of 5;
- DCO-PP-17X-BLABF-190013 – Permanent Works Layout Sheet 2 of 5;
- DCO-PP-17X-BLABF-190014 – Permanent Works Layout Sheet 3 of 5;
- DCO-PP-17X-BLABF-190015 – Permanent Works Layout Sheet 4 of 5;
- DCO-PP-17X-BLABF-190016 – Permanent Works Layout Sheet 5 of 5;

- DCO-PP-17X-BLABF-190017 – Proposed site features plan Sheet 1 of 3;
- DCO-PP-17X-BLABF-190047 – Construction phases – phase 1 Site setup sheet 1 of 2 – main works;
- DCO-PP-17X-BLABF-190048 – Construction phases – phase 1 Site setup sheet 2 of 2 – pier relocation;
- DCO-PP-17X-BLABF-190049 – Construction phases – phase 2 Shaft construction;
- DCO-PP-17X-BLABF-190050 – Construction phases – phase 3 Construction of other structures;
- DCO-PP-17X-BLABF-190051 – Construction phases – phase 4 Site demobilisation;

- 213601-01 – Facility and Amenity Map;
- Highway Mitigation Plans;
- Technical Note – Information for Blackfriars Foreshore Stage 1 RSA;
- Technical Memorandum – Blackfriars Bridge Foreshore – Accident Analysis;

NB Some of the above drawings indicate a note that states 'See Schedule of Works'. The Audit Team have not been provided with this Schedule. Some of the drawings show structural ramps and steps etc associated with the realignment of the Thames Path and access to relocated waterside facilities. These details have not been considered as part of this audit.

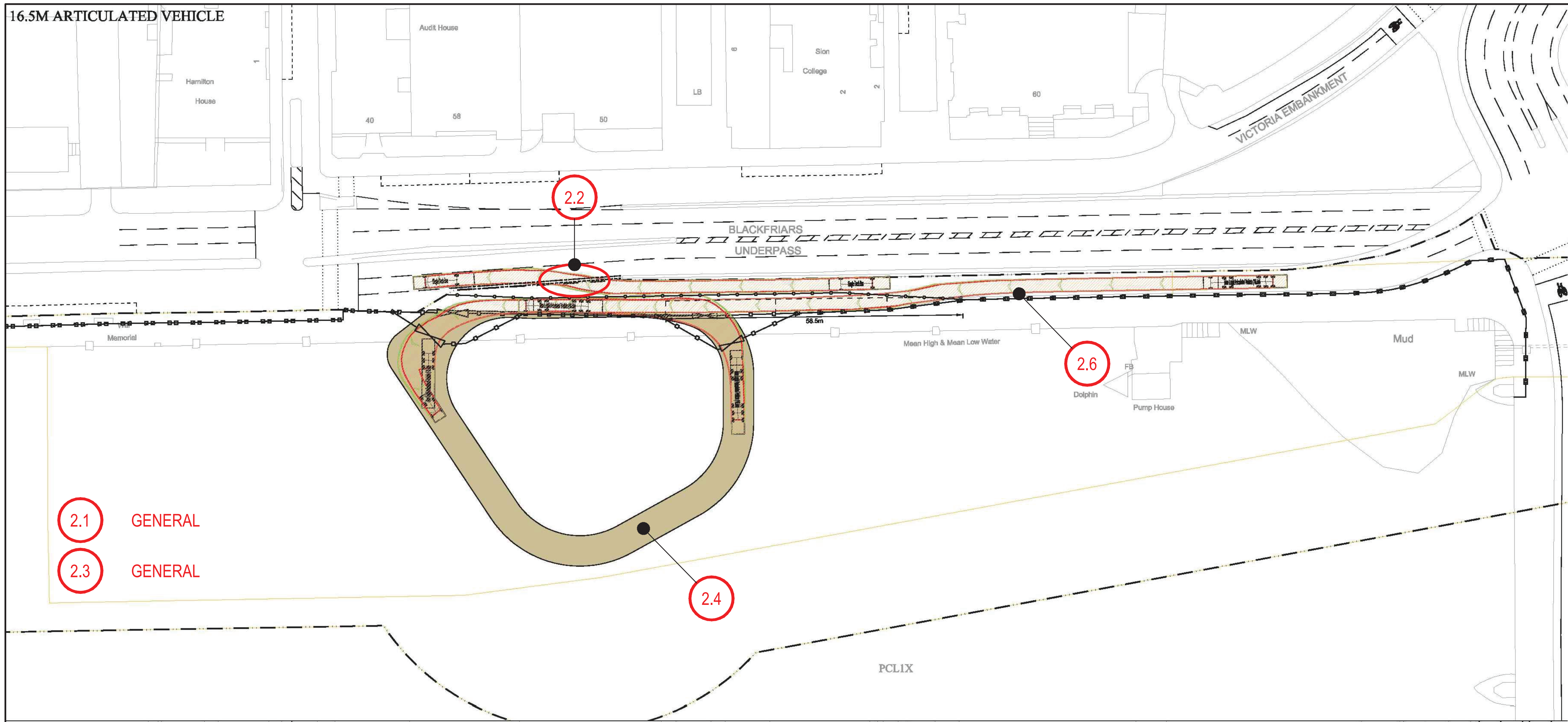
Appendix B

Appendix B

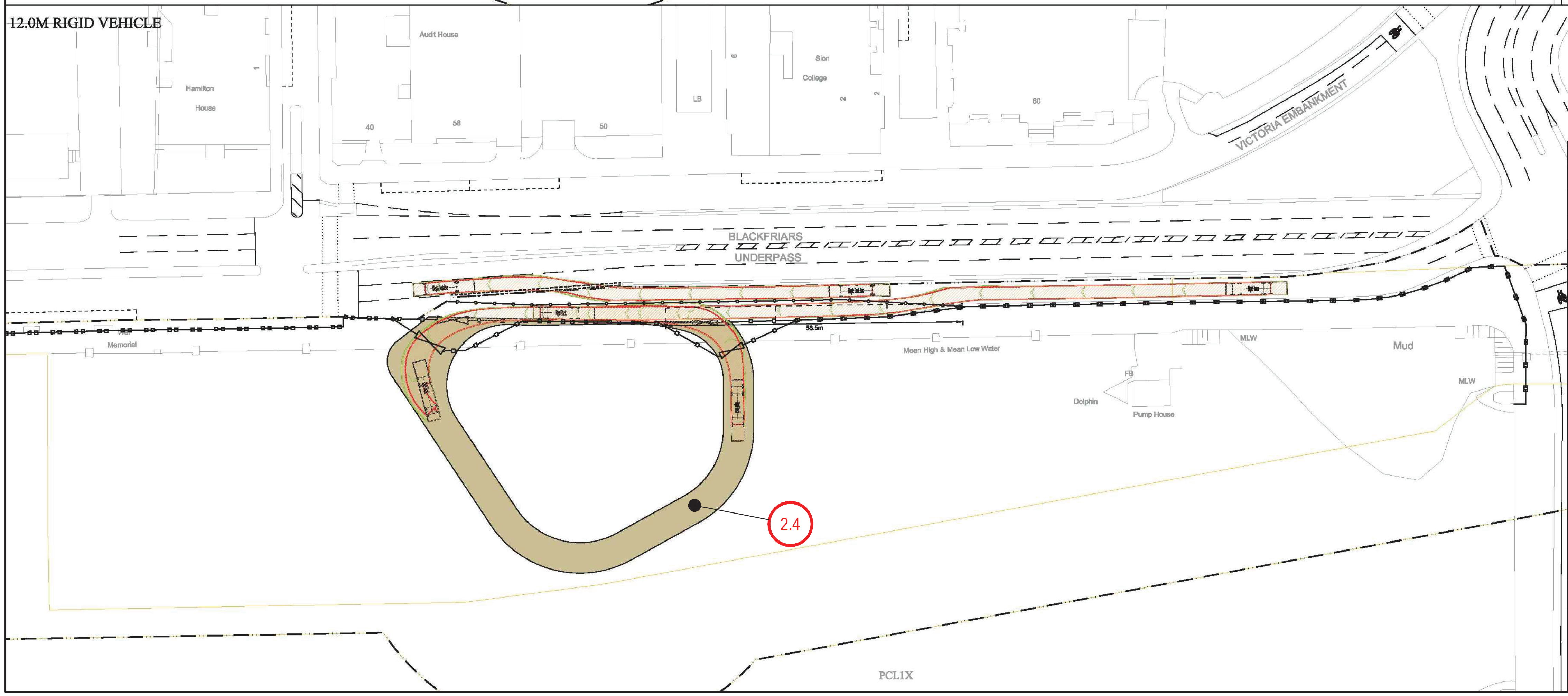
Site Reference Plans

27016/S1RSA1/BF1, 27016/S1RSA1/BF2, 27016/S1RSA1/BF3, 27016/S1RSA1/BF4, 27016/S1RSA1/BF5;

16.5M ARTICULATED VEHICLE



12.0M RIGID VEHICLE



Mark	Revision	Drawn	Date	Chkd

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UTILITIES NOTE: The position of any existing public or private sewers, utility services, plant or apparatus shown on this drawing is believed to be correct, but no warranty to this is expressed or implied. Other such plant or apparatus may also be present but not shown. The Contractor is therefore advised to undertake his own investigation where the presence of any existing sewers, services, plant or apparatus may affect his operations.

Drawing Issue Status
STAGE 1 ROAD SAFETY AUDIT

THAMES TIDEWAY TUNNEL
BLACKFRIARS FORESHORE

SITE REFERENCE PLAN (1 OF 5)

Client
THAMES WATER UTILITIES

Date of 1st Issue 08.01.2013	Drawn by pjd
A3 Scale 1:1000	Checked by SO
Drawing Number 27016/S1RSA/BF1	Revision -

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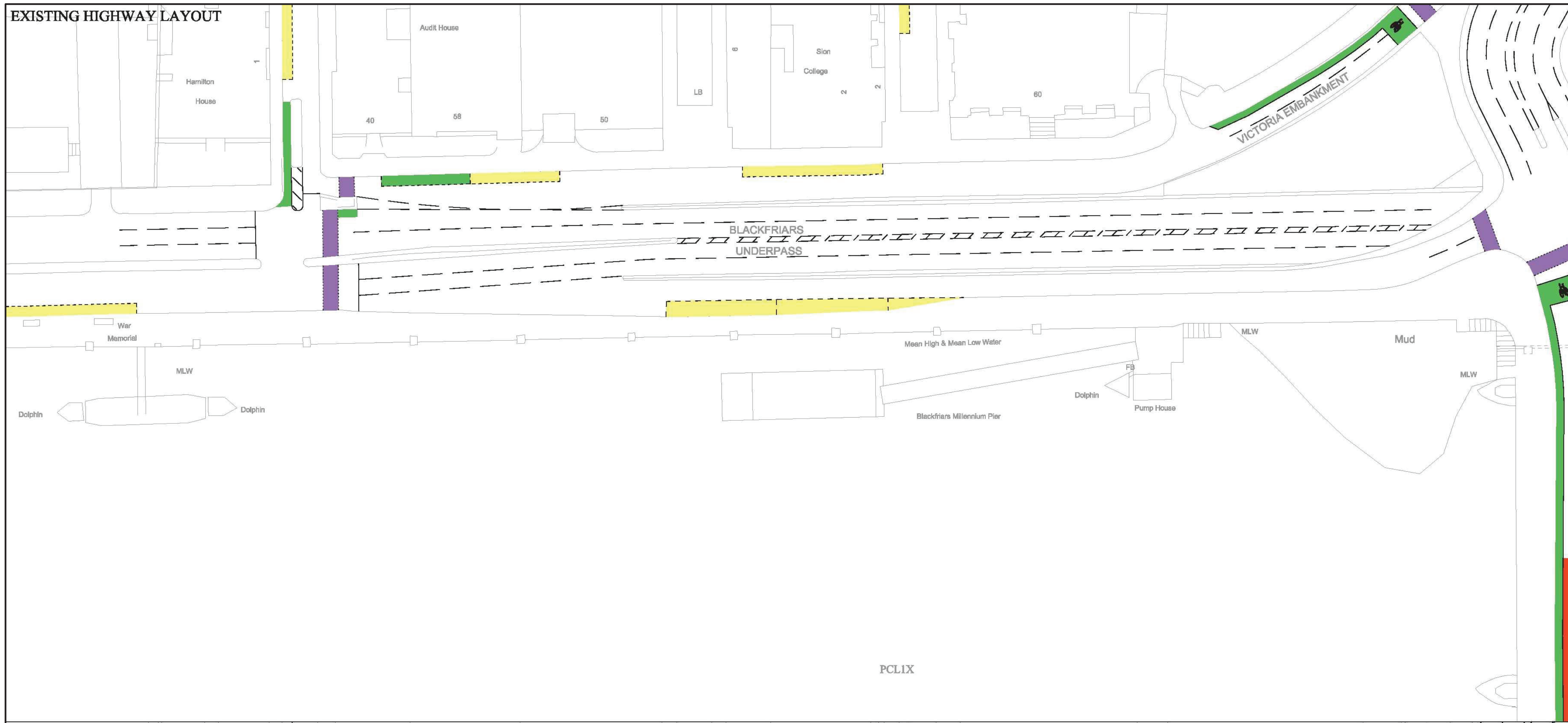
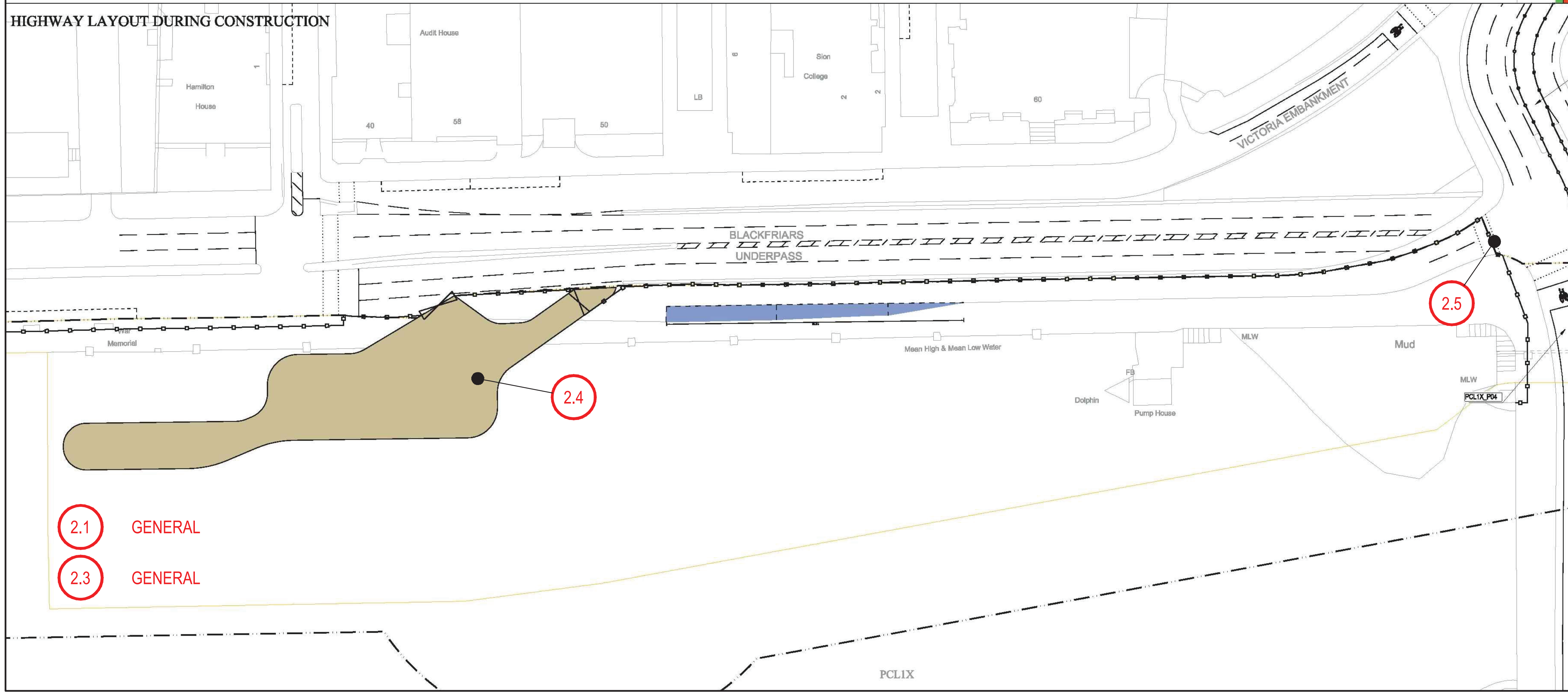
EXISTING HIGHWAY LAYOUT



HIGHWAY LAYOUT DURING CONSTRUCTION



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Drawing Issue Status
STAGE 1 ROAD SAFETY AUDIT

THAMES TIDEWAY TUNNEL
BLACKFRIARS FORESHORE

SITE REFERENCE PLAN (2 OF 5)

Client
THAMES WATER UTILITIES

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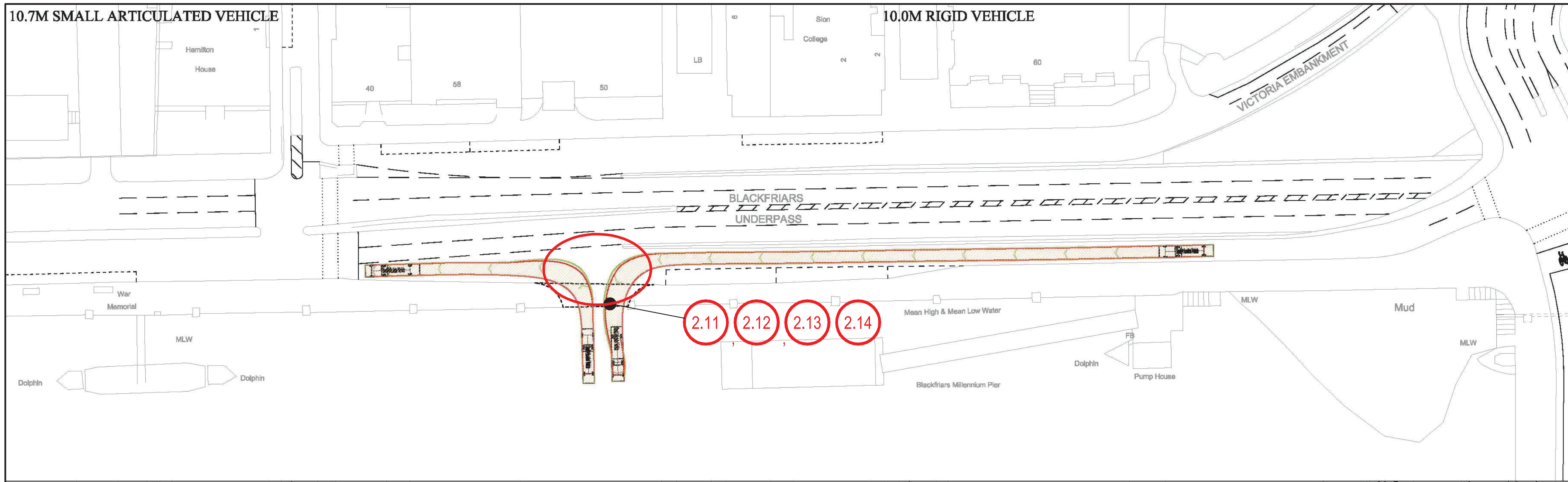

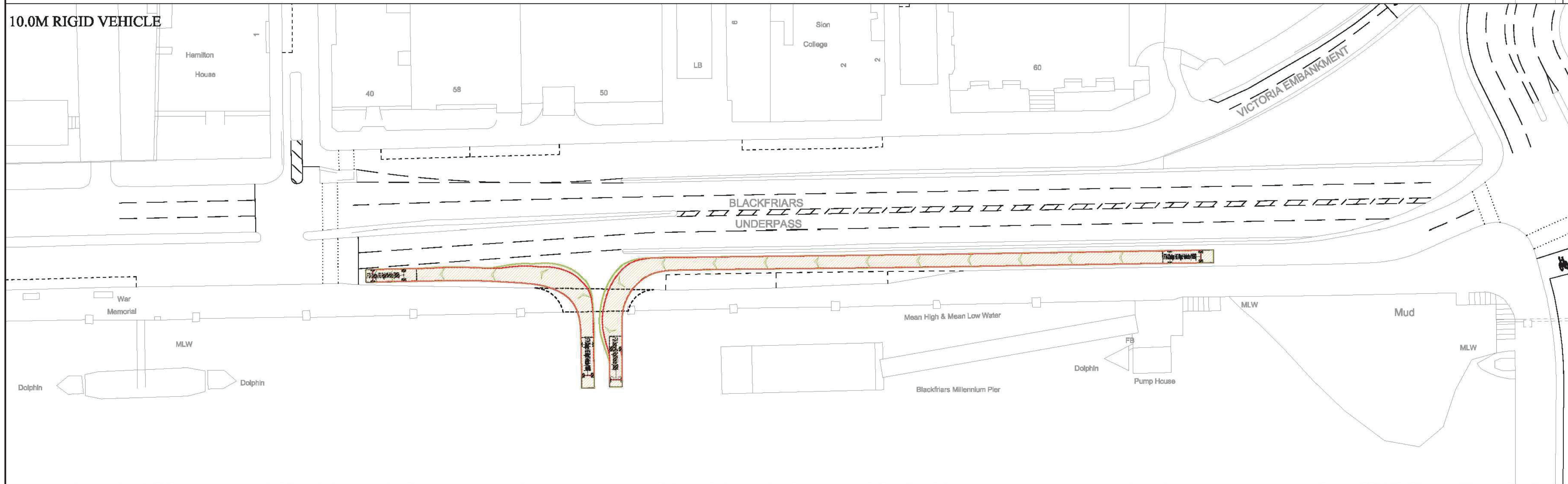

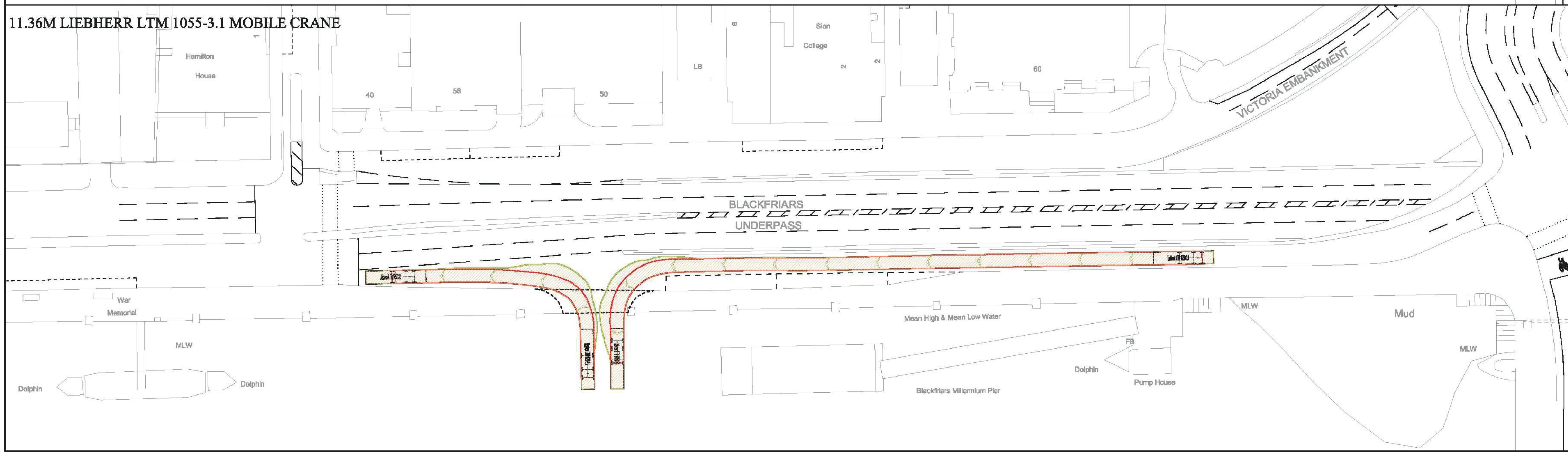

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Drawing Issue Status

STAGE 1 ROAD SAFETY AUDIT

THAMES TIDEWAY TUNNEL
BLACKFRIARS FORESHORE

SITE REFERENCE PLAN (3 OF 5)

Client

THAMES WATER UTILITIES

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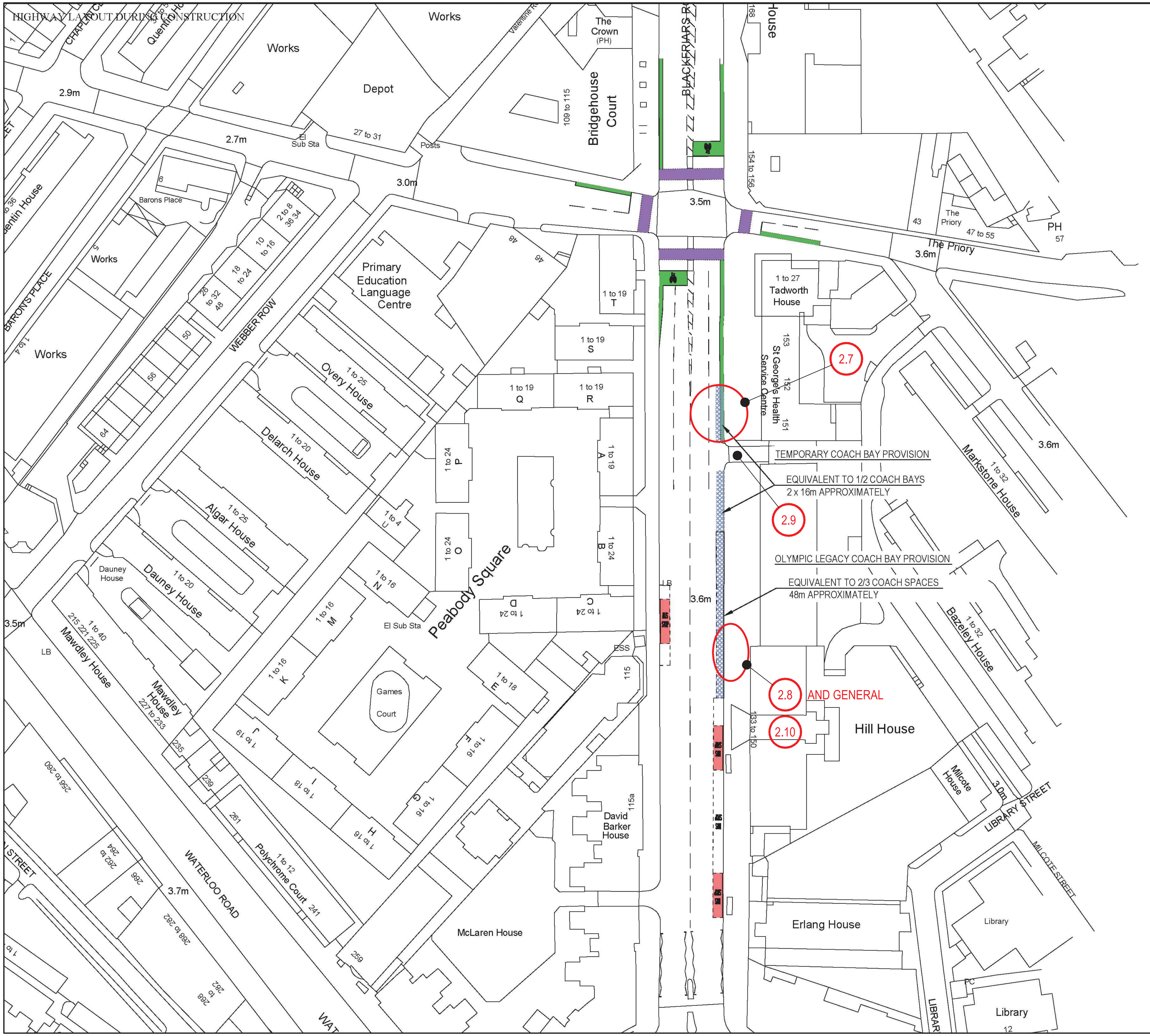
HIGHWAY LAYOUT DURING CONSTRUCTION



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Drawing Issue Status

STAGE 1 ROAD SAFETY AUDIT

THAMES TIDEWAY TUNNEL
BLACKFRIARS FORESHORE

SITE REFERENCE PLAN (4 OF 5)

Client

Thames Water

THAMES WATER UTILITIES

Date of 1st Issue	Drawn by
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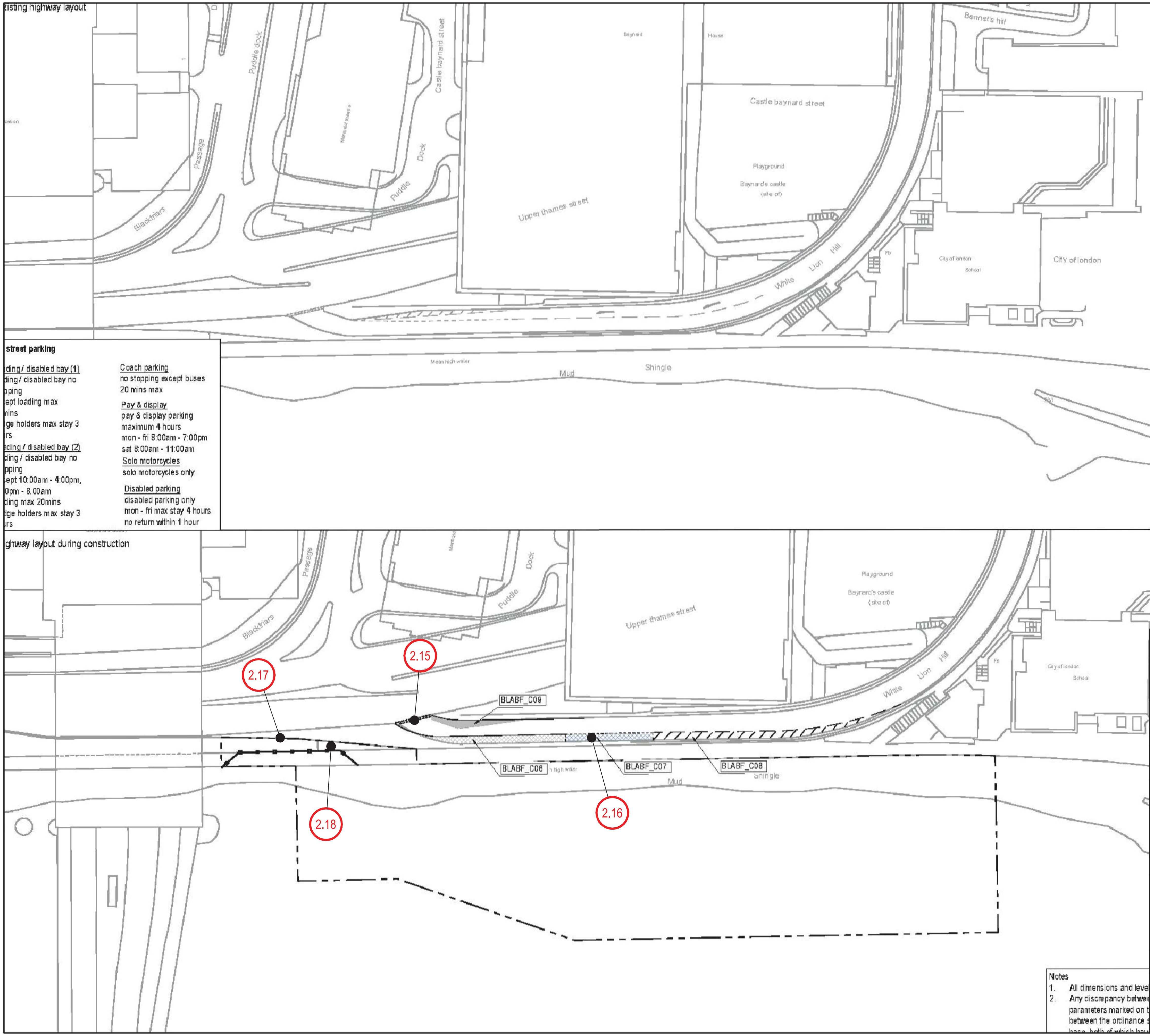

Notes
1. All dimensions and level
2. Any discrepancy betwe parameters marked on t between the ordinance s base, both of which hav

Mark	Revision	Drawn	Date	Chkd

SCALING NOTE: Do not scale from this drawing. If in doubt, ask.
UTILITIES NOTE: The position of any existing public or private sewers, utility services, plant or apparatus shown on this drawing is believed to be correct, but no warranty to this is expressed or implied. Other such plant or apparatus may also be present but not shown. The Contractor is therefore advised to undertake his own investigation where the presence of any existing sewers, services, plant or apparatus may affect his operations.

Drawing Issue Status
STAGE 1 ROAD SAFETY AUDIT

THAMES TIDEWAY TUNNEL
BLACKFRIARS FORESHORE

SITE REFERENCE PLAN (5 OF 5)

Client
THAMES WATER UTILITIES

Date of 1st Issue	Drawn by
08.01.2013	pjd
A3 Scale	Checked by
1:1000	SO
Drawing Number	Revision
27016/S1RSA/BF5	-

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READING
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Technical Note

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Project title	Thames Tideway Tunnel	Job number	211146-04
cc		File reference	211146
Prepared by	G Wicks (4/13)	Date	15 February 2013
Subject	RSA Stage 1 - Designer's response for Blackfriars Bridge Foreshore		

1 Introduction

This report is the Designer's Response to the Stage 1 Road Safety Audit Report for Blackfriars Bridge Foreshore site completed on 15 February 2013.

2 Responses to the items arising from the Stage 1 Road Safety Audit

2.1 Problem –

Location: General

Summary: Conflict through traffic management on westbound on-slip

The proposed arrangement of traffic management and the swept path analysis indicate that there may be insufficient space for vehicles to manoeuvre safely through the westbound on-slip. The high volume of large vehicles and cycles within the general traffic and generally high vehicle speeds observed during the site visit may give rise to the following potential problems when considered independently and/or in combination with the onerous swept path movements of the construction design vehicles:

- Conflict between vehicles and cyclists
- Conflict between construction traffic and general traffic, when accessing and egressing the public highway
- Conflict between all vehicles and temporary traffic management street furniture
- Conflict between all vehicles and site operatives

It is noted that the speed at which the swept path analysis has been carried out at is 5kph. This is a very slow speed and may not be realistic for construction vehicles accessing the site from the public highway or the general through traffic negotiation the traffic management.

For example, the Phase 3 construction arrangement and swept path analysis, suggests that it is likely that large vehicles entering / exiting the site may pass into adjacent live vehicle lanes, may not clear the carriageway and may cause other vehicles to make injudicious manoeuvres to avoid collision.

Recommendation

Notwithstanding the fact that the swept path analysis has been undertaken using Ordnance Survey data (and not topographical survey data), the effect on the swept paths of both construction and general vehicles travelling at a more realistic speed should be checked. Where necessary the traffic management arrangement should be reviewed. The Design Team should also consider the following, with all findings presented for consideration at a supplementary Stage 1 RSA:

- Test all individual and vehicle combinations / simultaneous swept path movements through the temporary traffic management and site access/exit
- Safe passing width to temporary traffic management and both existing and temporary street furniture
- Safe passing width to construction working zones
- Completing manoeuvres in one movement to clear carriageway
- The effect of slowing / turning manoeuvres on other vehicles in carriageway
- Lane widths through the traffic management should be appropriate to accommodate cyclists safely

Designer's Response

Recommendations noted. The vehicle swept path analysis will be reviewed at detail design (stage 2) to ensure all manoeuvres, both individual and in combination, can be completed and suitable passing widths are provided at the work sites.

2.2 Problem –

Location: Junction between on-slip and underpass and through-traffic management

Summary: All user conflict due to obstructed forward inter-visibility

The proposals indicate that vehicles from the west bound slip-on will be required to give-way to westbound vehicles from the underpass. The proposed give-way line is formed along the line of the existing lane markings, between these two carriageways, and as such is approximately parallel to the approach direction of vehicles from the on-slip and is unlikely to be easily / correctly interpreted by road users. This give way line is also in close proximity to the existing parapet and barrier retaining structure between both carriageways and is likely to obstruct intervisibility between road users. Individually or in combination, the above factors are likely to increase the risk of conflict between vehicles in this area.

Similarly, Phase 3 requires construction vehicles to access the site directly from the westbound underpass vehicle lanes, immediately after the point at which the existing parapet / retaining structure between the carriageways terminates. As such this is likely to obstruct forward visibility to this access, making it difficult to anticipate its location and may require vehicles to utilise the offside lane to complete the manoeuvre, increasing the risk of conflict with general westbound traffic on the underpass.

Furthermore, the temporary barrier used to isolate the general public vehicle movements and those of the construction vehicles, plus the proposed location of the security office may restrict intervisibility between all users

Recommendation

Review all proposed temporary traffic management layouts to ensure they afford all road users adequate forward / intervisibility and understanding of priority for the road ahead. The review should consider the following, with findings presented for consideration at a supplementary Stage 1 RSA:

- The proposed barrier type and its potential to become an obstruction to visibility
- The potential for all phases to be accessed from the slip-on road
- Swept path manoeuvres of construction traffic and general traffic
- Forward visibility and junction visibility
- Relocate the site security office out of the visibility splays
- Indicate appropriate visibility splays to/from junctions with construction accesses.

Designer's Response

Recommendation noted. The detail design (stage 2) will review vehicle access arrangements to ensure access / egress points have adequate forward visibility, including detailing of barrier type and additional road markings and/or signage that may be required.

Key vehicle manoeuvres are demonstrated on Blackfriars Bridge Foreshore *Transport Assessment* drawings, Highway layout during construction – Vehicle swept path analysis. These will be reviewed and amended to ensure suitability of temporary traffic management arrangements.

2.3 Problem

Location: General

Summary: Conflict between pedestrians and vehicles

The proposals indicate that the footway adjacent to the Thames along the westbound on-slip will be closed to a varying degree with pedestrians being diverted to the existing footway on the north side of the A3211 to continue their journey. The closure and diversion will have the following characteristics that may give rise to an increased risk for pedestrians, especially when considered in the context of the likely high pedestrian flows:

- The proposed diversion route is significantly longer than the closed route and utilises existing multi stage signal controlled crossings with potentially long wait times to cross the carriageway. This may encourage pedestrians to seek uncontrolled crossing opportunities and / or routes where no footway exists;
- The existing footway width is significantly reduced and in some locations significantly obstructed by trees and street furniture on the approach to signal controlled crossings. This may force pedestrians to use the carriageway to continue their journey;

- The proposed diversion route has significantly more conflict points with other users. Some of these conflicts are controlled but some are uncontrolled with undefined priority, especially between pedestrians and cyclists.
- The diversion route relies on a lift, (east side of bridge), for pedestrians with mobility impairment to continue their journey safely. Continuity of route may therefore have increased risks for this vulnerable road user group.

Recommendation

Review the proposed footway closures and diversions to ensure that the footway closures and diversion routes can be negotiated safely and provide an adequate level of service in the context of potentially high pedestrian flows. Ensure adequate space can be safeguarded for advance signage of diversion/restrictions without obstructing busy footways. Details to be prepared and submitted for consideration at a Stage 2 RSA.

Designer's Response

Recommendations noted. The Blackfriars Bridge Foreshore *Transport Assessment* documents set out the volume of pedestrians using the footways in the location of the site and sets out the potential changes to level of service with implementation of the footway diversions.

The layout of footway diversions, signage, etc. will be reviewed at detail design (stage 2). During all construction work and on any section of road subject to temporary diversions or restrictions imposed the risk to all road-users would be managed by the contractor(s), in accordance with the provisions made under the Traffic Signs Manual Chapter 8 - Traffic Safety Measures and Signs for Road Works. This would include compliance with TfL guidance (Cyclists at Roadworks – Guidance) to ensure safe passage for cyclists.

2.4 Problem

Location: Construction Access

Summary: Conflict for all users

Some of the proposed construction phase site access swept paths indicate vehicles entering and exiting the site but do not indicate the full turning manoeuvre on the site itself. It is therefore not clear if vehicles can exit the site in a forward gear. Should vehicles be required exit the site in a reverse gear the risk of conflict to all users will significantly increase.

Recommendation

The proposals must ensure that the largest anticipated vehicles can enter and exit the site in a forward gear.

Designer's Response

Recommendation noted. The project Code of Construction Practice sets out vehicle egress of work sites will be in forward gear. Site layouts will be confirmed in detail design (stage 2) and on-site turning manoeuvres revised as appropriate.

2.5 Problem

Location: Junction between westbound on-slip and Blackfriars

Summary: Conflict for all users

The drawing titled 'Construction Phases – Phase 3, Construction of other structures, Book of Plans – section 10' (Drg No. DCO-PP-17X-BLABF-190050) indicates a construction access at the existing junction between the westbound on-slip and Blackfriars Bridge. This is inconsistent with other drawings showing the general construction accesses and associated vehicle movements etc. The drawings do not include details of its intended use and operation and therefore this limits the level of consideration within the context of road safety within this Audit. However, the Audit Team have the following general concerns:

- Vehicles entering the site may not clear the main carriageway in one movement
- Vehicles exiting the site will enter the signalised junction without being controlled by its own signal phase
- Increased risk of conflict between cyclist and large vehicles turning left
- Vehicles turning through a strong pedestrian desire line

Recommendation

The Audit Team recommends that the proposals for a potential vehicle access at this location are reviewed and that its intended function is clarified. Should a vehicle access be provided at this location, The Design Team should assess its suitability, with reference to 2.1 and 2.2 above, present their analysis for consideration at a supplementary RSA1.

Designer's Response

Recommendation noted. The detail design (stage 2) will review vehicle access arrangements to ensure access / egress points is required. If so the access/egress will be reviewed for adequate forward visibility, including additional road markings and/or modification to signage traffic signals that may be required.

2.6 Problem

Summary: Westbound on-slip (Victoria Embankment)

Summary: Reduced 'Disabled Vehicle' Access

There are 3 existing parking bays on the westbound on-slip which are signed as exceptions, (for loading, disabled and buses), to the existing 'No Stopping on Red Route' parking restriction. The details include proposals for replacement Coach Parking and replacement Loading Bays, albeit that it is unclear that these replacements are directly related to those to be removed from the westbound on-slip. However, the proposals do not include for replacement of the existing 'Disabled' Parking Bays, that are removed during construction, which may result in increased risks for pedestrians with mobility impairment in this area.

Recommendation

The Audit Team recommends that the requirement to retain some provision for 'Disabled' Parking and access to this area is reviewed and, if necessary, provide suitable temporary replacements during construction.

Designer's Response

Recommendation noted. Detail design (stage 2) will review parking suspensions and suitable alternative or provision of temporary locations.

2.7 Problem

Location: Blackfriars Road – Replacement Coach Parking

Summary: Conflict for cyclists

The proposed on street coach parking bay extends north into the existing 2-lane southbound exit from the signalised cross roads, where the nearside lane includes a cycle lane provision. This reduction in the nearside lane length shortens the distance over which vehicles are required to merge, when the temporary coach bays are occupied by vehicles and may increase the risk of conflict between vehicles and cycles.

Recommendation

The proposals should include adequate distance, markings and signage to provide sufficient advanced warning and length to perform the merge safely.

Designers Response

Recommendation noted. Detail design (stage 2) will confirm additional signage and marking required to notify vehicles / cyclists of merge point.

2.8 Problem

Location: Blackfriars Road – Replacement Coach Parking

Summary: Obstructions to pedestrians

The proposed coach parking bays are adjacent to various items of street furniture close to the edge of the carriageway, which may obstruct the safe pedestrian access / egress to and from the coach.

Recommendation

The design team should consider the existing street furniture when determining the number and precise location of proposed parking bays. If necessary, street furniture should be relocated to avoid conflict.

Designer's Response

Recommendation noted. Detail design (stage 2) will review and detail any street furniture that is required for relocation as part of the implementation of the coach bays.

2.9 Problem

Location: Blackfriars Road – Replacement Coach Parking

Summary: Vehicle conflict with all users

The proposed coach parking bays are located either side of an existing vehicle access to St. George's Health Service Centre where vehicles appear to both reverse into and out of Blackfriars Road. The presence of coaches in these bays is likely to severely obstruct the intervisibility between all road users when vehicles are manoeuvring at this location.

Recommendation

The proposed parking bays should be located to avoid obstructing visibility splays.

Designer's Response

Recommendation noted. Detail design (stage 2) will review interaction with the vehicle access and ensure appropriate manoeuvring can be undertaken at vehicle access/egress point.

2.10 Problem

Location: Blackfriars Road – Replacement Coach Parking

Summary: Vehicle conflict

The proposed coach parking bays are located adjacent to directional signage that would be masked to other southbound drivers by the presence of large vehicles. This may lead to driver confusion and poor vehicle manoeuvres at downstream junctions, increasing the risk of vehicle conflict.

Recommendation

The proposed parking bays should be located to avoid obstructing forward visibility to all signage. If this cannot be avoided, relocated temporary signage should be provided.

Designer's Response

Recommendation noted. Detail design (stage 2) will review location of proposed coach bay or signage and outline where relocation is required.

2.11 Problem

Location: Permanent Vehicle Access

Summary: Conflict for all users

The proposed permanent maintenance access is indicated as a vehicle footpath crossing between the westbound slip-on and the parapet river wall, leading to a proposed area incorporating a realigned/reinstated Thames Path. The proposals do not indicate how this access will be secured or how unauthorised vehicle access may be restricted, but if a gate or bollards is provided along the line of the existing parapet wall it will not provide adequate space for a vehicle to clear the carriageway and as such may obstruct westbound vehicles. Furthermore, pedestrians may be required to walk in the carriageway to continue their journey.

Recommendation

Provision of a gate or other vehicle restriction and this access arrangement in general should be such that all vehicles required to access the site can clear the highway and footway in one movement.

Designer's Response

Recommendation noted. Detail design (stage 2) will determine the layout of the site in its operational phase. Review of vehicle turning movement to access site will be undertaken to ensure highway / footway manoeuvres are appropriate.

2.12 Problem

Location: Permanent Vehicle Access

Summary: Conflict for all vehicles with electricity supply

An existing string of high level lighting runs between the feature piers on the line of the existing parapet wall. It is not clear if this electricity supply will be retained in the final instance but may present a hazard to tall vehicles accessing the site.

Recommendation

If retained, the lighting and electricity supply should be located at a height that provides safe clearance to the tallest vehicle anticipated to visit the site. It may also be necessary to install appropriate hazard warning and /or vehicle height restrictions. Alternatively, this section of lighting could be removed or relocated to a position that is not at risk of conflict with vehicles.

Designer's Response

Recommendation noted. Detail design (stage 2) will determine the vehicle types that will be used in the operational phase. Further warning signage /height restriction will be reviewed and recommended as appropriate.

2.13 Problem

Location: Permanent Vehicle Access

Summary: Conflict for all users

The proposed site access location is adjacent to parking provision for large vehicles that are likely to obstruct intervisibility between all users and vehicles entering and exiting the site. Obstructed intervisibility may increase the risk of conflict due to difficulties anticipating the presence and movements of other users. This may be exacerbated by the potential for ad-hoc unscheduled use of this access as a pull-in / drop off outside of the scheduled movements of maintenance vehicles.

Recommendation

The permanent access arrangement should be designed to ensure that adequate intervisibility can be afforded for all users and vehicle movements associated with the proposed access.

Designer's Response

Recommendation noted. The vehicle swept path analysis and intervisibility to vehicles / pedestrians will be reviewed at detail design (stage 2).

2.14 Problem

Location: Permanent Vehicle Access

Summary: Conflict for all users

The proposed site access swept paths indicate vehicles entering and exiting the site but do not indicate the full turning manoeuvre on the site itself. It is therefore not clear if vehicles can exit the site in a forward gear. Should vehicles be required exit the site in a reverse gear the risk of conflict to all users will significantly increase.

Recommendation

The proposals must ensure that the largest anticipated vehicles can enter and exit the site in a forward gear.

Designer's Response

Recommendation noted. Detail design (stage 2) will determine the layout of the site in its operational phase. Review of vehicle turning movement to access site will be undertaken to ensure on-site manoeuvring is appropriate and vehicles can exit the site in forward gear.

2.15 Problem

Location: White Lion Hill – Junction with Upper Thames Street (A3211)

Summary: Difficult observation to/from junction

The existing junction between White Lion Hill and Upper Thames Street is formed with a very acute approach angle from White Lion Hill, which makes observations from the give-way line difficult and may lead to poor judgement of the speed and path of vehicles in Upper Thames Street, when trying to find gaps to manoeuvre into. The proposals indicate a removal of what appears to be an existing remedial realignment of the kerblines at the approach from White Lion Hill, which may have been installed to address an existing accident problem at this junction, (see drawing titled 'Transport - accident locations – Figure 18.4.9' (Drg.No. 1PL03-TT-50753). This may be exacerbated by the following observations made by the Audit Team during the site visit:

- Relatively high speeds of vehicles in both roads
- Relatively high number of cyclists in both roads
- Potentially restricted junction visibility due to elevation, parapet wall and railing associated with White Lion Hill, and building structure over Upper Thames Street.
- Potentially restricted awareness of side road due to obstructions mentioned above
- Down Hill Approach from White Lion Hill
- Relatively high volume of large vehicles making slow turning manoeuvres onto Upper Thames Street

The Audit Team observed a left-hand-drive coach joining Upper Thames Street from White Lion Hill, with great difficulty. This resulted in westbound vehicles in Upper Thames Street coming to a stand-still to allow the coach to carry out its manoeuvre.

Recommendation

Review the suitability of providing an additional volume of large vehicles through this junction. The review should include consideration of the following:

- Achievable junction visibility
- Actual vehicle speeds
- Swept path analysis of largest vehicle anticipated through this junction
- The causation / type of accidents at this junction

The findings of this review should be presented for consideration at a supplementary Stage 1 Road Safety Audit

Designer's Response

Recommendation noted. Detail design (stage 2) will determine the proposed kerb modification. Review of vehicle turning movement to access site will be undertaken to ensure manoeuvring is appropriate and vehicles speeds / accidents can be mitigated.

2.16 Problem

Location: White Lion Hill

Summary: Conflict for all users

The proposed purpose, function, vehicle type and frequency of use associated with this loading bay are unclear within the details provided for this Audit. As such the Audit Teams consideration of potential problems and risks has been limited. However, the following is a summary of the Audit Teams general observations and concerns:

- Existing building and street furniture potentially obstructs forward visibility on inside of right hand bend
- Narrow / no off carriageway pavement alongside or to the rear of delivery bay
- No connecting footways or other access for onward journey of items off-loaded
- No tapers provided on exit from proposed delivery bay
- Details of change of requirement for vehicles to merge from left to right rather than the existing right to left not detailed.
- Activities and their frequency associated with loading bay are unclear – potential for increased risks associated with pedestrians or other vehicles in the carriageway
- Large vehicles at loading bay may obstruct forward visibility to existing hazard warning signage.
- Existing vehicle weight and length restrictions may conflict and or cause confusion with vehicles anticipated to use the proposed loading bay

Recommendation

Review the suitability of providing a loading bay at this location. The review should include consideration of the following:

- Achievable forward visibility to loading bay
- Actual vehicle speeds
- Swept path analysis of largest vehicle anticipated with this loading bay
- Clarify purpose, function, loading vehicles and associated activities
- Review existing vehicle weight and length parking restriction

The findings of this review should be presented for consideration at a supplementary Stage 1 Road Safety Audit.

Designer's Response

Recommendation noted. Detail design (stage 2) will clarify the function of the loading bays and review design in terms of vehicle movements, such as visibility, swept path and vehicle speeds.

2.17 Problem

Location: White Lion Hill – Thames Path

Summary: Conflict for pedestrians

The proposals indicate a ‘Gate and emergency access for Blackfriars Pier’ at the existing wall between the paved areas adjacent to White Lion Hill and the Thames Path. No other details have been provided for consideration at this stage and therefore determination of potential risks has been limited. However, the following is a summary of the Audit Teams general observations and concerns:

- Existing wall, potential level difference and current construction works may result in obstructions to the feasibility of this access.
- There are no connecting footways for onward journeys from the paved area adjacent to White Lion Hill.

Recommendation

Review the suitability of providing an emergency access at this location and clarify its purpose and function for consideration at a supplementary Stage 1 Road Safety Audit.

Designer’s Response

Recommendation noted. Detail design (stage 2) will clarify the function of the gate and access point. It will review design in terms of pedestrian movements, usage and connection between footway levels.

2.18 Problem

Location: Thames Path – diversion route

Summary: Conflict for pedestrians

The proposals indicate a short diversion route around the proposed hoarding associated with the access ramps to the new pier. The diversion route appears narrow in places and may be obstructed by the final form of the current construction works and the existing wall adjacent to White Lion Hill, mentioned in 2.17 above. This may increase the risks of obstruction to pedestrians. Furthermore, the adjacent access to the pier, within the hoarding, suggests construction activities may conflict with the public access.

Recommendation

Review the feasibility of providing a level, unobstructed footway of adequate width at this location. Also provide clarification of the intended use of the access to the pier for consideration at a supplementary Stage 1 Road Safety Audit.

Designer’s Response

Recommendation noted. Detail design (stage 2) will review the temporary footway arrangement and the function of the gate and access point during the construction phase. It will review design in terms of pedestrian movements, usage and ensure sufficient footway widths are provided to minimise potential obstruction.

DOCUMENT CHECKING (not mandatory for File Note)

	Prepared by	Checked by	Approved by
Name	G Wicks (4/13)	G Wicks	S Jenkins
Signature			

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Thames Tideway Tunnel
Thames Water Utilities Limited

Application for Development Consent

Application Reference Number: WWO10001

Transport Assessment

Doc Ref: **7.10.15**

Blackfriars Bridge Foreshore

Figures

APFP Regulations 2009: Regulation **5(2)(q)**

Hard copy available in

Box **52** Folder **A**
January 2013

Thames Tideway Tunnel
Creating a cleaner, healthier River Thames

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Thames Tideway Tunnel

Transport Assessment

Section 18: Blackfriars Bridge Foreshore figures

List of contents

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Plans

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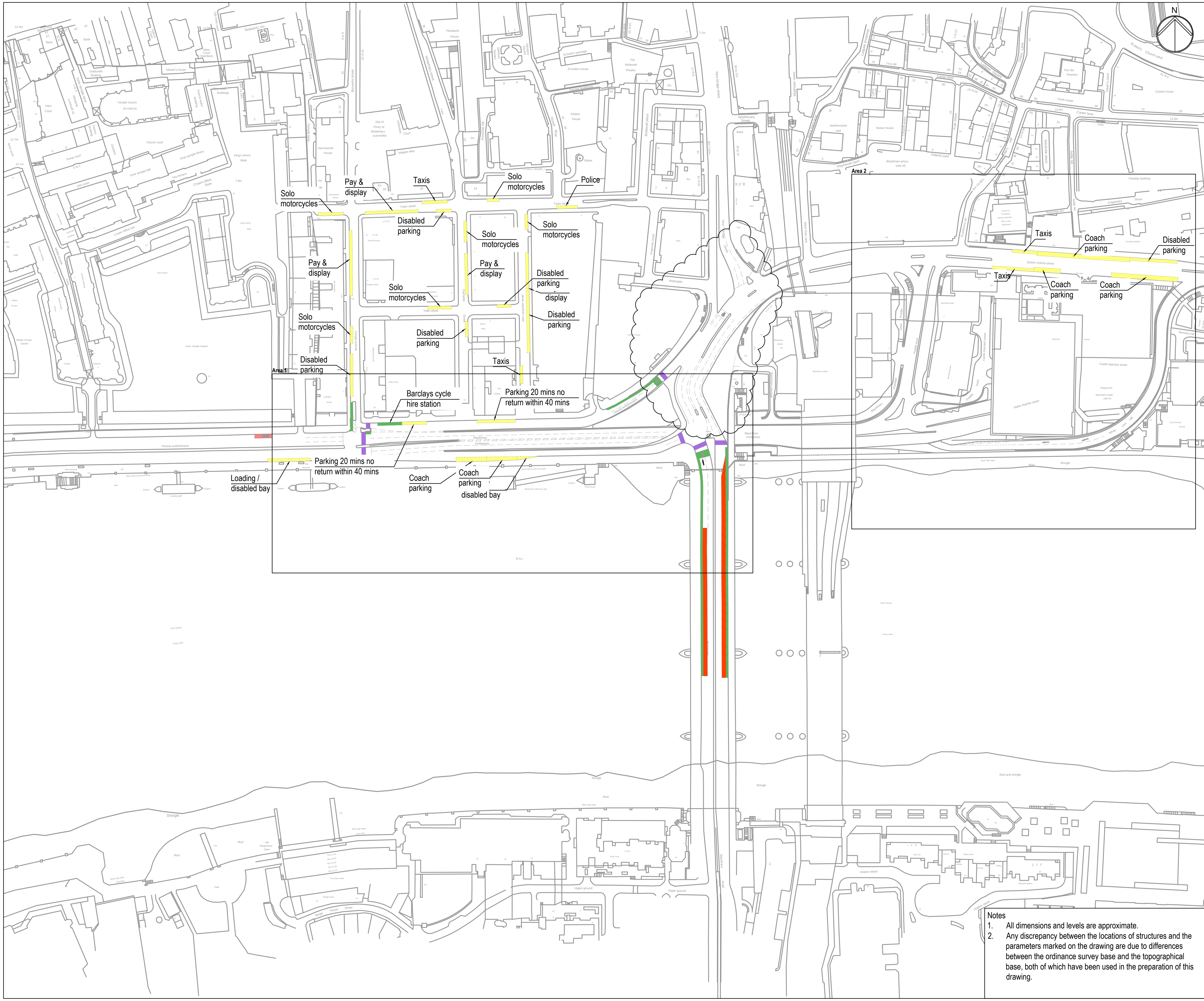
Blackfriars Embankment Foreshore

THAMES TIDEWAY TUNNEL - SCHEDULE OF ASSOCIATED HIGHWAY WORKS

Drawing Number	Works Reference	Location	Item of Work	Date of Implementation
DCO-PP-17X-BLABF-190058	BLABF_C01	Victoria Embankment - westbound on-slip	Suspension of loading bay (1No.) and coach bays (2No.)	TBC
	BLABF_C02	Victoria Embankment	Obscurement / removal of existing road markings. Provision of give-way markings.	TBC
DCO-PP-17X-BLABF-190060	BLABF_C03	Victoria Embankment	Traffic barrier to be used to close right turn lane at Blackfriars Road / Victoria Embankment to the westbound on-slip road. Includes traffic signal timing modifications. *(Note: layout would be modified to newly constructed arrangement in detail design stage)*	TBC
	BLABF_C04	Blackfriars Road	Modify white lining (direction arrow). Remove left turn arrow.	TBC
DCO-PP-17X-BLABF-190061	BLABF_C05	Blackfriars Road	Temporary provision of coach bays (2No.)	TBC
DCO-PP-17X-BLABF-190062	BLABF_C06	White Lion Hill	Provision of new kerb build out (approximately 40m) to widen carriageway edging to suitable footway width (approximately 1.8m).	TBC
	BLABF_C07	White Lion Hill	Provision of new loading bay (1no.)	TBC
	BLABF_C08	White Lion Hill	Provision of road markings (approximately 85m).	TBC
	BLABF_C09	White Lion Hill	Removal of existing kerbing (approximately 40m) and provision of carriageway (approximately 40m). Obscurement of white lining (approximately 50m hatching and 2no. kicker arrows).	TBC
DCO-PP-17X-BLABF-190063	BLABF_P01	Victoria Embankment - westbound on-slip	Re-provision of loading bay (1No.) and coach bays (2No.)	TBC
	BLABF_P02	Victoria Embankment - westbound on-slip	Provision of strengthened footway / partially dropped kerbs to enable maintenance vehicle access.	TBC
	BLABF_P03	Victoria Embankment - westbound on-slip	Obscurement / removal of give-way markings. New road markings to denote slip lane.	TBC
	BLABF_P04	Blackfriars Road	Modify white lining (direction arrow). Reinstate left turn arrow.	TBC
	BLABF_P05	Blackfriars Road	Reinstate right turn lane at Blackfriars Road / Victoria Embankment to the westbound on-slip road. Includes traffic signal timing modifications. *(Note: layout would be modified to newly constructed arrangement in detail design stage)*	TBC



Notes
1. All dimensions and levels are approximate.
2. Any discrepancy between the locations of structures and the parameters marked on the drawing are due to differences between the ordinance survey base and the topographical base, both of which have been used in the preparation of this drawing.

Keyplan:

This drawing

Coordinates are to be Ordance Survey Datum OSGB36. All levels are in metres and relate to the Tunnel Datum which is 100 metres below Ordnance Datum Newlyn.

Key
- On street parking
- Bus stop / stand
- Bus lane
- Pedestrian crossing
- Cycle lane / advance stop line
- Recently updated junction layout not shown

On street parking

Loading / disabled bay (1)
loading / disabled bay no stopping except loading max 20mins badge holders max stay 3 hours

Loading / disabled bay (2)
loading / disabled bay no stopping except 10:00am - 4:00pm, 7.00pm - 8.00am loading max 20mins badge holders max stay 3 hours

Coach parking
no stopping except buses 20 mins max

Pay & display
pay & display parking maximum 4 hours mon - fri 8:00am - 7:00pm sat 8:00am - 11:00am

Solo motorcycles
solo motorcycles only

Disabled parking
disabled parking only mon - fri max stay 4 hours no return within 1 hour

Standards
- Design manual for roads and bridges, Dft, 1992
- Traffic signs regulations & general directions, TSO, 2002
- Traffic signs manual, Dft, 2006
- Manual for streets, Dft, 2007
- Manual for streets 2, CIHT, 2010
- Designing for deliveries, Fta, 1998
- Cycle infrastructure design Ltn 2/08, Dft, 2008
- Design of pedestrian crossings Ltn 2/95, Dft, 1995
- Guidance for the use of tactile paving, Dft, 1998
- Accessible bus stop design guidance, TfL, 2006

Stage
Existing

10m 0 100m

Scale 1:1250 at A1
1:2500 if reproduced at A3

FOR INFORMATION

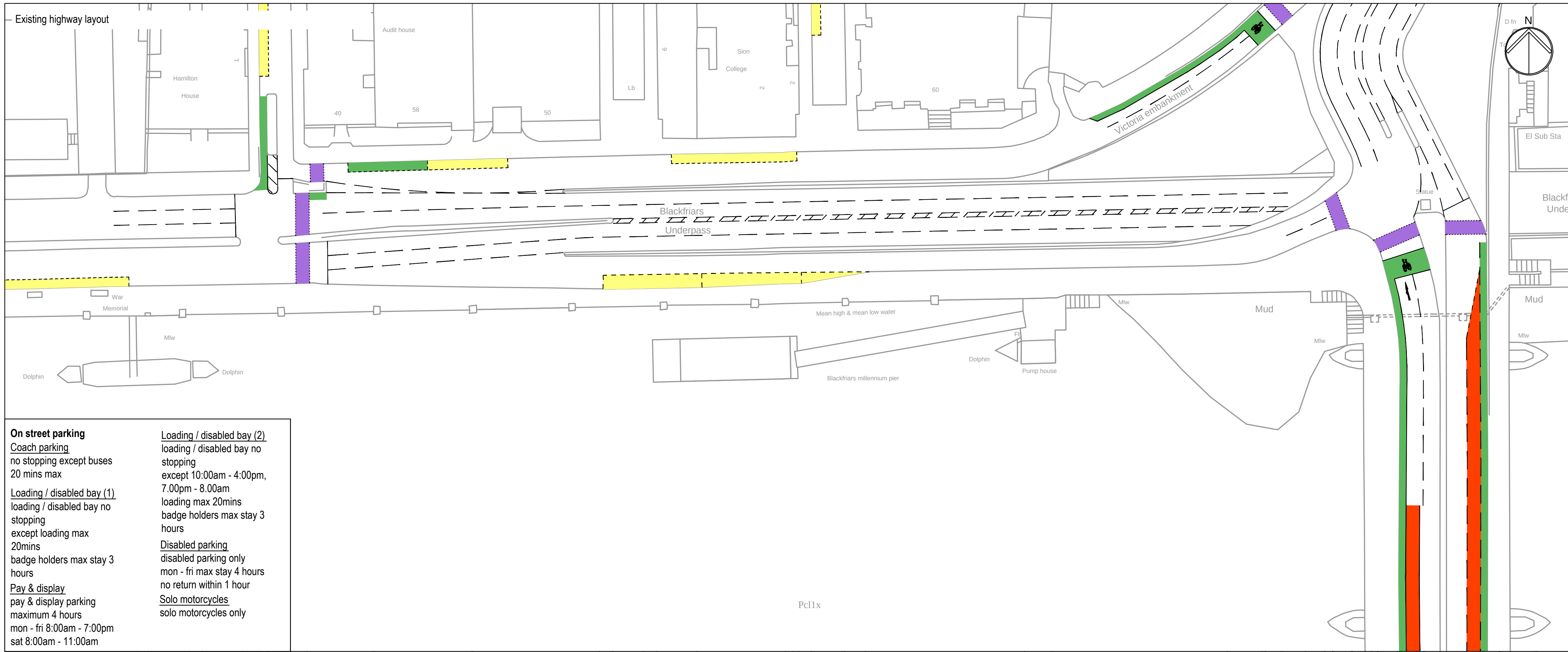
Location
Blackfriars Foreshore
City of London Corporation

Document Information
Application for Development Consent
Existing highway layout

DCO-PP-17X-BLABF-190057
January 2013

Thames Tideway Tunnel
Creating a cleaner, healthier River Thames

Thames Water



On street parking

Coach parking
no stopping except buses
20 mins max

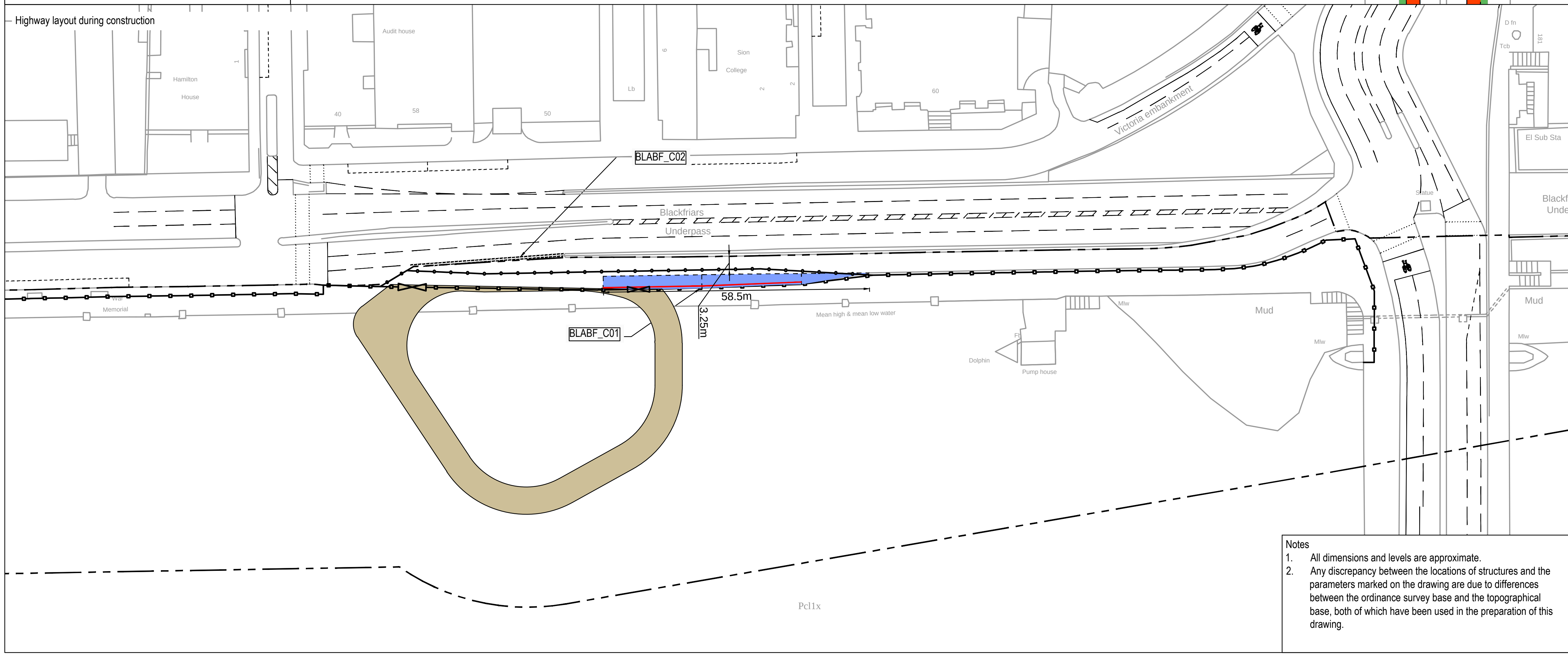
Loading / disabled bay (1)
loading / disabled bay no stopping
except loading max 20mins
badge holders max stay 3 hours

Pay & display
pay & display parking
maximum 4 hours
mon - fri 8:00am - 7:00pm
sat 8:00am - 11:00am

Loading / disabled bay (2)
loading / disabled bay no stopping
except 10:00am - 4:00pm, 7.00pm - 8.00am
loading max 20mins
badge holders max stay 3 hours

Disabled parking
disabled parking only
mon - fri max stay 4 hours
no return within 1 hour

Solo motorcycles
solo motorcycles only



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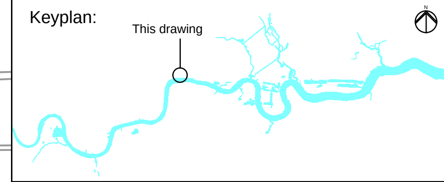
Keyplan:



Coordinates are to be Ordance Survey Datum OSGB36. All levels are in metres and relate to the Tunnel Datum which is 100 metres below Ordnance Datum Newlyn.

Key

Existing
- On street parking
- Bus lane
- Pedestrian crossing
- Cycle lane / advance stop line

Revised
- L.L.A.U.
- Suspended on street parking
- Illustrative on-site manoeuvring zone
- BLABF_C00 See schedule of works
- Hoarding line
- Site access
- Traffic barrier

Standards

- Design manual for roads and bridges, Dft, 1992
- Traffic signs regulations & general directions, TSO, 2002
- Traffic signs manual, Dft, 2006
- Manual for streets, Dft, 2007
- Manual for streets 2, CIHT, 2010
- Designing for deliveries, Fta, 1998
- Cycle infrastructure design Ltn 2/08, Dft, 2008
- Design of pedestrian crossings Ltn 2/95, Dft, 1995
- Guidance for the use of tactile paving, Dft, 1998
- Accessible bus stop design guidance, TfL, 2006

Stage
Construction phase

10m 0 40m

Scale 1:500 at A1
1:1000 if reproduced at A3

ILLUSTRATIVE

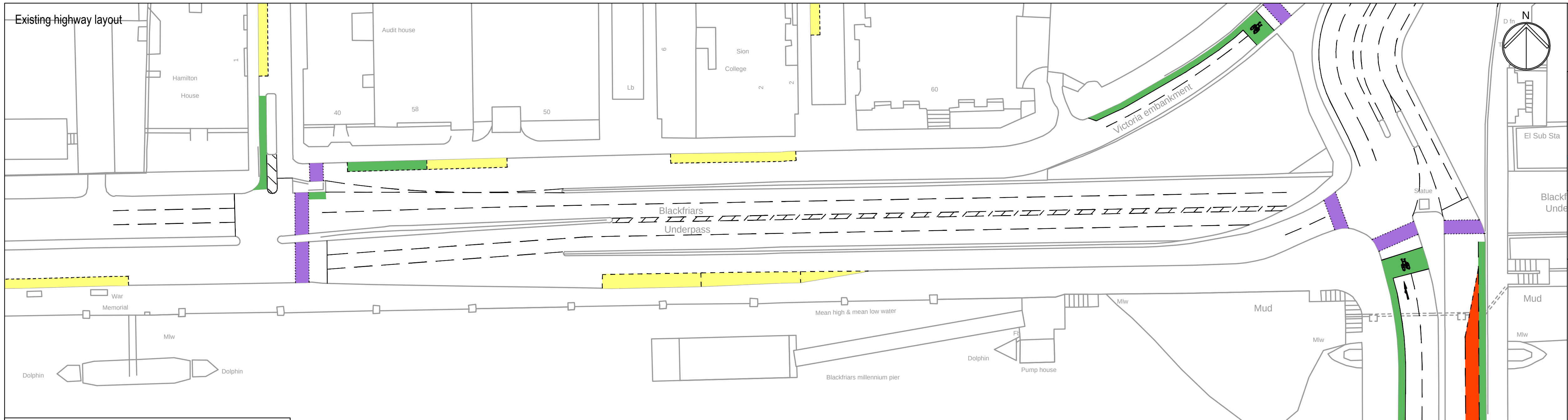
Location
Blackfriars Foreshore
City of London Corporation

Document Information
Application for Development Consent
Highway layout during construction
Phase 1

DCO-PP-17X-BLABF-190058
January 2013

Thames Tideway Tunnel
Creating a cleaner, healthier River Thames

Thames Water



On street parking

Coach parking
no stopping except buses
20 mins max

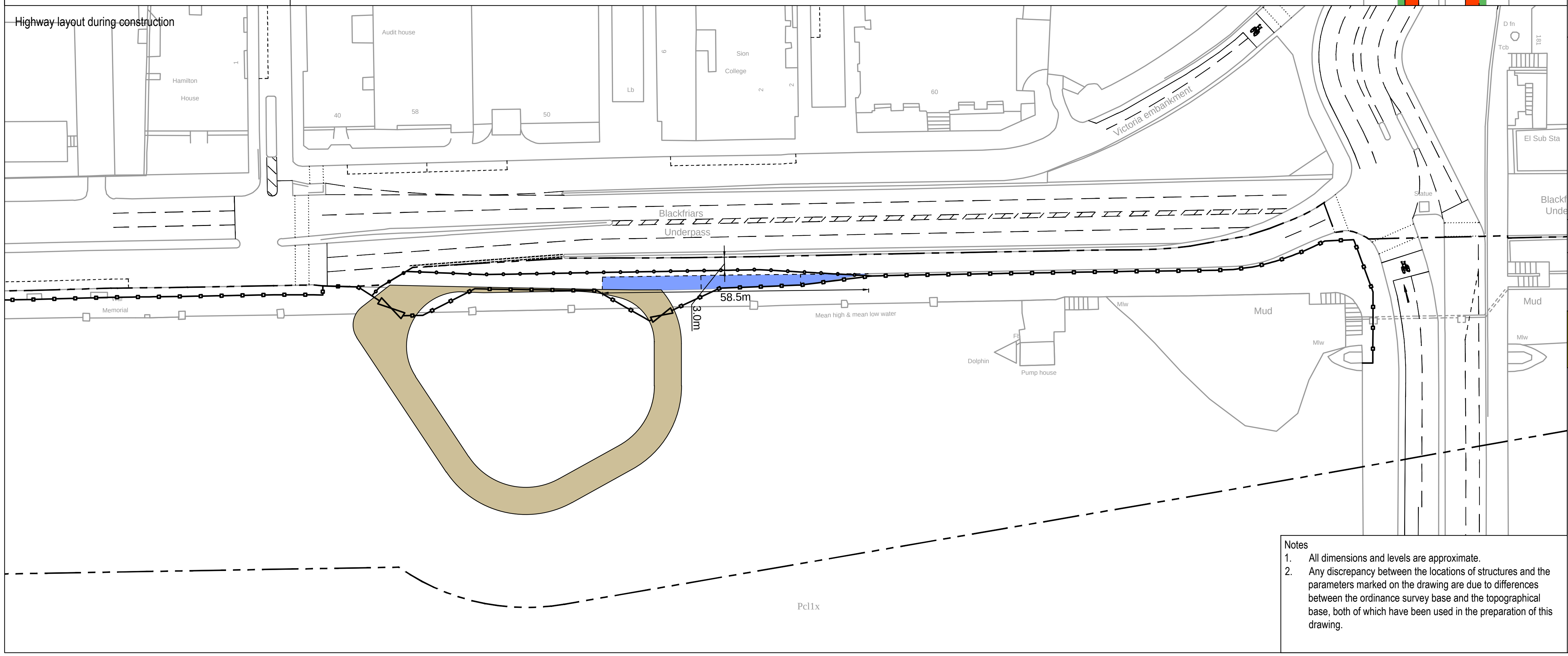
Loading / disabled bay (1)
loading / disabled bay no stopping
except loading max 20mins
badge holders max stay 3 hours

Pay & display
pay & display parking
maximum 4 hours
mon - fri 8:00am - 7:00pm
sat 8:00am - 11:00am

Loading / disabled bay (2)
loading / disabled bay no stopping
except 10:00am - 4:00pm, 7.00pm - 8.00am
loading max 20mins
badge holders max stay 3 hours

Disabled parking
disabled parking only
mon - fri max stay 4 hours
no return within 1 hour

Solo motorcycles
solo motorcycles only



Notes
1. All dimensions and levels are approximate.
2. Any discrepancy between the locations of structures and the parameters marked on the drawing are due to differences between the ordinance survey base and the topographical base, both of which have been used in the preparation of this drawing.

Keyplan: This drawing

Coordinates are to be Ordance Survey Datum OSGB36. All levels are in metres and relate to the Tunnel Datum which is 100 metres below Ordnance Datum Newlyn.

Key

Existing
- On street parking
- Bus lane
- Pedestrian crossing
- Cycle lane / advance stop line

Revised
- L.L.A.U.
- Suspended on street parking
- Illustrative on-site manoeuvring zone
- BLABF_C00 See schedule of works
- Hoarding line
- Site access
- Traffic barrier

Standards

- Design manual for roads and bridges, Dft, 1992
- Traffic signs regulations & general directions, TSO, 2002
- Traffic signs manual, Dft, 2006
- Manual for streets, Dft, 2007
- Manual for streets 2, CIHT, 2010
- Designing for deliveries, Fta, 1998
- Cycle infrastructure design Ltn 2/08, Dft, 2008
- Design of pedestrian crossings Ltn 2/95, Dft, 1995
- Guidance for the use of tactile paving, Dft, 1998
- Accessible bus stop design guidance, TfL, 2006

Stage
Construction phase

10m 0 40m
Scale 1:500 at A1
1:1000 if reproduced at A3

ILLUSTRATIVE

Location
Blackfriars Foreshore
City of London Corporation

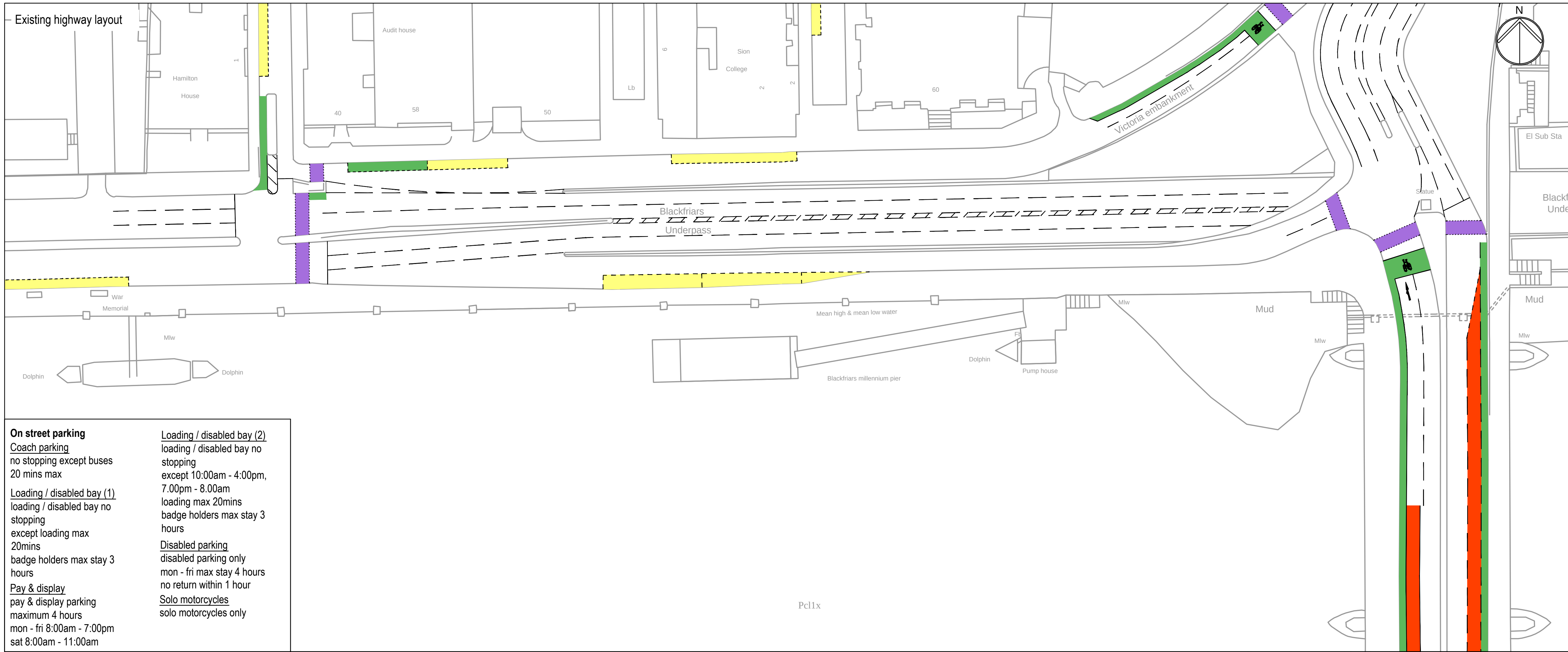
Document Information
Application for Development Consent
Highway layout during construction
Phase 2

DCO-PP-17X-BLABF-190059
January 2013

Thames Tideway Tunnel
Creating a cleaner, healthier River Thames

Thames Water

Existing highway layout



On street parking

Coach parking
no stopping except buses
20 mins max

Loading / disabled bay (1)
loading / disabled bay no stopping
except loading max 20mins
badge holders max stay 3 hours

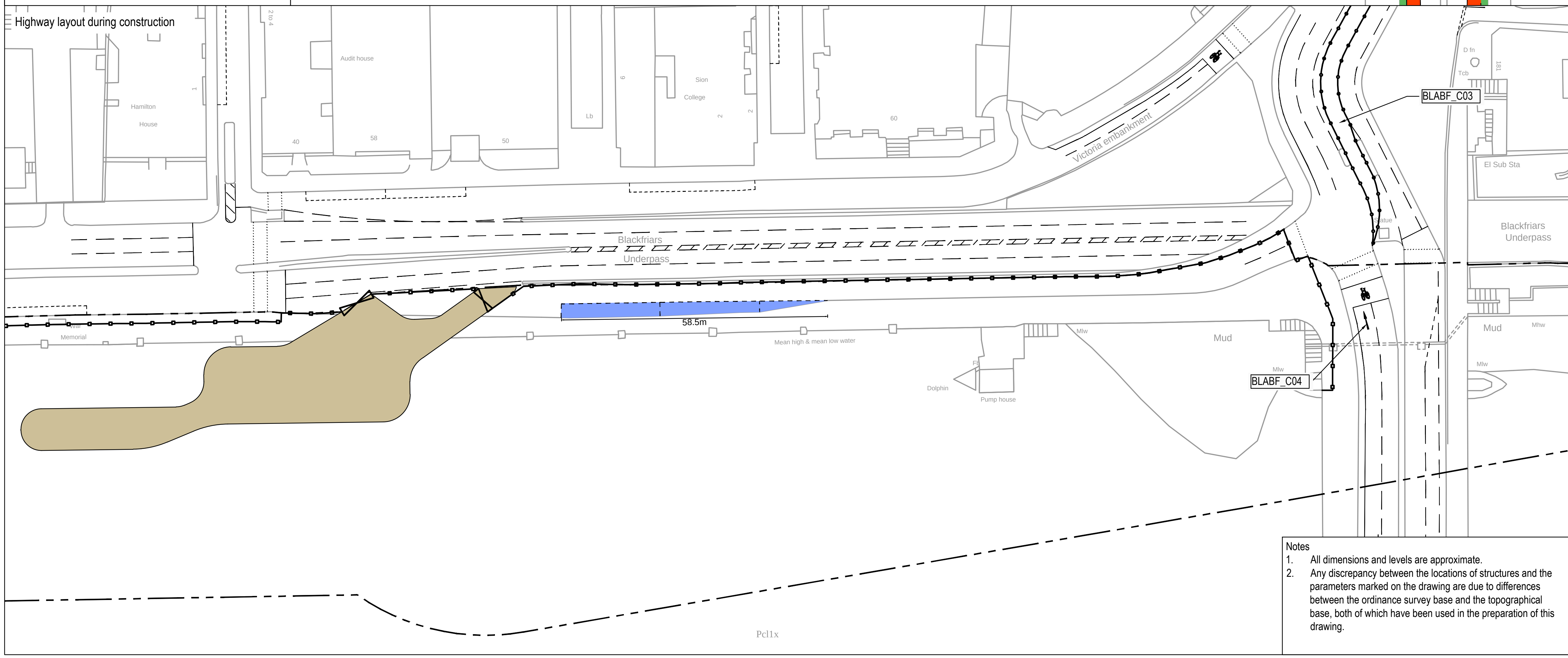
Pay & display
pay & display parking
maximum 4 hours
mon - fri 8:00am - 7:00pm
sat 8:00am - 11:00am

Loading / disabled bay (2)
loading / disabled bay no stopping
except 10:00am - 4:00pm, 7.00pm - 8.00am
loading max 20mins
badge holders max stay 3 hours

Disabled parking
disabled parking only
mon - fri max stay 4 hours
no return within 1 hour

Solo motorcycles
solo motorcycles only

Highway layout during construction



Notes
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Keyplan:

This drawing

Coordinates are to be Ordance Survey Datum OSGB36. All levels are in metres and relate to the Tunnel Datum which is 100 metres below Ordnance Datum Newlyn.

Key

Existing
- On street parking
- Bus stop / stand
- Bus lane
- Pedestrian crossing
- Cycle lane / advance stop line

Revised
- L.L.A.U.
- Removal of footway / central reserve / pedestrian refuge
- Suspended on street parking
- Illustrative on-site manoeuvring zone
- BLABF_p00 See schedule of works
- Hoarding line
- Site access
- Traffic barrier

Standards

- Design manual for roads and bridges, Dft, 1992
- Traffic signs regulations & general directions, TSO, 2002
- Traffic signs manual, Dft, 2006
- Manual for streets, Dft, 2007
- Manual for streets 2, CIHT, 2010
- Designing for deliveries, Fta, 1998
- Cycle infrastructure design Ltn 2/08, Dft, 2008
- Design of pedestrian crossings Ltn 2/95, Dft, 1995
- Guidance for the use of tactile paving, Dft, 1998
- Accessible bus stop design guidance, TfL, 2006

Stage
Construction phase

10m 0 40m
Scale 1:500 at A1
1:1000 if reproduced at A3

ILLUSTRATIVE

Location
Blackfriars Foreshore
City of London Corporation

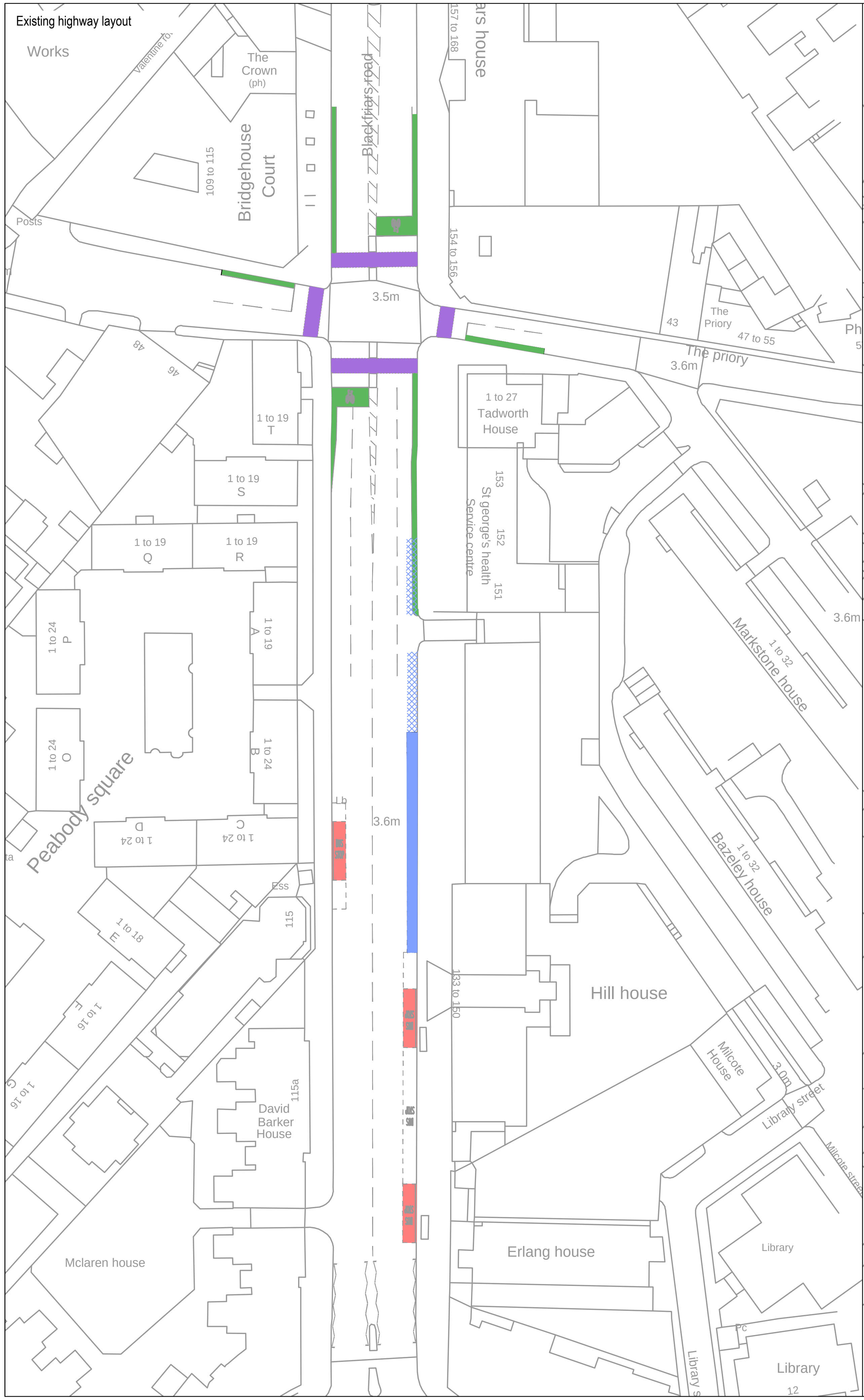
Document Information
Application for Development Consent
Highway layout during construction
Phase 3

DCO-PP-17X-BLABF-190060
January 2013

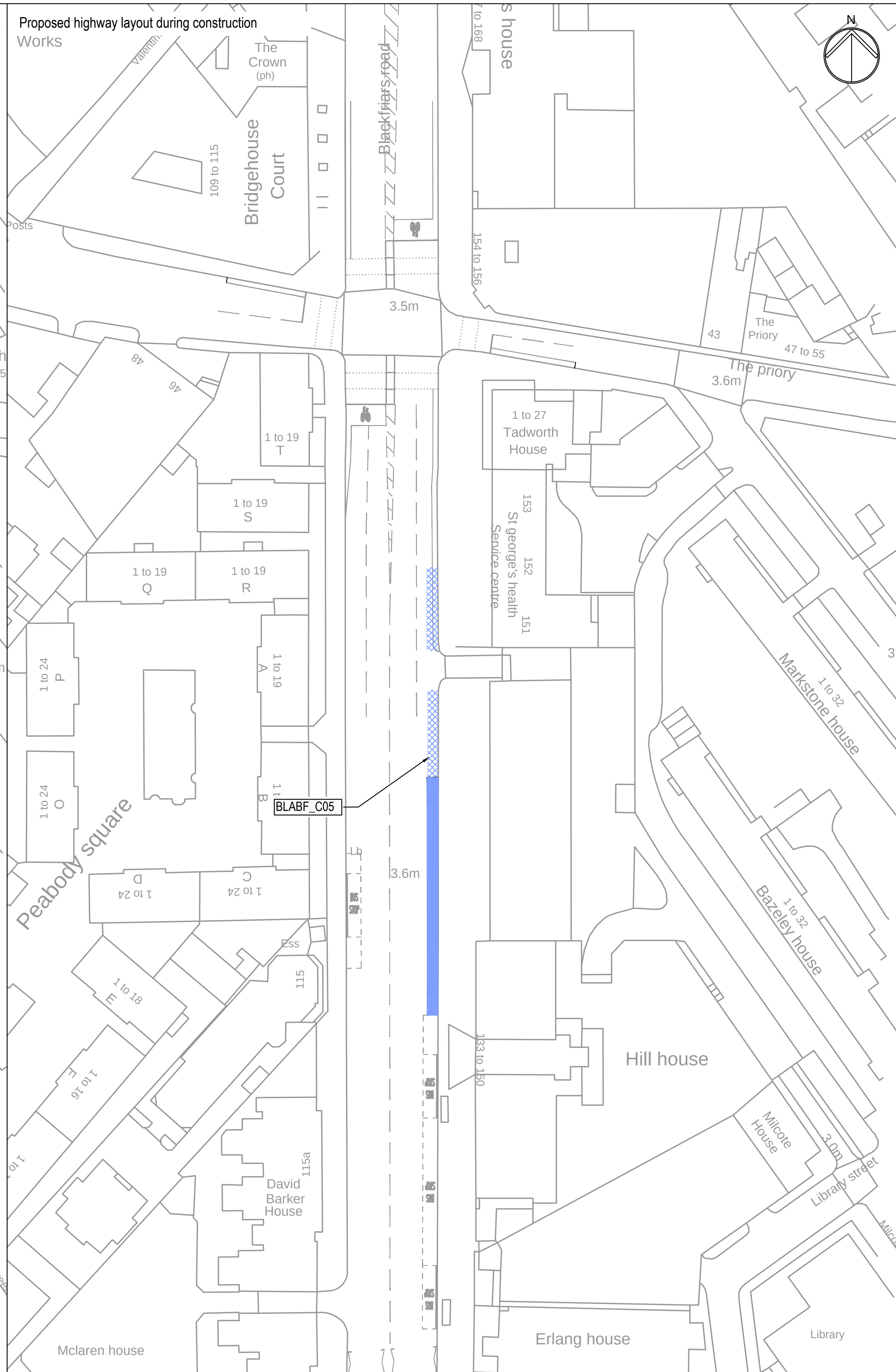
Thames Tideway Tunnel
Creating a cleaner, healthier River Thames

Thames Water

Existing highway layout



Proposed highway layout during construction



Notes
1. All dimensions and levels are approximate.
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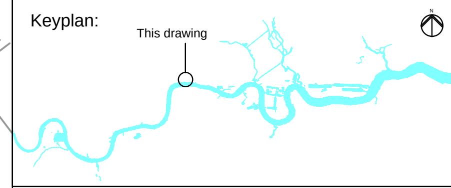
Keyplan:



Coordinates are to be Ordance Survey Datum OSGB36. All levels are in metres and relate to the Tunnel Datum which is 100 metres below Ordnance Datum Newlyn.

Key

Existing
- Bus stop / stand
- Pedestrian crossing
- Cycle lane / advance stop line

Revised
- Proposed on-street parking bay (coach parking only)
- BLABF_p00 See schedule of works
- TfL Proposed on-street parking bay (coach parking only)

Standards

- Design manual for roads and bridges, Dft, 1992
- Traffic signs regulations & general directions, TSO, 2002
- Traffic signs manual, Dft, 2006
- Manual for streets, Dft, 2007
- Manual for streets 2, CIHT, 2010
- Designing for deliveries, Fta, 1998
- Cycle infrastructure design Ltn 2/08, Dft, 2008
- Design of pedestrian crossings Ltn 2/95, Dft, 1995
- Guidance for the use of tactile paving, Dft, 1998
- Accessible bus stop design guidance, TfL, 2006

Stage
Construction phase

10m 0 40m
Scale 1:500 at A1
1:1000 if reproduced at A3

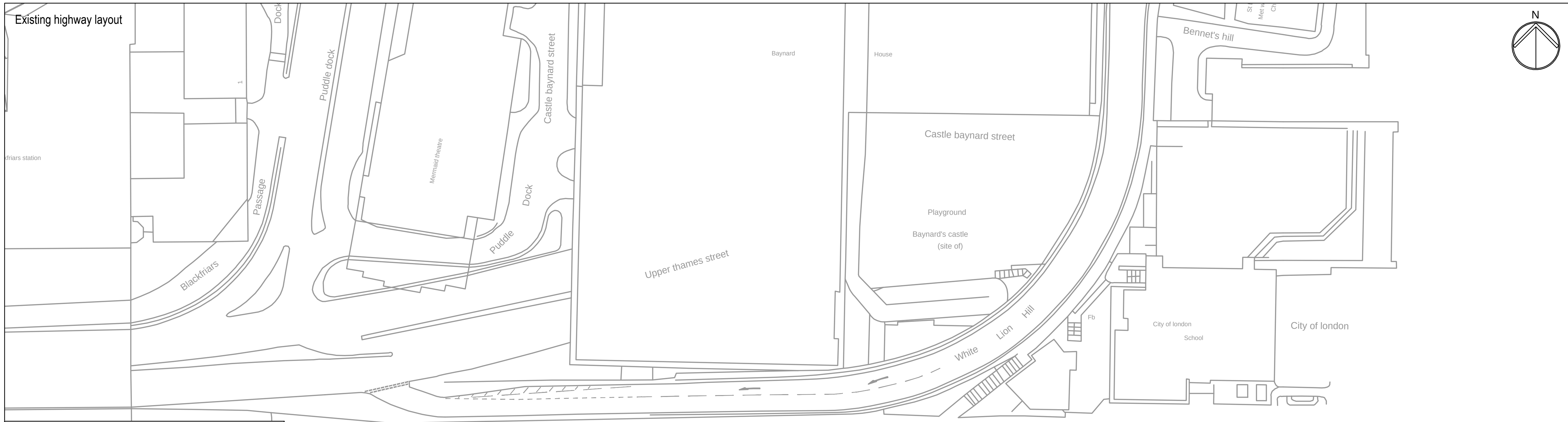
ILLUSTRATIVE

Location
Blackfriars Foreshore
City of London Corporation

Document Information
Application for Development Consent
Illustrive highway layout during Construction -temporary coach bays
LB Southwark
DCO-PP-17X-BLABF-190061
January 2013

Thames Tideway Tunnel
Creating a cleaner, healthier River Thames
Thames Water

Existing highway layout



On street parking

Loading / disabled bay (1)
loading / disabled bay no stopping
except loading max 20mins
badge holders max stay 3 hours

Loading / disabled bay (2)
loading / disabled bay no stopping
except 10:00am - 4:00pm, 7.00pm - 8.00am
loading max 20mins
badge holders max stay 3 hours

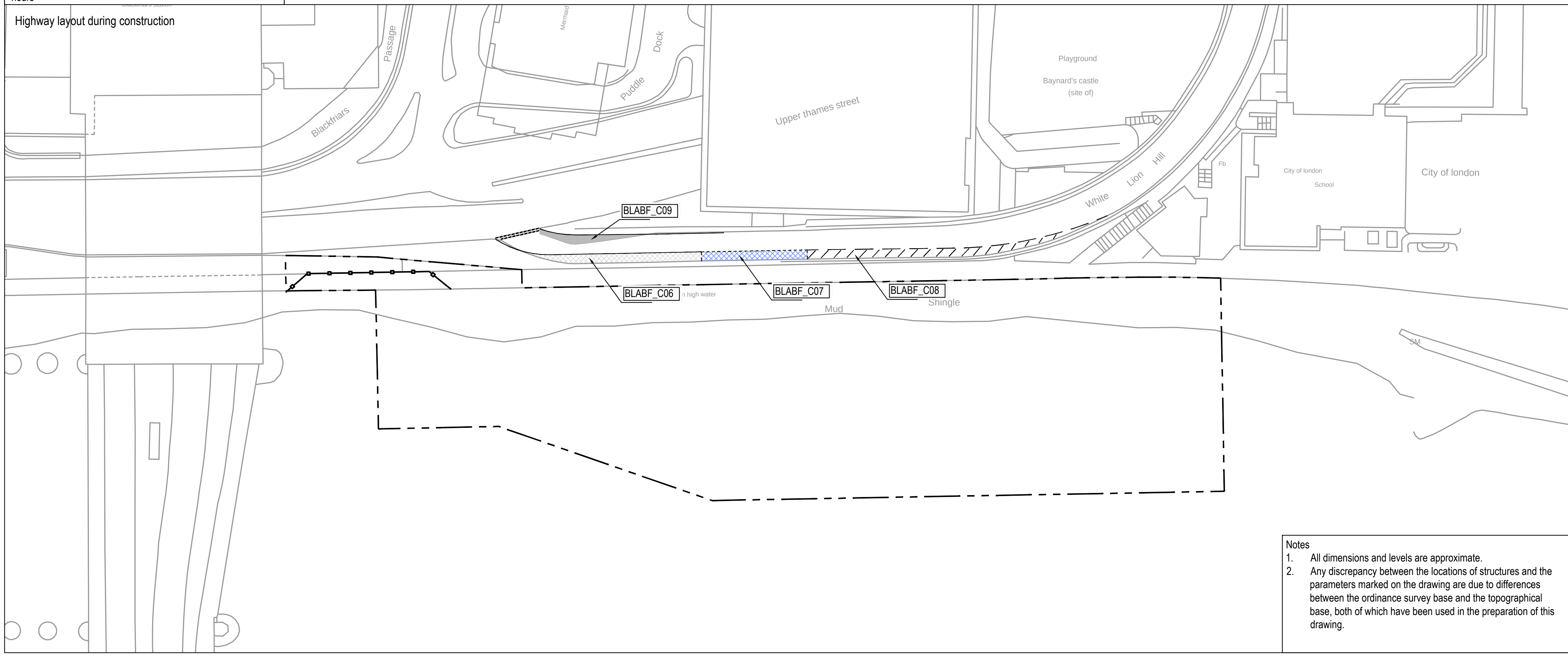
Coach parking
no stopping except buses
20 mins max

Pay & display
pay & display parking
maximum 4 hours
mon - fri 8:00am - 7:00pm
sat 8:00am - 11:00am

Solo motorcycles
solo motorcycles only

Disabled parking
disabled parking only
mon - fri max stay 4 hours
no return within 1 hour

Highway layout during construction



Notes
1. All dimensions and levels are approximate.
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Keyplan:

This drawing

Coordinates are to be Ordance Survey Datum OSGB36. All levels are in metres and relate to the Tunnel Datum which is 100 metres below Ordnance Datum Newlyn.

Key

Revised
- L.L.A.U.
- Removal of footway / central reserve / pedestrian refuge
- On-street parking bay (loading only)
- New footway
- BLABF_C00 See schedule of works
- Hoarding line

Standards

- Design manual for roads and bridges, Dft, 1992
- Traffic signs regulations & general directions, TSO, 2002
- Traffic signs manual, Dft, 2006
- Manual for streets, Dft, 2007
- Manual for streets 2, CIHT, 2010
- Designing for deliveries, Fta, 1998
- Cycle infrastructure design Ltn 2/08, Dft, 2008
- Design of pedestrian crossings Ltn 2/95, Dft, 1995
- Guidance for the use of tactile paving, Dft, 1998
- Accessible bus stop design guidance, TfL, 2006

Stage
Construction / permanent

10m 0 40m

Scale 1:500 at A1
1:1000 if reproduced at A3

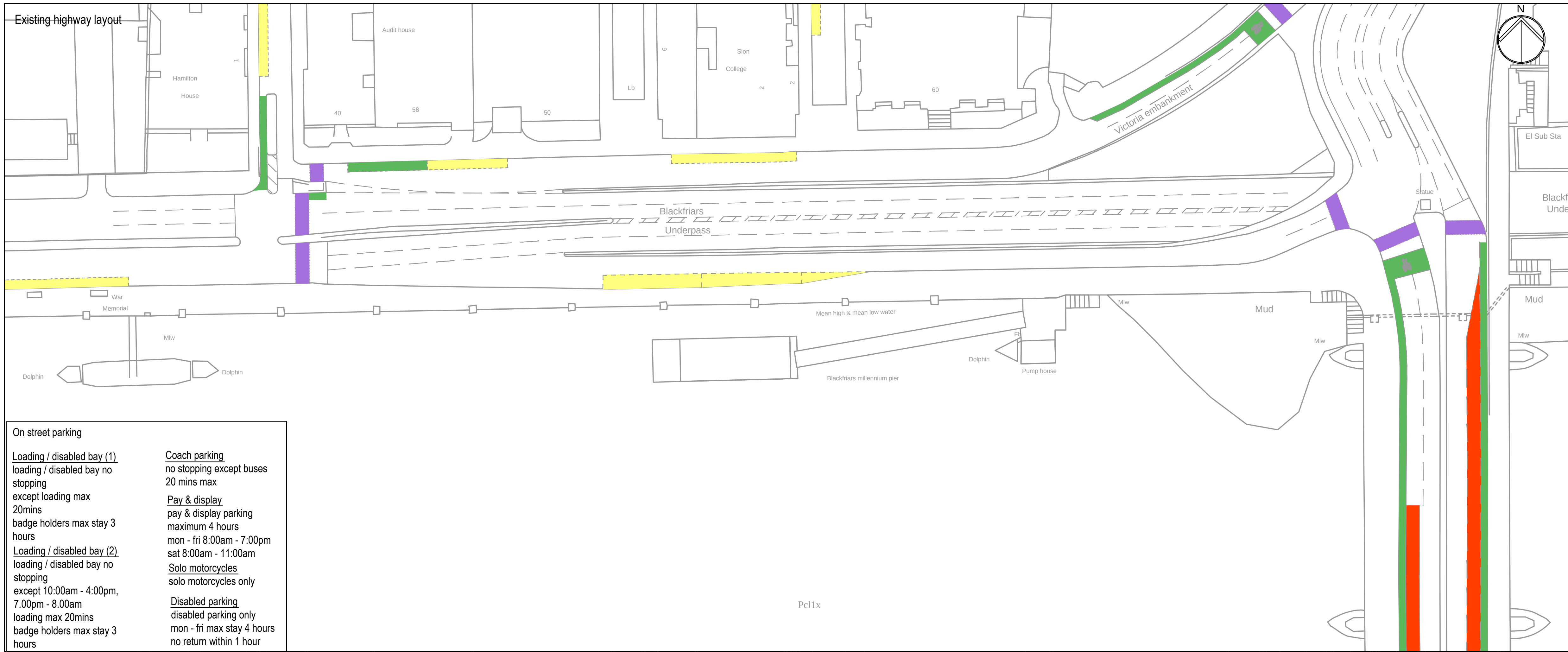
ILLUSTRATIVE

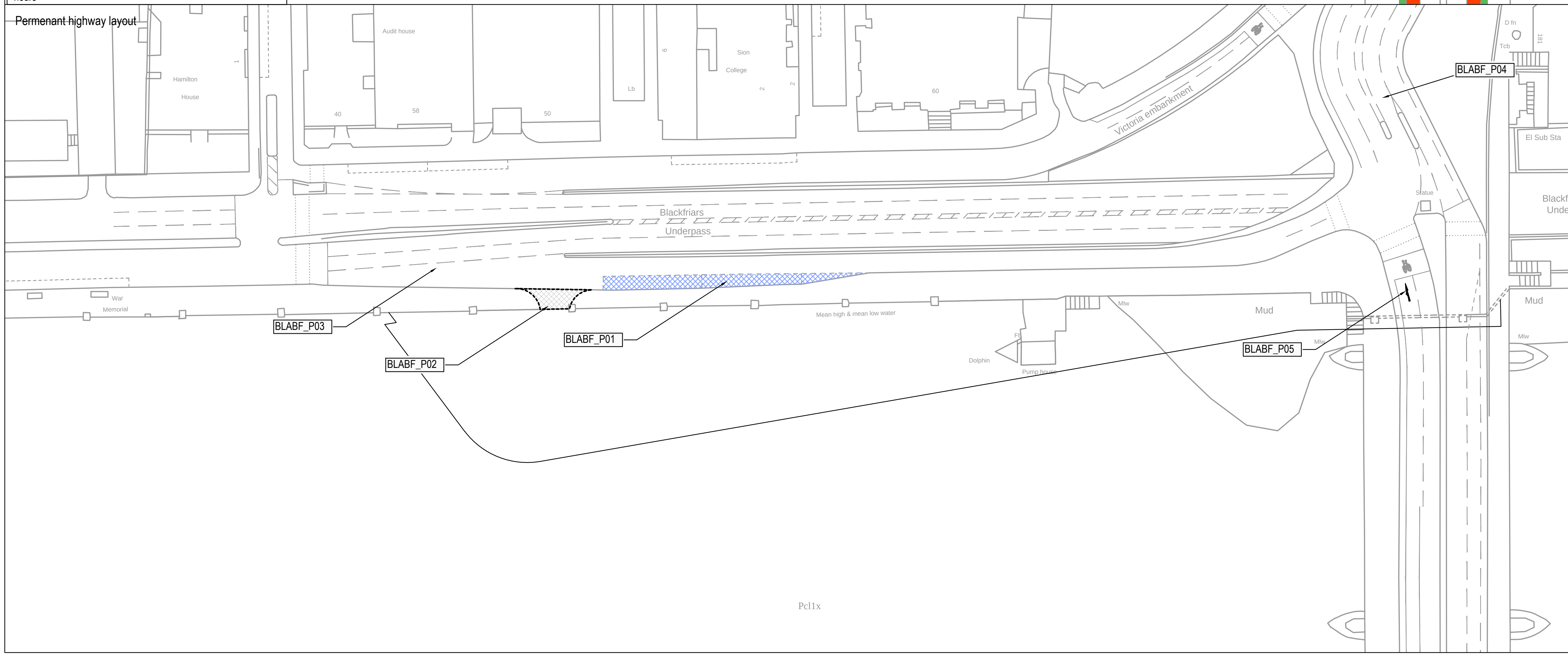
Location
Blackfriars Foreshore
City of London Corporation

Document Information
Application for Development Consent
Illustrive highway layout during Construction - loading bay relocation

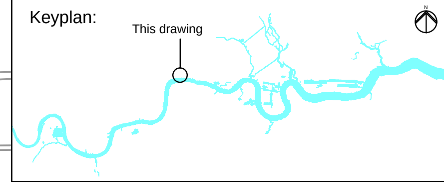
DCO-PP-17X-BLABF-190062
January 2013

Thames Tideway Tunnel
Creating a cleaner, healthier River Thames





Keyplan:



Coordinates are to be Ordance Survey Datum OSGB36. All levels are in metres and relate to the Tunnel Datum which is 100 metres below Ordnance Datum Newlyn.

Key

Existing
- On street parking
- Bus lane
- Pedestrian crossing
- Cycle lane / advance stop line

Revised
- Reinstated footway
- Reinstated on street parking
- BLABF_P00 See schedule of works

Standards

- Design manual for roads and bridges, Dft, 1992
- Traffic signs regulations & general directions, TSO, 2002
- Traffic signs manual, Dft, 2006
- Manual for streets, Dft, 2007
- Manual for streets 2, CIHT, 2010
- Designing for deliveries, Fta, 1998
- Cycle infrastructure design Ltn 2/08, Dft, 2008
- Design of pedestrian crossings Ltn 2/95, Dft, 1995
- Guidance for the use of tactile paving, Dft, 1998
- Accessible bus stop design guidance, TfL, 2006

Stage
Permanent phase

10m 0 40m
Scale 1:500 at A1
1:1000 if reproduced at A3

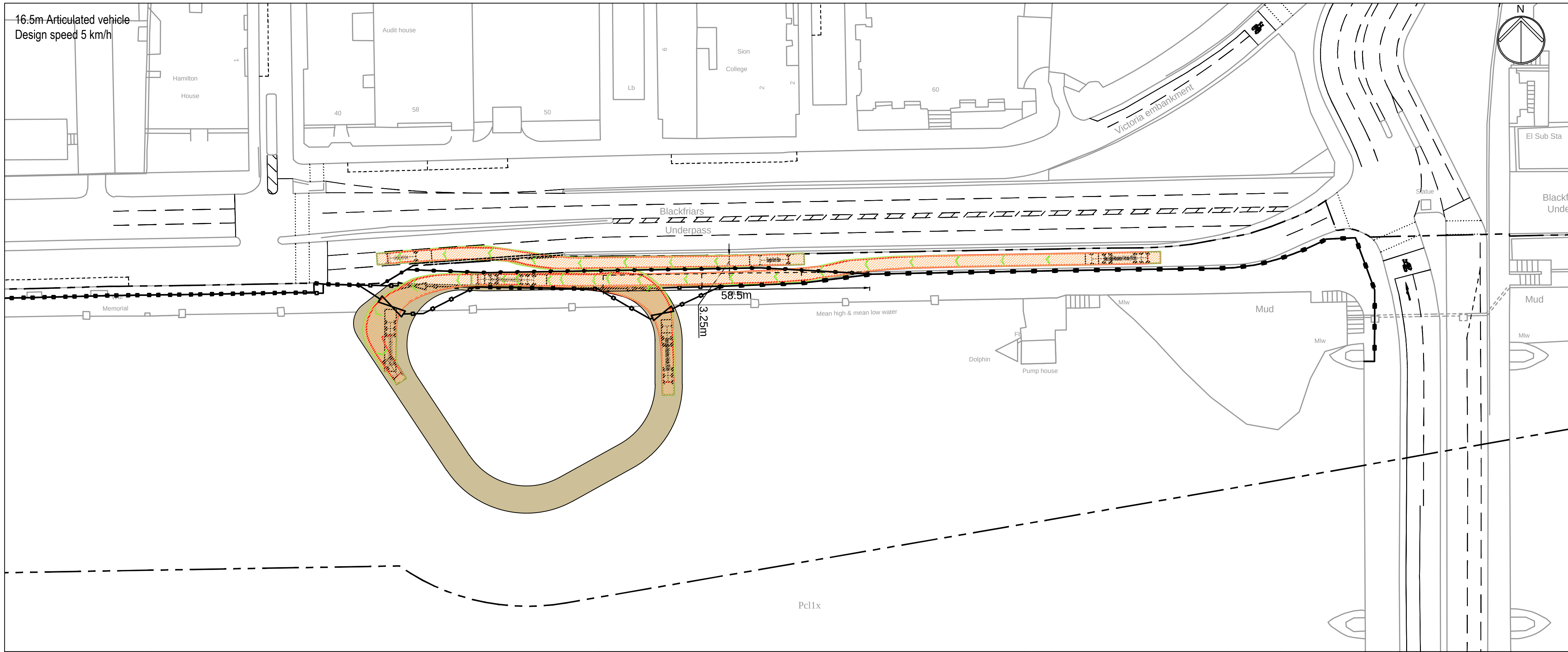
ILLUSTRATIVE

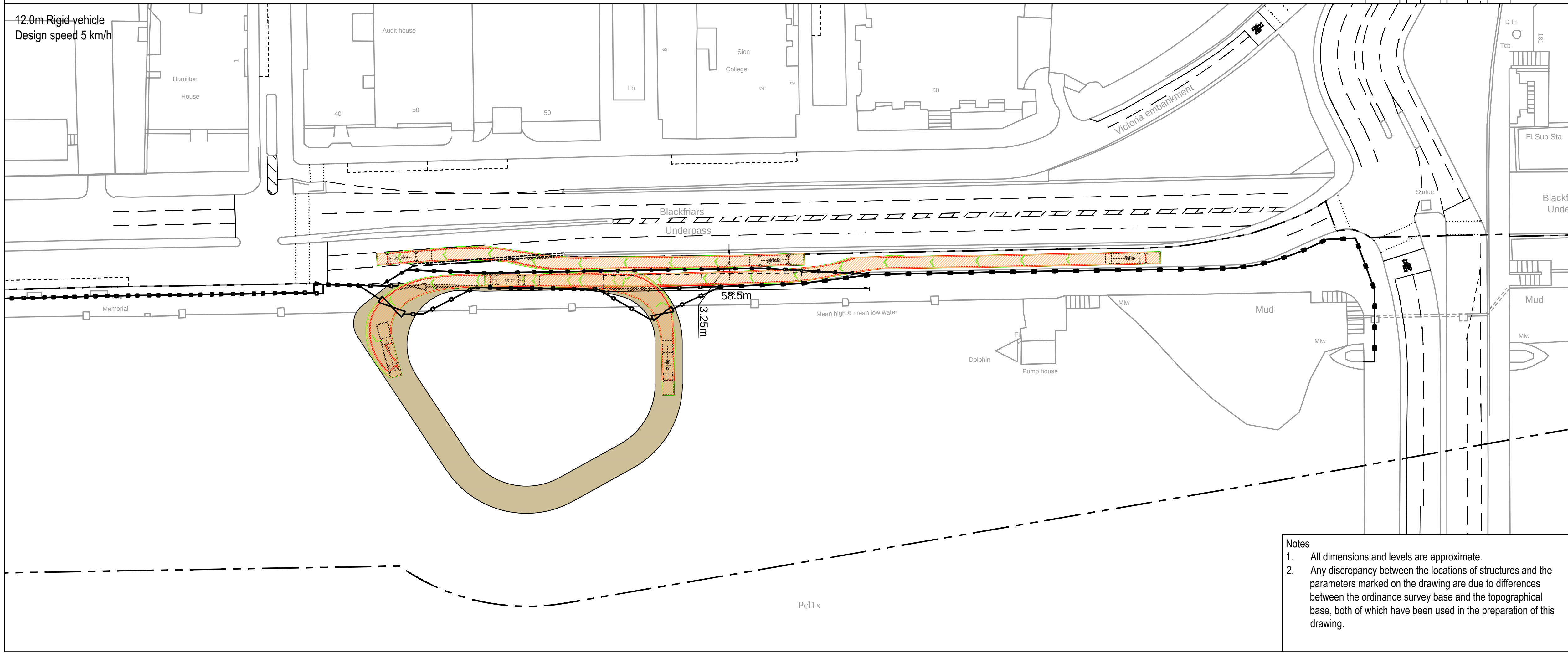
Location
Blackfriars Foreshore
City of London Corporation

Document Information
Application for Development Consent
Permanent highway layout

DCO-PP-17X-BLABF-190063
January 2013

Thames Tideway Tunnel
Creating a cleaner, healthier River Thames





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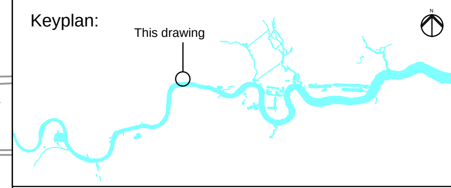
Keyplan:

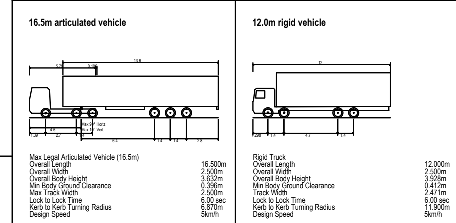


Coordinates are to be Ordance Survey Datum OSGB36. All levels are in metres and relate to the Tunnel Datum which is 100 metres below Ordnance Datum Newlyn.

Key

Revised
- L.L.A.U.
- Illustrative on-site manoeuvring zone
- Hoarding line
- Traffic barrier

Vehicle swept path analysis
- Vehicle body outline
- Vehicle chassis outline
- Vehicle swept path



Standards

- Design manual for roads and bridges, Dft, 1992
- Traffic signs regulations & general directions, TSO, 2002
- Traffic signs manual, Dft, 2006
- Manual for streets, Dft, 2007
- Manual for streets 2, CIHT, 2010
- Designing for deliveries, Fta, 1998
- Cycle infrastructure design Ltn 2/08, Dft, 2008
- Design of pedestrian crossings Ltn 2/95, Dft, 1995
- Guidance for the use of tactile paving, Dft, 1998
- Accessible bus stop design guidance, TfL, 2006

Stage
Construction phase

10m 0 40m

Scale 1:500 at A1
1:1000 if reproduced at A3

ILLUSTRATIVE

Location
Blackfriars Foreshore
City of London Corporation

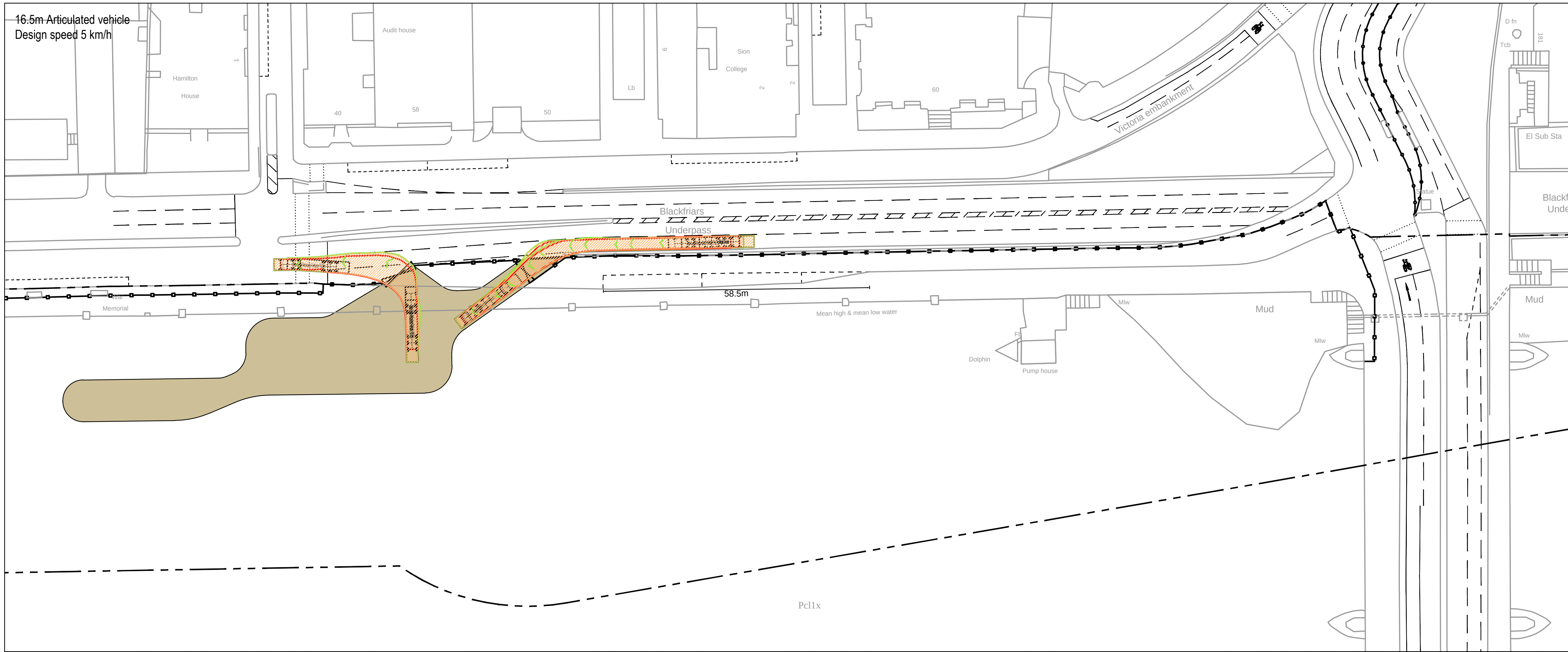
Document Information
Application for Development Consent

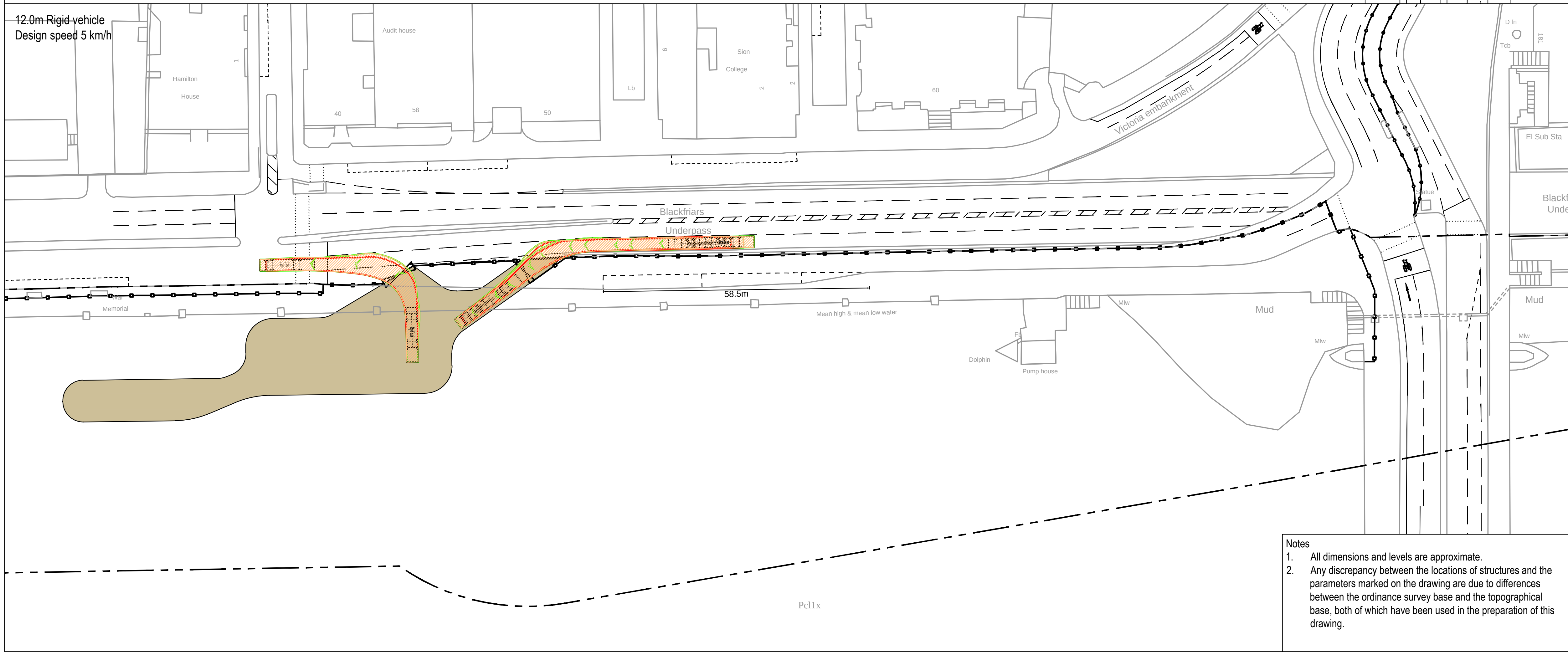
Highway layout during construction
Phases 1 & 2 - Vehicle swept path analysis

DCO-PP-17X-BLABF-190064
January 2013

Thames Tideway Tunnel
Creating a cleaner, healthier River Thames

Thames Water





Notes
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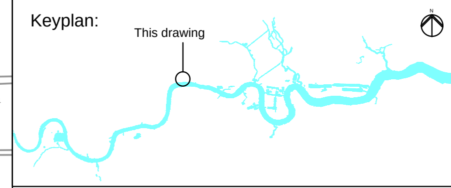
Keyplan:



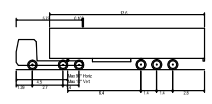
Coordinates are to be Ordance Survey Datum OSGB36. All levels are in metres and relate to the Tunnel Datum which is 100 metres below Ordnance Datum Newlyn.

Key

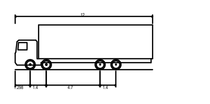
Revised
- L.L.A.U.
- Illustrative on-site manoeuvring zone
- Hoarding line
- Traffic barrier

Vehicle swept path analysis
- Vehicle body outline
- Vehicle chassis outline
- Vehicle swept path

16.5m Articulated vehicle



12.0m Rigid vehicle



Standards

- Design manual for roads and bridges, Dft, 1992
- Traffic signs regulations & general directions, TSO, 2002
- Traffic signs manual, Dft, 2006
- Manual for streets, Dft, 2007
- Manual for streets 2, CIHT, 2010
- Designing for deliveries, Fta, 1998
- Cycle infrastructure design Ltn 2/08, Dft, 2008
- Design of pedestrian crossings Ltn 2/95, Dft, 1995
- Guidance for the use of tactile paving, Dft, 1998
- Accessible bus stop design guidance, TfL, 2006

Stage
Construction phase

10m 0 40m

Scale 1:500 at A1
1:1000 if reproduced at A3

ILLUSTRATIVE

Location
Blackfriars Foreshore
City of London Corporation

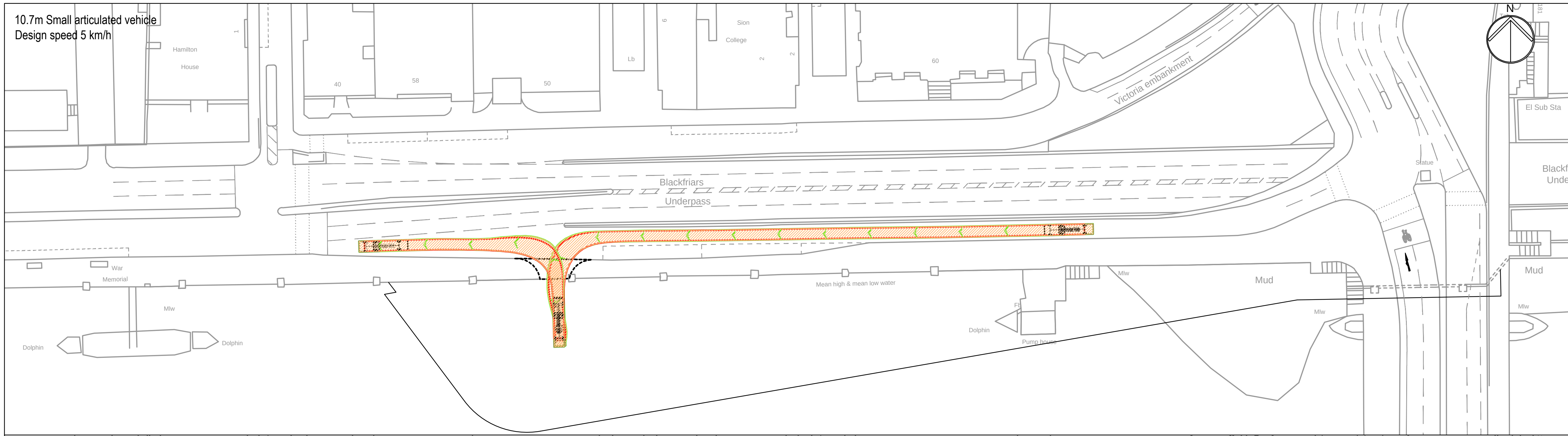
Document Information
Application for Development Consent

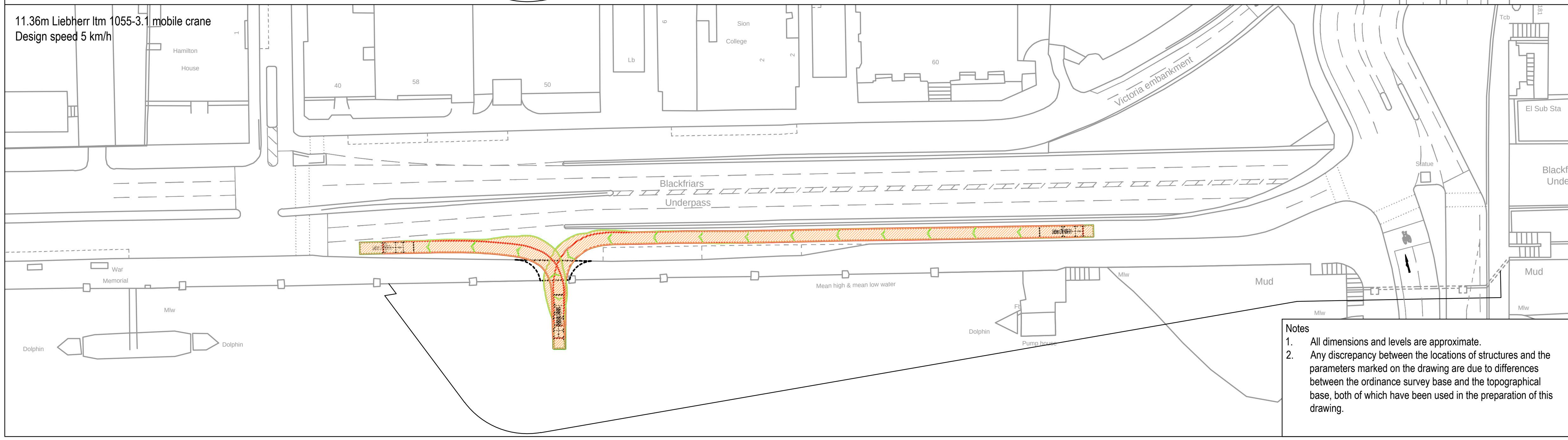
Highway layout during construction
Phase 3 - Vehicle swept path analysis

DCO-PP-17X-BLABF-190065
January 2013

Thames Tideway Tunnel
Creating a cleaner, healthier River Thames

Thames Water





Notes
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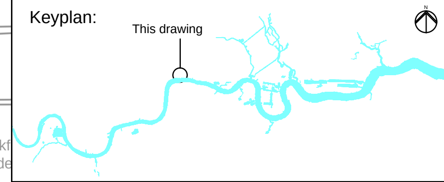
Keyplan:

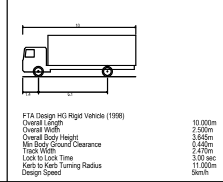


Coordinates are to be Ordance Survey Datum OSGB36. All levels are in metres and relate to the Tunnel Datum which is 100 metres below Ordnance Datum Newlyn.

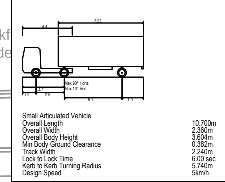
Key

Vehicle swept path analysis
- Vehicle body outline
- Vehicle chassis outline
- Vehicle swept path

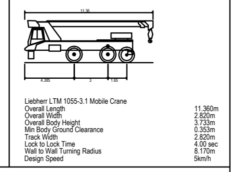
10.0m Rigid vehicle



10.7m Small articulated vehicle



11.36m Liebherr ltm 1055-3.1 mobile crane



Standards

- Design manual for roads and bridges, Dft, 1992
- Traffic signs regulations & general directions, TSO, 2002
- Traffic signs manual, Dft, 2006
- Manual for streets, Dft, 2007
- Manual for streets 2, CIHT, 2010
- Designing for deliveries, Fta, 1998
- Cycle infrastructure design Ltn 2/08, Dft, 2008
- Design of pedestrian crossings Ltn 2/95, Dft, 1995
- Guidance for the use of tactile paving, Dft, 1998
- Accessible bus stop design guidance, TfL, 2006

Stage
Permanent phase

10m 0 40m
Scale 1:500 at A1
1:1000 if reproduced at A3

ILLUSTRATIVE

Location
Blackfriars Foreshore
City of London Corporation

Document Information
Application for Development Consent

Permanent highway layout
Vehicle swept path analysis

DCO-PP-17X-BLABF-190066
January 2013

Thames Tideway Tunnel
Creating a cleaner, healthier River Thames

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Transport assessment figures

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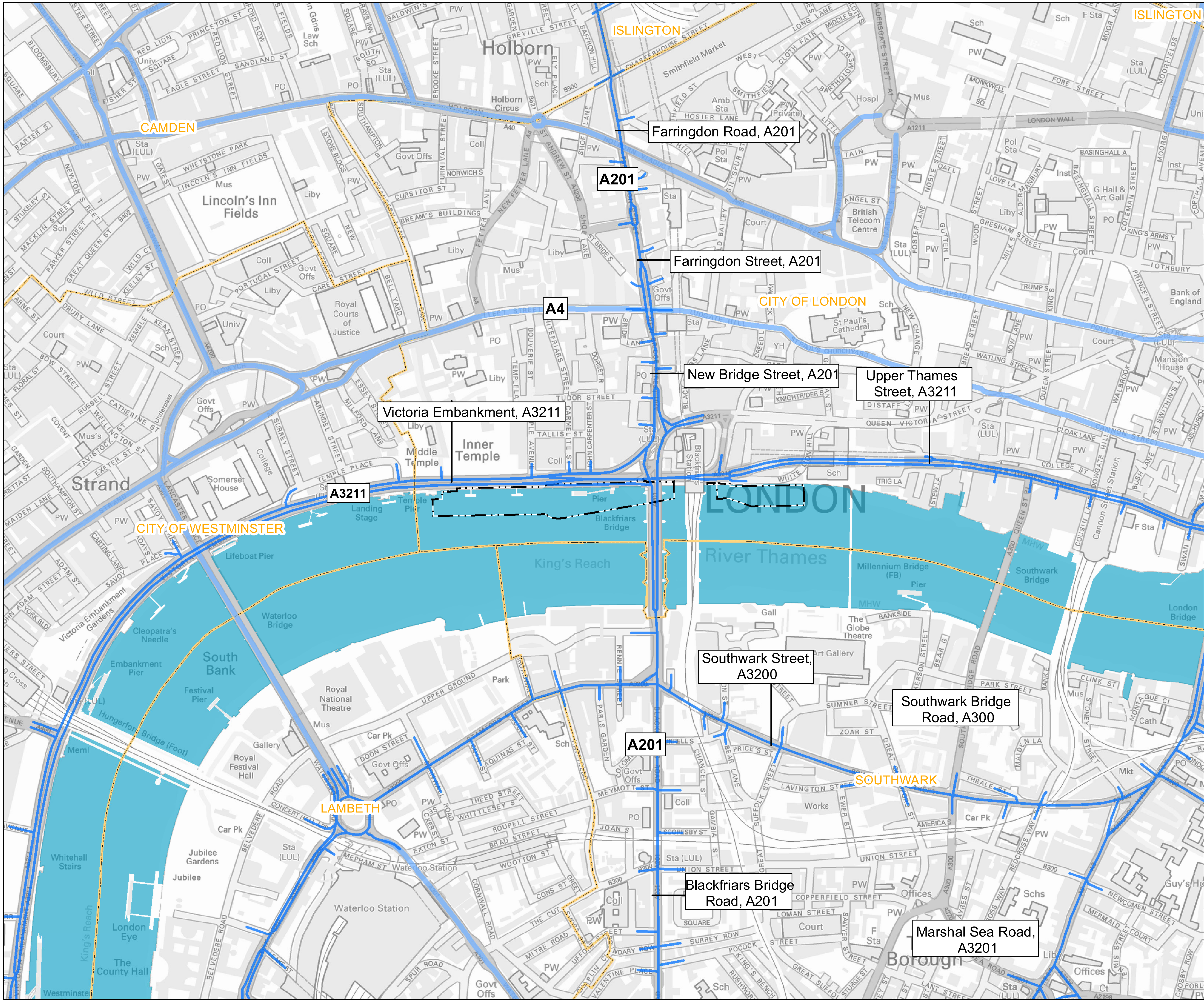
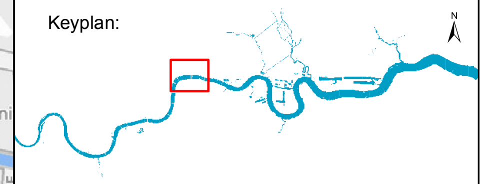


Keyplan:



Key

- TFL road network
- Strategic road network
- Limits of Land to be Acquired or Used
- Local authority boundary

110 55 0 110 m

Scale 1 : 7,500 at A3

FOR INFORMATION

Location

Blackfriars Bridge Foreshore

City Of London

Document Information

Transport Assessment

Transport - site location plan

Figure 18.2.1

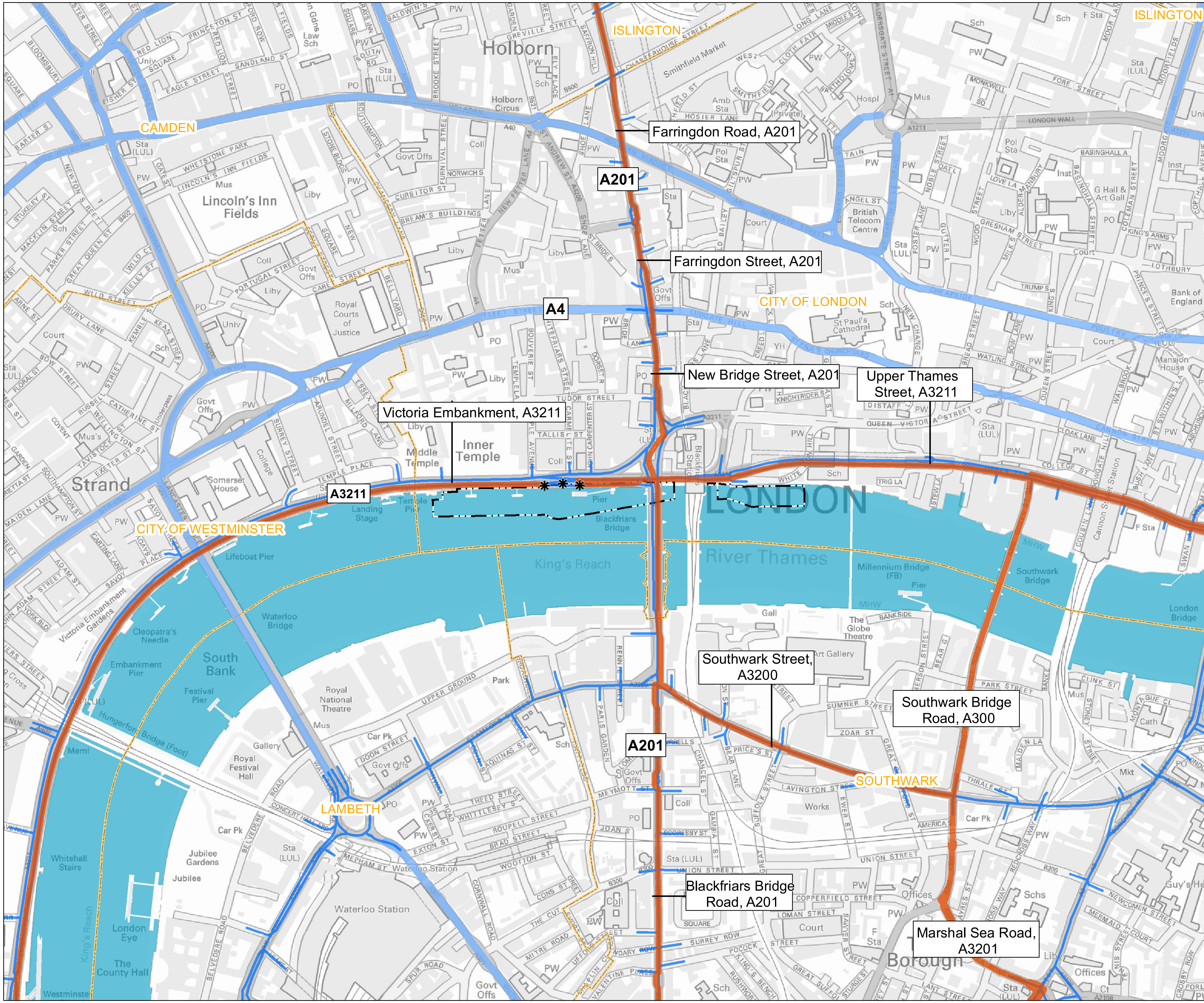
1PL03-TT-50657

January 2013

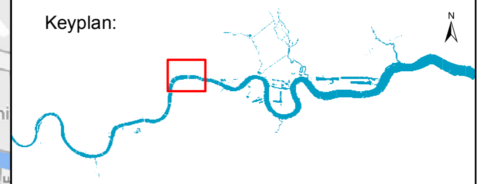
Thames Tideway Tunnel

Creating a cleaner, healthier River Thames

Thames Water



Keyplan:



Key

- Site access
- TFL road network
- Strategic road network
- Primary construction route
- Limits of Land to be Acquired or Used
- Local authority boundary

110 55 0 110 m

Scale 1 : 7,500 at A3

FOR INFORMATION

Location

Blackfriars Bridge Foreshore

City Of London

Document Information

Transport Assessment

Transport - construction traffic routes

Figure 18.2.2

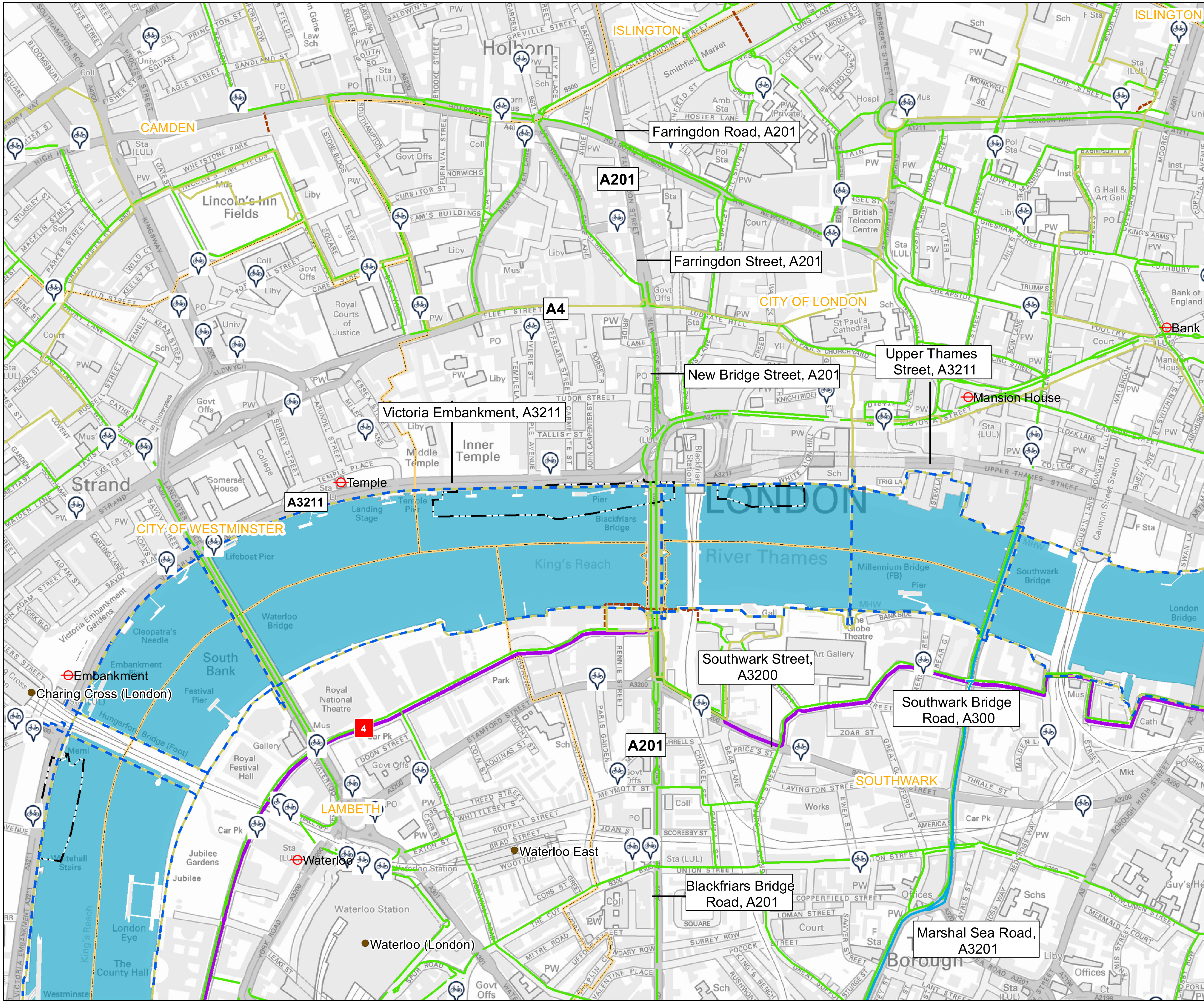
1PL03-TT-50649

January 2013

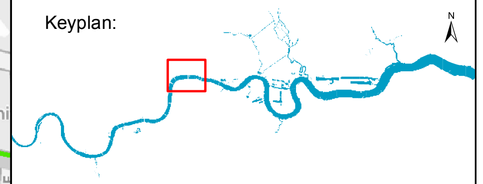
Thames Tideway Tunnel

Creating a cleaner, healthier River Thames

Thames Water



Keyplan:



Key

- National rail stations with cycle parking
- Underground Stations with cycle parking
- Barclays cycle hire docking stations
- London strategic walk network
- Cycle superhighway (open)
- London cycle routes
- Thames path
- Pedestrian routes

National cycle network

Route Type

- Open Traffic Free
- Open on-road
- Limits of Land to be Acquired or Used
- Local authority boundary

110 55 0 110 m

Scale 1 : 7,500 at A3

FOR INFORMATION

Location

Blackfriars Bridge Foreshore
City Of London

Document Information

Transport Assessment

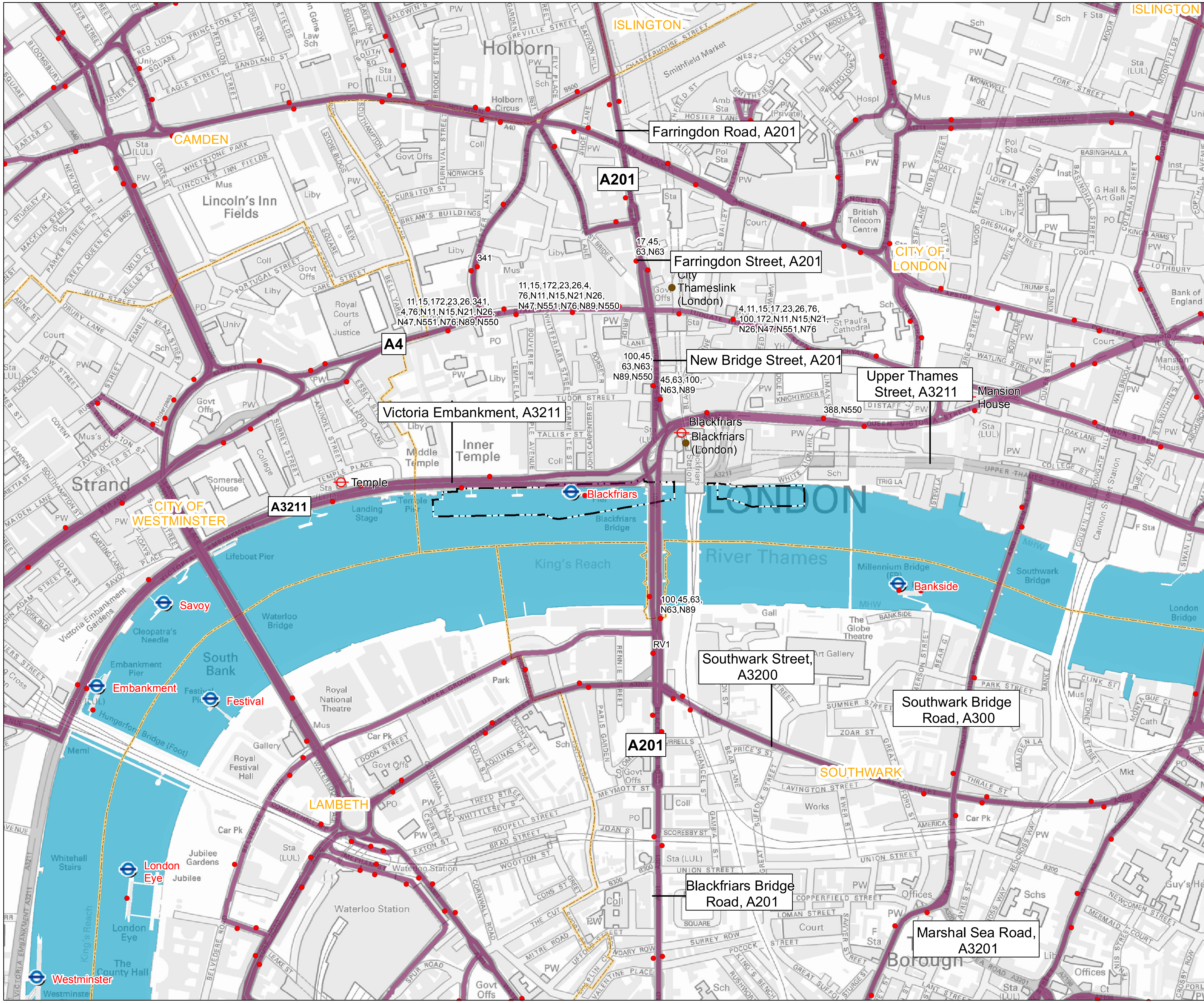
Transport - pedestrian and cycle network

Figure 18.4.1

1PL03-TT-50665
January 2013

Thames Tideway Tunnel
Creating a cleaner, healthier River Thames

Thames Water



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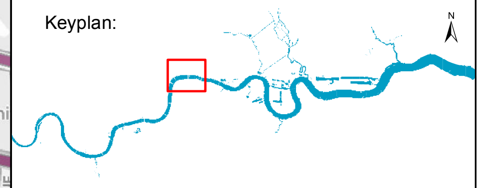
Keyplan:



Key

- TFL bus stops
- National rail stations
- London underground stations
- Pier locations
- TfL bus routes
- Limits of Land to be Acquired or Used
- Local authority boundary

110 55 0 110 m

Scale 1 : 7,500 at A3

FOR INFORMATION

Location

Blackfriars Bridge Foreshore

City Of London

Document Information

Transport Assessment

Transport - public transport

Figure 18.4.2

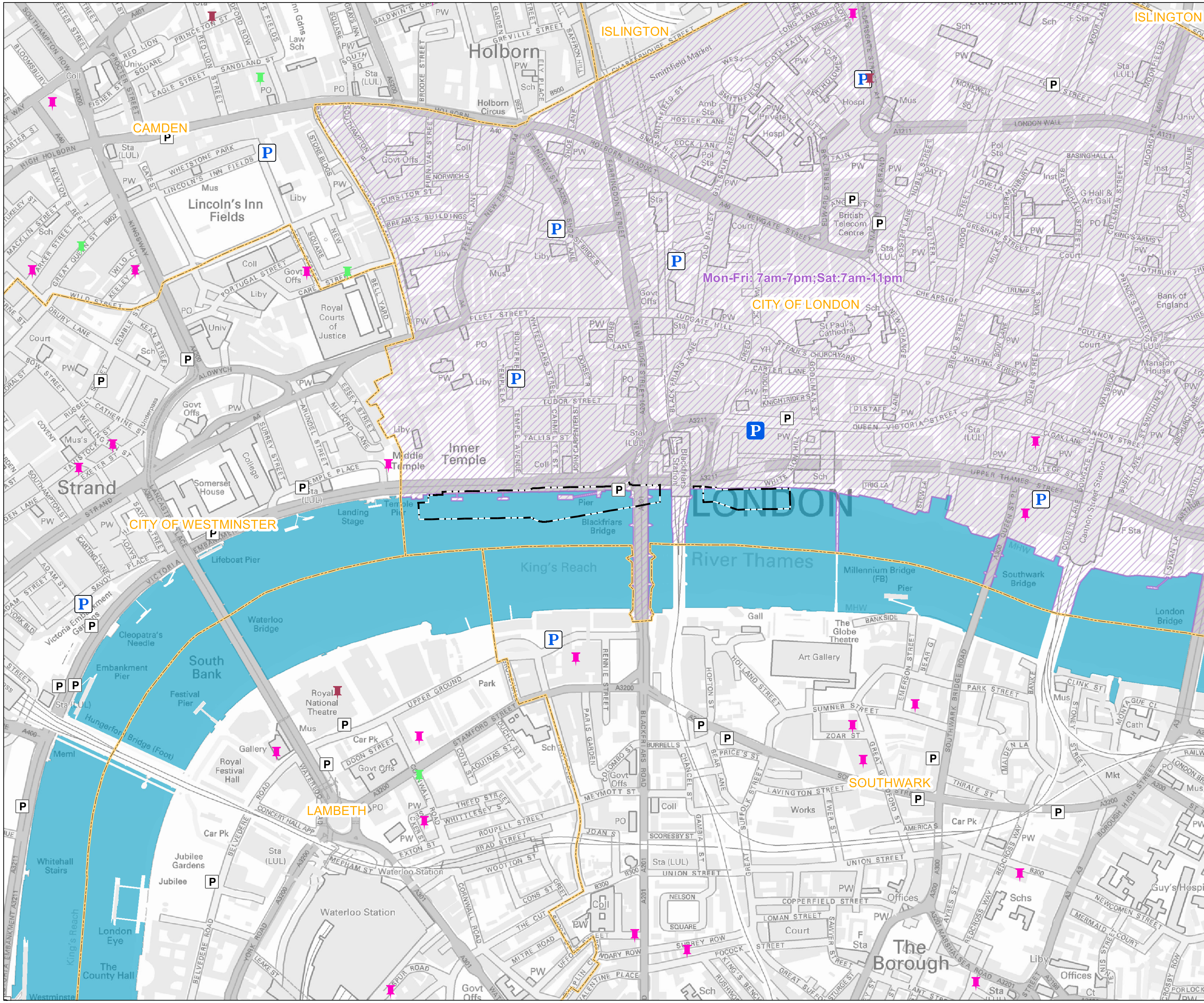
1PL03-TT-50673

January 2013

Thames Tideway Tunnel

Creating a cleaner, healthier River Thames

Thames Water



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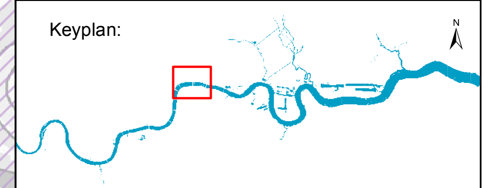


Key

- Council parking
- Private car parking
- Coach Parking
- Zip Car
- Hertz on Demand
- City Car
- Controlled Parking Zones and hours of operation
- Limits of Land to be Acquired or Used
- Local authority boundary

110 55 0 110 m

Scale 1 : 7,500 at A3

FOR INFORMATION

Location

Blackfriars Bridge Foreshore

City Of London

Document Information

Transport Assessment

Transport - parking

Figure 18.4.3

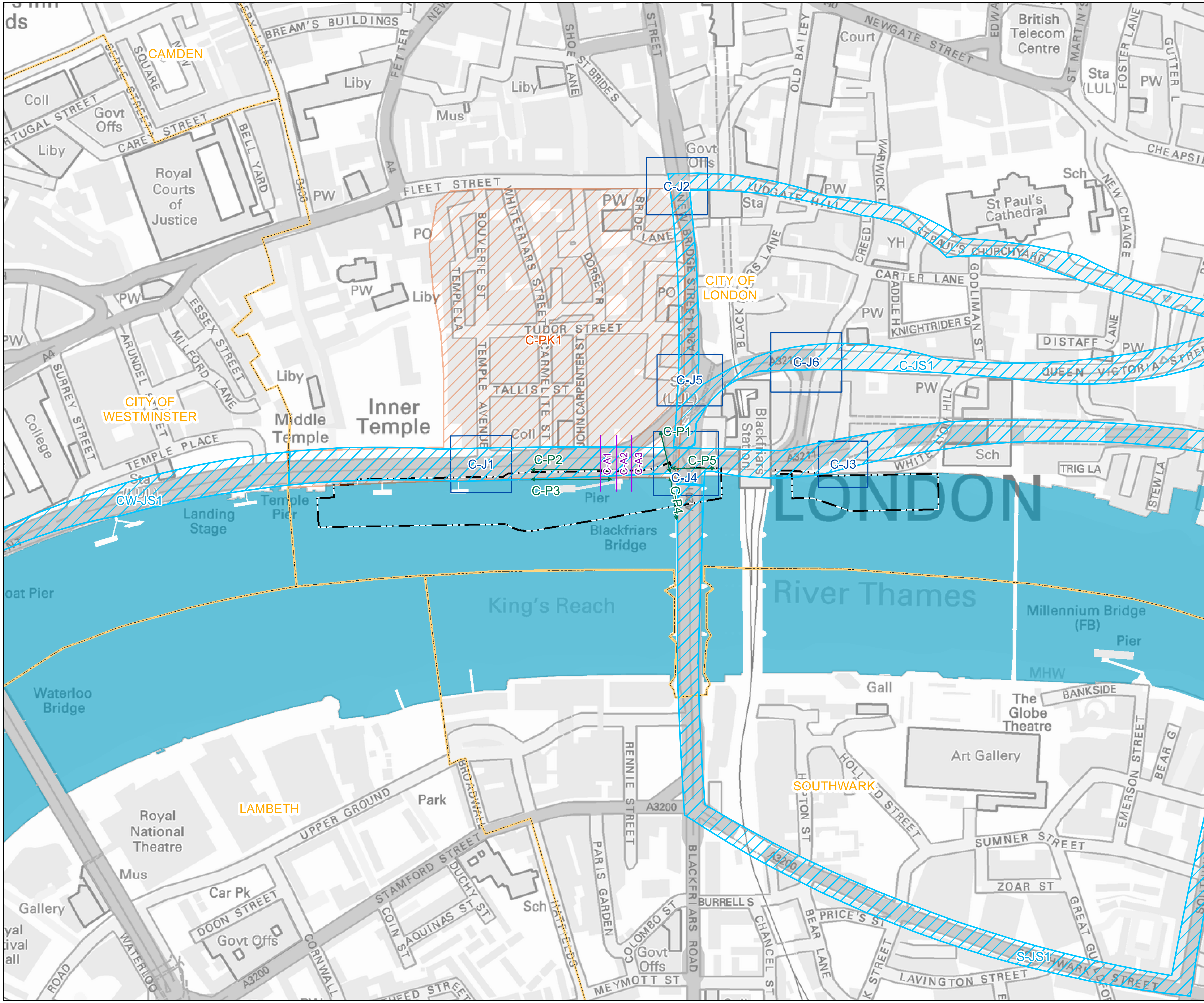
1PL03-TT-50681

January 2013

Thames Tideway Tunnel

Creating a cleaner, healthier River Thames

Thames Water



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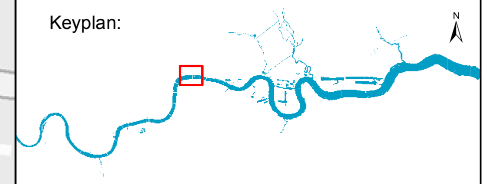
Keyplan:



Key

- Automatic traffic count surveys
- Pedestrian and cycle surveys
- Junction surveys
- Journey time surveys
- Parking surveys
- Limits of Land to be Acquired or Used
- Local authority boundary

70 35 0 70 m

Scale 1 : 4,500 at A3

FOR INFORMATION

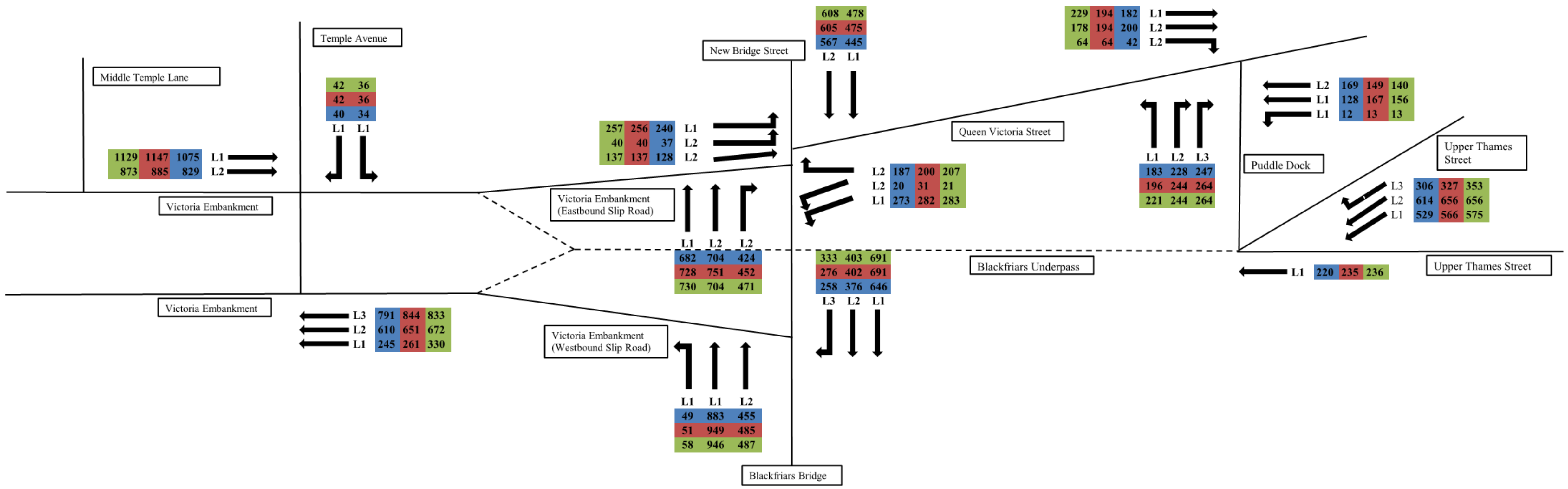
Location
Blackfriars Bridge Foreshore
City Of London

Document Information
Transport Assessment
Transport - survey locations

Figure 18.4.4
1PL03-TT-50689
January 2013

Thames Tideway Tunnel
Creating a cleaner, healthier River Thames

Thames Water



Keyplan:

Key

Base Traffic Flow

Construction Base

Development Case

FOR INFORMATION

Location

Blackfriars Bridge Foreshore

City of London

Document Information

Transport Assessment

Transport - Baseline, Construction and Development case traffic flow (AM peak hour)

Figure 18.4.5

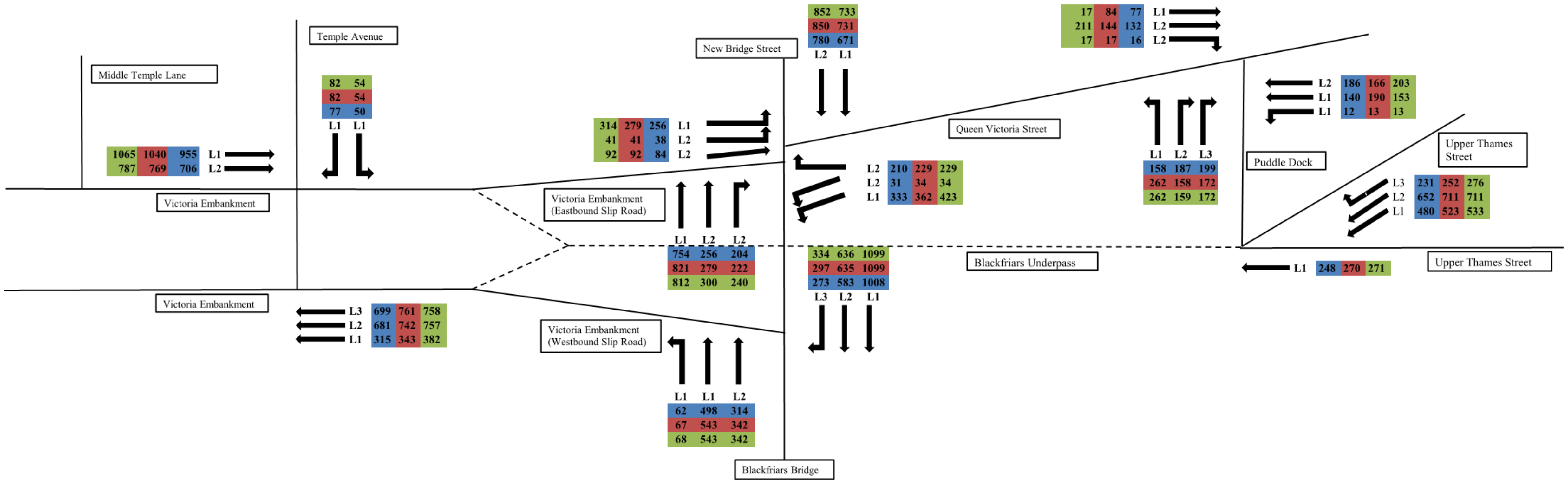
1PL03-TT-50908

January 2013

Thames Tideway Tunnel

Creating a cleaner, healthier River Thames

Thames Water



Keyplan:

Key

Base Traffic Flow

Construction Base

Development Case

FOR INFORMATION

Location

Blackfriars Bridge Foreshore

City of London

Document Information

Transport Assessment

Transport - Baseline, Construction and Development case traffic flow (PM peak hour)

Figure 18.4.6

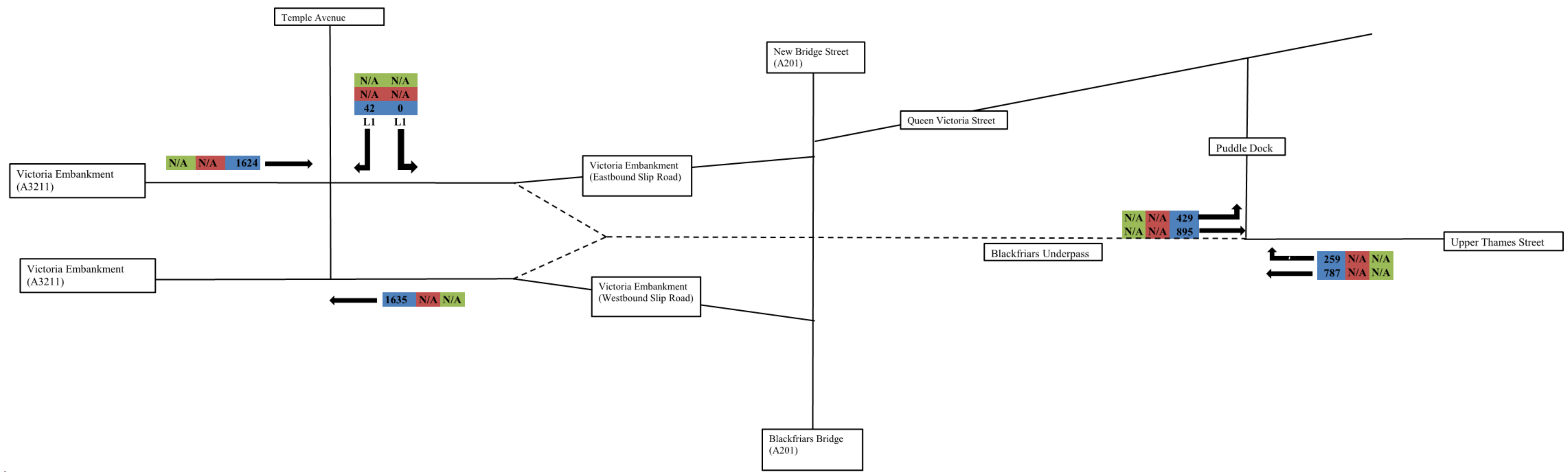
1PL03-TT-50932

January 2013

Thames Tideway Tunnel

Creating a cleaner, healthier River Thames

Thames Water



Keyplan:

Key

- Base Traffic Flow
- Construction Base
- Development Case

FOR INFORMATION

Location

Blackfriars Bridge Foreshore

City of London

Document Information

Transport Assessment

Transport – TfL Baseline Traffic Flow (AM peak hour)

Figure 18.4.7

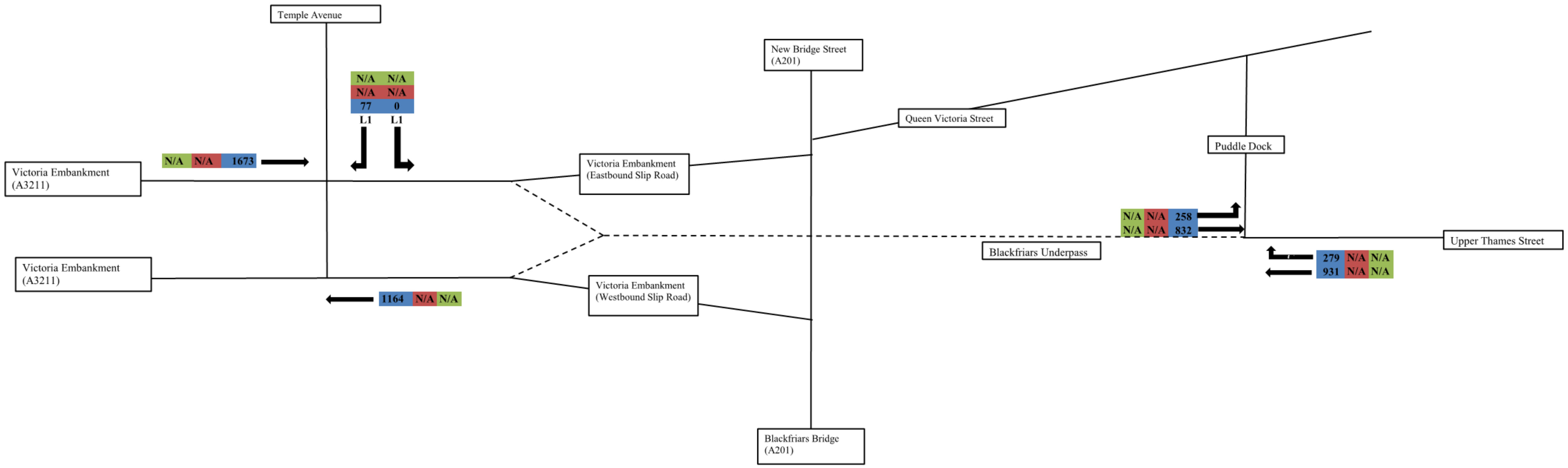
1PL03-TT-50949

January 2013

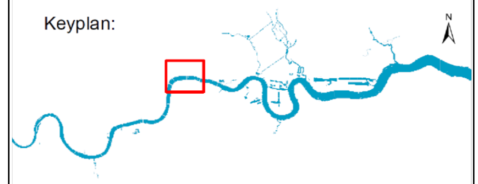
Thames Tideway Tunnel

Creating a cleaner, healthier River Thames

Thames Water



Keyplan:



Key

- Base Traffic Flow
- Construction Base
- Development Case

FOR INFORMATION

Location

Blackfriars Bridge Foreshore
City of London

Document Information

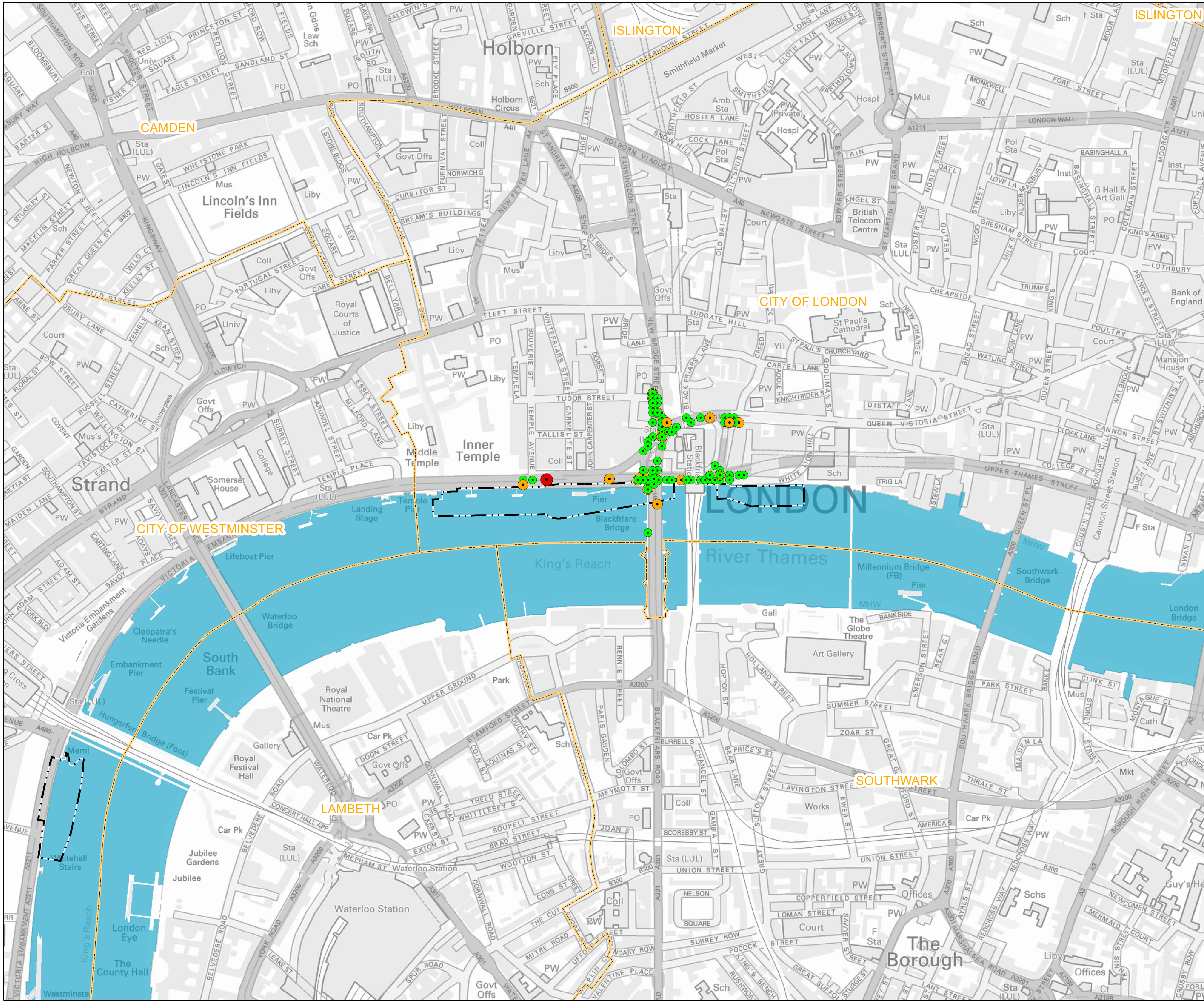
Transport Assessment

Transport – TfL Baseline Traffic Flow (PM peak hour)
Figure 18.4.8

1PL03-TT-50955
January 2013

Thames Tideway Tunnel
Creating a cleaner, healthier River Thames

Thames Water



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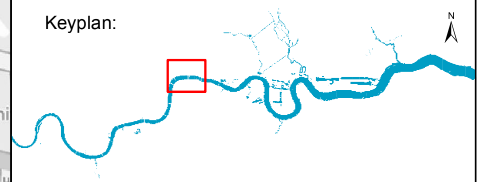
Keyplan:



Key

- Slight
- Serious
- Fatal
- Limits of Land to be Acquired or Used
- Local authority boundary

110 55 0 110 m

Scale 1 : 7,500 at A3

FOR INFORMATION

Location

Blackfriars Bridge Foreshore

City Of London

Document Information

Transport Assessment

Transport - accident locations

Figure 18.4.9

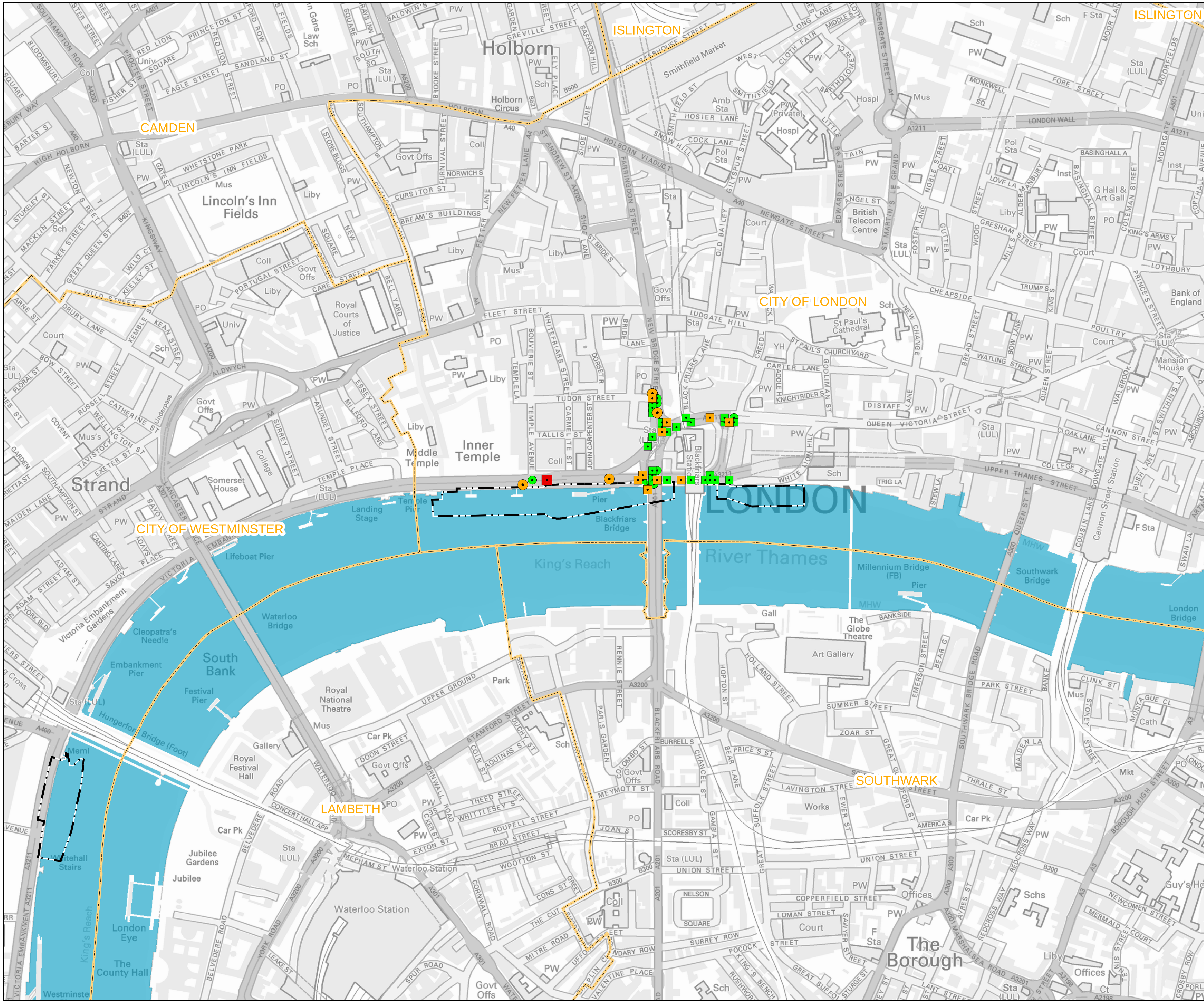
1PL03-TT-50753

January 2013

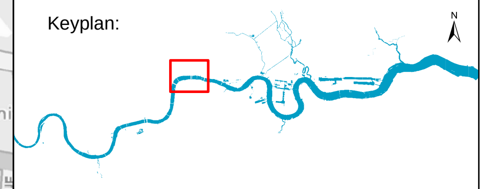
Thames Tideway Tunnel

Creating a cleaner, healthier River Thames

Thames Water



Keyplan:



Key

Accidents

(Severity, Mode of travel)

- Slight, Pedestrian
- Slight, Pedal Cycle
- Serious, Pedestrian
- Serious, Pedal Cycle
- Fatal, Pedal Cycle
- Limits of Land to be Acquired or Used
- Local authority boundary

110 55 0 110 m

Scale 1 : 7,500 at A3

FOR INFORMATION

Location

Blackfriars Bridge Foreshore
City Of London

Document Information

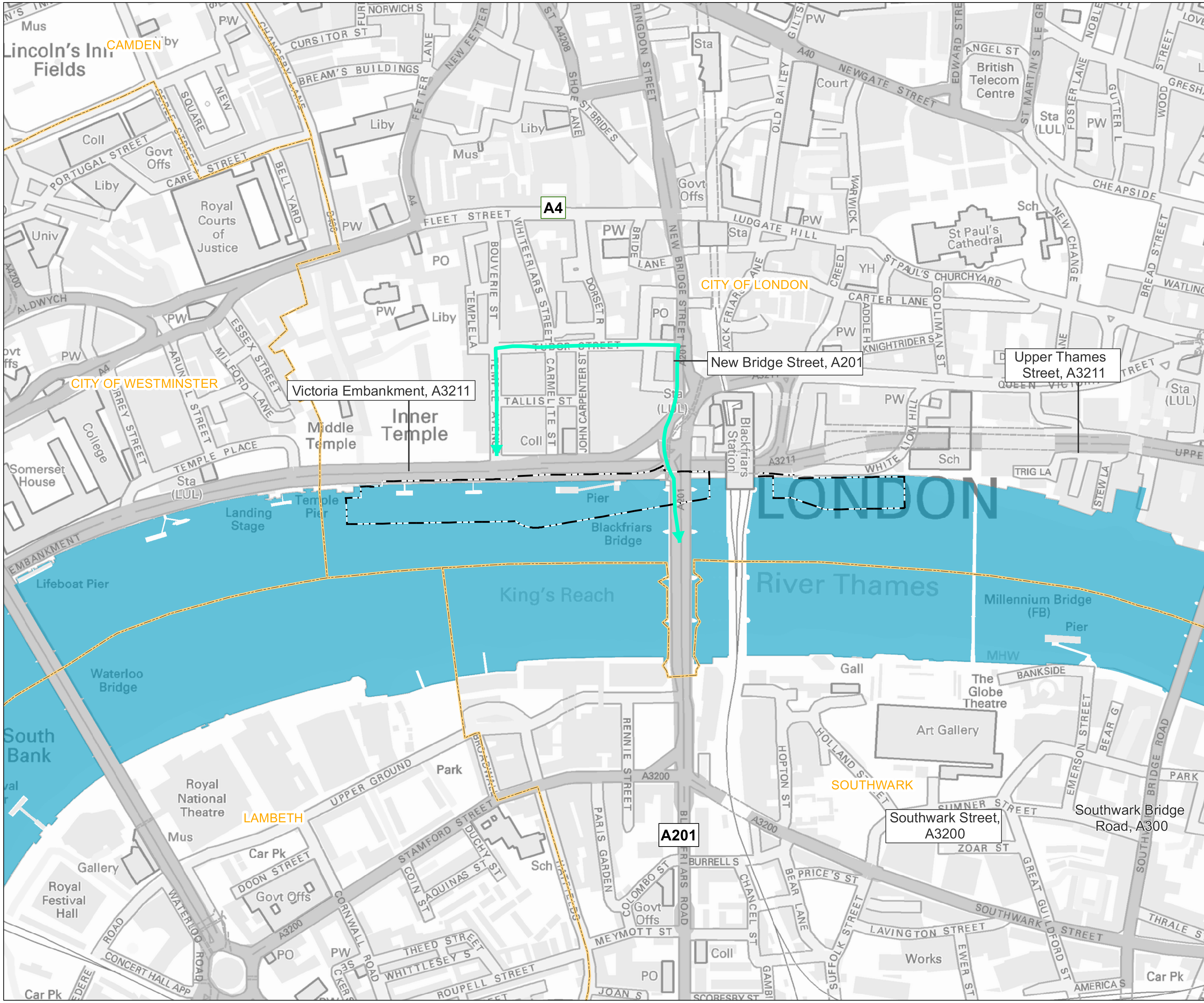
Transport Assessment

Transport - pedestrian and cyclist accidents by severity
Figure 18.4.10

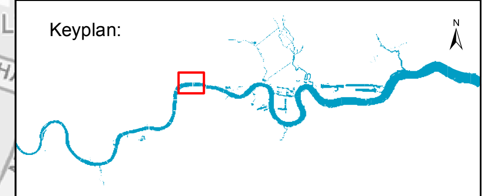
1PL03-TT-50837
January 2013

Thames Tideway Tunnel
Creating a cleaner, healthier River Thames

Thames Water



Keyplan:



Key

- Proposed cycle diversion
- Limits of Land to be Acquired or Used
- Local authority boundary

80 40 0 80 m

Scale 1 : 5,000 at A3

FOR INFORMATION

Location

Blackfriars Bridge Foreshore

City Of London

Document Information

Transport Assessment

Transport - cycle diversion for Blackfriars Bridge Foreshore - construction phase 3

Figure 18.5.1

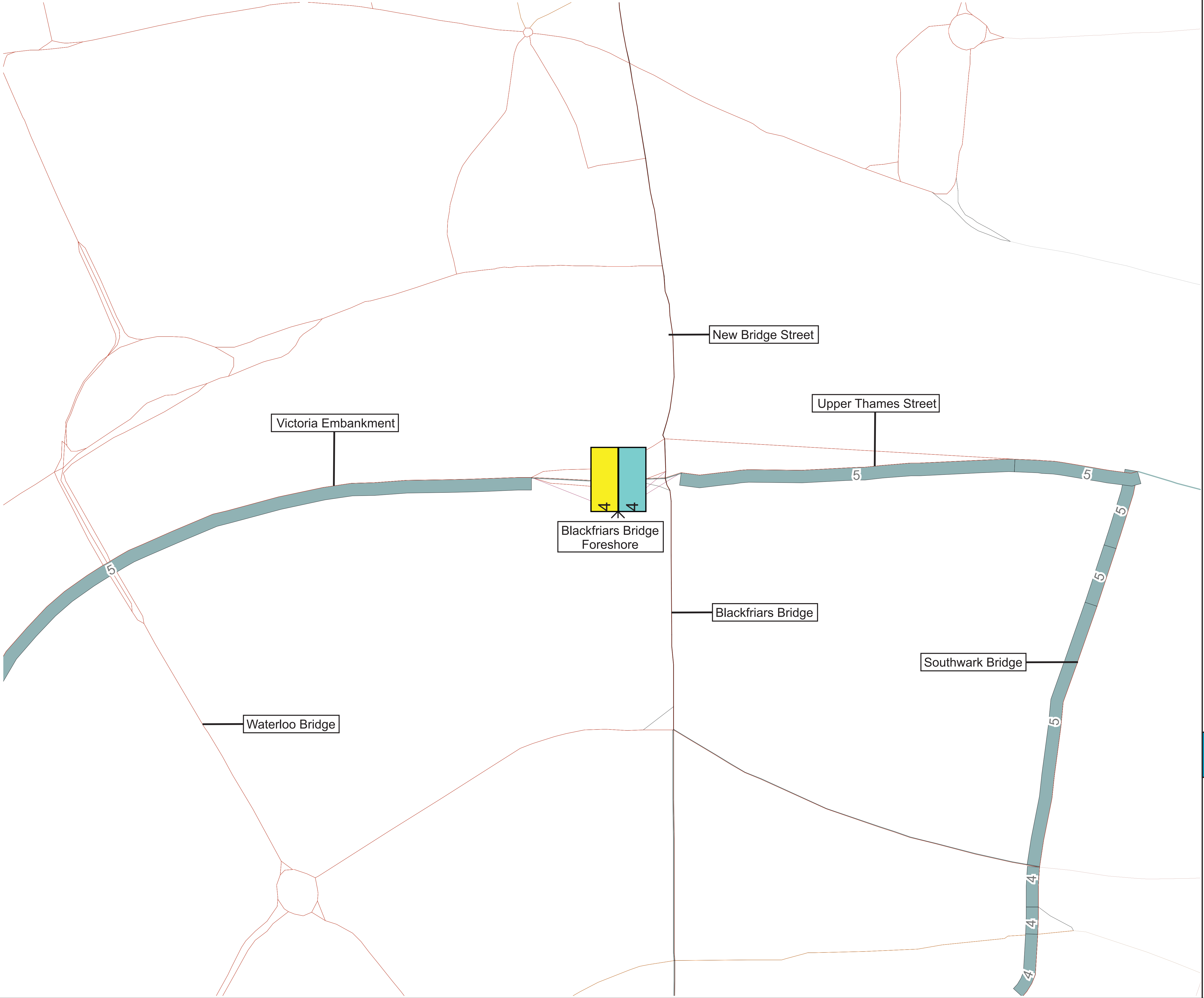
1PL03-TT-50770

January 2013

Thames Tideway Tunnel

Creating a cleaner, healthier River Thames

Thames Water



Hourly construction lorries arrivals and departures

- Arrivals
- Departures

Hourly construction lorries movements

- 0 - 5
- 5 - 10
- 10 - 15
- 15 - 20
- 20 - 25
- 25 - 30
- 30 - 35
- 35 - 40
- 40 - 45
- 45 - 50
- 50 - 55
- 55 - 60
- 60 - 65
- 65 - 70
- 70 - 75
- > 75

Note: Construction vehicle flows include all Thames Tideway Tunnel sites on this network during this period.

FOR INFORMATION

Location
Blackfriars Bridge Foreshore
City of London

Document Information
Transport Assessment
Hourly Construction Lorry Movements - Site Year 2 of Construction

Figure 18.5.2
1PL03-TT-50885

Thames Tideway Tunnel
Creating a cleaner, healthier River Thames

Thames Water

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Thames Water Utilities Limited
Clearwater Court, Vastern Road, Reading RG1 8DB

DCO-DT-000-ZZZZZ-071015