



**London Underground Limited
Strategy and Service Development**

Underground 2025 – South London Corridor Report January 2007

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1: Executive Summary:

Extending the Bakerloo Line in a south-easterly direction could create a new strategic south-east to north-west route for London to complement the east to west Crossrail 1 and the north to south Thameslink project.

Analysis of transport capacity in London post the PPP upgrades, Crossrail and Thameslink shows continued pressure on lines running north-south and from the south-east. The south-east of London away from the Thames is one of the least well served in terms of its accessibility to central London. This study has examined potential extensions of the Bakerloo, Northern and Victoria lines at their southern end. The more promising extensions are of the Bakerloo Line towards Lewisham and then running onto the current National Rail 'Mid-Kent Line' towards Catford, Beckenham and Hayes. Such extensions could add around 25% more rail capacity from south-east London easing pressure on National Rail lines coming into the London Bridge, and the Jubilee and Victoria lines. They would offer time savings of up to 30 minutes on West End journeys along the Hayes line corridor. Significant improvements to the Isle of Dogs would also be possible through the DLR connection at Lewisham. These improvements in accessibility would extend the employment and commercial catchment areas of large parts of central London helping to sustain economic growth.

The extensions could also strengthen a number of town centres including the Elephant and Castle, Peckham, Lewisham, Catford and Beckenham. The routes would serve significant areas of deprivation in inner south London.

The Bakerloo already connects with all other Underground lines, except the East London Line, and nearly 50% of National Rail lines. Extending it would link it in with the extended East London Line, the Docklands Light Railway and the Cross River Tram allowing a wide range of orbital journeys as well as providing connections to a wider range of central London destinations.

Costs and benefits have been estimated for these options using the Railplan model and unit costs for the Jubilee Line extension. The options could be delivered in phases to reduce the peak funding burden. The most promising options have overall capital costs of the order of £2 billion and benefit to cost ratios of around 2:1 on a traditional transport appraisal. Economic agglomeration benefits would increase this further.

2: Background:

The companion report 'Underground 2025 - Background Report' examined transport provision to central London following LUL's line upgrade programme and Crossrail in terms of congestion, accessibility and ability to support economic growth and regeneration. The report identified a number of areas which will remain under pressure in the longer term including the south and south-easterly approaches to London. This report focuses on this side of London. It identifies and evaluates a number of options for potential extensions to the Underground network. From this analysis, it distils those worth further development.

3: Option Selection:

Options for south London extensions were devised to test the relative importance of a number of transport related factors whilst also addressing socio-economic and deliverability factors. These include:

- the choice of line to extend, the Bakerloo, Northern (Charing Cross branch), or Victoria lines. The Bakerloo Line is relatively underused northbound whilst the Victoria Line is still quite crowded;
- the direction of extensions through inner south London, whether to take a southerly route towards Tulse Hill, an easterly route through New Cross or a south-easterly route through Peckham;
- whether to bias congestion relief benefits towards the Victoria Line, or the National Rail lines through London Bridge and the Jubilee Line;
- the opportunity to exploit 'secondary' National Rail routes and paths, thereby releasing paths to main line termini to increase frequencies on other routes;
- targeting areas of relatively poor accessibility to central London, areas of relative deprivation and regeneration areas;
- the ability to deliver options incrementally.

Fourteen options have been identified and assessed. They are outlined below and described in detail in the Appendix.

The options are schematically summarised below in Figure 1.

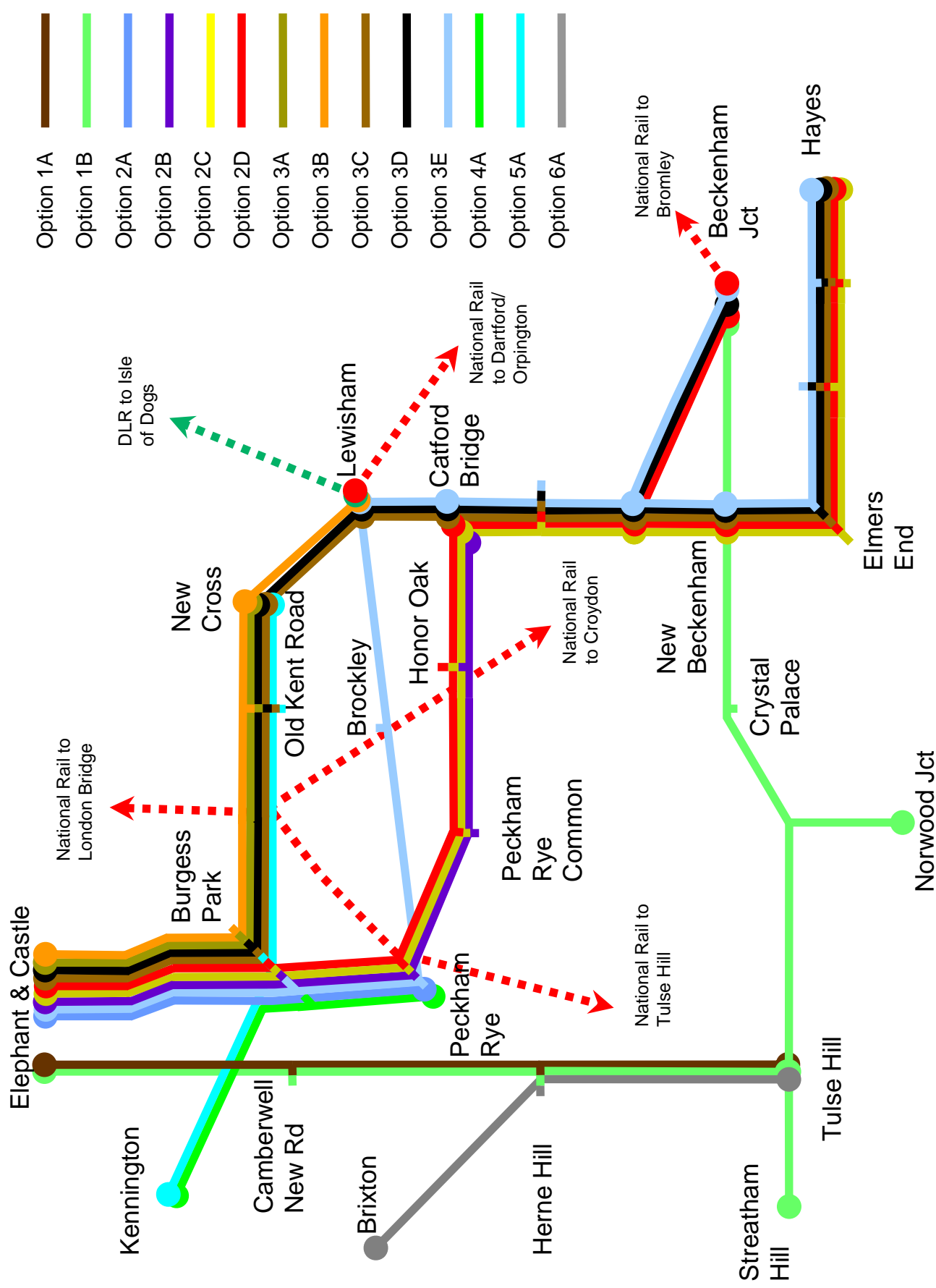


Figure 1 South London Options Routes Diagram

Southerly Extensions of the Bakerloo from Elephant & Castle:

1A to Tulse Hill via Camberwell Green and Herne Hill,
1B extending 1A to Crystal Palace, Beckenham Junction and Streatham Hill.

South-Easterly Extensions of the Bakerloo from Elephant & Castle:

2A to Camberwell Road/Burgess Park and Peckham Rye,
2B extending 2A to Catford via Honor Oak Park,
2C extending 2B to Hayes via Beckenham and Elmers End (Mid-Kent Line),
2D as 2C with an additional spur to Beckenham Junction.

South-Easterly Extensions of the Bakerloo towards New Cross and Lewisham:

3A to New Cross via Camberwell Road/Burgess Park and Old Kent Road,
3B extending 3A to Lewisham,
3C extending 3B to Hayes via Catford, Beckenham and Elmers End (Mid-Kent Line),
3D as 3C with additional spur to Beckenham Junction.

South-Easterly Extension of the Bakerloo via Peckham Rye and Lewisham:

3E extending 2A to Lewisham via Brockley then to Hayes and Beckenham Junction as per 3D.

South-Easterly Extensions of the Northern Line from Kennington:

4A to Peckham Rye via Camberwell Road/Burgess Park (equivalent to 2A),
5A to New Cross via Camberwell Road/Burgess Park and Old Kent Road (equivalent to 3A).

South-Easterly Extension of the Victoria Line from Brixton:

6A to Tulse Hill via Herne Hill.

Where 'secondary' National Rail lines are incorporated in the London Underground network the displaced paths on the approaches to main line stations, such as London Bridge, are transferred to other National Rail services to boost their capacity.

4: Appraisal of Options:

The impacts of these options would be significant across a number of dimensions including:

- accessibility to central London;
- additional capacity and crowding relief;
- regeneration;
- town centre development;
- interchange and
- orbital journey opportunities.

Each of these is discussed in turn along with key questions of costs, deliverability and value for money in terms of benefit to cost ratios.

4.1: Additional Capacity and Crowding Relief:

As indicated in the Background Report the public transport network post PPP Upgrades and Crossrail will still experience crowding pressure on north south routes on both Underground and rail routes, see figures 2A and 2B below. The Bakerloo line from the south end however has significant spare capacity with its limited penetration and interchange. However, the line runs through the busy West End and the growing Paddington and South Bank areas. Extending it in a southerly direction effectively brings the capacity of a new line into south London without the cost of central area tunnels and stations.

Coming through London Bridge the combination of National Rail lines including Thameslink and the Jubilee line services provide around 120 trains per hour. Serving most of south-east London and Kent these are some of the busiest on the National Rail Network. The extension options that head towards New Cross, Lewisham and Catford effectively add around 25% more trains to this part of London.

The options that head towards Tulse Hill and Crystal Palace will intercept many of the lines and localities that feed into the south end of the Victoria line and provide an alternative route to West End destinations, thereby reducing congestion on this end of the line.

The impact of the different options on congestion levels for key links into central London is shown below. The congestion level is shown as the average density of standing passengers. Densities above 2 are considered crowded, densities above 3 very crowded.

South London base

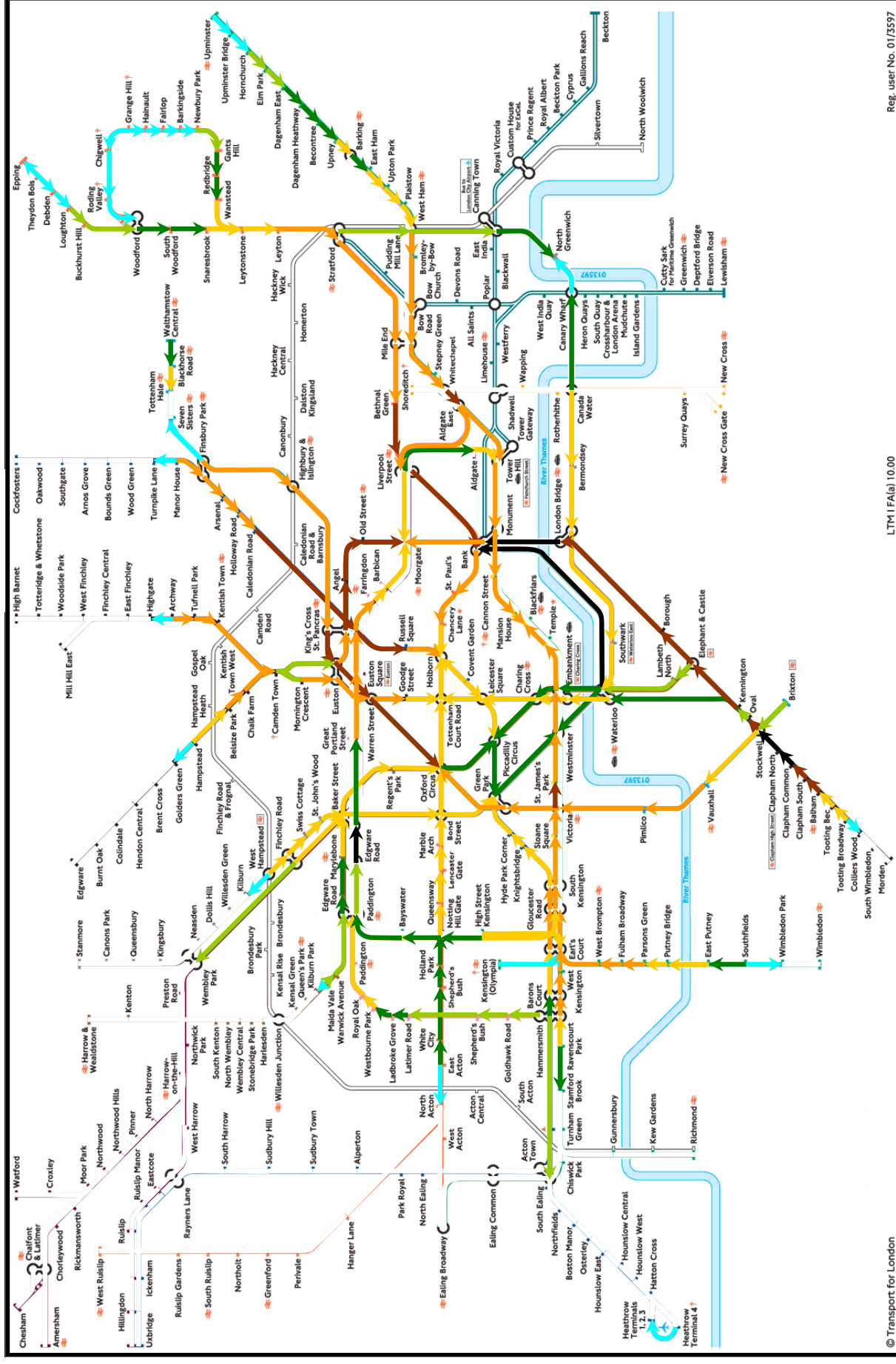


Figure 2A South London Base

2026 FULL VISION (without NLLX) – National Rail Standing Density (person/sqm) - Inner

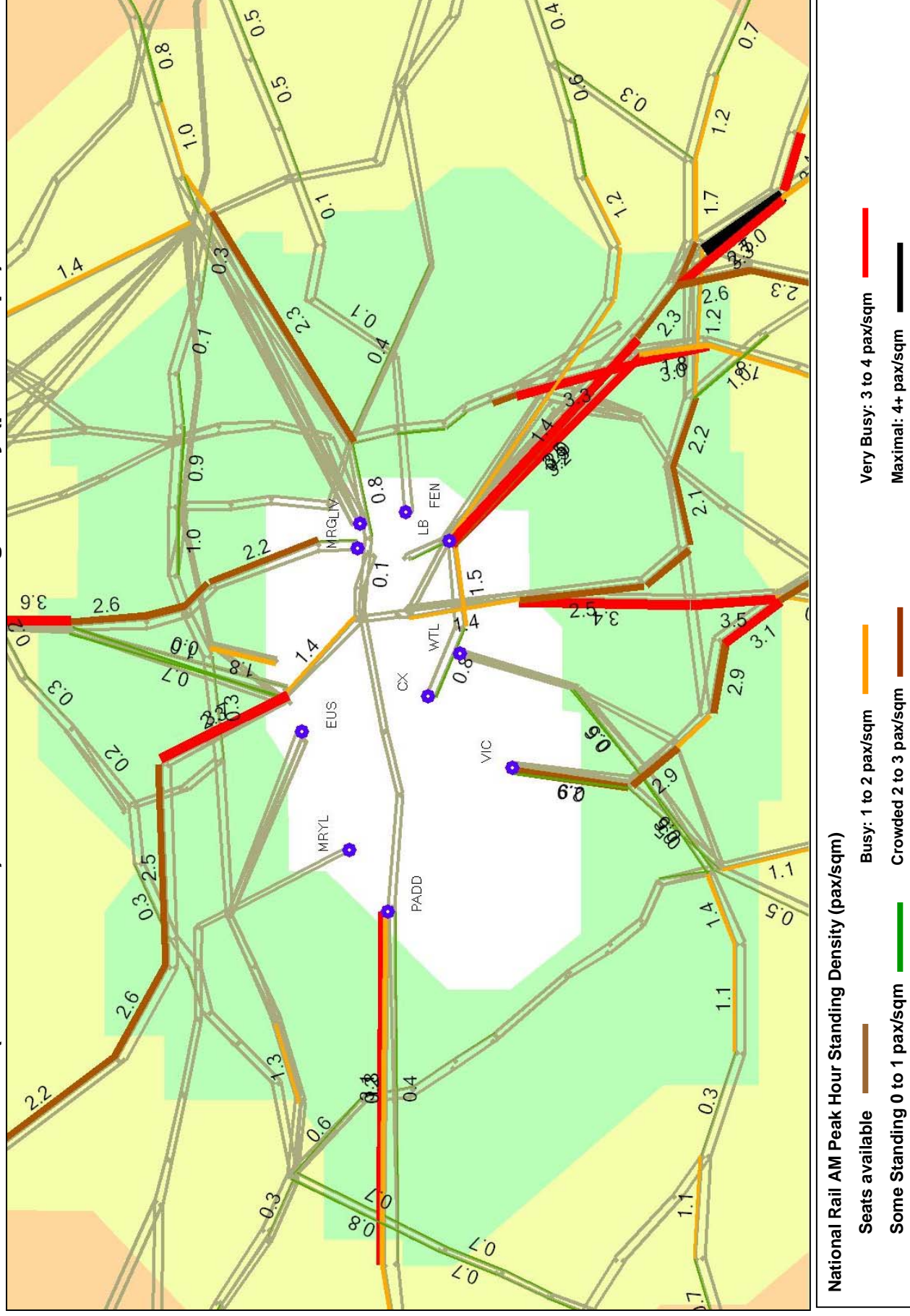


Figure 2B National Rail Crowding Map

Table 1: Congestion Impacts of Options:

Option	Victoria to Green Park	London Bridge to Southwark	New Cross to London Bridge
<u>BASE POST PPP UPGRADES)</u>	3.0	1.7	4.0
1A E&C to Tulse Hill	2.6	1.6	4.0
1B E&C to Norwood Junction	2.6	1.6	4.0
2A E&C to Peckham Rye	2.9	1.6	3.8
2B E&C to Catford Bridge	2.9	1.4	3.4
2C E&C to Hayes	2.9	1.4	3.4
2D E&C to Hayes & Beckenham	2.9	1.4	3.4
3A E&C to New Cross	3.0	1.3	2.5
3B E&C to New Cross & Lewisham	3.0	1.2	2.5
3C E&C to New Cross & Hayes	2.9	1.2	2.6
3D E&C to Hayes & Beckenham	2.9	1.2	2.6
3E E&C to Hayes & Beckenham via Peckham Rye, Lewisham	2.9	1.2	2.9
4A Kennington to Peckham Rye	2.9	1.6	4.0
5A Kennington to New Cross	3.0	1.5	3.6
6A Brixton to Tulse Hill	3.2	1.7	4.0

The projects fall into two groups, those that predominantly relieve the Victoria Line, heading towards Tulse Hill and those that head towards New Cross and Lewisham. Extensions of the Victoria Line while potentially beneficial in other directions tend to exacerbate congestion on an already crowded line.

The T2025 and Rail 2025 projects are looking to provide longer trains (12 instead of 10 car) on most of the routes through London Bridge. Whilst this will ease crowding it is still expected that the rail approach to London Bridge will still leave trains very crowded, see figure 2B. South-easterly extensions to and beyond Lewisham would therefore still offer significant crowding benefits. None of the options reduces pressure on the City branch of the Northern line and some slightly increase it. Congestion on the Northern Line has therefore been addressed by specific proposals to increase capacity north of Kennington.

4.2: Accessibility Improvements:

Economic growth depends on adequate capacity and good accessibility through the routes which have the capacity. The Background Report identified the relatively longer journey times to central London from large parts of the boroughs of Southwark, Lewisham and Bromley. The extensions of Underground lines which penetrate the West End offer some very substantial time reductions through a combination of higher frequencies and avoiding interchange at mainline termini. Figure 3 below shows option 3E (Elephant and Castle to Hayes & Beckenham) time savings from across south London to Oxford Circus whilst table 2 summarises for each option areas with significant time savings.

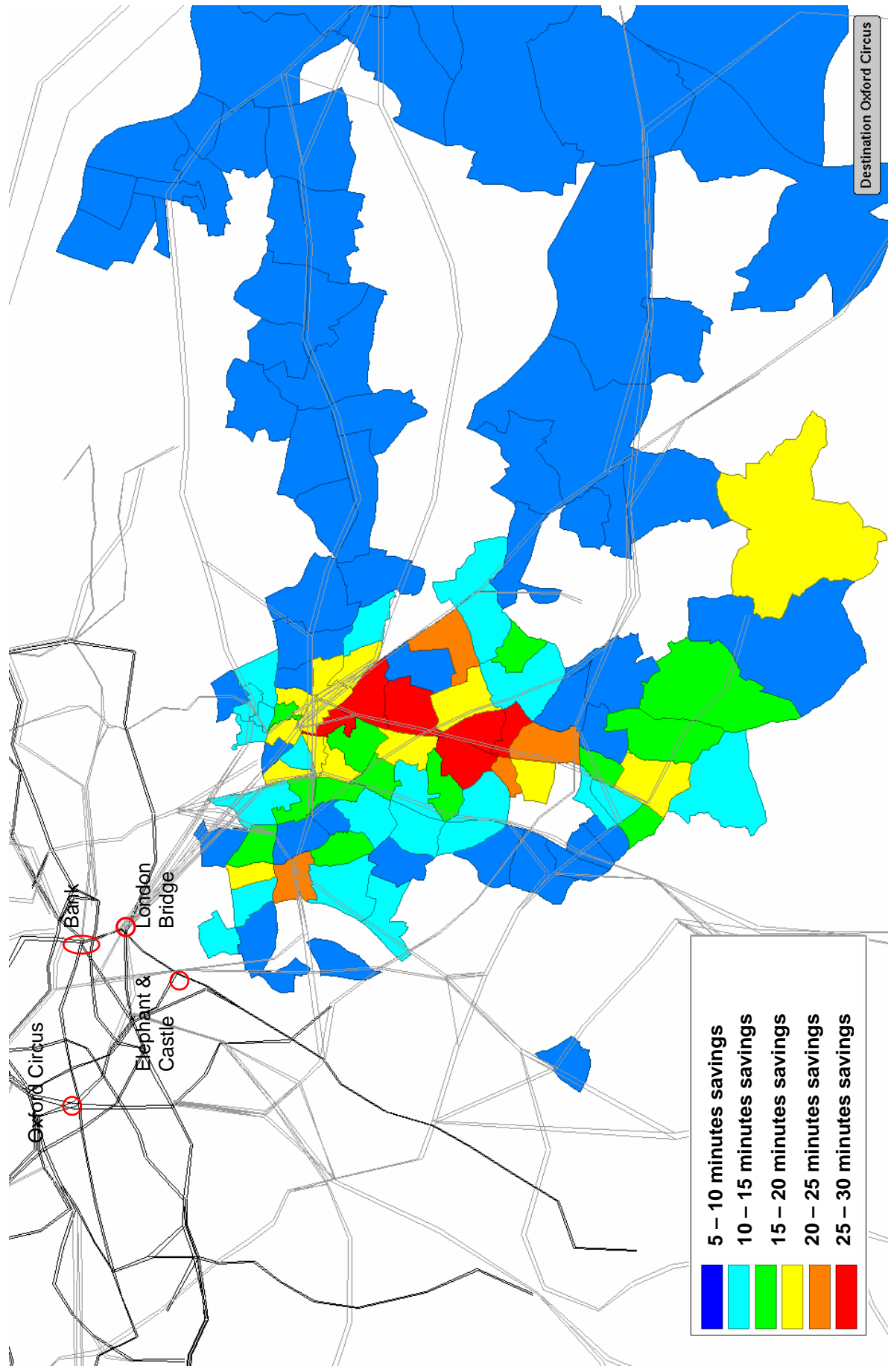


Figure 3 Journey Time Savings for the 'South London Corridor'

Table 2: Areas with significant Time Savings:

Options	Area	Savings (in weighted minutes)
1A	Tulse Hill towards Gipsy Hill	15 to 20
1B	As 1A plus Crystal Palace and Norwood Junction	25 to 30
2A	Peckham Rye	15 to 20
2B	Honor Oak, Catford, Bellingham	25 to 30
2C	As 2B plus Beckenham, Elmers End and Hayes	25 to 30
2D	As 2C	25 to 30
3A	Old Kent Road, New Cross	15 to 25
3B	As 3A plus Lewisham	25 to 35
3C	As 3B plus Catford to Hayes	20 to 35
3D	As 3C	20 to 35
3E	As 2A plus Lewisham, Catford to Beckenham and Hayes	20 to 35
4A	As 2A	15 to 20
5A	As 3A	15 to 25
6A	Tulse Hill to Crystal Palace	15 to 20

To illustrate where the accessibility improvements arise the table below shows the journey times for a direct route to Oxford Circus compared to pre-extension times for a selection of stations. Typically, the benefits arise from avoiding a feeder journey with a 15 to 20 minute wait and an interchange of around 20 minutes (weighted).

Table 3: Typical Time Savings to Oxford Circus (weighted minutes):

Origin Station	Tulse Hill	Peckham Rye	Lewisham	Catford
Direct Time (riding on train) on extension	18	17	22	27
Pre Extension				
Interchange point	Elephant & Castle	Elephant & Castle	Charing Cross	Charing Cross
Riding on train	24	19	20	25
waiting for mainline train (interval)	15	15	20	20
Interchange time (weighted by 2)	16	16	14	14
Interchange Penalty	5	5	5	5
Overall	60	55	59	64
Improvement	42	38	37	37

5: Town Centre Development:

The options above run through a number of town centres and strengthen the quality of public transport to these centres. This in turn lessens dependency on private car access, and if planned in a co-ordinated way allows improvement of the public realm fostering regeneration of these centres.

These centres include:

Elephant & Castle
Peckham
Lewisham and
Catford

The centres not only gain the benefit of improved local access but also improved links to Central London and other town centres. So for example, Peckham Rye would have local tram and bus links to Camberwell, Elephant & Castle, Surrey Quays, New Cross, Forest Hill, Dulwich and Herne Hill and direct rail links to Victoria, Paddington, West End, South Bank, Kings Cross, Bishopsgate, Lewisham, Dartford and Croydon.

Figures 4A to 4D illustrate the potential public transport connections at each of these town centres.

The 2026 population estimate catchment areas for the town centres and the stations for each route are shown in figure 5.

Figure 4A

The Lewisham Hub

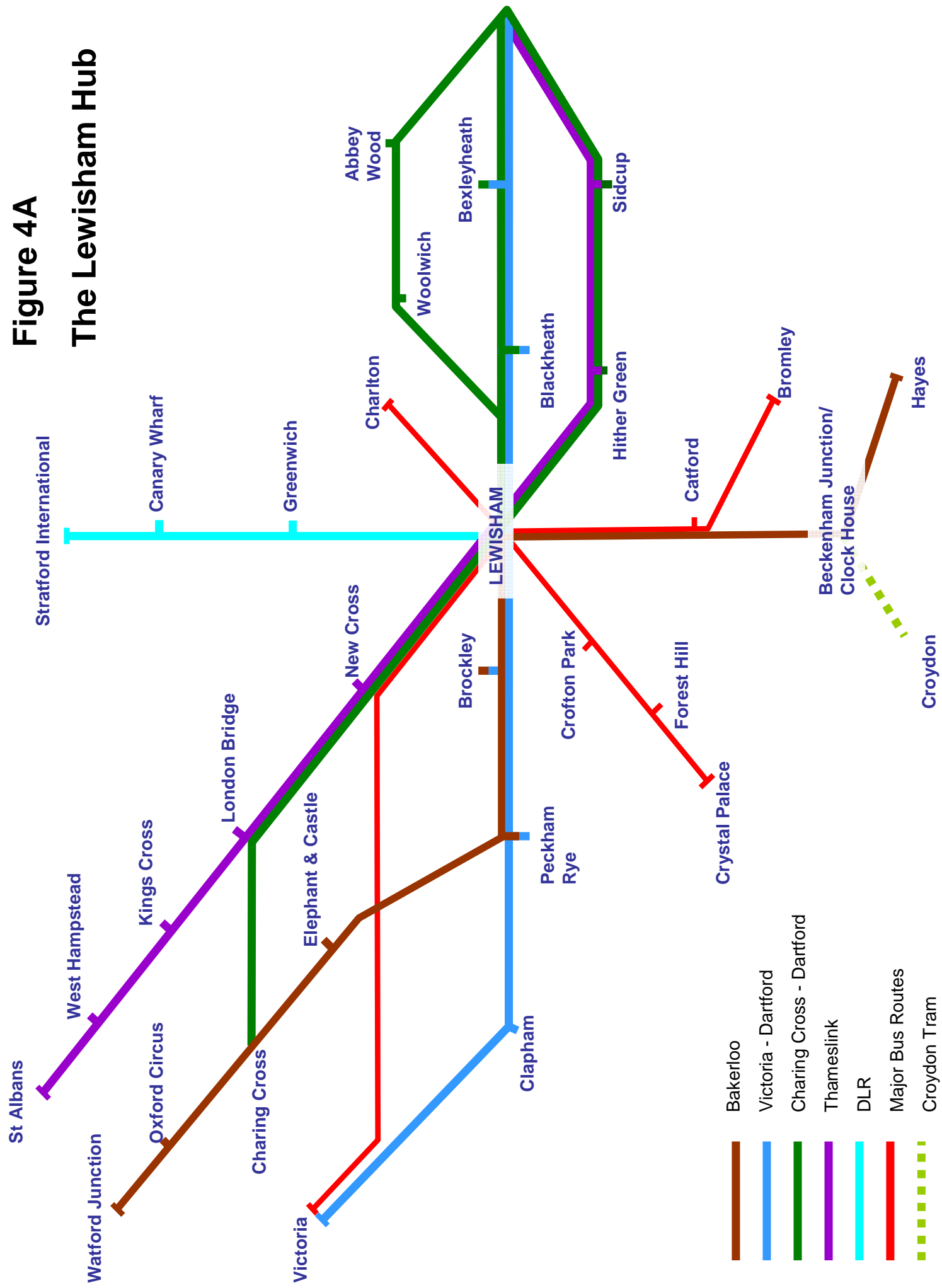


Figure 4B
The Elephant & Castle Hub

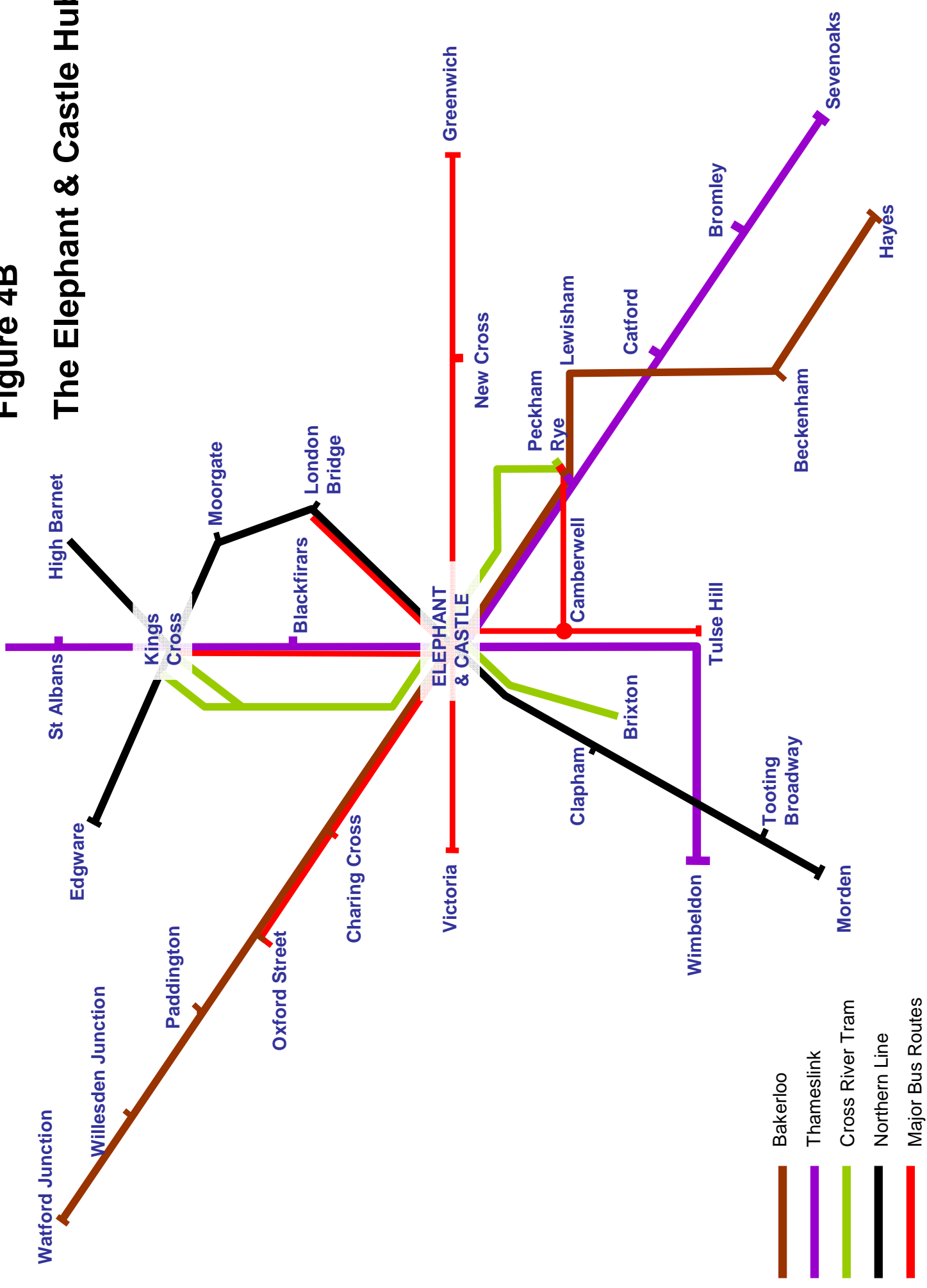


Figure 4C

The Peckham Rye Hub

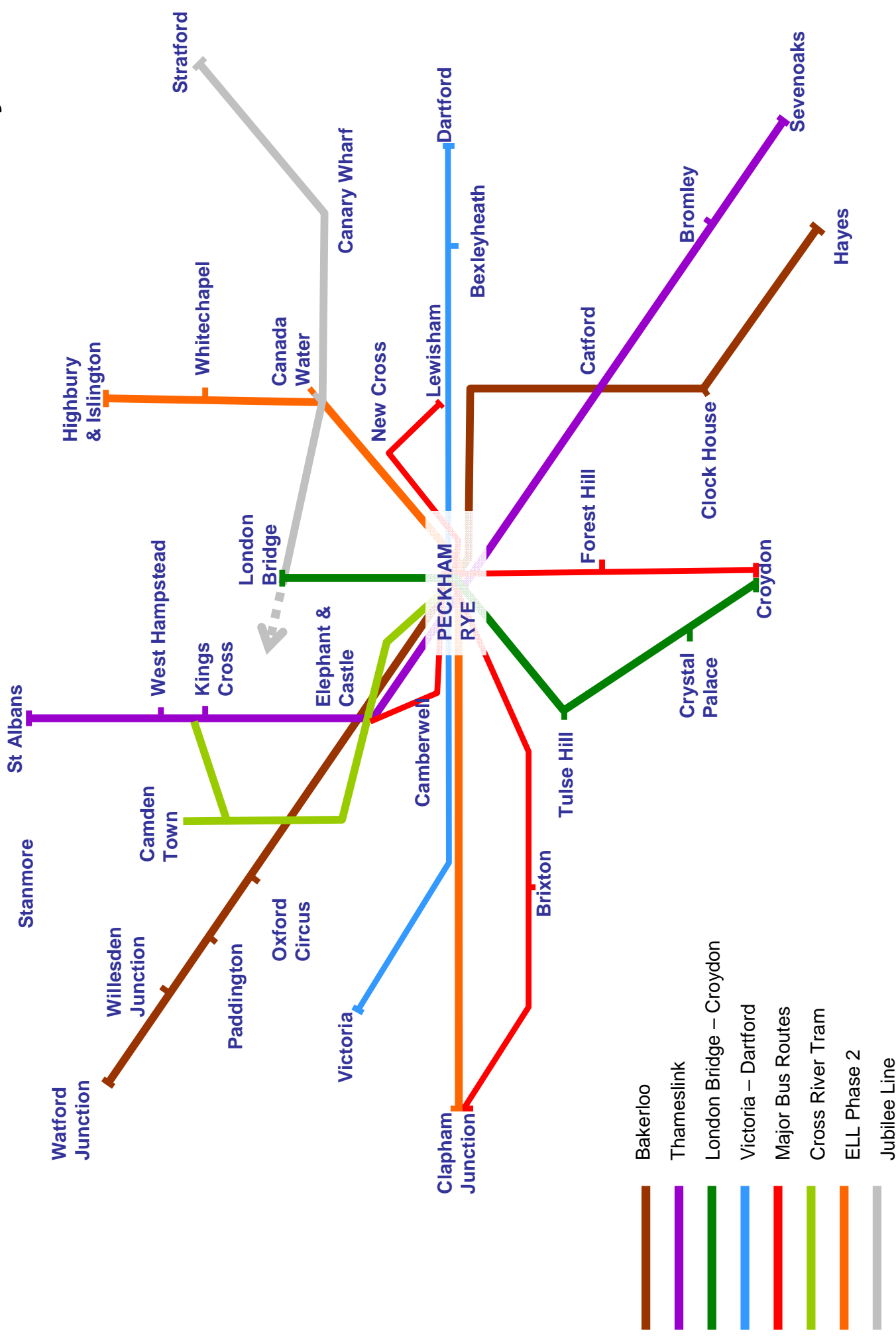


Figure 4D

The Catford Hub

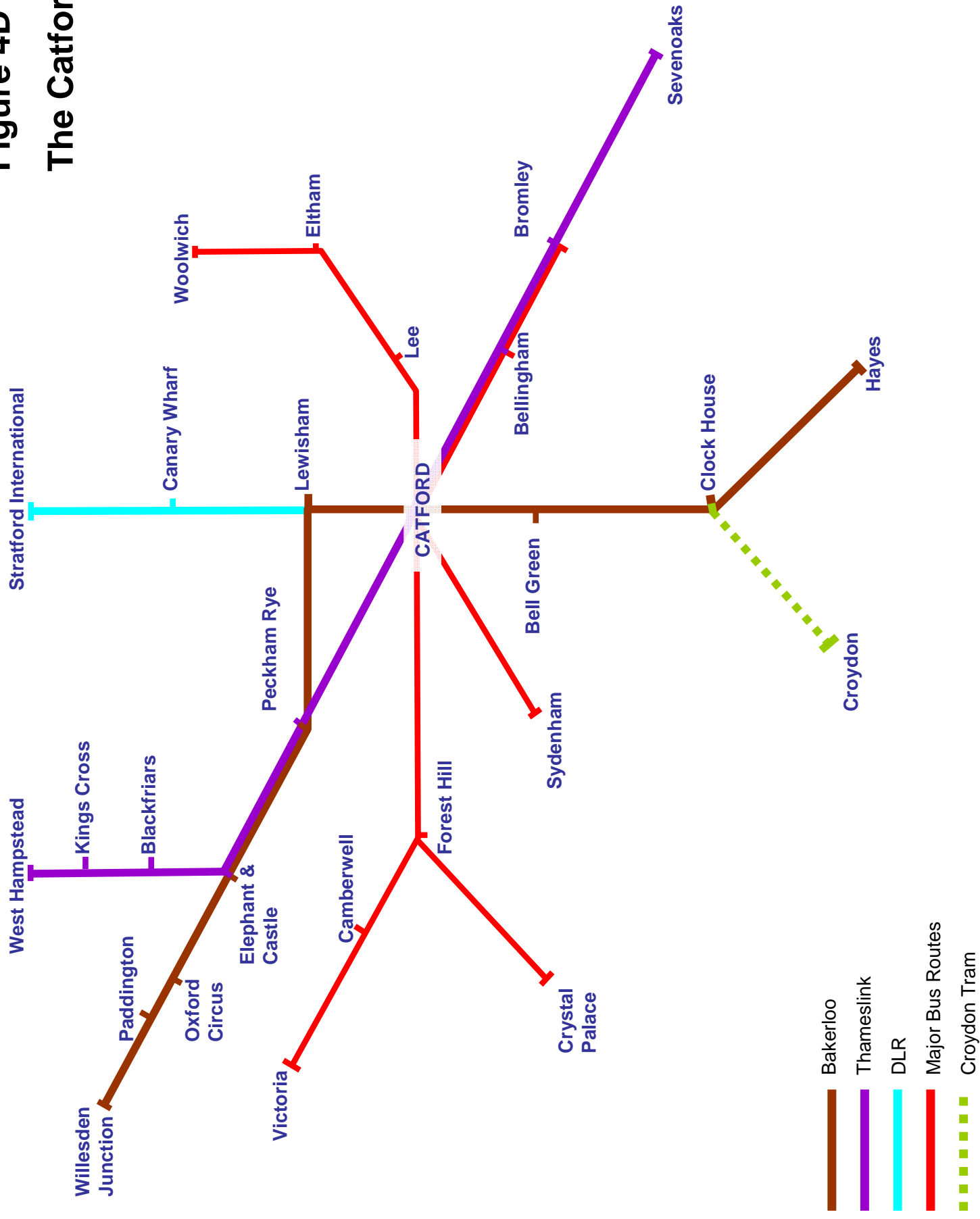


Figure 5: 2026 Population Estimate Catchment Areas:

2026 Population estimates by station (LTS B5.2 rounded)		
Station	1km radius	2kms radius
Beckenham Junction	14,000	58,000
Brixton	46,000	159,000
Brockley	30,000	118,000
Burgess Park	57,000	191,000
Camberwell New Road	46,000	180,000
Catford Bridge	25,000	100,000
Clock House	17,000	69,000
Crystal Palace	18,000	85,000
Eden Park	12,000	49,000
Elephant & Castle	56,000	162,000
Elmers End	17,000	74,000
Gypsy Hill	21,000	80,000
Hayes	7,000	26,000
Herne Hill	27,000	112,000
Honour Oak Park	23,000	101,000
Kennington	55,000	182,000
Ladywell	27,000	106,000
Lewisham	27,000	103,000
Lower Sydenham	20,000	78,000
New Beckenham	15,000	73,000
New Cross	37,000	136,000
Norwood Junction	23,000	94,000
Old Kent Road	36,000	166,000
Peckham Rye	74,000	273,000
Streatham Hill	31,000	129,000
Tulse Hill	29,000	105,000
West Norwood	31,000	95,000
West Wickham	10,000	40,000

6: Interchange and Orbital Connections:

Central London in the future will stretch from Paddington/White City in the west to Canary Wharf/Stratford in the east. From the south and north it is not possible to provide direct connections from each locality to all these central London destinations. A network of good interchanges between Underground, Rail, DLR is therefore vital to provide good accessibility. Better interchange outside central London also eases pressure on central London stations.

Many of the town centre locations become interchange hubs.

Lewisham for example with a Bakerloo extension would have direct connections with most of the extended central London including:

- the Isle of Dogs and Stratford via the DLR
- the City and South Bank via Southeastern Trains
- Kings Cross/Farringdon/Blackfriars via Thameslink
- The West End, Baker Street/Paddington via the Bakerloo line
- Victoria via Southeastern Trains

Peckham Rye could connect the Streatham, Tulse Hill, Dulwich corridor with the West End and Paddington via the Bakerloo line and the Whitechapel, Bishopsgate, Dalston corridor via the East London Line.

Brockley interchange could link the Crystal Palace, Croydon corridor to the West End and Paddington, and the Lewisham/Catford/Hayes corridor to Whitechapel, Bishopsgate and Dalston.

More convenient orbital journeys can also be created. Many of the existing services from south-east London, for reasons of track capacity do not call at Lewisham. The combination of Thameslink and a Bakerloo extension through Lewisham should enable a greater number of services to call at Lewisham. This in turn allows Lewisham to become a more credible and convenient hub for orbital interchange. The Catford/Beckenham corridor can be readily connected to services to Woolwich, Bexleyheath or Sidcup or local bus routes.

Beckenham Junction could link the Swanley to Beckenham corridor with Catford/Lewisham corridor and Lewisham can be connected better with Croydon and Crystal Palace through Tramlink interchange or interchange at Brockley.

7: Deliverability:

Many of the options have been structured so that they can be delivered in stages. For example option 2A can be followed by 2B and then 2C or 2D. The short stages may require some additional train stabling in north London which would need to be allowed for in potential extensions of the Bakerloo to Watford Junction. There would be construction and permanent requirements for land, the implications of which would need to be worked through with local authorities and other local stakeholders.

8: Regeneration:

The most significant areas of deprivation in south London are between the Elephant and Castle and Peckham in Southwark and North Lambeth. Extensions of the Bakerloo towards either Peckham Rye, or the Old Kent Road and New Cross would improve access to central London significantly. As discussed previously the extensions through town centre hubs should also widen their catchment areas and strengthen their economic development, though this may also depend on other non-transport regeneration projects promoted by the local authorities and other agencies.

Figures 5A and 5B show in detail areas of deprivation and the routes taken by the different options along with their catchment areas.

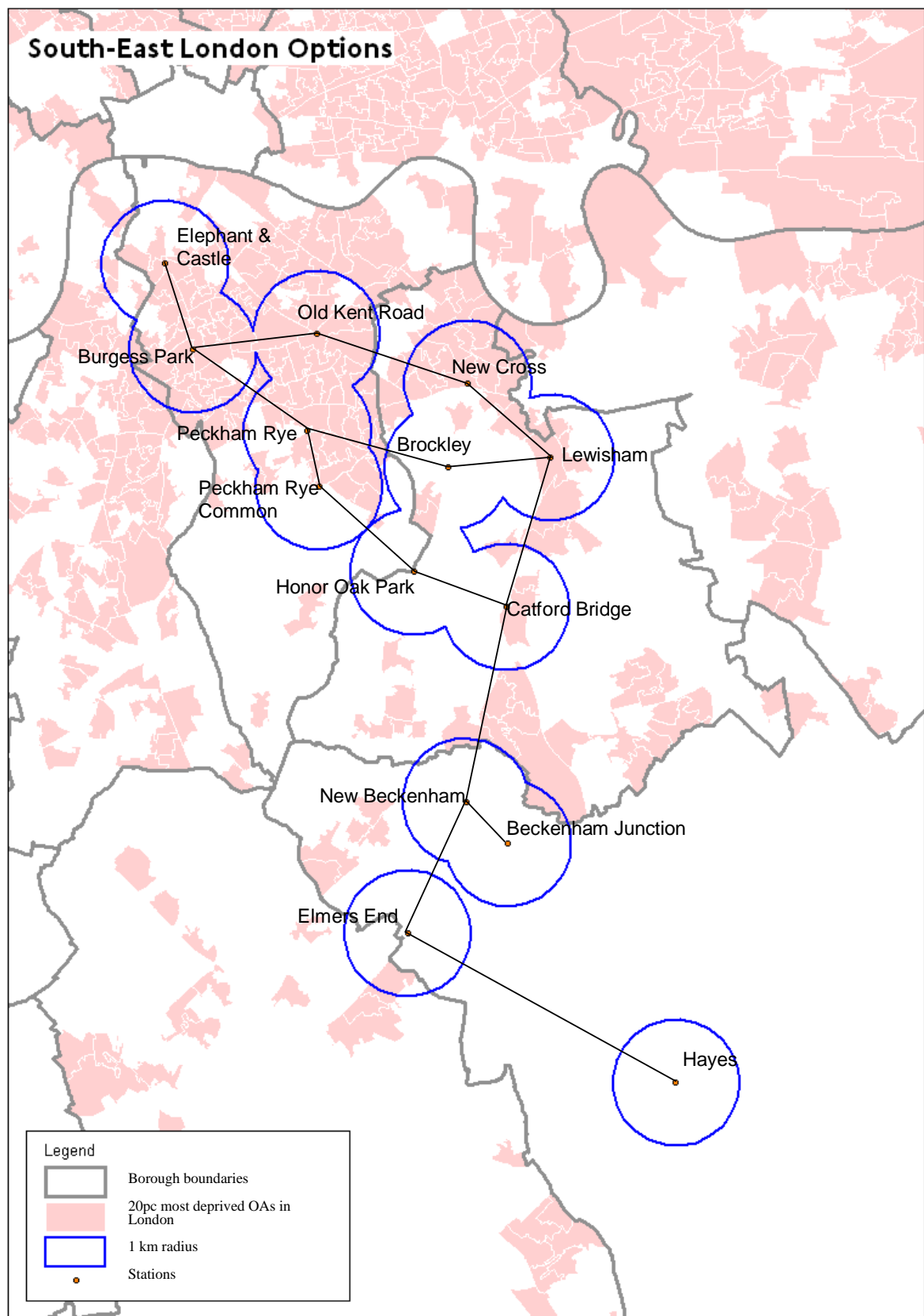


Figure 5A: Areas of deprivation and the south-east London route options:

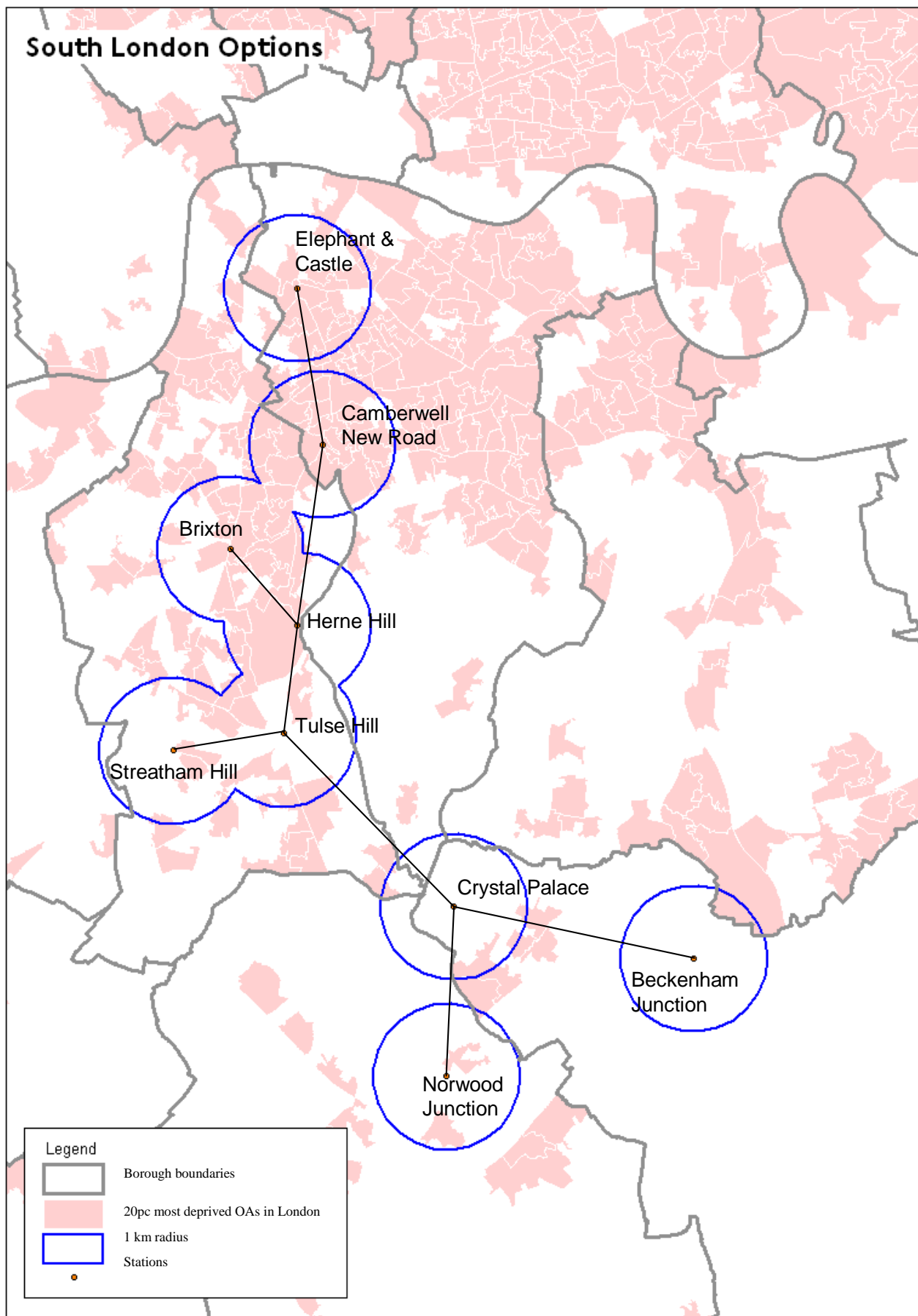


Figure 5B: Areas of deprivation and the south London route options:

9: Business Case:

Transport benefits from these options will arise from savings in journey time, reduced crowding and highway congestion relief. TfL's Railplan model has been used to quantify these benefits. Capital costs for the options have been based on unit costs derived from the Jubilee Line Extension project. Costs at this stage are not based on detailed engineering assessments. An indicative high level evaluation for the options is shown below.

Table 4: Indicative Costs and Benefits:

Option (All costs and benefits in £billion present value)	Capital Costs incl. Optimism bias	Passenger Benefits	Benefit to Cost Ratio
1A to Tulse Hill	1.36	1.01	0.7
1B to Norwood Junction	1.69	1.59	0.9
2A to Peckham Rye	0.80	0.61	0.7
2B to Catford	1.84	1.76	0.9
2C to Hayes	2.19	2.58	1.1
2D to Hayes/Beckenham Junction	2.17	2.54	1.2
3A to New Cross	1.27	1.02	0.7
3B to Lewisham	1.63	1.61	1.0
3C to Hayes	1.97	3.10	1.7
3D to Hayes/Beckenham Junction	1.95	3.10	1.7
3E to Hayes/Beckenham Junction	1.96	3.09	1.7
4A to Peckham Rye	0.72	0.33	0.4
5A to New Cross	1.17	0.60	0.4
6A to Tulse Hill	0.83	0.73	0.8

The table suggests the most promising routes are Bakerloo extensions towards Beckenham and Hayes via Lewisham and Peckham Rye or New Cross. These options are deliverable in stages but the best value comes from connecting onto the National Rail line to Hayes. This is in part because it releases paths to boost capacity on other lines into London Bridge. Extensions of the Northern or Victoria lines do not have as good value.

As with other projects analysed in the TfL T2025 report there would be wider economic agglomeration benefits associated with improved transport capacity and accessibility.

10: Conclusion:

Extending the Bakerloo line in a south-easterly direction towards Lewisham and beyond could create a new south-east to north-west strategic route through London providing critical long term capacity from the south-east, improving significantly access from south-east to central London and helping the regeneration of inner south London.

11: Appendix – Extension Option Details:

1A and 1B: Southerly extensions of the Bakerloo Line:

Both options extend the Bakerloo from the Elephant and Castle.

1A (6.4 kms) includes stops at:

- Camberwell Green for local town centre and bus interchange
- Herne Hill for bus and National Rail routes to Bromley
- Tulse Hill for bus and National Rail routes to Croydon, Sutton and Wimbledon.

1B (18.1 kms) includes 1A and then runs on to existing National Rail tracks to Streatham Hill, Beckenham Junction and Norwood Junction. It includes stops at Camberwell Green, Herne Hill and Tulse Hill as in 1A and

- Streatham Hill for Streatham Town Centre
- West Norwood
- Gipsy Hill
- Crystal Palace
- Birkbeck
- Beckenham Junction for interchange to Croydon Tramlink and National Rail
- Norwood Junction for National Rail lines to Croydon and Sutton
- The existing National Rail services from Crystal Palace, West Norwood to Victoria and London Bridge would be diverted to boost frequencies on the Selhurst route.

2A to 2D: South-easterly extensions of the Bakerloo Line via Peckham Rye:

All options extend the Bakerloo from the Elephant and Castle.

2A (3.9 kms) includes stops at:

- Camberwell Road/Burgess Park for bus interchange
- Peckham Rye for interchange with bus, Cross River Tram and National Rail routes to Tulse Hill and Croydon and East London Line (Phase 2).

2B (8.5 kms) incorporates 2A with further stops at:

- Peckham Rye Common
- Honor Oak Park for interchange with National Rail lines to Croydon and East London Line Phase 1
- Catford for Town Centre and interchange with bus and National Rail lines to Bromley, Beckenham and Hayes.

Options 2A and 2B would be in tunnel.

2C (19 kms) incorporates 2B but south of Catford would run onto the National Rail line to New Beckenham and Hayes (the 'Mid-Kent Line'). The existing service to Hayes would be curtailed at Catford Bridge. It would therefore include additional stations at:

- Lower Sydenham
- New Beckenham
- Clock House for interchange with bus
- Elmers End with interchange to Croydon Tramlink
- West Wickham and
- Hayes

This would connect large areas of the boroughs of Lewisham and Bromley directly onto the Underground.

2D (20.1 kms) is a simple variant of 2C with an additional short spur between New Beckenham and Beckenham Junction to link into the town centre at Beckenham and interchange with bus, National Rail lines to Bromley and the Croydon Tramlink.

3A to 3D: South-easterly extensions of the Bakerloo Line towards New Cross and Lewisham:

All options extend the Bakerloo line from the Elephant and Castle.

3A (16.4 kms) includes stops at:

- Camberwell Road/Burgess Park (as in 2A) for bus interchange;
- Old Kent Road/Rotherhithe New Road for bus interchange
- New Cross for interchange with bus, National Rail lines to Dartford and East London Line.

3B (8.2 kms) incorporates 3A and includes an additional stop at Lewisham for the town centre and interchange with bus, the National Rail lines to Dartford and Orpington and the DLR.

3B is in tunnel from the Elephant and Castle to Lewisham.

3C (20.3 kms) incorporates 3B but runs south of Lewisham onto the National Rail line to Catford Bridge and Hayes. As a consequence the Bakerloo line would directly serve:

- Ladywell
- Catford Bridge (with interchange to buses and National Rail line to Bromley)
- Lower Sydenham
- New Beckenham
- Clock House
- Elmers End with interchange to Croydon Tramlink
- West Wickham and
- Hayes

As with 2C it would directly link the Underground with south Lewisham and Bromley.

The existing National Rail services from Charing Cross and Cannon Street to Hayes would be diverted to Dartford to ease the congestion on these Dartford lines.

3D (21.4 kms) like 2D is a variant with a spur to Beckenham Junction.

3E: South-easterly extensions of the Bakerloo Line towards Peckham Rye and Lewisham:

Option 3E (21.1 kms) is a hybrid of 2D and 3D with stops at:

- Camberwell Road/Burgess Park for bus interchange
- Peckham Rye for National Rail, bus and tram interchange
- Brockley for interchange with bus and National Rail/East London Line to Croydon, Crystal Palace, and Whitechapel/Dalston.
- Lewisham for interchange with bus, DLR and National Rail lines to Dartford and Orpington
- Ladywell, Catford Bridge for interchange with buses and National Rail to Bromley
- Lower Sydenham
- New Beckenham
- Beckenham Junction for bus, Tramlink and National Rail to Bromley
- Clock House
- Elmers End for interchange to Croydon Tramlink
- West Wickham
- Hayes

4A and 5A: Southerly extensions of the Northern Line Charing Cross branch:

4A (3.8 kms) The Northern Line is extended from Kennington to Camberwell Road/Burgess Park and Peckham Rye.

This is designed to test the relative merits of extending the Northern Line compared with the Bakerloo Line and is comparable with option 2A.

5A (16.2 kms) The Northern Line is extended from Kennington to:

- Camberwell Road/Burgess Park
- Old Kent Road
- New Cross

This option is comparable with Option 3A.

6A (2.9 kms) Southerly extensions of the Victoria Line from Brixton to Herne Hill and Tulse Hill:

This option is designed to test the relative merits of extending the Victoria Line compared to the Bakerloo. It is comparable with option 1A.