

Northern Line Extension

**C6: Traffic and Transport Output,  
2020 & 2031, AM & PM peak**

Report

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**1**

**Introduction**

1.1 This Appendix provides detailed traffic and transport output tables for the 2020 AM and PM peak periods and the 2031 AM and PM peak periods. The tables presented for the 2031 AM peak are consistent with those presented in Chapter 6A of the Environmental Statement Addendum (ESA).

1.2 All of the information presented here supports the conclusions presented in the Environmental Statement (ES) and ESA.

**Assessment Methodology and Criteria**

1.3 The assessment presented in this document uses the same methodology, criteria and study area as that presented in paragraphs 6.32 to 6.58 of the ES. Table 6-1 and Table 6-2 of the ES are used to define significant effects.

**2**

**Operational Impacts – 2020 AM peak**

**Introduction**

2.1 This section considers the effects of the NLE during the AM peak in its opening year 2020 against the forecast situation *without* the NLE in place. The effects in the 2020 AM peak are assessed against Table 6-2 in the ES.

**Assumptions and methodology**

2.2 In both the ‘with’ and ‘without’ NLE scenarios, the baseline incorporates population and employment growth, including consented developments in the Vauxhall Nine Elms Battersea Opportunity Area (VNEB OA) which are expected to be completed and occupied by 2020. It also includes committed and funded upgrades to the transport network. The assumptions are based upon an assessment of consented planning permissions in the OA and the TfL Business Plan (Ref. 1).

**London Underground Effects**

**Northern line passenger flows**

2.3 Table 2.1 presents the forecast number of passengers using the NLE in 2020 between Battersea, Nine Elms and Kennington stations in the AM peak.



**Table 2.1 Forecast patronage on the NLE, AM Peak Period (07:00-10:00), 2020**

From	To	AM peak period (07:00–10:00)
<b>Northbound</b>		
Battersea	Nine Elms	1,400
Nine Elms	Kennington	4,000
<b>Southbound</b>		
Kennington	Nine Elms	2,400
Nine Elms	Battersea	1,300

Source: TfL Regional Railplan model

- 2.4 These forecast flows are well within the capacity provided by the NLE and it is able to accommodate the forecast demand.
- 2.5 Table 2.2 shows the forecast changes in flows on the Charing Cross branch of the Northern line north of Kennington in the AM peak as a result of the NLE. This is the section of the network that is forecast to experience the greatest change in passenger flows as a consequence of the NLE.

**Table 2.2 Forecast Change in Patronage – Northern Line Charing Cross Branch, North of Kennington Station, AM Peak Period (07:00–10:00), 2020**

From	To	Flows – 3 hour AM peak, (07:00-10:00)			
		Without NLE	With NLE	Absolute Change	Per cent Change
<b>Northbound</b>					
Kennington	Waterloo	17,000	19,200	2,200	+13%
Waterloo	Embankment	26,400	27,900	1,500	+6%
Embankment	Charing Cross	24,200	25,200	1,000	+4%
Charing Cross	Leicester Square	27,400	28,300	900	+3%
Leicester Square	Tottenham Court Road	25,200	25,800	600	+2%
Tottenham Court Road	Goodge Street	25,600	26,000	400	+2%
Goodge Street	Warren Street	12,200	12,600	400	+3%
Warren Street	Euston	10,800	11,100	300	+3%
Euston	Mornington Crescent	9,600	9,900	300	+3%
Mornington Crescent	Camden Town	7,800	8,000	200	+3%
<b>Southbound</b>					
Camden Town	Mornington Crescent	29,200	29,200	0	0%
Mornington Crescent	Euston	29,200	29,300	100	0%
Euston	Warren Street	31,600	31,700	100	0%
Warren Street	Goodge Street	31,000	31,200	200	+1%
Goodge Street	Tottenham Court Road	27,800	28,000	200	+1%
Tottenham Court Road	Leicester Square	22,600	23,100	500	+2%
Leicester Square	Charing Cross	17,900	18,600	700	+4%
Charing Cross	Embankment	16,900	17,700	800	+5%
Embankment	Waterloo	10,500	11,700	1,200	+11%
Waterloo	Kennington	3,400	4,900	1,500	+44%

Source: TfL Regional Railplan model

- 2.6 As seen in Table 2.2, the largest change in absolute flows on the Charing Cross branch of the Northern line occurs in the northbound direction between Kennington and Waterloo. While this increase is large, the flow with the NLE is well within the capacity of the line as set out in by the crowding analysis shown in Table 2.6.
- 2.7 On the Bank branch, the changes brought about by the NLE are noticeably smaller than on the Charing Cross branch. Table 2.3 shows the forecast changes in flows on the Bank branch north of Kennington in the AM peak.

**Table 2.3 Forecast Change in Patronage – Northern Line Bank Branch, North of Kennington Station, AM Peak Period (07:00–10:00), 2020**

From	To	Flows – 3 hour AM peak, (07:00-10:00)			
		Without NLE	With NLE	Absolute Change	Per cent Change
<b>Northbound</b>					
Kennington	Elephant & Castle	32,100	32,800	700	+2%
Elephant & Castle	Borough	32,700	33,400	700	+2%
Borough	London Bridge	32,500	33,100	600	+2%
London Bridge	Bank	39,100	39,700	600	+2%
Bank	Moorgate	35,500	35,800	300	+1%
Moorgate	Old Street	29,100	29,200	100	0%
Old Street	Angel	23,200	23,100	-100	0%
Angel	King's Cross	15,400	15,300	-100	-1%
King's Cross	Euston	15,900	15,800	-100	-1%
Euston	Camden Town	16,900	16,700	-200	-1%
<b>Southbound</b>					
Camden Town	Euston	30,800	30,800	0	0%
Euston	King's Cross	33,400	33,400	0	0%
King's Cross	Angel	36,200	36,200	0	0%
Angel	Old Street	33,600	33,700	100	0%
Old Street	Moorgate	35,300	35,400	100	0%
Moorgate	Bank	31,200	31,300	100	0%
Bank	London Bridge	28,500	28,700	200	+1%
London Bridge	Borough	14,500	14,700	200	+1%
Borough	Elephant & Castle	11,800	12,000	200	+2%
Elephant & Castle	Kennington	10,000	10,200	200	+2%

Source: TfL Regional Railplan model

2.8 As shown in Table 2.3, the largest change in flows on the Bank branch is 700 passengers on the links between Kennington and Borough.

2.9 Table 2.4 shows the modelled change in flows on the Northern line south of Kennington in the AM Peak.

**Table 2.4 Forecast Change in Patronage – Northern Line, South of Kennington Station, AM Peak Period (07:00-10:00), 2020**

From	To	Flows – 3 hour AM peak, (07:00-10:00)			
		Without NLE	With NLE	Absolute Change	Per cent Change
<b>Northbound</b>					
Clapham Common	Clapham North	48,900	48,700	-200	0%
Clapham North	Stockwell (Northern)	51,700	51,500	-200	0%
Stockwell (Northern)	Oval	43,200	42,600	-600	-1%
Oval	Kennington	45,100	44,500	-600	-1%
<b>Southbound</b>					
Kennington	Oval	11,200	10,900	-300	-3%
Oval	Stockwell (Northern)	11,800	11,400	-400	-3%
Stockwell (Northern)	Clapham North	14,200	14,100	-100	-1%
Clapham North	Clapham Common	13,200	13,200	0	0%

Source: TfL Regional Railplan model

2.10 Although the changes are small, Table 2.4 shows that all of the links south of Kennington experience a reduction or no changes in passenger flows as a consequence of the NLE. Fewer passengers using this portion of the line will help to relieve congestion on the busiest part of the Northern line.

**Victoria line passenger flows**

2.11 Passenger flows also decrease on the Victoria line north of Vauxhall in the AM peak as a consequence of the NLE, as shown in Table 2.5.

**Table 2.5 Forecast Change in Patronage – Victoria Line, Around Vauxhall Station, AM Peak Period (07:00-10:00), 2020**

From	To	Flows – 3 hour AM peak, (07:00-10:00)			
		Without NLE	With NLE	Absolute Change	Per cent Change
<b>Northbound</b>					
Brixton	Stockwell	16,900	17,000	100	+1%
Stockwell	Vauxhall	31,100	31,300	200	+1%
Vauxhall	Pimlico	44,500	44,100	-400	-1%
Pimlico	Victoria	44,100	43,700	-400	-1%
Victoria	Green Park	60,500	60,200	-300	0%
Green Park	Oxford Circus	50,900	50,600	-300	-1%
Oxford Circus	Warren Street	35,800	35,600	-200	-1%
Warren Street	Euston	29,500	29,400	-100	0%
<b>Southbound</b>					
Euston	Warren Street	65,500	65,400	-100	0%
Warren Street	Oxford Circus	61,900	61,700	-200	0%
Oxford Circus	Green Park	42,300	42,100	-200	0%
Green Park	Victoria	36,400	35,900	-500	-1%
Victoria	Pimlico	23,400	22,700	-700	-3%
Pimlico	Vauxhall	15,500	14,800	-700	-5%
Vauxhall	Stockwell	8,100	8,200	100	+1%
Stockwell	Brixton	4,400	4,400	0	0%

Source: TfL Regional Railplan model

2.12 Similar to links south of Kennington on the Northern line, the NLE will generally reduce passenger flows on the Victoria line (although there would be a marginal increase in passengers between Vauxhall and Stockwell in both directions).

**London Underground crowding levels**

2.13 Crowding levels are recorded as the number of people standing per square metre (pax/sqm). Tables 2.6 to 2.9 denote whether any increase in crowding as a result of the NLE meets the Assessment Criteria in Table 6-2 of the ES. The assessment shows that there are no significant effects on these links in the 2020 AM peak.

**Table 2.6 Forecast Crowding Levels – Northern Line Charing Cross Branch, North of Kennington Station, AM Peak Period (07:00-10:00). Absolute Standing Pax / Sqm Ratio, 2020**

From	To	3 hour AM peak, (07:00-10:00) Standing Pax/Sqm				
		Without NLE	With NLE	Base > 3 pax/sqm	% Change	Meets Criteria
<b>Northbound</b>						
Kennington	Waterloo	1.2	1.6	No	+33%	No
Waterloo	Embankment	3.4	3.7	Yes	+9%	No
Embankment	Charing Cross	2.9	3.1	Yes	+7%	No
Charing Cross	Leicester Square	3.3	3.5	Yes	+6%	No
Leicester Square	Tottenham Court Road	2.5	2.6	No	+4%	No
Tottenham Court Road	Goodge Street	2.1	2.2	No	+5%	No
Goodge Street	Warren Street	1.5	1.6	No	+7%	No
Warren Street	Euston	0.8	0.9	No	+13%	No
Euston	Mornington Crescent	0.3	0.4	No	+33%	No
Mornington Crescent	Camden Town	-0.4	-0.3	No	+25%	No
<b>Southbound</b>						
Camden Town	Mornington Crescent	3.2	3.2	Yes	0%	No
Mornington Crescent	Euston	3.1	3.1	Yes	0%	No
Euston	Warren Street	3.3	3.3	Yes	0%	No
Warren Street	Goodge Street	3.0	3.1	Yes	+3%	No
Goodge Street	Tottenham Court Road	2.8	2.8	No	0%	No
Tottenham Court Road	Leicester Square	1.5	1.5	No	0%	No
Leicester Square	Charing Cross	0.9	1.0	No	+11%	No
Charing Cross	Embankment	0.8	0.9	No	+13%	No
Embankment	Waterloo	-0.4	-0.2	No	+50%	No
Waterloo	Kennington	-1.5	-1.2	No	+20%	No

Source: TfL Regional Railplan model

**Table 2.7 Forecast Crowding Levels – Northern Line Bank Branch, North of Kennington Station, AM Peak Period (07:00-10:00). Absolute Standing Pax / Sqm Ratio, 2020**

From	To	3 hour AM peak, (07:00-10:00) Standing Pax/Sqm				
		Without NLE	With NLE	Base > 3 pax/sqm	% Change	Meets Criteria
<b>Northbound</b>						
Kennington	Elephant & Castle	4.1	4.2	Yes	+2%	No
Elephant & Castle	Borough	4.3	4.5	Yes	+5%	No
Borough	London Bridge	4.3	4.5	Yes	+5%	No
London Bridge	Bank	5.3	5.5	Yes	+4%	No
Bank	Moorgate	4.5	4.5	Yes	0%	No
Moorgate	Old Street	2.7	2.7	No	0%	No
Old Street	Angel	1.2	1.2	No	0%	No
Angel	King's Cross	0.6	0.6	No	0%	No
King's Cross	Euston	0.1	0.1	No	0%	No
Euston	Camden Town	0.7	0.7	No	0%	No
<b>Southbound</b>						
Camden Town	Euston	4.3	4.4	Yes	+2%	No
Euston	King's Cross	4.2	4.2	Yes	0%	No
King's Cross	Angel	5.3	5.3	Yes	0%	No
Angel	Old Street	5.1	5.1	Yes	0%	No
Old Street	Moorgate	4.2	4.3	Yes	+2%	No
Moorgate	Bank	3.6	3.6	Yes	0%	No
Bank	London Bridge	2.1	2.1	No	0%	No
London Bridge	Borough	0.5	0.6	No	+20%	No
Borough	Elephant & Castle	0.3	0.3	No	0%	No
Elephant & Castle	Kennington	-0.2	-0.1	No	+50%	No

Source: TfL Regional Railplan model

**Table 2.8 Forecast Crowding Levels – Northern Line, South of Kennington Station, AM Peak Period (07:00-10:00). Absolute Standing Pax/Sqm Ratio, 2020**

From	To	3 hour AM peak, (07:00-10:00) Standing Pax/Sqm				
		Without NLE	With NLE	Base > 3 pax/sqm	% Change	Meets Criteria
<b>Northbound</b>						
Clapham Common	Clapham North	4.7	4.7	Yes	0%	No
Clapham North	Stockwell	5.2	5.1	Yes	-2%	No
Stockwell (Northern)	Oval	4.2	4.1	Yes	-2%	No
Oval	Kennington	5.0	4.8	Yes	-4%	No
<b>Southbound</b>						
Kennington	Oval	-0.2	-0.3	No	+50%	No
Oval	Stockwell	-0.6	-0.6	No	0%	No
Stockwell (Northern)	Clapham North	-0.5	-0.5	No	0%	No
Clapham North	Clapham Common	-0.5	-0.5	No	0%	No

Source: TfL Regional Railplan model

**Table 2.9 Forecast Crowding Levels – Victoria Line Around Vauxhall Station, AM Peak Period (07:00-10:00). Absolute Standing Pax / Sqm Ratio, 2020**

From	To	3 hour AM peak, (07:00-10:00) Standing Pax/Sqm				
		Without NLE	With NLE	Base > 3 pax/sqm	% Change	Meets Criteria
<b>Northbound</b>						
Brixton	Stockwell	0.0	0.0	No	0%	No
Stockwell	Vauxhall	1.8	1.8	No	0%	No
Vauxhall	Pimlico	3.1	3.0	No	-3%	No
Pimlico	Victoria	3.2	3.2	Yes	0%	No
Victoria	Green Park	4.8	4.8	Yes	0%	No
Green Park	Oxford Circus	3.8	3.7	Yes	-3%	No
Oxford Circus	Warren Street	1.4	1.4	No	0%	No
Warren Street	Euston	0.7	0.7	No	0%	No
<b>Southbound</b>						
Euston	Warren Street	4.8	4.8	Yes	0%	No
Warren Street	Oxford Circus	4.4	4.3	Yes	-2%	No
Oxford Circus	Green Park	2.9	2.8	No	-3%	No
Green Park	Victoria	2.2	2.1	No	-5%	No
Victoria	Pimlico	-0.1	-0.1	No	0%	No
Pimlico	Vauxhall	-0.5	-0.6	No	+20%	No
Vauxhall	Stockwell	-1.3	-1.2	No	+8%	No
Stockwell	Brixton	-1.5	-1.5	No	0%	No

Source: TfL Regional Railplan model



2.14 Based on the flows and crowding levels presented above, the overall effect of the NLE on London Underground is not considered significant. Taking into account both the effect of the NLE on flows and on crowding, the conclusions are that in the 2020 AM peak:

- on northbound Northern line links south of Kennington there is a minor beneficial effect due to the reduction in passenger flows and crowding levels;
- on northbound Northern line links north of Kennington (both branches) there is a minor adverse effect due to the increase in passenger flows but only a small change in crowding levels;
- on northbound Victoria line links north of Vauxhall there is a minor beneficial effect due to the reduction in passengers flows and crowding levels; and
- on southbound Northern and Victoria line links there is a minor beneficial effect due to the utilisation of the available capacity meaning the Underground network is being used more efficiently.

2.15 In the case of identified minor adverse effects mitigation is not required as the additional demand generated by the NLE and the wider VNEB OA can be accommodated on the network without causing a significant increase in crowding levels.

#### Stations

2.16 Increased patronage on the Underground as a result of the NLE will also have an effect on stations in or near the OA. With the NLE in place the greatest effect will be seen at Kennington and Vauxhall stations, which are considered individually in the following paragraphs.

#### Kennington

2.17 At Kennington station there will be an increase in passenger throughput as a consequence of the NLE. Table 2.10 shows that this effect is predominantly due to an increase in interchanging passengers between the two branches of the Northern line.

**Table 2.10 Forecast passenger entries/exits and interchange at Kennington Station, AM peak (07:00-10:00), 2020**

	Flows – 3 hour AM peak, (07:00-10:00)			
	Without NLE	With NLE	Absolute Change	Per cent Change
Entries/Exits	6,300	6,200	-100	-2%
Interchange between branches	11,600	12,300	700	+6%
Total	17,900	18,500	600	+3%

Source: TfL Regional Railplan model, factored using survey data according to London Underground's combination forecasting methodology

2.18 The effect of the NLE at Kennington station, with the additional cross passages in place to reduce congestion, has been assessed for the AM peak in 2031 where passenger flows are higher (See Appendix C4A). Based on the 2031 assessment, the effect at Kennington station is expected to be moderate beneficial. This effect is also assumed in 2020 when passenger demand is lower.

#### Vauxhall

2.19 The overall effect of the NLE on Vauxhall Underground station is shown in Table 2.11.

**Table 2.11 Forecast Passenger Flows at Vauxhall Station, AM Peak Period (07:00-10:00), 2020**

	Flows – 3 hour AM peak, (07:00-10:00)			
	Without NLE	With NLE	Absolute change	Per cent change
Entries/Exits	26,800	25,200	-1,600	-6%

Source: TfL Regional Railplan model, factored using survey data according to London Underground's combination forecasting methodology

2.20 Table 2.11 shows that the NLE will have a moderate beneficial effect on Vauxhall LU station by reducing passengers at this important interchange.

#### National Rail Effects

##### National Rail services

2.21 The NLE will reduce flows on some NR services in the AM peak, albeit by a small amount. Table 2.12 to 2.14 show the forecast changes in flows on services that stop at NR stations in the OA.

**Table 2.12 Forecast Change in Patronage on National Rail Services To/From Battersea Park Station, AM Peak Period (07:00-10:00), 2020**

From	To	Flows – 3 hour AM peak, (07:00-10:00)			
		Without NLE	With NLE	Absolute change	Per cent change
<b>Northbound</b>					
Clapham Junction	Battersea Park	12,700	12,700	0	0%
Battersea Park	London Victoria	11,700	11,700	0	0%
<b>Southbound</b>					
London Victoria	Battersea Park	1,300	1,300	0	0%
Battersea Park	Clapham Junction	1,400	1,400	0	0%

Source: TfL Regional Railplan model

**Table 2.13 Forecast Change in Patronage on National Rail Services To/From Queenstown Road Station, AM Peak Period (07:00-10:00), 2020**

From	To	Flows – 3 hour AM peak, (07:00-10:00)			
		Without NLE	With NLE	Absolute Change	Per cent Change
<b>Northbound</b>					
Clapham Junction	Queenstown Road	17,000	17,000	0	0%
Queenstown Road	Vauxhall	16,800	16,700	-100	-1%
<b>Southbound</b>					
Vauxhall	Queenstown Road	5,800	5,600	-200	-3%
Queenstown Road	Clapham Junction	5,800	5,800	0	0%

Source: TfL Regional Railplan model

**Table 2.14 Forecast Change in Patronage on National Rail Services To/From Vauxhall Station, AM Peak Period (07:00-10:00), 2020**

From	To	Flows – 3 hour AM peak, (07:00-10:00)			
		Without NLE	With NLE	Absolute Change	Per cent Change
<b>Northbound</b>					
Clapham Junction	Vauxhall	52,100	52,100	0	0%
Vauxhall	London Waterloo	36,600	36,500	-100	0%
<b>Southbound</b>					
London Waterloo	Vauxhall	7,300	7,100	-200	-3%
Vauxhall	Clapham Junction	8,800	8,800	0	0%

Source: TfL Regional Railplan model

- 2.22 As changes in passenger flows on all links to and from the OA are small, the effect is considered negligible.
- 2.23 The NR effects are further informed by the levels of crowding, presented in Table 2.15 and Table 2.16 which show that the changes in crowding levels do not meet the criteria in Table 6-2. The effect on NR as a consequence of the NLE is therefore considered negligible.

**Table 2.15 Forecast Crowding Levels on National Rail Services To/From Battersea Park Station, AM Peak Period (07:00-10:00). Absolute Standing Pax / Sqm Ratio, 2020**

From	To	3 hour AM peak, (07:00-10:00) Standing Pax/Sqm				
		Without NLE	With NLE	Base > 3 pax/sqm	% Change	Meets Criteria
<b>Northbound</b>						
Clapham Junction	Battersea Park	1.9	1.9	No	0%	No
Battersea Park	London Victoria	1.8	1.8	No	0%	No
<b>Southbound</b>						
London Victoria	Battersea Park	-3.2	-3.2	No	0%	No
Battersea Park	Clapham Junction	-2.7	-2.7	No	0%	No

Source: TfL Regional Railplan model

**Table 2.16 Forecast Crowding Levels on National Rail Services To/From Queenstown Road and Vauxhall NR Stations, AM Peak Period (07:00-10:00). Absolute Standing Pax /Sqm Ratio, 2020**

From	To	3 hour AM peak, (07:00-10:00) Standing Pax/Sqm				
		Without NLE	With NLE	Base > 3 pax/sqm	% Change	Meets Criteria
<b>Northbound</b>						
Clapham Junction	Queenstown Road	4.5	4.5	Yes	0%	No
Queenstown Road	Vauxhall	4.4	4.4	Yes	0%	No
Vauxhall	London Waterloo	3.0	2.9	No	-3%	No
<b>Southbound</b>						
London Waterloo	Vauxhall	-2.2	-2.2	No	0%	No
Vauxhall	Queenstown Road	-1.9	-1.9	No	0%	No
Queenstown Road	Clapham Junction	-1.9	-1.9	No	0%	No

Source: TfL Regional Railplan model

#### **National Rail Stations**

- 2.24 In addition to NR flows, the NLE will also have an effect on the three NR stations located in the OA. Table 2.17 presents the change in flow at each of the stations as a result of the NLE.

**Table 2.17 Trip Generation at National Rail stations, AM Peak Period (07:00 – 10:00), 2020**

Station	Flows – 3 hour AM peak, (07:00-10:00)			
	Without NLE	With NLE	Absolute Change	Per cent Change
Battersea Park	1,800	1,800	0	0%
Queenstown Road	1,900	1,600	-300	-16%
Vauxhall	17,700	17,700	0	0%

Source: TfL Regional Railplan model, factored using survey data according to London Underground's combination forecasting methodology

2.25 Table 2.17 shows a minor beneficial effect at Queenstown Road NR station and a negligible effect at Vauxhall and Battersea Park NR stations as a result of the NLE.

### Bus Effects

2.26 The NLE will have an effect on bus services in the OA. Table 2.18 indicates that the NLE is expected to reduce bus demand by around 9% on services in the area, with a large proportion of these being inbound trips. There is forecast to be a 6% decrease in total outbound trips.

**Table 2.18 Forecast bus passenger flows on total OA bus services, AM Peak Period (07:00-10:00), 2020**

Direction of flow	Flows – 3 hour AM peak, (07:00-10:00)			
	Without NLE	With NLE	Absolute Change	Per cent Change
Inbound	23,300	20,600	-2,700	-12%
Outbound	15,700	14,800	-900	-6%
Total	39,000	35,400	-3,600	-9%

Source: TfL Regional Railplan model

2.27 The largest difference in bus flows as a result of the NLE is forecast to be along the routes closest to the proposed stations at Battersea and Nine Elms along Battersea Park Road / Nine Elms Lane and Wandsworth Road respectively.

**Table 2.19 Forecast Bus Passenger Flows on Nine Elms Lane /Battersea Park Road Bus Services near Battersea station, AM Peak Period (07:00-10:00), 2020**

Direction of flow	Flows – 3 hour AM peak, (07:00-10:00)			
	Without NLE	With NLE	Absolute Change	Per cent Change
<b>Nine Elms Lane east of Battersea station</b>				
Eastbound	2,500	2,200	-300	-12%
Westbound	1,800	1,400	-400	-22%
<b>Battersea Park Road west of Battersea station</b>				
Eastbound	2,400	2,700	300	+13%
Westbound	1,600	1,700	100	+6%

Source: TfL Regional Railplan model

**Table 2.20 Forecast Bus Passenger Flows on Wandsworth Road Bus Services near Nine Elms station, AM Peak Period (07:00-10:00), 2020**

Direction of flow	Flows – 3 hour AM peak, (07:00-10:00)			
	Without NLE	With NLE	Absolute Change	Per cent Change
<b>Wandsworth Road east of Nine Elms station</b>				
Eastbound	3,900	2,600	-1,300	-33%
Westbound	1,400	1,100	-300	-21%
<b>Wandsworth Road west of Nine Elms station</b>				
Eastbound	3,800	3,900	100	+3%
Westbound	1,400	1,300	-100	-7%

Source: TfL Regional Railplan model

2.28 The flow of passengers on individual bus services and corridors generally decreases as shown in Table 2.19 and Table 2.20. The effect on the bus network is considered to be minor beneficial.

### Highway Effects

2.29 The forecast effects on the highway network with the NLE include the committed changes to the network associated with the future baseline as well as changes that will be implemented as a consequence of the additional development that will be enabled by the NLE.

### Changes in Traffic Levels

2.30 Table 2.21 shows the change in two-way flows on each of these eleven key highway links, in the AM peak hour and average inter-peak hour. These represent percentage changes between the 'without NLE' and the 'with NLE' scenario.

**Table 2.21 Forecast Percentage Change in Two-Way Hourly Traffic Flow Due to the NLE on Key Links, AM Peak (08:00-09:00), 2020**

Link	AM peak (08:00–09:00)	Inter-peak (average hour 10:00-16:00)
Vauxhall Bridge	-1%	-5%
Albert Embankment (A3036)	-1%	-1%
Nine Elms Lane (A3205)	-2%	-3%
Battersea Park Road (A3205)	-2%	-3%
Kennington Park Road (A3)	0%	1%
Harleyford Road (A202)	0%	-1%
Kennington Lane (A3204)	0%	-1%
Kennington Road (A23)	-1%	0%
S Lambeth Road (A203)	-1%	-2%
Queenstown Road (A3216)	+2%	+2%
Wandsworth Road (Principal route)	0%	+3%

Source: TfL Central London Highway Assignment Model (CLOHAM)



2.31 The key highway links are forecast to have small changes in traffic flows in the 2020 AM peak and thus the effect is considered negligible.

**Impact on Capacity and Congestion**

2.32 The effect of additional traffic volumes on the network will depend on how close to capacity the network is operating – the closer to theoretical capacity, the greater impact that additional traffic will have in terms of congestion. Congested links have been defined as links where the volume to capacity ratio is greater than 85%.

2.33 The volume to capacity ratios for each of the key links is presented (as a percentage of the maximum theoretical capacity) in Table 2.22 for the AM peak hour and Table 2.23 for the inter-peak average hour.

**Table 2.22 Forecast Volume to Capacity on Key Links, With and Without NLE (Two-Way Average), AM Peak Hour (08:00–09:00), 2020**

Link	Current Baseline	Without NLE	With NLE
Vauxhall Bridge	54%	63%	62%
Albert Embankment (A3036)	9%	11%	11%
Nine Elms Lane (A3205)	36%	41%	40%
Battersea Park Road (A3205)	37%	40%	40%
Kennington Park Road (A3)	34%	34%	34%
Harleyford Road (A202)	57%	65%	65%
Kennington Lane (A3204)	64%	68%	68%
Kennington Road (A23)	36%	46%	45%
S Lambeth Road (A203)	13%	15%	15%
Queenstown Road (A3216)	74%	86%	88%
Wandsworth Road (Principal route)	22%	26%	26%

Source: TfL Central London Highway Assignment Model (CLOHAM)

**Table 2.23 Forecast Volume to Capacity on Key Links, With and Without NLE (Two-Way Average), Inter-Peak, 2020**

Link	Current Baseline	Without NLE	With NLE
Vauxhall Bridge	48%	65%	62%
Albert Embankment (A3036)	10%	11%	11%
Nine Elms Lane (A3205)	37%	40%	38%
Battersea Park Road (A3205)	36%	36%	36%
Kennington Park Road (A3)	30%	32%	33%
Harleyford Road (A202)	33%	43%	43%
Kennington Lane (A3204)	64%	62%	62%
Kennington Road (A23)	27%	35%	35%
S Lambeth Road (A203)	15%	18%	18%
Queenstown Road (A3216)	83%	90%	95%
Wandsworth Road (Principal route)	19%	24%	25%

Source: TfL Central London Highway Assignment Model (CLOHAM)

2.34 Tables 2.22 and 2.23 show that, except for Queenstown Road, all of the analysed links have a low volume to capacity ratio, even with NLE. These links will operate within capacity and will therefore be capable of accommodating an increase in traffic flow. The overall effect on these links is therefore expected to be negligible.

2.35 The volume to capacity ratio for Queenstown Road indicates that there is congestion on this link (above 85%) both with and without the NLE, albeit the level of congestion will be higher with the NLE in both the AM and inter-peak. As AM and inter-peak traffic flows are expected to rise by only 2%, compared to the threshold criterion of 30%, this is therefore considered to have a minor adverse effect.

**Change in Traffic Speeds**

2.36 The effect of the proposed NLE on traffic speeds on the key links is presented in Table 2.24.

**Table 2.24 Forecast Percentage Change in Traffic Speeds on Key Links Due to the NLE, AM Peak (08:00-9:00), 2020**

Link	AM peak (08:00–09:00)	Inter-peak (average hour 10:00-16:00)
Vauxhall Bridge	-6%	+11%
Albert Embankment (A3036)	0%	0%
Nine Elms Lane (A3205)	0%	0%
Battersea Park Road (A3205)	-22%	-29%
Kennington Park Road (A3)	0%	0%
Harleyford Road (A202)	0%	0%
Kennington Lane (A3204)	0%	0%
Kennington Road (A23)	0%	0%
S Lambeth Road (A203)	0%	0%
Queenstown Road (A3216)	-8%	-23%
Wandsworth Road (Principal route)	0%	0%

Source: TfL Central London Highway Assignment Model (CLOHAM)

2.37 The table shows that the effect on traffic speeds is greatest along Battersea Park Road which is the closest link to the BPS development. During the AM peak traffic speeds decrease in excess of 10% on Battersea Park Road (a non-congested link). During the inter-peak there are decreases of 29% on Battersea Park Road and 23% on Queenstown Road but no decreases in excess of 30%. The effect on traffic speed on Battersea Park Road and Queenstown Road is therefore considered to be moderate adverse. This effect is caused by changes to the highway network as a result of the development enabled by the NLE.

2.38 The enabled development at Battersea Power Station (BPS) will require a new access on Battersea Park Road and adjustments to the junction at Kirtling Street. Both of these changes will reduce speeds on the Battersea Park Road corridor. This



effect has been assessed and mitigation measures have been proposed as part of the BPS Transport Assessment (Ref. 2).

- 2.39 Except for a decrease of 6% on Vauxhall Bridge, there are no other links that experience a decrease in speeds of over 5%, and therefore the effect on speeds on other sections of the network is negligible.

### 3 Operational Impacts –2020 PM peak

- 3.1 This section considers the effects of the NLE during the PM peak in its opening year of 2020 against the forecast situation *without* the NLE in place. The effects in the 2020 PM peak are assessed against Table 6-2 in the ES.

#### London Underground Effects

##### Northern line passenger flows

- 3.2 Table 3.1 presents the forecast number of passengers using the NLE in 2020 between Battersea, Nine Elms and Kennington stations in the PM peak.

**Table 3.1 Forecast Patronage on the NLE, PM Peak Period (16:00-19:00), 2020**

From	To	PM peak period (16:00-19:00)
<b>Northbound</b>		
Battersea	Nine Elms	1,800
Nine Elms	Kennington	3,200
<b>Southbound</b>		
Kennington	Nine Elms	3,100
Nine Elms	Battersea	1,300

Source: TfL Regional Railplan model

- 3.3 These forecast flows are well within the capacity provided by the NLE and it is able to easily accommodate the forecast demand.
- 3.4 Table 3.2 shows the forecast changes in flows on the Charing Cross branch of the Northern line north of Kennington in the PM peak as a result of the NLE. This is the section of the network that is forecast to experience the greatest change in passenger flows as a consequence of the NLE.

**Table 3.2 Forecast Change in Patronage – Northern Line Charing Cross Branch, North of Kennington Station, PM Peak Period (16:00–19:00), 2020**

From	To	Flows – 3 hour PM peak, (16:00-19:00)			
		Without NLE	With NLE	Absolute Change	Per cent Change
<b>Northbound</b>					
Kennington	Waterloo	6,900	9,200	2,300	+33%
Waterloo	Embankment	13,400	15,200	1,800	+13%
Embankment	Charing Cross	18,200	19,600	1,400	+8%
Charing Cross	Leicester Square	19,100	20,300	1,200	+6%
Leicester Square	Tottenham Court Road	21,800	22,600	800	+4%
Tottenham Court Road	Goodge Street	26,300	26,700	400	+2%
Goodge Street	Warren Street	25,800	26,100	300	+1%
Warren Street	Euston	26,400	26,600	200	+1%
Euston	Mornington Crescent	23,700	23,800	100	0%
Mornington Crescent	Camden Town	22,800	22,900	100	0%
<b>Southbound</b>					
Camden Town	Mornington Crescent	18,400	18,500	100	+1%
Mornington Crescent	Euston	19,900	19,900	0	0%
Euston	Warren Street	19,800	19,900	100	+1%
Warren Street	Goodge Street	21,200	21,300	100	0%
Goodge Street	Tottenham Court Road	28,900	29,200	300	+1%
Tottenham Court Road	Leicester Square	30,300	30,600	300	+1%
Leicester Square	Charing Cross	29,800	30,400	600	+2%
Charing Cross	Embankment	25,400	26,100	700	+3%
Embankment	Waterloo	25,500	26,700	1,200	+5%
Waterloo	Kennington	11,400	13,400	2,000	+18%

Source: TfL Regional Railplan model

- 3.5 As seen in Table 3.2 the largest change in absolute flows on the Charing Cross branch of the Northern line occur in the northbound direction between Kennington and Waterloo. While this increase is large, the flow with the NLE is well within the capacity of the line as set out in by the crowding analysis shown in Table 3.6.
- 3.6 On the Bank branch, the changes brought about by the NLE are noticeably smaller than on the Charing Cross branch. Table 3.3 shows the forecast changes in flows on the Bank branch north of Kennington in the PM peak.

**Table 3.3 Forecast Change in Patronage – Northern Line Bank Branch, North of Kennington Station, PM Peak Period (16:00–19:00), 2020**

From	To	Flows – 3 hour PM peak, (16:00-19:00)			
		Without NLE	With NLE	Absolute Change	Per cent Change
<b>Northbound</b>					
Kennington	Elephant & Castle	12,700	12,900	200	+2%
Elephant & Castle	Borough	14,400	14,500	100	+1%
Borough	London Bridge	17,900	18,000	100	+1%
London Bridge	Bank	27,100	27,200	100	0%
Bank	Moorgate	33,600	33,700	100	0%
Moorgate	Old Street	30,500	30,600	100	0%
Old Street	Angel	32,500	32,600	100	0%
Angel	King's Cross	33,400	33,500	100	0%
King's Cross	Euston	28,000	28,100	100	0%
Euston	Camden Town	29,500	29,600	100	0%
<b>Southbound</b>					
Camden Town	Euston	17,700	17,600	-100	-1%
Euston	King's Cross	17,900	17,900	0	0%
King's Cross	Angel	18,100	18,000	-100	-1%
Angel	Old Street	25,100	25,200	100	0%
Old Street	Moorgate	28,800	28,800	0	0%
Moorgate	Bank	30,500	30,600	100	0%
Bank	London Bridge	35,200	35,300	100	0%
London Bridge	Borough	24,500	24,700	200	+1%
Borough	Elephant & Castle	23,700	23,900	200	+1%
Elephant & Castle	Kennington	21,500	21,700	200	+1%

Source: TfL Regional Railplan model

3.7 As shown in Table 3.3, the largest change in flows on the Bank branch is in the northbound direction with an additional 200 passengers between Kennington and Elephant and Castle. The southbound, peak flow direction, experiences only a 1% increase in passengers over the 3 hour PM peak.

3.8 Table 3.4 shows the modelled change in flows on the Northern line south of Kennington in the PM Peak.

**Table 3.4 Forecast Change in Patronage – Northern Line, South of Kennington Station, PM Peak Period (16:00-19:00), 2020**

From	To	Flows – 3 hour PM peak, (16:00-19:00)			
		Without NLE	With NLE	Absolute Change	Per cent Change
<b>Northbound</b>					
Clapham Common	Clapham North	15,400	15,300	-100	-1%
Clapham North	Stockwell	16,500	16,400	-100	-1%
Stockwell (Northern)	Oval	15,300	14,900	-400	-3%
Oval	Kennington	17,000	16,600	-400	-2%
<b>Southbound</b>					
Kennington	Oval	25,300	24,800	-500	-2%
Oval	Stockwell	27,500	27,000	-500	-2%
Stockwell (Northern)	Clapham North	37,400	37,300	-100	0%
Clapham North	Clapham Common	34,500	34,600	100	0%

Source: TfL Regional Railplan model

3.9 Although the change is small, Table 3.4 shows that all of the links south of Kennington experience a reduction or no change in passenger flows as a consequence of the NLE. Fewer passengers using this portion of the line will help to relieve congestion on what is the busiest part of the Northern line.

**Victoria line passenger flows**

3.10 Overall, passenger flows decrease on links in both directions on the Victoria line in the PM peak as a consequence of the NLE, as shown in Table 3.5.

**Table 3.5 Forecast Change in Patronage – Victoria Line, Around Vauxhall Station, PM Peak Period (16:00-19:00), 2020**

From	To	Flows – 3 hour PM peak, (16:00-19:00)			
		Without NLE	With NLE	Absolute Change	Per cent Change
<b>Northbound</b>					
Brixton	Stockwell	7,400	7,400	0	0%
Stockwell	Vauxhall	11,400	11,500	100	+1%
Vauxhall	Pimlico	25,400	24,600	-800	-3%
Pimlico	Victoria	31,700	30,900	-800	-3%
Victoria	Green Park	49,100	48,500	-600	-1%
Green Park	Oxford Circus	54,900	54,500	-400	-1%
Oxford Circus	Warren Street	63,400	63,000	-400	-1%
Warren Street	Euston	65,300	65,000	-300	0%
<b>Southbound</b>					
Euston	Warren Street	35,100	34,900	-200	-1%
Warren Street	Oxford Circus	37,000	36,800	-200	-1%
Oxford Circus	Green Park	43,800	43,400	-400	-1%
Green Park	Victoria	53,000	52,400	-600	-1%
Victoria	Pimlico	34,000	33,300	-700	-2%
Pimlico	Vauxhall	31,000	30,300	-700	-2%
Vauxhall	Stockwell	26,900	26,800	-100	0%
Stockwell	Brixton	12,400	12,400	0	0%

Source: TfL Regional Railplan model

3.11 Similar to links south of Kennington on the Northern line, the NLE will generally reduce passenger flows on the Victoria line. There would be a marginal increase in passengers northbound between Stockwell and Vauxhall.

**London Underground crowding levels**

3.12 Table 3.6 to Table 3.9 denote whether any increase in crowding as a result of the NLE meets the Assessment Criteria in Table 6-2 of the ES. The assessment shows that there are no significant effects on these links in the 2020 PM peak.

**Table 3.6 Forecast Crowding Levels – Northern Line Charing Cross Branch, North of Kennington Station, PM Peak Period (16:00-19:00). Absolute Standing Pax / Sqm Ratio, 2020**

From	To	3 hour PM peak, (16:00-19:00) Standing Pax / Sqm				
		Without NLE	With NLE	Base > 3 pax/sqm	% Change	Meets Criteria
<b>Northbound</b>						
Kennington	Waterloo	-0.9	-0.4	No	+56%	No
Waterloo	Embankment	0.7	1.1	No	+57%	No
Embankment	Charing Cross	1.4	1.7	No	+21%	No
Charing Cross	Leicester Square	1.9	2.2	No	+16%	No
Leicester Square	Tottenham Court Road	2.4	2.6	No	+8%	No
Tottenham Court Road	Goodge Street	3.0	3.1	Yes	+3%	No
Goodge Street	Warren Street	3.2	3.3	Yes	+3%	No
Warren Street	Euston	3.4	3.5	Yes	+3%	No
Euston	Mornington Crescent	2.6	2.6	No	0%	No
Mornington Crescent	Camden Town	2.0	2.0	No	0%	No
<b>Southbound</b>						
Camden Town	Mornington Crescent	0.7	0.7	No	0%	No
Mornington Crescent	Euston	1.1	1.2	No	+9%	No
Euston	Warren Street	1.2	1.2	No	0%	No
Warren Street	Goodge Street	1.9	2.0	No	+5%	No
Goodge Street	Tottenham Court Road	2.8	2.8	No	0%	No
Tottenham Court Road	Leicester Square	2.9	3.0	No	+3%	No
Leicester Square	Charing Cross	3.1	3.2	Yes	+3%	No
Charing Cross	Embankment	2.5	2.6	No	+4%	No
Embankment	Waterloo	2.5	2.7	No	+8%	No
Waterloo	Kennington	0.2	0.7	No	+250%	No

Source: TfL Regional Railplan model

**Table 3.7 Forecast Crowding Levels – Northern Line Bank Branch, North of Kennington Station, PM Peak Period (16:00-19:00). Absolute Standing Pax / Sqm Ratio, 2020**

From	To	3 hour PM peak, (16:00-19:00) Standing Pax / Sqm				
		Without NLE	With NLE	Base > 3 pax/sqm	% Change	Meets Criteria
<b>Northbound</b>						
Kennington	Elephant & Castle	-0.4	-0.3	No	+25%	No
Elephant & Castle	Borough	0.3	0.4	No	+33%	No
Borough	London Bridge	0.7	0.7	No	0%	No
London Bridge	Bank	1.8	1.8	No	0%	No
Bank	Moorgate	3.4	3.4	Yes	0%	No
Moorgate	Old Street	2.9	3.0	No	+3%	No
Old Street	Angel	3.4	3.5	Yes	+3%	No
Angel	King's Cross	3.7	3.7	Yes	0%	No
King's Cross	Euston	2.5	2.6	No	+4%	No
Euston	Camden Town	3.3	3.3	Yes	0%	No
<b>Southbound</b>						
Camden Town	Euston	1.0	1.0	No	0%	No
Euston	King's Cross	1.2	1.2	No	0%	No
King's Cross	Angel	1.4	1.4	No	0%	No
Angel	Old Street	1.5	1.5	No	0%	No
Old Street	Moorgate	2.8	2.8	No	0%	No
Moorgate	Bank	3.6	3.6	Yes	0%	No
Bank	London Bridge	4.4	4.5	Yes	+2%	No
London Bridge	Borough	2.9	2.9	No	0%	No
Borough	Elephant & Castle	2.8	2.9	No	+4%	No
Elephant & Castle	Kennington	2.7	2.7	No	0%	No

Source: TfL Regional Railplan model

**Table 3.8 Forecast Crowding Levels – Northern Line, South of Kennington Station, PM Peak Period (16:00-19:00). Absolute Standing Pax / Sqm Ratio, 2020**

From	To	3 hour PM peak, (16:00-19:00) Standing Pax / Sqm				
		Without NLE	With NLE	Base > 3 pax/sqm	% Change	Meets Criteria
<b>Northbound</b>						
Clapham Common	Clapham North	0.0	0.0	No	0%	No
Clapham North	Stockwell	0.1	0.1	No	0%	No
Stockwell (Northern)	Oval	-0.2	-0.2	No	0%	No
Oval	Kennington	-0.1	-0.1	No	0%	No
<b>Southbound</b>						
Kennington	Oval	3.3	3.2	Yes	-3%	No
Oval	Stockwell	2.6	2.5	No	-4%	No
Stockwell (Northern)	Clapham North	3.3	3.3	Yes	0%	No
Clapham North	Clapham Common	2.8	2.8	No	0%	No

Source: TfL Regional Railplan model



**Table 3.9 Forecast Crowding Levels – Victoria Line Around Vauxhall Station, PM Peak Period (16:00-19:00). Absolute Standing Pax / Sqm Ratio, 2020**

From	To	3 hour PM peak, (16:00-19:00) Standing Pax / Sqm				
		Without NLE	With NLE	Base > 3 pax/sqm	% Change	Meets Criteria
<b>Northbound</b>						
Brixton	Stockwell	0.0	0.0	No	0%	No
Stockwell	Vauxhall	-0.8	-0.8	No	0%	No
Vauxhall	Pimlico	0.1	0.1	No	0%	No
Pimlico	Victoria	0.7	0.6	No	-14%	No
Victoria	Green Park	3.0	3.0	No	0%	No
Green Park	Oxford Circus	3.5	3.4	Yes	-3%	No
Oxford Circus	Warren Street	4.1	4.1	Yes	0%	No
Warren Street	Euston	4.5	4.5	Yes	0%	No
<b>Southbound</b>						
Euston	Warren Street	1.0	1.0	No	0%	No
Warren Street	Oxford Circus	1.4	1.4	No	0%	No
Oxford Circus	Green Park	2.9	2.8	No	-3%	No
Green Park	Victoria	3.9	3.9	Yes	0%	No
Victoria	Pimlico	1.7	1.6	No	-6%	No
Pimlico	Vauxhall	1.4	1.3	No	-7%	No
Vauxhall	Stockwell	0.7	0.7	No	0%	No
Stockwell	Brixton	-0.5	-0.5	No	0%	No

Source: TfL Regional Railplan model

3.13 Based on the flows and crowding levels presented above, the overall effect of the NLE on London Underground is considered not significant. Taking into account both the effect of the NLE on flows and on crowding, the conclusions in the 2020 PM peak are the same as the ES:

- on southbound Northern line links south of Kennington there is a minor beneficial effect due to the reduction in passenger flows and crowding levels;
- on southbound Northern line links north of Kennington (both branches) there is a minor adverse effect due to the increase in passenger flows but with a small change in crowding levels;
- on southbound Victoria line links there is a minor beneficial effect due to the reduction in passengers flows and crowding levels; and
- on northbound Northern and Victoria line links there is a minor beneficial effect due to the utilisation of the available capacity meaning the Underground network is being used more efficiently.

3.14 In the case of identified minor adverse effects, mitigation is not required as the additional demand generated by the NLE and the wider VNEB OA can be

accommodated on the network without causing a significant increase in crowding levels.

**Stations**

3.15 Increased patronage on the Underground as a result of the NLE will also have an effect on stations in or near the OA. With the NLE in place the greatest effect will be seen at Kennington and Vauxhall stations, considered individually in the following paragraphs.

*Kennington*

3.16 At Kennington station there will be a large increase in passenger throughput as a consequence of the NLE. Table 3.10 shows that this effect is predominantly due to an increase in interchanging passengers between the two branches of the Northern line. There is only a small increase in total passengers entering or exiting the station.

**Table 3.10 Forecast passenger entries/exits and interchange at Kennington Station, PM peak (16:00-19:00), 2020**

	Flows – 3 hour PM peak, (16:00-19:00)			
	Without NLE	With NLE	Absolute Change	Per cent Change
Entries/Exits	5,800	6,100	300	+5%
Interchange between branches	7,300	8,100	800	+11%
Total	13,100	14,200	1,100	+8%

Source: TfL Regional Railplan model, factored using survey data according to London Underground's combination forecasting methodology

3.17 The effect of the NLE at Kennington station, with the additional cross passages in place to reduce congestion, has been assessed for the PM peak in 2031 where passenger flows are higher (See Appendix C9). Based on the 2031 assessment, the effect at Kennington station is expected to be moderate beneficial. This effect is also assumed in 2020 when passenger demand is lower.

*Vauxhall*

3.18 The overall effect of the NLE on Vauxhall Underground station is shown in Table 3.11.

**Table 3.11 Forecast Passenger Flows at Vauxhall Station, PM Peak Period (16:00-19:00), 2020**

	Flows – 3 hour PM peak, (16:00-19:00)			
	Without NLE	With NLE	Absolute Change	Per cent Change
Entries/Exits	21,100	19,300	-1,800	-9%

Source: TfL Regional Railplan model, factored using survey data according to London Underground's combination forecasting methodology

3.19 Table 3.1 shows that the NLE will have a moderate beneficial effect on Vauxhall LU station by reducing passengers at this important interchange.

### National Rail Effects

#### National Rail services

3.20 The NLE will reduce flows on some NR services in the PM peak, albeit by a small amount, with no change on others. Table 3.12 to Table 3.14 show the forecast changes in flows on NR services that stop at stations in the OA.

**Table 3.12 Forecast Change in Patronage on National Rail Services To/From Battersea Park Station, PM Peak Period (16:00-19:00), 2020**

From	To	Flows – 3 hour PM peak, (16:00-19:00)			
		Without NLE	With NLE	Absolute Change	Per cent Change
<b>Northbound</b>					
Clapham Junction	Battersea Park	2,100	2,100	0	0%
Battersea Park	London Victoria	2,100	2,100	0	0%
<b>Southbound</b>					
London Victoria	Battersea Park	5,800	5,800	0	0%
Battersea Park	Clapham Junction	6,100	6,100	0	0%

Source: TfL Regional Railplan model

**Table 3.13 Forecast Change in Patronage on National Rail Services To/From Queenstown Road Station, PM Peak Period (16:00-19:00), 2020**

From	To	Flows – 3 hour PM peak, (16:00-19:00)			
		Without NLE	With NLE	Absolute Change	Per cent Change
<b>Northbound</b>					
Clapham Junction	Queenstown Road	8,300	8,300	0	0%
Queenstown Road	Vauxhall	8,500	8,200	-300	-4%
<b>Southbound</b>					
Vauxhall	Queenstown Road	13,800	13,700	-100	-1%
Queenstown Road	Clapham Junction	13,700	13,700	0	0%

Source: TfL Regional Railplan model

**Table 3.14 Forecast Change in Patronage on National Rail Services To/From Vauxhall Station, PM Peak Period (16:00-19:00), 2020**

From	To	Flows – 3 hour PM peak, (16:00-19:00)			
		Without NLE	With NLE	Absolute Change	Per cent Change
<b>Northbound</b>					
Clapham Junction	Vauxhall	17,800	17,600	-200	-1%
Vauxhall	London Waterloo	8,800	8,600	-200	-2%
<b>Southbound</b>					
London Waterloo	Vauxhall	40,500	40,400	-100	0%
Vauxhall	Clapham Junction	45,200	45,300	100	0%

Source: TfL Regional Railplan model

3.21 As changes in passenger flows on all links to and from the OA are small, the effect is considered negligible.

3.22 The NR effects are further informed by the levels of crowding, presented in Table 3.15 and 3.16 which show that the change in crowding levels do not meet the criteria in Table 6-2. The effect on NR as a consequence of the NLE is negligible.

**Table 3.15 Forecast Crowding Levels on National Rail Services To/From Battersea Park Station, PM Peak Period (16:00-19:00). Absolute Standing Pax/Sqm Ratio, 2020**

From	To	3 hour PM peak, (16:00-19:00) Standing Pax/Sqm				
		Without NLE	With NLE	Base > 3 pax/sqm	% Change	Meets Criteria
<b>Northbound</b>						
Clapham Junction	Battersea Park	-2.4	-2.4	No	0%	No
Battersea Park	London Victoria	-2.9	-2.9	No	0%	No
<b>Southbound</b>						
London Victoria	Battersea Park	0.7	0.7	No	0%	No
Battersea Park	Clapham Junction	0.5	0.5	No	0%	No

Source: TfL Regional Railplan model

**Table 3.16 Forecast Crowding Levels on National Rail Services To/From Queenstown Road and Vauxhall NR Stations, PM Peak Period (16:00-19:00). Absolute Standing Pax/Sqm Ratio, 2020**

From	To	3 hour PM peak, (16:00-19:00) Standing Pax/Sqm				
		Without NLE	With NLE	Base > 3 pax/sqm	% Change	Meets Criteria
<b>Northbound</b>						
Clapham Junction	Queenstown Road	-1.1	-1.1	No	0%	No
Queenstown Road	Vauxhall	-1.1	-1.1	No	0%	No
Vauxhall	London Waterloo	-2.1	-2.2	No	+5%	No
<b>Southbound</b>						
London Waterloo	Vauxhall	2.8	2.8	No	0%	No
Vauxhall	Queenstown Road	3.2	3.2	Yes	0%	No
Queenstown Road	Clapham Junction	3.2	3.2	Yes	0%	No

Source: TfL Regional Railplan model

#### National Rail Stations

3.23 In addition to NR flows, the NLE will also have an effect on the three NR stations located in the OA. Table 3.17 presents the change in flow at each of the stations as a result of the NLE.

**Table 3.17 Trip Generation at National Rail stations, 3-Hour PM Peak Period, 2020**

Station	Flows – 3 hour PM peak, (16:00-19:00)			
	Without NLE	With NLE	Absolute Change	Per cent Change
Battersea Park	1,000	1,000	0	0%
Queenstown Road	2,000	1,600	-400	-20%
Vauxhall	14,800	14,700	-100	-1%

Source: TfL Regional Railplan model, factored using survey data according to London Underground's combination forecasting methodology

3.24 Table 3.17 shows a minor beneficial effect at Queenstown Road NR station and a negligible effect at Vauxhall and Battersea Park NR stations as a result of the NLE.

#### Bus Effects

3.25 The NLE will also have an effect on bus services in the OA. Table 3.18 indicates that the NLE is expected to reduce bus demand by around 8% on services in the area with a mix of inbound and outbound trips.

**Table 3.18 Forecast bus passenger flows on total OA bus services, 2020**

Direction of flow	Flows – 3 hour PM peak, (16:00-19:00)			
	Without NLE	With NLE	Absolute Change	Per cent Change
Inbound	12,300	11,400	-900	-7%
Outbound	10,700	9,800	-900	-8%
Total	23,000	21,200	-1,800	-8%

Source: TfL Regional Railplan model

3.26 The largest difference in bus flows, as a result of the NLE, is forecast to be along the routes closest to the proposed stations at Battersea, along Battersea Park Road / Nine Elms Lane and at Nine Elms along Wandsworth Road.

**Table 3.19 Forecast Bus Passenger Flows on Nine Elms Lane /Battersea Park Road Bus Services near Battersea station, PM Peak Period (16:00-19:00), 2020**

Direction of flow	Flows – 3 hour PM peak, (16:00-19:00)			
	Without NLE	With NLE	Absolute change	Per cent Change
<b>Nine Elms Lane east of Battersea station</b>				
Eastbound	2,300	1,800	-500	-22%
Westbound	1,700	1,400	-300	-18%
<b>Battersea Park Road west of Battersea station</b>				
Eastbound	2,000	2,200	200	+10%
Westbound	1,700	1,800	100	+6%

Source: TfL Regional Railplan model

**Table 3.20 Forecast Bus Passenger Flows on Wandsworth Road Bus Services near Nine Elms station, PM Peak Period (16:00-19:00), 2020**

Direction of flow	Flows – 3 hour PM peak, (16:00-19:00)			
	Without NLE	With NLE	Absolute Change	Per cent Change
<b>Wandsworth Road east of Nine Elms station</b>				
Eastbound	2,400	2,000	-400	-17%
Westbound	1,900	1,400	-500	-26%
<b>Wandsworth Road west of Nine Elms station</b>				
Eastbound	2,200	2,100	-100	-5%
Westbound	3,000	2,900	-100	-3%

Source: TfL Regional Railplan model

3.27 Overall, the flow of passengers on individual bus services and corridors decreases as shown in Table 3.19 and Table 3.20. Bus services along Battersea Park Road are forecast to have a small increase in passenger west of Battersea station. The effect on the bus network is considered to be minor beneficial.



**Highway Effects**

3.28 The forecast effects on the highway network with the NLE include the committed changes to the network associated with the future baseline as well as changes that will be implemented as a consequence of the additional development that will be enabled by the NLE.

**Changes in Traffic Levels**

3.29 Table 3.21 shows the change in two-way flows on each of these eleven key highway links, in the PM peak hour. These represent percentage changes between the ‘without NLE’ and the “with NLE” scenario.

**Table 3.21 Forecast Percentage Change in Two-Way Hourly Traffic Flow Due to the NLE on Key Links, 2020**

Link	PM peak (08:00–09:00)
Vauxhall Bridge	0%
Albert Embankment (A3036)	-3%
Nine Elms Lane (A3205)	-6%
Battersea Park Road (A3205)	-9%
Kennington Park Road (A3)	-3%
Harleyford Road (A202)	+2%
Kennington Lane (A3204)	-1%
Kennington Road (A23)	-4%
S Lambeth Road (A203)	0%
Queenstown Road (A3216)	+1%
Wandsworth Road (Principal route)	+6%

Source: TfL Central London Highway Assignment Model (CLOHAM)

3.30 Traffic on Wandsworth Road has the largest per cent increase in traffic volume at 6%. The overall effect in the PM peak is considered negligible as the increases in flow on these links of the highway network do not exceed 10%.

**Impact on Capacity and Congestion**

3.31 The effect of additional traffic volumes on the network will depend on how close to capacity the network is operating – the closer to theoretical capacity, the greater impact that additional traffic will have in terms of congestion. Congested links have been defined as links where the volume to capacity ratio is greater than 85%.

3.32 The volume to capacity ratios for each of the key links is presented (as a percentage of the maximum theoretical capacity) in Table 3.22 for the PM peak hour.

**Table 3.22 Forecast Volume to Capacity on Key Links, With and Without NLE (Two-Way Average), PM Peak Hour (17:00–18:00), 2020**

Link	Current Baseline	Without NLE	With NLE
Vauxhall Bridge	54%	61%	61%
Albert Embankment (A3036)	9%	9%	8%
Nine Elms Lane (A3205)	44%	44%	41%
Battersea Park Road (A3205)	41%	42%	37%
Kennington Park Road (A3)	33%	40%	38%
Harleyford Road (A202)	46%	48%	49%
Kennington Lane (A3204)	68%	69%	69%
Kennington Road (A23)	21%	26%	26%
S Lambeth Road (A203)	17%	16%	16%
Queenstown Road (A3216)	75%	83%	84%
Wandsworth Road (Principal route)	23%	25%	27%

Source: TfL Central London Highway Assignment Model (CLOHAM)

3.33 The NLE has a small effect on the V/C ratio on all links in and around the OA with all links remaining below 85%. Thus the effect is considered negligible.

**Change in Traffic Speeds**

3.34 The effect of the proposed NLE on traffic speeds on the key links is presented in Table 3.23.

**Table 3.23 Forecast Percentage Change in Traffic Speeds on Key Links Due to the NLE, 2020**

Link	PM peak (17:00–18:00)
Vauxhall Bridge	-1%
Albert Embankment (A3036)	0%
Nine Elms Lane (A3205)	0%
Battersea Park Road (A3205)	-35%
Kennington Park Road (A3)	0%
Harleyford Road (A202)	0%
Kennington Lane (A3204)	+1%
Kennington Road (A23)	0%
S Lambeth Road (A203)	0%
Queenstown Road (A3216)	+2%
Wandsworth Road (Principal route)	0%

Source: TfL Central London Highway Assignment Model (CLOHAM)

3.35 The table shows that the effect on traffic speeds is greatest along Battersea Park Road which is the closest link to the BPS development. During the PM peak traffic speeds decrease in excess of 10% on Battersea Park Road (a non-congested link). During the PM peak there are decreases of 35% on Battersea Park. The effect on traffic speed on Battersea Park Road is therefore considered to be moderate



adverse. This effect is caused by changes to the highway network as a result of the development enabled by the NLE.

- 3.36 The enabled development at BPS will require a new access on Battersea Park Road and adjustments to the junction at Kirtling Street and both of these changes will reduce speeds on the Battersea Park Road corridor. This effect has been assessed and mitigation measures have been proposed as part of the BPS Transport Assessment (Ref. 2).
- 3.37 There are no other links that experience a decrease in speeds of over 5%, and therefore the effect on speeds on other sections of the network is negligible.

#### 4 Operational Effects – 2031 AM Peak

- 4.1 This section considers the effects of the NLE during the AM peak in 2031 against the forecast situation *without* the NLE in place. This section presents an expanded assessment of passenger flows and crowding for London Underground in the 2031 AM peak.

##### London Underground Effects

##### Northern and Victoria Line Passenger Flows

- 4.2 Table 4.1 presents the forecast number of passengers using the NLE in 2031 between Battersea, Nine Elms and Kennington stations in the AM peak

**Table 4.1 Forecast Patronage on the NLE, 2031**

From	To	AM peak period (07:00–10:00)
<b>Northbound</b>		
Battersea	Nine Elms	4,200
Nine Elms	Kennington	8,300
<b>Southbound</b>		
Kennington	Nine Elms	6,300
Nine Elms	Battersea	4,200

Source: TfL Regional Railplan model

- 4.3 These forecast flows are well within the capacity provided by the NLE and it is able to easily accommodate the forecast demand.
- 4.4 Table 4.2 – Table 4.5 show the forecast changes in flows on the Northern line and Victoria line in the AM peak as a result of the NLE.

**Table 4.2 Forecast Change in Patronage – Northern Line Charing Cross Branch, North of Kennington Station, AM Peak Period (07:00 – 10:00), 2031**

From	To	Flows – 3 hour AM peak, (07:00-10:00)			
		Without NLE	With NLE	Absolute Change	Per cent Change
<b>Northbound</b>					
Kennington	Waterloo	14,400	18,800	4,400	+31%
Waterloo	Embankment	26,600	29,600	3,000	+11%
Embankment	Charing Cross	26,000	27,800	1,800	+7%
Charing Cross	Leicester Square	29,700	31,300	1,600	+5%
Leicester Square	Tottenham Court Road	27,500	28,600	1,100	+4%
Tottenham Court Road	Goodge Street	28,100	28,900	800	+3%
Goodge Street	Warren Street	13,500	14,100	600	+4%
Warren Street	Euston	12,100	12,500	400	+3%
Euston	Mornington Crescent	12,400	12,900	500	+4%
Mornington Crescent	Camden Town	10,200	10,600	400	+4%
<b>Southbound</b>					
Camden Town	Mornington Crescent	34,000	34,300	300	+1%
Mornington Crescent	Euston	34,000	34,300	300	+1%
Euston	Warren Street	38,300	38,900	600	+2%
Warren Street	Goodge Street	37,300	38,000	700	+2%
Goodge Street	Tottenham Court Road	33,100	33,900	800	+2%
Tottenham Court Road	Leicester Square	27,800	29,300	1,500	+5%
Leicester Square	Charing Cross	20,800	22,700	1,900	+9%
Charing Cross	Embankment	19,400	21,600	2,200	+11%
Embankment	Waterloo	12,000	15,100	3,100	+26%
Waterloo	Kennington	3,100	7,000	3,900	+126%

Source: TfL Regional Railplan model

**Table 4.3 Forecast Change in Patronage – Northern Line Bank Branch, North of Kennington Station, AM Peak Period (07:00 – 10:00), 2031**

From	To	Flows – 3 hour AM peak, (07:00-10:00)			
		Without NLE	With NLE	Absolute Change	Per cent Change
<b>Northbound</b>					
Kennington	Elephant & Castle	37,100	38,600	1,500	+4%
Elephant & Castle	Borough	38,200	39,600	1,400	+4%
Borough	London Bridge	37,900	39,200	1,300	+3%
London Bridge	Bank	46,500	47,500	1,000	+2%
Bank	Moorgate	41,900	42,400	500	+1%
Moorgate	Old Street	35,300	35,600	300	+1%
Old Street	Angel	28,400	28,500	100	0%
Angel	King's Cross	19,100	19,000	-100	-1%
King's Cross	Euston	19,200	19,200	0	0%
Euston	Camden Town	19,200	18,900	-300	-2%
<b>Southbound</b>					
Camden Town	Euston	36,800	36,900	100	0%
Euston	King's Cross	40,200	40,300	100	0%
King's Cross	Angel	44,400	44,400	0	0%
Angel	Old Street	40,700	40,900	200	0%
Old Street	Moorgate	42,700	42,900	200	0%
Moorgate	Bank	37,800	37,900	100	0%
Bank	London Bridge	34,500	35,000	500	+1%
London Bridge	Borough	19,600	20,400	800	+4%
Borough	Elephant & Castle	16,600	17,500	900	+5%
Elephant & Castle	Kennington	13,700	14,700	1,000	+7%

Source: TfL Regional Railplan model

**Table 4.4 Forecast change in patronage – Northern line, south of Kennington station, AM peak period (07:00 – 10:00), 2031**

From	To	Flows – 3 hour AM peak, (07:00-10:00)			
		Without NLE	With NLE	Absolute Change	Per cent Change
<b>Northbound</b>					
Clapham Common	Clapham North	48,600	48,300	-300	-1%
Clapham North	Stockwell	51,400	51,100	-300	-1%
Stockwell (Northern)	Oval	44,000	42,700	-1,300	-3%
Oval	Kennington	46,100	44,700	-1,400	-3%
<b>Southbound</b>					
Kennington	Oval	15,000	14,500	-500	-3%
Oval	Stockwell	14,200	13,700	-500	-4%
Stockwell (Northern)	Clapham North	16,300	16,200	-100	-1%
Clapham North	Clapham Common	15,300	15,200	-100	-1%

Source: TfL Regional Railplan model

**Table 4.5 Forecast change in patronage – Victoria line, around Vauxhall station, AM peak period (07:00 – 10:00), 2031**

From	To	Flows – 3 hour AM peak, (07:00-10:00)			
		Without NLE	With NLE	Absolute Change	Per cent Change
<b>Northbound</b>					
Brixton	Stockwell	17,900	17,900	0	0%
Stockwell	Vauxhall	31,800	32,100	300	+1%
Vauxhall	Pimlico	46,000	45,400	-600	-1%
Pimlico	Victoria	45,500	44,800	-700	-2%
Victoria	Green Park	63,000	62,300	-700	-1%
Green Park	Oxford Circus	52,600	52,200	-400	-1%
Oxford Circus	Warren Street	38,600	38,300	-300	-1%
Warren Street	Euston	32,000	31,900	-100	0%
<b>Southbound</b>					
Euston	Warren Street	69,600	69,400	-200	0%
Warren Street	Oxford Circus	66,000	65,600	-400	-1%
Oxford Circus	Green Park	44,800	44,300	-500	-1%
Green Park	Victoria	39,000	38,100	-900	-2%
Victoria	Pimlico	24,700	23,500	-1,200	-5%
Pimlico	Vauxhall	16,200	14,900	-1,300	-8%
Vauxhall	Stockwell	8,800	8,600	-200	-2%
Stockwell	Brixton	4,700	4,700	0	0%

Source: TfL Regional Railplan model

4.5 Table 4.2 to Table 4.5 show that the forecast changes in flows on the Northern line and Victoria line in the AM peak as a result of the NLE.

**London Underground Crowding Levels**

4.6 Table 4.6 to Table 4.9 denote whether any increase in crowding as a result of the NLE meets the Assessment Criteria in Table 6-2 of the ES. None of these links show a crowding effect that meets the assessment criteria as being significant for the 2031 AM peak.

**Table 4.6 Forecast Crowding Levels – Northern line Charing Cross branch, North of Kennington station, AM peak period (07:00 – 10:00). absolute standing pax/sqm ratio, 2031**

From	To	3 hour AM peak, (07:00-10:00) Standing Pax/Sqm				
		Without NLE	With NLE	Base > 3 pax/sqm	% Change	Meets Criteria
<b>Northbound</b>						
Kennington	Waterloo	0.0	0.8	No	+800%	No
Waterloo	Embankment	2.3	2.8	No	+22%	No
Embankment	Charing Cross	2.1	2.4	No	+14%	No
Charing Cross	Leicester Square	2.6	2.9	No	+12%	No
Leicester Square	Tottenham Court Road	1.9	2.0	No	+5%	No
Tottenham Court Road	Goodge Street	1.6	1.7	No	+6%	No
Goodge Street	Warren Street	1.0	1.2	No	+20%	No
Warren Street	Euston	0.5	0.6	No	+20%	No
Euston	Mornington Crescent	0.4	0.5	No	+25%	No
Mornington Crescent	Camden Town	0.3	0.4	No	+33%	No
<b>Southbound</b>						
Camden Town	Mornington Crescent	2.8	2.8	No	0%	No
Mornington Crescent	Euston	2.8	2.8	No	0%	No
Euston	Warren Street	3.1	3.2	Yes	+3%	No
Warren Street	Goodge Street	2.9	2.9	No	0%	No
Goodge Street	Tottenham Court Road	2.5	2.6	No	+4%	No
Tottenham Court Road	Leicester Square	1.4	1.6	No	+14%	No
Leicester Square	Charing Cross	0.7	0.9	No	+29%	No
Charing Cross	Embankment	0.5	0.8	No	+60%	No
Embankment	Waterloo	-0.6	-0.2	No	+67%	No
Waterloo	Kennington	-1.7	-1.0	No	+41%	No

Source: TFL Regional Railplan model

**Table 4.7 Forecast crowding levels – Northern Line bank branch, north of Kennington station, AM peak period (07:00 – 10:00). absolute standing pax/sqm ratio, 2031**

From	To	3 hour AM peak, (07:00-10:00) Standing Pax/Sqm				
		Without NLE	With NLE	Base > 3 pax/sqm	% Change	Meets Criteria
<b>Northbound</b>						
Kennington	Elephant & Castle	3.5	3.7	Yes	+6%	No
Elephant & Castle	Borough	3.7	3.9	Yes	+5%	No
Borough	London Bridge	3.7	3.9	Yes	+5%	No
London Bridge	Bank	4.8	4.9	Yes	+2%	No
Bank	Moorgate	3.9	4.0	Yes	+3%	No
Moorgate	Old Street	2.4	2.5	No	+4%	No
Old Street	Angel	1.0	1.0	No	0%	No
Angel	King's Cross	0.5	0.5	No	0%	No
King's Cross	Euston	0.0	0.0	No	0%	No
Euston	Camden Town	0.5	0.5	No	0%	No
<b>Southbound</b>						
Camden Town	Euston	4.1	4.1	Yes	0%	No
Euston	King's Cross	4.0	4.0	Yes	0%	No
King's Cross	Angel	5.2	5.2	Yes	0%	No
Angel	Old Street	4.8	4.9	Yes	+2%	No
Old Street	Moorgate	4.0	4.1	Yes	+2%	No
Moorgate	Bank	3.5	3.5	Yes	0%	No
Bank	London Bridge	2.0	2.0	No	0%	No
London Bridge	Borough	0.8	0.9	No	+13%	No
Borough	Elephant & Castle	0.6	0.8	No	+33%	No
Elephant & Castle	Kennington	0.0	0.2	No	200%	No

Source: TFL Regional Railplan model

**Table 4.8 Forecast crowding levels – Northern line, south of Kennington station, AM peak period (07:00 – 10:00). absolute standing pax/sqm ratio, 2031**

From	To	3 hour AM peak, (07:00-10:00) Standing Pax/Sqm				
		Without NLE	With NLE	Base > 3 pax/sqm	% Change	Meets Criteria
<b>Northbound</b>						
Clapham Common	Clapham North	4.9	4.9	Yes	0%	No
Clapham North	Stockwell	5.4	5.4	Yes	0%	No
Stockwell (Northern)	Oval	4.5	4.3	Yes	-4%	No
Oval	Kennington	5.0	4.8	Yes	-4%	No
<b>Southbound</b>						
Kennington	Oval	-0.1	-0.2	No	+100%	No
Oval	Stockwell	0.0	-0.1	No	0%	No
Stockwell (Northern)	Clapham North	-0.1	-0.1	No	0%	No
Clapham North	Clapham Common	-0.1	-0.1	No	0%	No

Source: TfL Regional Railplan model

**Table 4.9 Forecast crowding levels – Victoria line around Vauxhall station, AM peak period (07:00 – 10:00). absolute standing pax/sqm ratio, 2031**

From	To	3 hour AM peak, (07:00-10:00) Standing Pax/Sqm				
		Without NLE	With NLE	Base > 3 pax/sqm	% Change	Meets Criteria
<b>Northbound</b>						
Brixton	Stockwell	0.2	0.2	No	0%	No
Stockwell	Vauxhall	1.9	1.9	No	0%	No
Vauxhall	Pimlico	3.2	3.2	Yes	0%	No
Pimlico	Victoria	3.4	3.3	Yes	-3%	No
Victoria	Green Park	5.1	5.0	Yes	-2%	No
Green Park	Oxford Circus	4.0	3.9	Yes	-3%	No
Oxford Circus	Warren Street	1.7	1.6	No	-6%	No
Warren Street	Euston	0.9	0.9	No	0%	No
<b>Southbound</b>						
Euston	Warren Street	5.2	5.2	Yes	0%	No
Warren Street	Oxford Circus	4.8	4.7	Yes	-2%	No
Oxford Circus	Green Park	3.1	3.1	Yes	0%	No
Green Park	Victoria	2.5	2.4	No	-4%	No
Victoria	Pimlico	0.0	-0.1	No	0%	No
Pimlico	Vauxhall	-0.5	-0.6	No	+20%	No
Vauxhall	Stockwell	-1.2	-1.2	No	0%	No
Stockwell	Brixton	-1.5	-1.5	No	0%	No

Source: TfL Regional Railplan model

4.7 Based on the flows and crowding levels presented above, the overall effect of the NLE on London Underground using the Assessment Criteria is considered not significant, the same conclusion as presented in the ES. Taking into account both the effect of the NLE on flows and on crowding, the conclusions are that in the 2031 AM peak:

- on northbound Northern line links south of Kennington there is a minor beneficial effect due to the reduction in passenger flows and crowding levels
- on northbound Northern line links north of Kennington (both branches) there is a minor adverse effect due to the increase in passenger flows but a small impact on crowding levels
- on northbound Victoria line links there is a minor beneficial effect due to the reduction in passengers flows and crowding levels
- on southbound Northern line links there is a minor beneficial effect due to the utilisation of the available capacity meaning the Underground network is being used more efficiently.

4.8 In the case of identified minor adverse effects, no mitigation is required as the additional demand generated by the NLE and the wider VNEB OA can be accommodated on the network without causing a significant increase in crowding levels.

#### Stations

4.9 The forecast effects on LUL stations in the 2031 AM peak are reported in the *ESA, Chapter 6A*.

#### National Rail Effects

4.10 The forecast effects on National Rail in the 2031 AM peak are reported in the *ESA, Chapter 6A*.

#### Bus Effects

4.11 The forecast effects on the bus network in the 2031 AM peak are reported in the *ESA, Chapter 6A*.

#### Highway Effects

4.12 The forecast effects on the highway network in the 2031 AM peak are reported in the *ESA, Chapter 6A*.



**5 Operational Impacts – 2031 PM Peak**

5.1 This section considers the effects of the NLE during the PM peak in 2031, against the forecast situation *without* the NLE in place. The effects in the 2031 PM peak are assessed against Table 6-2 in the ES.

**London Underground Effects**

**Northern line passenger flows**

5.2 Table 5.1 presents the forecast number of passengers using the NLE in 2031 between Battersea, Nine Elms and Kennington stations in the PM peak.

**Table 5.1 Forecast patronage on the NLE, 2031**

From	To	PM peak period (16:00–19:00)
<b>Northbound</b>		
Battersea	Nine Elms	4,800
Nine Elms	Kennington	7,300
<b>Southbound</b>		
Kennington	Nine Elms	6,500
Nine Elms	Battersea	3,500

Source: TfL Regional Railplan model

5.3 These flows are well within the capacity provided by the NLE and it is able to easily accommodate the forecast demand.

5.4 Table 5.2 shows the forecast changes in flows on the Charing Cross branch of the Northern line north of Kennington in the PM peak as a result of the NLE. This is the section of the network that is forecast to experience the greatest change in passenger flows as a consequence of the NLE.

**Table 5.2 Forecast Change in Patronage – Northern Line Charing Cross Branch, North of Kennington Station, PM Peak Period (16:00–19:00), 2031**

From	To	Flows – 3 hour PM peak, (16:00-19:00)			
		Without NLE	With NLE	Absolute Change	Per cent Change
<b>Northbound</b>					
Kennington	Waterloo	7,000	11,800	4,800	+69%
Waterloo	Embankment	16,100	19,400	3,300	+20%
Embankment	Charing Cross	22,400	24,800	2,400	+11%
Charing Cross	Leicester Square	23,600	25,600	2,000	+8%
Leicester Square	Tottenham Court Road	27,400	28,800	1,400	+5%
Tottenham Court Road	Goodge Street	32,900	33,700	800	+2%
Goodge Street	Warren Street	32,800	33,400	600	+2%
Warren Street	Euston	33,500	34,000	500	+1%
Euston	Mornington Crescent	29,400	29,700	300	+1%
Mornington Crescent	Camden Town	28,400	28,600	200	+1%
<b>Southbound</b>					
Camden Town	Mornington Crescent	20,300	20,600	300	+1%
Mornington Crescent	Euston	22,000	22,300	300	+1%
Euston	Warren Street	23,600	24,000	400	+2%
Warren Street	Goodge Street	25,100	25,600	500	+2%
Goodge Street	Tottenham Road	33,800	34,700	900	+3%
Tottenham Road	Leicester Square	35,000	36,500	1,500	+4%
Leicester Square	Charing Cross	32,900	34,800	1,900	+6%
Charing Cross	Embankment	27,500	29,500	2,000	+7%
Embankment	Waterloo	27,000	30,000	3,000	+11%
Waterloo	Kennington	10,400	14,700	4,300	+41%

Source: TfL Regional Railplan model

5.5 As seen in Table 5.2 on the Charing Cross branch of the Northern line, southbound trains experience large flows of passengers. Between Embankment and Waterloo, 3,000 additional passengers are expected to use the Northern line. While this increase is large, the flow with the NLE is well within the capacity of the line as set out by the crowding analysis shown in Table 5.6.

5.6 The biggest change in flow on the Charing Cross branch of the Northern line is 4,800 passengers northbound between Kennington and Waterloo. While this increase is large, it is in the contraflow direction and indicates a greater use of currently underused capacity allowing the line to operate more efficiently.

5.7 A similarly large increase is forecast in the southbound direction between Waterloo and Kennington. While this increase is large, the flow with the NLE is well within the capacity of the line as set out in by the crowding analysis shown in Table 5.6.

5.8 On the Bank branch, the changes brought about by the NLE are noticeably smaller than on the Charing Cross branch. Table 5.3 shows the forecast changes in flows on the Bank branch north of Kennington in the PM peak.

**Table 5.3 Forecast change in patronage –Northern line bank branch, north of Kennington station, PM peak period (16:00 – 19:00), 2031**

From	To	Flows – 3 hour PM peak, (16:00-19:00)			
		Without NLE	With NLE	Absolute Change	Per cent Change
<b>Northbound</b>					
Kennington	Elephant & Castle	17,300	18,100	800	+5%
Elephant & Castle	Borough	19,300	20,000	700	+4%
Borough	London Bridge	22,900	23,600	700	+3%
London Bridge	Bank	33,700	33,900	200	+1%
Bank	Moorgate	41,600	41,800	200	0%
Moorgate	Old Street	38,000	38,200	200	+1%
Old Street	Angel	40,600	40,700	100	0%
Angel	King's Cross	41,700	41,700	0	0%
King's Cross	Euston	33,600	33,800	200	+1%
Euston	Camden Town	34,900	35,000	100	0%
<b>Southbound</b>					
Camden Town	Euston	22,800	22,700	-100	0%
Euston	King's Cross	23,400	23,400	0	0%
King's Cross	Angel	24,100	24,000	-100	0%
Angel	Old Street	31,900	31,900	0	0%
Old Street	Moorgate	35,900	36,000	100	0%
Moorgate	Bank	37,500	37,600	100	0%
Bank	London Bridge	41,700	42,100	400	+1%
London Bridge	Borough	28,800	29,300	500	+2%
Borough	Elephant & Castle	28,200	28,700	500	+2%
Elephant & Castle	Kennington	24,900	25,400	500	+2%

Source: TfL Regional Railplan model

5.9 As shown in Table 5.3, the largest change in flows on the Bank branch is in the counter-peak direction with an additional 800 passengers between Kennington and Elephant and Castle. The southbound, peak flow direction, experiences only a 2% increase in passengers over the 3 hour PM peak.

5.10 Table 5.4 shows the modelled change in flows on the Northern line south of Kennington in the PM Peak.

**Table 5.4 Forecast change in patronage – northern line, south of Kennington station, PM peak period (16:00 – 19:00), 2031**

From	To	Flows – 3 hour PM peak, (16:00-19:00)			
		Without NLE	With NLE	Absolute Change	Per cent Change
<b>Northbound</b>					
Clapham Common	Clapham North	17,600	17,400	-200	-1%
Clapham North	Stockwell	18,900	18,600	-300	-2%
Stockwell (Northern)	Oval	18,400	17,800	-600	-3%
Oval	Kennington	20,500	19,800	-700	-3%
<b>Southbound</b>					
Kennington	Oval	31,000	30,100	-900	-3%
Oval	Stockwell	28,900	28,200	-700	-2%
Stockwell (Northern)	Clapham North	38,500	38,300	-200	-1%
Clapham North	Clapham Common	35,400	35,400	0	0%

Source: TfL Regional Railplan model

5.11 Although the changes are small, Table 5.4 shows that all of the links south of Kennington experience a reduction or no change in passenger flows as a consequence of the NLE. Fewer passengers using this portion of the line will help to relieve congestion on what is the busiest part of the Northern line.

**Victoria line passenger flows**

5.12 Passenger flows also decrease on the Victoria line north of Vauxhall in the PM peak as a consequence of the NLE, as shown in Table 5.5.

**Table 5.5 Forecast change in patronage – Victoria line, around Vauxhall station, PM peak period (16:00 – 19:00), 2031**

From	To	Flows – 3 hour PM peak, (16:00-19:00)			
		Without NLE	With NLE	Absolute Change	Per cent Change
<b>Northbound</b>					
Brixton	Stockwell	8,000	8,000	0	0%
Stockwell	Vauxhall	12,200	12,100	-100	-1%
Vauxhall	Pimlico	27,400	25,700	-1,700	-6%
Pimlico	Victoria	33,800	32,200	-1,600	-5%
Victoria	Green Park	52,800	51,800	-1,000	-2%
Green Park	Oxford Circus	59,300	58,500	-800	-1%
Oxford Circus	Warren Street	69,700	69,200	-500	-1%
Warren Street	Euston	71,200	70,900	-300	0%
<b>Southbound</b>					
Euston	Warren Street	38,900	38,700	-200	-1%
Warren Street	Oxford Circus	41,000	40,700	-300	-1%
Oxford Circus	Green Park	46,700	45,900	-800	-2%
Green Park	Victoria	56,900	56,200	-700	-1%
Victoria	Pimlico	36,000	35,000	-1,000	-3%
Pimlico	Vauxhall	32,900	32,000	-900	-3%
Vauxhall	Stockwell	28,800	28,800	0	0%
Stockwell	Brixton	13,700	13,800	100	+1%

Source: TfL Regional Railplan model

5.13 Similar to links south of Kennington on the Northern line, the NLE will generally reduce passenger flows on the Victoria line. There would be a marginal increase in passengers southbound between Stockwell and Brixton.

**London Underground crowding levels**

5.14 Table 5.6 to Table 5.9 denote whether any increase in crowding as a result of the NLE meets the Assessment Criteria in Table 6-2 of the ES. The assessment shows that there are no significant effects on these links in the 2031 PM peak.

**Table 5.6 Forecast Crowding Levels – Northern Line Charing Cross Branch, North of Kennington Station, PM Peak Period (16:00-19:00). Absolute Standing Pax/Sqm Ratio, 2031**

From	To	3 hour PM peak, (16:00-19:00) Standing Pax/Sqm				
		Without NLE	With NLE	Base > 3 pax/sqm	% Change	Meets Criteria
<b>Northbound</b>						
Kennington	Waterloo	-1.1	-0.3	No	+73%	No
Waterloo	Embankment	0.6	1.2	No	+100%	No
Embankment	Charing Cross	1.3	1.7	No	+31%	No
Charing Cross	Leicester Square	1.9	2.2	No	+16%	No
Leicester Square	Tottenham Court Road	2.5	2.7	No	+8%	No
Tottenham Court Road	Goodge Street	3.0	3.2	Yes	+7%	No
Goodge Street	Warren Street	3.3	3.4	Yes	+3%	No
Warren Street	Euston	3.5	3.6	Yes	+3%	No
Euston	Mornington Crescent	2.6	2.6	No	0%	No
Mornington Crescent	Camden Town	1.8	1.8	No	0%	No
<b>Southbound</b>						
Camden Town	Mornington Crescent	0.3	0.3	No	0%	No
Mornington Crescent	Euston	0.8	0.8	No	0%	No
Euston	Warren Street	1.1	1.1	No	0%	No
Warren Street	Goodge Street	1.7	1.8	No	+6%	No
Goodge Street	Tottenham Court Road	2.4	2.6	No	+8%	No
Tottenham Court Road	Leicester Square	2.5	2.7	No	+8%	No
Leicester Square	Charing Cross	2.4	2.7	No	+13%	No
Charing Cross	Embankment	1.9	2.2	No	+16%	No
Embankment	Waterloo	1.7	2.2	No	+29%	No
Waterloo	Kennington	-0.5	0.3	No	+160%	No

Source: TfL Regional Railplan model

**Table 5.7 Forecast crowding levels – northern line bank branch, north of Kennington station, PM peak period (16:00 – 19:00). absolute standing pax/sqm ratio, 2031**

From	To	3 hour PM peak, (16:00-19:00) Standing Pax/Sqm				
		Without NLE	With NLE	Base > 3 pax/sqm	% Change	Meets Criteria
<b>Northbound</b>						
Kennington	Elephant & Castle	-0.2	-0.1	No	+50%	No
Elephant & Castle	Borough	0.5	0.6	No	+20%	No
Borough	London Bridge	0.7	0.8	No	+14%	No
London Bridge	Bank	1.7	1.8	No	+6%	No
Bank	Moorgate	3.3	3.4	Yes	+3%	No
Moorgate	Old Street	2.9	2.9	No	0%	No
Old Street	Angel	3.4	3.4	Yes	0%	No
Angel	King's Cross	3.7	3.7	Yes	0%	No
King's Cross	Euston	2.4	2.4	No	0%	No
Euston	Camden Town	3.1	3.1	Yes	0%	No
<b>Southbound</b>						
Camden Town	Euston	1.0	1.0	No	0%	No
Euston	King's Cross	1.3	1.3	No	0%	No
King's Cross	Angel	1.5	1.5	No	0%	No
Angel	Old Street	1.4	1.4	No	0%	No
Old Street	Moorgate	2.6	2.6	No	0%	No
Moorgate	Bank	3.3	3.3	Yes	0%	No
Bank	London Bridge	3.9	4.0	Yes	+3%	No
London Bridge	Borough	2.5	2.6	No	+4%	No
Borough	Elephant & Castle	2.4	2.5	No	+4%	No
Elephant & Castle	Kennington	2.2	2.3	No	+5%	No

Source: TfL Regional Railplan model

**Table 5.8 Forecast crowding levels – northern line, south of Kennington station, PM peak period (16:00 – 19:00). absolute standing pax/sqm ratio, 2031**

From	To	3 hour PM peak, (16:00-19:00) Standing Pax/Sqm				
		Without NLE	With NLE	Base > 3 pax/sqm	% Change	Meets Criteria
<b>Northbound</b>						
Clapham Common	Clapham North	0.5	0.5	No	0%	No
Clapham North	Stockwell	0.7	0.6	No	-14%	No
Stockwell (Northern)	Oval	0.5	0.4	No	-20%	No
Oval	Kennington	0.2	0.1	No	-50%	No
<b>Southbound</b>						
Kennington	Oval	3.1	2.9	No	-6%	No
Oval	Stockwell	3.0	2.9	No	-3%	No
Stockwell (Northern)	Clapham North	3.7	3.7	Yes	0%	No
Clapham North	Clapham Common	3.2	3.2	Yes	0%	No

Source: TfL Regional Railplan model

**Table 5.9 Forecast crowding levels – victoria line around Vauxhall station, PM peak period (16:00 – 19:00). absolute standing pax/sqm ratio, 2031**

From	To	3 hour PM peak, (16:00-19:00) Standing Pax/Sqm				
		Without NLE	With NLE	Base > 3 pax/sqm	% Change	Meets Criteria
<b>Northbound</b>						
Brixton	Stockwell	-1.2	-1.2	No	0%	No
Stockwell	Vauxhall	-0.7	-0.7	No	0%	No
Vauxhall	Pimlico	0.3	0.2	No	-33%	No
Pimlico	Victoria	0.8	0.7	No	-13%	No
Victoria	Green Park	3.4	3.3	Yes	-3%	No
Green Park	Oxford Circus	3.9	3.8	Yes	-3%	No
Oxford Circus	Warren Street	4.7	4.7	Yes	0%	No
Warren Street	Euston	5.1	5.0	Yes	-2%	No
<b>Southbound</b>						
Euston	Warren Street	1.4	1.3	No	-7%	No
Warren Street	Oxford Circus	1.8	1.7	No	-6%	No
Oxford Circus	Green Park	3.2	3.1	Yes	-3%	No
Green Park	Victoria	4.3	4.3	Yes	0%	No
Victoria	Pimlico	1.9	1.8	No	-5%	No
Pimlico	Vauxhall	1.6	1.5	No	-6%	No
Vauxhall	Stockwell	0.9	0.9	No	0%	No
Stockwell	Brixton	-0.4	-0.3	No	+25%	No

Source: TfL Regional Railplan model



5.15 Based on the flows and crowding levels presented above, the overall effect of the NLE on London Underground is not considered significant. Taking into account both the effect of the NLE on flows and on crowding, the conclusions are that in the 2031 PM peak:

- on southbound Northern line links south of Kennington there is a minor beneficial effect due to the reduction in passenger flows and crowding levels;
- on southbound Northern line links north of Kennington (both branches) there is a minor adverse effect due to the increase in passenger flows but a small change in crowding levels;
- on southbound Victoria line links there is a minor beneficial effect due to the reduction in passengers flows and crowding levels; and
- on southbound Northern and Victoria line links there is a minor beneficial effect due to the utilisation of the available capacity meaning the Underground network is being used more efficiently.

5.16 In the case of identified minor adverse effects, mitigation is not required as the additional demand generated by the NLE and the wider VNEB OA can be accommodated on the network without causing a significant increase in crowding levels.

#### Stations

5.17 Increased patronage on the Underground as a result of the NLE will also have an effect on stations in or near the OA. With the NLE in place the greatest effect will be seen at Kennington and Vauxhall stations, which are considered individually in the following paragraphs.

#### Kennington

5.18 At Kennington station there will be a large increase in passenger throughput as a consequence of the NLE. Table 5.10 shows that this effect is predominantly due to a large increase in interchanging passengers between the two branches of the Northern line. There is only a small increase in total passengers entering or exiting the station.

**Table 5.10 Forecast passenger entries/exits and interchange at Kennington station, PM peak, 2031**

	Flows – 3 hour PM peak, (16:00-19:00)			
	Without NLE	With NLE	Absolute change	Per cent change
Entries/Exits	8,600	8,800	200	+2%
Interchange between branches	12,400	15,700	3,300	+27%
Total	21,000	24,500	3,500	+17%

Source: TfL Regional Railplan model, factored using survey data according to London Underground's combination forecasting methodology

5.19 Although the number of passengers interchanging at Kennington Station increases, the effect is considered moderate beneficial as congestion will be reduced due to the four new cross passages that will be constructed at Kennington as part of the NLE (See Appendix C10).

#### Vauxhall

5.20 The overall effect of the NLE on Vauxhall Underground station is shown in Table 5.11.

**Table 5.11 forecast passenger flows at Vauxhall station, PM peak period (16:00 – 19:00), 2031**

	Flows – 3 hour PM peak, (16:00-19:00)			
	Without NLE	With NLE	Absolute Change	Per cent Change
Entries/Exits	23,800	20,500	-3,300	-14%

Source: TfL Regional Railplan model, factored using survey data according to London Underground's combination forecasting methodology

5.21 Table 5.11 shows that the NLE will have a moderate beneficial effect on Vauxhall LU station by reducing passengers at this important interchange.

#### National Rail Effects

##### National Rail services

5.22 Overall, the NLE will reduce flows on NR services in the PM peak. Tables 5.12 to 5.14 show the forecast changes in flows on NR services that stop at stations in the OA.

**Table 5.12 Forecast change in Patronage on national rail services to/from Battersea Park Station, PM peak period (16:00 – 19:00), 2031**

From	To	Flows – 3 hour PM peak, (16:00-19:00)			
		Without NLE	With NLE	Absolute Change	Per cent Change
<b>Northbound</b>					
Clapham Junction	Battersea Park	2,300	2,400	100	+4%
Battersea Park	London Victoria	2,200	2,200	0	0%
<b>Southbound</b>					
London Victoria	Battersea Park	6,900	6,800	-100	-1%
Battersea Park	Clapham Junction	7,200	7,400	200	+3%

Source: TfL Regional Railplan model

**Table 5.13 Forecast Change in patronage on national rail services to/from Queenstown Road station, PM peak period (16:00 – 19:00), 2031**

From	To	Flows – 3 hour PM peak, (16:00-19:00)			
		Without NLE	With NLE	Absolute Change	Per cent Change
<b>Northbound</b>					
Clapham Junction	Queenstown Road	9,700	9,700	0	0%
Queenstown Road	Vauxhall	9,800	9,300	-500	-5%
<b>Southbound</b>					
Vauxhall	Queenstown Road	14,900	14,600	-300	-2%
Queenstown Road	Clapham Junction	14,800	14,900	100	+1%

Source: TfL Regional Railplan model

**Table 5.14 Forecast change in patronage on national rail services to/from Vauxhall station, PM peak period (16:00 – 19:00), 2031**

From	To	Flows – 3 hour PM peak, (16:00-19:00)			
		Without NLE	With NLE	Absolute Change	Per cent Change
<b>Northbound</b>					
Clapham Junction	Vauxhall	17,100	16,900	-200	-1%
Vauxhall	London Waterloo	8,900	8,700	-200	-2%
<b>Southbound</b>					
London Waterloo	Vauxhall	44,200	43,700	-500	-1%
Vauxhall	Clapham Junction	49,000	49,100	100	0%

Source: TfL Regional Railplan model

- 5.23 Changes in passenger flows on all links to and from the OA are small and therefore, the effect is considered negligible.
- 5.24 The NR effects are further informed by the levels of crowding, presented in Tables 5.15 and 5.16 which show that the change in crowding levels as a consequence of the NLE is negligible.

**Table 5.15 Forecast crowding levels on national rail services to/from Battersea Park station, PM peak period (16:00 – 19:00). absolute standing pax/sqm ratio, 2031**

From	To	3 hour PM peak, (16:00-19:00) Standing Pax/Sqm				
		Without NLE	With NLE	Base > 3 pax/sqm	% Change	Meets Criteria
<b>Northbound</b>						
Clapham Junction	Battersea Park	-2.2	-2.2	No	0%	No
Battersea Park	London Victoria	-2.7	-2.7	No	0%	No
<b>Southbound</b>						
London Victoria	Battersea Park	1.2	1.2	No	0%	No
Battersea Park	Clapham Junction	1.0	1.0	No	0%	No

Source: TfL Regional Railplan model

**Table 5.16 Forecast crowding levels on national rail services to/from Queenstown Road and Vauxhall nr stations, PM peak period (16:00 – 19:00). absolute standing pax/sqm ratio, 2031**

From	To	3 hour PM peak, (16:00-19:00) Standing Pax/Sqm				
		Without NLE	With NLE	Base > 3 pax/sqm	% Change	Meets Criteria
<b>Northbound</b>						
Clapham Junction	Queenstown Road	-0.4	-0.5	No	-25%	No
Queenstown Road	Vauxhall	-0.4	-0.5	No	-25%	No
Vauxhall	London Waterloo	-1.6	-1.6	No	0%	No
<b>Southbound</b>						
London Waterloo	Vauxhall	3.5	3.4	Yes	-3%	No
Vauxhall	Queenstown Road	4.0	4.0	Yes	0%	No
Queenstown Road	Clapham Junction	4.0	4.0	Yes	0%	No

Source: TfL Regional Railplan model

**National Rail Stations**

- 5.25 In addition to NR flows, the NLE will also have an effect upon the three NR stations located in the OA. Table 5.17 presents the change in flow at each of the stations as a result of the NLE.

**Table 5.17 Trip generation at National Rail Stations, 3-Hour PM peak period, 2031**

Station	Flows – 3 hour PM peak, (16:00-19:00)			
	Without NLE	With NLE	Absolute Change	Per cent Change
Battersea Park	1,100	1,400	300	+27%
Queenstown Road	2,100	1,800	-300	-14%
Vauxhall	17,500	17,300	-200	-1%

Source: TfL Regional Railplan model, factored using survey data according to London Underground's combination forecasting methodology

5.26 Table 5.17 shows a minor beneficial effect at Queenstown Road NR station and a negligible effect at Vauxhall NR station as a result of the NLE as some passenger demand is transferred to the new London Underground stations at Battersea and Nine Elms.

5.27 Battersea Park experiences a large percentage increase in passenger flows as a result of the NLE. The effect on Battersea Park station is considered to be minor adverse due to the low number of passenger movements at this station (See appendix C10).

#### Bus Effects

5.28 The NLE will also have an effect on bus services in the OA. Table 5.18 indicates that the combination of the NLE and the additional development enabled by the NLE is expected to reduce bus demand by around 10% on services in the area, with reductions to inbound and outbound trips.

**Table 5.18 Forecast bus passenger flows on total OA bus services, 2031**

Direction of flow	Flows – 3 hour PM peak, (16:00-19:00)			
	Without NLE	With NLE	Absolute Change	Per cent Change
Inbound	13,600	12,300	-1,300	-10%
Outbound	11,800	10,500	-1,300	-11%
Total	25,400	22,800	-2,600	-10%

Source: TfL Regional Railplan model

5.29 The largest difference in bus flows, as a result of the NLE, are forecast to be along the routes closest to the proposed stations at Battersea, along Battersea Park Road / Nine Elms Lane and at Nine Elms along Wandsworth Road.

**Table 5.19 Forecast bus passenger flows on Nine Elms Lane/Battersea Park Road bus services near Battersea station, PM peak period (16:00 – 19:00), 2031**

Direction of flow	Flows – 3 hour PM peak, (16:00-19:00)			
	Without NLE	With NLE	Absolute Change	Per cent change
<b>Nine Elms Lane east of Battersea station</b>				
Eastbound	2,700	2,500	-200	-7%
Westbound	2,200	2,100	-100	-5%
<b>Battersea Park Road west of Battersea station</b>				
Eastbound	2,300	2,900	600	+26%
Westbound	2,000	2,800	800	+40%

Source: TfL Regional Railplan model

**Table 5.20 Forecast bus passenger flows on Wandsworth Road bus services near Nine Elms station, PM peak period (16:00 – 19:00), 2031**

Direction of flow	Flows – 3 hour PM peak, (16:00-19:00)			
	Without NLE	With NLE	Absolute Change	Per cent change
<b>Wandsworth Road east of Nine Elms station</b>				
Eastbound	2,800	1,600	-1,200	-43%
Westbound	2,400	2,100	-300	-13%
<b>Wandsworth Road west of Nine Elms station</b>				
Eastbound	2,500	2,300	-200	-8%
Westbound	3,100	3,100	0	0%

Source: TfL Regional Railplan model

5.30 Overall the effect on individual bus services and corridors is varied with a mixture of increases and decreases as shown in Tables 5.19 and 5.20. There is a pattern of passengers interchanging to and from bus services to use the NLE leading to large changes as the bus reaches and departs the stations. Such varied flows will be accounted for by TfL when it plans the future bus network.

5.31 As overall bus patronage decreases in the OA, the effect on the bus network is considered to be minor beneficial.

#### Highway Effects

5.32 The forecast effects on the highway network with the NLE include the committed changes to the network associated with the future baseline as well as changes that will be implemented as a consequence of the additional development that will be enabled by the NLE.

**Changes in Traffic Levels**

5.33 Table 5.21 shows the change in two-way flows on each of these eleven key highway links, in the PM peak hour. These represent percentage changes between the future baseline and the “with NLE” scenario.

**Table 5.21 Forecast percentage change in two-way hourly traffic flow due to the NLE on key links, 2031**

Link	PM peak (17:00–18:00)
Vauxhall Bridge	0%
Albert Embankment (A3036)	+2%
Nine Elms Lane (A3205)	0%
Battersea Park Road (A3205)	+17%
Kennington Park Road (A3)	+1%
Harleyford Road (A202)	+1%
Kennington Lane (A3204)	-2%
Kennington Road (A23)	+1%
S Lambeth Road (A203)	-1%
Queenstown Road (A3216)	+3%
Wandsworth Road (Principal route)	+10%

Source: TfL Central London Highway Assignment Model (CLOHAM)

5.34 Traffic on Battersea Park Road and Wandsworth Road has the largest percentage increase in traffic volume at 17% and 10%, respectively. The increases during the PM peak at Battersea Park Road and Wandsworth Road are considered to represent a moderate adverse effect as the increase in flow on these links of the highway network exceed 10%. However, the increases in traffic flow need to be considered in relation to the capacity of the road.

**Impact on Capacity and Congestion**

5.35 The effect of additional traffic volumes on the network will depend on how close to capacity the network is operating – the closer to theoretical capacity, the greater impact that additional traffic will have in terms of congestion. Congested links have been defined as links where the volume to capacity ratio is greater than 85%.

5.36 The volume to capacity ratios for each of the key links is presented (as a percentage of the maximum theoretical capacity) in Table 5.22 for the PM peak hour.

**Table 5.22 Forecast volume to capacity on key links, with and without NLE (two-way) average, PM peak hour (17:00 – 18:00), 2031**

Link	Current Baseline	Without NLE	With NLE
Vauxhall Bridge	54%	61%	61%
Albert Embankment (A3036)	9%	9%	9%
Nine Elms Lane (A3205)	44%	47%	47%
Battersea Park Road (A3205)	41%	45%	51%
Kennington Park Road (A3)	33%	43%	44%
Harleyford Road (A202)	46%	48%	48%
Kennington Lane (A3204)	68%	65%	63%
Kennington Road (A23)	21%	32%	32%
S Lambeth Road (A203)	17%	16%	16%
Queenstown Road (A3216)	75%	83%	89%
Wandsworth Road (Principal route)	23%	28%	31%

Source: TfL Central London Highway Assignment Model (CLOHAM)

5.37 The V/C ratio for Queenstown Road indicates that there this link is close to becoming congested (above 85%) without the NLE. With the NLE, the V/C ratio increases by 6% to 89% thereby becoming congested. As PM peak traffic flows are expected to rise by only 6%, compared to the threshold criterion of 30%, the effect on this link is therefore considered to have a moderate adverse effect.

5.38 The NLE has a small effect on the V/C ratio on other key links in and around the OA and thus the effect on these links effect is considered negligible.

**Change in Traffic Speeds**

5.39 The effect of the proposed NLE on traffic speeds on the key links is presented in Table 1.26.

**Table 5.23 Forecast percentage change in traffic speeds on key links due to the NLE, 2031**

Link	PM peak (17:00–18:00)
Vauxhall Bridge	0%
Albert Embankment (A3036)	0%
Nine Elms Lane (A3205)	0%
Battersea Park Road (A3205)	-36%
Kennington Park Road (A3)	0%
Harleyford Road (A202)	0%
Kennington Lane (A3204)	+1%
Kennington Road (A23)	0%
S Lambeth Road (A203)	0%
Queenstown Road (A3216)	-32%
Wandsworth Road (Principal route)	0%

Source: TfL Central London Highway Assignment Model (CLOHAM)



- 5.40 The table shows that the effect on traffic speeds is greatest along Battersea Park Road and Queenstown Road, which are both the closest to the BPS development. During the PM peak traffic speeds decrease in excess of 10% on Battersea Park Road (a non-congested link) and in excess of 5% on Queenstown Road (a congested link). The effect on traffic speed on Battersea Park Road and Queenstown Road is therefore considered to be moderate adverse. The greater than 30% decrease in speeds is due to the already low speeds on these roads.
- 5.41 This effect is caused by changes to the highway network as a result of the development enabled by the NLE. The BPS development will require a new access on Battersea Park Road and adjustments to the junction at Kirtling Street and both of these changes will reduce speeds on the Battersea Park Road corridor. This effect has been assessed and mitigation measures have been proposed as part of the BPS Transport Assessment (Ref. 2).
- 5.42 There are no other links that experience a decrease in speeds of over 5%, and therefore the effect on speeds on other sections of the network is negligible.

## 6 Conclusion

- 6.1 This Appendix has provided detailed traffic and transport output tables for the 2020 AM and PM peak periods and the 2031 AM and PM peak periods.
- 6.2 Analysis of the information provided in these tables confirms that this analysis supports the conclusions presented in the ES and ESA.

## 7 References

- Ref. 1 Transport for London (2012): Business Plan  
[http://www.tfl.gov.uk/assets/downloads/corporate/tfl-business\\_plan-2012.pdf](http://www.tfl.gov.uk/assets/downloads/corporate/tfl-business_plan-2012.pdf)
- Ref. 2 Steer Davies Gleave (2010); Battersea Power Station Transport Assessment (London Borough of Wandsworth Planning Application ref 2009/3575)

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