



WEST ANGLIA ROUTES GROUP (WARG) – STATION SURVEYS 2012

LUL station multiplier rates and use on West Anglia lines JRC 526U, 15 August 2013
(Updated from original JRC 526, 20 November 2012)

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Background

West Anglia Routes Group (WARG) appointed Jonathan Roberts Consulting and Railway Management Services (JRC/RMS) to undertake annual station usage counts during Autumn 2012. JRC is responsible for analysis of the counts data.

WARG had asked for proposals to include how to gross-up data from part-daily to yearly volumes. Bidders were invited to comment on methods, and suggest any alternatives and / or modifications which would ensure that the estimates are realistic and robust, and comparable with previous counts and other sources of station usage information.

JRC proposed in its tender (JRC 519) to undertake a more precise assessment of grossing up, by reviewing trends in demand changes at nearby and equivalent Underground stations including across the north-eastern suburbs. This report undertakes that work.

Part-daily to weekday volumes

JRC uses two methods to extrapolate from part-daily to daily (generally to weekday): (1) by reversing flows on a detailed period-by-period basis, with the original survey also including sufficient peak shoulder and offpeak travel data and noting schoolchildren and student travel, to allow judgments about other non-peak travel, and (2) a simpler grossing-up based on doubling observed flows and taking a cautious view about other travel during the rest of the day. A central daily estimate is derived from these methods.

TfL London Rail in its moderation of the 2011 WARG surveys had expressed the hope that it would be possible to undertake several full day surveys in 2012, to give a clearer basis for grossing up to daily volumes elsewhere. However the available budget and survey specification defined by WARG did not allow for a full day survey, so the same methodology is maintained for almost all stations for 2012.

Two consecutive 6-hour weekday surveys were undertaken at Edmonton Green, from 05:30 to 11:30 and 14:30 to 20:30 which provided extensive coverage for 2/3 of the day and covered sufficient offpeak and peak shoulder periods to provide a strong basis for extrapolation of demand to a full weekday. Edmonton Green was also surveyed on Saturday morning for a complete half-day, from 05:30 to 13:00, so that a full Saturday could also be estimated. This could be contrasted with previous years' surveys which included long weekday surveys and a full Saturday shopping period. This confirmed the viability of JRC's two methods of extrapolation from part-daily to daily.

JRC also extended its planned 2 x 6-hour surveys at Stratford at no cost to WARG, to cover from first train 06:03 to 21:40. This embraced the full peak and peak shoulder periods, and the full Westfield shopping day on a Thursday (09:00 to 21:00). The West Anglia departure at 21:30 was also covered, to include Westfield staff returning home. This gave virtually a full day's survey, and the rest of the day was extrapolated from previous year's surveys.

This extended survey was important, to be clear about the changes in demand at Stratford arising post-Olympics, Westfield and with other Stratford City and interchange trends. It would be unwise to extrapolate from Stratford to most of the West Anglia network, as it is an exceptional station and catchment. However the data (with an overall 37% *net* growth in demand compared to 2011) provides encouraging pointers to the potential for a better local service on the Lea Valley line, and for reopening Lea Bridge station.

Weekday to yearly volumes – previous method

In previous years, JRC used a standardised grossing factor of 300 to take weekday data to yearly. This had been derived in 2010 from London Underground station usage data for 2002-2009, for stations in the West Anglia catchment.

In summary, LUL adopts a standardised multiplier for grossing from daily to yearly: x253 for weekdays, x52 for Saturdays and x59 for Sundays and bank holidays (a 364 day year). For year-to-year consistency in comparisons, LUL applies these multipliers regardless of when bank holidays arise and whether stations were actually open on 26th December.

When divided by the weekday volume, the yearly estimates can in turn be used to define a weekday to yearly multiplier which is geared to the local proportion of weekday vs weekend travel. This varies extensively across London. JRC had previously taken note of Liverpool Street and Tottenham Hale interchanges. There the annual grossing factor had previously been 300 or under, and there were few possible sources of large scale weekend travel other than National Rail. Liverpool Street provided recent multipliers fluctuating between 300 and 310, so 300 was a cautious baseline.

Table 1: Some LUL weekday to yearly multipliers

Weekday to yearly multipliers											
Year	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002	
Liverpool Street	300.8	302.4	305.8	309.9	302.8	301.9	298.5	298.7	295.3	301.2	
Seven Sisters	320.5	320.7	320.9	320.6	323.7	327.9	324.2	323.4	326.1	341.9	
Tottenham Hale	313.0	317.5	312.4	313.1	310.3	311.6	314.4	298.8	298.1	293.4	
Walthamstow Central	319.4	320.1	317.2	318.4	318.9	319.9	320.2	314.0	316.6	313.2	
Canary Wharf	286.3	281.7	277.3	283.2	286.2	285.6	287.4	289.8	290.3	290.6	

The evidence of Canary Wharf, with recent weekday to yearly multipliers in the 280-290 range and a workforce of over 100,000, also suggests that changes in Monday-Friday volume can mask underlying changes in weekend travel. The table below shows LUL's estimate of combined Saturday and Sunday travel at the five stations listed above.

Table 2: Some LUL estimated weekend travel on yearly basis (counting Saturday, Sunday and bank holidays)

Weekend and bank holiday travel, 000 journeys										
Year	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002
Liverpool Street	10,111	10,240	10,518	11,777	10,086	9,385	7,721	7,777	6,871	8,659
Seven Sisters	2,639	2,625	2,620	2,813	2,954	2,998	2,300	2,184	2,096	2,543
Tottenham Hale	1,699	1,688	1,473	1,603	1,421	1,335	1,295	893	778	709
Walthamstow Central	2,975	2,883	2,719	2,908	2,840	2,716	2,529	2,125	2,101	1,642
Canary Wharf	5,416	4,224	3,470	4,636	4,833	4,393	4,098	3,795	3,112	2,806

The table shows considerable underlying growth in weekend and bank holiday travel (except at Seven Sisters), which is camouflaged in the multipliers above because of masking by other trends. A better estimate of weekday to yearly multipliers by catchment is needed for West Anglia, not just a sample from a few stations.

Daily to yearly volumes – new analysis

So it is necessary to undertake a larger scale analysis of general multiplier rates across LUL stations, and particularly in the East<->North quadrant of London. This is now undertaken with reference to how those might be applied to West Anglia lines.

At a few specific stations with partly industrial catchments, such as between Tottenham Hale and Enfield Lock, JRC had previously adopted a lower grossing factor which was proportional to the scale of originating travel from the local residential catchment. **This basic process is maintained in 2012.**

The multiplier is changed from JRC's x230 which had an in-built holiday allowance, to LUL's nominal x253 rate for Monday-Friday weekday to yearly (**adjusted to x252 for West Anglia, as most of National Rail doesn't run on 2 days of the year**). LUL allows for holidays by adjusting the surveys' observed volumes for seasonality.

LUL general demand 1999-2011

JRC is grateful to Transport for London for making available detailed LUL station data by time of day and period of week for all its stations. The information for 1999-2011 was selected for assessment. Detailed worksheets are attached with this report which contain the full data and subsequent analysis on a weekday/Saturday/Sunday (or bank holiday) and yearly basis.

Influence of changes in demand overall

During 1999-2011, there were radical changes in marketing and ticketing, as Oyster and then Pay-as-you-go were put into operation from 2003 to 2006. London also saw greater population in its suburbs, particularly the inner areas, and this growth continues. Such changes could have a major influence on multiplier rates, and is the first point to check.

Table 3: Overall change in demand and multipliers across LUL during 1999-2011

Year	LUL passenger volume	Multiplier	Total passenger volume			Percentage growth since 2005			Percentage growth since 1999		
	Annual weighted total entry/exit	Weekday to Yearly	Weekday	Saturday	Sunday	Weekday	Saturday	Sunday	Weekday	Saturday	Sunday
2011	2,561,397,177	316.7	8,088,197	5,624,023	3,773,460	125%	129%	134%	130%	126%	134%
2010	2,469,396,686	315.3	7,831,909	5,353,758	3,551,327	121%	123%	127%	126%	120%	127%
2009	2,425,470,978	316.7	7,658,941	5,390,214	3,516,403	118%	124%	125%	123%	121%	125%
2008	2,461,722,976	315.8	7,794,685	5,398,685	3,541,289	120%	124%	126%	125%	121%	126%
2007	2,393,454,182	314.9	7,601,582	5,207,469	3,380,772	117%	120%	120%	122%	117%	120%
2006	2,235,348,914	314.8	7,101,079	4,870,331	3,144,385	110%	112%	112%	114%	109%	112%
2005	2,029,045,261	313.5	6,472,481	4,344,208	2,806,928	100%	100%	100%	104%	97%	100%
2004	2,039,150,092	314.6	6,482,639	4,449,907	2,841,479				104%	100%	101%
2003	1,903,119,627	314.1	6,058,553	4,121,461	2,643,894				97%	92%	94%
2002	2,026,161,968	313.5	6,462,333	4,394,319	2,757,409				104%	99%	98%
2001	1,957,663,934	311.4	6,287,245	4,136,974	2,574,039				101%	93%	92%
2000	2,005,944,982	314.9	6,370,184	4,445,020	2,765,210				102%	100%	99%
1999	1,975,388,962	316.7	6,237,432	4,456,593	2,806,370				100%	100%	100%

This shows that an overall LUL system multiplier has been very consistent throughout a dynamic period of increasing passenger demand. The figures include loss of ELL services from LUL before 2008, and various station openings. It is also clear that while system usage fluctuated in the period from 1999 to 2005, underlying demand has grown mainly since 2005 as Oyster and PAYG have taken effect.

Overall growth in demand at weekends has been comparable to weekdays, and slightly faster than weekdays since 2005. However, as shown above, this masks some large variations in station-by-station or area-by-area demand.

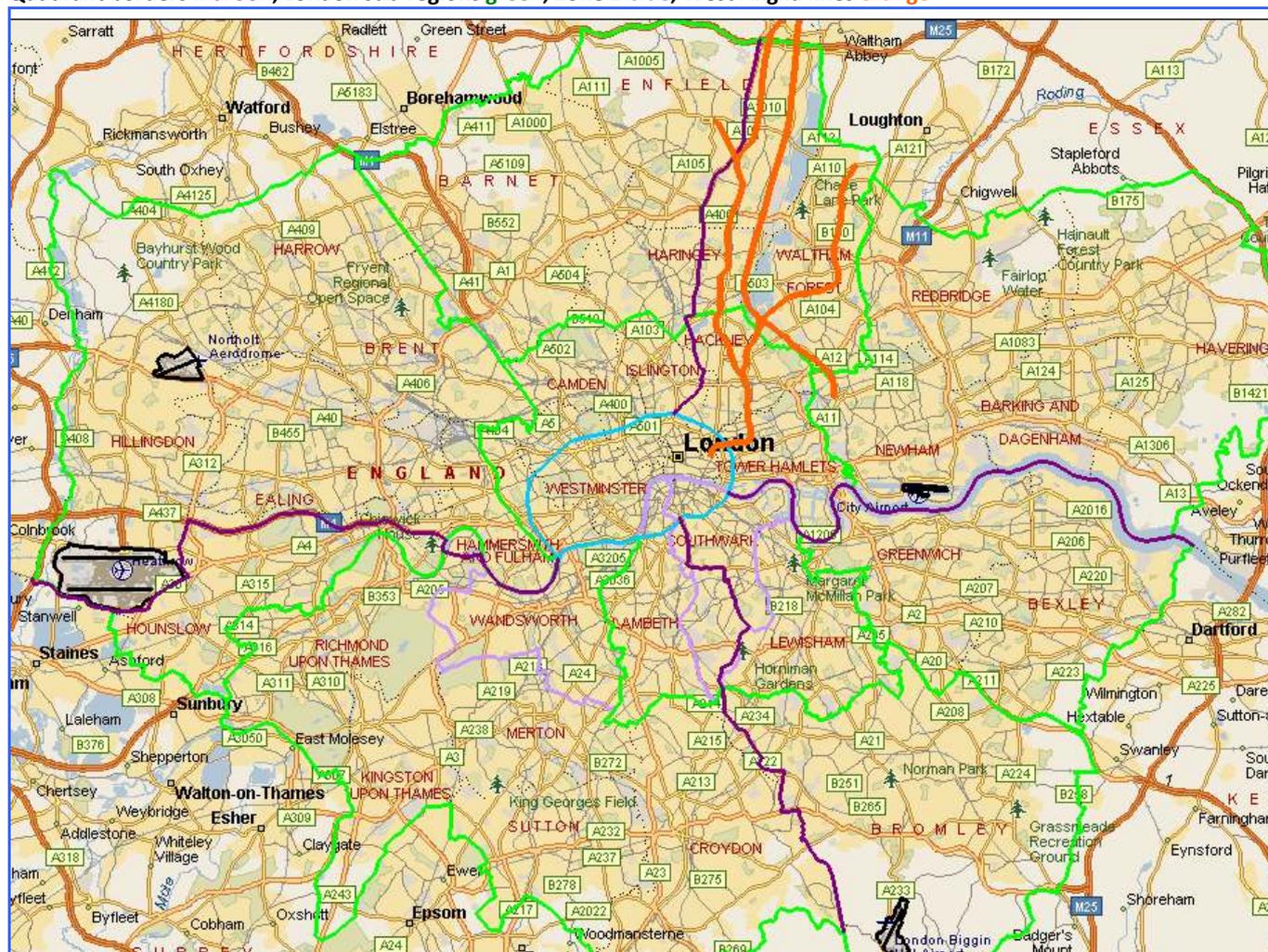
The growth in demand provides clear evidence that there may be a business case for improved Saturday and Sunday services across London, as well as weekdays. JRC notes that in 2012 London Overground has improved weekday late evening services in response to increased demand.

Influence of changes in demand by zone and quadrant

JRC has divided the London area into quadrants, outside the Zone 1 Central area. Broadly these are NE, NW, SE and SW, but to reinforce that these are complete quadrants not just a 45° angle, they are styled East<>North, West<>North etc. The quadrant boundaries are shown on the attached **Map 4**.

Map 4: JRC definition of London quadrants

Quadrant borders maroon, London sub-regions green, Zone 1 blue, West Anglia lines orange



The boundaries are an amalgam of conventional borders such as the River Thames and London boroughs, and socio-economic borders such as the Great Cambridge Road and the Great West Road. Heathrow is included in West<>North London, because of its inclusion in LB Hillingdon and its tube and rail links which focus on this quadrant.

Table 5 shows the LUL weekday to yearly multipliers disaggregated by zone and by quadrant, for the three most recent years, 2009 to 2011. Multiplier rates are broadly stable within each combination of zone and quadrant in the East<>North and West<>North quadrants, with a maximum spread of about 6 points between 2009 and 2011 and an average spread of 3.85 points. However there are clear differences in demand by zonal distance from Central London and by London quadrant.

Table 5: LUL weekday to yearly multipliers disaggregated by zone and quadrant

Quadrant assessment													
Weekday to yearly multipliers, 2009-2011													
LUL stations by quadrant and zone													
Beyond Zone 6	Zone 6 / 67	Zone 5 / 56	Zone 4 / 45	Zone 3 / 34	Zone 2 / 23		Zone 2 / 23	Zone 3 / 34	Zone 4 / 45	Zone 5 / 56	Zone 6 / 67	Beyond Zone 6	
West <-> North						East <-> North							
						Average for LUL stations		Incl	Excl				
289.0	317.6	310.7	312.3	314.5	321.7	2011	303.8	333.5	325.7	313.0	305.3	299.8	
290.2	326.8	310.2	312.2	314.2	321.6	2010	301.1	321.3	320.9	309.0	301.5	295.8	
287.5	324.8	311.5	317.4	316.3	324.5	2009	300.2	322.1	318.2	309.0	300.3	293.8	
inc Stratford exc													
at Stations NOT on West End tubes													
289.0	300.1	302.7	296.0	292.0	313.6	2011	304.8	322.3	322.3	312.0	306.2	299.8	
290.2	297.2	300.4	295.6	290.9	315.1	2010	304.2	320.4	320.4	307.7	302.2	295.8	
287.5	298.3	301.0	293.5	291.5	319.9	2009	303.7	316.5	316.5	307.2	300.9	293.8	
at Stations ON West End tubes													
	364.3	314.5	313.9	315.9	324.0	2011	303.5	336.7	324.3	313.4	300.5	305.8	
	365.9	315.0	314.1	315.6	323.5	2010	300.2	321.5	321.1	309.5	298.5	300.2	
	360.7	317.3	320.0	317.8	325.9	2009	299.2	324.0	319.1	309.7	296.7	300.1	
	Incl Heathrow												
West <-> South						East <-> South							
Hours/low West only						Average for LUL stations							
	330.7	321.2	317.0	322.4	321.4	2011	327.4						
	326.6	318.4	316.6	321.8	313.9	2010	313.9						
	324.7	320.2	316.5	321.5	312.9	2009	312.9						
at Stations NOT on West End tubes													
		328.2	314.9	308.1	321.1	2011							
		325.3	315.5	317.4	321.0	2010							
		324.0	317.3	315.7	320.9	2009							
at Stations ON West End tubes													
	330.7	318.3	318.1	323.5	327.4	2011	327.4						
	326.6	315.5	317.2	322.2	313.9	2010	313.9						
	324.7	314.3	316.1	322.0	312.9	2009	312.9						

Data is shown for each combination of zone and quadrant, and further split for:

- stations on lines serving the West End (mostly the tube network)
- stations on lines NOT serving the West End (mostly the sub-surface network, but excluding stations served by tube trains).¹

This sub-division achieves a closer parallel with the West Anglia circumstances, where no WA train directly serves the West End. The relevant East<>North data is highlighted.

Influence of changes in travel demand at Stratford

The table notes the general impact of spatial changes in Stratford on travel demand in the East<>North quadrant. The Westfield shopping area opened in September 2011. Large scale construction work was also underway for the 2012 Olympics.

Taking a period from before full-scale construction work began at Stratford for the Olympics, in 2007 the LUL flows through the station were 25.6 million passengers entry/exit, with a weekday to yearly multiplier of nearly 326. In autumn 2011, there were 48.6 million LUL passengers entry/exit, with a multiplier of nearly 355. Combined average Saturday plus Sunday flows for a single weekend had risen from 104,600 to 255,000 (up 144%), compared to a weekday rise from 78,600 to 136,900 (up 74%).

¹ Rayners Lane-Uxbridge is counted as sub-surface not tube, with a roundabout West End route via Acton.

Since 2011 the Olympic Games have taken place but Stratford City developments are now having a permanent effect on travel demand, including continuing growth at Westfield. **The 10 point average difference between LUL Zone 3 / Zone 34 stations with and without Stratford is noted for subsequent use in West Anglia data.**

Specific numbers for Shepherds Bush Central Line shows a similar radical change in total volume and multiplier at that station, which serves the other Westfield in London. There has been no other major development in the Shepherds Bush area, so the Westfield effect has been very strong.

In 2007, Shepherds Bush Central Line handled 12.1 million passengers entry/exit, with a weekday to yearly multiplier of 318. In 2011 it handled 21.6 million passengers entry/exit, with a multiplier of 340. The station had increased its average weekend volume from 45,300 on a Saturday plus Sunday to 101,000 passengers (up 123%), compared with a weekday rise from 38,200 to 63,500 (up 66%).

Other stations with major multiplier impacts include the international and national interchanges at Heathrow and main line termini, and Kensington Olympia with its weekend travel predominance. Specific analysis to identify weekday to yearly multipliers for West Anglia has excluded these stations, except to identify a specific multiplier for Stansted Airport station [based on passenger volumes at Heathrow LUL stations in 2011].

Influence of distance from Central London

Railways can sometimes take a roundabout route between Central London and the suburbs, including on West Anglia. The comparison below is based on a straight line 'crow's flight' distance from a Central London boundary station to suburban stations.

Analysis is shown for the East<>North and West<>North quadrants. On the Underground these extend the furthest from Central London and have the greatest density of stations, in contrast with the East<>South and West<>South quadrants.

Charts 6 and 7 scale the 2011 station multipliers by direct distance from Central London. The starting points are mostly London main line termini and Baker Street. They include Lancaster Gate and South Kensington rather than Notting Hill Gate and Earls Court, to provide comparable distance data to Paddington. Different charts are shown for (**Chart 6**) lines serving West End and (**Chart 7**) lines NOT serving the West End, both showing the E<>N and W<>N quadrants.

Chart 6: Weekday > yearly multipliers, LUL lines serving the West End

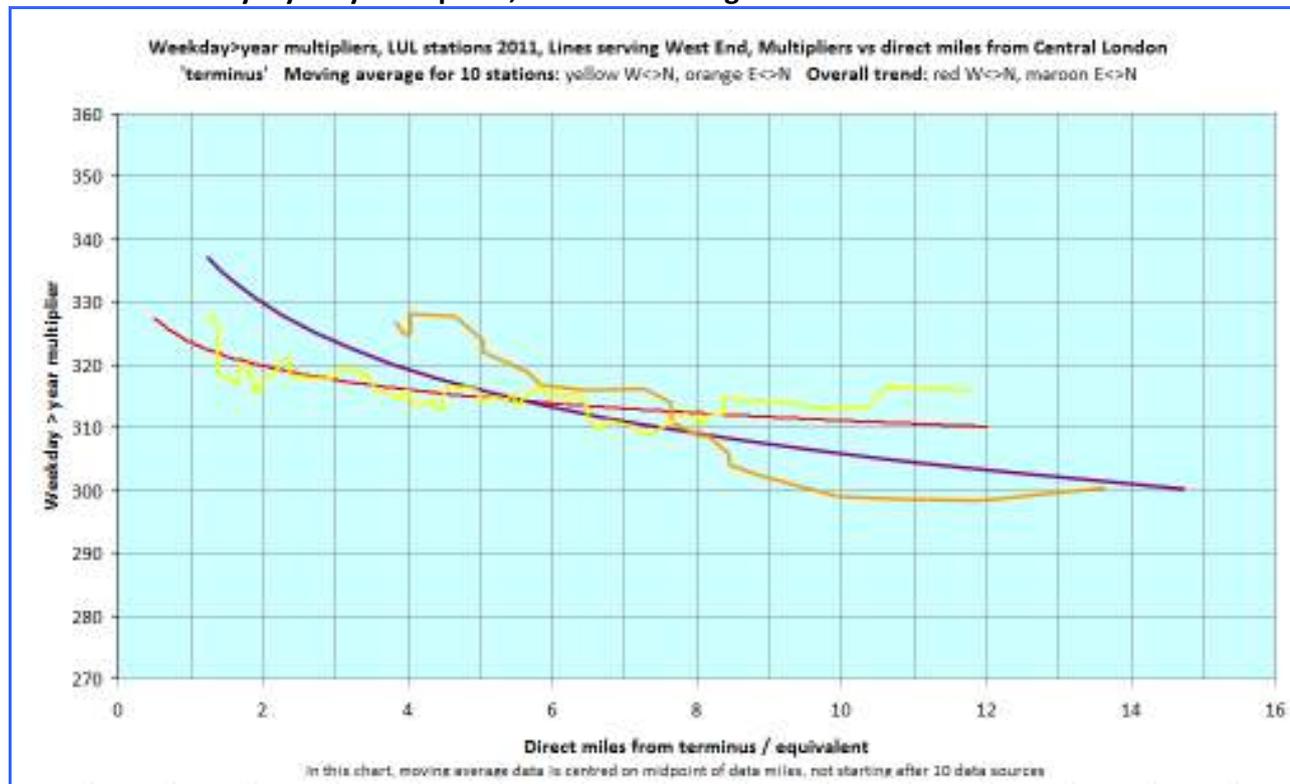
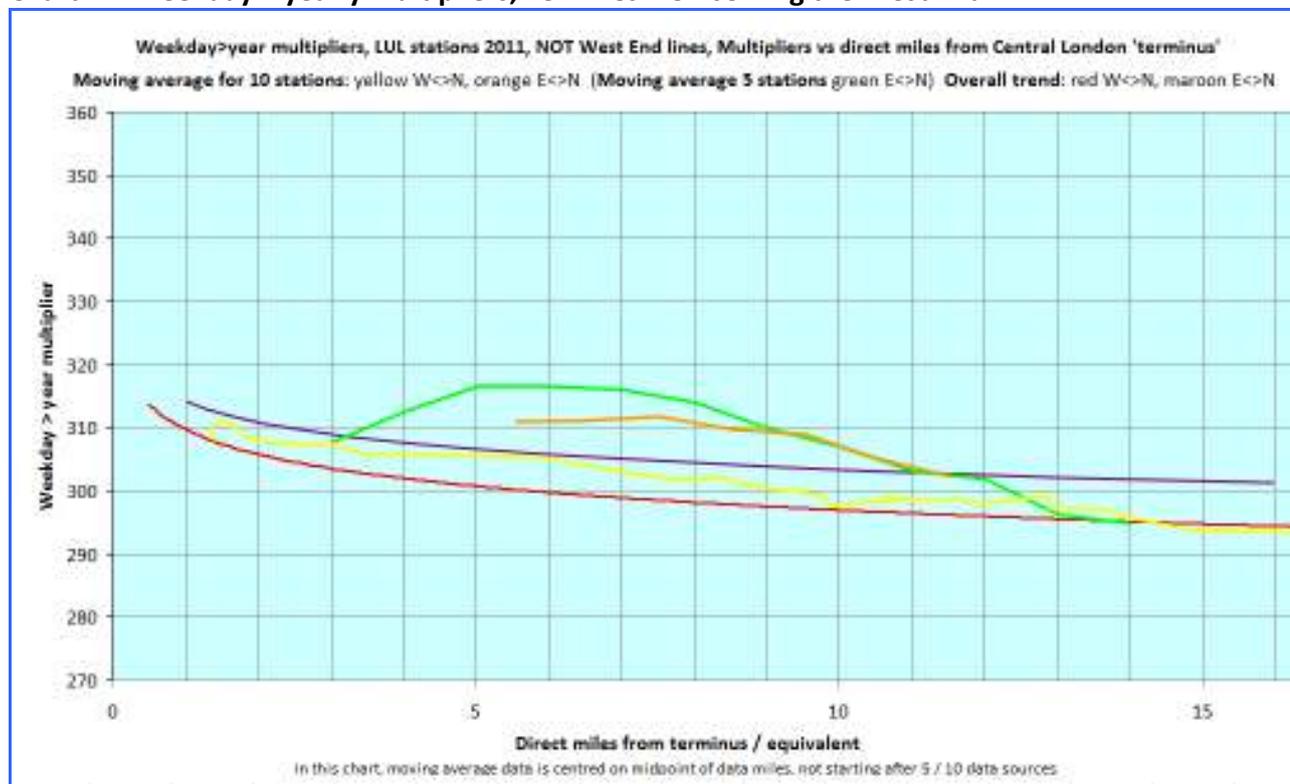


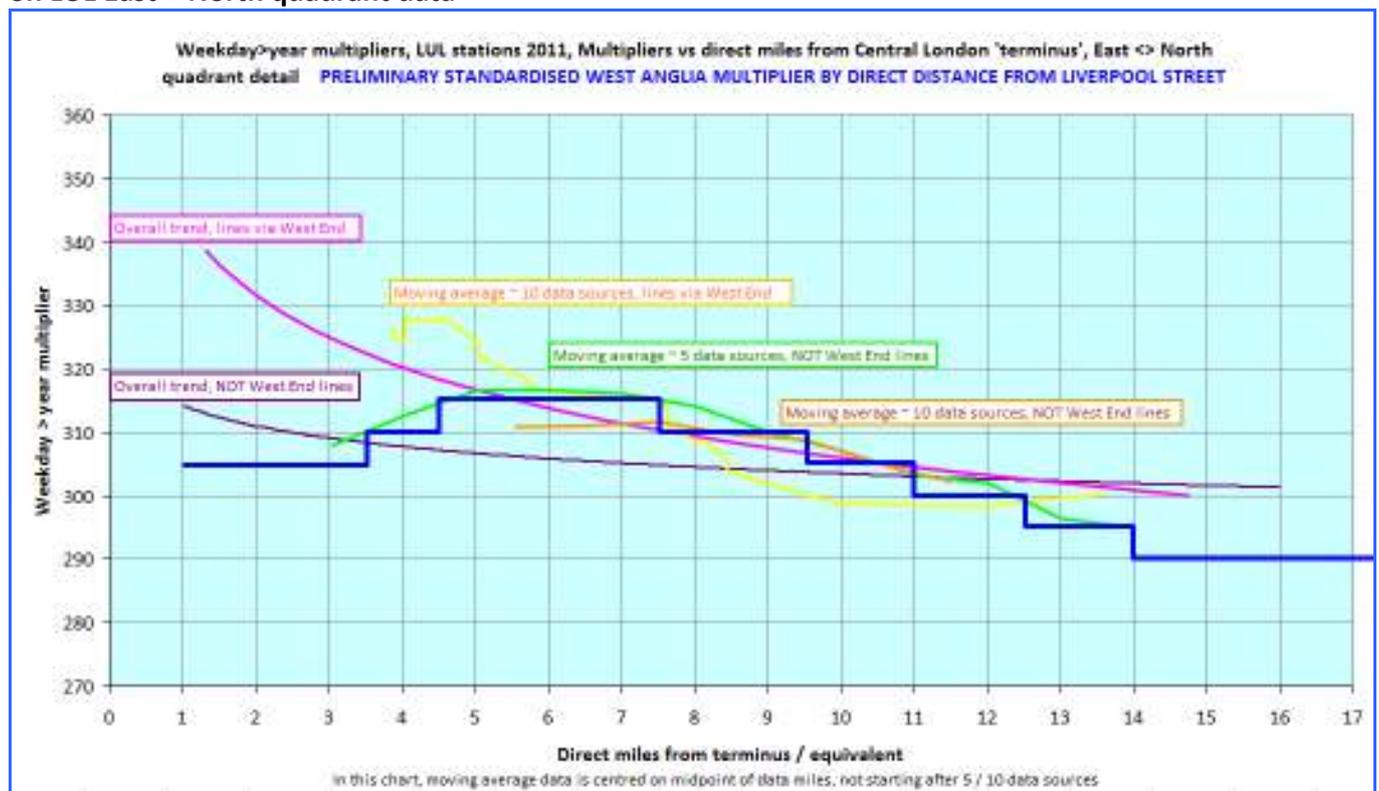
Chart 7: Weekday > yearly multipliers, LUL lines NOT serving the West End



This comparison between the East<>North and West<>North quadrants shows a higher multiplier in East<>North in the early mileages from Central London, up to 7 miles or so, whether looking at lines serving or avoiding the West End. This effect is extended in the case of lines NOT serving the West End, with an overall trend greater in E<>N by 5 points or more, than for W<>N. Local moving averages continue higher until 13 miles from Central London. It isn't clear if higher car ownership in West<>North London affects demand, nevertheless multipliers for E<>N need to reflect its stronger quadrant data.

Chart 8 then contrasts just the East<>North quadrant flows, at stations on different service categories, via West End and on NOT West End lines. Overlaid is a proposed standardised multiplier – subject to further modification discussed below – to apply from the LUL data to West Anglia stations within a 1-17 mile band. The banding is applied cautiously, by rising *after* the moving average data has increased, and dropping back once any decline in multiplier values is indicated:

Chart 8: Outline weekday to yearly multiplier for West Anglia stations in 1-17 mile band, based on LUL East<>North quadrant data



Unlike the E<>N and W<>N comparisons, there is closer symmetry between the moving averages of multipliers for the E<>N stations served on lines via the West End, and those on lines NOT via the West End. The symmetry gives a larger statistical base to rely on. There is a higher multiplier for some mileages, in favour of the NOT West End lines, which might appear counter-intuitive. It is real data, so why can this be the output?

As background information, the zonal data for lines via the West End is also displayed. A maximum 6 point variation in data for the years 2009 to 2011 was noted earlier, with an average range of 3.85 points. **A 5 point variation will be used for sensitivity tests.**

Adjusting multipliers to train service levels

Train service levels at West Anglia stations by time of day or week are not often the same as London Underground. This could affect the size of multiplier to be used, and this factor is now reviewed.

High frequency is not the issue. A ‘decent walk-on’ service is used as a yardstick by London Overground for its highly successful services which have greatly increased passenger volumes. It is a well marketed operation which has consistent services throughout the traffic week, generally 4 trains per hour or better every day (3 tph on Euston-Watford). Some outer parts of London Underground can be low frequency, again partly counterbalanced by good marketing with the Underground diagram. Line frequencies in E<>N London are summarised below:

Table 10: LUL & Overground service levels + service ratios, stations in East <> North quadrant

Trains per hour each way	MF	MF	MF	Sat	Sun	RATIO 443217	Weekday > yearly multiplier 2011					If West End tube overlaps with 'NOT West End' line, data shown with West End tube											
	withPK	contraPK	offPK				Direct miles from Central London					Stations with significant offpeak reduction orange, weekend reduction in yellow											
	Service ratio during week						1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
District Line																							
Hammersmith & City Line																							
Zone 1 to Whitechapel	24	23	18	20	20	44333	302.7																
Stepney Green to Plaistow	24	23	18	20	20	44333		301.8	313.2	304.5	316.6												
Upton Park to Barking	24	22	18	20	20	44333						323.8	313.6										
Upney to Dagenham East	16	16	12	12	6	44331							301.4	306.5	306.1								
Elm Park to Upminster	14	12	12	12	6	43332												294.1	289.4	298.4			
Central Line																							
Zone 1 to Leytonstone	30	22	24	24	21	43333		330.5	323.8	354.9	332.0	322.8											
Wanstead to Newbury Park	15	11	12	12	12	43333						320.5	312.0	317.5									
Barkingside to Hainault	15	11	9	9	9	43222								299.2	303.5								
Grange Hill to Woodford	6	3	3	3	3	42222								288.0	291.3	292.0							
Snarebrook to Woodford	15	11	12	12	9	43332						301.4	311.9										
Buckhurst Hill to Loughton	12	11	12	12	9	44443									300.3	304.5							
Debden	10	8	9	9	6	43442											287.1						
Theydon Bois to Epping	8	8	9	9	6	44443														311.5	319.9		
Victoria Line																							
Zone 1 to Seven Sisters	28	25	23	20	20	43333				320.5													
Tottenham to W'atow Chl	16	16	17	17	17	44444					316.5												
Jubilee Line																							
Zone 1 to North Greenwich	28	28	21	24	20	44333			286.3														
Canning Town to West Ham	24	24	21	20	20	44333				337.6													
Stratford	24	24	21	20	20	44333				354.9													
Acton Central	4	4	4	4	4	44444	London Overground stations, service ratios shown, no multiplier																
South Tottenham	4	4	4	4	4	44444																	
Stratford	8	8	6	6	6	44333																	
Headstone Lane	3	3	3	3	3	33333																	

Comparative service volumes are shown in ratio to the with-flow AM peak. Weekend demand (associated with weekend service levels) is a main feature influencing multiplier rates. Substantially lower offpeak LUL service volumes are also identified. Such stations have a proportionately low weekend service, so multiplier levels are also low. Overall, numbers point to a 300-310 multiplier for the 6-10 mile range from Central London at

stations with a proportionately low weekend service, and 290-300 for 11-15 miles. Debden has a partly industrial catchment, with a lower multiplier in any case (below 290, based on LUL data).

Specific weekend passenger demand is available for Cambridge Heath and London Fields stations (Saturdays and Sundays in October 2010, Zone 2, 1.5 and 1.9 miles respectively from Central London), and at Edmonton Green (May 2011 and October 2012 Saturday data, Zone 4, 7.5 miles direct from Liverpool Street). **Table 11** shows the available data.

Table 11: Available West Anglia weekend travel data, and implications for multipliers (1) Cambridge Heath 2010

Observed passenger volumes			Comments
Weekday	Sat	Sun	
Cambridge Heath, 2010			
2,325	1,183	610	Passenger numbers
2,266			MF reduced by 2½% for seasonality (MF figure is combination of May & December 2010)
	1,123	579	Sat/Sun figures reduced by 5% for seasonality (October 2010 counts only)
571,032	58,396	34,161	Apply LUL multipliers from daily to yearly (x252 not x253 MF, x52 Sat, x59 Sun & bank hols)
	663,589		Total volume during year based on LUL process
	293		Weekday to yearly multiplier, with seasonally adjusted passenger volume
86%	9%	5%	Ratio MF/Sa/Su passenger volume as % of yearly demand
805	147	59	Service volume in 2010 as % of weekly trains (2012 now 770)
	1,011		Total train service volume per week
80%	15%	6%	Ratio MF/Sa/Su train volume as % of weekly supply, note similarity to passenger demand
571,032	58,396	58,396	If Sunday services grew to basic 4 tph and similar passenger volume to Saturday...
	687,824		Total volume during year based on LUL process
	304		Weekday to yearly multiplier, with seasonally adjusted passenger volume
Broad conclusion from Cambridge Heath, to reduce standard multiplier to local service levels:			
If weak Sat+potential Sunday flow (Sat under 10% of weekday) & if services 2 tph Sundays vs other days 4 tph, multiplier range 10 points			

(2) London Fields 2010

Observed passenger volumes			Comments
Weekday	Sat	Sun	
London Fields, 2010			
2,690	2,104	900	Passenger numbers
2,622			MF reduced by 2½% for seasonality (MF figure is combination of May & December 2010)
	1,998	855	Sat/Sun figures reduced by 5% for seasonality (October 2010 counts only)
660,744	103,896	50,445	Apply LUL multipliers from daily to yearly (x252 not x253 MF, x52 Sat, x59 Sun & bank hols)
	815,085		Total volume during year based on LUL process
	311		Weekday to yearly multiplier, with seasonally adjusted passenger volume
81%	13%	6%	Ratio MF/Sa/Su passenger volume as % of yearly demand
805	147	59	Service volume in 2010 as % of weekly trains
	1,011		Total train service volume per week
80%	15%	6%	Ratio MF/Sa/Su train volume as % of weekly supply, note similarity to passenger demand
660,744	103,896	103,896	If Sunday services grew to basic 4 tph and similar passenger volume to Saturday...
	868,536		Total volume during year based on LUL process
	331		Weekday to yearly multiplier, with seasonally adjusted passenger volume
Broad conclusion from London Fields, to reduce standard multiplier to local service levels:			
If better Sat+potential Sunday flow (Sat 10-15% of weekday) & if services 2 tph Sundays vs other days 4 tph, multiplier range 20 points			

(3) Edmonton Green 2011

Observed passenger volumes			
Weekday	Sat	Sun	Comments
Edmonton Green, 2011			
11,600	6,950	3,475	Passenger numbers, Sunday volume n/a, minimum taken as 50% of Saturday
11,600			MF not reduced for seasonality as survey in May 2011
	6,950	3,475	Sat figure not reduced for seasonality as survey in May 2011
2,923,200	361,400	205,025	Apply LUL multipliers from daily to yearly (x252 not x253 MF, x52 Sat, x59 Sun & bank hols)
	3,489,625		Total volume during year based on LUL process
	301		Weekday to yearly multiplier, with seasonally adjusted passenger volume
84%	10%	6%	Ratio MF/Sa/Su passenger volume as % of yearly demand (incl. Sunday projection)
865	149	128	Service volume in 2011 as % of weekly trains
	1,142		Total train service volume per week
76%	13%	11%	Ratio MF/Sa/Su train volume as % of weekly supply, suggests Sunday pass demand higher than 6%
2,923,200	361,400	361,400	If Sunday services taken as basic 4 tph and similar passenger volume to Saturday...
	3,646,000		Total volume during year based on LUL process
	314		Weekday to yearly multiplier, with seasonally adjusted passenger volume
Broad conclusion from Edmonton Green, to reduce standard multiplier to local service levels: If better Sat+potential Sunday flow (Sat 10-15% of weekday) & if services 2 tph Sundays vs other days 4 tph, multiplier range 13 points Because Edmonton Green is 4tph also on Sundays though not to all local stations, the data suggests approx. 310 multiplier now			

(4) Edmonton Green 2012

Observed passenger volumes			
Weekday	Sat	Sun	Comments
Edmonton Green, 2012			
10,625	6,642	3,321	Passenger numbers, Sunday volume n/a, minimum taken as 50% of Saturday
10,093			MF reduced by 5% for seasonality as survey in October 2012
	6,309	3,154	Sat figure reduced by 5% for seasonality as survey in October 2012
2,543,436	328,068	186,086	Apply LUL multipliers from daily to yearly (x252 not x253 MF, x52 Sat, x59 Sun & bank hols)
	3,057,590		Total volume during year based on LUL process
	303		Weekday to yearly multiplier, with seasonally adjusted passenger volume
83%	11%	6%	Ratio MF/Sa/Su passenger volume as % of yearly demand (incl. Sunday projection)
910	149	129	Service volume in 2012 as % of weekly trains
	1,188		Total train service volume per week
77%	13%	11%	Ratio MF/Sa/Su train volume as % of weekly supply, suggests Sunday pass demand higher than 6%
2,543,436	328,068	328,068	If Sunday services taken as basic 4 tph and similar passenger volume to Saturday...
	3,199,572		Total volume during year based on LUL process
	317		Weekday to yearly multiplier, with seasonally adjusted passenger volume
Broad conclusion from Edmonton Green, to reduce standard multiplier to local service levels: If better Sat+potential Sunday flow (Sat 10-15% of weekday) & if services 2 tph Sundays vs other days 4 tph, multiplier range 14 points Because Edmonton Green is 4tph also on Sundays though not to all local stations, the data suggests approx. over 310 multiplier now			

It is encouraging to put the actual and forecast passenger multiplier estimates for these stations against the theoretical multipliers from Chart 9. The theoretical multipliers propose a full 4tph all week service at a score of 305, for Cambridge Heath and London Fields. This is very close to the equivalent Cambridge Heath level (304) before downgrading to 293 for 2010 levels. Current 2012 service levels have been reduced in the AM peak as well as Sundays, so the multiplier should rise a little. 300 is proposed.

The London Fields estimate for actual data shows a multiplier of 311 in 2010. 310 will be adopted here.

At Edmonton Green the standardised West Anglia multiplier from Chart 9 would now be 310-315, which again is very close to the actual multiplier observed from 2011 and 2012 passenger numbers. The current multiplier is taken cautiously as 310.

Overall, the comparative results from actual passenger numbers are a good match, although limited in number. They show that the proposed standardised multipliers are on the right lines, providing that allowance is made for actual service levels during the full week especially at weekends. Looking ahead, a direct Hackney Interchange linking to the Overground and Stratford should boost travel at many inner West Anglia stations.

The final schedule of West Anglia weekday to yearly multipliers at stations, by direct distance and route from Central London, is proposed below. Commentary is set out.

Table 12: Proposed weekday to yearly multipliers at West Anglia stations

Stations	Miles from Liv St in a direct line	Miles from Stratford in a direct line	MF Sat Sun service ratio	Basic WA multiplier level	Proposed variation	Comment
Sorted by Zone/miles		MF: withPk/contra/offPk/				
Zone 2			Sat/Sun			
Bethnal Green	1.0		44443	305	305	
Cambridge Heath	1.5		44332	305	300	net -5 points, low frequency Sunday service but also reduced AM peak
London Fields	1.9		44332	305	310	from 2010 actual passenger counts
Hackney Downs	2.3		43333	305	305	
Rectory Road	2.9		44331	305	295	-10 points, low frequency Sunday service
Stoke Newington	3.3		44331	305	295	-10 points, low frequency Sunday service
Clapton (Z2/3)	3.2		44444	305	305	
Zone 3						
Stamford Hill	3.9		45442	310	305	net -5 points, low frequency Sunday service but also reduced AM peak
Seven Sisters	4.4		43222	310	305	net -5 points, weakened local Sunday service
Bruce Grove	5.3	-	43331	320	310	-10 points, low frequency Sunday service
White Hart Lane	6.2	-	43331	315	305	-10 points, low frequency Sunday service
Stratford Lea Valley	-	0.0	22221	320	320	320 start with Westfield, +10 points weekend pull, but -10 low Sunday service
Lea Bridge	-	2.2				reopening planned
Tottenham Hale	5.0	4.0	00000	320	330	+10 points, with Stansted Express weekend passenger flows
Northumberland Park	6.0	4.7	2211-	320	278	part industrial, low offpeak/Sat, no Sun. trains, multiplier from 2012 data sheet
St James Street	4.8	-	44444	320	320	
Walthamstow Central	5.2	-	44444	320	320	
Zone 4						
Silver Street	6.8	-	43331	315	305	-10 points, low frequency Sunday service
Edmonton Green	7.5	-	43222	315	310	net -5 points, weakened local Sunday service
Angel Road	6.9	5.3	11---	315	252	open peak periods only, mostly industrial catchment
Picketts Lock	7.8	6.0				possible station if 3/4 track
Wood Street	6.0	-	44444	315	315	
Highams Park	7.2	-	44444	315	315	
Zone 5						
Bush Hill Park	8.6	-	44222	310	290	-20 points for low offpeak & Sunday service, urban area
Enfield Town	9.3	-	44222	310	290	-20 points for low offpeak & Sunday service, urban area
Southbury	9.2	-	22222	310	310	
Ponders End	8.9	7.0	22221	310	303	part industrial, low freq. Sun. service, multiplier from analysis in 2011 data sheet
Brimsdown	9.9	7.9	32221	310	296	part industrial, low freq. Sun. service, multiplier from analysis in 2011 data sheet
Chingford	9.0	-	44444	310	310	

Stations	Miles from Liv St in a direct line	Miles from Stratford in a direct line	MF Sat Sun service ratio	Basic WA multiplier level	Proposed variation	Comment
Zone 6						
Carterhatch	9.9	-				potential for station
Turkey Street	10.6	-	22222	305	305	
Enfield Lock	10.8	8.9	43331	305	295	-10 points, low frequency Sunday service
Inner Home Counties						
Theobalds Grove	12.1	-	22222	300	300	
Waltham Cross	11.8	9.9	42331	300	290	-10 points, low frequency Sunday service
Cheshunt	13.0	11.1	43332	300	300	
Wormley	14.6	12.8				possible station if 3/4 track
Broxbourne	16.1	14.0	43332	290	290	
Rye House	17.7	15.6	32222	290	290	
St Margarets (Herts)	19.0	16.8	32222	290	290	
Ware	20.2	18.3	32222	290	290	
Hertford East	19.3	17.8	32222	290	290	
Outer Home Counties						
Roydon	18.5		33221	290	280	-10 points, low frequency Sunday service
Harlow Town	19.7		43332	290	290	
Harlow Mill	21.0		33221	290	280	-10 points, low frequency Sunday service
Sawbridgeworth	22.8		43332	290	290	
Bishops Stortford	26.3		41332	290	290	
Stansted Mountfitchet	29.1		32222	290	290	
Stansted Airport	29.7		44444	290	370	based on average of LUL Heathrow stations in 2011
Elsenham	30.7		22111	290	280	-10 points, low frequency offpeak and Sunday service, rural area, vol. low already
Newport	34.4		22111	290	280	-10 points, low frequency offpeak and Sunday service, rural area, vol. low already
Audley End	35.9		42222	290	290	
Great Chesterford	39.2		22111	290	280	-10 points, low frequency offpeak and Sunday service, rural area, vol. low already
Whittlesford Parkway	41.9		42222	290	290	
Shelford	44.5		22111	290	280	-10 points, low frequency offpeak and Sunday service, rural area, vol. low already
Cambridge	47.7		42222	290	310	+20 points, assumed higher usage by visitors/students during weekends
Cambridge North (Chesterton)	49.7					planned new station