LEEDS SITE ALLOCATIONS PLAN SUBMISSION DRAFT DECEMBER 2016 BACKGROUND PAPER – TRANSPORT

1 Summary

- 1.1 This report summarises the forecast impacts of the proposed developments in the Site Allocations Publication Draft Plan on the transport network in Leeds.
- 1.2 The population of Leeds is forecast to increase by 14% between 2012-28 and alongside increased car ownership it is considered that this will result in an increase in traffic of between 14-24% across the District. However, at the same time the level of investment in transport infrastructure is increasing substantially. It should be noted that more recent forecasts (ONS Subnational Population Projections 2014) suggest a lower rate of growth at around 10%.
- 1.3 Schemes prioritised in the West Yorkshire Plus Transport Fund, together with existing major transport schemes such as City Connect and Kirkstall Forge station, represent an investment of £570M. On top of this, DfT have earmarked £173.5M in recognition of the need to for public transport investment in the city, First Group are to invest in a new fleet of buses, while Highways England and the rail industry are also investing in additional capacity on the strategic road and rail networks.
- 1.4 In combination these programmes are being delivered to support the economic growth of Leeds, to provide good alternatives to the private car and to reduce carbon emissions, in line with the objectives of the Local Transport Plan, the draft West Yorkshire Transport Strategy and the Leeds Core Strategy.
- 1.5 In addition, a number of further interventions have been identified to mitigate the forecast impacts of growth at key junctions across the Leeds highway network. It is expected that contributions will be obtained from developers towards the delivery of these interventions, alongside contributions towards schemes within the WYPTF.
- 1.6 It is proposed that support for public transport, walking and cycling schemes will mainly be sought through the Community Infrastructure Levy and the Leeds Public Transport Investment programme.
- 1.7 This report is an updated version of the background paper produced for the Site Allocations Plan (Publication Draft).

2 Introduction

- 2.1 This report sets out the work undertaken to understand the impacts of the proposed development sites contained within the Site Allocations Plan (Submission Draft) and Aire Valley Leeds Area Action Plan (Submission Draft) upon the transport system of Leeds. It documents the current conditions for travel, provides an overview of planned interventions and a forecast of conditions at the end of the plan period in 2028 if all development is delivered.
- 2.2 The evaluation assumes that all Identified and Allocated sites in the Plan will be built out by 2028. No sensitivity tests have been undertaken around the delivery timetable although some tests have been undertaken regarding the spatial delivery of the employment sites.
- 2.3 The sections below examine the transport changes from a high level, strategic view across the main road network in Leeds. Local issues and appropriate mitigation are assumed to be dealt with via the development control process of transport assessments.

3 Background

- 3.1 In recent years there has been a step change in devolved decision making affecting the delivery of transport investment across the Leeds City Region. The West Yorkshire Combined Authority (WYCA) was set up in 2014 to manage the £1 billion West Yorkshire Plus Transport Fund and support economic growth. In addition, as a member of RailNorth, WYCA will also be involved with the management of the Northern and TransPennine rail franchises from April 2016 onwards.
- 3.2 WYCA has published and consulted on a draft West Yorkshire Transport Strategy and an associated Bus Strategy for West Yorkshire. The new plan is a twenty year vision for developing an integrated transport network that supports the Leeds City Region Enterprise Partnership's Strategic Economic Plan for sustained and healthy economic growth - especially for jobs and housing. The Transport Strategy¹ updates the current West Yorkshire Local Transport Plan (LTP3) and sets out a step change in the quality and performance of the transport system within West Yorkshire, and our connections with the rest of the UK.
- 3.3 The Bus Strategy sets out the how local bus services should contribute to the achievement of the growth ambitions set out in the SEP. It includes required actions relating to integration (fares, ticketing, information and co-ordination), service standards, environmental standards and responsiveness to growth areas (housing and employment) identified in the SEP.
- 3.4 Transport for the North (TfN) is a new partnership involving the northern city regions, LEPs and Government. In combination with Highways England, Network Rail and HS2 Ltd, TfN is aiming to transform the Northern economy

¹ Previously known as the Single Transport Plan

and create a 'Northern Powerhouse' through a long term investment in transport networks and infrastructure.

3.5 These significant changes will enable local decision makers to have a much greater level of control over transport investment, enabling the delivery of the key pieces of infrastructure required to support the Leeds Core Strategy and accompanying Site Allocations Plan.

4 Historic Trends and Current conditions

- 4.1 The Core Strategy housing allocations represent a significant increase in population for Leeds District of around 14% between 2012 and 2028². More recent forecasts suggest a lower rate of growth of around 10%³, however, this is not reflected in this Background Paper as it is concerned purely with assessing the impacts of the Site Allocations Plan proposals for housing which are directly determined by the Core Strategy. Past trends in Leeds, however, show that despite significant increases in population, employment and car ownership, traffic growth has not been as great.
- 4.2 Figure 1 shows that over the twenty years from 1991 the population of Leeds grew by 10%, the number of employed residents by 24% and the number of cars by 44%. However, all day traffic levels over the same period grew by only 8% on radial roads approaching Leeds city centre, while growth on a sample of A, B and C roads across the District was less than 5%.
- 4.3 An examination of peak traffic levels on radial routes approaching the city centre shows that the trend has been more marked with peak hour flows actually falling and peak period flows increasing by less than all day traffic. These changes reflect greater flexibility in the labour market, the growth of part time jobs, a shift away from the traditional 9-5 working day and the consequent growth in peak spreading. Figure 2 shows morning peak traffic levels since 1990.



Figure 1

Source: Census, Leeds Central Monitoring Cordon and LCC Note 13. # Note cordon data relates to 1992, 2002 and 2012 as data not available for all years.

² From 757,655 (2012 mid-year estimate)(ONS) to 860,618 (Core Strategy forecast for 2028)

³ To 836,000 by 2028 (ONS Subnational Population Projections 2014)





Source: Leeds Central Monitoring Cordon

4.4 Over the past decade modal split surveys covering morning peak period journeys approaching the city centre show that there has been a significant growth in cycling, walking and rail usage, while car and motorcycle usage has fallen. Bus patronage declined steadily up to 2012 but has been increasing since then – see Figures 3 and 4.





Source: Leeds Monitoring Cordon Mode Split Surveys





Source: Leeds Monitoring Cordon Mode Split Surveys

- 4.5 Although car remains the principal mode it should be noted that not all the journeys recorded here are to the city centre as many vehicles use the inner ring road and M621 to travel to other destinations within the city. Census data shows that between 2001 and 2011 car commuting to the city centre fell in absolute terms by 9% although the number of people working there rose by 4%.
- 4.6 One key trend in terms of the city centre has been the growth in city centre living. Although not everyone who lives there works in the city centre, the majority of residents travel to work by sustainable modes so that only 24% travel by car compared with 65% across Leeds District⁴.
- 4.7 As a major city within a wider city region Leeds' transport activity reflects the many employment options available to residents. Analysis of census data⁵ shows that 25% of Leeds residents (with a fixed place of employment) work outside the District and that 31% of people working in Leeds travel in from outside. This rises to 37% for those working in the city centre.
- 4.8 Within Leeds District 20% of residents either work at/from home or stay within their own ward; 18% work in the city centre. A very significant proportion therefore are travelling either to another ward within Leeds or outside the District. Catering for these journeys by sustainable modes is challenging and this is reflected in the high car mode share for these trips (75%).

⁴ 2011 census QS701EW (excludes those working at/from home)

⁵ 2011 census WU03EW

4.9 Like other urban areas in the UK a high proportion of journeys made by Leeds residents are relatively short. Surveys in 2008 covering the main urban area of Leeds revealed that almost half (48%) were less than 2 miles and 72% were less than 4 miles. A high proportion of these short journeys are made by car as illustrated in Figure 5.



Figure 5

Source: Transport for Leeds Travel Diaries (2008)

- 4.10 The Department for Transport (DfT) provides all local authorities with data on vehicle travel times that has been collected from vehicles with GPS devices. This information is currently supplied to the DfT by TrafficMaster and allows average journey times and speeds to be analysed by individual road and time of day.
- 4.11 DfT published statistics show that average morning peak period (0700-1000) speeds on all local authority A roads in Leeds are faster than other comparable cities in England and have improved by around 3% between 2006-07 and 2014-15. In contrast the majority of other Core Cities have experienced a fall in speeds over this period. See Figure 6.

Figure 6



Source: DfT Cgn0206

- 4.12 Leeds City Council officers have undertaken a detailed analysis of the TrafficMaster data to derive journey times on radial and orbital routes in Leeds for three academic years: 2009-10, 2011-12 and 2013-14 (weekdays excluding school holidays). This shows that the routes consistently experiencing the highest levels of peak hour congestion (in terms of delay/km) are the A660, the A65 (between Rawdon and the Inner Ring Road) and the A61 (N), alongside the A62 and A657/A647 for inbound am peak journeys and the A61(S) and A65 (Rawdon to Menston) for outbound pm peak journeys.
- 4.13 When average peak hour journey times are compared with daytime free flow conditions congestion adds at least 80% to travel times on these routes see Table 1 below. Across the whole urban main road network (excluding the M621) in 2013-14 congestion added 70% to journey times on inbound radial routes (0800-0900) and 68% to outbound radials (1700-1800).

Route	Congestion Delay		Congestion Delay	
	(%)		(mins / km)	
	0800-0900	1700-1800	0800-0900	1700-1800
	inbound	outbound	inbound	outbound
A61 (N)	Over 90%	Over 100%	Over 1.2	Over 1.3
A61 (S)		100%		Over 1.3
M621 (E)		Over 140%		
A643			Almost 1.2	
M621 (W)	Over 120%			
A62	Over 110%		Over 1.6	
A58 (S)			Almost 1.0	
A647	Over 80%		Almost 1.0	
A657/A647	Almost 80%		Over 1.2	
A65a #				Over 1.0
A65b ##	Over 100%	Over 80%	Over 1.6	Over 1.2
A660	Over 80%	Over 120%	Over 1.4	Over 2.0
Inner RR Anti- clockwise		Almost 100%		Over 1.2

Table 1 - Routes where peak hour congestion adds 80% or 1 min / km to journey times (2013-14)

Notes: # Menston to S of Rawdon; ## Rawdon to City Centre. A61 (S) and M621 (E) affected by M1 Smart motorway construction.

- 4.14 Using the same journey time data, junctions that are seen as congestion 'hotspots' have been analysed to gauge the current levels of delay. 96 sites were examined using the 2011-12 data for weekday morning and evening peak hour delays as well as 12 hour delays from 7am to 7pm. It should be noted that since this analysis was carried out improvement schemes have been undertaken at several of the junctions, including M1 junction 44, however, at the time of writing a full set of post-scheme data is not available to allow the impacts to be assessed.
- 4.15 Figure 7 shows the location of the sites, highlighting those with the greatest levels of delay. The majority of these junctions are within the main urban area

of Leeds. Sites marked in orange 'with notable delays' have at least one approach with more significant delays than the other legs of the junction. In the main, junctions within the city centre were not assessed. Further details of these sites are included in Appendix 1.

- 4.16 Carbon emissions across the local authority road network are estimated annually by the government. This shows a sustained downward trend in recent years in Leeds District and across West Yorkshire. The most recent data shows that between the peak in 2007 and 2013 carbon emissions due to traffic on local roads fell in Leeds by 15% and in West Yorkshire by 14%. These changes are in line with national trends.
- 4.17 Results from the city centre monitoring site for nitrogen dioxide (NO2) show that background air quality improved significantly during the 1990s but there has been little change since 2000 (Figure 8). Although background concentrations are unlikely to exceed EU Directive or UK AQ Regulation objectives, air quality remains a concern. Currently, there are six Air Quality Management Areas in Leeds (where residential properties close to heavily trafficked roads are exposed to concentrations of NO2 in excess of the AQ objective) and there are parts of the city failing to meet the EU Directive for NO2. As a consequence DEFRA has identified Leeds as one of five cities where Clean Air Zones will be required by 2020. In addition, while the standards set for particles (PM10 and PM2.5) are achieved, any reduction in these pollutants will have health benefits for the whole population.





Summary of significant trends:

- Traffic growth over the past two decades has consistently been significantly less than growth in car ownership and employment;
- Peak spreading and changes in employment patterns mean that peak hour flows on radial routes around Leeds city centre are lower now than in 1990;
- Rail and cycling levels have risen significantly over the past decade;
- Bus usage has fallen overall, however, there are signs of growth since 2012;
- A significant proportion of Leeds residents work outside Leeds District and equally a high proportion of jobs in Leeds are undertaken by people commuting into Leeds;
- Almost half of all the journeys made by residents within urban Leeds are less than 2 miles long;
- Morning peak traffic speeds on A roads across Leeds are faster than in other Core Cities, however, on the most congested radials journey times are twice as long in the peak as at other times of the day;
- Carbon emissions due to transport on Leeds' roads have fallen since 2005, however, previous falls in NO2 emissions have levelled off and there has been no improvement since the year 2000.

Figure 7 - Leeds Congestion Hotspot Junctions (2011-12)



5 Strategy

- 5.1 Core Strategy Spatial Policy 11 provides a strategic framework for the delivery of new transport infrastructure across Leeds in line with the objectives of LTP3 and the Leeds City Region Transport Strategy. Specifically the delivery of schemes to enhance radial public transport, including rapid transit and park and ride, and targeted highway improvements to expand orbital capacity and target congestion hotspots. Interventions to improve access to the Aire Valley and Leeds Bradford Airport are also included, as well as measures to support new developments and improve connectivity for cyclists and pedestrians.
- 5.2 SP11 also references interventions to address the needs of people with impaired mobility, improve road safety, address accessibility and support low carbon technologies. Lastly the policy supports the delivery of HS2 and the substantial connectivity enhancements that it will deliver in the longer term.
- 5.3 Transport Policies T1 and T2 contain measures to manage travel demand by the use of travel plans, the control of parking, requirements for developments to be located in accessible places and to contribute to infrastructure to mitigate their impacts and ensure that developments do not materially add to existing problems
- 5.4 The aim of the strategy is to provide choice and ensure that suitable alternatives to the private car are available in particular for journeys to local services, education, employment, shopping and to the city centre and to therefore increase the proportion of these trips made by sustainable modes. As shown earlier, the relatively high car mode share for many short journeys means that there is significant scope for increasing the use of walking and cycling; equally the high public transport accessibility of the city centre (together with planned improvements) should ensure that car usage can be reduced.
- 5.5 For travel to work the diversity of destinations outside the city centre makes it hard to cater for direct travel to these locations by public transport (unless residents live on the route of a direct bus or train service) and therefore it is important that they are linked directly to major public transport interchanges (such as the city centre) to facilitate these journeys. This is reflected in the Accessibility Standards in the Core Strategy. It is nevertheless recognised that for many people car will remain the primary mode for a high proportion of these journeys and therefore the provision of additional orbital highway capacity will be a key outcome of the strategy.
- 5.6 The Leeds Parking Supplementary Planning Document (SPD) provides more detail on Core Strategy Policy T1, including parking standards for new developments and the control of public long stay commuter parking in the city centre.
- 5.7 City centre living forms an important component of the spatial distribution of the housing locations in Leeds with a planned 11,974 dwellings being allocated to the city centre in the Site Allocations Plan. Census data shows that although not all city centre residents chose to work in Leeds city centre, the availability of

good alternatives to the private car means that the vast majority (76%⁶) use sustainable modes to travel to work.

5.8 It has long been recognised that the interaction of transport and land use can have a significant effect on travel patterns. Thus delivery of significant infrastructure can encourage people to move to the local area to make use of the new facilities to access employment elsewhere. Historically rail investment around London lead to the growth in commuting. It has been estimated that people on average change jobs every 3 years and move home every 7 years – this means that there is significant scope for individuals and families to change their travel patterns during this process. It is considered that investment in sustainable modes such as buses, park and ride and rail will in turn have an effect upon local travel in and around Leeds and Leeds City Region.

6 Transport Interventions

Local Projects

- 6.1 The first West Yorkshire Local Transport Plan (LTP) was adopted in 2001 and since then investment in local transport has been guided by the strategies and policies within the plan and its two successors. The current plan (LTP3) runs from 2011-26. As highlighted in section 3 the WYCA is in the process of creating a Transport Strategy that will update and supersede LTP3.
- 6.2 A number of key interventions have been delivered in Leeds in recent years to address existing problems and to cater for future travel demand resulting from a growing economy. Key amongst these was the completion of Leeds Inner Ring Road in 2008; the opening of the A63 East Leeds Link Road in 2009; the delivery of the A65 Quality Bus Corridor in 2012; and the opening of the 800 space park and ride site at Elland Road in 2014. To the west of the city, works to signalise three key roundabout junctions at Thornbury Barracks, Rodley and Horsforth were completed during 2015 and two new rail stations, with associated park and ride, were completed at Apperley Bridge and Kirkstall Forge in 2015 and 2016 respectively. Within the city centre a new southern access to Leeds rail station was opened in early 2016 and a major maintenance scheme completed on the inner ring road in September of that year.
 - The <u>Inner Ring Road scheme</u>, in combination with the M621, for the first time completes a full ring road around the city centre allowing through traffic to pass around it and providing a direct link between the A63 East Leeds Link Road and the M621. Future plans for the city centre, described below, will build upon this to remove through traffic and enhance the urban realm and local environment so that the city is better able to attract new investment.
 - The <u>A63 East Leeds Link Road (ELLR)</u> provides a dual carriageway link through the Aire Valley between the city centre and the M1 to the east. This scheme therefore forms a key component in opening up the Aire Valley to

⁶ 2011 census QS701EW (LSOA within Leeds IRR, excludes those working at/from home)

investment in employment and housing, and supporting the Local Enterprise Zone. Plans are already well advanced to open a 1000 space park and ride site adjacent to the ELLR in 2017 (see below).

- The <u>A65 Quality Bus Corridor (QBC)</u> has significantly enhanced bus priority on this major radial route, complementing previous investment on the A61 Scott Hall Road and the A64 and A63 in east Leeds. The provision of good local bus services that are insulated from future congestion by priority measures is an important component of the city's transport strategy and will be key to the future growth of the city centre.
- Although rail based <u>park and ride</u> is common across West Yorkshire, <u>Elland</u> <u>Road</u> represents the first major investment in bus based park and ride in Leeds. Following its opening in 2014 the original 400 surfaced spaces has been expanded to 800, reflecting the success of the site. Providing a good alternative for car commuters to reach the city centre is key to reducing traffic levels on congested radial routes and improving the environment within the city centre.
- The <u>Leeds Station Southern Entrance</u> scheme provides a new entrance to the City Station from the Holbeck/South Bank area. This will directly support the Core Strategy's employment and residential growth plans for the city centre, and by enhancing rail connectivity forms a key element of the emerging city centre transport strategy.
- <u>Leeds Rail Growth Package</u> comprises two new stations with associated car parks on the electrified Airedale and Wharfedale lines. Apperley Bridge station provides an alternative option for travel to Leeds city centre (and other wider destinations) from the north west of Leeds and communities to the north east of Bradford and alongside Kirkstall Forge station will work to relieve traffic levels on the A65 Kirkstall Road.
- The <u>Leeds Inner Ring Road Major Maintenance Scheme</u> was completed in September 2016 and will ensure the continued availability of the critical Woodhouse tunnel. The inner ring road carries up to 85,000 vehicles per weekday and performs a vital component of the city's highway network, not only for traffic heading for the city centre but also facilitating city wide movements within the main urban area.
- The <u>roundabout improvement and signalisation schemes</u> at Thornbury Barracks, Rodley and Horsforth will support housing growth in the west of the city.
- 6.3 As a city Leeds has a good track record of delivering major transport schemes however, this has to some extent been constrained by the need to seek government funding on a project by project basis and the lengthy timescales involved in gaining approval. Recent significant changes in government policy has led to the City Deal, the creation of the West Yorkshire Combined Authority, RailNorth and Transport for the North. These changes will facilitate more local decision making and in combination with the West Yorkshire Plus

Transport Fund will result in a significant increase in investment and a more streamlined delivery process.

- 6.4 The £1 billion West Yorkshire Plus Transport Fund comprises £600m of Government funding over 20 years, £183m of other devolved transport funding previously secured through the City Deal and local contributions. It will underpin growth by improving the City Region's roads and railways and connecting people to jobs and goods to markets seamlessly.
- 6.5 Managed by the West Yorkshire Combined Authority (WYCA), the fund will be targeted at reducing congestion, improving the flow of freight and making it easier for people to commute to and from expected major growth areas. A package of transformational transport schemes which meet the WYCA and the LEP's aims of supporting economic growth has been identified and includes a number of major projects in Leeds. Four of these have been prioritised for early implementation: East Leeds Orbital Route and Outer Ring Road junction Improvements; A65-Airport-A658 Link Road; Leeds City Centre Package; and Aire Valley Temple Green Park and Ride.
- 6.6 The WYPTF projects will build upon other major schemes that are being delivered through direct investment by the Department for Transport, Highways England and Network Rail. These include: the City Connect cycle superhighway (DfT/LTP); M1 Junction 45 phase 2 improvement and M621 Junctions 1-7 improvements (Highways England RIS schemes); and TransPennine electrification (Network Rail).
- 6.7 In total these schemes represent a substantial investment in the city's transport infrastructure that will act as a catalyst and driver for Leeds and the City Region's economic growth and regeneration. All the schemes are in line with the transport infrastructure investment priorities specified in Core Strategy Spatial Policy 11.
 - <u>East Leeds Orbital Route (ELOR)</u> is a proposed dual carriageway road from M1 Jn 46 to the A6120 to the west of the A58 Wetherby Road. The southern section of this route – Manston Lane Link – is to be provided by the Thorpe Park development. This scheme is directly tied to the East Leeds Extension housing proposals and will provide direct traffic relief to the existing outer ring road through Cross Gates and Seacroft. In addition to ELOR, improvements to five junctions on or adjacent to the A6120 are also contained within this package (A6120/King La; King La/Stonegate Rd; A6120/A61 Harrogate Rd; A61 Scott Hall Rd/Harrogate Rd and A6120/Roundhay Park La). In combination with ELOR these schemes form part of the Council's proposals for enhancing orbital highway capacity on the outer ring road.
 - <u>A65-Airport-A658 Link Road</u> is a proposed single carriageway road linking the A65 west of Horsforth with Leeds Bradford Airport and the A658 to the north. This proposal would also include bus priority measures on the A65 eastbound approach to the A6120. This scheme represents a key transport intervention to facilitate growth of the airport and reduce traffic levels on local roads, in line with Core Strategy Spatial Policies 11 and 12. In

addition, a new station is planned to serve the airport as part of the Leeds Public Transport Investment programme – see para. 6.9 below.

- Leeds City Centre Package is a key component of the emerging city centre transport strategy. The proposed scheme will provide additional orbital capacity on the inner ring road (specifically at Armley Gyratory) and, in combination with Highway England's RIS scheme, to the M621 to facilitate orbital movements and to enable traffic levels to be reduced within the city centre. To support this it is proposed to close City Square to general traffic and to reduce the scale of highways within the South Bank, reallocating road space to pedestrians, cyclists and public transport. The growth in city centre living and employment contained within the Core Strategy and Aire Valley Leeds AAP will require a new approach to the transport networks and urban realm to accommodate the greater levels of walking, cycling and public transport use associated with this growth. The emphasis here is to significantly enhance the city centre as a place and reduce the dominance of highway infrastructure. The scheme is a key project to enable the city to be HS2 ready and will complement the proposals to increase rail usage, the Council's plans for park and ride and the enhanced cycling network contained within City Connect.
- The <u>Temple Green Park and Ride</u> proposal is scheduled to be operational by the summer of 2017 and represents the first phase of the Aire Valley Enterprise Zone Package. This scheme will provide a 1000 space car park served by a dedicated bus service to the city centre which will also serve other locations within the Aire Valley. This scheme, in combination with the Council's other park and ride proposals, is a key element in supporting the growth of the city centre as well as directly enhancing public transport connectivity to the Enterprise Zone.
- The <u>City Connect Cycle Superhighway scheme</u> provides 23km of segregated cycle superhighway connecting Bradford to East Leeds via Leeds city centre, upgrades to the canal towpath between Kirkstall and Shipley and additional city centre cycle parking. The western section of the superhighway scheme opened in June 2016 with the eastern section substantially complete in autumn 2016. The superhighway element represents a significant step change in provision for cycling and is expected to build upon the significant growth in cycling in Leeds in recent years. In addition further funding has been awarded for a second phase covering works in and around Leeds city centre, including links to the South Bank, with delivery planned during 2018. These schemes will directly support the increased use of sustainable modes across the city as well as the emerging city centre transport strategy.
- <u>Highway England's Road Investment Strategy (2015/16-2020/21)</u> contains proposals to improve capacity at M1 junction 45 and on the M621 between junctions 1 and 7. The M621 interventions form a key component of the Leeds City Centre Package and Leeds City Council are actively working with Highways England to ensure that delivery of these projects is coordinated. Works at M1 junction 45 are expected to start in 2017.

- The proposals for <u>TransPennine electrification</u> will include a full route upgrade to deliver faster journey times and significantly more capacity between Manchester, Leeds and York. The upgrade is expected to provide capacity for 6 fast or semi-fast trains per hour, take up to 15 minutes off today's journey time between Manchester and York and be complete in the early 2020's. When the work is finished, the whole route from Liverpool to Newcastle (via Manchester, Leeds and York) will be fully electrified and journey times will be significantly reduced compared to the current situation.
- 6.8 Plans for the New Generation Transport (NGT) trolleybus system have now been abandoned following the Secretary of State's decision in May 2016 not to approve the powers for the 14.8km scheme following a public inquiry. The system was planned as a two line trolleybus network with associated park and ride sites that would link Stourton (M1 Jn 7) and Holt Park/Bodington with Leeds city centre. The cancellation of the scheme also affects the proposals in the WYPTF fund for a future extension to directly serve the Aire Valley Enterprise Zone and Temple Green park and ride.
- 6.9 Nevertheless, the DfT have allocated their planned £173.5M contribution to NGT towards public transport schemes in Leeds and the Council submitted a strategic case for the <u>Leeds Public Transport Investment Programme</u> to DfT in December 2016. This package includes an additional private sector investment of up to £100M and comprises proposals for:
 - A new high frequency bus network
 - A comprehensive package of bus priority measures across the city to improve journey times on some of the most congested corridors
 - Investment by First Group in 284 environmentally clean buses
 - Provision of real time information at 1000 more bus stops
 - Three new rail stations serving Leeds Bradford airport, Thorpe Park⁷ and White Rose and the provision of additional parking at New Pudsey station
 - Two additional park and ride sites at Stourton and the north of the city together with further expansion of the existing Elland Rd site
 - Accessibility improvements at Cross Gates, Morley and Horsforth stations
 - New improved bus hub interchange facilities in the city centre and district centres
- 6.10 In combination with allocated funding for other major projects and the WYPTF schemes this represents a total planned investment in local transport of over £840M.

⁷ Previously referred to as East Leeds Parkway

- 6.11 To inform the emerging transport strategy for the city and the allocation of the Government funding, Leeds City Council has instigated an extensive engagement and conversation on the future direction of transport provision across the city. The first phase of this was concluded on 11 November 2016 and included a survey completed by over 8,000 people, workshops and Community Committee meetings.
- 6.12 The Council's ambition remains to have a transport system that can move large numbers of people through the city. Options for mass-transit solutions such as light rail, tram-train or tram will therefore be reviewed. However, developing and implementing such an option will take a number of years. Consequently, as transport improvements are needed now the Leeds Public Transport Investment Programme has been developed to deliver improvements in the shorter term.
- 6.13 In addition to the interventions outlined above, a further group of Leeds projects have been prioritised within the West Yorkshire Plus Transport Fund as well as a number of other schemes where a proportion of the investment will have a direct role to play in facilitating the economic growth of the city. These comprise:
 - Leeds Outer Ring Road A6110 junction improvement package
 - A653 Leeds-Dewsbury Corridor bus priority measures, highways efficiency, express bus service and local safety scheme
 - Aire Valley Enterprise Zone Package Phase 2 provision of a new northsouth cross river link road between B6481 Pontefract Rd and A63
 - Leeds City Station Gateway enhancements to public realm and accessibility in line with the emerging station masterplan
 - Rail Park and Ride Package 2,000 additional spaces at stations across West Yorkshire (including Horsforth, Morley and Garforth) to accompany DfT investment in additional rail capacity.
 - Corridor Improvement Programme (formerly the Highway Efficiency and Bus Package and the Highway Network Efficiency Programme) – targeted interventions to address key corridors and congestion hotspots and to deliver improvements to the overall traffic control systems.

Strategic Road Network Projects

- 6.14 Significant investment in the Strategic Road Network (SRN) by Highways England (formerly the Highways Agency) has also been undertaken in recent years and will continue through their Route Strategies. Key interventions comprise:
 - M62 Smart Motorway Upgrade (Jn 25-30) open autumn 2013
 - M1 Jn 44 pinch point scheme open spring 2015

- M1 Smart Motorway Upgrade (Jn 39-42) open winter 2015/16
- M1 Jn 45 improvement start on site 2017
- M621 (Jn 1-7) localised improvements and widening start on site by 2020 (elements of this form part of the Leeds City Centre Package as described above)
- M1/M62 Lofthouse Interchange reconstruction (2020-25)

Rail Investment

- 6.15 As shown earlier, there has been a substantial growth in rail travel in recent years and the industry is now planning for further growth into the future. This is reflected in the requirements for the new franchises which require the provision of additional capacity for travel into and out of Leeds during the peak periods. Rail commuters into Leeds will benefit from a 52% increase in the number of seats in the morning peak on Trans-Pennine Express trains, and a 40% increase in the number of passengers that can be carried on Northern trains by the end of 2019⁸. This is equivalent to capacity for an additional 13,000 passengers a 50% increase above current (Autumn 2015) levels⁹. This will be rolled out over a number of years with the Dec 2017 timetable bringing additional capacity for some 2,200 passengers. Further capacity expansion requirements are expected through the DfT High Level Output Specification for 2019-24.
- 6.16 The franchises will deliver over 500 new-build carriages, including brand new high spec 125mph intercity bi-mode trains (that run on both diesel and electric) for TransPennine Express, and a mix of new electric and diesel units for Northern. The Pacer units currently in use on the Northern network will be completely phased out by 2020. Trains will be longer with more seats, particularly on the most crowded routes into the North's largest cities. Northern stations will be improved, with at least £30 million of investment across the franchise.
- 6.17 In addition to these changes, Network Rail are working in parallel to increase the proportion of the electrified rail network within West Yorkshire. Electrification of the TransPennine route from Manchester to Leeds and York, along with the line from Leeds to Selby, was announced in 2011. Completion of these works is expected in the early 2020's.

Transport for the North

6.18 Transport for the North (TfN) is a new partnership between northern city regions, LEPs and Government working closely with Highways England, Network Rail and HS2 Ltd. The Partnership's aim is to transform the Northern economy through the long term investment in transport networks to create the 'Northern Powerhouse'. TfN will allow the Northern cities to speak with one

⁸ Rail North briefing note and Franchise Agreements

⁹ DfT annual survey shows 26,467 passenger arrivals at Leeds (0700-1000)(RAI0201).

voice about our future vision and to be clear with Government about where investment is needed.

- 6.19 Transport for the North is on its way to becoming a statutory body. The following covers the current aspirations:
 - Rail a Northern Powerhouse Rail network connecting the northern cities, alongside the full HS2 Y shaped network which should be delivered as soon as possible. For the Leeds/Manchester/Sheffield triangle, journey times of 30 minutes between the 3 cities are envisaged including looking at new route options across the Pennines.
 - Highways a core free flowing east-west motorway network with a 'mile a minute' typical journey times for more reliable journeys between the major cities. This plan draws on Highways England's Roads Investment Strategy (RIS1) which includes upgrading the M62 to 4 lane 'smart' motorway between Leeds and Manchester and tackling hotspots around the M621. Strategic studies into upgrading key trans-Pennine road links that could relieve pressure on the M62 will be undertaken for the A66/A69 and a new road/tunnel link between Sheffield and Manchester. TfN will produce its prioritised investment proposals for the second Road Investment Strategy (2020 to 2025) for the North of England, working with the Department for Transport and Highways England.
 - Smart North is the programme to deliver simplified fares, integrated ticketing, and improved online passenger information across all public transport modes in the North. It was allocated £150m over the life of this Parliament in the 2015 Spending Review.
 - International Connectivity is about improving connectivity to the North's international gateways and beyond to global markets is required to support the North's businesses competing on the world stage. TfN's Chair, John Cridland CBE, has launched a Commission of business experts to identify the international connectivity needs of the North, taking into account the needs of key capabilities and the opportunities arising in global markets.
 - TfN is working to identify the interventions to improve strategic freight connectivity and local connectivity to the strategic network that will support the overall Northern Transport Strategy.

Additional Schemes Arising Directly From the Site Allocations

6.20 In order to inform the Plan site requirements the Leeds Transport Model (LTM) has been used to forecast future highway conditions in 2028. The model tests include all the residential and employment sites contained within the Site Allocations Plan (Submission Draft) and Aire Valley Leeds AAP (submission Draft). They also include the current growth aspirations of Leeds' neighbouring local authorities, including the planned spatial distribution of housing in Bradford. Overall employment growth has been taken from the Regional Econometric Model (REM)¹⁰. Taken together this level of growth is substantial and in the main far exceeds the latest national growth forecasts produced by the Department for Transport¹¹ as illustrated in Figures 9 and 10, below. This clearly demonstrates that the model tests, although representative of local aspirations, nevertheless represent a very robust assessment of future travel demand.



Figure 9 – Modelled Housing Growth

¹⁰ Autumn 2015 forecasts

¹¹ Tempro 7 (NTEM 7.0) 2016



Figure 10 – Modelled Employment Growth

- 6.21 Since this assessment was originally undertaken for the SAP Publication Draft the modelling has been updated to reflect the cancellation of NGT and the outcome of further scheme feasibility work on schemes in the WYPTF. This has enabled the potential contribution of significant housing and employment sites to traffic growth and congestion at key junctions to be estimated. For the purposes of this exercise all residential development sites of 50 or more dwellings and significant employment sites have been assessed. In addition, locations where these is a cumulative impact have also been identified. This analysis has led to the identification of a number of transport interventions that are likely to be required during the Plan period. These mitigation measures are deemed to be key schemes to facilitate the delivery of the housing targets. Once feasibility studies have been completed for these junctions a clearer picture of the scale and cost of these interventions will be available. At this stage, the results of high level feasibility assessments have been used to run additional model tests to assist in understanding the additional congestion relief potentially provided by these schemes.
- 6.22 Figure 11 shows these identified interventions, together with other major transport schemes, the planned WYPTF schemes and those from Network Rail.

Clean Air Zone

- 6.23 In December 2015 the Government announced plans to introduce Clean Air Zones (CAZ) in Birmingham, Leeds, Nottingham, Derby and Southampton by 2020. These Zones will not affect private car owners, but will see the most polluting vehicles, like old buses, taxis, coaches and lorries discouraged from entering the zone through charges.
- 6.24 The Clean Air Zones will be targeted at areas of each city where the air quality problem is most serious. These Zones will reduce the pollution in city centres and encourage the replacement of old, polluting vehicles with modern, cleaner vehicles. In Leeds one of the main area of concern is the inner ring road, in

particular the western section adjacent to Armley Gyratory. Leeds City Council is actively working with DEFRA to assess the situation and to develop a proposition for a CAZ.

Figure 11 – Transport Interventions in Leeds



- 6.25 Model tests have been run containing the majority of the major interventions described in the previous sections, including a number of the planned WYPTF schemes (where sufficient information is available to define them in the model). These schemes (defined as Do Something schemes) are listed below:
 - Temple Green Park and Ride
 - East Leeds Orbital Route and ORR N Junction Improvements
 - A65 Airport A658 Link Road¹²
 - Leeds City Centre Package, including M621 enhancements
 - A6110 Junction Improvements (A58 and A62)
 - Aire Valley North-South Link Road
 - Otley Eastern Bypass
 - East Leeds Parkway (Thorpe Park)
 - M1 Jn 45 improvement
- 6.26 As described above, an additional Do Something Plus test to show the forecast impacts of the Plan and supporting transport investment has also been undertaken. The principal additional schemes included in this test are:
 - Dawson's Corner improvement (A647/A6120)
 - A6120 dualling between A647 and A65
 - Rodley roundabout improvement (A657/A6120)¹³
 - Horsforth roundabout improvement (A65/A6120)
 - Dyneley Arms improvement (A660/A658)
 - M1 Junction 47 improvement¹⁴
 - A63 Garforth southern bypass
- 6.27 It should be emphasised that these potential schemes do not at this stage have any formal status or funding, although where appropriate it will expected that delivery or financial contributions will be required from relevant developments. Interventions in the Garforth area (M1 Junction 47 and southern bypass) will

¹² Preferred alignment

¹³ Indicative scheme to facilitate operation of ORR dualling. To date no feasibility work has been undertaken at this junction.

¹⁴ Indicative scheme to facilitate operation of this junction with Parlington and E of Garforth developments. To date no feasibility work has been undertaken for this junction.

have to be assessed in detail alongside the proposals for the allocated Parlington and East Garforth housing sites

- 6.28 The model tests indicate that by 2028 all day traffic levels within Leeds will grow by around 24% from 2012 levels with traffic on radials approaching the city centre increasing by 23%. Growth in the peak hours is forecast to be lower than this, with peak hour traffic forecast to rise by around 16-17% on the same radial routes. These are broadly in line with forecasts from the latest version of the National Trip End Model (NTEM 7.0) which predicts a 22% increase in weekday car traffic in Leeds when the same employment and household growth assumptions are applied¹⁵.
- 6.29 Historically, traffic growth forecasts at both a national and local level have tended to significantly over estimate growth. For example the previous version of the NTEM (NTEM 6.2) suggested that weekday car traffic in Leeds rose by 26% between 2001-15, when in fact the Leeds Monitoring Cordon around the city centre shows only a 2.5% increase in all day traffic since 2000 (data is not available for 2001). Data from DfT surveys covering A roads across the District shows a similar 2.6% growth in total traffic between 2001-13, and although growth since then has been more significant (11% for 2001-15) the increase nevertheless is less than half of the NTEM forecast. These forecasts therefore need to be viewed with some caution. It is considered that both the model and NTEM forecasts represent very much a worse case in terms of traffic growth, in particular with regards to radial peak hour traffic.
- 6.30 Figure 12 illustrates this, showing historic traffic from 1990-2015 and the forecast up to 2028. Although the impact of the economic downturn will have influenced traffic levels it is notable that the fall in Leeds commenced several years prior to 2008. It is also worth noting that the historic growth in all day traffic across the Leeds cordon has consistently exceeded the growth in peak period traffic.
- 6.31 Bearing in mind the past trends, it is considered that weekday traffic growth is likely to grow by at least the rate of population growth (14%) with the forecast of 24% from the Leeds Transport Model representing the upper limit. Peak traffic growth is likely to be less than this and within the main urban area significantly less.

¹⁵ This has been undertaken using the alternative growth assumptions option in Tempro 7. The default NTEM forecast for Leeds is for 14% growth in weekday car traffic alongside lower growth in households and jobs – see Figures 9 and 10.

Figure 12 – Historic and forecast traffic growth in Leeds (1990-2028)



Sources: 24 hr cordon, am peak hr and am peak period – Leeds monitoring cordon (1990-2015); Leeds all day – Note 13 all sites (1990-2015)

- 6.32 Public transport trips to the city centre are forecast in the Leeds Transport Model to increase by 28% while overall public transport use is forecast to rise by 23%, broadly the same as vehicle traffic.
- 6.33 Peak journey times are forecast to increase by 2028, however, as Figures 13 and 14 demonstrate the WYPTF and other major scheme interventions, as well as schemes delivered since 2012, will have a significant impact on mitigating the impacts. The figures show the difference between a 2028 Do Nothing scenario where the network only includes schemes in place in 2012 and a 2028 Do Something scenario with the inclusion of planned interventions.

Figure 13 – Forecast changes in morning peak hour travel times between 2012 and 2028 (Do Nothing and Do Something)



Note: Network covers all main radial and orbital A and M roads. DN = 2028 Do Nothing (no changes from 2012); DS = 2028 Do Something (with planned interventions)





Note: Network covers all main radial and orbital A and M roads. DN = 2028 Do Nothing (no changes from 2012); DS = 2028 Do Something (with planned interventions)

6.34 In addition, sensitivity tests have been undertaken to reflect the uncertainty regarding delivery of the employment sites. The Core Strategy target for office, industry and warehousing sites was informed by the 2010 Employment Land Review. This shows that over the period 2010-26 the net increase in B class jobs was forecast to be 17,000 FTE¹⁶ jobs. However, the allocated land for

¹⁶ ELR 2010 (August 2011) Table 5

these user classes is considerably in excess of the forecast net change – approaching four times for offices and ten times for industry/warehousing¹⁷. Importantly, this is to allow for the loss of existing sites and the provision of a margin of choice (based on 5 years' supply). In addition, a further need was identified for office floor space in the city centre and town centres which increased the total to the 1M sqm in the Core Strategy. However, it is not possible to know in advance which existing sites will become vacant over the Plan period and consequently sensitivity tests have been carried out to try and understand the potential impacts on future congestion levels and traffic growth.

- 6.35 The LTM utilises data from the Regional Econometrics Model (REM) to cap employment growth at a District level. As described above, the B class sites provide more land than the net forecast employment needs for these uses, and indeed more land than the total forecast net employment growth across Leeds up to 2028. The LTM automatically factors down existing employment so that the cap is not exceeded and the tests do not over-represent employment growth. However, this assumes full build out of all the B class sites, and therefore the reduction of existing sites is likely to be greater than would be expected.
- 6.36 One sensitivity test (test A) therefore matched the supply of B class sites to the overall net increase in employment derived from the REM. This was achieved by factoring down the size of each site so that each was 40% of the proposed allocation.
- 6.37 The other sensitivity test (test B) took account of the fact that B class jobs only form a proportion of all employment (around 50% of the forecast growth based on the ELR 2010¹⁸). In this case the size of each site was factored down so that each was 20% of the proposed allocation. In this case the LTM automatically allocates additional employment growth across the district in proportion to existing levels to reflect the remaining employment types (for example education, the NHS, retailing, hotels etc).
- 6.38 In both these tests, the net increase in employment remained constant, the only difference being the spatial distribution of employment across the district. This is illustrated in Figure 15, below. (The LTM has a 2008 Base year, therefore all changes are relative to that starting point).

¹⁷ Core Strategy Spatial Policy 9; ELR 2010 Table 13 and footnote.

¹⁸ 17,000 out of 33,651 FTE jobs growth 2010-26 (Tables 5 and 4)



Figure 15 : Leeds Employment Changes with Sensitivity Tests

- 6.39 The overall impact of the two sensitivity tests is to increase the number of vehicle trips in Leeds giving 27% growth from 2012, (though the comments made in paragraph 6.27 still apply). This is because a high proportion of the office employment sites in the SAP/AVLAAP are in Leeds city centre when these are factored down the overall effect is to increase travel to non-city centre locations. Because travel to destinations outside the city centre tend to be more car dominated, the effect of this is to increase journey times on the highway network, although the total impact is small. The overall increase in peak hour journey times from 2012 (shown in Figures 13 and 14) rises from 11% to 13% in the morning peak and from 15% to 16% in the evening peak under the Do Something scenario
- 6.40 It should be noted that this analysis does not include all the schemes identified during the modelling process, and that therefore the combined impact of all the proposed interventions will be greater. There will nevertheless remain additional congestion caused within Leeds that cannot be effectively mitigated against.
- 6.41 Table 2, below, lists junctions where congestion is forecast to worsen significantly by 2028 and interventions will be potentially required in addition to those already planned. This has been informed by a range of model tests, including the two sensitivity tests to ensure that all the key locations are identified. It also includes a number of other junctions immediately adjacent to developments. A number of these schemes have been identified within the WYPTF and contributions will be required to support their delivery. Other junctions can be linked directly to specific developments while others experience cumulative impacts that are relatively modest from individual sites but in combination have a marked impact on congestion. Direct contributions have been identified where the site adds 5% to traffic on the affected approach to the junction; cumulative contributions where the site adds 10 vehicles or more.

- 6.42 The table also includes information on whether the junction was identified in the hotspots analysis see Appendix 1 alongside the physical constraints surrounding it. It should be noted that there are very likely to be some locations on this list where site constraints will preclude a comprehensive solution. Feasibility studies will be required to establish options. In addition, there are locations on this list where the junctions concerned effectively shelter adjacent downstream junctions from congestion. The implication of unlocking these bottlenecks will have to be reviewed as part of a corridor approach to prevent queues from simply being transferred to the next junction.
- 6.43 It should be emphasised that this assessment is very much a strategic overview and does not represent a substitute for local evaluations during the consideration of planning applications. Where issues are identified local mitigating measures will be required where appropriate. The use of the LTM to model the SAP does, however, allow LCC to identify key junctions where interventions are likely to be required during the Plan period and to reflect this in the individual Site Requirements, which cover both direct and cumulative impacts.
- 6.44 The Site Requirements contains details of the locations where contributions towards improvements will be required from the Allocated sites. Sites previously included in the Unitary Development Plan (Identified sites) where development has not yet commenced and where planning permission has not been granted or has lapsed or new permissions are sought will also be expected to contribute towards these schemes in line with the requirements for adjacent Allocated sites.
- 6.45 Due to their scale some sites have a potentially greater cumulative impact across the wider network than others (for example East Leeds Extension, the East of Garforth site and Parlington). In these cases the cumulative impact threshold has not been comprehensively applied. With the former, the site forms part of the Identified sites and funding will be required towards East Leeds Orbital Route. In the case of Garforth and Parlington, comprehensive transport studies will be required and these will need to consider both direct and cumulative impacts.
- 6.46 The locations are listed in a clockwise direction starting with the A61 Harrogate Road.

Table 2 – Identified Interventions

Location	Status	Site Requirements	
A61/Alwoodley La	Top 70 hotspot – very constrained site	Direct contributions (1 site)	
A61/A6120 Moortown	Top 70 hotspot – very constrained site. WYPTF scheme	Direct contributions (1 site)	
A61/Street La	Constrained site	Cumulative contributions (1 site)	
A61/Potternewton La	Top 30 hotspot – constrained site	No sites identified	
A6120/Shadwell La	Constrained site.	No sites identified	
A6120/Roundhay Park La	Unconstrained site. WYPTF scheme	No sites identified	
A58/A6120	Top 30 hotspot – unconstrained site. Benefits from ELOR WYPTF scheme	No sites identified	
Roundhay Rd/Oakwood La (Oakwood Clock)	Top 30 hotspot – very constrained site	No sites identified	
A58/Harehills La (Fforde Green)	Top 30 hotspot – very constrained site	No sites identified	
A58 Barrack Rd/Chapeltown Rd	Constrained site	No sites identified	
A58 Clay Pit La/Meanwood Rd	Constrained site	Cumulative contributions (1 site)	
A6120/Coal Rd/Ramshead App	Benefits from ELOR WYPTF scheme	No sites identified	
A64/Scholes La	Unconstrained site. Potentially improve as part of ELOR WYPTF scheme	No sites identified	
A64/A6120	Top 70 hotspot – constrained site. Benefits from ELOR WYPTF scheme	No sites identified	
A64/Cross Gates Rd	Constrained site	No sites identified	
A64/B6159 Halton Dial	Top 70 hotspot – very constrained site	Cumulative contribution (1 site)	
A64/Gipton Approach	Constrained site	No sites identified	
A64/Burmantofts St, Woodpecker junction	Very constrained site	Cumulative contribution (1 site)	

Location	Status	Site Requirements
Barwick Rd/A6120	Top 70 hotspot – constrained site. Benefits from ELOR WYPTF scheme	No sites identified
Austhorpe Rd/A6120	Very constrained site. Benefits from ELOR WYPTF scheme	No sites identified
M1 Jn 46/A63 Colton	Highways England improvement associated with Thorpe Park and East Leeds Extension	Contributions from East of Garforth site – subject to comprehensive transport study. Cumulative contributions (2 other sites)
M1 Jn 47/A642 Garforth		Direct contributions from Parlington and East of Garforth sites – subject to comprehensive transport studies. Cumulative contributions (1 site)
A63 Garforth southern bypass	Potential scheme to address issues arising from East of Garforth site	Subject to comprehensive transport study for East of Garforth site. Cumulative contribution (1 site)
A63/A642 Old George rbt	Constrained site	Subject to comprehensive transport study for East of Garforth site. Cumulative contribution (1 site)
A63/B6137 Lidgett La	Top 70 hotspot – very constrained site. Benefits from potential Garforth Southern Bypass scheme	Subject to comprehensive transport study for East of Garforth site. Cumulative contribution (1 site)
A63/B6137 Leeds Rd	Unconstrained site. Benefits from potential Garforth Southern Bypass scheme	Subject to comprehensive transport study for East of Garforth site. Cumulative contribution (1 site)
A63/Ninelands La	Unconstrained site. Benefits from potential Garforth Southern Bypass scheme	Subject to comprehensive transport study for East of Garforth site. Cumulative contribution (1 site)
B6159/Chapel St Halton	Very constrained site. Signalised in 2015	No sites identified

Location	Status	Site Requirements
M1 Jn 45/A63 East Leeds Link Road	Highways England improvement scheme scheduled for 2017 start	None – due to delivery of planned scheme
A656/B6137 Longdike La	Unconstrained site	Subject to comprehensive transport study for East of Garforth site.
A642/Bullerthorpe La	Top 70 hotspot – very constrained site	Cumulative contributions (1 site)
A639/B6481 Pontefract Rd	Top 70 hotspot - constrained site. WYPTF scheme	Cumulative contributions (1 site)
A61/A654 Leadwell La	Top 70 hotspot - constrained site	Cumulative contributions (4 sites)
A61/Sharpe La	Top 70 hotspot - constrained site	Cumulative contributions (3 sites)
A61/Wood Lane	Top 70 hotspot - unconstrained site	Direct contributions (1 site) cumulative (4 sites)
M1 Jn 41/A650		Cumulative contributions (1 site)
M1 Jn 42/M62 Jn 29 Lofthouse		No sites identified
A650/Common La	Top 70 hotspot - constrained site	Direct contributions (1 site) cumulative contributions (3 sites)
A650/Thorpe La	Top 70 hotspot – unconstrained site	Direct contributions (1 site)
M62 Jn 28/A653 Tingley	Top 70 hotspot – constrained site. WYPTF A653 Corridor scheme	Direct contributions (1 site) cumulative (5 sites)
A653/Ring Road Middleton (Tommy Wass)	Top 30 hotspot – very constrained site. WYPTF A653 Corridor scheme	No sites identified
A650/A6039 Rein Rd	Top 70 hotspot – very constrained site	Direct contribution (1 site) cumulative (3 sites)
A650/A643 Bruntcliffe La	Top 30 hotspot – constrained site	Cumulative contributions (1 site)
A643/A6110	Top 70 hotspot – constrained site. Potential addition to WYPTF A6110 scheme	Direct contributions (2 sites) cumulative (1 site)
A643/Wesley St	Constrained site.	No sites identified
A643/M621 Jn 2	WYPTF City Centre Package scheme	Cumulative contributions (1 site)
Location	Status	Site Requirements
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A6110/M621 Jn 1	Very constrained site. Potential addition to WYPTF A6110 scheme	Direct contribution (1 site) cumulative (2 sites)
M62 Jn 26/A62 Gildersome		Direct contribution (2 sites) cumulative (1 site)
A62/Asquith Ave	Top 30 hotspot – constrained site	Direct contribution (3 sites) cumulative (2 sites)
A6110/A62 Gelderd Rd, Wheatsheaf	Top 30 hotspot – very constrained site. WYPTF scheme	Direct contributions (2 sites) cumulative (1 site)
A58/B6135 Drighlington	Very constrained site	Direct contributions (1 site)
A6110/A58 Whitehall Rd, Ringways	Top 70 hotspot – constrained site. WYPTF scheme	Direct contributions (1 site) cumulative (1 site)
A58 Domestic Rd/Domestic St	Very constrained site. Potential addition to WYPTF City Centre Package scheme	No sites identified
A6110/Branch Rd	Constrained site. Potential addition to WYPTF A6110 scheme	Cumulative contributions (1 site)
A6110/Tong Rd	Constrained site. Potential addition to WYPTF A6110 scheme	Cumulative contributions (2 sites)
A647/B6154 Thornbury Barracks	Top 30 hotspot – very constrained site. Current pinch point scheme completed 2015	None – due to delivery of 2015 scheme
A647/A6120 Dawson's Corner	Top 30 hotspot - constrained site. Potential WYPTF Leeds-Bradford Corridor scheme	Cumulative contributions (7 sites)
A647/B6155 Richardshaw Lane	Top 70 hotspot – very constrained site	No sites identified
A647/Armley Ridge Rd	Constrained site. Potential WYPTF Leeds-Bradford Corridor scheme	No sites identified
A647/Ledgard Way	Top 30 hotspot – very constrained site. Potential WYPTF Leeds-Bradford Corridor scheme	No sites identified

Location	Status	Site Requirements
A647/A643/A58 Armley Gyratory	Top 30 hotspot – very constrained site. WYPTF City Centre Package scheme	Direct contributions (4 sites) cumulative (5 sites)
A657/A6120 Rodley	Previous top 30 hotspot - unconstrained site. Signalised in 2015 but further improvements required	Direct contributions (1 site) cumulative (2 sites)
A658/Micklefield La	Constrained site	Cumulative contributions (1 site)
A658/Bayton La	Top 70 hotspot – constrained site. Affected by WYPTF A65-Airport- A658 Link Rd scheme	Cumulative contributions (2 sites)
A6038/B6153 Park Rd Guiseley	Top 70 hotspot - constrained site	Direct contribution (1 site)
A65/Oxford Rd	Top 70 hotspot – very constrained site	Cumulative contributions (1 site)
A65/A6120 'Horsforth roundabout'	Previous top 30 hotspot – very constrained site. Signalised in 2015 but further improvements required	Direct contributions (1 sites) cumulative (7 sites)
B6157 Bridge Rd/Wyther La/Broad La junctions	Top 30 hotspot – very constrained site	No sites identified
A65/Kirkstall La/Savins Mill La	Top 70 hotspot – very constrained site	Direct contribution (1 site)
A65/Willow Rd	Top 30 hotspot – very constrained site. A65 QBI completed 2012	Direct contribution (1 site)
Willow Rd/Burley Rd	Very constrained site	Cumulative contributions (1 site)
A65/A58 Inner Ring Rd	Very constrained site. A65 QBI completed 2012	Direct contributions (3 sites) cumulative (3 sites)
A6120/Low La	Top 70 hotspot - constrained site	No sites identified
East of Otley Relief Road	Top 30 hotspot – severely constrained site (A659/Kirkgate)	To be delivered through East of Otley housing site (UDP requirement)

Location	Status	Site Requirements
A660/A658 Dyneley Arms	Top 30 hotspot – unconstrained site. Potential addition to WYPTF A65-Airport-A658 Link Rd scheme	No sites identified
A660/A6120 Lawnswood	Top 70 hotspot - constrained site	Cumulative contributions (2 sites).
A660/St Anne's La/Shaw La	Top 30 hotspot - very constrained site	No sites identified
A660/North La	Top 30 hotspot - severely constrained site	No sites identified
A660/Hyde Park Rd	Top 30 hotspot - severely constrained site	No sites identified
A6120/Weetwood La	Constrained site.	Cumulative contributions (1 site)
A6120/King La	Top 70 hotspot - constrained site. WYPTF scheme	Cumulative contributions (1 site)
King La/Stonegate Rd	WYPTF scheme	No sites identified

- 6.47 It is anticipated that contributions towards the implementation of these schemes will be required from site developers. A full list of the sites where site requirements have been specified for each junction/scheme is included in Appendix 2. In addition, it is proposed that schemes to deliver enhanced facilities for public transport, walking and cycling will be mainly funded through the Community Infrastructure Levy (CIL) and the Leeds Public Transport Investment programme. See below.
- 6.48 Public transport and cycling schemes:
 - Elland Rd park and ride expansion
 - Stourton M621 Junction 7 park and ride
 - An additional bus based park and ride in the north of the city at a location to be determined¹⁹.
 - Thorpe Park (East Leeds Parkway) rail station
 - White Rose rail station
 - Leeds Bradford airport parkway station
 - New Pudsey station car park expansion
 - Morley Station car park expansion
 - Horsforth Station car park expansion
 - A61(N) Bus Corridor enhancements
 - A58 (N) Bus Corridor enhancements
 - A64 Bus Corridor enhancements
 - A639 Bus Corridor enhancements
 - A61(S) Leeds Wakefield Bus Corridor
 - A653 Leeds Dewsbury Corridor
 - A62 Bus Corridor enhancements
 - A58 (S) Bus Corridor enhancements
 - A647 Leeds Bradford Corridor
 - A65 Bus Corridor enhancements

¹⁹ This will include consideration of a number of potential locations including the previously identified sites at Bodington, Alwoodley and Grimes Dyke.

- A660 Bus Corridor enhancements
- Transport hubs and gateways:
 - Leeds City station
 - Leeds bus station
 - Corn Exchange
 - o Headrow
 - o Albion St
 - o Infirmary St
 - o Woodhouse La
 - Cross Gates
- Cycle Superhighway: Leeds Shadwell
- Cycle Superhighway: Morley Moortown
- Cycle Superhighway: Morley Middleton
- Cycle Superhighway: Leeds Wakefield
- Cycle Superhighway: Leeds Outer Ring Road Corridor
- Leeds Core Cycle Network

7 Conclusions

- 7.1 This report summarises the forecast impacts of the proposed developments in the Site Allocations Publication Draft Plan on the transport network in Leeds.
- 7.2 The population of Leeds is forecast to increase by 14% between 2012-28 and alongside increased car ownership it is considered that this will result in an increase in traffic of between 14-24% across the District. Past trends, however, suggest that traffic growth has tended to be well below forecasts, particularly in the peak hours, and so these figures must be regarded as a worst case scenario.
- 7.3 Nevertheless a significant step change in transport investment is planned across the city and the wider city region to support the economic growth of Leeds, provide good alternatives to the private car and to reduce carbon emissions. Schemes prioritised in the West Yorkshire Plus Transport Fund, together with existing major transport schemes such as City Connect and Kirkstall Forge station, represent an investment of £570M. On top of this, DfT have earmarked £173.5M towards improvements to public transport alongside investment by First Group in new buses while Highways England and the rail

industry are also investing in additional capacity on the strategic road and rail networks.

- 7.4 In addition to these projects, a number of further interventions have been identified to mitigate the forecast impacts of growth at key junctions across the Leeds highway network. It is expected that contributions will be obtained from developers towards the delivery of these interventions, alongside contributions towards schemes within the WYPTF.
- 7.5 As well as sites that have a direct impact upon specific junctions, sites have also been identified where the additional traffic generations are lower, but in combination with other sites have a cumulative impact at these junctions and along corridors. It is expected that contributions will also be obtained from these sites to support appropriate improvements.
- 7.6 It is proposed that support for public transport, walking and cycling schemes will mainly but not exclusively be sought through the Community Infrastructure Levy together with the Leeds Public Transport Investment Programme.

APPENDIX 1

Analysis of Congestion 'Hotspots' in Leeds District

CONGESTION 'HOTSPOTS' IN LEEDS

Executive Summary

1. A comprehensive analysis of congested junctions across Leeds District has been undertaken. In total 96 junctions have been evaluated. The use of TrafficMaster data has enabled the average delay for each approach to be determined for seven time periods during an average term time weekday. The resulting outputs have enabled the junctions to be ranked on the basis of total delay.

Introduction

- 2. The Department for Transport (DfT) provide all local authorities with data on vehicle travel times that has been collected from vehicles with GPS devices. This information is currently supplied to the DfT by TrafficMaster and allows average journey times and speeds to be analysed by individual road and time of day.
- Leeds City Council officers have undertaken a detailed analysis of radial and orbital routes in Leeds for the academic years 2009-10 and 2011-12 (weekdays excluding school holidays). This shows that the highest levels of peak congestion in 2011-12 occurred on the A61 N, M621 E, A62, A647, A65 (between Rawdon and the Inner Ring Road) and the A660.
- 4. As a follow up to this route analysis further work has been undertaken to quantify delays at individual junctions using the 2011-12 data. A total of 96 junctions across Leeds District have been analysed to determine average delays. These junctions were selected on the basis of officer knowledge supported by a review of the radial/orbital average speed plots and also online data from Google Traffic.
- 5. In the light of the analysis it is clear that a number of the 96 junctions only suffer from very marginal levels of congestion while others are severely congested. Total junction delays summed across all approaches during both the morning and evening peak hours range from 0.5 minutes to just under 23 minutes. It must be recognised that these figures represent an average over all term time weekdays and over full hours. Delays at the peak of the peak are likely to be much greater, however, this analysis does provide a robust evaluation of congestion on a comparable basis that allows future interventions to be targeted at locations with the greatest need.
- 6. Junctions within Leeds City Centre have not been included; the only exceptions being Domestic Rd/Domestic St and Woodhouse Lane/Clay Pit Lane. Junctions within this area will all be affected by the proposed WYPTF City Centre Package.
- 7. TrafficMaster data was utilised for weekdays during 2011-12 (September-July), excluding bank holidays and school holidays, and covering seven time periods:
 - A1 0700-0800
 - A2 0800-0900
 - A3 0900-1000
 - IP 1000-1600
 - P1 1600-1700
 - P2 1700-1800
 - P3 1800-1900
- 8. For each junction data was extracted for each approach going back as far as the previous significant junction usually a roundabout or signals. This was

subsequently reviewed to ensure that this didn't include any notable intermediate congestion points. The average distance covered per approach was just under one kilometre, although some were significantly shorter.

- 9. Once journey time had been extracted the level of 'congestion delay' was determined for each approach and time period. This approach was developed for the radial and orbital route analysis and is calculated by comparing travel times with daytime 'free-flow' times (determined from the minimum observed times for each highway segment between 7 a.m. and 7 p.m.). This provides a representative figure for uncongested travel and is considered more appropriate than using night-time or inter-peak data.
- 10. In order to rank the sites the congestion delay outputs were summed to obtain the total level of delay on all approaches to each junction during the morning and evening peak hours. In addition, the total level of daytime (0700-1900) delay was also calculated. Two rankings were therefore derived: a peak hour and a 12 hour figure. In many cases the results were similar, but for some sites there were notable differences with 8 sites changing by more than 20 places.
- 11. In order to obtain a single ranking therefore, the peak hour and 12 hour delay data was added together (so that the peak hours were counted twice to give more emphasis to these time periods) and the resulting rank calculated. It must be emphasised that this is effectively a presentational tool and that junctions with lower levels of delay but higher traffic volumes may merit interventions more than other sites, where for example all the delay relates to minor arms.
- 12. In addition to the overall combined ranking an examination was also made of the sites to determine whether there were junctions with perhaps one approach that suffers from excessive levels of delay while the others are relatively congestion free. A threshold of a 2 minute peak hour delay or an 8 minute daytime (12 hour) delay was utilised for this these represent the top 10% of individual delays. This identified 14 junctions outside the top 30 with this level of delay on at least one approach.

Analysis Results

13. Table 1 lists the sites ranked within the top 30 (based on the combined ranking). Seven of the top 10 are also within the top 10 in both the peak and 12 hour rankings.

Combined	Junction	Peak	12 hour	Peak	12 hour	Peak	12 hr
rank		delay	delay	rank	rank	delays >2	delays >8
		(mins)	(mins)			mins	mins
1	A6120 / A657 Rodley La	22.8	50.1	1	1	6	3
2	A647 / Ledgard Way	16.7	46.7	5	3	3	3
3	A660 / B6157 North La	13.4	48.5	8	2	2	2
4	Armley Gyratory	19.1	41.8	2	4	3	2
5	A6110 / A62 Gelderd Rd, Wheatsheaf	17.3	37.4	3	6	3	2
6	Burley Rd / Cardigan Rd	15.8	38.1	6	5	3	2
7	A6120 / A65 Rawdon Rd, Horsforth	16.7	33.6	4	8	3	2
8	A58 / Harehills Rd	8.4	36.5	17	7	2	2
9	A660 / B6157 Shaw La	12.8	29.7	9	11	2	2
10	Wetherby Rd / Princes Ave, Oakwood	12.8	29.7	10	12	2	1
11	A660 / Hyde Park Rd	7.1	32.4	25	9	1	1
12	B6157 Leeds & Bradford Rd / Wyther La	13.6	25.8	7	13	3	1
13	A659 / B6451 Clapgate, Otley	6.7	31.4	28	10	0	2
14	A58 / B6159 Harehills La, Fforde Green	8.3	25.7	18	14	1	1
15	A650 / A643 Bruntcliffe La, Morley	11.9	21.7	11	16	2	0
16	A6120 / A58 Wetherby Rd	11.5	20.3	12	21	2	1
17	A61 / B6159 Potternewton La	11.2	19.9	13	22	3	0
18	B6157 Kirkstall La / Morris La	7.8	21.6	20	17	1	1
19	M1 (J44) / A639 Leeds Rd, Rothwell	10.0	18.3	14	27	2	1
20	A6120 / A647, Dawsons Corner	7.0	20.7	27	19	0	1
21	Harrogate Rd / B6159 Harehills La	6.4	21.2	33	18	0	0
22	A653 / Ring Rd Beeston Park	6.6	20.6	30	20	1	0
23	A647 / B6154 Galloway La	9.3	17.8	15	29	3	0
24	A64 / B6159 Harehills La	4.9	22.0	47	15	0	2
25	B6157 Stonegate Rd / King La	8.0	18.6	19	26	1	1
26	A65 / Willow Rd	7.6	18.7	22	25	1	1
27	A61 / A659 (E), Harewood	7.4	18.8	23	24	1	1
28	A62 / B6126 Asquith Ave, Gildersome	8.5	16.8	16	33	2	0
29	A660 / A658, Dyneley Arms	7.1	17.7	26	30	0	0
30	Harrogate Rd / Street La	4.3	19.5	54	23	0	0

Table 1 – Leeds Top 30 Congestion Hotspots (2011-12)

Note: Ranking based on total delay and takes no account of traffic levels. Combined ranking double counts peak hour delays to give more emphasis to these time periods.

- 14. Table 2 lists the sites ranked from 31 to 70. Four junctions fall outside the top 30 although they rank within it on the basis of either peak hour or 12 hour delays. This list contains all the remaining sites where peak or 12 hour delays exceed 2 and 8 minutes respectively on at least one approach. Figure 1 shows the locations of all the evaluated sites.
- 15. A number of the junctions in this evaluation have improvement schemes that are either currently being implemented or are planned. The vast majority, however, are constrained so that significant improvements would require third party land and or property demolition. Tables 3-5 provide comments for each site covering these points, with further detail being available in Appendix A.

Combined	Junction	Peak	12 hour	Peak	12 hour	Peak	12 hr
rank		delay	delay	rank	rank	delays >2	delays >8
		(mins)	(mins)			mins	mins
31	A658 / Bayton La, Yeadon	6.2	17.2	34	32	0	0
32	A61 / Alwoodley La	6.1	16.7	35	34	0	0
33	A647 / Richardshaw La, Pudsey	5.3	17.4	41	31	0	0
34	A6120 / B6159 Selby Rd, Colton	7.6	13.8	21	43	0	0
35	B6155 Lidget Hill / B6154 Church La, Pudsey	3.1	18.2	66	28	0	0
36	Station Rd / Long Row, Horsforth	6.0	15.2	37	38	0	0
37	A63 / B6137 Lidgett La, Garforth	5.2	15.8	42	35	0	1
38	A650 / Common La, East Ardsley	5.3	15.6	40	36	0	0
39	A61 / Sharp La, Robin Hood	7.2	13.5	24	45	2	0
40	A6029 / A650 / B6127 Bridge St, Morley	6.6	13.8	31	42	1	0
41	A650 / Thorpe La, Tingley	5.7	14.5	39	41	0	0
42	A642 / B6137 Main St, Garforth	4.8	14.7	50	40	0	0
43	M621 (J7) / A61 / A639, Stourton	6.4	13.1	32	47	2	0
44	A65 / Oxford Rd, Guiseley	4.1	15.4	58	37	0	0
45	A6120 / A660 Otley Rd, Lawnswood	6.0	13.2	36	46	0	0
46	A6120 / Low La, Horsforth	6.6	12.5	29	50	1	0
47	A65 / B6153 Park Rd, Guiseley	4.1	14.8	57	39	0	0
48	A65 / Kirkstall La	4.9	13.7	45	44	0	0
49	A6120 / A61 Harrogate Rd, Moortown	5.9	11.8	38	52	1	0
50	A6120 / A64 York Rd	4.3	12.7	55	48	1	0
51	A61 / Wood La, Rothwell	5.2	11.7	43	53	1	0
52	M62 (J28) / A653 / A650, Tingley	4.9	11.9	48	51	0	0
53	A6120 / King La	4.9	11.4	46	54	0	0
54	A6120 / A64 Barwick Rd	5.1	10.8	44	58	0	0
55	Shadwell La / Wike Ridge La, Shadwell	3.1	12.6	68	49	0	0
56	A61 / A659 (W), Harewood	4.4	11.1	53	56	1	1
57	B6159 / Primrose La, Halton	4.1	11.2	56	55	1	0
58	A65 / A658 Green La, Rawdon	4.6	10.3	51	60	0	0
59	A61107 A58 Whitehall Rd, Ringways	4.8	9.8	49	62	0	0
60	B6126 Brunswick St / B6127 Chapel Hill, Moriey	3.1	11.1	6/	57	0	0
61	A61107 Millisnaw Rd / White Rose (N)	3.9	10.3	59	61	0	0
62	AC1 / Herrogate Dd	3.3	10.4	65	59	0	0
63	ACI / Hallogale Ku	3.8	9.0	61	64	1	0
64	A6397 B0481 POILEITACL RU	3.4	9.7	04 52	03 72	1	0
60	AGIIU / AG45 Elialiu Ru (5)	4.4	0.1	52 62	75	1	0
67	AG028 / BG153 Dark Rd, Guicolou	3.4 2 E	9.0 0 E	60 61	60	0	0
60	A61 / A654 Leadwell La Pobia Hood	3.5	0.0	60	69 67	0	0
00	A661 / Boston Rd / High St Wetherby	3.0	9.0	09 91	65	0	0
70	A642 / Bullerthorne La Woodlesford	2.2	9.4 Q /	70	05	1	0
70	none i bullettiloipe La, wooulesioiu	2.0	0.4	70	70	L 1	0

Table 2 – Leeds Congestion Hotspots 31-70 (2011-12)

Note: Ranking based on total delay and takes no account of traffic levels. Combined ranking double counts peak hour delays to give more emphasis to these time periods.



Combined	Junction	Description	Schemes
rank			
1	A6120 / A657 Rodley La	Roundabout. Unconstrained site	Pinch Point signalisation (open 2015)
2	A647 / Ledgard Way	Signalled junction. Very constrained site	Leeds-Bd Corridor (WYPTF)
3	A660 / B6157 North La	Signalled junction. Severely constrained site	
4	Armley Gyratory	Signalled gyratory. Very constrained site	City Centre Package (WYPTF)
5	A6110 / A62 Gelderd Rd, Wheatsheaf	Signalled junction. Very constrained site.	A6110 (WYPTF)
6	Burley Rd / Cardigan Rd	Signalled junction. OB bus lane. Very constrained site	
7	A6120 / A65 Rawdon Rd, Horsforth	Roundabout. Very constrained site	Signalisation (open 2015)
8	A58 / Harehills Rd	Signalled junction. OB bus lane. Severely constrained site	
9	A660 / B6157 Shaw La	Signalled junction. IB bus lane. Very constrained site	
10	Wetherby Rd / Princes Ave, Oakwood	Signalled junction. Very constrained site	
11	A660 / Hyde Park Rd	Signalled junction. OB bus lane. Severely constrained site	
12	B6157 Leeds & Bradford Rd / Wyther La	Signalled junction. Very constrained site	Small impt linked to a devt
13	A659 / B6451 Clapgate, Otley	Signalled junction. Severely constrained site	Otley Relief Rd
14	A58 / B6159 Harehills La, Fforde Green	Signalled junction. IB HOV Lane. Very constrained site	
15	A650 / A643 Bruntcliffe La, Morley	Signalled junction. Constrained site	MOVA
16	A6120 / A58 Wetherby Rd	Roundabout. Unconstrained site	ELOR (WYPTF)
17	A61 / B6159 Potternewton La	Roundabout. IB/OB guideways. Constrained site	
18	B6157 Kirkstall La / Morris La	Signalled junction. Constrained site	Scheme linked to adjacent development
19	M1 (J44) / A639 Leeds Rd, Rothwell	Roundabout. Unconstrained site	HE Pinch Point signalisation (open 2015)
20	A6120 / A647, Dawsons Corner	Signalled gyratory. Constrained site	Feasibility study ongoing
21	Harrogate Rd / B6159 Harehills La	Signalled junction. Very constrained site	
22	A653 / Ring Rd Beeston Park	Signalled junction. Very constrained site. Improved 2011	
23	A647 / B6154 Galloway La	Roundabout. Very constrained site.	Pinch Point signalisation (open 2015)
24	A64 / B6159 Harehills La	Signalled junction. IB bus la & OB guideway. Very constrained site	
25	B6157 Stonegate Rd / King La	Roundabout. Constrained site.	ELOR/ORR improvement (WYPTF)

Combined	Junction	Description	Schemes
rank			
26	A65 / Willow Rd	Signalled junction. OB bus lane. Very constrained site. QBC 2012	
27	A61 / A659 (E), Harewood	Signalled junction. Very constrained site	
28	A62 / B6126 Asquith Ave, Gildersome	Signalled junction. Constrained site	Improvement associated with development
29	A660 / A658, Dyneley Arms	Signalled junction. Unconstrained site	Feasibility study ongoing
30	Harrogate Rd / Street La	Signalled junction. Very constrained site	MOVA scheme?
31	A658 / Bayton La, Yeadon	Signalled junction. Constrained site	LBIA Link Rd (WYPTF)
32	A61 / Alwoodley La	Signalled junction. Very constrained site	
33	A647 / Richardshaw La, Pudsey	Signalled junction. Very constrained site.	
34	A6120 / B6159 Selby Rd, Colton	Roundabout. Constrained site.	ELOR (WYPTF)
35	B6155 Lidget Hill / B6154 Church La, Pudsey	Signalled junction. Severely constrained site	
36	Station Rd / Long Row, Horsforth	Roundabout. Very constrained site	
37	A63 / B6137 Lidgett La, Garforth	Signalled junction. Very constrained site	Possible bypass linked to housing site
38	A650 / Common La, East Ardsley	Signalled junction. Constrained site	
39	A61 / Sharp La, Robin Hood	Signalled junction. Constrained site	
40	A6029 / A650 / B6127 Bridge St, Morley	Signalled gyratory. Very constrained site	
41	A650 / Thorpe La, Tingley	Signalled junction. Unconstrained site	
42	A642 / B6137 Main St, Garforth	Signalled junction. Very constrained site	Minor improvement scheme
43	M621 (J7) / A61 / A639, Stourton	Roundabout. Partly signalled. Constrained site.	SB off slip widening (HE)
44	A65 / Oxford Rd, Guiseley	Signalled junction. Severely constrained site	Addition of pedestrian phase
45	A6120 / A660 Otley Rd, Lawnswood	Roundabout. Constrained site.	
46	A6120 / Low La, Horsforth	Roundabout. Constrained site	
47	A65 / B6153 Park Rd, Guiseley	Signalled gyratory. Very constrained site	
48	A65 / Kirkstall La	Signalled junction. OB bus lane. Very constrained site. QBC 2012	
49	A6120 / A61 Harrogate Rd, Moortown	Roundabout. Constrained site.	ELOR/ORR improvement (WYPTF)
50	A6120 / A64 York Rd	Roundabout. Constrained site.	ELOR (WYPTF)

Combined	Junction	Description	Schemes
rank			
51	A61 / Wood La, Rothwell	Signalled junction. Unconstrained site	OB bus lane (open 2016)
52	M62 (J28) / A653 / A650, Tingley	Signalled gyratory. Constrained site	HE scheme
53	A6120 / King La	Roundabout. Part signals. Constrained site.	ELOR/ORR improvement (WYPTF)
54	A6120 / A64 Barwick Rd	Roundabout Constrained site.	ELOR (WYPTF)
55	Shadwell La / Wike Ridge La, Shadwell	Signalled junction. Very constrained site	
56	A61 / A659 (W), Harewood	Priority junction. Unconstrained site	
57	B6159 / Primrose La, Halton	Signalled junction. OB bus lane. Very constrained site	
58	A65 / A658 Green La, Rawdon	Roundabout. Constrained site.	
59	A6110 / A58 Whitehall Rd, Ringways	Roundabout. Constrained site	A6110 (WYPTF)
60	B6126 Brunswick St / B6127 Chapel Hill, Morley	Signalled junction. Severely constrained site	
61	A6110 / Millshaw Rd / White Rose (N)	Roundabout. Constrained site.	A653 Leeds-Dewsbury corridor (WYPTF)
62	B6157 North La / Cardigan Rd	Signalled junction. Severely constrained site	
63	A61 / Harrogate Rd	Roundabout. Very constrained site	ELOR/ORR improvement (WYPTF)
64	A639 / B6481 Pontefract Rd	Signalled junction. Constrained site	
65	A6110 / A643 Elland Rd (S)	Roundabout. Constrained site.	A6110 (WYPTF)
66	A64 / B6159 Selby Rd, Halton Dial	Signalled junction. IB & OB guideways. Very constrained site	
67	A6038 / B6153 Park Rd, Guiseley	Priority junction. Constrained site.	
68	A61 / A654 Leadwell La, Robin Hood	Signalled junction. Constrained site	
69	A661 / Boston Rd / High St, Wetherby	Mini roundabout. Very constrained site	
70	A642 / Bullerthorpe La, Woodlesford	Priority junction. Very constrained site	

Appendix A - Interventions and Constraints

Definitions

This appendix attempts to classify congestion hotspots based on how constrained they may be by their location in terms of potential for unlocking capacity through widening, enlarging or relocating the junction. By nature, these definitions are subjective, but the following give an indication of the criteria considered.

Unconstrained:-

• There appears to be undeveloped land available (whether highway or otherwise) on most or all approaches to allow additional lanes to be added or the junction repositioned or enlarged.

Constrained:-

- There is retail or civic activity around the junction, high pedestrian flows and/or loading requirements, which could affect the potential for improvement.
- There is non-highway land adjacent to the junction and approaches which could be utilised, but the effect of the land take on the property is likely to be undesirable, e.g. removes car parking, landscape buffers etc.

Very constrained

- There are buildings or engineering/ environmental constraints which make it quite uncertain whether an improvement is deliverable. Land take will be required.
- The junction has buildings in proximity to the junction or approaches, but they are set back and/or appear to be of lower intrinsic value to the function and quality of the local area, and hence there could be a medium to term long prospect of redevelopment (leading to a potential improvement line).

Severely constrained:

- The junction is surrounded by buildings which are an integral part of the character or function of the area and which presently seem very unlikely to be demolished.
- The junction in very close proximity to one or more structures or topographical features, such as railway lines, rivers or environmental features which would appear to prevent substantial modification to the junction.

Junction Assessment

1) A6120 / A657 Rodley Lane (roundabout)

Unconstrained. Although there is development to the south and east of the junction, there is enough room to realign Rodley Lane (west arm) and the Ring Road (north) arm to provide a 'staggered' junction arrangement.

2) A647 / Ledgard Way (signalled junction)

Very constrained. The north and east arms have some prospect for widening, although the latter would have a greater impact and may ultimately not be deliverable without demolition. The south arm is tightly constrained between property whilst the west arm has softer constraints (bowls club lawn and off-street car parking). There are pedestrian facilities, and pedestrian demand, which will constrain improvements.

3) A660 / B6157 North Lane (signalled junction)

Severely constrained. At the heart of the thriving Headingley Centre, with very high pedestrian footfalls and buildings at or close to the back of footway. Ideally footways would be wider, and better cycle facilities provided, meaning that there is already significant pressure on accommodating non-motorised users in the event that more space did become available.

4) Armley Gyratory (signalled gyratory)

Very constrained. Presence of railway viaducts to the north and southeast, and major gas plant within the gyratory mean that this otherwise large site has design limitations. The relocation of gas facilities would however help release opportunities. There is also some open space to the west, but the junction with the B6154 could constrain if this can be effectively used. The B6154 alignment, status etc could be reviewed.

5) A6110 / A62 Gelderd Road, Wheatsheaf (signalled junction)

Very constrained. There is some heavy electrical plant (substation?) to the southwest, which limits potential improvement lines to the adjacent M621 junction. New buildings to the east, including car showrooms on the northeast corner, limit the amount of widening which can be provided. To the west of the junction are low density industrial buildings with a degree of set back from the highway, which could offer some junction improvement potential. The proximity of the M621 junction 1 is an operational constraint which further constrains workable schemes.

6) Burley Road / Cardigan Road (signalled junction)

Very constrained. Although there is open space to the southeast, the railway bridge to the west and residential properties fronting the north arm effectively limit any potential improvement as they result in single lane approaches and exits on the west and north arms. Significant demolition or detrimental acquisition of private land would be required on the north arm. The small property on the southwest corner could potentially provide some scope for capacity improvements.

7) A6120 / A65 Rawdon Road, Horsforth (roundabout)

Very constrained. Although there is open space to the west, the skewed geometry of the approach roads and the location of housing and a petrol filling station on the A65 south arm limits the scope for enhancement.

8) A58 / Harehills Road (signalled junction)

Severely constrained. At the heart of a busy local centre with high pedestrian flows, demand for loading and retail premises on all corners of the junction. The only prospect for widening appears to be land take of private forecourts on the northwest side of the A58, but this will have impacts on the amenity of the area and on the properties concerned. All other locations are severely constrained by properties at or close to the highway boundary.

9) A660 / B6157 Shaw Lane (signalled junction)

Very constrained. High pedestrian and cycle flows. The NGT scheme is planning a capacity improvement to the junction through minor localised widening to accommodate pedestrian crossing islands on the side roads. A more substantial scheme would impact on the existing service access road for the shops on the northwest side, remove mature trees which are a key part of the streetscape, acquire front garden and could require demolition of retail property.

10) Wetherby Road / Princes Avenue, Oakwood (signalled junction)

Very constrained. Although, in theory, there is scope for widening on the northwestern (Princes Avenue) and northeastern (Wetherby Road) approaches, the impact on mature trees and good quality open space is likely to make any improvement line challenging to justify and difficult to deliver. The bustling local centre on Roundhay Road has high pedestrian demands, kerbside parking and loading and street activity and would make any further carriageway widening improbable, especially given that there are already three lanes at the stop line and the Gledhow Lane junction interferes with eastbound flow on Roundhay Road. Oakwood Lane is very constrained, with side turnings and premises on each side of the road.

11) A660 / Hyde Park Road (signalled junction)

Severely constrained. The junction is surrounded on three corners by retail premises, with generally narrow footways and moderately high pedestrian demands. Given the high cycle flows and lack of cycle lanes through the junction, it is already considered to be sub-optimal. The junction of Victoria Road to the northwest can impact on traffic progression through the junction. The NGT scheme is proposing to improve the junction by banning turns and accommodating these using the adjacent junctions. This scheme should release capacity and enable a shorter cycle time and it also signalises Victoria Road. Any further enhancement for capacity does not seem likely.

12) B6157 Leeds & Bradford Road / Wyther Lane (signalled junction)

Very constrained. The junction is on a bridge straddling twin track railway lines and the River Aire which effectively prevents any widening on all three approaches. Wyther Lane is restricted to one lane each way unless some land is acquired and property demolished from the premises to the east of the Wyther Lane / Broad Lane junction. East of the River Aire there is scope to widen to the south side but this will impact on a tree belt between the road and playing fields. In the long term, capacity improvement is not out of the question, but there are significant obstacles requiring a significant investment.

13) A659 / B6451 Clapgate, Otley (signalled junction)

Severely constrained. The junction is surrounded by retail premises in the heart of Otley, with high pedestrian flows and narrow footways. Clapgate itself also has near right-angle bends in it, reducing the effective ability of the road to deliver higher flows through a signal junction. There is no scope for further capacity enhancement through road widening.

14) A58 / B6159 Harehills Lane, Fforde Green (signalled junction)

Very constrained. Adjacent to A58 / Harehills Road (number 8 above), this junction also has retail premises on all four corners of the junction. Some widening may be possible through the acquisition of private forecourts. Some widening on Harehills Lane (south) could be possible through land acquisition, but this will affect off-street parking for businesses and is not an easy option.

15) A650 / A643 Bruntcliffe Lane, Morley (signalled junction)

Constrained. The three houses on the northwest corner could present a significant obstacle to enlarging the junction, but on each arm there appears to be some scope for widening either within the highway or by taking private land (typically car parking), but with no further demolition. There may be an opportunity to protect an improvement line at this junction.

16) A6120 / A58 Wetherby Road (roundabout)

Unconstrained. Although there is no room to widen on the A58 (North) arm without acquiring private gardens, with an impact on trees, there is scope to realign the whole junction southwestwards, and scope to widen and realign the other three approaches.

17) A61 / B6159 Potternewton Lane (roundabout)

Constrained. Potternewton Lane to the west cannot be widened without acquiring gardens. Widening on Scott Hall Road (north arm) may require removal of the guided busway and an impact on mature trees lining the street. To the east and south there is scope for widening into the open space.

18) B6157 Kirkstall Lane / Morris Lane (signalled junction)

Constrained. Widening opportunities exist on the eastern side of Morris Lane at and south of the junction and on the southern side of Kirkstall Lane west of the junction, through land acquisition. However, widening opportunities are limited on the other two arms – the eastern arm possibly allowing a short flare although the impact on the houses north of the road could be too significant. These limitations mean that it appears unlikely, upon initial inspection, that a step-change improvement in capacity could be realised without acquiring property, unless pedestrian crossing islands can be accommodated to replace the 'all-red' stage with walk-with-traffic.

19) M1 (J44) / A639 Leeds Rd, Rothwell (roundabout)

Unconstrained. Although the Motorway and overbridge are a constraint, there appears to be enough open land around the junction to the north and south to facilitate capacity improvements over and above the Pinch Point signalisation scheme recently implemented by the Highways Agency.

20) A6120 / A647, Dawsons Corner (signalled roundabout)

Constrained. There is open space to the southwest – where the dominant flow movements are – and some scope for acquiring land each side of the Ring Road. However, to the south there is the Bradford railway line which restricts widening on the northbound approach, plus property on the northwest and southeast corner.

21) Harrogate Road / B6159 Harehills Lane (signalled junction)

Very constrained. Although there are few properties hard up against the footway, the prospect for widening is limited as the buildings are in relatively close proximity to the highway on all arms except for Harehills Lane, and the impact of land take on the settings of the properties would appear to be significant. The junction operation is likely to be constrained by the adjacent junctions, meaning that the likelihood of significant operational gains is low.

22) A653 / Ring Road Beeston Park "Tommy Wass" (signalled junction)

Very constrained. The junction was upgraded in 2011. Opportunities for further capacity enhancements appear limited given the location of the Tommy Wass public house right on the corner and requirement for private forecourts and gardens to achieve any improvement line.

23) A647 / B6154 Galloway Lane "Thornbury Barracks" (roundabout)

Very constrained. Signalisation scheme on site. Housing on three sides, front gardens would be required for any widening on the approaches or enlargement of the roundabout. An improvement scheme would be more likely with redevelopment of the Barracks site fronting the roundabout.

24) A64 / B6159 Harehills Lane (signalled junction)

Very constrained. The junction already has banned turns and additional lanes on the approaches, and further improvement looks difficult to accommodate because of buildings on the southeast side of the junction. There is already a two-lane left turn out of Harehills Lane.

25) B6157 Stonegate Road / King Lane (roundabout)

Constrained. The King Lane (north) approach has scope for significant widening, but the junction configuration to the south and east constrains options, as it is effectively a 5 arm junction. Residential and church properties and mature trees surround the junction, meaning that, environmentally, the footprint of any junction improvement scheme is likely to be restricted.

26) A65 / Willow Road (signalled junction)

Very constrained. Although there is some open space to the north/east of the junction, effective alignments are constrained by the Harrogate Line viaduct across the A65 immediately to the west and properties had up against the sides of Viaduct Road to the south. The latter constraints could in the medium to long term be overcome if redevelopment takes place.

27) A61 / A659 (E), Harewood (Signalled junction)

Very constrained. The junction is surrounded by the old boundary walls to Harewood House and high quality residential boundaries of mature hedges and trees, at the current main entrance to Harewood House. Land take from gardens would be required to enhance the junction and it does not appear to be possible without a significant detrimental effect on the locality and residents.

28) A62 / B6126 Asquith Avenue, Gildersome (signalled junction)

Constrained. There is undeveloped land or commercial car parking which could be utilised to widen three of the four approaches, whilst the fourth approach (Branch End) is restricted particularly by a few terraced properties on the southwestern side.

29) A660 / A658, "Dyneley Arms" (signalled junctions)

Unconstrained. There is open space to the east and south which could be used to realign the A658, if widening is unacceptable on the A660 west arm south of the Dyneley Arms, because of the mature trees present.

30) Harrogate Road / Street Lane (signalled junction)

Very constrained. The junction is surrounded by retail and residential property, with reasonably high pedestrian flows and servicing requirements. In theory some widening of the approaches could be possible with land take from forecourts and front gardens, but in practice this seems unlikely to be tenable.

31) A658 / Bayton Lane, Yeadon (signalled junction)

Constrained. The A658 south arm is constrained away from the junction by property on each side of the road, although widening at the junction entry may be practical (with private land take). On the remaining three arms, some road widening may be possible using private land (car parking, front gardens) with an impact on a row of mature trees on the A658 (north) arm.

32) A61 / Alwoodley Lane (signalled junction)

Very constrained. The A61 (N) arm is flanked closely by property which makes any widening impossible without significant acquisition and demolition. The remaining arms can only be widened by encroaching into private gardens, with a significant impact on established boundaries including hedges and mature trees. The eastern arm looks tight for space which is also likely to impact on potential improvement schemes.

33) A647 / Richardshaw Lane, Pudsey (signalled junction)

Very constrained. The junction is already grade separated. Properties on the south and north side of the junction, coupled with the width of the A647 overbridge, mean that the scope for improvement is limited.

34) A6120 / B6159 Selby Rd, Colton (roundabout)

Constrained. Although there is scope to widen both arms of the A6120 without property demolition, the two minor arms of B6159 Selby Road and Colton Lane – coupled with the property on the western corner – make significant capacity increases challenging (though not impossible). Widening of the eastern arm of the A6120 is likely to impact on mature trees in the bank of trees on the south side. It may be possible to reduce capacity of the minor arms and give it to the major arms (the B6159 was the A63 but has not been provided for by the East Leeds Link Road).

35) B6155 Lidget Hill / B6154 Church Lane, Pudsey (signalled junction)

Severely constrained. Significant property surrounds the junction, close to the trafficked highway, on three corners, restricting any potential improvement to redevelopment of the western corner and the potential to realign the highway to create a staggered junction. It is in the middle of a retail area with moderately high footfall.

36) Station Road / Long Row, Horsforth (roundabout)

Very constrained. A five arm roundabout in a suburban area with retail activity. Enlargement of the roundabout is restricted by adjacent buildings. The most likely opportunity for enhancing capacity could come from closing the two minor arms (St Margaret's Road and Brownberrie Avenue) and possibly signalising it.

37) A63 / B6137 Lidgett Lane, Garforth (signalled junction)

Very constrained. There appears to be some scope for widening the A63 on the public highway, but the presence of property right on the northeast corner and south side opposite it effectively make it unlikely without acquiring residential property.

38) A650 / Common Lane, East Ardsley (signalled junction)

Constrained. On the A650, there is scope for widening on both approaches; whilst on the western minor arm there is scope for a slight realignment and widening at the mouth to accommodate a pedestrian crossing island, using green space. However, the Country Baskets mill building and housing mean that there is no prospect of any widening or realignment on the northern minor arm. There are retail premises to the south with off-street parking and road widening could impact on these, making a substantial improvement scheme challenging.

39) A61 / Sharp Lane, Robin Hood (signalled junction)

Constrained. It appears possible to widen on all approaches without property demolition, although to do so will require land outside the highway boundary and (depending on the design) could affect mature trees, the edge of some allotments and on-street parking. There is a war memorial on the southwest corner which will need to be considered and it is too early to say whether this would be adversely affected.

40) A6029 / A650 / B6127 Bridge Street, Morley (signalled gyratory)

Very constrained. Surrounded by property on all sides, although some of the buildings are set back. There is a potential improvement line if the property to the north of the A650 is redeveloped, notably to get a better two lane approach on the B6127 (north) arm.

41) A650 / Thorpe Lane, Tingley (signalled junction)

Unconstrained. Although there is housing on the south side, the north side is open fields, with scope for enlarging the junction. The staggered side road Smithy Lane could also possibly be widened through land acquisition from the adjacent Primary School.

42) A642 / B6137 Main St, Garforth (signalled junction)

Very constrained. There is an opportunity to realign the A642 west of the junction and Barrowby Lane (north arm) to create a staggered junction, which could release capacity. However, the B6137 Main Street is tightly constrained between buildings, as is the eastern arm of the A642. These latter constraints will constrain the overall benefit of a significant junction improvement.

43) M621 (J7) / A61 / A639, Stourton (part-signalised roundabout-style junction)

Constrained. Although there is open space around most of the roundabout, there are constraints created by the adjacent railway, the freight terminal access location and the retaining wall on the northbound on-slip. In addition, the M621 overbridges themselves create a constraint which would be very expensive to replace or modify. The NGT scheme is proposing amendments to the junction which will accommodate extra traffic.

44) A65 / Oxford Road, Guiseley (signalled junction)

Severely constrained. There are properties close to the road on all corners of the junction in this local centre. Upon initial inspection there appears to be no realistic prospect for any enlargement of the junction.

45) A6120 / A660 Otley Road, Lawnswood (roundabout)

Constrained. The NGT scheme is proposing to upgrade the junction by signalising it and amending the geometry. Any further enlargement of the junction is constrained on the northwest former by housing, but enlargement on the remaining corners may be possible with land take, noting impact on mature trees and school grounds.

46) A6120 / Low Lane, Horsforth (roundabout)

Constrained. The junction is loosely surrounded by development, but the A6120 can be widened on its approaches. A larger roundabout may be unrealistic without property acquisition and demolition, but a signalled junction may be practical with land take on the east sides of both minor arms.

47) A65 / B6153 Park Rd, Guiseley (signalled gyratory)

Very constrained. Skew railway line passes underneath the junction and there are properties around the junction which constrain potential improvement lines.

48) A65 / Kirkstall Lane (signalled junction)

Very constrained. Property is very close or abuts three approaches to the junction, whilst the fourth (eastern) arm is on a gradient. The operation is restricted by the adjacent signals gaining access to Morrisons.

49) A6120 / A61 Harrogate Rd, Moortown (roundabout)

Constrained. There is a churchyard on the northeastern corner and the Scott Hall Road / Harrogate Road junction is in close proximity. There are significant banks of mature trees and retail premises on the south arm close to the highway. There is scope for some highway widening.

50) A6120 / A64 York Rd (roundabout)

Constrained. The York Road / North Parkway is close, and the two junctions' interaction will constrain capacity improvements. There are properties around the junction, although set back, meaning that improvement could be possible. The ELOR scheme will remove traffic from the junction.

51) A61 / Wood Lane, Rothwell (signalled junction)

Unconstrained. There are open fields to the west and south of the junction, meaning realignment and widening of both the A61 and Wood Lane is possible.

52) M62 (J28) / A653 / A650, Tingley (signalled gyratory)

Constrained. Housing and development to the south of the junction constrains any widening or realignment of the A653 and A650 approaches and to some extent the A650 also. Any scheme which affects the motorway overbridges will also jeopardise feasibility.

53) A6120 / King Lane (roundabout, part-signalled)

Constrained. Housing and development to the south and west, places side road accesses, places some constraints on any improvement scheme, although there is some open space to the north/east.

54) A6120 / A64 Barwick Road (roundabout)

Constrained. Although there is open space which could be used for a widening scheme, the housing and other development on Barwick Road and immediately south/east of the junction constrains potential alignment improvements. The ELOR scheme will remove traffic from this junction.

55) Shadwell Lane / Wike Ridge Lane, Shadwell (signalled junction)

Very constrained. Surrounded by housing and some retail, any enhancement to this junction looks like it would have a significant effect on surrounding property.

56) A61 / A659 (W), Harewood (priority junction)

Unconstrained. Although there is a house immediately south of the junction, the remainder of the frontage is open farmland and there is scope for realignment and widening. There is a

potential issue with the alignment of the A61, which is 'bendy' here, which could increase scheme costs and impacts.

57) B6159 / Primrose Lane, Halton (signalled junction)

Very constrained. There is development on all corners of the junction which prohibits a whole-scale upgrade, although some widening may be possible without building demolition through use of Lidl car parking and private land. The Selby Road east arm, however, can only be widened a short way because of the retail centre / buildings.

58) A65 / A658 Green Lane, Rawdon (roundabout)

Constrained. There is scope for widening and/or reconfiguring the junction, the main constraint seems to be a church building on the eastern corner. Land take would likely be required.

59) A6110 / A58 Whitehall Road, Ringways (roundabout)

Constrained. There is very little scope for widening without land take, but there are opportunities to enhance the junction through using car parking and other land around the junction.

60) B6126 Brunswick St / B6127 Chapel Hill, Morley (signalled junction)

Severely constrained. The junction is surrounded by buildings against the back of footway and the highway alignment and topography further make future (long term) prospects very limited.

61) A6110 / Millshaw Rd / White Rose (N) (roundabout)

Constrained. This five arm roundabout is constrained by houses to the east, topography and (to a lesser extent) office development to the west.

62) B6157 North Lane / Cardigan Road (signalled junction)

Severely constrained. On the edge of the Headingley retail area and adjacent to Headingley Stadium, this junction is surrounded by property close to the back of footway and there would appear to be no prospect of any increase in highway footprint.

63) A61 / Harrogate Road (roundabout)

Very constrained. The junction is surrounded by houses and is in close proximity to the A6120 / A61 junction, with retail businesses between the two junction. Whilst there may be some options to explore, the scope for junction enlargement or road widening is limited.

64) A639 / B6481 Pontefract Road (signalled junction)

Constrained. There could be some opportunities for acquiring adjacent land to enlarge the junction, with no demolition.

65) A6110 / A643 Elland Road (S) (roundabout)

Constrained. Although there is scope for widening and enlarging the junction, the alignment of the A643 is at a skew angle which will limit widening options.

66) A64 / B6159 Selby Road, "Halton Dial" (signalled junction)

Very constrained. The railway line and bridge immediately to the south is already a restriction on junction performance and operation, whilst the busier western arm of the A64 is flanked by housing, where some loss of bus lane or on-street parking would be required to facilitate any more traffic lanes.

67) A6038 / B6153 Park Road, Guiseley (priority junction)

Constrained. There is farmland to the south/southwest which could be used to turn the crossroads into a staggered junction to increase capacity. The width of the eastern (minor) and northern (major) arms look difficult to widen without impact on mature trees and private land.

68) A61 / A654 Leadwell Lane, Robin Hood (signalled junction)

Constrained. The Old Halfway House is right on the eastern corner of the junction. The western arm has property close to both sides. The northern arm could possibly be widened within the highway boundary, but widening of the southern arm will have an impact on adjacent properties (though without needing demolition).

69) A661 / Boston Rd / High St, Wetherby (mini-roundabout)

Very constrained. Immediately adjacent to the River Wharfe bridge, this four arm miniroundabout is within Wetherby's busy retail area and near areas of high pedestrian flow. Although there is only property on one side immediately next to the back of footway, the location of property in the vicinity (plus the river) restricts any potential for enlargement of the junction.

70) A642 / Bullerthorpe Lane, Woodlesford

Very constrained. The location of property around the junction and its placement next to the bridge over the River Aire means that the site is very constrained and forming multiple lanes on the A642 seems undeliverable. An extra lane on the minor arm could be achievable subject to visibility issues.

Appendix 2 – Site Requirements Register by Junction

Location	Site Requirements	Direct impact sites	Cumulative impact sites
A61/Alwoodley La	Direct contributions (1 site)	HG2-36	
A61/A6120 Moortown	Direct contributions (1 site)	HG2-36	
A61/Street La	Cumulative contributions (1 site)		HG2-36
A61/Potternewton La	No sites identified		
A6120/Shadwell La	No sites identified		
A6120/Roundhay Park La	No sites identified		
A58/A6120	No sites identified		
Roundhay Rd/Oakwood La (Oakwood Clock)	No sites identified		
A58/Harehills La (Fforde Green)	No sites identified		
A58 Barrack Rd/Chapeltown Rd	No sites identified		
A58 Clay Pit La/Meanwood Rd	Cumulative contributions (1 site)		HG2-99
A6120/Coal Rd/Ramshead App	No sites identified		
A64/Scholes La	No sites identified		
A64/A6120	No sites identified		
A64/Cross Gates Rd	No sites identified		
A64/B6159 Halton Dial	Cumulative contribution (1 site)		HG2-107

Table 1 : Sites Identified for Interventions

Location	Site Requirements	Direct impact sites	Cumulative impact sites
A64/Gipton Approach	No sites identified		
A64/Burmantofts St, Woodpecker junction	Cumulative contribution (1 site)		MX2-37
Barwick Rd/A6120	No sites identified		
Austhorpe Rd/A6120	No sites identified		
M1 Jn 46/A63 Colton	Contributions from East of Garforth site – subject to comprehensive transport study. Cumulative contributions (2 other sites)		MX2-38, HG2-120
M1 Jn 47/A642 Garforth	Direct contributions from Parlington and East of Garforth sites – subject to comprehensive transport studies. Cumulative contributions (1 site)	MX2-39, HG2-124	HG2-125
A63 Garforth southern bypass	Subject to comprehensive transport study for East of Garforth site. Cumulative contribution (1 site)	HG2-124	HG2-235
A63/A642 Old George rbt	Subject to comprehensive transport study for East of Garforth site. Cumulative contribution (1 site)	HG2-124	HG2-235
A63/B6137 Lidgett La	Subject to comprehensive transport study for East of Garforth site. Cumulative contribution (1 site)	HG2-124	HG2-235
A63/B6137 Leeds Rd	Subject to comprehensive transport study for East of Garforth site. Cumulative contribution (1 site)	HG2-124	HG2-235

Location	Site Requirements	Direct impact sites	Cumulative impact sites
A63/Ninelands La	Subject to comprehensive transport study for East of Garforth site. Cumulative contribution (1 site)	HG2-124	HG2-235
B6159/Chapel St Halton	No sites identified		
M1 Jn 45/A63 East Leeds Link Road	None – due to delivery of planned scheme		
A656/B6137 Longdike La	Subject to comprehensive transport study for East of Garforth site.	HG2-124	
A642/Bullerthorpe La	Cumulative contributions (1 site)		HG2-180
A639/B6481 Pontefract Rd	Cumulative contributions (1 site)		HG2-173
A61/A654 Leadwell La	Cumulative contributions (4 sites)		HG2-165, HG2-181, HG2-185, EG2-21
A61/Sharpe La	Cumulative contributions (3 sites)		HG2-165, HG2-181, HG2-185
A61/Wood Lane	Direct contributions (1 site) cumulative (4 sites)	HG2-173	HG2-165, HG2-174, HG2-181, HG2-185
M1 Jn 41/A650	Cumulative contributions (1 site)		HG2-171
M1 Jn 42/M62 Jn 29 Lofthouse	No sites identified		
A650/Common La	Direct contributions (1 site) cumulative contributions (3 sites)	HG2-171	HG2-167, HG2- 168,HG2-169
A650/Thorpe La	Direct contributions (1 site)	HG2-167	
M62 Jn 28/A653 Tingley	Direct contributions (1 site) cumulative (5 sites)	EG2-19	HG2-158, HG2-167, HG2-168, HG2-169, HG2-171
A653/Ring Road Middleton (Tommy Wass)	No sites identified		
A650/A6039 Rein Rd	Direct contribution (1 site) cumulative (3 sites)	HG2-158	HG2-157, HG2-169, EG2-19
A650/A643 Bruntcliffe La	Cumulative contributions (1 site)		HG2-157

Location	Site Requirements	Direct impact sites	Cumulative impact sites
A643/A6110	Direct contributions (2 sites) cumulative (1 site)	HG2-149, HG2-150	EG2-19
A643/Wesley St	No sites identified		
A643/M621 Jn 2	Cumulative contributions (1 site)		EO2-6
A6110/M621 Jn 1	Direct contribution (1 site) cumulative (2 sites)	HG2-149	HG2-137, HG2-150
M62 Jn 26/A62 Gildersome	Direct contribution (2 sites) cumulative (1 site)	HG2-145, EG2-23	HG2-143
A62/Asquith Ave	Direct contribution (3 sites) cumulative (2 sites)	HG2-145, HG2-148, EG2-23	HG2-146, HG2-147
A6110/A62 Gelderd Rd, Wheatsheaf	Direct contributions (2 sites) cumulative (1 site)	HG2-145, HG2-148	HG2-137
A58/B6135 Drighlington	Direct contributions (1 site)	HG2-143	
A6110/A58 Whitehall Rd, Ringways	Direct contributions (1 site) cumulative (1 site)	HG2-136	HG2-137
A58 Domestic Rd/Domestic St	No sites identified		
A6110/Branch Rd	Cumulative contributions (1 site)		HG2-76
A6110/Tong Rd	Cumulative contributions (2 sites)		HG2-76, HG2-77
A647/B6154 Thornbury Barracks	None – due to delivery of 2015 scheme		
A647/A6120 Dawson's Corner	Cumulative contributions (7 sites)		HG2-63, HG2-65, HG2-66, HG2-67, HG2-69, HG2-73, HG2-204
A647/B6155 Richardshaw Lane	No sites identified		

Location	Site Requirements	Direct impact sites	Cumulative impact sites
A647/Armley Ridge Rd	No sites identified		
A647/Ledgard Way	No sites identified		
A647/A643/A58 Armley Gyratory	Direct contributions (4 sites) cumulative (5 sites)	MX2-11, EO2-2, EO2- 6, HG2-112	EG2-36, MX2-9, MX2-10, MX2-19, HG2-113
A657/A6120 Rodley	Direct contributions (1 site) cumulative (2 sites)	HG2-41	HG2-43, HG2-56
A658/Micklefield La	Cumulative contributions (1 site)		HG2-10
A658/Bayton La	Cumulative contributions (2 sites)		HG2-3, HG2-9
A6038/B6153 Park Rd Guiseley	Direct contribution (1 site)	HG2-4	
A65/Oxford Rd	Cumulative contributions (1 site)		HG2-1
A65/A6120 'Horsforth roundabout'	Direct contributions (1 sites) cumulative (7 sites)	HG2-41	HG2-1, HG2-2, HG2- 3, HG2-5, HG2-9, HG2-10, HG2-43
B6157 Bridge Rd/Wyther La/Broad La junctions	No sites identified		
A65/Kirkstall La/Savins Mill La	Direct contribution (1 site)	MX2-4	
A65/Willow Rd	Direct contribution (1 site)	MX2-9	
Willow Rd/Burley Rd	Cumulative contributions (1 site)		MX2-9
A65/A58 Inner Ring Rd	Direct contributions (3 sites) cumulative (3 sites)	MX2-9, MX2-19, EO2- 6	HG2-113, EO2-2, MX2-10

Location	Site Requirements	Direct impact sites	Cumulative impact sites
A6120/Low La	No sites identified		
East of Otley Relief Road	To be delivered through East of Otley housing site (UDP requirement)	MX1-26	
A660/A658 Dyneley Arms	No sites identified		
A660/A6120 Lawnswood	Cumulative contributions (2 sites).		HG2-17, HG2-18
A660/St Anne's La/Shaw La	No sites identified		
A660/North La	No sites identified		
A660/Hyde Park Rd	No sites identified		
A6120/Weetwood La	Cumulative contributions (1 site)		HG2-38
A6120/King La	Cumulative contributions (1 site)		HG2-17
King La/Stonegate Rd	No sites identified		

Table 2 :	Other	Site	Requirements
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Location	Site Requirements	Direct impact sites	Cumulative impact sites
A6110 Junctions			HG2-205
Pudsey Rd/ A6110		HG2-76	
Leeds City Centre Package			MX2-32, EO2-9
Holbeck Urban Village traffic management, streetscape and pedestrian improvements			HG2-194, HG2-195, MX2-30, MX2-32
Beckett St-Burmantofts St corridor		MX2-37	
A64 / Torre Rd / Lupton Ave		MX2-37	
A1(M) Junction 46, Wetherby		HG2-226	
M621 Junction 2			MX2-9, EO2-6, EO2- 2
M621 Junction 7, Stourton			HG2-173
M62 Junction 30, Rothwell			HG2-180
Thornbury Gyratory, Bradford			HG2-63, HG2-65, HG2-66, HG2-69, HG2-73
Cutler Heights La, Bradford			HG2-69, HG2-73

Appendix 3 – Sustainability Appraisal Scoring

- 1. The scoring for SA objective 13, 15 and 16 has been informed by a ranking criteria devised by the LCC Highways officers to assess the suitability of sites in terms of accessibility, highway access into a site and the effect on the transport network. The criteria are explained in Table 1 below.
- 2. As part of the update of the Employment Land Assessment and in conjunction with the West Yorkshire Combined Authority, the scoring system for employment sites in terms of accessibility of sites to public transport has been revised at Pre-Submission Changes stage. The scoring criteria outlined in the SA Report was open to significant interpretation as it made reference to meeting Core Strategy standards when there are two separate standards for employment depending on whether the end use is offices or a general employment use.
- 3. The revised scoring system has been devised to remove this ambiguity using the Core Strategy office accessibility standard as the basis for achieving the highest score for this measure (5) and the general employment accessibility standard as the minimum level of accessibility (scoring 2). Sites which fail to meet the general employment accessibility standard are the least sustainable scoring 1 (or a double negative score) against the relevant SA objectives. The criteria for scoring 3 or 4 lies between the office and general employment standard and thus provides a good or very good level of accessibility for general employment but marginally fails the accessibility standard for office development.
- 4. Table 1 Guide to Ranking Criteria has been revised to differentiate between sites assessed for housing and employment uses.
- 5. It should be noted that the "impact on local highway network" score was given at an early stage in the assessment process to allow an initial sifting of sites and predated the transport modelling work and could not take the cumulative impact of the planned development into account. Where site requirements have identified improvement of infrastructure for certain sites, this is as a result of an outcome from the transport modelling work. The "impact on local highway network" score may not accord with the site requirement i.e. a site need not necessarily have scored 3 or less to have a site requirement for infrastructure improvements.

Table 1 Guide to Ranking Criteria

Housing Sites

Transport issue	Score	Criteria
Accessibility to public transport	1	No public transport or local services within walking distance
	2	Public transport offer not in line with Core Strategy standards
	3	Public transport offer not in line with Core Strategy standards but availability of local services (e.g. Local Centre, schools etc)
	4	Meets Core Strategy accessibility standards but lacking in local services
	5	Meets Core Strategy accessibility standards with good footway network and walking distance of local services
Highway access	1	No access achievable
	2	Highway frontage but adequate access / visibility not achievable
	3	Requires development of adjacent site for access
	4	Access achievable with mitigation works e.g. signalised junction
	5	Adequate frontage/s for suitable access/es and visibility splays within site / adopted highway
Impact on local highway network	1	Unsuitable local network and no potential for mitigation
	2	Unsuitable local network but mitigation potential
	3	Local congestion issues
	4	Spare local capacity and suitable network but likely cumulative impact issues
	5	Spare local network capacity and suitable network

Employment sites

Transport	Score	Criteria
issue		
Accessibility to public transport	1	Average time to access public transport services ²⁰ >40 mins (fails to meet Core Strategy standard)
	2	Average time to access public transport services >20 mins and <=40 mins (equivalent to Core Strategy standard for general employment uses)
	3	Average time to access public transport services >15 mins and <=20 mins
	4	Average time to access public transport services >12.5 mins and <=15 mins
	5	Average time to access public transport services <= 12.5 mins (equivalent to Core Strategy standard for office uses)
Highway access	1	No access achievable
	2	Highway frontage but adequate access / visibility not achievable
	3	Requires development of adjacent site for access
	4	Access achievable with mitigation works e.g. signalised junction
	5	Adequate frontage/s for suitable access/es and visibility splays within site / adopted highway
Impact on local highway	1	Unsuitable local network and no potential for mitigation
network	2	Unsuitable local network but mitigation potential
	3	Local congestion issues
	4	Spare local capacity and suitable network but likely cumulative impact issues
	5	Spare local network capacity and suitable network

²⁰ Under the accessibility to public transport criteria average time to access public transport factors in walk time to a bus stop and the frequency of services serving that stop. It is calculated using the following formula (Average time = x min walks = $(0.5 \times y \text{ min bus} \text{ frequency})$ e.g. 5 min walk and 15 min frequency (the Core Strategy accessibility standard for offices) = 5 + (0.5×15) = 12.5 mins. Any site within 10 mins walk (800 m) of a railway station also scores 5. See Employment Land Assessment for further details.
Appendix 4 - Leeds Transport Model (LTM)

About the LTM and its Development

- The LTM is a sophisticated transport model comprising a suite of individual models which work together to provide future year forecasts of travel demand by cars, commercial vehicles and public transport. The model comprises three elements: a highway model, a public transport model (covering both bus and rail) and a demand model. Inputs to the model comprise changes to the highway and public transport networks, including new schemes, changes in the cost of travel and changes in land use.
- 2. The model was developed on behalf of Leeds City Council between 2008 and 2011. Survey data was collected in the main during autumn 2008, however, this was supplemented by other surveys in 2009 and some bus user surveys in late 2007. The model 'base year' is 2008. During the development process a number of versions of the model were released. The Site Allocations utilises version 3 which is the version used for the NGT Business Case that was considered at the public inquiry in 2014.

Base Year

- 3. The development of a model such as the LTM is a very expensive and complex process and consequently updates are only undertaken periodically. As noted above the current model base year is 2008, however, the LTM is currently being updated to a new base year of 2015. Following extensive surveys in the spring of 2015 this work has unfortunately taken longer than anticipated and consequently it has not proved possible to utilise the new model to evaluate the proposals in the SAP at this time. The work to assess the site allocations has itself been undertaken over many months and consequently the future year 2028 assessments reported in this report are based on the version 3 model, built upon a 2008 base year, as this is the latest model available. Nevertheless, as the modelling of the SAP is an ongoing process it is planned to utilise the new 2015 model as soon as practicable.
- 4. Although it has a base year of 2008, traffic levels over the intervening period have not changed very significantly and therefore the use of the LTM represents a reasonable approach to modelling the site allocations proposals until the revised model is available. The model allows for the complex interaction of journeys across the whole city and the city region beyond, taking account of growth both within and outside Leeds District. This is important because census journey to work data shows that 25% of Leeds residents work outside Leeds and 31% of Leeds workers live outside Leeds, as referenced in para 4.7 of the report.
- 5. The LTM models the effects of traffic congestion and travel choice (including route choice, using public transport and choosing to travel at a different time

of day). A more simplistic approach using up-to-date base counts would not have been able to reflect future year conditions as the LTM can.

6. The 2008 base model is the best available tool at this time. The update to 2015 should eliminate any perceived or actual issues with the use of a 2008 base model. Nevertheless, both models remain strategic models and this modelling work will not replace the need for detailed Transport Assessments for sites as part of the planning process. The use of the LTM to model the SAP does, however, allow LCC to identify key junctions where interventions are likely to be required during the Plan period and to reflect this in the individual Site Requirements, which covers both direct and cumulative impacts.

Model Validation

- 7. It is standard practice to check that a model replicates reality. The degree to which it has to do this depends on the size of the model and criteria are laid down by the DfT. There are also several criteria used to validate a model.
- 8. The LTM is a strategic model which provides an overall view of the performance of the network and, as noted above, the highway model is but one component. It has been developed to cover the whole of Leeds and some of the outlying area. Its purpose is to assess the overall 'pressure' on and performance of the network and the validation criteria reflect this, i.e. it is not expected to model flows accurately at an individual link level. Results have to be within a certain tolerance when viewing the network at a high level. A comprehensive validation exercise was completed for the LTM for the 2008 model (see Ref 1 below), and refined for NGT (see Ref 2 and Ref 3 below). This validation covered aspects such as flow, journey time and trip length. As noted earlier, the model used for the site allocations process was Version 3, the same as the NGT scheme.
- 9. Data sources for the model included classified manual counts and automatic traffic counts (ATCs). Because of the size of the Leeds road network and the number of time periods, traffic flows have been reported on a summary basis and not for individual links. Documentation which specifically shows all the modelled versus observed flows is not held by the Council.
- 10. Figures 4 and 5 of the original Model Validation Report (Ref 1) show the traffic flow sites used in developing the model and Figure 9 the location of the road side interviews (which were also accompanied by both manual classified and automatic traffic counts). Figure 20 shows the RSI, calibration and validation screenlines.
- 11. Validation results for the latest version of the model used for the NGT scheme and Site Allocations Plan are shown in Appendix A of Ref 3 (LTM Model Update Report for NGT, Jan 2014). Tables 27 and 28 show the summary results for the model screenlines; Tables 29 to 31 shows the summary performance on a link by link basis; Table 33 shows journey times.

LTM References

LTM Reports, all publicly accessible from the NGT website, can be found here:

Ref 1: Leeds Transport Model -Highway Assignment Model Development and Validation Report, September 2011:

http://www.ngtmetro.com/uploadedFiles/Content/Documents/Archive/Appendi x7LTMHighwayModelValidationReport(1).pdf

Ref 2: LTM Highway Local Model Validation Report for NGT Business Case, March 2012:

http://www.ngtmetro.com/uploadedFiles/Content/Documents/Archive/Appendi x9NGTLMVRv4.pdf

Ref 3: LTM Model Update Report for NGT, January 2014:

http://www.ngtmetro.com/WorkArea/DownloadAsset.aspx?id=4294968248

Ref 4: LTM data and Traffic Surveys Report, January 2010:

http://www.ngtmetro.com/Documents/Appendices/Appendix-3---Data-and-Traffic-Surveys-Documents/

Appendix 5 - Highway Interventions to Deal with Extra Traffic Arising from Development

Identification of Locations with Extra Congestion

1. Table 2 in this report lists the locations where the LTM modelling described above shows that congestion will worsen significantly. Paragraph 6.41 states:-

Table 2, below, lists junctions where congestion is forecast to worsen significantly by 2028 and interventions will be potentially required in addition to those already planned... It also includes a number of other junctions immediately adjacent to developments. A number of these schemes have been identified within the WYPTF and contributions will be required to support their delivery. Other junctions can be linked directly to specific developments while others experience cumulative impacts that are relatively modest from individual sites but in combination have a marked impact on congestion.

- 2. If a junction is not on the list in Table 2, then the modelling is not suggesting a significant worsening of congestion as a result of the Site Allocations. A significant worsening has been defined as locations where modelled delays increase on any entry by an average of more than 30 seconds per vehicle during the peak hours. Of course if a junction is already congested, but does not get significantly worse (by this margin), then it will not appear on the list.
- 3. In addition, a number of other junctions are included in the list where significant housing developments are proposed adjacent to the junction. This is an evolving piece of work and will be re-visited as the site allocations process progresses, including tests with the new 2015 version of the model.
- 4. It should be noted that this evaluation has in the main been limited to the main A road network and motorways. This is because the model network does not include all local roads within Leeds, nor does it include sufficient zone detail to allow flows on minor roads to be modelled reliably. Where appropriate, the effect of new development on local roads will be covered by Transport Assessments.
- 5. The report, in Para 6.40, states that, despite infrastructure improvement schemes, 'There will nevertheless remain additional congestion caused within Leeds that cannot be effectively mitigated against.' The Site Allocations process has not claimed that the highway interventions and transport schemes will completely eliminate the effect of a significant growth in population. The Council believes that the process which has been followed is sound, and that the LTM represents the best available tool to assess the impacts, and to subsequently identify locations for mitigation.
- 6. The work undertaken by the Council for this current process has exceeded any previous plan development, in terms of the use of transport models and the sophistication of planning for new development.

Junction designs

- 7. The modelling work undertaken has included the effects of planned or committed major transport schemes, as reported in this Background Paper report. The modelling has identified locations where delays worsen significantly, but has not included junction improvement schemes within the modelling to mitigate the effects of the extra congestion. The forecast highway conditions therefore are a worst case.
- 8. Appropriate schemes will be designed, funded and delivered using an appropriate mechanism, including using developer contributions as specified in the Transport Background Paper.
- 9. As each development is brought forward through the planning process, it will still have to satisfy the Highway Authority that the impact is acceptable. The Site Allocations process is not circumventing the need for proper Transport Assessments to be prepared by the developer and for the developer to make appropriate contributions to highway improvements.
- 10. The Council does not at this stage have detailed junction designs for the locations identified in Table 2, referred to above, because it would be premature to do this. Nevertheless, the Council has identified at a high level how feasible improvements could be based upon the physical land constraints around each junction, as reported in the report. Further high level work is being undertaken to examine potential schemes at these locations to inform further discussion and where appropriate these will be included in future model tests. As stated in para 6.42: 'It should be noted that there are very likely to be some locations on this list where site constraints will preclude a comprehensive solution.' There are also likely to be locations where an improvement at one location may simply shift the queues downstream and a decision will have to be made to decide whether the original improvement is therefore appropriate.