Kirklees Draft Local Plan

Technical Paper:
Transport Model

November 2015

Planning Policy Group
Investment and Regeneration Service
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1. Introduction

Kirklees Council has produced a transport model to help support the development of the Local Plan. The Local Plan is the council's strategy for growth from 2013 to 2031. The government requires all local councils to develop a long-term plan which sets out how and where land can be developed over the next 15 years, in order to meet the growing needs of local people and businesses. The plan will be used to guide development and inform planning decisions once adopted.

Due to its use as a basis for informing planning decisions, the Local Plan needs to be sound. This includes its strategies and policies being based on robust and credible evidence. From the perspective of transport, it is considered prudent to understand the cumulative transport impact of the local plan proposals on the transport network and to show how this translates into a transport strategy and potential transport improvements.

To achieve the above, Kirklees Council undertook to model strategically the transport network (highway and public transport) in order to assess the cumulative transport impact of the land use allocations in the draft local plan. The work identifies locations on the highway network which are forecast to suffer increased delays as a result of the proposals and therefore where the Council needs to concentrate its transport mitigation strategy. **It also shows whether the mitigation strategy is able to accommodate the growth over the plan period**.

This report summarises the methodology and results of the modelling study. The results of this study have been and will be used in further work to help identify potential transport improvements in the borough of Kirklees. The improvements study informs the Council's Infrastructure Delivery Plan, which forms part of the evidence base for the Local Plan.

The report includes the following information:

- Model build information
- The methodology of the transport study
- The assumptions used for forecasting future travel demand
- Tests Undertaken
- A summary of the key results
- Conclusions and recommendations

In addition this report is designed to provide background to information that is contained in the draft Kirklees Local Plan- Allocations and Designations Document and the Kirklees Infrastructure Delivery Plan.

2. Model Build Information

The transport modelling study has been undertaken using a newly commissioned Kirklees Transport Model 2015. The methodology used was based on information available in the Department for Transport's Transport Analysis Guidance (TAG)

The Transport Model operates as a five stage transport demand model and has three component parts. The five stages are:

1. **Trip generation** determines the frequency of origins or destinations of trips in pre-determined zones within the model by trip purpose, as a function of land uses and household demographics, and other socio-economic factors.
2. **Trip distribution** matches origins with destinations, using existing travel patterns as a starting point.
3. **Time of day choice** determines which trips occur in the peak hours and which in the interpeak or offpeak.
4. **Mode choice** computes the proportion of trips between each origin and destination that use a particular transportation mode.
5. **Route assignment** allocates trips between an origin and destination by a particular mode to a route taking into account the congestion caused by other travellers.

The three components of the model are:

1	Demand Model which performs the first three stages above.
2 and 3	Highway Assignment Model and Public Transport Assignment Models which undertake the fourth and fifth stages stage in relation to highway and public transport trips.

The Kirklees Transport Model is a strategic transport model, the coverage of which is shown in Appendix A. The model covers a full 24 hour period although the highway and public transport assignment models only cover the morning and evening weekday period periods of 0900-0800 and 1700–1800, in addition to an inter-peak average hour 1000-1600.

Essentially the model divides Kirklees and large parts of the neighbouring districts into a number of small zones. The purpose of the model is to understand how people currently move between these zones either on the highway or public transport network and then when new development is proposed in the zones, these patterns can be replicated and therefore the impact on the two networks can be broadly calculated. A zone and network plan can be found in Appendix B.

The highway assignment model contains a detailed representation of the local and strategic highway network with associated highway characteristics, which are represented by relationships between flow and speed as well as junction capacities. These characteristics are used within the model to reflect how much traffic a road can accommodate and what delays will result from the traffic.

The public transport assignment model contains a representation of the bus and rail routes that make up the local public transport network.

For the highway element, the model uses existing travel patterns in the time periods described above between zones. These are referred to as trips. These trips are taken from national census data, known as Journey to work data and more locally from mobile phone data. This has been supplemented by 9 roadside interviews in order to provide actual “on the ground” journey purpose information and undertake some validation of the phone data.

The trips are then assigned to the highway network based on the principle of user equilibrium[1]. To ensure the numbers of vehicles on the network broadly reflects what is happening on the street, the assignment is verified against traffic counts that have taken place around the district. Clearly it is not financially feasible or practical to count traffic on every single road in the district or indeed in the modelled area. However as many major routes as possible are counted, along with known links between these routes and routes around local settlements. A plan of all the count locations is shown in Appendix C.

To ensure that journey times across the network are realistic the journey times on 25 routes were surveyed and these data used to calibrate the model.

For the public transport element, the model is built using Census journey to work data with other journey purposes being synthesised. Counts were undertaken at around 50 locations to check that the volume and routing of trips across the network are realistic.

Further information on the structure of the Kirklees Transport Model 2015 update is provided in the following reports:

- Kirklees Transport Model Specification 2015
- Local Model Validation Report, Kirklees Transport Model 2015

[1] *The journey times in all routes actually used are equal and less than those which would be experienced by a single vehicle on any unused route.* Each user non-cooperatively seeks to minimize his cost of transportation. The traffic flows that satisfy this principle are usually referred to as "user equilibrium" (UE) flows, since each user chooses the route that is the best. Specifically, a user-optimized equilibrium is reached when no user may lower his transportation cost through unilateral action. *At equilibrium the average journey time is minimum.* This implies that each user behaves cooperatively in choosing his own route to ensure the most efficient use of the whole system

3. Transport Study Methodology

In addition to the base modelled 2015 flows, the study considered future year growth scenarios of 2020 and 2030 in line with the plan period. These future year scenarios contained various assumptions relating to potential changes to the highway network and traffic demand.

Traffic growth was applied to the base model to account for forecast changes in traffic demand in the two forecast years. The growth was calculated based on best practice guidance and future housing and employment targets.

Traffic growth is the change over time of the number of cars and goods vehicles on the highway network. When forecasting the performance of the highway network in the future, it is necessary to allow for changes in traffic demand.

Traffic growth can be split into two broad areas:

1. New trips: Changes in population and employment directly affect how many trips are made.
2. Frequency of trips: Changes in GDP, income, car ownership and travel costs affect how frequently people travel by each mode.

The first of these are taken from the Kirklees Local Plan. Outside of the Kirklees area the forecasts contained within the DfT National Trip End Model are used.

The changes in the second group of factors are taken from national forecasts provided either within TEMPRO or in the DfT's WebTAG guidance for transport modelling.

4. Tests Undertaken

As noted earlier the purpose of the model is to understand the cumulative impact of the development allocations in the Kirklees Local Plan. As part of this analysis, current transport schemes that are being worked on by the Council to mitigate the impact of the development have also been tested. The results have been used to inform the effectiveness of the current mitigation strategy and identify any gaps in infrastructure provision.

Initially a base model was constructed for 2015. *The base model gives as realistic a representation as is possible of the current flows on the transport network*, using the Census, mobile phone and road side interview data, supplemented with the traffic count and journey time surveys. Once the base model was constructed, 2 forecast years were created, 2020 and 2030, i.e. 5 and 15 years from the base.

Within each forecast year, two scenarios were run using the model and these are presented below. The 2014 Planning Practice guidance states that: "The Local Plan should make clear, for at least the first five years, what infrastructure is required, who is going to fund and provide it, and how it relates to the anticipated rate and phasing of development. This may help in reviewing the plan and in development management decisions. For the later stages of the plan period, less detail may be

provided as the position regarding the provision of infrastructure is likely to be less certain.

The following table summarises the forecasts and what transport schemes were tested.

Table 1: Modelled Scenarios

Forecast	Forecast Name	Contains (development supply)	Contains (Transport Supply)
1	Base	Nothing	Nothing- This is the current situation in 2015 and is a representation of the highway network as it operates now.
2	Do Minimum 2020	5 year allocation Commitments Windfall	Nothing- This test shows how the network would cope with no transport interventions in 5 years from now
3	Do Something 2020	5 year allocation Commitments Windfall	1. A616/B6108 Lockwood Bar junction improvements 2. Cavalry Arms Junction + widening on approach to Ainley Top + Red Route 3. Dewsbury Ring Road Schemes- A638 / A652 and B6409 / Church Street 4. UTC Package
4	Do Minimum 2030	15 year allocation Commitments Windfall	Nothing- This test shows how the network would cope with no transport interventions in 15 years from now, i.e. the end of the plan period
5	Do Something 2030	15 year allocation Commitments Windfall	1. As Do Something 2020, plus 2. Bradley Link Road, Bradley+ Cooper Bridge + Three Nuns junctions 3. M62 J24a 4. A62 Leeds Road schemes 5. A653 / B6128Shaw Cross 6. Ravensthorpe Relief Road + potential road improvements around South Dewsbury 7. A62 Longroyd Bridge 8. Selected primary route traffic management treatment. (Link Red Routes)

5. Results of Do Minimum- Base Situation 2015

The forecast scenarios were created by amending the model to include additional development traffic, applying traffic growth and where relevant, including new traffic schemes, to the validated base model.

The forecast scenarios also included a traffic signal optimising procedure. The signal timings contained within the model are fixed at the start of the model run, and changes in traffic flow due to developments may result in the original timings becoming inappropriate. The majority of signalised junctions within Kirklees operate on a system which coordinates signal timings, so junction capacity at these locations may be underestimated without optimisation.

The results of the forecast scenarios were then analysed in the am peak (0800-0900) and a number of outputs created. The model outputs include traffic flows, queues, delays, and the Ratio of Flow to Capacity (RFC) for junction movements in the model. The RFC of a movement at a junction is a measure of the congestion of that movement. A movement with a capacity of 1,000 vehicles per hour and a traffic demand of 900 vehicles per hour has an RFC of 0.9.

The maximum ideal junction performance is when no movements have an RFC of in excess of 0.85–0.9. A junction is defined as operating over capacity if it has a movement with an RFC greater than one. However the model represents an average day and traffic flow is subject to day to day as well as seasonal variation. This means that a junction which is modelled with a RFC of 0.85 on an average day my exceed 1.0 on some days. As the RFC increases above 0.85 then the delays experience tend to increase exponentially and this in turn leads to unreliable journey times and an increase in queuing.

A lot of thought has been given as to how best represent the results from the model. It is considered important for readers to understand how congested particular junctions are now.

Rejected options have included:

a) Flagging a junction as congested if any one turn in the junction exceeded n RFC of 85% and then categorising the results into 3 bands:
    1. 85%-90% RFC
    2. 90%-95% RFC
    3. >95% RFC

b) Using a demand weighted average. This option fails as there may be junctions with fairly busy movements but are operating under capacity, but it is not possible to reallocate the spare capacity elsewhere within the junction. Ainley Top is an example of this as there is spare capacity on some of the in internal movements but it cannot be allocated to the external arms. This brings the demand weighted average down to an unrealistic level for reporting purposes.

c) Refining option a) to include only roads where the RFC was >85% and the 2-way flow rate was at a minimum 600 pcu's[2] or 500 pcu's in the peak. The figure is represented as flow (pcu) * delay (sec). The figures are congestion indicators representing the worst movement in the junction, calculated from modelled flow and delay.

In order to include junctions where congestion issues are known, sensitivity tests were carried out on option c) using flow rates between 600 and 300 pcu's. A flow rate of 350 pcu's was eventually settled on. This is referred to as option d)

350 pcu's per hour equates to almost 6, 2-way vehicle movements per minute, which could be considered conservative, but was chosen as spatial analysis of the results showed that it picked up the majority of junctions where council officers recognised that residents would point out that some degree of congestion already occurs.

[2] Traffic is composed of various types of vehicles, the range and relative composition of which can vary from location to location. Traffic modelling software frequently utilises a common unit, known as the Passenger Car Unit (PCU), to represent general traffic. Common vehicle types are assigned a conversion factor so that an equivalent PCU value can be generated from classified vehicle data collected. Nominally 1 PCU is 5.75m

6. Results of Do Minimum- 2020 and 2030

The National Planning Policy Framework places great importance on Local Plans being evidence based. Paragraph 162 states that Local Planning Authorities should assess the quality and capacity of infrastructure for transport and its ability to meet forecast demands.

For this reason the impact of potential new development across the plan period on the transport network has been assessed. This is calculated as the junctions in the model that experience the greatest levels of congestion as a result of development. The Plan's mitigation strategy is based around accommodating the impact of new development.

The table below summarises this and shows how these have been calculated from the traffic model forecast scenarios:

Table 2: Summary of the Do Minimum Scenarios

Grouping	Explanation	Model
1	Junctions ranked in order of congestion based on option d) congestion indicator	Base Congested Situation (Forecast 1)
2	Junctions ranked in order of congestion after 5 years of development based on option d) congestion indicator	Forecast 2 (Do minimum 2020)
3	Junctions ranked in order of congestion after 15 years of development based on option d) congestion indicator	Forecast 4 (Do minimum 2030)

The top 20 for each group have been mapped and these are shown in Figure 1~~Figure 1~~ and Figure 2~~Figure 2~~ below:

Figure 1: Congested Junctions – Northern Kirklees

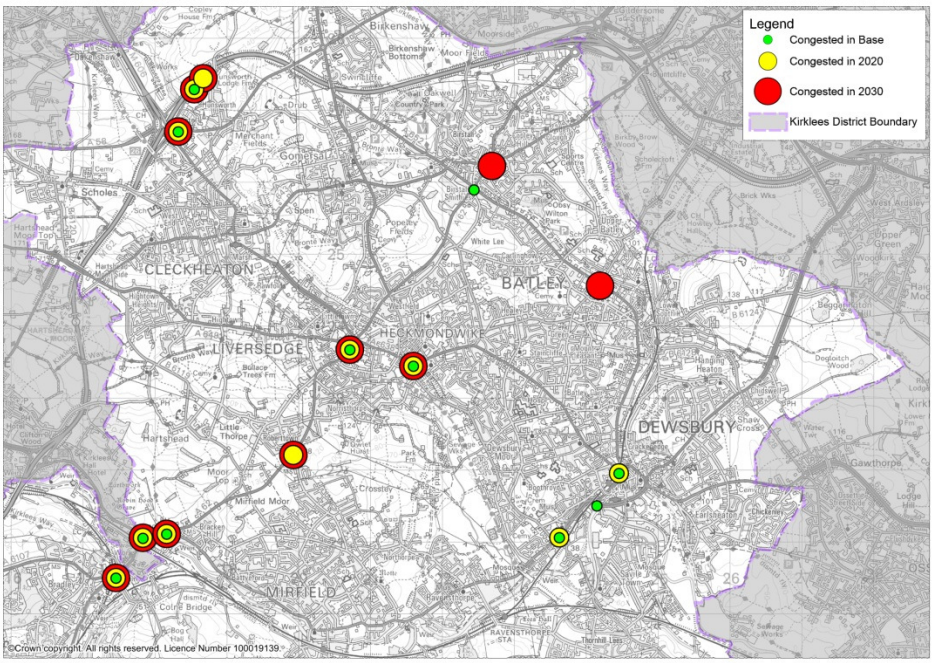
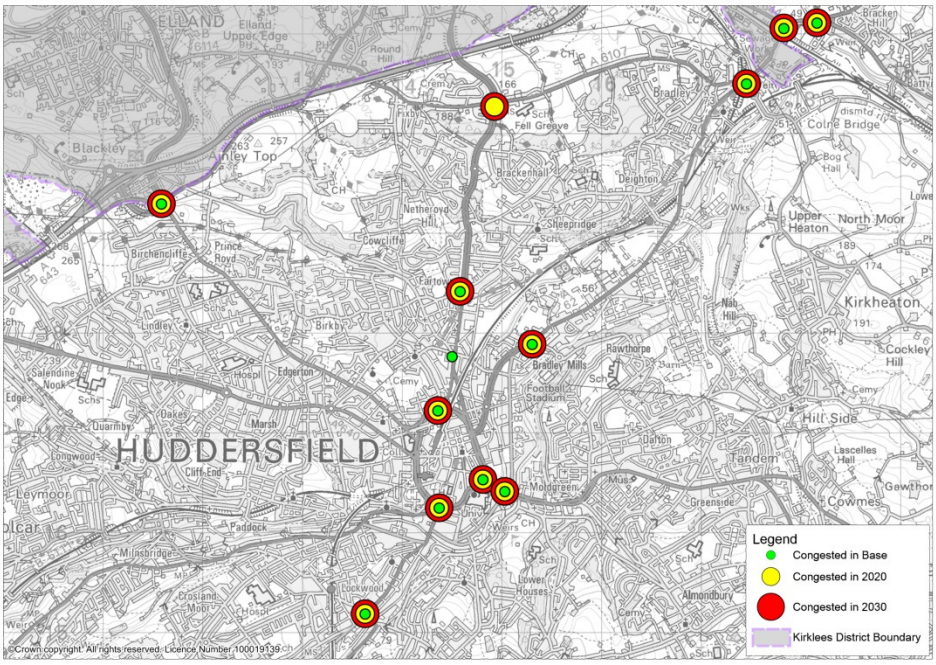


Figure 2: Congested Junctions - Southern Kirklees



Whilst the choice of dealing with 20 is an arbitrary decision, it is considered reasonable to consider these as a priority and that a realistic mitigation strategy can be developed as a result.

Full lists of all the junctions ranked in the 3 do-minimum scenarios can be found in Appendix D. Care should be taken when interpreting these rankings. The total delay figure (in hours) in the final column in the tables is a planning figure and has been calculated to assist the Planning Authority in understanding total delay over the full hour for all vehicles using the arm of the junction in question and therefore where improvements are most needed from a strategic plan perspective. For example there are occasions where high ranking junctions (in any forecast scenario) show low delays per vehicle, but because they are being used by large numbers of vehicles; the total delay is extremely high.

Impacts on individual drivers, i.e. Individual vehicle delays are to be found in the column adjacent and give a better feel for average delay incurred.

6. Do something Position

To arrive at a do something position (i.e. an understanding of what the transport mitigation strategy should look like), a spatial analysis of the results of the three do-minimum scenarios was undertaken. This analysis of the top 20 junctions in the 3 do-minimum scenarios shows that they fall into 9 broad areas or corridors and a mitigation strategy has been designed to reflect these impacts. The references reflect the schemes as they have been identified in the draft Kirklees Local Plan-Allocations and Designations Document and the Kirklees Infrastructure Delivery Plan. Appendix E shows the mitigation strategy and its broad congruence with the congested junctions.

The following table provides detail on the mitigation strategy and shows how, through identified programmes and funding sources, Kirklees intends to address these highway issues.

All the locations flagged through the modelling work as being congested or impacted by development traffic in future years have been identified through a strategic forecasting process and they should be read as what might happen given a number of assumptions, not what will happen. Therefore the Authority will continue to work to refine both the forecasts and the mitigation strategy between now and submission of the plan to the Secretary of State in late 2016.

Table 3: Congestion Locations and Programme Opportunities

Corridor /Area	Location	Programme and funding Opportunity[3]
TS 1	A62 Leeds Road/Bradley Mills Road A62 Leeds Road/ A6107 Bradley Road A62 Leeds Road/ A644 Wakefield Road (Cooper Bridge) A62 Leeds Road/ A644 Huddersfield Road (Three Nuns) A62 Leeds Road/ Sunny Bank Road A62 Huddersfield Road/ A649 Halifax Road Leeds Road Cycle Super Highway	West Yorkshire Transport Fund Projects: • A62/A644 Cooper Bridge Junction • A62 and A644 corridors including work around South Dewsbury and Ravensthorpe.

Cont.

[3] All WY+TF project information can be found at http://www.westyorks-ca.gov.uk/wytf/ and https://democracy.kirklees.gov.uk/Data/Cabinet/201304251600/Agenda/CABINET25041348113D.pdf

Corridor /Area	Location	Programme and funding Opportunity
TS 2	A641 Bradford Road/ A62 Castlegate/ St Johns Road A641 Bradford Road/Willow Lane A641 Bradford Road/ Fartown Green Road (Fartown Bar) A641Bradford Road/A6107 Bradley Road Roundabout	West Yorkshire Transport Fund Project : • M62 Junction 24a scheme including works to the A641 Bradford Road
TS 3	A616 Woodhead Road/ B6108 Meltham Road (Lockwood Bar) A616 Chapel Hill/ A62Queensgate A62 Queensgate/A629 Wakefield Road (Shorehead) A629 Wakefield Road/B6432 St Andrews Road	Lockwood Bar and Chapel Hill- Part funded Through the West Yorkshire Transport Fund (Highways Efficiency and Bus Priority Programme) Intention to expand this programme to cover the remaining two junctions.
TS 4	A629 Halifax Road/ Birkby Road A629 Ainley Top Roundabout	West Yorkshire Transport Fund: • A629 Corridor
TS 5	A644 Huddersfield Road – Ravensthorpe Gyratory A644 Huddersfield Road/A638 Dewsbury Ring Road (Webster Hill A638 Dewsbury Ring Road/ A638 Halifax Road	West Yorkshire Transport Fund Project: • A653 Dewsbury to Leeds Corridor
TS6 and TS8	A62 Huddersfield Road /A652 Bradford Road (Birstall Smithies) A62 Gelderd Road/ A643 Leeds Road (Coach and Six A652 Bradford Road/ B6123 Stocks Lane signals	No funding opportunity identified to date , although partial funding will be sought from the WY+TF Highway Network Efficiency Programme (HNEP)
TS7	A629 Wakefield Road from Huddersfield Ring Road to Waterloo Junction A638 Cleckheaton to (but not including) junction 26 of the M62 (Chain Bar roundabout) A641 Bradford Road from Huddersfield Ring Road to the Kirklees/Calderdale authority border	West Yorkshire Transport Fund Project: • Highway Efficiency and Bus Priority Programme HEBP
New Scheme, previously unidentified	A638/B6117 Heckmondwike	No funding opportunity identified to date, but linkages to TS1 will be made and complimentary schemes developed.
Highways England responsibility	M62Junction 26 Chain Bar	Highways England Roads Investment Strategy

7. Impact of Mitigation

To understand the impact of the mitigation strategy a number of key transport corridors have been chosen, broadly congruent with the forecast existing and potential areas of congestion identified in forecasts 1, 2 and 4 in table 1 above.

The key transport corridors and extents are shown in figure 3 below.

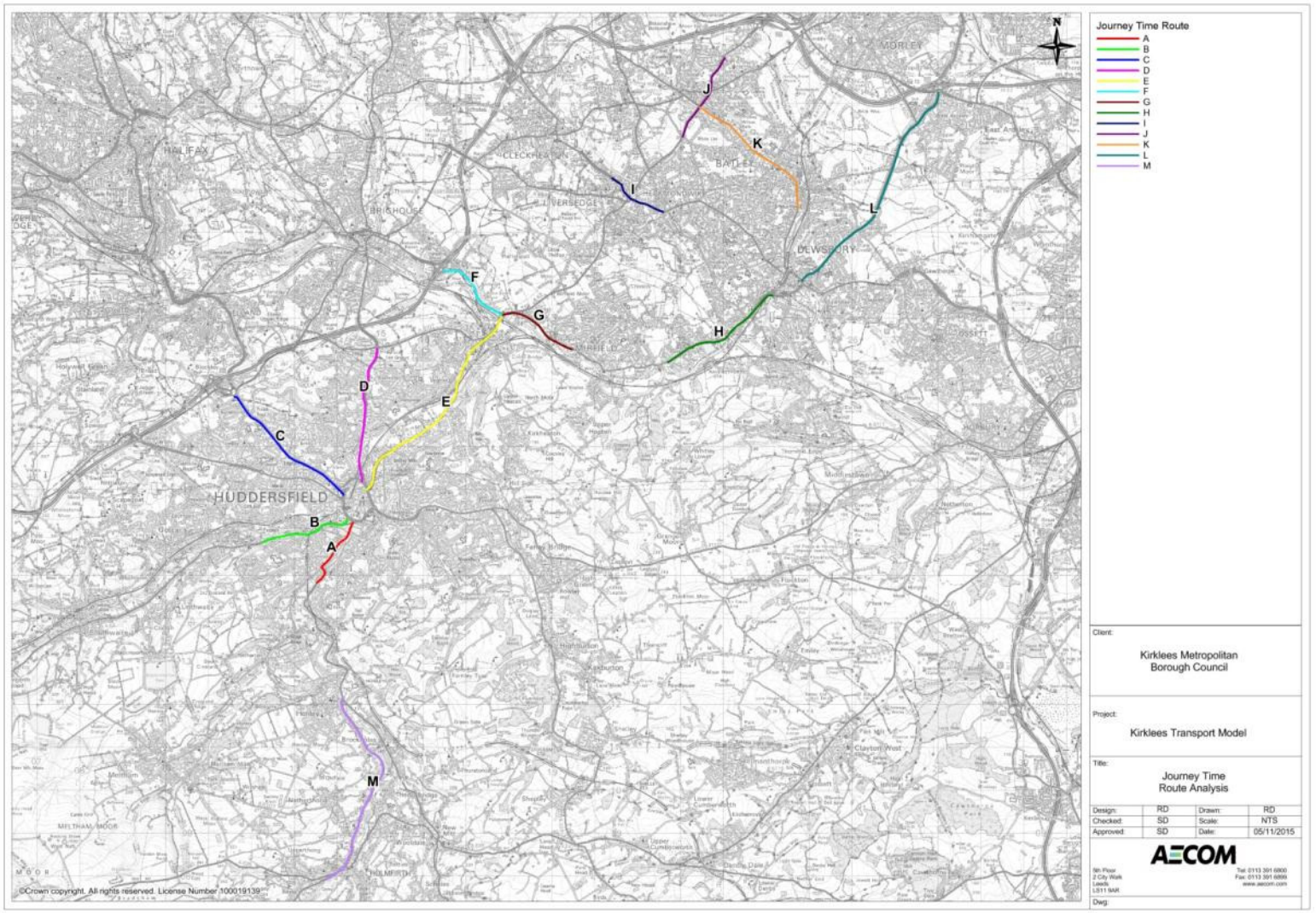
The transport models have been run to include the known mitigation schemes set out in Table 1~~Table 1~~ above (Forecasts 3 and 5). The impact of these schemes in terms of journey time along the congested corridors is set out below:

This shows that there is an improvement in the average speed along the congested corridor as a result of implementing the schemes in the existing programmes.

Table 4: Change in Journey Time as a result of Implementing Schemes in Existing Programmes

Congestion / Mitigation Area	Route Key (Map)	Route	BASE AM	DM 2020 AM	DM 2030 AM	DS 2020 AM	DS 2030 AM
			Speed (kmh)	Speed (kmh)	Speed (kmh)	Speed (kmh)	Speed (kmh)
TS1	E	A62 Hudds RR - Cooper Bridge	22	19	18	19	23
TS1	F	A644 M62 J25 - Cooper Bridge	19	14	11	15	13
TS1	G	A644 Stocks Bank Rd - Cooper Bridge	13	11	10	11	32
TS2	D	A641/A6107 Roundabout - Hudds RR	31	32	32	31	32
TS3	A	A616 Taylor Hill - Chapel Hill	17	15	14	16	16
TS4	C	A629 Hudds RR - Ainley Top	21	18	17	20	22
TS5	H	A644 Low Mill Ln - Webster Hill	20	17	16	19	19
TS5	L	A653 Dewsbury - M62 J28	33	32	31	32	32
TS6/TS8	J	A62 White Lee Road - Dark Lane	24	21	21	22	21
TS6/TS8	K	A652 Alexandra Rd – Birstall Smithies	28	27	24	28	25
TS7	I	A638 Knowler Hill – Station Ln	11	10	8	10	10
TS9	M	A6024 Modd Lane – A6024 Eastgate	30	26	24	27	24
Average			**22**	**20**	**19**	**21**	**22**

Figure 3: Journey Time Routes



8. Concluding Remarks

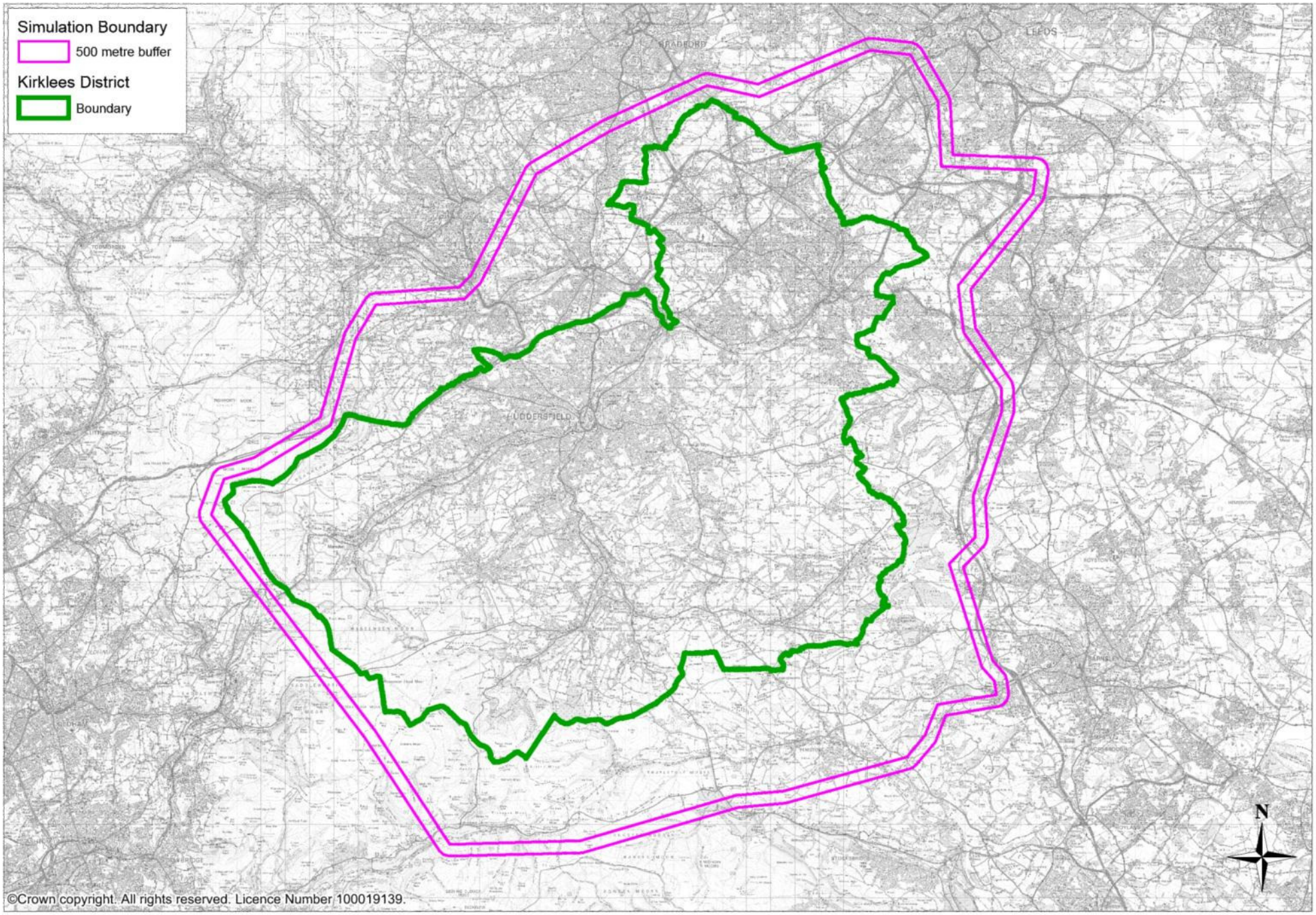
The results of the journey speed analyses show that the average speed across the 12 corridors is maintained across the plan period from 22mph in the forecast base year of 2015 through to the do something (i.e. with all the development and the proposed transport schemes in place) forecast year of 2030. This evidence backs up the conclusion that at a district-wide level the proposed transport mitigation strategy can accommodate the development proposed in the Kirklees Local Plan period 2015-2030.

The model is a strategic representation of a large proportion of the Kirklees transport network and care must be taken when interpreting the results at the relatively spatially coarse short corridor level. Nonetheless the results at a corridor level do give an indication of where further investigation and analysis must be carried out to understand the impact of the proposed land uses allocations and the subsequent impact of the mitigation proposed

Throughout the more detailed analysis and investigation of the traffic model the Local Authority will ensure that appropriate mitigation is developed. It should be noted that this work will be undertaken between November 2015 and the following 9 months.

Appendix A

Model Area Coverage


Simulation Boundary
500 metre buffer
Kirklees District
Boundary
BRADFORD
LEEDS
HUDDERSFIELD
N
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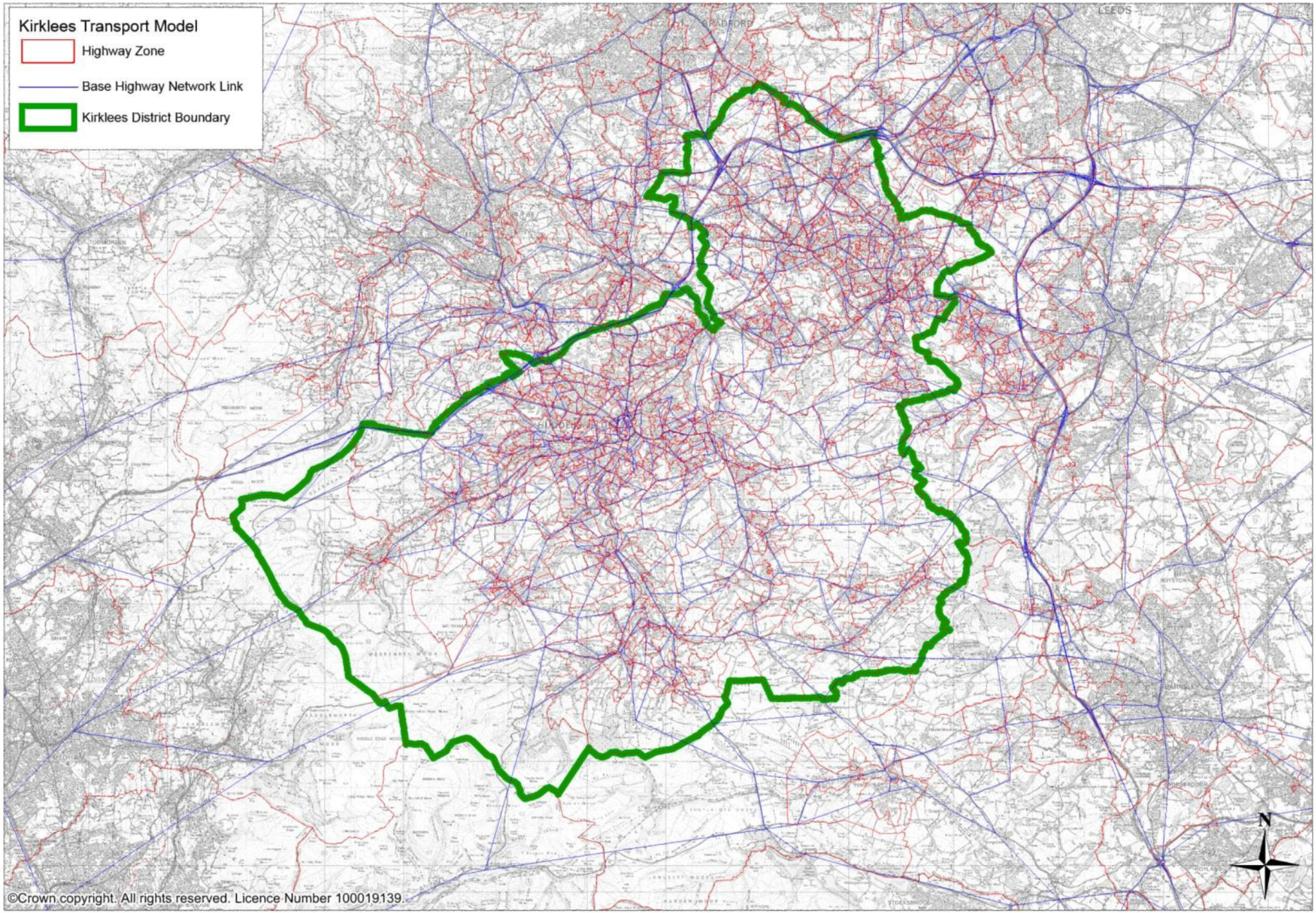
Appendix B

Zone and Network Plan


Kirklees Transport Model
Highway Zone
Base Highway Network Link
Kirklees District Boundary
LEEDS
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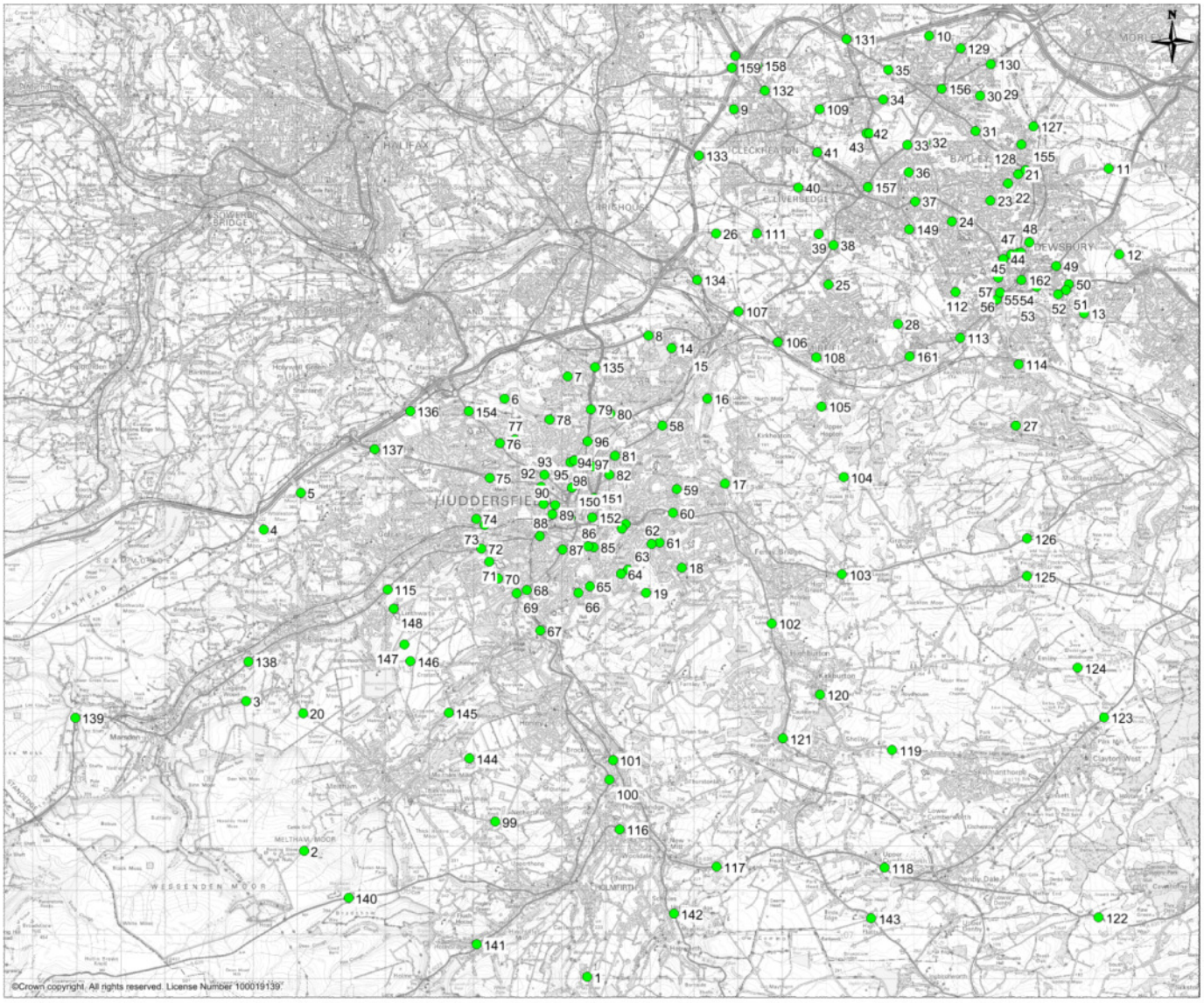
Appendix C

Location of Traffic Counts



Key

- Proposed ATC and MCC Location

Client: Kirklees Council

Project: Kirklees Transport Model

Title: Proposed ATC and MCC Locations

Design:	RD	Drawn:	RD
Checked:	JP	Scale:	NTS
Approved:	SD	Date:	03/03/2015

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Dwg: 002

Appendix D

3 Do Minimum Scenario's

Junction Ranking

D1 Base Scenario- Junction ranking.

No.	Junction	BASE Delay/veh (secs)	BASE Flow	BASE DELAY (Hrs)
1	Ainley Top	42	21128	244.17
2	Chain Bar	27	32655	244.11
3	A62 Huddersfield Road - A649 Halifax Road signals	355	1600	157.89
4	A62 Leeds Road - A644 Wakefield Road Cooper Bridge roundabout	59	7894	129.53
5	A62 Leeds Road - A644 Huddersfield Road Three Nuns signals	190	1947	102.77
6	Junction 26 M62 slip road westbound off	62	5026	86.85
7	A62 Leeds Road - A6107 Bradley Road signals	76	3274	69.10
8	A638 High Street - B6117 Market Street signals	115	2030	64.96
9	A641 Bradford Road - Spaines Road signals	73	2996	60.56
10	A62 Queensgate - A616 Chapel Hill - A62 Manchester Road signals	65	3091	55.75
11	A616 Lockwood Road - B6108 Meltham Road signals	66	2623	47.87
12	Shorehead Roundabout	28	5950	46.46
13	A62 Leeds Road - Bradley Mills Road signals	71	2093	41.12
14	A644 Huddersfield Road - Thornhill Road signals	53	2816	41.09
15	A638 Dewsbury Ring Road - A638 Halifax Road signals	60	2436	40.75
16	A641 Bradford Road - Willow Lane East signals	52	2793	40.23
17	A62 Castlegate - St Johns Road - A641 Bradford Road signals	54	2636	39.83
18	A629 Wakefield Road - B6432 St Andrew's Road signals	32	3876	34.44
19	A652 Bradford Road - A62 Huddersfield Road Birstall Smithies signals	56	2065	31.88
20	A644 Webster Hill - A638 Dewsbury Ring Road signals	43	2625	31.14
21	A653 Leeds Road - B6128 Challenge Way signals	61	1745	29.60
22	A62 Manchester Road - Morley Lane - Cowlersley Lane signals	87	1219	29.50
23	A62 Leeds Road - Thistle Street signals	49	2047	27.58
24	A643 Leeds Road - A62 Gelderd Road - A62 Huddersfield Road signals	45	2210	27.49
25	A629 Halifax Road - Birkby Road signals	61	1604	27.29
26	A62 Leeds Road - A638 Bradford Road signals	48	2006	26.96
27	A629 Halifax Road - Birchencliffe Hill Road	39	2250	24.31
28	A62 Leeds Road - Sunny Bank Road signals	57	1519	24.16
29	A6107 Bradley Road - A641 Bradford Road roundabout	32	2741	24.01
30	A652 Bradford Road - B6128 Rouse Mill Lane signals	52	1636	23.58
31	A62 Huddersfield Road - Norristhorpe Lane signals	46	1844	23.52
32	A62 Leeds Road - A651 Gomersal Road Six Lanes End signals	43	1957	23.30

No.	Junction	BASE Delay/veh (secs)	BASE Flow	BASE DELAY (Hrs)
33	A652 Bradford Road - B6128 Station Road signals	31	2547	21.98
34	A652 Bradford Road - Town Street signals	48	1629	21.78
35	A6024 Huddersfield Road - A635 Victoria Street signals	86	904	21.65
36	A652 Bradford Road - B6123 Stocks Lane signals	33	2363	21.65
37	A638 Dewsbury Ring Road - A638 Wakefield Road signals	25	3109	21.59
38	A653 Leeds Road - B6124 Soothill Lane	38	1991	21.17
39	A638 Dewsbury Ring Road - A653 Leeds Road signals	33	2262	20.92
40	A62 Manchester Road - Longroyd Lane signals	58	1275	20.65
41	A62 Gelderd Road - M621 junction 27 westbound slip road roundabout	12	6010	20.48
42	A62 Leeds Road end of bus lane pedestrian crossing	63	1171	20.42
43	A644 Huddersfield Road Ravensthorpe Gyratory	15	4955	20.19
44	A62 Leeds Road - Stocks Bank Road signals	47	1458	19.18
45	A638 Aldams Road - B6409 Wilton Street signals	49	1397	19.07
46	A651 Oxford Road - A643 Spen Lane signals	40	1688	18.54
47	A616 Folly Hall - B6432 Saint Thomas Road signals	28	2356	18.36
48	A62 Southgate - A62 Leeds Road signals	35	1806	17.77
49	A638 Webster Hill - Mill Street West signals	27	2285	17.44
50	A629 Wakefield Road - Broad Lane signals	26	2407	17.25

D2 2020 Scenario Junction Ranking.

Base Rank	New Rank	Junction	DM 2020 Delay/veh (secs)	DM 2020 Flow	DM 2020 DELAY (Hrs)
1	1	Ainley Top	57	21742	343.52
2	2	Chain Bar	31	34814	300.14
4	3	A62 Leeds Road - A644 Wakefield Road Cooper Bridge roundabout	89	7994	198.70
3	4	A62 Huddersfield Road - A649 Halifax Road signals	370	1779	182.90
6	5	Junction 26 M62 slip road westbound off	92	6113	155.92
5	6	A62 Leeds Road - A644 Huddersfield Road Three Nuns signals	242	2051	137.87
7	7	A62 Leeds Road - A6107 Bradley Road signals	109	3353	101.73
9	8	A641 Bradford Road - Spaines Road signals	104	2953	85.64
12	9	Shorehead Roundabout	50	6179	85.35
10	10	A62 Queensgate - A616 Chapel Hill - A62 Manchester Road signals	86	3284	78.10
8	11	A638 High Street - B6117 Market Street signals	138	2019	77.44
13	12	A62 Leeds Road - Bradley Mills Road signals	110	2457	75.04
91	13	Junction 26 M62 slip road eastbound on	17	14166	66.58
17	14	A62 Castlegate - St Johns Road - A641 Bradford Road signals	80	2857	63.40
11	15	A616 Lockwood Road - B6108 Meltham Road signals	83	2728	62.63
29	16	A6107 Bradley Road - A641 Bradford Road roundabout	76	2837	59.91
18	17	A629 Wakefield Road - B6432 St Andrew's Road signals	48	4133	55.66
14	18	A644 Huddersfield Road - Thornhill Road signals	61	2921	49.61
28	19	A62 Leeds Road - Sunny Bank Road signals	99	1768	48.47
15	20	A638 Dewsbury Ring Road - A638 Halifax Road signals	62	2741	47.18
25	21	A629 Halifax Road - Birkby Road signals	96	1728	46.13
24	22	A643 Leeds Road - A62 Gelderd Road - A62 Huddersfield Road signals	64	2544	45.44
19	23	A652 Bradford Road - A62 Huddersfield Road Birstall Smithies signals	69	2310	44.24
20	24	A644 Webster Hill - A638 Dewsbury Ring Road signals	53	2815	41.52
36	25	A652 Bradford Road - B6123 Stocks Lane signals	54	2698	40.79
21	26	A653 Leeds Road - B6128 Challenge Way signals	67	2087	38.95
16	27	A641 Bradford Road - Willow Lane East signals	50	2803	38.56
35	28	A6024 Huddersfield Road - A635 Victoria Street signals	123	1105	37.68
33	29	A652 Bradford Road - B6128 Station Road signals	45	2888	36.40
23	30	A62 Leeds Road - Thistle Street signals	56	2239	34.62
22	31	A62 Manchester Road - Morley Lane - Cowlersley Lane signals	92	1244	31.85
32	32	A62 Leeds Road - A651 Gomersal Road Six Lanes End signals	55	2087	31.79
39	33	A638 Dewsbury Ring Road - A653 Leeds Road signals	43	2624	31.47
38	34	A653 Leeds Road - B6124 Soothill Lane	43	2547	30.64
30	35	A652 Bradford Road - B6128 Rouse Mill Lane signals	60	1808	30.24
40	36	A62 Manchester Road - Longroyd Lane signals	75	1437	29.84
37	37	A638 Dewsbury Ring Road - A638 Wakefield Road signals	30	3575	29.73
42	38	A62 Leeds Road end of bus lane pedestrian crossing	82	1211	27.54

Base Rank	New Rank	Junction	DM 2020 Delay/veh (secs)	DM 2020 Flow	DM 2020 DELAY (Hrs)
43	39	A644 Huddersfield Road Ravensthorpe Gyratory	17	5623	27.17
46	40	A651 Oxford Road - A643 Spen Lane signals	53	1855	27.15
56	41	A638 Wakefield Road - Syke Lane signals	42	2316	26.87
45	42	A638 Aldams Road - B6409 Wilton Street signals	64	1509	26.80
34	43	A652 Bradford Road - Town Street signals	52	1804	26.05
51	44	A6024 Woodhead Road - Station Road signals	56	1652	25.82
49	45	A638 Webster Hill - Mill Street West signals	36	2534	25.19
44	46	A62 Leeds Road - Stocks Bank Road signals	60	1489	24.72
54	47	B6123 Batley Road - B6122 White Lee Road signals	80	1103	24.53
41	48	A62 Gelderd Road - M621 junction 27 westbound slip road roundabout	13	6645	24.00
48	49	A62 Southgate - A62 Leeds Road signals	39	2190	23.99
59	50	A62 Gelderd Road - Highwood Road	47	1851	23.93

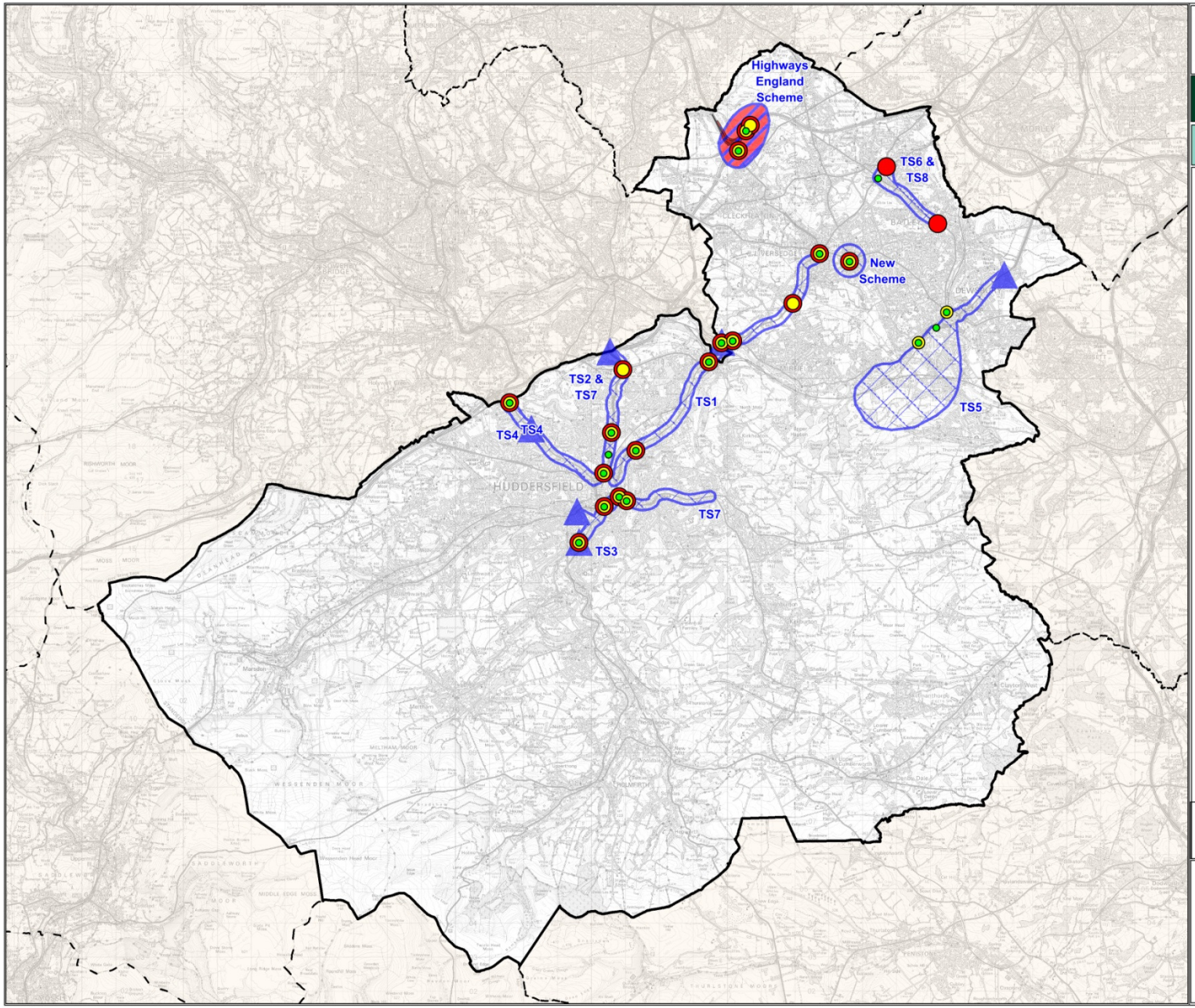
D3 2030 Scenario Junction Ranking.

Base Rank	New Rank	Junction	DM 2030 Delay/veh (secs)	DM 2030 Flow	DM 2030 DELAY (Hrs)
1	1	Ainley Top	68	22036	415.20
2	2	Chain Bar	39	35628	381.86
4	3	A62 Leeds Road - A644 Wakefield Road Cooper Bridge roundabout	115	7904	253.29
6	4	Junction 26 M62 slip road westbound off	96	6812	181.89
5	5	A62 Leeds Road - A644 Huddersfield Road Three Nuns signals	270	2336	174.95
3	6	A62 Huddersfield Road - A649 Halifax Road signals	262	1809	131.74
91	7	Junction 26 M62 slip road eastbound on	29	15406	123.28
7	8	A62 Leeds Road - A6107 Bradley Road signals	131	3361	122.53
9	9	A641 Bradford Road - Spaines Road signals	127	2916	103.18
29	10	A6107 Bradley Road - A641 Bradford Road roundabout	124	2981	102.99
28	11	A62 Leeds Road - Sunny Bank Road signals	192	1896	101.23
12	12	Shorehead Roundabout	54	6451	97.63
13	13	A62 Leeds Road - Bradley Mills Road signals	132	2550	93.26
8	14	A638 High Street - B6117 Market Street signals	159	2005	88.39
10	15	A62 Queensgate - A616 Chapel Hill - A62 Manchester Road signals	93	3356	86.96
17	16	A62 Castlegate - St Johns Road - A641 Bradford Road signals	95	2939	77.54
36	17	A652 Bradford Road - B6123 Stocks Lane signals	90	2821	70.31
18	18	A629 Wakefield Road - B6432 St Andrew's Road signals	57	4398	69.82
11	19	A616 Lockwood Road - B6108 Meltham Road signals	90	2752	68.54
24	20	A643 Leeds Road - A62 Gelderd Road - A62 Huddersfield Road signals	87	2637	63.91
14	21	A644 Huddersfield Road - Thornhill Road signals	74	3023	61.89
56	22	A638 Wakefield Road - Syke Lane signals	82	2562	58.32
15	23	A638 Dewsbury Ring Road - A638 Halifax Road signals	66	2955	54.17
19	24	A652 Bradford Road - A62 Huddersfield Road Birstall Smithies signals	77	2506	53.88
21	25	A653 Leeds Road - B6128 Challenge Way signals	82	2356	53.74
25	26	A629 Halifax Road - Birkby Road signals	105	1790	52.12
130	27	M62 junction 25 slip road, westbound on	37	5115	52.11
38	28	A653 Leeds Road - B6124 Soothill Lane	56	3185	49.94
35	29	A6024 Huddersfield Road - A635 Victoria Street signals	140	1241	48.22
20	30	A644 Webster Hill - A638 Dewsbury Ring Road signals	61	2834	48.11
44	31	A62 Leeds Road - Stocks Bank Road signals	108	1510	45.38
33	32	A652 Bradford Road - B6128 Station Road signals	51	2993	42.62
37	33	A638 Dewsbury Ring Road - A638 Wakefield Road signals	38	3672	38.35
16	34	A641 Bradford Road - Willow Lane East signals	49	2797	37.80
45	35	A638 Aldams Road - B6409 Wilton Street signals	85	1569	37.00
30	36	A652 Bradford Road - B6128 Rouse Mill Lane signals	70	1860	36.42
23	37	A62 Leeds Road - Thistle Street signals	57	2287	36.40
39	38	A638 Dewsbury Ring Road - A653 Leeds Road signals	46	2813	36.04

Base Rank	New Rank	Junction	DM 2030 Delay/veh (secs)	DM 2030 Flow	DM 2030 DELAY (Hrs)
64	39	A638 Westgate - B6117 Northgate signals	77	1649	35.22
22	40	A62 Manchester Road - Morley Lane - Cowlersley Lane signals	100	1252	34.64
51	41	A6024 Woodhead Road - Station Road signals	67	1845	34.56
49	42	A638 Webster Hill - Mill Street West signals	48	2521	33.80
40	43	A62 Manchester Road - Longroyd Lane signals	80	1498	33.37
32	44	A62 Leeds Road - A651 Gomersal Road Six Lanes End signals	54	2122	31.62
52	45	B6409 Savile Road - Mill Street West signals	46	2438	30.91
34	46	A652 Bradford Road - Town Street signals	59	1860	30.33
43	47	A644 Huddersfield Road Ravensthorpe Gyratory	19	5780	29.91
48	48	A62 Southgate - A62 Leeds Road signals	45	2393	29.68
54	49	B6123 Batley Road - B6122 White Lee Road signals	95	1128	29.66
81	50	A638 Wakefield Road - High Road	37	2820	29.20

Appendix E

Do Something Scenario
And Transport Mitigation Strategy



Kirklees COUNCIL

Local Plan Transport Mitigation Strategy

Draft Local Plan - November 2015

Transport

Highways England Transport Scheme

Transport Scheme

Improvement to transport hub/junction

Area subject to transport improvement scheme

Congested Junctions

Congested in Base

Congested in 2020

Congested in 2030

Map scale: 1:100,000 @ A3

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