EVALUATION OF MITIGATION REQUIREMENTS FOR LEEDS SITE ALLOCATIONS PLAN DEVELOPMENT IN THE EAST LEEDS AND GARFORTH AREA

28 JUNE 2018

1. INTRODUCTION

1.1. The Submission draft Leeds Site Allocations Plan (SAP) contains proposals for the delivery of 67,817 dwellings between 2012 and 2028[1]. Just over half this total are included in Identified sites (35,374) and 32,443 in Allocated sites.

1.2. The two largest allocated housing sites are located adjacent to Garforth:

- MX2-39 Parlington Estate, Aberford – Outer NE HMCA – 1,850 dwellings and 5 Ha employment

- HG2-124 Stourton Grange Farm South, Selby Road - Ridge Road, Garforth – Outer SE HMCA – 2,314 dwellings

1.3. These two sites will generate significant volumes of traffic that is likely to add considerably to congestion on the local and strategic road network.

1.4. In addition, a number of smaller sites are also located within the communities of Garforth and Kippax as well as major developments at Thorpe Park and East Leeds Extension.

1.5. This report documents the results of a local transport modelling exercise that has been undertaken to evaluate the potential impacts of the SAP in the Garforth and east Leeds area. It includes a consideration of the impact of mitigation schemes at M1 junction 47 and on the A63 at Garforth.

1.6. This work has been undertaken using a local highway transport model funded jointly by Leeds City council, Highways England and the promoters of the Parlington and Stourton Grange Farm sites. The model tests have been undertaken by Leeds City Council.

2. GARFORTH AND EAST LEEDS MODEL

2.1. In order to assess the impacts of the SAP a local traffic model was developed to cover the area of interest. The coverage of the model is shown in Figure 1 below. The model was principally based on the existing Leeds Transport Model (LTM) supplemented by additional survey data and a refined zoning system.

2.2. Comprehensive traffic surveys were undertaken in the spring of 2017 covering all the key roads around Garforth. These comprised automatic traffic counts (ATC) and manual classified junction counts (MCC). The former were undertaken for a period of 2 weeks in late March to provide a robust measure of average traffic levels, while the MCC were carried out on a single weekday from 0700-1900. ANPR surveys were carried out on the A63 and A642 at Garforth to determine the levels of through traffic. See Figure 2.

2.3. All the data was collected at 15 minute intervals to allow an assessment of the peak periods and ensure that the resulting model reflected the local morning and evening peak hours. Following an assessment of the ATC data it was determined that these were 0730-0830 and 1645-1745.

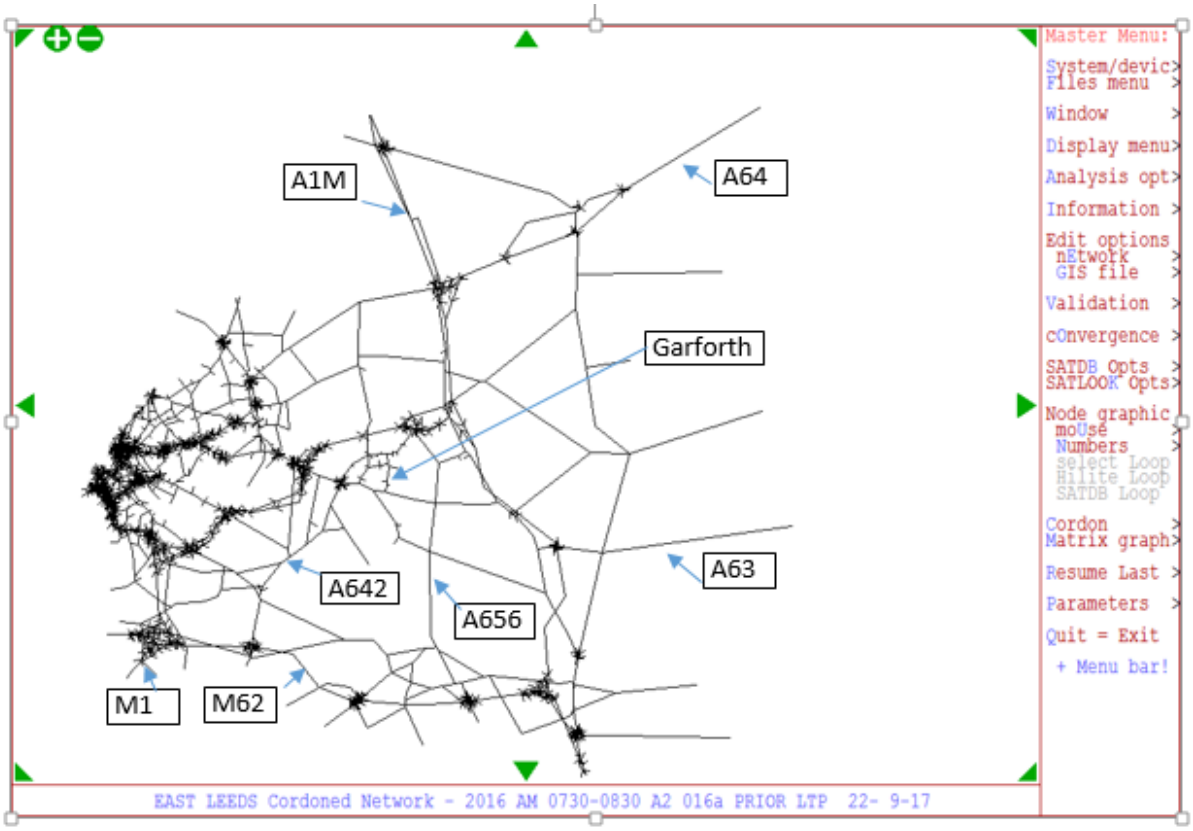
2.4. In addition, these surveys were supplemented by other survey data collected principally in 2015 for the most recent update of the LTM, and the latest weekday journey time data

[1] Leeds SAP Table 1

collected by TrafficMaster and provided by the DfT to local authorities. This data covered the academic year 2015-16 excluding school and bank holidays.

2.5. In order to provide a consistent survey database for the development of the model all the traffic counts were factored to a common 2016 baseline. Throughout the report the base situation referred to is for 2016.

Figure 1 – Garforth and East Leeds Model Coverage



2.6. The resulting traffic model was calibrated and validated to ensure that it replicated the observed traffic levels and journey times. This is reported in the Local Model Validation Report.

2.7. In order to forecast the impacts of the SAP, future year trip matrices were created based on the sites contained in the site allocations plan and trip rates previously used by Leeds City Council in the consideration of the wider plan. These are shown in Table 1. External traffic movements were grown in line with the DfT NTEM 7.2 (Tempro) database.

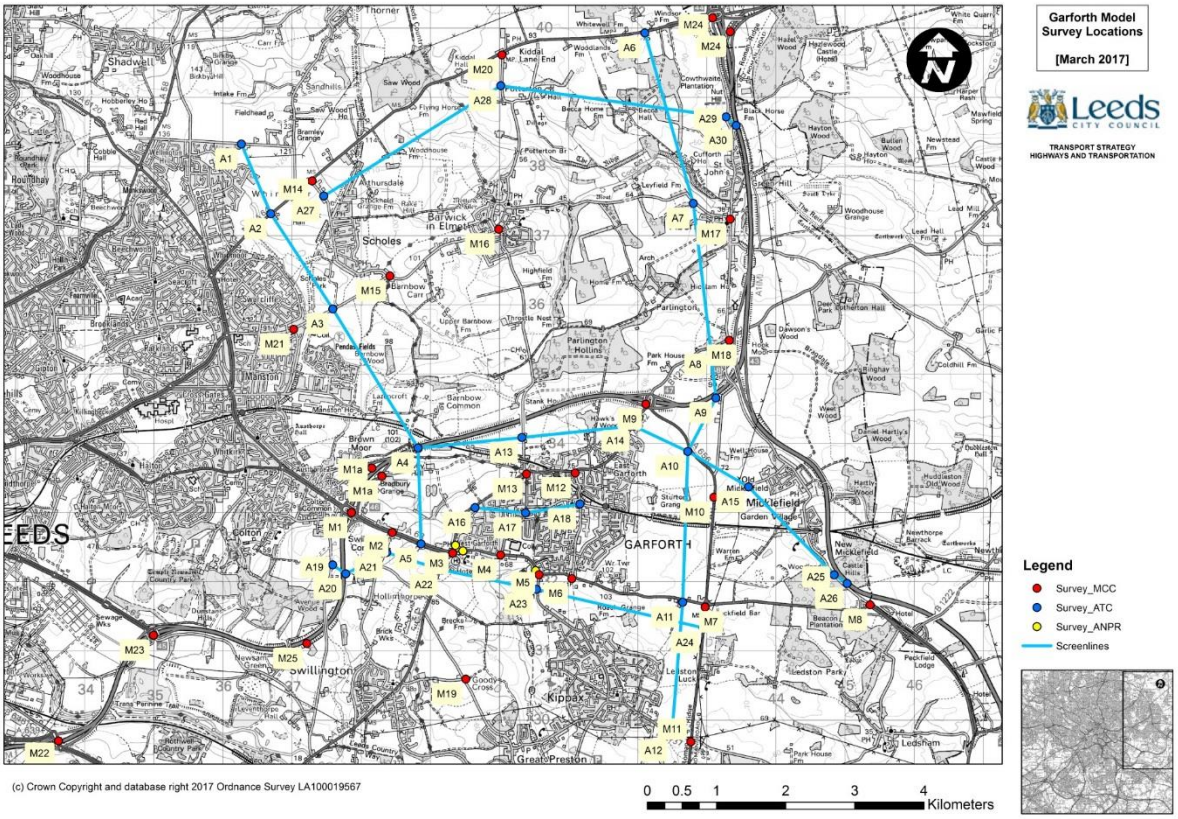
Table 1 – Development Trip Rates (vehs)

Use Type	Location	AM (08:00 to 09:00)			PM (17:00 to 18:00)		
		IN	OUT	TOTAL	IN	OUT	TOTAL
Housing & flats	Not city centre	0.138	0.413	0.551	0.378	0.214	0.592
Housing (flats)	City centre	0.054	0.165	0.219	0.125	0.070	0.195
B1 office	Not city centre	1.716	0.305	2.021	0.209	1.420	1.629
	City centre	1.513	0.248	1.761	0.237	1.336	1.573
General employment*	All	0.208	0.097	0.305	0.059	0.185	0.244

Note: Rate per dwelling for residential, rate per 100sqm GFA for employment

2.8. To ensure that the local peak hours were reflected in the forecasts, the trip rates were applied without any adjustment.

Figure 2 – Data collection March 2017



2.9. For the majority of development sites in the model the existing trip distribution from the relevant model zones was assumed to apply to future development. However, given that the Parlington and Stourton Grange Farm sites are in green field locations an alternative approach was adopted that utilised trip distributions from a number of adjacent communities.

2.10. In the case of Parlington, this was based on model zones covering Barwick in Elmet, Aberford, Micklefield and Garforth. For Stourton Grange Farm the source zones were Micklefield, Garforth and Kippax.

2.11. Two horizon years were modelled, reflecting different levels of delivery: 2028 and 2033. In addition, a number of intermediate years were also developed to enable a high level assessment of possible trigger points and reflecting the partial build out of the sites – see Table 2.

Table 2

Scenario	2024	2028	2033
1 – full build out by 2028	Intermediate test	Full build out	-

2 – full build out by 2033	Intermediate test	Intermediate test	Full build out

2.12. Full details of the forecasts are contained in the Model Forecasting Report.

2.13. This report only considers the results of the model tests for Scenario 1 with a horizon year of 2028.

3. MODELLED TRAFFIC IMPACTS

3.1. All the model tests runs described below are based on Scenario 1 for 2028 (ie full build out of development sites with the maximum potential impact on traffic levels).

3.2. The future year model forecasts included an assumption that a number of transport schemes will have been completed (current status listed in brackets):

- M1 Junction 45 improvement (under construction)
- East Leeds Orbital Road/Manston Lane Link Road/M1 Junction 46 (ELOR scheme under development, MLLR under construction)
- Temple Green Park and Ride (completed, open July 2017)
- A63 Selby Rd/B6137 Leeds Rd junction improvement (scheme associated with housing development in Kippax)
- A642 Lidl development and associated junctions, Garforth (completed March 2018)

3.3. The ELOR scheme was included on the grounds that it facilitates much of the development in East Leeds Extension. Limited improvements to the southern roundabout junction between the A63 / A6120 and Motorway slip roads at M1 junction 46 associated with the ELOR scheme have also been included. The Leeds Rd junction improvement is associated with the Sandgate Dr, Kippax housing development (HG3-19). No other interventions were included.

3.4. These tests are referred to thereafter as Do Minimum (DM) tests. Appendix 1 includes scheme plans where available for the Do Minimum and Do Something schemes.

Do Minimum impacts

3.5. The Do Minimum model tests for 2028 indicate that high levels of traffic growth will occur at M1 junction 47 and the M1 between J46 and 47 in both directions. Traffic also grows on the A63 through Garforth and the minor road network around Barwick-in-Elmet and Scholes. Significant increases in two way flow of between 600 and 1000 vehicles per hour are forecast in the morning and evening peak hours on a number of these routes.

3.6. Traffic flow changes on key links are illustrated in Table 3, highlighting the more significant changes from the modelled base 2016 situation.

3.7. The biggest absolute changes in flow are experienced on the M1 westbound in the AM and PM peaks, with the biggest impact between junction 47 and 46 where flows are forecast to rise by up to 1300 pcus (27%) westbound in the AM peak hour and by 1100 pcus (31%) in the PM peak. In the eastbound direction the flow increases by a lower amount in the PM peak, but with a significant increase of 915 pcus in the AM peak (24%). Flows on the B1217 between the Parlington site access and M1 junction 47 also increase significantly in the AM peak (101%). In the eastbound direction the flow increases by a much lower amount in the PM peak. This suggests that traffic uses alternative routes away from the M1 to return to the Parlington site and other destinations served by the B1217 reflecting capacity issues affecting the EB off slip at junction 47.

3.8. In percentage terms the minor road network around Aberford, Barwick in Elmet and Scholes is forecast to experience by far the biggest increases in traffic flow, with a number of links

forecast to more than double or treble the level of traffic. Overall, peak direction flows on these parts of the network are forecast to rise by between 500 and 1000 pcus.

3.9. Significant increases in traffic of between 50% and nearly 200% are also forecast for the A642 and A656 around Garforth particularly in the vicinity of M1 junction 47.

Table 3 : Changes in traffic flow on key links between the base year (2016) and the forecast year (2028) in the Do Minimum situation without any mitigation for the 2 large sites

Key link	Dirn	Base conditions 2016		Do minimum 2028		Change from 2016		%age Change from 2016	
Scenario 1		Am pk hour	Pm pk hour	Am pk hour	Pm pk hour	Am pk hour	Pm pk hour	Am pk hour	Pm pk hour
		Actual flow	Actual flow	Actual flow	Actual flow	Actual flow	Actual flow	Actual flow	Actual flow
A63 east of Garforth	WB	668	611	1076	582	408	-29	61%	-5%
A63 east of Garforth	EB	495	578	527	821	31	242	6%	42%
A63 Garforth (E of Lidgett La)	WB	1139	775	1270	755	131	-21	12%	-3%
A63 Garforth (E of Lidgett La)	EB	581	1029	523	1135	-58	106	-10%	10%
A63 west of Garforth	WB	1807	935	2130	817	323	-118	18%	-13%
A63 west of Garforth	EB	1035	1723	961	1917	-73	194	-7%	11%
A656 south of Jn 47	NB	846	354	922	991	75	637	9%	180%
A656 south of Jn 47	SB	371	843	787	1098	415	255	112%	30%
A656 south of A63	NB	579	458	839	735	260	277	45%	60%
A656 south of A63	SB	447	550	722	718	274	169	61%	31%
A642 south of Jn 47	NB	609	619	680	993	71	374	12%	60%
A642 south of Jn 47	SB	540	580	762	688	222	108	41%	19%
A642 south of A63	NB	548	431	836	772	288	340	53%	79%
A642 south of A63	SB	475	706	785	1123	310	418	65%	59%
B1217 north of Jn 47	WB	584	260	1171	662	587	402	101%	155%
B1217 north of Jn 47	EB	230	488	436	673	206	185	90%	38%
Main St Aberford	NB	289	251	880	260	591	8	205%	3%
Main St Aberford	SB	234	238	225	896	-9	658	-4%	277%
Cattle La	WB	143	124	641	134	498	10	349%	8%
Cattle La	EB	115	117	203	731	88	614	76%	526%
Long La south of Barwick	NB	250	249	247	165	-3	-84	-1%	-34%
Long La south of Barwick	SB	197	240	263	491	66	251	33%	105%
Leeds Rd west of Barwick	WB	429	292	950	258	521	-34	121%	-12%
Leeds Rd west of Barwick	EB	199	362	346	1292	147	930	74%	257%
Leeds Rd west of Scholes	WB	324	246	1026	301	702	54	217%	22%
Leeds Rd west of Scholes	EB	145	296	360	1277	215	981	148%	331%
M1 Jn 47-48	WB	4106	3573	4725	3885	620	312	15%	9%
M1 Jn 47-48	EB	4021	3750	3946	4041	-75	291	-2%	8%
M1 Jn 46-47	WB	4835	3525	6121	4621	1286	1096	27%	31%
M1 Jn 46-47	EB	3854	4380	4769	4740	915	360	24%	8%
M1 Jn 45-46	WB	5975	4482	6220	4966	245	484	4%	11%
M1 Jn 45-46	EB	4611	5449	5272	5344	661	-104	14%	-2%

Absolute changes of between +/- 100 and =/- 499 vehicles have been highlighted in orange. Changes that are greater than +/- 500 vehicles have been highlighted in red. Percentage changes between +/- 10% and =+/- 50% are highlighted in orange. Percentage changes in excess of +/- 50% are highlighted in red.

3.10. Figures 3 and 4 indicate which links are used by traffic generated by the two developments in the morning peak in 2028. This shows that without any mitigation measures most traffic generated by the Parlington site routes through M1 junction 47 to access the M1 westbound in the AM peak hour while traffic from the East of Garforth site is split between the A63 and junction 47. A similar pattern is forecast in the PM peak (Figures 5 and 6).

Figure 3 : Do Minimum trips from the Parlington site in the AM peak (2028).

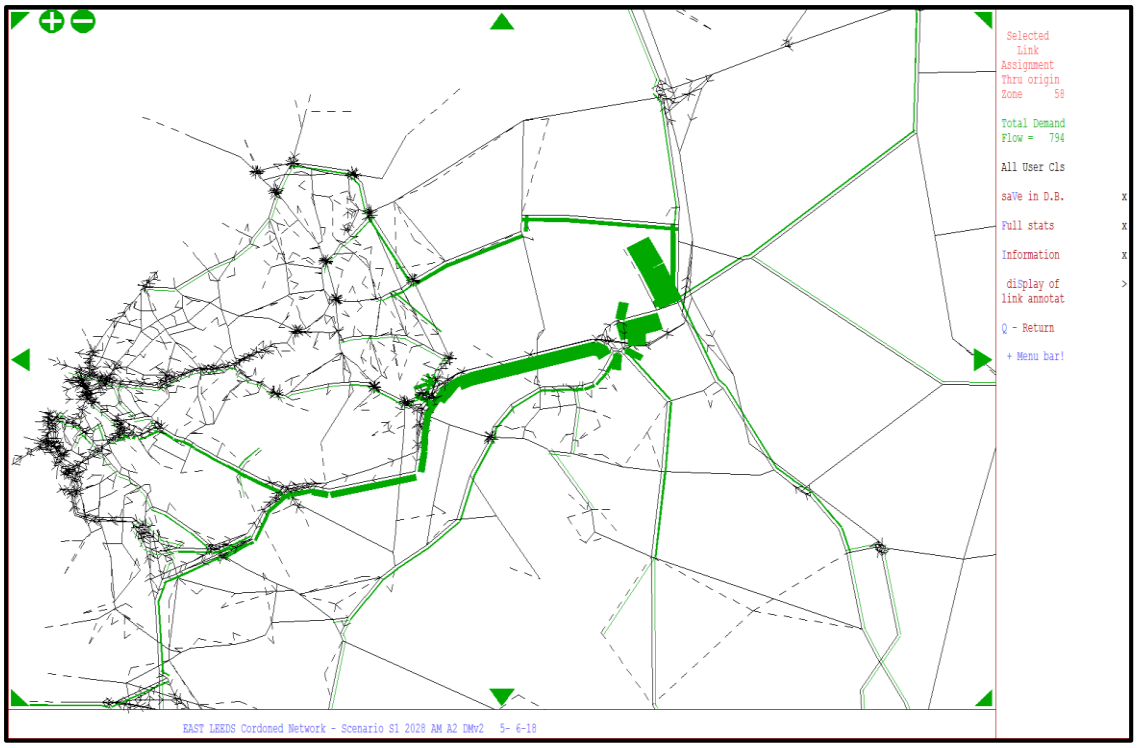


Figure 4 : Do Minimum trips from the East of Garforth Site in the AM peak (2028).

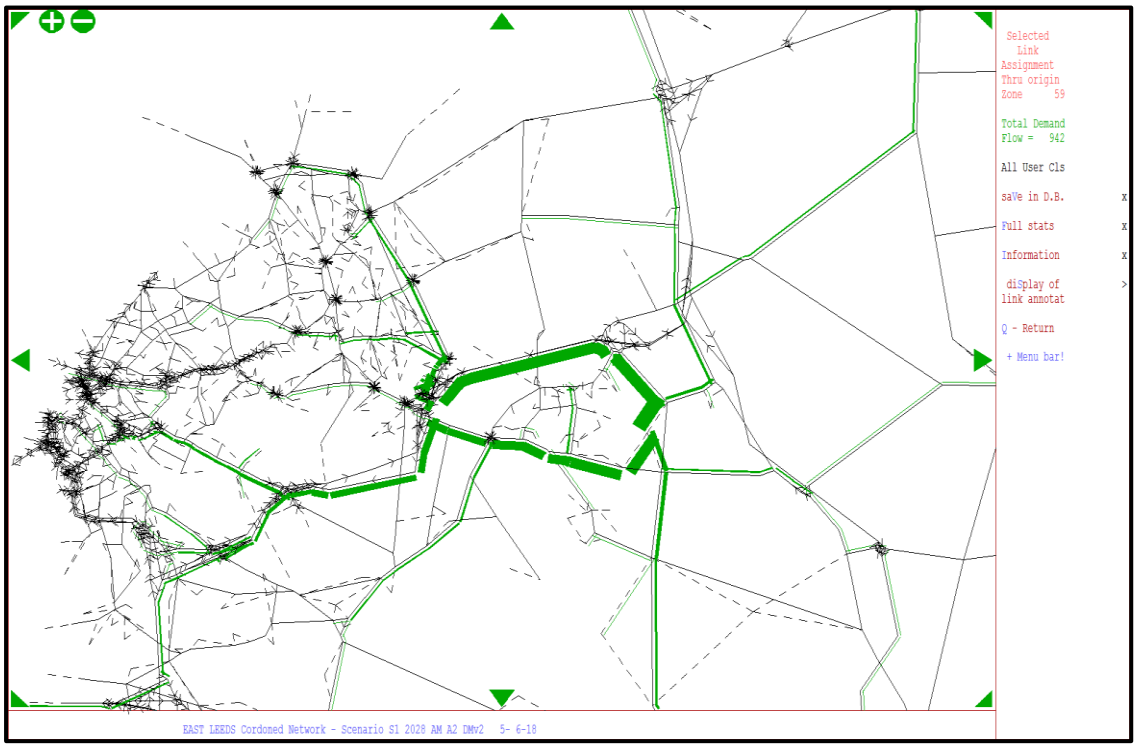


Figure 5 : Do Minimum trips to the Parlington site in the PM peak (2028).

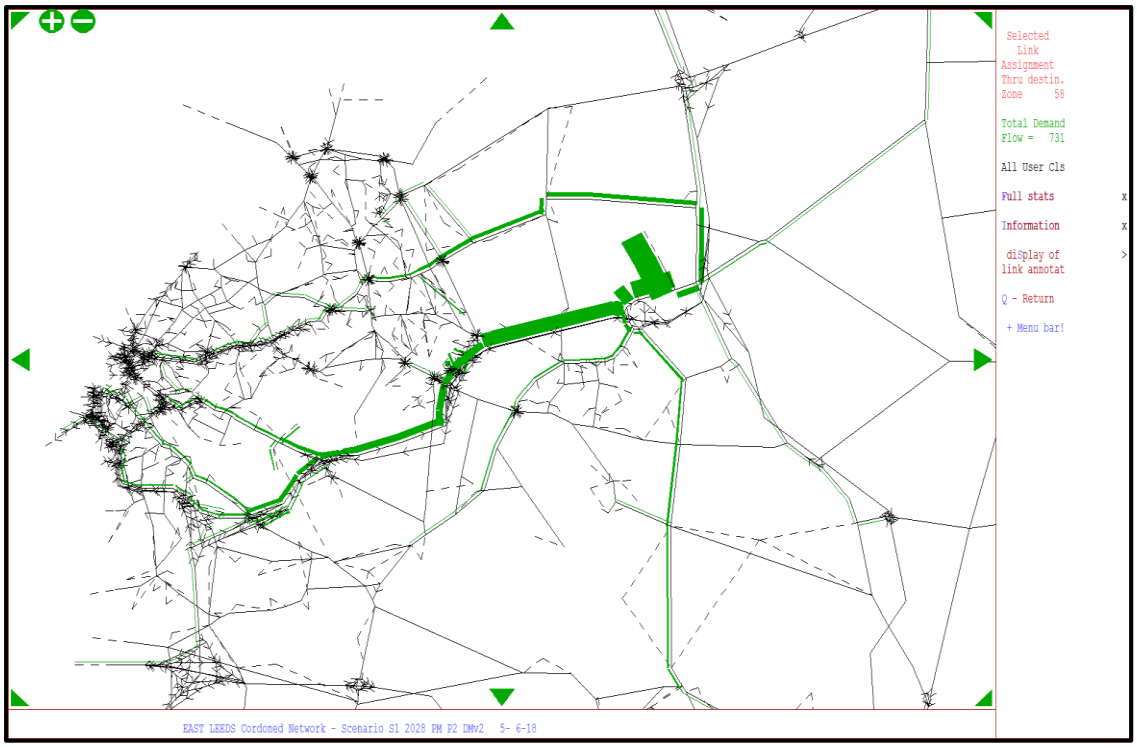
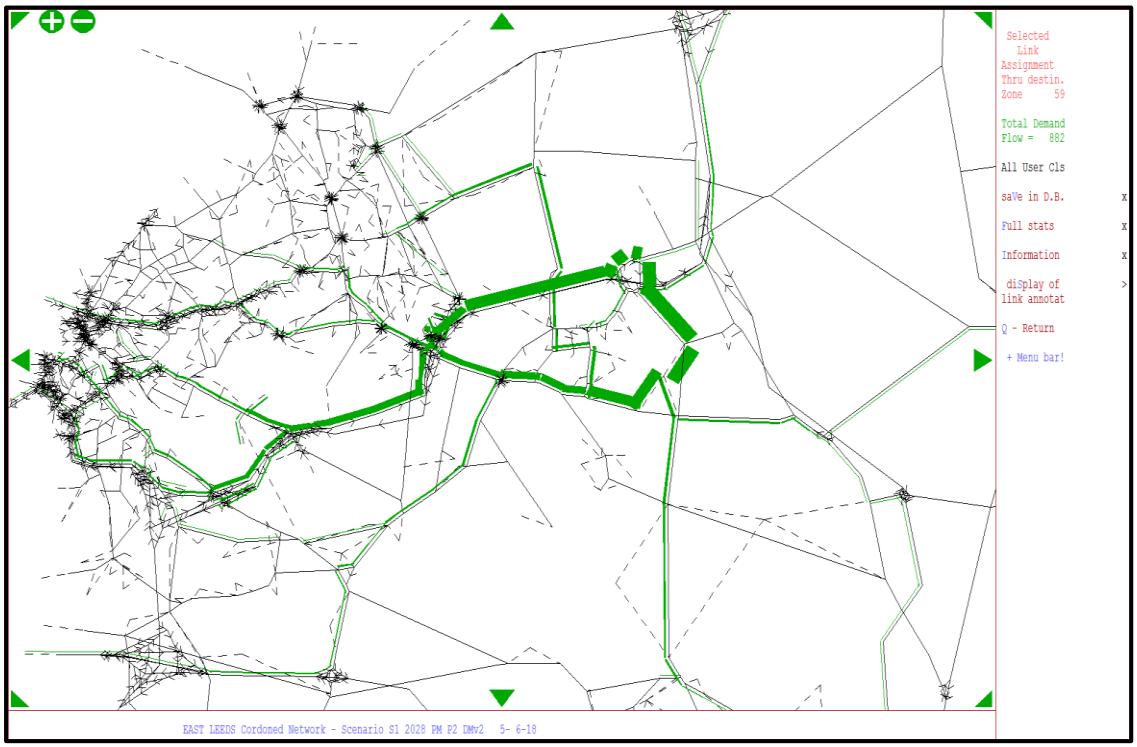


Figure 6 : Do Minimum trips to the East of Garforth Site in the PM peak (2028).



3.11. Tables 4 and 5 show the proportion of traffic generated by the two developments (away from the site in the AM and into the site in the PM) on key links in the Do Minimum situation. It should be noted that trips can pass through more than 1 of the listed sites (for example some trips will route on the A656 and on the M1 between junctions 47 and 46), so the figures in the table cannot be aggregated to give a total distribution

3.12. The tables show that the proportion of trips using the M1 varies significantly between the two sites. Most of the traffic from Parlington in the morning and to Parlington in the evening uses the M1 between junction 46 and 47 (55% in the AM peak and 61% in the PM peak). A lower proportion of trips from / to the East of Garforth site uses the M1 (37% and 42% in the AM and PM peaks respectively).

3.13. Without mitigation up to a fifth of traffic from / to Parlington uses minor roads in and around Aberford to avoid delays on the main road network. Around a third of the East of Garforth site traffic routes through Garforth on the A63. Between 6% and 13% of traffic from/to both sites is forecast to use the A63 East Leeds link road between M1 junction 45 and the City Centre.

3.14. The impact of the developments on key junctions in the Garforth and east Leeds area is illustrated in Tables 6 and 7, which compare traffic volumes and delays in the base year (2016) with the Do Minimum in 2028. Traffic levels at junction 47 are forecast to rise by around 50% in both peak hours, while flows through some of the minor junctions are forecast to rise by as much as 100%.

3.15. Two of the biggest increases in delay are forecast for the roundabout junction of the A63 and A642 to the south west of Garforth (the Old George), where increases of between 9 and 10 minutes per pcu are forecast for the AM and PM peaks. Delays are also forecast to increase significantly at junctions 46 and 47 of the M1, with around 12 to 13 minutes of additional delay per pcu forecast. Forecast increases in junction delay are minimal along the A63 through Garforth (in part because link capacity and the delays at the A63 / A642 junction restrict flow along the A63), with the biggest increase at the Lidgett lane traffic signals in the PM peak of about 1 minute per pcu.

3.16. Substantial increases in delays are also forecast at the A656/Church La junction and the junctions of the A642 north of Garforth with Bar La and Main St, reflecting the significant increases in traffic using these roads.

3.17. Journey times have been extracted from the model for a route along the A63, for 2016 (base year) and 2028 Scenario 1 (Do Minimum without any mitigation). Westbound the route starts at the A656/A63 roundabout and finishes on the A6120 just west of M1 junction 46. The eastbound route matches the westbound in reverse. Table 6 illustrates the journey times and change from base to forecast year. As might be expected the biggest changes are westbound in the AM peak hour and eastbound in the PM peak. The increase in the AM peak is just over 8 minutes in 2028 westbound towards Leeds. Eastbound delays increase by around 6 minutes in 2028. In the absence of mitigation this represents an average increase in journey times of 60% to 90%.

3.18. It should be noted that when considering the outputs from the model runs that historically traffic growth has tended to be well below forecasts, so that the levels of growth predicted are unlikely to occur in practise[2]. However, the effects of congestion tends to be under

[2] See CD1/35 Infrastructure Background Paper Appendix 3

predicted in models (because they cannot account for the peak of the peak effect and also assume a greater degree of driver awareness than occurs in practise). This means that the average delays forecast by the model are likely to be significantly exceeded during the most congested parts of the peak hours.

Table 4 : Proportion of development related traffic on key links from (in the AM) and to (in the PM) the Parlington site in 2028.

Proportion of traffic from / to Parlington in 2028 Sc1 in Do Minimum situation						
	Dir	No of trips	% of trips AM (origin)	Dir	No of trips	% of trips PM (destination)
A642 (south of M1 J47 Garforth)	sb	95	12%	nb	54	7%
A656 Ridge Road (south of M1 J47)	sb	41	5%	nb	52	7%
A656 Ridge Road (south of A63)	sb	41	5%	nb	51	7%
A1(M) (south of A63)	sb	12	2%	nb	9	1%
A63 (between Ninelands Lane and B6137)	wb	10	1%	eb	3	0%
A1(M)(between J46 and J47)	wb	434	55%	eb	445	61%
A63 East Leeds Link Road	wb	104	13%	eb	43	6%
A1(M) (north of A64)	nb	15	2%	sb	10	1%
A64 (east of A1(M))	eb	0	0%	wb	0	0%
Barwick Road (south of M1)	sb	0	0%	nb	0	0%
Leeds Road, Scholes (east of Scholes)	wb	106	13%	eb	117	16%
Main Street, Aberford	nb	137	17%	sb	137	19%
Cattle Lane, Barwick in Elmet	wb	114	14%	eb	123	17%
TOTAL	OUT	794		IN	731	

Table 5 : Proportion of development related traffic on key links from (in the AM) and to (in the PM) the East of Garforth site in 2028.

Proportion of traffic from / to East of Garforth in 2028 Sc1 in Do Minimum situation						
	Dir	No of trips	% of trips AM (origin)	Dir	No of trips	% of trips PM (destination)
A642 (south of M1 J47 Garforth)	sb	20	2%	nb	34	4%
A656 Ridge Road (south of M1 J47)	nb	370	39%	sb	446	51%
A656 Ridge Road (south of A63)	sb	98	10%	nb	71	8%
A1(M) (south of A63)	sb	12	1%	nb	11	1%
Church lane (Micklefield)	eb	88	9%	wb	9	1%
A63 (between Ninelands Lane and B6137)	wb	302	32%	eb	237	27%
M1 (between J46 and J47)	wb	350	37%	eb	369	42%
A63 East Leeds Link Road	wb	107	11%	eb	108	12%
A1(M) (north of A64)	nb	17	2%	sb	11	1%
A64 (east of A1(M))	eb	0	0%	wb	17	2%
Barwick Road (south of M1)	nb	1	0%	sb	67	8%
Leeds Road, Scholes (east of Scholes)	wb	3	0%	eb	70	8%
Main Street, Aberford	nb	37	4%	sb	11	1%
Cattle Lane, Barwick in Elmet	wb	11	1%	eb	8	1%
TOTAL	OUT	942		IN	882	

Table 6 : Changes in delay between 2016 base year and 2028 Do Minimum in the AM peak at key junctions around Garforth

Key Junction	Base 2016 Am pk		Do Min 2028 Am pk			Change from 2016		%age change	
Scenario 1	Traffic (pcus)	Delay (secs)	Traffic (pcus)	Delay (secs)	No of approaches where v/c exceeds 85%	Traffic (pcus)	Delay (secs)	Traffic	Delay
A63 Selby Rd / A656 Ridge Rd	2382	318	2759	351	3	376	32	16%	10%
A63 Selby Rd / Ninelands La, Garforth	1573	153	1899	161	0	326	8	21%	5%
A63 Selby Rd / B6137 Leeds Rd, Garforth	1889	31	2091	42	0	203	11	11%	34%
A63 Selby Rd / B6137 Lidgett La, Garforth	2131	212	2155	204	1	24	-7	1%	-4%
A63 Selby Rd / A642 Wakefield Rd, Garforth	3481	38	4248	616	4	767	578	22%	1529%
A64/A1(M) Junction 44	3353	70	3794	84	0	441	14	13%	20%
A63 Pontefract La / M1 Junction 45	3111	153	4552	217	1	1441	64	46%	42%
A63 Selby Rd / A6120 / M1 Junction 46	5255	315	6474	1102	8	1219	787	23%	250%
Thorpe Park/Jn46	1563	79	4734	223	2	3171	144	203%	183%
A656 Ridge Rd / A642 Aberford Rd / B1217 Aberford Rd / M1 Junction 47	2879	25	4430	484	3	1551	459	54%	1829%
A656 Ridge Rd / Church La	1245	56	1987	745	3	742	689	60%	1238%
A656 Ridge Rd / B6137 Longdike La	1417	181	2080	223	0	663	42	47%	23%
A642 Aberford Rd / Bar La, Garforth	1382	29	1833	452	2	452	423	33%	1479%
A642 Aberford Rd / B6137 Main St / Barwick Rd, Garforth	1400	167	2101	781	3	701	614	50%	368%
Leeds Rd / Long La, Barwick	776	18	1473	44	0	697	26	90%	147%
Leeds Rd / Main St, Scholes	808	18	1461	32	0	653	14	81%	81%
B1217 Aberford Rd / Gt North Rd / Bunkers Hill, Aberford	958	39	1682	41	0	724	2	76%	6%
Main St / Cattle La, Aberford	653	16	1321	26	0	667	10	102%	61%

Table 7 : Changes in delay between 2016 base year and 2028 Do Minimum in the PM peak at key junctions around Garforth

Key Junction	Base 2016 Pm pk		Do Min 2028 Pm pk			Change from 2016		%age change	
Scenario 1	Traffic (pcus)	Delay (secs)	Traffic (pcus)	Delay (secs)	No of approaches where v/c exceeds 85%	Traffic (pcus)	Delay (secs)	Traffic	Delay
A63 Selby Rd / A656 Ridge Rd	2280	134	2597	190	0	317	56	14%	42%
A63 Selby Rd / Ninelands La, Garforth	1721	173	1767	191	0	46	18	3%	11%
A63 Selby Rd / B6137 Leeds Rd, Garforth	2060	37	2149	43	0	89	6	4%	17%
A63 Selby Rd / B6137 Lidgett La, Garforth	2125	239	2262	294	1	137	56	6%	23%
A63 Selby Rd / A642 Wakefield Rd, Garforth	3444	54	4259	600	3	815	546	24%	1003%
A64/A1(M) Junction 44	3248	73	3446	85	0	197	11	6%	15%
A63 Pontefract La / M1 Junction 45	2487	134	4368	156	0	1881	22	76%	17%
A63 Selby Rd / A6120 / M1 Junction 46	5191	434	5963	1157	9	773	723	15%	167%
Thorpe Park/Jn46	1576	78	4463	162	2	2887	84	183%	108%
A656 Ridge Rd / A642 Aberford Rd / B1217 Aberford Rd / M1 Junction 47	2799	40	4314	351	2	1515	311	54%	780%
A656 Ridge Rd / Church La	1225	55	2189	489	2	964	433	79%	782%
A656 Ridge Rd / B6137 Longdike La	1471	181	2174	241	0	703	60	48%	33%
A642 Aberford Rd / Bar La, Garforth	1580	35	2012	105	1	432	70	27%	203%
A642 Aberford Rd / B6137 Main St / Barwick Rd, Garforth	1417	168	2105	331	2	688	162	49%	96%
Leeds Rd / Long La, Barwick	806	18	1692	40	0	886	21	110%	116%
Leeds Rd / Main St, Scholes	876	17	1686	18	1	810	1	92%	4%
B1217 Aberford Rd / Gt North Rd / Bunkers Hill, Aberford	897	37	1345	36	0	447	-1	50%	-3%
Main St / Cattle La, Aberford	654	16	1295	23	0	641	6	98%	39%

Table 8 : Changes in journey time between 2016 base year and 2028 Do Minimum in the AM and PM peaks on the A63 through Garforth [3]

Journey time results (seconds)				
AM	**A2 2016**	**A2 2028 DM**	**Change**	**% change**
A63 westbound	547	1030	483	88%
A63 eastbound	459	517	58	13%
PM	**P2 2016**	**P2 2028 DM**	**Change**	**% change**
A63 westbound	497	540	43	9%
A63 eastbound	582	949	367	63%

[3] from A656 roundabout to pedestrian crossing west of M1 junction 46 and vice versa

4. Mitigation Test 1 Impacts (M1 junction 47 capacity upgrade scheme)

4.1. The first potential mitigation scheme to be tested involved signalising all approaches to M1 junction 47 and widening of the approaches with additional circulatory lanes on the roundabout. Following initial tests that suggested there would be significant delays on the slip road merging onto the M1 westbound in the AM peak, the improvement now includes a "tiger tail" parallel merge on the westbound slip road. The required merge upgrade will be confirmed by Highways England using a DMRB merge assessment. Appendix 1 includes an indicative scheme plan showing these potential improvements to M1 junction 47 as developed by SYSTRA on behalf of Highways England. Note that the plan does not include the tiger tail merge. A scheme to increased capacity at the A63 / A656 roundabout has also been assumed to be built as part of this option. In addition, this option, as with all the mitigation tests, also includes an improvement scheme at M1 Junction 46 (Appendix 1). Both these interventions are currently unfunded.

4.2. Table 9 lists the changes in flow between the 2016 Base, 2028 Do Minimum and the 2028 Do Something situation with the Junction 47 improvements in the AM and PM peak hours.

4.3. In the AM peak flows on the M1 between junction 46 and 47 are forecast to remain broadly the same as in the Do Minimum situation which is around 30% higher than the base in the peak direction (westbound towards Leeds in the AM) and exceeding link capacity. Between junctions 46 and 45 forecast westbound demand also exceeds link capacity, adding significantly to delays. The requirement for additional link capacity and merge diverge upgrades will be confirmed by Highways England using DMRB assessments. Flows on the minor road network around Aberford, Barwick and Scholes are forecast to be lower than in the Do Minimum situation suggesting that more development traffic uses the strategic network. Traffic is still much higher on these minor roads than it is in the 2016 base. Flows on the A63 through Garforth are similar to the Do Minimum (and much higher than the base year) and approaching the link capacity of the road westbound.

4.4. In the PM peak significantly less traffic is forecast to use the minor road network around Aberford, Barwick and Scholes than in the Do Minimum. This traffic routes via M1 junction 47 instead, as evidenced by the significant increase in northbound traffic flow on the B1217 just north of M1 junction 47 (on the section leading to the Parlington development access). Traffic flows on the M1 between 46 and 47 eastbound are still around 20% higher than in the base year, but within the capacity of the road. Eastbound flows on the A63 through Garforth are again forecast to be much higher than in the base year, and marginally higher than in the Do Minimum situation.

4.5. Figures 7 and 8 indicate which links are used by traffic generated by the two developments in the morning peak. This shows that with the mitigation measures at Junction 47 nearly all of the traffic generated by the Parlington site would route through M1 junction 47 to access the M1 in the AM peak. The majority of traffic from the East of Garforth site also now routes via M1 junction 47 reflecting the provision of a direct access onto the A656.

4.6. Figures 9 and 10 indicate which links are used by traffic attracted by the two developments in the evening peak. This indicates that nearly all trips to both sites are now forecast to route via junction 47 of the M1.

4.7. Tables 10 and 11 show the proportion of traffic generated by the two developments (away from the site in the AM and into the site in the PM) on key links in the with M1 Junction 47 scheme situation. This shows that for both sites the proportion of traffic associated with the

developments using the M1 between junctions 46 and 47 increases. For Parlington to between two thirds around three quarters of trips route this way. For East of Garforth, the proportion is slightly lower (between 50 and 60%). The mitigation at junction 47 reduces the proportion of trips from / to Parlington using minor roads in and around Aberford to around 10% in the AM peak and under 5% in the PM peak. The proportion of traffic from / to the East of Garforth site passing through Garforth on the A63 is reduced to 17% in the AM and just 4% in the PM. Similarly to the Do Minimum between 10 and 12% of traffic from/to both sites is forecast to use the East Leeds link road between M1 junction 45 and the City Centre.

4.8. The mitigated impact of the developments on key junctions in the Garforth area is illustrated in Tables 15 and 16, which compare traffic volumes and delays in the Base and Do Minimum situations with the Do Something (junction47 only) situation in 2028.

4.9. Between the 2016 base year and 2028 flows through the junctions and delays are forecast to increase significantly. The biggest absolute change in delay is forecast at the A642 / A63 "Old George" roundabout in Garforth, where delays increase by nearly 10 minutes per pcu in the AM peak. Delays increase by over 6 minutes per pcu in the AM peak at the A656 / Church lane junction with a similar increase forecast in the PM peak.

4.10. Two junctions are forecast to experience significant increases in delay when compared to the Do Minimum, but only in the PM peak. The M1 / A63 Junction 45 roundabout is forecast to see an increase in delay of just over 15 minutes per pcu. This is associated with delays on the slip roads affecting the ability of traffic to join the motorway, particularly in the southbound direction. This reflects the high volume of traffic on the motorway itself, although more detailed work will be required to assess the reliability of this forecast as the capacity of such merges is very sensitive to small changes in model parameters, Highways England will undertake a DMRB merge assessment to confirm whether an upgrade to this merge is required. The Thorpe Park / M1 junc 46 dumbbells are forecast to see an increase of around 6 minutes as a result of traffic rerouting onto the M1 via the improved M1 junction 47. Further work is currently being carried out to look at the design of this junction with ELOR in place to address this issue.

4.11. When compared with the 2028 Do Minimum the impacts of the interventions are to significantly reduce delays at nine junctions in both the AM and PM peak hours Of these, seven junctions benefit from improvements in both peak hours: Large reductions in delay are forecast for the A63 / A656 junction and M1 junctions 46 and 47 due to the increased capacity provided. In addition the Main Street and Bar Lane junctions with the A642 Aberford Rd in Garforth also get improvements, and there are smaller benefits in Barwick and Aberford. Overall, the time savings are greatest in the AM peak hour.

4.12. Journey times have been extracted from the model for a route along the A63, for the situation with the junction 47 scheme in place for the same routes analysed in 2016 Base and Do Minimum. Table 17 shows the journey times and changes from the 2016 base year and 2028 Do Minimum to the 2028 Do Something. As might be expected the biggest changes are westbound in the AM peak and eastbound in the PM peak. The AM peak westbound towards Leeds sees just over 1.5 minutes of less delay compared to the Do Minimum but over 6 minutes additional delay when compared to the base year. The benefit of the junction 47 scheme is more apparent in the PM peak with a time saving of over 3 minutes eastbound compared with the Do Minimum, though again journey times are greater than in the 2016 base year.

Table 9 : Changes in traffic flow on key links in the forecast year 2028 between the Do Minimum situation without mitigation and the Do Something with a mitigation scheme for junction 47 (only).

Key link	Dirn	Base conditions 2016		Do Minimum 2028		Do something 2028		Change from 2016 Base		% Change from 2016		Change from Do min		%age Change from 2028	
Scenario 1		Am pk hour	Pm pk hour	Am pk hour	Pm pk hour	Am pk hour	Pm pk hour	Am pk hour	Pm pk hour	Am pk hour	Pm pk hour	Am pk hour	Pm pk hour	Am pk hour	Pm pk hour
		Actual flow	Actual flow	Actual flow	Actual flow	Actual flow	Actual flow	Actual flow	Actual flow	Actual flow	Actual flow	Actual flow	Actual flow	Actual flow	Actual flow
A63 east of Garforth	WB	668	611	1076	582	913	652	245	42	37%	7%	-163	71	-15%	12%
A63 east of Garforth	EB	495	578	527	821	601	710	105	132	21%	23%	74	-110	14%	-13%
A63 Garforth (E of Lidgett La)	WB	1139	775	1270	755	1226	830	87	55	8%	7%	-44	75	-3%	10%
A63 Garforth (E of Lidgett La)	EB	581	1029	523	1135	631	1161	50	132	9%	13%	109	26	21%	2%
A63 west of Garforth	WB	1807	935	2130	817	2100	1004	293	70	16%	7%	-30	187	-1%	23%
A63 west of Garforth	EB	1035	1723	961	1917	1199	1810	164	88	16%	5%	238	-107	25%	-6%
A656 south of Jn 47	NB	846	354	922	991	1431	844	585	491	69%	139%	509	-146	55%	-15%
A656 south of Jn 47	SB	371	843	787	1098	663	1320	291	477	78%	57%	-124	222	-16%	20%
A656 south of A63	NB	579	458	839	735	983	690	404	232	70%	51%	144	-45	17%	-6%
A656 south of A63	SB	447	550	722	718	767	773	320	224	72%	41%	46	55	6%	8%
A642 south of Jn 47	NB	609	619	680	993	547	927	-62	307	-10%	50%	-132	-67	-19%	-7%
A642 south of Jn 47	SB	540	580	762	688	780	681	240	101	44%	17%	18	-7	2%	-1%
A642 south of A63	NB	548	431	836	772	821	693	273	262	50%	61%	-15	-78	-2%	-10%
A642 south of A63	SB	475	706	785	1123	867	907	392	201	83%	29%	82	-216	10%	-19%
B1217 north of Jn 47	WB	584	260	1171	662	1452	700	868	440	149%	169%	281	38	24%	6%
B1217 north of Jn 47	EB	230	488	436	673	555	1200	325	711	141%	146%	119	527	27%	78%
Main St Aberford	NB	289	251	880	260	717	293	428	41	148%	16%	-164	33	-19%	13%
Main St Aberford	SB	234	238	225	896	238	554	3	317	1%	133%	12	-342	5%	-38%
Cattle La	WB	143	124	641	134	525	140	382	16	268%	13%	-116	5	-18%	4%
Cattle La	EB	115	117	203	731	176	400	60	283	52%	242%	-27	-332	-13%	-45%
Long La south of Barwick	NB	250	249	247	165	305	135	55	-114	22%	-46%	58	-30	23%	-18%
Long La south of Barwick	SB	197	240	263	491	225	304	27	64	14%	27%	-39	-187	-15%	-38%
Leeds Rd west of Barwick	WB	429	292	950	258	920	236	491	-57	114%	-19%	-31	-23	-3%	-9%
Leeds Rd west of Barwick	EB	199	362	346	1292	331	771	133	409	67%	113%	-14	-521	-4%	-40%
Leeds Rd west of Scholes	WB	324	246	1026	301	1014	283	691	36	213%	15%	-12	-18	-1%	-6%
Leeds Rd west of Scholes	EB	145	296	360	1277	344	802	199	506	137%	171%	-16	-475	-4%	-37%
M1 Jn 47-48	WB	4106	3573	4725	3885	4537	3886	431	313	10%	9%	-189	2	-4%	0%
M1 Jn 47-48	EB	4021	3750	3946	4041	4151	3651	130	-100	3%	-3%	205	-390	5%	-10%
M1 Jn 46-47	WB	4835	3525	6121	4621	6220	4693	1385	1167	29%	33%	99	71	2%	2%
M1 Jn 46-47	EB	3854	4380	4769	4740	4607	5287	753	907	20%	21%	-162	547	-3%	12%
M1 Jn 45-46	WB	5975	4482	6220	4966	6220	5349	245	868	4%	19%	0	384	0%	8%
M1 Jn 45-46	EB	4611	5449	5272	5344	5280	5404	669	-45	15%	-1%	9	59	0%	1%

Figure 7 : Do Something (junction 47 only) trips from the Parlington site in the AM peak (2028).

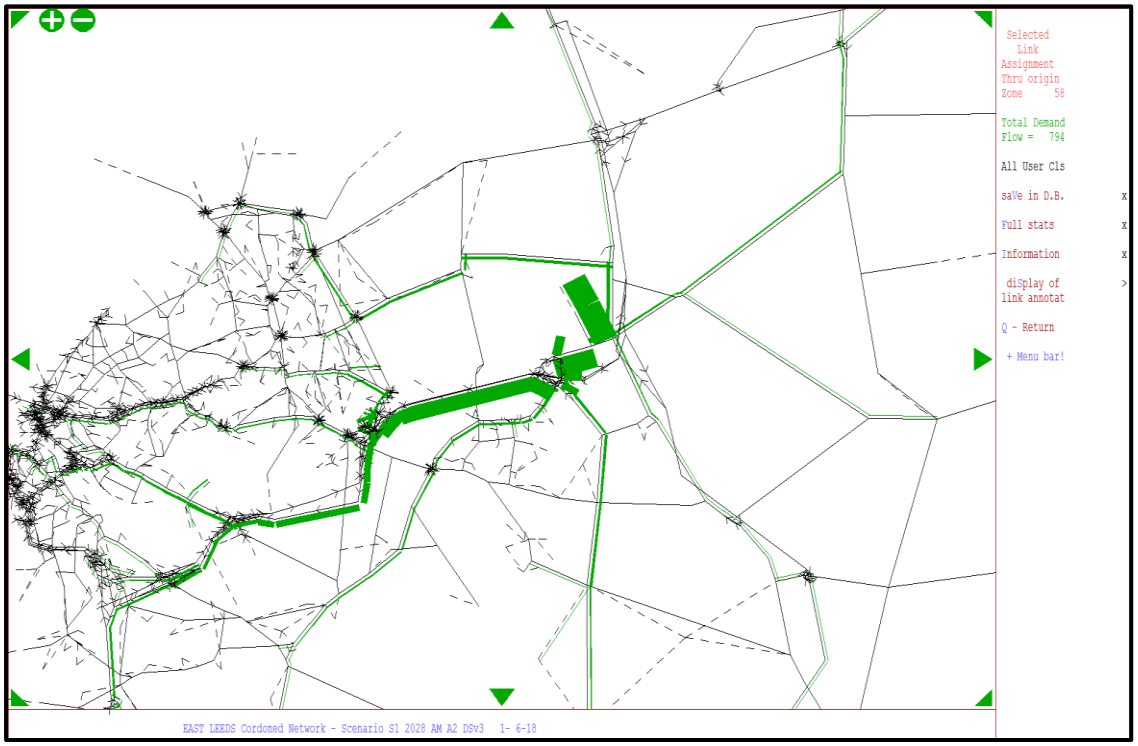


Figure 8 : Do Something (junction 47 only) trips from the East of Garforth site in the AM peak (2028).

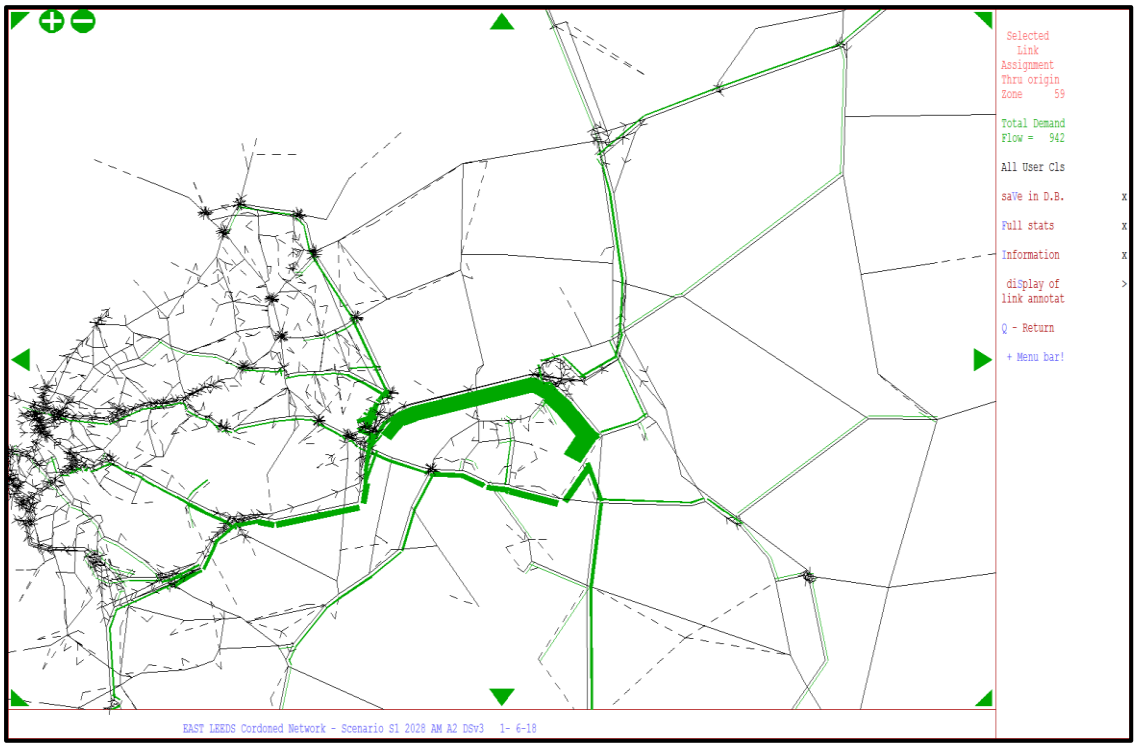


Figure 9 : Do Something (junction 47 only) trips to the Parlington site in the PM peak (2028).

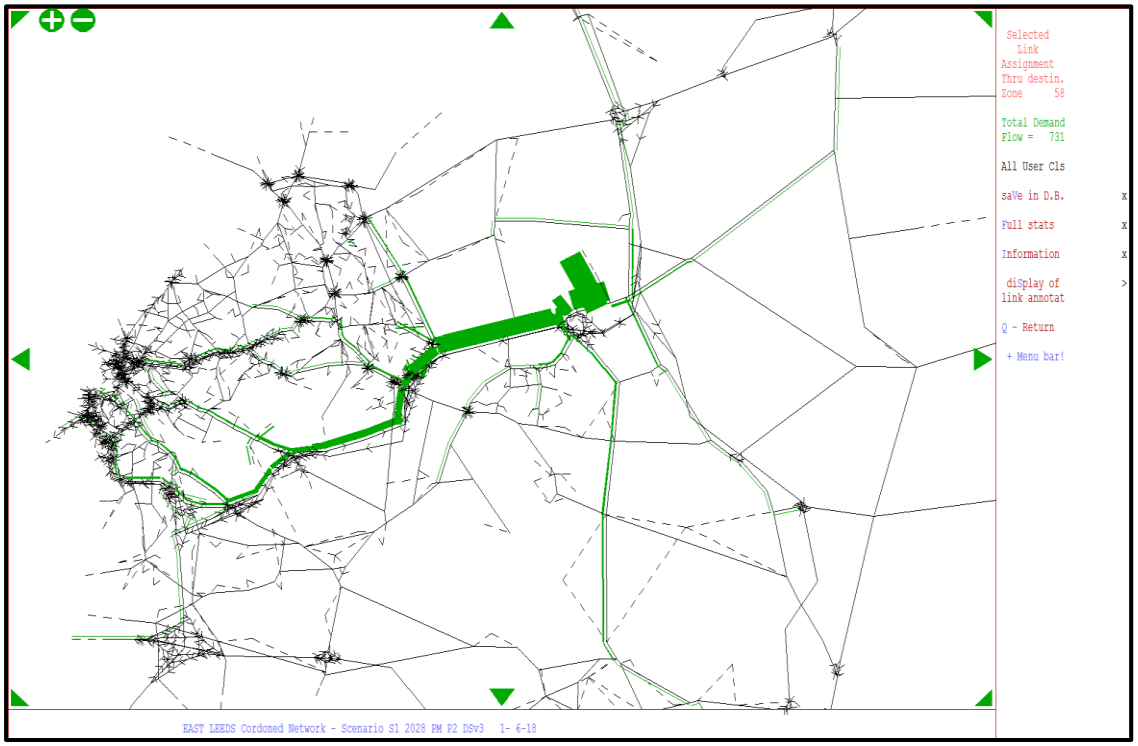


Figure 10 : Do Something (junction 47 only) trips to the East of Garforth site in the PM peak (2028).

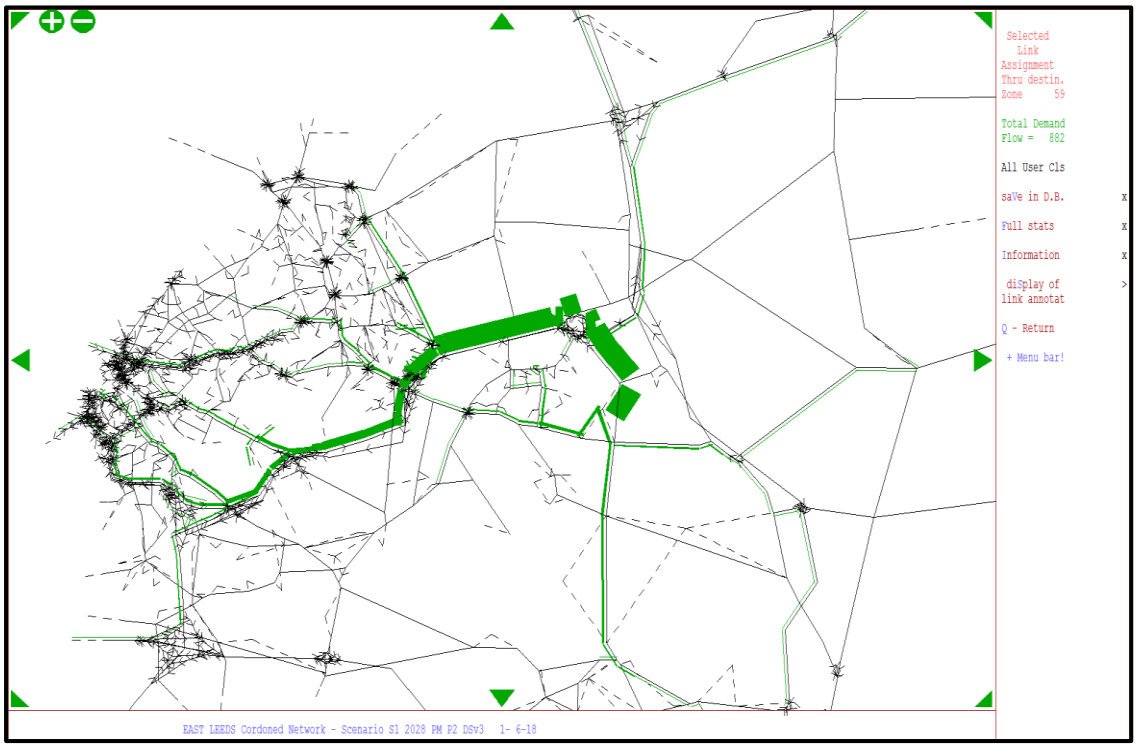


Table 10 : Proportion of development related traffic on key links from (in the AM) and to (in the PM) the Parlington site in 2028.

Proportion of traffic from / to Parlington in 2028 Sc1 with Junction 47 scheme						
	Dir	No of trips	% of trips AM (origin)	Dir	No of trips	% of trips PM (destination)
A642 (south of M1 J47 Garforth)	sb	88	11%	nb	49	7%
A656 Ridge Road (south of M1 J47)	sb	67	8%	nb	44	6%
A656 Ridge Road (south of A63)	sb	67	8%	nb	43	6%
A1(M) (south of A63)	sb	10	1%	nb	9	1%
A63 (between Ninelands Lane and B6137)	wb	4	1%	eb	7	1%
A1(M)(between J46 and J47)	wb	477	60%	eb	562	77%
A63 East Leeds Link Road	wb	99	12%	eb	87	12%
A1(M) (north of A64)	nb	15	2%	sb	10	1%
A64 (east of A1(M))	eb	0	0%	wb	0	0%
Barwick Road (south of M1)	sb	0	0%	nb	0	0%
Leeds Road, Scholes (east of Scholes)	wb	63	8%	eb	9	1%
Main Street, Aberford	nb	92	12%	sb	29	4%
Cattle Lane, Barwick in Elmet	wb	70	9%	eb	15	2%
TOTAL	OUT	794		IN	731	

Table 11 : Proportion of development related traffic on key links from (in the AM) and to (in the PM) the East of Garforth site in 2028.

Proportion of traffic from / to East of Garforth in 2028 Sc1b with Junction 47 scheme						
	Dir	No of trips	% of trips AM (origin)	Dir	No of trips	% of trips PM (destination)
A642 (south of M1 J47 Garforth)	sb	33	4%	nb	13	1%
A656 Ridge Road (south of M1 J47)	nb	573	61%	sb	686	78%
A656 Ridge Road (south of A63)	sb	95	10%	nb	68	8%
A1(M) (south of A63)	sb	12	1%	nb	11	1%
Church lane (Micklefield)	eb	37	4%	wb	9	1%
A63 (between Ninelands Lane and B6137)	wb	161	17%	eb	37	4%
M1 (between J46 and J47)	wb	494	52%	eb	636	72%
A63 East Leeds Link Road	wb	91	10%	eb	96	11%
A1(M) (north of A64)	nb	20	2%	sb	11	1%
A64 (east of A1(M))	eb	24	3%	wb	17	2%
Barwick Road (south of M1)	nb	7	1%	sb	9	1%
Leeds Road, Scholes (east of Scholes)	wb	3	0%	eb	7	1%
Main Street, Aberford	nb	10	1%	sb	9	1%
Cattle Lane, Barwick in Elmet	wb	5	1%	eb	4	0%
TOTAL	OUT	942		IN	882	

Table 12 : Changes in delay between 2028 Do Minimum and 2028 Do Something (Junction 47 only) in the AM peak at key junctions around Garforth

Key Junction	Base 2016		Do Min 2028 Am pk			Do Som 2028 Am pk			Change from 2016 Base		%age change from 2016		Change from Do Min		%age change from DM	
Scenario 1	Traffic (pcus)	Delay (secs)	Traffic (pcus)	Delay (secs)	No of approaches where v/c exceeds	Traffic (pcus)	Delay (secs)	No of approaches where v/c exceeds	Traffic (pcus)	Delay (secs)	Traffic	Delay	Traffic (pcus)	Delay (secs)	Traffic	Delay
A63 Selby Rd / A656 Ridge Rd	2382	318	2759	351	3	2929	114	0	547	-204	23%	-64%	170	-237	6%	-67%
A63 Selby Rd / Ninelands La, Garforth	1573	153	1899	161	0	1769	160	0	196	7	12%	5%	-130	-1	-7%	-1%
A63 Selby Rd / B6137 Leeds Rd, Garforth	1889	31	2091	42	0	2041	33	0	153	2	8%	7%	-50	-9	-2%	-21%
A63 Selby Rd / B6137 Lidgett La, Garforth	2131	212	2155	204	1	2221	202	0	90	-10	4%	-5%	65	-2	3%	-1%
A63 Selby Rd / A642 Wakefield Rd, Garforth	3481	38	4248	616	4	4500	631	4	1018	593	29%	1569%	251	15	6%	2%
A64/A1(M) Junction 44	3353	70	3794	84	0	3638	87	0	285	17	9%	24%	-156	3	-4%	4%
A63 Pontefract La / M1 Junction 45	3111	153	4552	217	1	4541	233	1	1430	80	46%	53%	-11	16	0%	8%
A63 Selby Rd / A6120 / M1 Junction 46	5255	315	6474	1102	8	7027	531	4	1773	216	34%	69%	554	-571	9%	-52%
Thorpe Park/Jn46	1563	79	4734	223	2	4792	238	5	3229	159	207%	202%	58	15	1%	7%
A656 Ridge Rd / A642 Aberford Rd / B1217 Aberford Rd / M1 Junction 47	2879	25	4430	484	3	4808	171	0	1929	146	67%	584%	377	-312	9%	-65%
A656 Ridge Rd / Church La	1245	56	1987	745	3	2308	447	3	1063	392	85%	704%	321	-298	16%	-40%
A656 Ridge Rd / B6137 Longdike La	1417	181	2080	223	0	2270	247	0	853	66	60%	36%	190	24	9%	11%
A642 Aberford Rd / Bar La, Garforth	1382	29	1833	452	2	1961	170	2	579	141	42%	492%	128	-282	7%	-62%
A642 Aberford Rd / B6137 Main St / Barwick Rd, Garforth	1400	167	2101	781	3	2176	362	3	776	196	55%	117%	75	-419	4%	-54%
Leeds Rd / Long La, Barwick	776	18	1473	44	0	1385	34	0	609	17	78%	94%	-89	-9	-6%	-22%
Leeds Rd / Main St, Scholes	808	18	1461	32	0	1442	32	0	634	14	78%	77%	-19	-1	-1%	-2%
B1217 Aberford Rd / Gt North Rd / Bunkers Hill, Aberford	958	39	1682	41	0	1840	51	0	882	12	92%	31%	158	10	9%	24%
Main St / Cattle La, Aberford	653	16	1321	26	0	1154	23	0	501	6	77%	38%	-166	-4	-13%	-14%

Table 13 : Changes in delay between 2028 Do Minimum and 2028 Do Something (Junction 47 only) in the PM peak at key junctions around Garforth

Key Junction	Base 2016		Do Min 2028 Pm pk			Do Som 2028 Pm pk			Change from 2016 Base		%age change from 2016		Change from Do Min		%age change from DM	
Scenario 1	Traffic (pcus)	Delay (secs)	Traffic (pcus)	Delay (secs)	No of approaches where v/c exceeds	Traffic (pcus)	Delay (secs)	No of approaches where v/c exceeds	Traffic (pcus)	Delay (secs)	Traffic	Delay	Traffic (pcus)	Delay (secs)	Traffic	Delay
A63 Selby Rd / A656 Ridge Rd	2280	134	2597	190	0	2607	108	0	327	-26	14%	-20%	9	-83	0%	-43%
A63 Selby Rd / Ninelands La, Garforth	1721	173	1767	191	0	1852	194	0	131	21	8%	12%	85	3	5%	2%
A63 Selby Rd / B6137 Leeds Rd, Garforth	2060	37	2149	43	0	2264	52	0	204	15	10%	41%	115	9	5%	21%
A63 Selby Rd / B6137 Lidgett La, Garforth	2125	239	2262	294	1	2302	322	1	177	83	8%	35%	40	27	2%	9%
A63 Selby Rd / A642 Wakefield Rd, Garforth	3444	54	4259	600	3	4047	298	2	602	243	17%	447%	-212	-303	-5%	-50%
A64/A1(M) Junction 44	3248	73	3446	85	0	3511	86	0	262	13	8%	17%	65	1	2%	2%
A63 Pontefract La / M1 Junction 45	2487	134	4368	156	0	2681	1052	2	193	918	8%	685%	-1688	896	-39%	573%
A63 Selby Rd / A6120 / M1 Junction 46	5191	434	5963	1157	9	6333	602	5	1142	168	22%	39%	370	-555	6%	-48%
Thorpe Park/Jn46	1576	78	4463	162	2	4395	532	4	2819	454	179%	582%	-68	369	-2%	227%
A656 Ridge Rd / A642 Aberford Rd / B1217 Aberford Rd / M1 Junction 47	2799	40	4314	351	2	4903	142	0	2104	102	75%	255%	589	-209	14%	-60%
A656 Ridge Rd / Church La	1225	55	2189	489	2	2245	565	1	1020	510	83%	920%	55	77	3%	16%
A656 Ridge Rd / B6137 Longdike La	1471	181	2174	241	0	2155	231	0	683	50	46%	27%	-19	-10	-1%	-4%
A642 Aberford Rd / Bar La, Garforth	1580	35	2012	105	1	1981	72	0	401	38	25%	109%	-31	-32	-2%	-31%
A642 Aberford Rd / B6137 Main St / Barwick Rd, Garforth	1417	168	2105	331	2	1794	192	0	377	24	27%	14%	-310	-138	-15%	-42%
Leeds Rd / Long La, Barwick	806	18	1692	40	0	1144	22	0	338	4	42%	21%	-548	-18	-32%	-44%
Leeds Rd / Main St, Scholes	876	17	1686	18	1	1166	15	0	290	-2	33%	-12%	-520	-3	-31%	-16%
B1217 Aberford Rd / Gt North Rd / Bunkers Hill, Aberford	897	37	1345	36	0	1512	44	0	615	6	68%	17%	167	8	12%	21%
Main St / Cattle La, Aberford	654	16	1295	23	0	1021	19	0	367	2	56%	14%	-274	-4	-21%	-18%

Table 14 : Changes in journey time between 2016 base year and 2028 Do Something (junction 47 only) in the AM and PM peaks on the A63 through Garforth

Journey time results (seconds)			Scenario 1				
AM	A2 2016	A2 2028 DM	A2 2028 DS	change from base	% change	change from Do Min	% change
A63 westbound	547	1030	933	386	71%	-97	-9%
A63 eastbound	459	517	510	51	11%	-7	-1%
PM	P2 2016	P2 2028 DM	P2 2028 DS	change from base	% change	change from Do Min	% change
A63 westbound	497	540	470	-27	-5%	-70	-13%
A63 eastbound	582	949	741	159	27%	-208	-22%

5. **Mitigation Test 2 Impacts (Garforth Southern Bypass)** The second potential mitigation scheme to be tested involved a new wide single carriageway road providing a southern bypass of Garforth between the A63 / A642 roundabout and the Ninelands Lane junction with the A63. It would include a new intermediate roundabout junction with the B6137 Leeds road and a realigned junction at Ninelands Lane. The A63 / A642 roundabout would be signalised to provide sufficient capacity for the additional traffic anticipated to be attracted by the bypass. No improvements are assumed at M1 junction 47. Appendix 1 includes an indicative scheme plan showing a potential alignment for a Garforth Southern Bypass. Note that the modelled scheme varies slightly from the plan included here, with a realigned signalised junction at Ninelands Lane tested rather than a new roundabout, no changes at the Lidgett La junction and modifications to the new traffic signals on the A63 / A642 roundabout.

5.2. Table 15 lists the changes in flow between the 2016 Base, 2028 Do Minimum and the 2028 Do Something situation with Garforth Southern bypass in the AM and PM peak hours.

5.3. In the AM peak flows on the M1 are forecast to remain broadly the same as in the Do Minimum situation. The forecast flow on the M1 westbound between junction 47 and 46 is significantly higher than the base and approaching the capacity of the link, which may lead to additional delays, while between junctions 46 and 45 westbound demand is forecast to exceed link capacity. The requirement for additional link capacity and merge diverge upgrades will be confirmed by Highways England using DMRB assessments.

5.4. Flows on the minor road network around Aberford, Barwick and Scholes are forecast to be much lower than in the Do Minimum, but much higher than the base. There is a forecast 21% increase in westbound traffic on the A63 west of Garforth (between the bypass and M1 junction 46) compared to the Do Minimum. This flow is just over 40% greater than in the base year, but still well within the link capacity. As would be expected flows on the bypassed section of the A63 through Garforth reduce significantly compared to both the base and Do Minimum.

5.5. In the PM peak significantly less traffic is forecast to use the minor road network around Aberford, Barwick and Scholes than in the Do Minimum. Although much greater flows are forecast than in the base the flows are still well within link capacities. Flows increase by 50% eastbound (compared to the base year) on the A63 between M1 junction 46 and Garforth. As in the AM peak, traffic flows decrease significantly on the bypassed section of the A63 through Garforth (particularly westbound).

5.6. Figures 11 and 12 indicate which links are used by traffic generated by the two developments in the morning peak. This shows that with the Garforth southern bypass nearly all of the traffic generated by the Parlington site would still route through M1 junction 47 to access the M1 in the AM peak. A larger proportion of traffic generated by the East of Garforth development now routes through Garforth to access the M1 south at junction 46 and to the City centre via M1 junction 45. Trips from the East of Garforth site to Thorpe Park and destinations close to the new East Leeds Orbital Road still route via M1 junction 47.

5.7. Figures 13 and 14 indicate which links are used by traffic attracted by the two developments in the evening peak. This indicates that nearly all trips to Parlington are now forecast to route via junction 47 of the M1. Traffic to the East of Garforth site routes via several routes with a roughly even split between traffic using junction 46 and traffic using junction 47.

5.8. Tables 16 and 17 show the proportion of traffic generated by the two developments (away from the site in the AM and into the site in the PM) on key links in the with the Garforth

Southern bypass scheme. This shows that for the Parlington site the proportion of traffic associated with the development using the M1 between junctions 46 and 47 increases slightly to around 60% of trips. The Garforth Southern Bypass reduces the proportion of trips from / to Parlington using minor roads in and around Aberford slightly to between 12 and 15% in the AM and PM peaks. The proportion of traffic from / to the East of Garforth site passing Garforth on the A63 bypass is increased to 36% in the AM and 40% in the PM. As in the Do Minimum between 11 and 15% of traffic from/to both sites is forecast to use the East Leeds link road between M1 junction 45 and the City Centre.

5.9. The mitigated impact of the developments on key junctions in the Garforth area is illustrated in Tables 18 and 19 which compare traffic volumes and delays in the Do Minimum situation with the Do Something (Garforth southern bypass) situation in 2028.

5.10. The Bypass option attracts more traffic into the A63 corridor, however, this scheme provides only limited relief to traffic levels at M1 junction 47 compared with the Do Minimum. In most cases the delays at junctions in 2028 with mitigation are worse than the 2016 base situation, as the impacts of the generated traffic can't be fully mitigated. The main exceptions are the A63 / B6137 Lidgett Lane junction which is bypassed by the scheme and so delays are less than in the base year and the A63/A656 roundabout (where an improvement has been assumed). More significant additional capacity would be likely to be required to remove the additional delay forecast for M1 junction 46 in particular.

5.11. Between the Do Minimum and Do something scenarios in 2028, delays are reduced by at least 10% at 11 junctions in the AM peak hour and at 10 junctions in the PM peak. This includes reductions in both peaks at the following junctions:

A63/A656 roundabout (due to the improvement), the A63 / Lidgett La and A63 / A642 'Old George' junctions (due to the bypass), M1 junction 47, the A642 junctions with Bar La and Main St, the Leeds Rd / Long La junction in Barwick, the Main St / Cattle Lane junction in Aberford, and the A656 / Church La junction.

5.12. Some additional delay is forecast at the new roundabout junction between the B6137 Leeds road (from Kippax) and the A63 bypass, (although it is less than one minute in both the AM and PM peaks), resulting from the increased traffic attracted to use the A63 passing through the junction. Detailed design of the roundabout would be anticipated to result in a roundabout design capable of accommodating the volume of traffic forecast for 2028. Additionally, delays are modelled as increasing in the PM peak at the Ninelands La junction, though it remains within capacity. In general, however, the operation of the key junctions improves with less movements over capacity than in the Do Minimum.

5.13. There is a forecast increase in delays at the M1 junction 46 dumbbells (labelled Thorpe Park / Jn46) in the AM peak, although the junction is modelled as operating just within capacity in this time period and the more significant issues in the PM peak with the M1 junction 47 scheme do not materialise.

5.14. Journey times have been extracted from the model for a route along the A63 between the A656 and the 'Cracked Egg' Century Way junction, for the situation with the Garforth Bypass scheme in place for the same routes analysed in the Do Minimum. Table 20 illustrates the journey times and change from the 2016 base year and 2028 Do Minimum to the 2028 Do Something. As might be expected the biggest changes are westbound in the AM peak and eastbound in the PM peak. The AM peak westbound towards Leeds sees nearly 5 minutes

less delay compared to the Do Minimum, and a similar reduction eastbound in the PM peak. Nevertheless, journey times in both peaks are still greater than in the 2016 base year.

Table 15 Changes in traffic flow on key links in the forecast year 2028 between the Do Minimum situation without mitigation and the Do Something with a Garforth southern bypass.

Key link	Dirn	Base conditions 2016		Do Minimum 2028		Do something 2028		Change from 2016 Base		% Change from 2016		Change from Do min		%age Change from 2028	
Scenario 1		Am pk hour	Pm pk hour	Am pk hour	Pm pk hour	Am pk hour	Pm pk hour	Am pk hour	Pm pk hour	Am pk hour	Pm pk hour	Am pk hour	Pm pk hour	Am pk hour	Pm pk hour
		Actual flow	Actual flow	Actual flow	Actual flow	Actual flow	Actual flow	Actual flow	Actual flow	Actual flow	Actual flow	Actual flow	Actual flow	Actual flow	Actual flow
A63 east of Garforth	WB	668	611	1076	582	1358	500	691	-110	103%	-18%	282	-81	26%	-14%
A63 east of Garforth	EB	495	578	527	821	532	1162	37	583	7%	101%	5	341	1%	42%
A63 Garforth (E of Lidgett La)	WB	1139	775	1270	755	486	179	-653	-596	-57%	-77%	-784	-575	-62%	-76%
A63 Garforth (E of Lidgett La)	EB	581	1029	523	1135	123	467	-458	-562	-79%	-55%	-400	-668	-76%	-59%
A63 west of Garforth	WB	1807	935	2130	817	2568	942	761	7	42%	1%	438	125	21%	15%
A63 west of Garforth	EB	1035	1723	961	1917	1054	2580	19	858	2%	50%	92	663	10%	35%
A63 Garforth Southern Bypass	WB	n/a	n/a	n/a	n/a	1749	790	1749	790	n/a	n/a	1749	790	n/a	n/a
A63 Garforth Southern Bypass	EB	n/a	n/a	n/a	n/a	556	1492	556	1492	n/a	n/a	556	1492	n/a	n/a
A656 south of Jn 47	NB	846	354	922	991	906	988	60	634	7%	179%	-16	-3	-2%	0%
A656 south of Jn 47	SB	371	843	787	1098	770	1016	398	174	107%	21%	-17	-81	-2%	-7%
A656 south of A63	NB	579	458	839	735	796	609	217	151	38%	33%	-43	-126	-5%	-17%
A656 south of A63	SB	447	550	722	718	720	689	273	139	61%	25%	-1	-29	0%	-4%
A642 south of Jn 47	NB	609	619	680	993	785	952	176	333	29%	54%	105	-41	16%	-4%
A642 south of Jn 47	SB	540	580	762	688	776	734	235	154	44%	27%	14	46	2%	7%
A642 south of A63	NB	548	431	836	772	768	627	221	195	40%	45%	-68	-145	-8%	-19%
A642 south of A63	SB	475	706	785	1123	913	1143	438	438	92%	62%	128	20	16%	2%
B1217 north of Jn 47	WB	584	260	1171	662	1122	648	538	388	92%	149%	-49	-14	-4%	-2%
B1217 north of Jn 47	EB	230	488	436	673	441	716	211	228	92%	47%	5	43	1%	6%
Main St Aberford	NB	289	251	880	260	684	258	395	7	137%	3%	-196	-2	-22%	-1%
Main St Aberford	SB	234	238	225	896	239	597	5	359	2%	151%	14	-299	6%	-33%
Cattle La	WB	143	124	641	134	424	133	282	9	197%	7%	-217	-2	-34%	-1%
Cattle La	EB	115	117	203	731	182	445	67	329	58%	281%	-21	-286	-10%	-39%
Long La south of Barwick	NB	250	249	247	165	294	134	44	-116	18%	-46%	47	-32	19%	-19%
Long La south of Barwick	SB	197	240	263	491	166	294	-31	54	-16%	23%	-97	-197	-37%	-40%
Leeds Rd west of Barwick	WB	429	292	950	258	836	226	407	-67	95%	-23%	-114	-32	-12%	-13%
Leeds Rd west of Barwick	EB	199	362	346	1292	304	812	105	450	53%	124%	-42	-480	-12%	-37%
Leeds Rd west of Scholes	WB	324	246	1026	301	929	272	605	26	187%	11%	-97	-28	-9%	-9%
Leeds Rd west of Scholes	EB	145	296	360	1277	307	867	162	571	112%	193%	-53	-410	-15%	-32%
M1 Jn 47-48	WB	4106	3573	4725	3885	4690	3866	584	293	14%	8%	-36	-18	-1%	0%
M1 Jn 47-48	EB	4021	3750	3946	4041	4049	3917	27	166	1%	4%	102	-124	3%	-3%
M1 Jn 46-47	WB	4835	3525	6121	4621	6079	4560	1244	1035	26%	29%	-42	-61	-1%	-1%
M1 Jn 46-47	EB	3854	4380	4769	4740	4730	4666	876	286	23%	7%	-38	-74	-1%	-2%
M1 Jn 45-46	WB	5975	4482	6220	4966	6220	4907	245	425	4%	9%	0	-59	0%	-1%
M1 Jn 45-46	EB	4611	5449	5272	5344	5282	5408	671	-40	15%	-1%	10	64	0%	1%

Figure 11 Do Something (Garforth southern bypass) trips from the Parlington site in the AM peak (2028).

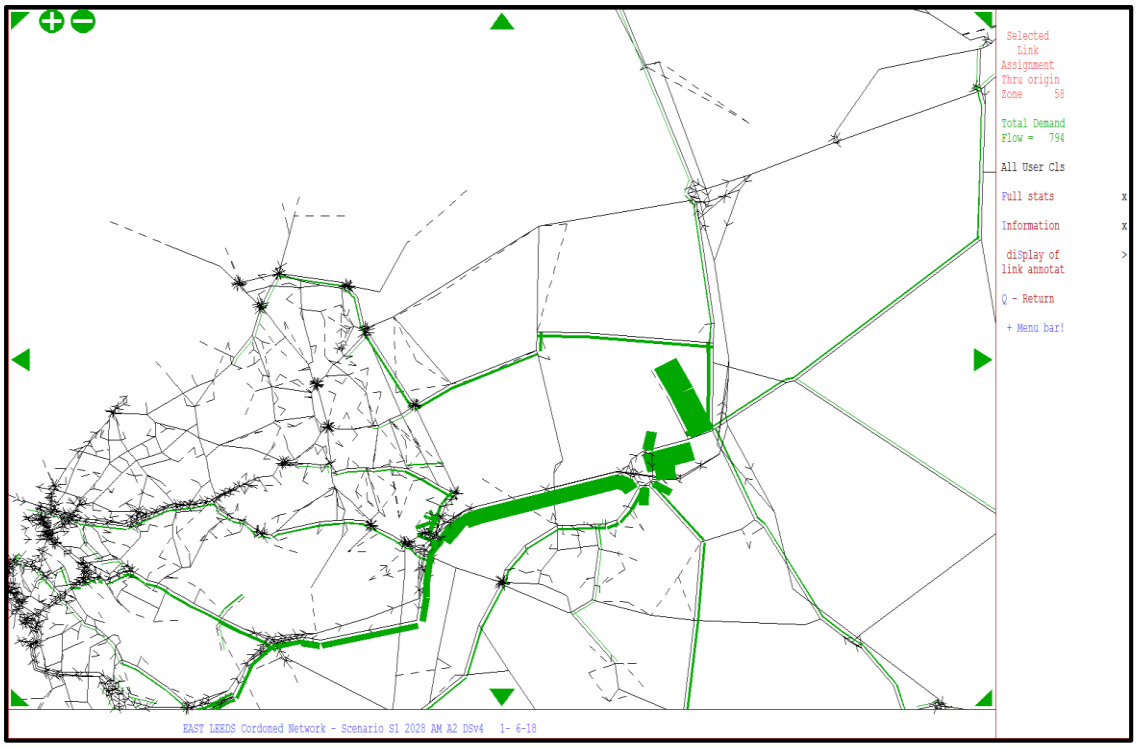


Figure 12 Do Something (Garforth southern bypass) trips from the East of Garforth site in the AM peak (2028).

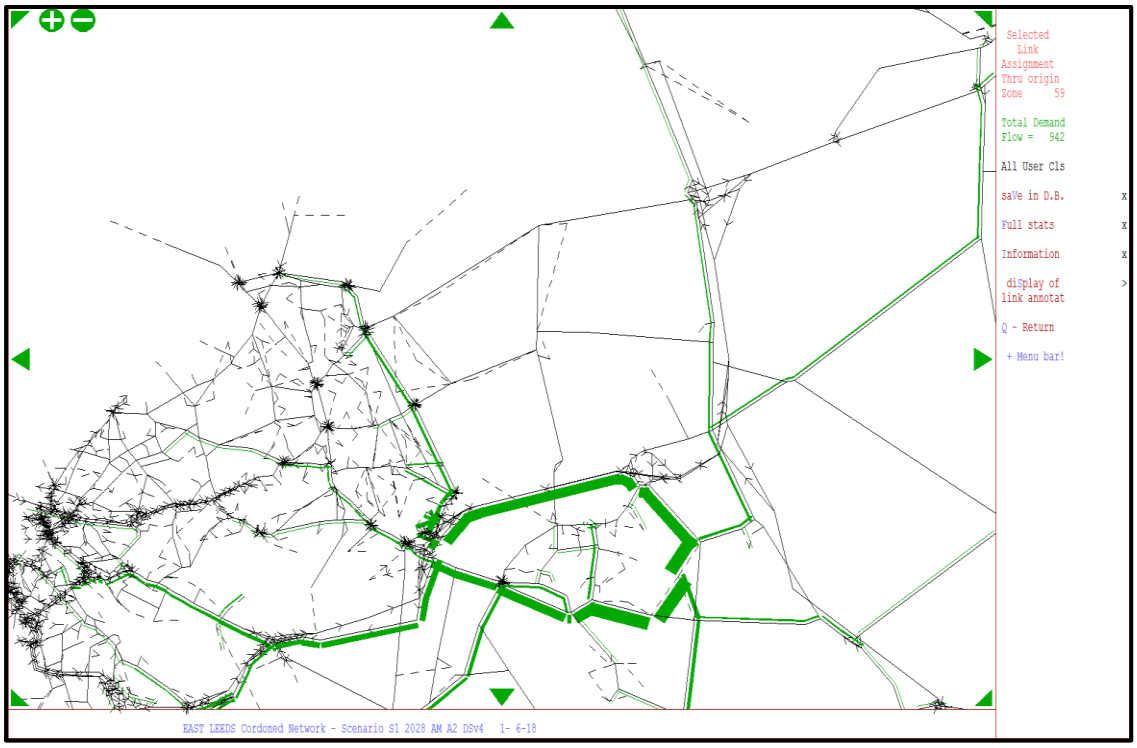


Figure 13 Do Something (Garforth southern bypass) trips to the Parlington site in the PM peak (2028)

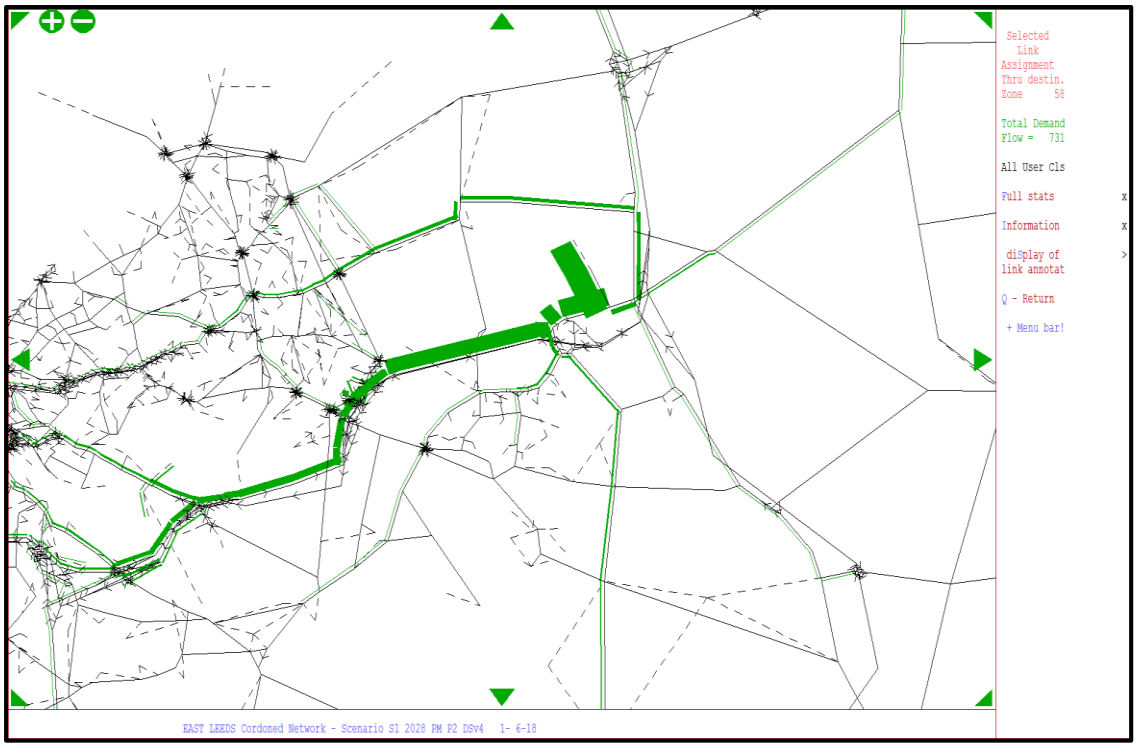


Figure 14 Do Something (Garforth southern bypass) trips to the East of Garforth site in the PM peak (2028)

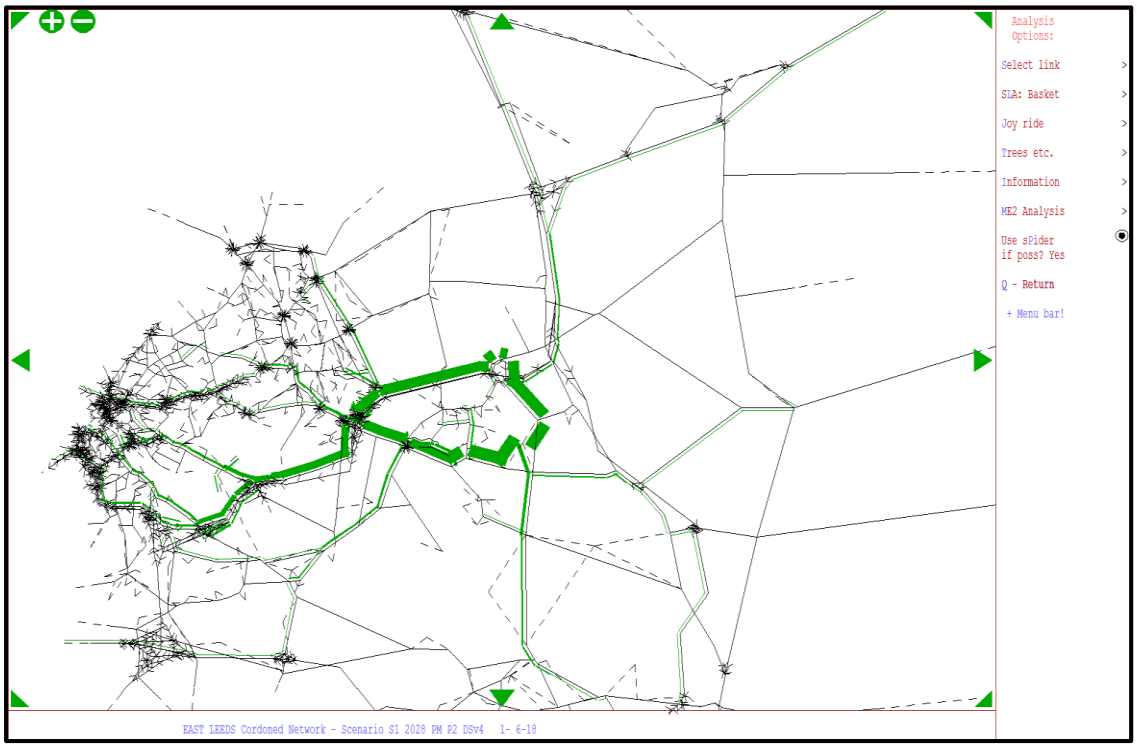


Table 16 Proportion of development related traffic on key links from (in the AM) and to (in the PM) the Parlington site in 2028.

Proportion of traffic from / to Parlington in 2028 Sc1 with Garforth southern bypass scheme						
	Dir	No of trips	% of trips AM (origin)	Dir	No of trips	% of trips PM (destination)
A642 (south of M1 J47 Garforth)	sb	95	12%	nb	52	7%
A656 Ridge Road (south of M1 J47)	sb	50	6%	nb	48	7%
A656 Ridge Road (south of A63)	sb	50	6%	nb	48	7%
A1(M) (south of A63)	sb	11	1%	nb	9	1%
A63 (between Ninelands Lane and B6137)	wb	10	1%	eb	7	1%
M1 (between J46 and J47)	wb	476	60%	eb	479	66%
A63 East Leeds Link Road	wb	96	12%	eb	107	15%
A1(M) (north of A64)	nb	15	2%	sb	10	1%
A64 (east of A1(M))	eb	0	0%	wb	0	0%
Barwick Road (south of M1)	sb	0	0%	nb	0	0%
Leeds Road, Scholes (east of Scholes)	wb	64	8%	eb	89	12%
Main Street, Aberford	nb	95	12%	sb	109	15%
Cattle Lane, Barwick in Elmet	wb	71	9%	eb	95	13%
TOTAL	OUT	794		IN	731	

Table 17 Proportion of development related traffic on key links from (in the AM) and to (in the PM) the East of Garforth site in 2028.

Proportion of traffic from / to East of Garforth in 2028 Sc1 with Garforth southern bypass scheme						
	Dir	No of trips	% of trips AM (origin)	Dir	No of trips	% of trips PM (destination)
A642 (south of M1 J47 Garforth)	sb	15	2%	nb	16	2%
A656 Ridge Road (south of M1 J47)	nb	333	35%	sb	368	42%
A656 Ridge Road (south of A63)	sb	93	10%	nb	75	9%
A1(M) (south of A63)	sb	12	1%	nb	11	1%
Church lane (Micklefield)	eb	35	4%	wb	9	1%
A63 (between Ninelands Lane and B6137)	wb	343	36%	eb	356	40%
M1 (between J46 and J47)	wb	315	33%	eb	317	36%
A63 East Leeds Link Road	wb	107	11%	eb	118	13%
A1(M) (north of A64)	nb	17	2%	sb	11	1%
A64 (east of A1(M))	eb	3	0%	wb	17	2%
Barwick Road (south of M1)	nb	9	1%	sb	9	1%
Leeds Road, Scholes (east of Scholes)	wb	3	0%	eb	3	0%
Main Street, Aberford	nb	28	3%	sb	4	0%
Cattle Lane, Barwick in Elmet	wb	3	0%	eb	1	0%
TOTAL	OUT	942		IN	882	

Table 18 Changes in delay between 2028 Do Minimum and 2028 Do Something (Garforth bypass) in the AM peak at key junctions around Garforth

Key Junction	Base 2016		Do Min 2028 Am pk			Do Som 2028 Am pk			Change from 2016 Base		%age change from 2016		Change from Do Min		%age change from DM	
Scenario 1	Traffic (pcus)	Delay (secs)	Traffic (pcus)	Delay (secs)	No of approaches where v/c exceeds	Traffic (pcus)	Delay (secs)	No of approaches where v/c exceeds	Traffic (pcus)	Delay (secs)	Traffic	Delay	Traffic (pcus)	Delay (secs)	Traffic	Delay
A63 Selby Rd / A656 Ridge Rd	2382	318	2759	351	3	2978	114	0	596	-205	25%	-64%	220	-237	8%	-68%
A63 Selby Rd / Ninelands La, Garforth	1573	153	1899	161	0	2438	175	0	865	22	55%	14%	538	14	28%	9%
A63 Selby Rd / B6137 Leeds Rd, Garforth	1889	31	2091	42	0	3141	80	0	-282	49	-15%	156%	1050	38	50%	91%
A63 Selby Rd / B6137 Lidgett La, Garforth	2131	212	2155	204	1	1063	166	0	-1068	-45	-50%	-21%	-1092	-38	-51%	-19%
A63 Selby Rd / A642 Wakefield Rd, Garforth	3481	38	4248	616	4	4828	315	2	1347	278	39%	735%	580	-300	14%	-49%
A64/A1(M) Junction 44	3353	70	3794	84	0	3752	85	0	399	15	12%	21%	-42	1	-1%	1%
A63 Pontefract La / M1 Junction 45	3111	153	4552	217	1	4568	219	1	1457	66	47%	43%	16	2	0%	1%
A63 Selby Rd / A6120 / M1 Junction 46	5255	315	6474	1102	8	7324	613	4	2070	298	39%	95%	851	-489	13%	-44%
Thorpe Park/Jn46	1563	79	4734	223	2	4788	271	4	3225	192	206%	244%	54	48	1%	21%
A656 Ridge Rd / A642 Aberford Rd / B1217 Aberford Rd / M1 Junction 47	2879	25	4430	484	3	4386	294	4	1506	268	52%	1070%	-45	-190	-1%	-39%
A656 Ridge Rd / Church La	1245	56	1987	745	3	1993	576	4	748	521	60%	936%	6	-168	0%	-23%
A656 Ridge Rd / B6137 Longdike La	1417	181	2080	223	0	2410	271	0	992	89	70%	49%	330	48	16%	21%
A642 Aberford Rd / Bar La, Garforth	1382	29	1833	452	2	1805	89	1	423	60	31%	210%	-29	-363	-2%	-80%
A642 Aberford Rd / B6137 Main St / Barwick Rd, Garforth	1400	167	2101	781	3	1679	184	0	280	17	20%	10%	-421	-597	-20%	-76%
Leeds Rd / Long La, Barwick	776	18	1473	44	0	1278	28	0	503	10	65%	59%	-195	-15	-13%	-36%
Leeds Rd / Main St, Scholes	808	18	1461	32	0	1328	27	0	520	9	64%	50%	-133	-6	-9%	-17%
B1217 Aberford Rd / Gt North Rd / Bunkers Hill, Aberford	958	39	1682	41	0	1432	39	0	474	0	49%	-1%	-250	-2	-15%	-6%
Main St / Cattle La, Aberford	653	16	1321	26	0	1103	22	0	450	6	69%	34%	-217	-4	-16%	-17%

Table 19 : Changes in delay between 2028 Do Minimum and 2028 Do Something (Garforth bypass) in the PM peak at key junctions around Garforth

Key Junction	Base 2016		Do Min 2028 Pm pk			Do Som 2028 Pm pk			Change from 2016 Base		%age change from 2016		Change from Do Min		%age change from DM	
Scenario 1	Traffic (pcus)	Delay (secs)	Traffic (pcus)	Delay (secs)	No of approaches where v/c exceeds	Traffic (pcus)	Delay (secs)	No of approaches where v/c exceeds	Traffic (pcus)	Delay (secs)	Traffic	Delay	Traffic (pcus)	Delay (secs)	Traffic	Delay
A63 Selby Rd / A656 Ridge Rd	2280	134	2597	190	0	2770	111	0	490	-23	21%	-17%	172	-79	7%	-42%
A63 Selby Rd / Ninelands La, Garforth	1721	173	1767	191	0	2323	237	1	601	64	35%	37%	555	46	31%	24%
A63 Selby Rd / B6137 Leeds Rd, Garforth	2060	37	2149	43	0	3201	84	0	-1141	47	-55%	129%	1052	41	49%	96%
A63 Selby Rd / B6137 Lidgett La, Garforth	2125	239	2262	294	1	888	172	0	-1237	-67	-58%	-28%	-1374	-122	-61%	-42%
A63 Selby Rd / A642 Wakefield Rd, Garforth	3444	54	4259	600	3	4861	319	0	1417	265	41%	486%	602	-281	14%	-47%
A64/A1(M) Junction 44	3248	73	3446	85	0	3455	83	0	206	10	6%	14%	9	-1	0%	-1%
A63 Pontefract La / M1 Junction 45	2487	134	4368	156	0	4331	164	1	1844	30	74%	22%	-37	8	-1%	5%
A63 Selby Rd / A6120 / M1 Junction 46	5191	434	5963	1157	9	6663	1182	7	1473	748	28%	172%	700	25	12%	2%
Thorpe Park/Jn46	1576	78	4463	162	2	4110	158	0	2534	80	161%	102%	-353	-5	-8%	-3%
A656 Ridge Rd / A642 Aberford Rd / B1217 Aberford Rd / M1 Junction 47	2799	40	4314	351	2	4305	289	2	1506	249	54%	623%	-9	-62	0%	-18%
A656 Ridge Rd / Church La	1225	55	2189	489	2	2115	437	1	890	382	73%	689%	-74	-51	-3%	-11%
A656 Ridge Rd / B6137 Longdike La	1471	181	2174	241	0	2253	241	0	782	60	53%	33%	79	0	4%	0%
A642 Aberford Rd / Bar La, Garforth	1580	35	2012	105	1	1902	66	0	322	31	20%	91%	-110	-39	-5%	-37%
A642 Aberford Rd / B6137 Main St / Barwick Rd, Garforth	1417	168	2105	331	2	1801	193	0	384	25	27%	15%	-304	-137	-14%	-42%
Leeds Rd / Long La, Barwick	806	18	1692	40	0	1177	23	0	371	4	46%	23%	-515	-17	-30%	-43%
Leeds Rd / Main St, Scholes	876	17	1686	18	1	1227	15	0	351	-2	40%	-12%	-459	-3	-27%	-16%
B1217 Aberford Rd / Gt North Rd / Bunkers Hill, Aberford	897	37	1345	36	0	1102	35	0	204	-2	23%	-5%	-243	-1	-18%	-2%
Main St / Cattle La, Aberford	654	16	1295	23	0	1006	18	0	352	2	54%	10%	-289	-5	-22%	-21%

Table 20 : Changes in journey time between 2016 base year and 2028 Do Something (Garforth southern bypass only) in the AM and PM peaks on the A63 through Garforth

Journey time results (seconds)			Scenario 1				
AM	A2 2016	A2 2028 DM	A2 2028 DS	change from base	% change	change from Do Min	% change
A63 westbound	547	1030	754	207	38%	-276	-27%
A63 eastbound	459	517	476	17	4%	-41	-8%
PM	P2 2016	P2 2028 DM	P2 2028 DS	change from base	% change	change from Do Min	% change
A63 westbound	497	540	424	-73	-15%	-116	-21%
A63 eastbound	582	949	657	75	13%	-292	-31%

6. Mitigation Test 3 Impacts (M1 junction 47 improvement and Garforth Southern Bypass combined)

6.1. The third option tested involved a combination of the two previously tested options for M1 junction 47 plus the new wide single carriageway road providing a southern bypass of Garforth between the A63 / A642 roundabout and the Ninelands Lane junction with the A63. Note that the Improvements at Junction 47 don't include the widening of the westbound slip road to 2 lanes with a parallel merge as the initial tests suggest this is not required with the Garforth Southern bypass.

6.2. Table 24 lists the changes in flow between the 2016 Base, 2028 Do Minimum and the 2028 Do Something situation with Junction 47 plus Garforth Southern bypass in the AM and PM peak hours.

6.3. In the AM peak flows on the M1 are forecast to remain broadly the same as in the Do Minimum situation, with flows approaching link capacity between junction 47 and 46 westbound and exceeding it between 46 and 45 westbound. The requirement for additional link capacity and merge diverge upgrades will be confirmed by Highways England using DMRB assessments. To the north between junctions 47 and 48 the eastbound flow on the M1 is forecast to increase slightly compared to the Do Minimum. Flows on the minor road network around Aberford, Barwick and Scholes are forecast to be lower than in both tests 1 and 2, but still significantly higher than in the base situation.

6.4. Compared to the Do Minimum AM peak flows increase by 23% westbound on the A63 west of Garforth, which is slightly more than Test 2 (between the bypass and M1 junction 46). As would be expected flows on the bypassed section of the A63 through Garforth reduce significantly. The flow on the Garforth southern bypass is very similar to the option with the bypass alone, suggesting that the additional capacity at junction 47 doesn't limit the amount of traffic that will reassign to the bypass. However as outlined later in para 6.7 the proportion of traffic from the East of Garforth site using the bypass is reduced in the PM peak. This flow is replaced by other trips to/from a wider range of locations (from other new developments and existing trips that had rerouted in the other tests).

6.5. In the PM peak significantly less traffic is forecast to use the minor road network around Aberford, Barwick and Scholes than in the Do Minimum, but again significantly more than in the base. The combined option provides the greatest reduction in flow compared to the Do Minimum for Main Street in Aberford and Leeds Road west of Barwick. Although flows are again much higher than the base, they are well within link capacity. Flows increase by 25% eastbound on the A63 between M1 junction 46 and Garforth. This is a much smaller increase than in Test 2. Most traffic returning to the East of Garforth site routes via M1 junction 47 in this test. As in the AM peak, traffic flows decrease significantly on the bypassed section of the A63 through Garforth. Virtually all traffic returning to Parlington in the PM peak do so via M1 junction 47 as evidenced by the increased flow on the B1217 north of M1 junction 47 between the M1 and the access to the Parlington site (+453 pcus).

6.6. Figures 15 and 16 indicate which links are used by traffic generated by the two developments in the morning peak. This shows that with Junction 47 and the Garforth southern bypass nearly all of the traffic generated by the Parlington site would route through M1 junction 47 to access the M1 in the AM peak. Traffic generated by the East of Garforth development is now split between two alternative routes. Traffic routes through on the A63 bypass south of Garforth to access the M1 south at junction 46 and to the City

centre via M1 junction 45. Trips from the East of Garforth site to Thorpe Park and destinations close to the new East Leeds Orbital Road route via M1 junction 47.

6.7. Figures 17 and 18 indicate which links are used by traffic attracted by the two developments in the evening peak. This indicates that nearly all trips to Parlington are now forecast to route via junction 47 of the M1. Traffic to the East of Garforth site routes via several routes although most traffic uses M1 junction 47, reflecting the direct access on to the A656 with the larger housing site. Given that the eastbound traffic flow on the bypass is similar to the option with the bypass alone, this suggests that other traffic (associated with other new developments) would use the bypass.

6.8. Tables 22 and 23 show the proportion of traffic generated by the two developments (away from the site in the AM and into the site in the PM) on key links in the situation with the M1 Junction 47 scheme and Garforth Southern bypass combined. This shows that for the Parlington site the proportion of traffic associated with the developments using the M1 between junctions 46 and 47 increases to 63% in the AM and 78% of trips in the PM. Trips from / to the East of Garforth site using the M1 between junctions 46 and 47 reduce slightly to 34% in the AM but increase significantly to 63% in the PM.

6.9. The mitigation at junction 47 reduces the proportion of trips from / to Parlington using minor roads in and around Aberford to just under 10% in the AM peak and virtually zero in the PM peak. The proportion of traffic from / to the East of Garforth site passing Garforth on the A63 bypass is increased to 36% in the AM peak. However just 15% uses this route in the PM. Similarly to the Do Minimum between 11 and 13% of traffic from/to both sites is forecast to use the East Leeds link road between M1 junction 45 and the City Centre.

6.10. The mitigated impact of the developments on key junctions in the Garforth area is illustrated in Tables 24 and 25 which compare traffic volumes and delays in the Do Minimum situation with the Do Something (J47 and Garforth southern bypass) situation in 2028.

6.11. Between the base year and 2028 Do Something situation flows through the junctions and delays are forecast to increase significantly, but generally less than with the Junction 47 scheme or the bypass schemes alone. The biggest absolute change in delay is again forecast at the A656 / Church lane junction to the west of Micklefield where delays increase by just over 4 minutes per pcu in the AM peak. Delays also increase by a similar amount in the AM peak at the A63/ A642 roundabout and M1 junction 46. Similar problems are forecast at these locations in the PM peak. The A63/ B6137 Lidgett Lane junction is bypassed and therefore sees a reduction in delay and traffic compared to the base in the AM and PM peaks.

6.12. Most junctions operate satisfactorily with the 2 mitigation schemes in place. Delays are forecast to fall by at least 10% compared with the Do Minimum at 11 junctions in the AM peak hour and by 10 in thePM peak. This includes reductions in both peaks at the A63/A656 roundabout (due to the improvement), the A63 / Lidgett Lane and A63 / A642 'Old George' junctions (due to the bypass), M1 junctions 46 and 47, the A642 junctions with Bar Lane and Main Street and the Leeds Rd / Long Lane junction in Barwick.

6.13. The combination of the bypass with M1 junction 47 improvement results in a small 4-5% rise in traffic passing through junction 47 in the AM and PM peaks compared with the Do Minimum. The scheme provides relief to the junction with delays significantly down and all arms operating satisfactorily in the PM peak and just one approach exceeding 85% v/c in the AM peak. The bypass attracts more traffic into the A63 corridor to a similar extent as Test 2

(bypass alone), although attracts slightly more traffic westbound in the PM peak. The Church Lane approach to the A656 remains an issue for traffic leaving Micklefield in both peaks. In the PM peak, M1 junction 46 still has some issues at the Thorpe Park dumbbells. As noted already, the design of this junction is being reviewed as part of the ELOR scheme.

6.14. In most cases the delays at junctions in 2028 with mitigation are worse than the 2016 base situation, as the impacts of the generated traffic can't be fully mitigated. The only exception is the A63 / B6137 Lidgett Lane junction which is bypassed by the Garforth southern bypass scheme and so delays are less than in the base year. More significant additional capacity would be likely to be required to remove the additional delay forecast for M1 junction 46 in particular.

6.15. Additional delays of around 40 seconds per pcu is forecast at the new roundabout junction between the B6137 Leeds road (from Kippax) and the A63 bypass in both peaks resulting from the increased flow attracted to use the A63 passing through the junction. Detailed design of the roundabout would be anticipated to result in a roundabout design capable of accommodating the volume of traffic forecast for 2028. In general the operation of the key junctions improve with less movements over capacity than in the Do Minimum.

6.16. Journey times have been extracted from the model for a route along the A63 between the A656 and the 'Cracked Egg' Century Way junction, for the situation with the Garforth Bypass scheme in place and for the same route in the base and Do Minimum. Table 26 illustrates the journey times and changes. In the AM peak hour westbound journey times are reduced by almost 5 minutes compared with the Do Minimum and in the PM peak eastbound by just over 6 minutes. Although AM peak journey times remain longer than in the 2016 base, in the PM peak the modelling suggests that a saving from 2016 could be achieved.

Table 21 : Changes in traffic flow on key links in the forecast year 2028 between the Do Minimum situation without mitigation and the Do Something with J47 improvements and a Garforth southern bypass.

Key link	Dirn	Base conditions 2016		Do Minimum 2028		Do something 2028		Change from 2016 Base		% Change from 2016		Change from Do min		%age Change from 2028	
Scenario 1		Am pk hour	Pm pk hour	Am pk hour	Pm pk hour	Am pk hour	Pm pk hour	Am pk hour	Pm pk hour	Am pk hour	Pm pk hour	Am pk hour	Pm pk hour	Am pk hour	Pm pk hour
		Actual flow	Actual flow	Actual flow	Actual flow	Actual flow	Actual flow	Actual flow	Actual flow	Actual flow	Actual flow	Actual flow	Actual flow	Actual flow	Actual flow
A63 east of Garforth	WB	668	611	1076	582	1262	759	594	148	89%	24%	186	177	17%	30%
A63 east of Garforth	EB	495	578	527	821	532	998	37	420	7%	73%	5	178	1%	22%
A63 Garforth (E of Lidgett La)	WB	1139	775	1270	755	440	185	-699	-590	-61%	-76%	-830	-569	-65%	-75%
A63 Garforth (E of Lidgett La)	EB	581	1029	523	1135	121	320	-460	-709	-79%	-69%	-402	-815	-77%	-72%
A63 west of Garforth	WB	1807	935	2130	817	2615	1198	808	264	45%	28%	486	382	23%	47%
A63 west of Garforth	EB	1035	1723	961	1917	1088	2398	53	675	5%	39%	126	481	13%	25%
A63 Garforth Southern Bypass	WB	n/a	n/a	n/a	n/a	1746	1058	1746	1058	n/a	n/a	1746	1058	n/a	n/a
A63 Garforth Southern Bypass	EB	n/a	n/a	n/a	n/a	554	1416	554	1416	n/a	n/a	554	1416	n/a	n/a
A656 south of Jn 47	NB	846	354	922	991	1325	432	479	79	57%	22%	403	-558	44%	-56%
A656 south of Jn 47	SB	371	843	787	1098	794	1255	423	412	114%	49%	7	157	1%	14%
A656 south of A63	NB	579	458	839	735	920	401	341	-57	59%	-12%	81	-334	10%	-45%
A656 south of A63	SB	447	550	722	718	739	731	291	181	65%	33%	17	13	2%	2%
A642 south of Jn 47	NB	609	619	680	993	625	967	16	348	3%	56%	-54	-26	-8%	-3%
A642 south of Jn 47	SB	540	580	762	688	794	772	254	193	47%	33%	32	84	4%	12%
A642 south of A63	NB	548	431	836	772	768	530	221	98	40%	23%	-68	-242	-8%	-31%
A642 south of A63	SB	475	706	785	1123	916	1124	442	419	93%	59%	132	1	17%	0%
B1217 north of Jn 47	WB	584	260	1171	662	1223	676	639	416	109%	160%	52	14	4%	2%
B1217 north of Jn 47	EB	230	488	436	673	474	1125	244	637	106%	131%	38	453	9%	67%
Main St Aberford	NB	289	251	880	260	603	306	314	55	109%	22%	-278	46	-32%	18%
Main St Aberford	SB	234	238	225	896	241	360	7	122	3%	51%	16	-536	7%	-60%
Cattle La	WB	143	124	641	134	394	143	252	19	176%	15%	-247	9	-38%	6%
Cattle La	EB	115	117	203	731	185	203	70	86	61%	73%	-18	-529	-9%	-72%
Long La south of Barwick	NB	250	249	247	165	302	140	52	-109	21%	-44%	55	-25	22%	-15%
Long La south of Barwick	SB	197	240	263	491	187	237	-11	-2	-5%	-1%	-76	-253	-29%	-52%
Leeds Rd west of Barwick	WB	429	292	950	258	813	238	384	-54	89%	-19%	-137	-20	-14%	-8%
Leeds Rd west of Barwick	EB	199	362	346	1292	327	509	128	147	64%	41%	-19	-783	-5%	-61%
Leeds Rd west of Scholes	WB	324	246	1026	301	904	287	581	41	179%	17%	-122	-14	-12%	-5%
Leeds Rd west of Scholes	EB	145	296	360	1277	328	587	183	291	126%	98%	-32	-691	-9%	-54%
M1 Jn 47-48	WB	4106	3573	4725	3885	4585	3852	480	278	12%	8%	-140	-33	-3%	-1%
M1 Jn 47-48	EB	4021	3750	3946	4041	4190	3699	169	-52	4%	-1%	244	-342	6%	-8%
M1 Jn 46-47	WB	4835	3525	6121	4621	6106	4271	1271	746	26%	21%	-15	-350	0%	-8%
M1 Jn 46-47	EB	3854	4380	4769	4740	4683	5194	829	814	22%	19%	-86	454	-2%	10%
M1 Jn 45-46	WB	5975	4482	6220	4966	6220	4873	245	391	4%	9%	0	-93	0%	-2%
M1 Jn 45-46	EB	4611	5449	5272	5344	5278	5554	667	105	14%	2%	6	209	0%	4%

Figure 15 Do Something (J47 and Garforth southern bypass) trips from the Parlington site in the AM peak (2028).

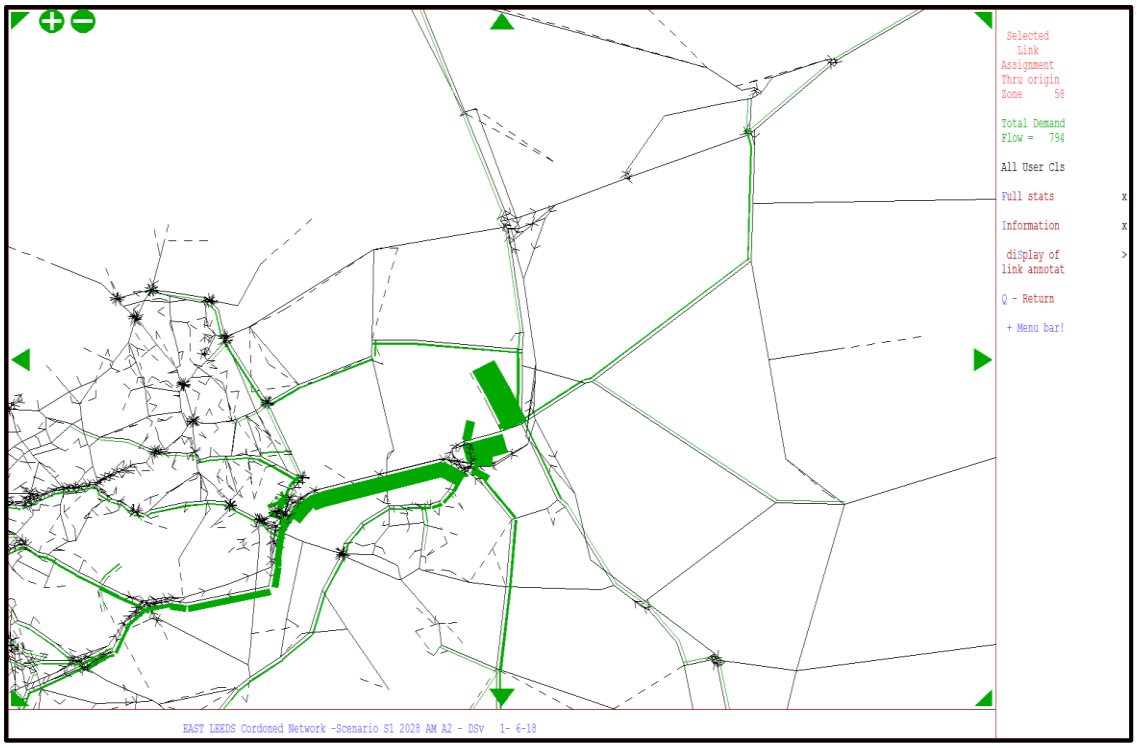


Figure 16 Do Something (J47 and Garforth southern bypass) trips from the East of Garforth site in the AM peak (2028).

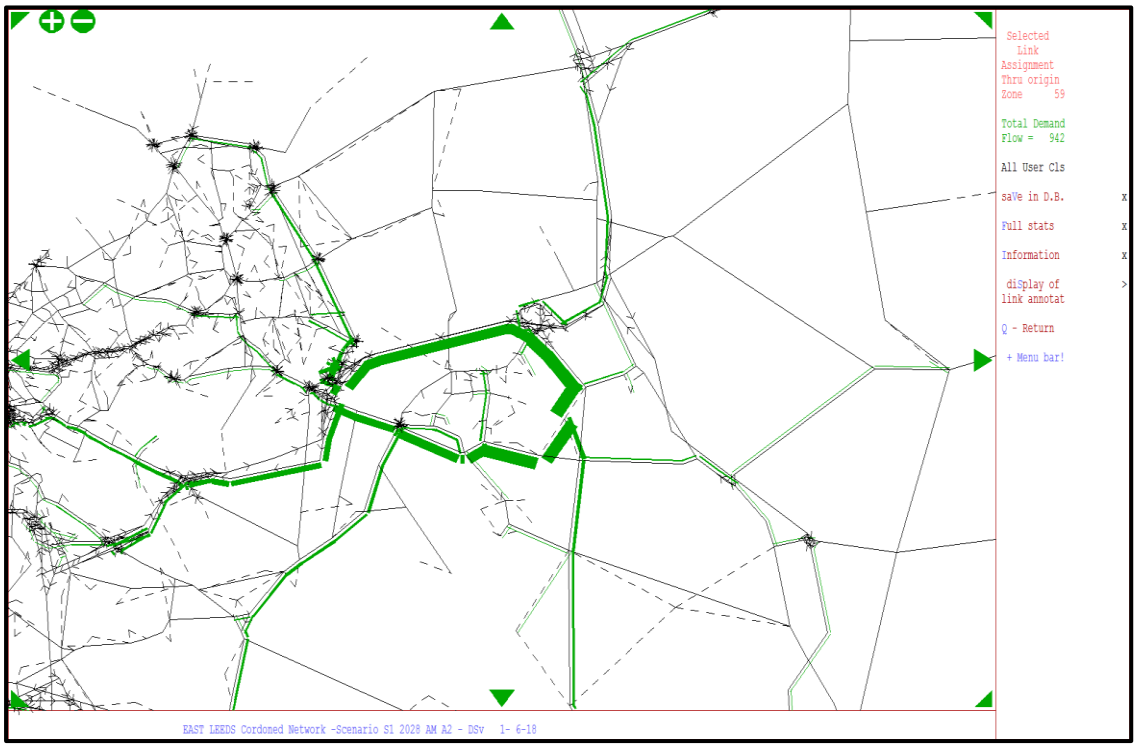


Figure 17 Do Something (J47 and Garforth southern bypass) trips to the Parlington site in the PM peak (2028).

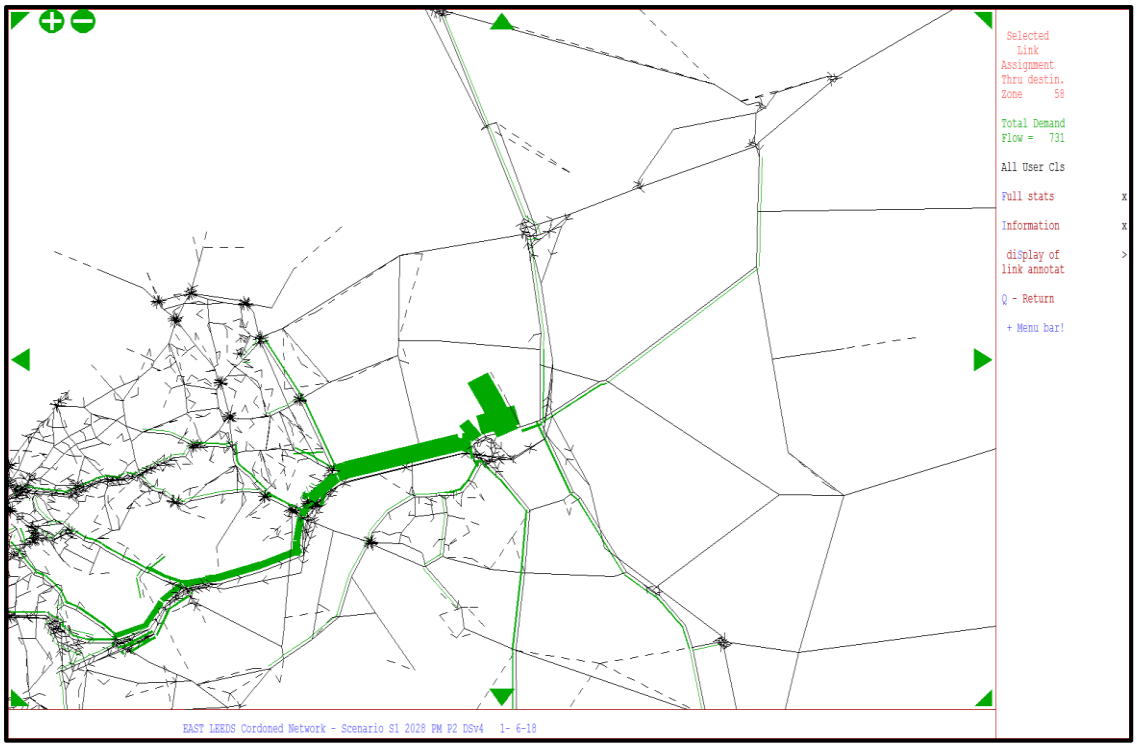


Figure 18 Do Something (J47 and Garforth southern bypass) trips to the East of Garforth site in the PM peak (2028).

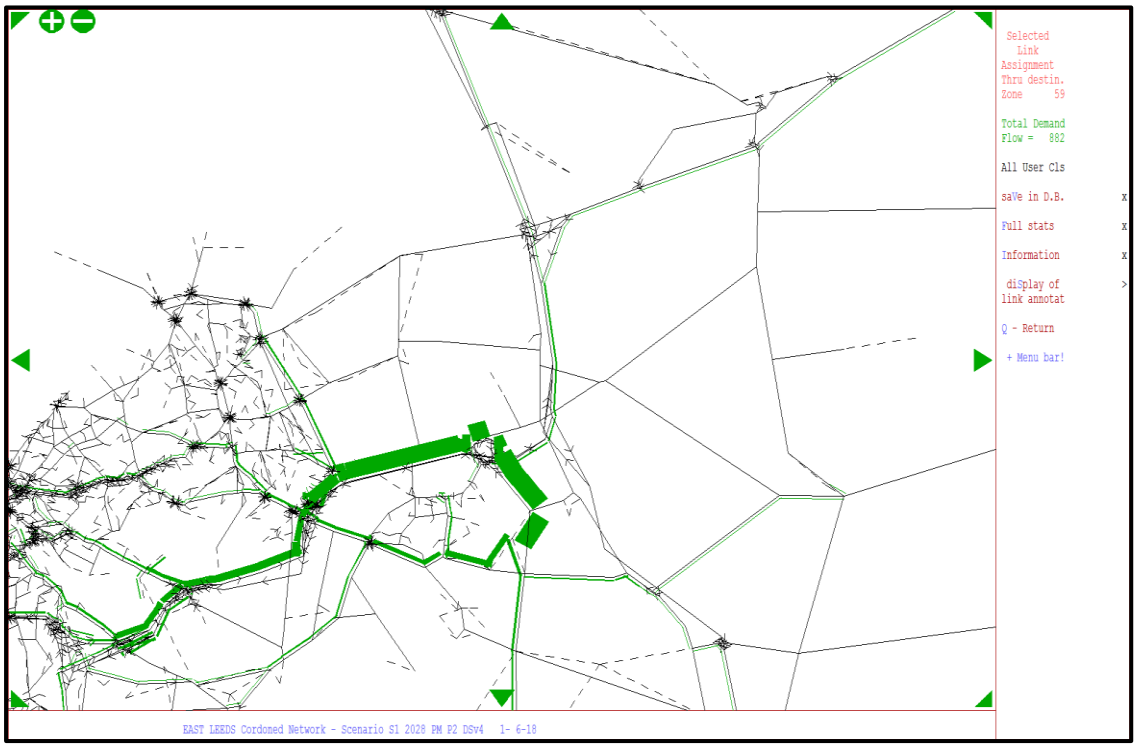


Table 22 : Proportion of development related traffic on key links from (in the AM) and to (in the PM) the Parlington site in 2028

Proportion of traffic from / to Parlington in 2028 Sc1 with M1 junc 47 imp and Garforth southern bypass scheme						
	Dir	No of trips	% of trips AM (origin)	Dir	No of trips	% of trips PM (destination)
A642 (south of M1 J47 Garforth)	sb	92	12%	nb	53	7%
A656 Ridge Road (south of M1 J47)	sb	63	8%	nb	32	4%
A656 Ridge Road (south of A63)	sb	63	8%	nb	32	4%
A1(M) (south of A63)	sb	10	1%	nb	9	1%
A63 (between Ninelands Lane and B6137)	wb	7	1%	eb	10	1%
M1 (between J46 and J47)	wb	499	63%	eb	568	78%
A63 East Leeds Link Road	wb	96	12%	eb	96	13%
A1(M) (north of A64)	nb	15	2%	sb	10	1%
A64 (east of A1(M))	eb	0	0%	wb	0	0%
Barwick Road (south of M1)	sb	0	0%	nb	0	0%
Leeds Road, Scholes (east of Scholes)	wb	40	5%	eb	2	0%
Main Street, Aberford	nb	70	9%	sb	21	3%
Cattle Lane, Barwick in Elmet	wb	48	6%	eb	7	1%
TOTAL	OUT	794		IN	731	

Table 23 : Proportion of development related traffic on key links from (in the AM) and to (in the PM) the East of Garforth site in 2028.

Proportion of traffic from / to East of Garforth in 2028 Sc1 with M1 junc 47 imp and Garforth southern bypass scheme						
	Dir	No of trips	% of trips AM (origin)	Dir	No of trips	% of trips PM (destination)
A642 (south of M1 J47 Garforth)	sb	24	3%	nb	11	1%
A656 Ridge Road (south of M1 J47)	sb	393	42%	nb	602	68%
A656 Ridge Road (south of A63)	sb	93	10%	nb	62	7%
A1(M) (south of A63)	sb	12	1%	nb	11	1%
Church lane (Micklefield)	eb	31	3%	wb	9	1%
A63 (between Ninelands Lane and B6137)	wb	339	36%	eb	134	15%
M1 (between J46 and J47)	wb	318	34%	eb	556	63%
A63 East Leeds Link Road	wb	106	11%	eb	105	12%
A1(M) (north of A64)	nb	20	2%	sb	11	1%
A64 (east of A1(M))	eb	28	3%	wb	17	2%
Barwick Road (south of M1)	nb	8	1%	sb	4	0%
Leeds Road, Scholes (east of Scholes)	wb	3	0%	eb	0	0%
Main Street, Aberford	nb	7	1%	sb	4	0%
Cattle Lane, Barwick in Elmet	wb	4	0%	eb	1	0%
TOTAL	OUT	942		IN	882	

Table 24 : Changes in delay between 2028 Do Minimum and 2028 Do Something (J47 and Garforth bypass) in the AM peak at key junctions

Key Junction	Base 2016		Do Min 2028 Am pk			Do Som 2028 Am pk			Change from 2016 Base		%age change from 2016		Change from Do Min		%age change from DM	
Scenario 1	Traffic (pcus)	Delay (secs)	Traffic (pcus)	Delay (secs)	No of approaches where v/c exceeds	Traffic (pcus)	Delay (secs)	No of approaches where v/c exceeds	Traffic (pcus)	Delay (secs)	Traffic	Delay	Traffic (pcus)	Delay (secs)	Traffic	Delay
A63 Selby Rd / A656 Ridge Rd	2382	318	2759	351	3	3173	124	0	791	-194	33%	-61%	414	-227	15%	-65%
A63 Selby Rd / Ninelands La, Garforth	1573	153	1899	161	0	2291	168	0	719	14	46%	9%	392	6	21%	4%
A63 Selby Rd / B6137 Leeds Rd, Garforth	1889	31	2091	42	0	3041	78	0	-396	46	-21%	148%	949	36	45%	84%
A63 Selby Rd / B6137 Lidgett La, Garforth	2131	212	2155	204	1	1023	166	0	-1108	-46	-52%	-22%	-1133	-38	-53%	-19%
A63 Selby Rd / A642 Wakefield Rd, Garforth	3481	38	4248	616	4	4914	313	2	1432	275	41%	728%	665	-303	16%	-49%
A64/A1(M) Junction 44	3353	70	3794	84	0	3674	86	0	321	15	10%	22%	-120	1	-3%	2%
A63 Pontefract La / M1 Junction 45	3111	153	4552	217	1	4568	217	1	1457	65	47%	42%	16	1	0%	0%
A63 Selby Rd / A6120 / M1 Junction 46	5255	315	6474	1102	8	7424	584	4	2170	269	41%	85%	951	-518	15%	-47%
Thorpe Park/Jn46	1563	79	4734	223	2	4858	266	5	3295	188	211%	238%	124	43	3%	20%
A656 Ridge Rd / A642 Aberford Rd / B1217 Aberford Rd / M1 Junction 47	2879	25	4430	484	3	4594	156	1	1715	131	60%	520%	163	-328	4%	-68%
A656 Ridge Rd / Church La	1245	56	1987	745	3	2294	334	2	1048	278	84%	500%	306	-411	15%	-55%
A656 Ridge Rd / B6137 Longdike La	1417	181	2080	223	0	2521	286	1	1104	105	78%	58%	441	63	21%	28%
A642 Aberford Rd / Bar La, Garforth	1382	29	1833	452	2	1821	64	0	439	36	32%	125%	-13	-388	-1%	-86%
A642 Aberford Rd / B6137 Main St / Barwick Rd, Garforth	1400	167	2101	781	3	1718	181	0	318	14	23%	8%	-383	-601	-18%	-77%
Leeds Rd / Long La, Barwick	776	18	1473	44	0	1277	27	0	501	9	65%	53%	-196	-17	-13%	-38%
Leeds Rd / Main St, Scholes	808	18	1461	32	0	1327	26	0	519	8	64%	44%	-134	-7	-9%	-21%
B1217 Aberford Rd / Gt North Rd / Bunkers Hill, Aberford	958	39	1682	41	0	1354	40	0	397	1	41%	3%	-327	-1	-19%	-3%
Main St / Cattle La, Aberford	653	16	1321	26	0	1028	20	0	374	4	57%	24%	-293	-6	-22%	-23%

Table 25 : Changes in delay between 2028 Do Minimum and 2028 Do Something (J47 and Garforth bypass) in the PM peak at key junctions

Key Junction	Base 2016		Do Min 2028 Pm pk			Do Som 2028 Pm pk			Change from 2016 Base		%age change from 2016		Change from Do Min		%age change from DM	
Scenario 1	Traffic (pcus)	Delay (secs)	Traffic (pcus)	Delay (secs)	No of approaches where v/c exceeds	Traffic (pcus)	Delay (secs)	No of approaches where v/c exceeds	Traffic (pcus)	Delay (secs)	Traffic	Delay	Traffic (pcus)	Delay (secs)	Traffic	Delay
A63 Selby Rd / A656 Ridge Rd	2280	134	2597	190	0	2525	106	0	245	-28	11%	-21%	-73	-84	-3%	-44%
A63 Selby Rd / Ninelands La, Garforth	1721	173	1767	191	0	2385	219	0	664	46	39%	27%	617	28	35%	15%
A63 Selby Rd / B6137 Leeds Rd, Garforth	2060	37	2149	43	0	3263	83	0	-1271	46	-62%	126%	1114	40	52%	93%
A63 Selby Rd / B6137 Lidgett La, Garforth	2125	239	2262	294	1	737	170	0	-1387	-68	-65%	-29%	-1525	-124	-67%	-42%
A63 Selby Rd / A642 Wakefield Rd, Garforth	3444	54	4259	600	3	4847	318	0	1403	264	41%	484%	588	-282	14%	-47%
A64/A1(M) Junction 44	3248	73	3446	85	0	3505	86	0	257	12	8%	17%	60	1	2%	1%
A63 Pontefract La / M1 Junction 45	2487	134	4368	156	0	4153	276	3	1666	142	67%	106%	-215	120	-5%	77%
A63 Selby Rd / A6120 / M1 Junction 46	5191	434	5963	1157	9	6791	840	7	1601	406	31%	94%	828	-316	14%	-27%
Thorpe Park/Jn46	1576	78	4463	162	2	4190	609	3	2614	531	166%	681%	-273	447	-6%	275%
A656 Ridge Rd / A642 Aberford Rd / B1217 Aberford Rd / M1 Junction 47	2799	40	4314	351	2	4549	119	0	1750	80	63%	200%	235	-231	5%	-66%
A656 Ridge Rd / Church La	1225	55	2189	489	2	1794	706	3	569	651	46%	1174%	-395	217	-18%	44%
A656 Ridge Rd / B6137 Longdike La	1471	181	2174	241	0	2148	222	0	677	41	46%	22%	-26	-19	-1%	-8%
A642 Aberford Rd / Bar La, Garforth	1580	35	2012	105	1	2015	87	0	435	53	28%	153%	3	-17	0%	-16%
A642 Aberford Rd / B6137 Main St / Barwick Rd, Garforth	1417	168	2105	331	2	1784	188	0	367	20	26%	12%	-321	-143	-15%	-43%
Leeds Rd / Long La, Barwick	806	18	1692	40	0	892	19	0	86	1	11%	4%	-800	-21	-47%	-52%
Leeds Rd / Main St, Scholes	876	17	1686	18	1	948	15	0	72	-2	8%	-13%	-738	-3	-44%	-17%
B1217 Aberford Rd / Gt North Rd / Bunkers Hill, Aberford	897	37	1345	36	0	1283	41	0	385	4	43%	10%	-62	5	-5%	14%
Main St / Cattle La, Aberford	654	16	1295	23	0	839	18	0	185	1	28%	7%	-456	-5	-35%	-23%

Table 26 : Changes in journey time between 2016 base year and 2028 Do Something (J47 and Garforth southern bypass) in the AM and PM peaks on the A63 through Garforth

Journey time results (seconds)			Scenario 1				
AM	A2 2016	A2 2028 DM	A2 2028 DS	change from base	% change	change from Do Min	% change
A63 westbound	547	1030	733	186	34%	-297	-29%
A63 eastbound	459	517	479	20	4%	-38	-7%
PM	P2 2016	P2 2028 DM	P2 2028 DS	change from base	% change	change from Do Min	% change
A63 westbound	497	540	465	-32	-6%	-75	-14%
A63 eastbound	582	949	563	-19	-3%	-386	-41%

7. Mitigation Test 4 Impacts (link road from Parlington development to Long Lane Barwick-in-Elmet "Barwick Link road" with Junction 47 improvements)

7.1. The fourth option tested involved a new single carriageway road providing a link between the Parlington development and Long Lane. A new roundabout junction has been assumed on Long Lane approximately half way between Barwick-in-Elmet and Garforth. Note that this test also includes improvements at M1 Junction 47. There is no indicative scheme plan available for the link road, however Appendix 1 includes a Plot of the SATURN test network to show how the link road ties in to the existing network on Long Lane.

7.2. Table 30 lists the changes in flow between the 2016 Base, 2028 Do Minimum and the 2028 Do Something situation with the Barwick Link Road in the AM and PM peak hours.

7.3. In the AM peak flows on the M1 are forecast to remain similar to the Do Minimum situation with the M1 westbound at or close to link capacity between junctions 47, 46 and 45. The requirement for additional link capacity and merge diverge upgrades will be confirmed by Highways England using DMRB assessments. Flows on Main Street and Cattle Lane, Aberford, are forecast to be lower than in the Do Minimum. Unsurprisingly flows increase significantly on Long Lane and (more marginally) on Leeds Road Scholes and Leeds Road Barwick-in-Elmet. Flows fall by 2% westbound on the A63 west of Garforth (between the bypass and M1 junction 46) which is similar to Test 1, as opposed to increases in Tests 2 and 3.

7.4. In the PM peak a different pattern is observed to the AM, with a significant 10% increase on the M1 Motorway between junctions 46 and 47 eastbound compared to the Do Minimum. Traffic flows through Aberford, Barwick and Scholes increase compared to the base, but much less than in the Do Minimum situation. Flows in and around Garforth on the A63, A642 and A656 are generally lower than the Do Minimum. The significant exceptions to this are the A656 southbound away from junction 47 which is 21% higher than the Do Minimum and the A63 westbound to the west of Garforth which is 24% higher.

7.5. Figures 19 and 20 indicate which links are used by traffic generated by the two developments in the morning peak. This shows that in the AM peak with the Barwick Link Road in operation traffic generated by the Parlington site is split between the new link road and junction 47 / M1 (but with the largest share still routing via M1 junction 47). Most traffic generated by the East of Garforth development now routes via M1 junction 47, reflecting the direct access onto the A656 with the larger site. Trips from the East of Garforth site to the City centre still route via the A63, (through M1 junctions 46 and 45).

7.6. Figures 21 and 22 indicate which links are used by traffic attracted by the two developments in the evening peak. This indicates that many trips to Parlington are still forecast to route via junction 47 of the M1 with a similar proportion to the AM using the new link road. Traffic to the East of Garforth site routes via several routes although most traffic uses M1 junction 47.

7.7. Tables 28 and 29 show the proportion of traffic generated by the two developments (away from the site in the AM and into the site in the PM) on key links in the situation with the Barwick Link Road scheme. This shows that for the Parlington site the proportion of traffic associated with the developments using the M1 between junctions 46 and 47 is 49% in the AM and 60% of trips in the PM, which is lower than is the case with Tests 1,2 and 3. Trips from / to the East of Garforth site using the M1 between junctions 46 and 47 increase to 54% in the AM and 73% in the PM. This suggests that the removal of some Parlington related trips from Junction 47 encourages East Garforth site traffic to route via M1 junction 47 rather than using the A63 through Garforth. Caution should be used when looking at the modelled flows as the proportion using the A63 through Garforth may remain higher than predicted as it is a shorter route.

7.8. The Barwick Link Road reduces the proportion of trips from / to Parlington using minor roads in and around Aberford to 3% in the AM peak and 2% in the PM peak. However the proportion passing through Barwick increases to 16% in the AM peak and 18% of trips in the PM peak.

7.9. The proportion of traffic from / to the East of Garforth site passing Garforth on the A63 is around 15% in the AM and just under 4% in the PM peak. This indicates that most traffic now routes via M1 junction 47 in the test with the Barwick Link Road and Junction 47 combined.

7.10. In the AM and PM peaks between 10 and 12% of traffic from/to both sites is forecast to use the East Leeds link road between M1 junction 45 and the City Centre which is similar to the Do Minimum situation.

7.11. The mitigated impact of the developments on key junctions in the Garforth area is illustrated in Tables 30 and 31 which compare traffic volumes and delays in the Do Minimum situation with the Do Something (Barwick Link Road) situation in 2028.

7.12. Between the base year and 2028 Do Something situation flows through the junctions and delays are forecast to increase significantly. The biggest absolute change in delay is forecast at the A63 / A642 roundabout where delays increase by nearly 10 minutes per pcu in the AM peak. The A656 / Church Lane junction west of Micklefield is forecast to experience around 6 minutes of delay per pcu. Delays increase by around 2 to 3 minutes per pcu in the AM peak at M1 junction 46 and M1 junction 47. Similar problems are forecast at all these locations in the PM peak. The A63/A656 roundabout is forecast to see a reduction in delay compared to the base in the both peaks linked to the assumed improvement scheme.

7.13. Between the Do Minimum and the Do Something 9 junctions are forecast to see a fall in delays of 10% or more in both peak hours. Of these, notable improvements occur at the A656/A63 junction (due to the assumed scheme), M1 junctions 46 and 47 and the Bar La and Main St junctions with the A642 at Garforth.

7.14. Two junctions are forecast to experience a notable increase in delay in the PM peak. M1 junction 45 (with the A63) and the dumbbells at M1 junction 46 (Thorpe park / Junction 46). The significant worsening at M1 junction 45 is due to the issues with the operation of the slip roads that also occurs in the previous tests. The requirement for additional link capacity and merge diverge upgrades will be confirmed by Highways England using DMRB assessments. Equally, addressing the increased delays at the junction 46 Thorpe Park dumbbells is being looked at as part of the ELOR scheme design.

7.15. Table 32 shows the journey time changes for the route along the A63 between the A656 and the 'Cracked Egg' Century Way junction, for the situation with the Garforth Bypass scheme in place and for the same route in the base and Do Minimum. The impact of the interventions is relatively limited in the AM peak hour (to around 2 minutes westbound), but journey times eastbound are reduced on the A63 by 23% (nearly 4 mins) in the PM peak, though they remain greater than in the 2016 base.

Table 27 Changes in traffic flow on key links in the forecast year 2028 between the Do Minimum situation without mitigation and the Do Something with Junction 47 improvement and Barwick Link Road.

Key link	Dirn	Base conditions 2016		Do Minimum 2028		Do something 2028		Change from 2016 Base		% Change from 2016		Change from Do min		%age Change from 2028	
Scenario 1		Am pk hour	Pm pk hour	Am pk hour	Pm pk hour	Am pk hour	Pm pk hour	Am pk hour	Pm pk hour	Am pk hour	Pm pk hour	Am pk hour	Pm pk hour	Am pk hour	Pm pk hour
		Actual flow	Actual flow	Actual flow	Actual flow	Actual flow	Actual flow	Actual flow	Actual flow	Actual flow	Actual flow	Actual flow	Actual flow	Actual flow	Actual flow
A63 east of Garforth	WB	668	611	1076	582	926	656	258	45	39%	7%	-150	74	-14%	13%
A63 east of Garforth	EB	495	578	527	821	597	695	102	117	21%	20%	70	-125	13%	-15%
A63 Garforth (E of Lidgett La)	WB	1139	775	1270	755	1220	828	81	52	7%	7%	-50	73	-4%	10%
A63 Garforth (E of Lidgett La)	EB	581	1029	523	1135	634	1155	52	125	9%	12%	111	20	21%	2%
A63 west of Garforth	WB	1807	935	2130	817	2084	1009	277	74	15%	8%	-46	192	-2%	24%
A63 west of Garforth	EB	1035	1723	961	1917	1204	1806	169	84	16%	5%	243	-111	25%	-6%
A656 south of Jn 47	NB	846	354	922	991	1431	840	585	487	69%	138%	509	-151	55%	-15%
A656 south of Jn 47	SB	371	843	787	1098	659	1323	288	480	77%	57%	-128	226	-16%	21%
A656 south of A63	NB	579	458	839	735	992	690	413	232	71%	51%	153	-45	18%	-6%
A656 south of A63	SB	447	550	722	718	767	781	320	232	72%	42%	45	63	6%	9%
A642 south of Jn 47	NB	609	619	680	993	544	918	-65	298	-11%	48%	-136	-76	-20%	-8%
A642 south of Jn 47	SB	540	580	762	688	724	662	184	83	34%	14%	-38	-26	-5%	-4%
A642 south of A63	NB	548	431	836	772	822	687	275	255	50%	59%	-13	-85	-2%	-11%
A642 south of A63	SB	475	706	785	1123	882	912	407	206	86%	29%	97	-212	12%	-19%
B1217 north of Jn 47	WB	584	260	1171	662	1328	566	744	306	127%	118%	157	-96	13%	-14%
B1217 north of Jn 47	EB	230	488	436	673	524	1144	294	656	128%	134%	88	471	20%	70%
Main St Aberford	NB	289	251	880	260	645	288	356	36	123%	14%	-236	28	-27%	11%
Main St Aberford	SB	234	238	225	896	210	500	-24	263	-10%	111%	-15	-396	-7%	-44%
Cattle La	WB	143	124	641	134	448	133	306	9	214%	7%	-193	-2	-30%	-1%
Cattle La	EB	115	117	203	731	147	345	32	228	28%	195%	-56	-386	-28%	-53%
Long La south of Barwick	NB	250	249	247	165	431	218	181	-32	73%	-13%	184	52	74%	32%
Long La south of Barwick	SB	197	240	263	491	231	396	34	156	17%	65%	-32	-95	-12%	-19%
Leeds Rd west of Barwick	WB	429	292	950	258	991	311	562	19	131%	6%	41	53	4%	20%
Leeds Rd west of Barwick	EB	199	362	346	1292	331	808	132	446	67%	123%	-14	-484	-4%	-37%
Leeds Rd west of Scholes	WB	324	246	1026	301	1085	360	761	114	235%	46%	59	59	6%	20%
Leeds Rd west of Scholes	EB	145	296	360	1277	350	836	205	539	141%	182%	-10	-442	-3%	-35%
M1 Jn 47-48	WB	4106	3573	4725	3885	4538	3892	432	318	11%	9%	-188	7	-4%	0%
M1 Jn 47-48	EB	4021	3750	3946	4041	4147	3657	126	-93	3%	-2%	201	-384	5%	-10%
M1 Jn 46-47	WB	4835	3525	6121	4621	6220	4617	1385	1092	29%	31%	99	-4	2%	0%
M1 Jn 46-47	EB	3854	4380	4769	4740	4602	5273	748	893	19%	20%	-167	532	-3%	11%
M1 Jn 45-46	WB	5975	4482	6220	4966	6220	5342	245	860	4%	19%	0	376	0%	8%
M1 Jn 45-46	EB	4611	5449	5272	5344	5281	5408	670	-40	15%	-1%	9	64	0%	1%

Figure 19 Do Something (Barwick Link Road) trips from the Parlington site in the AM peak (2028).

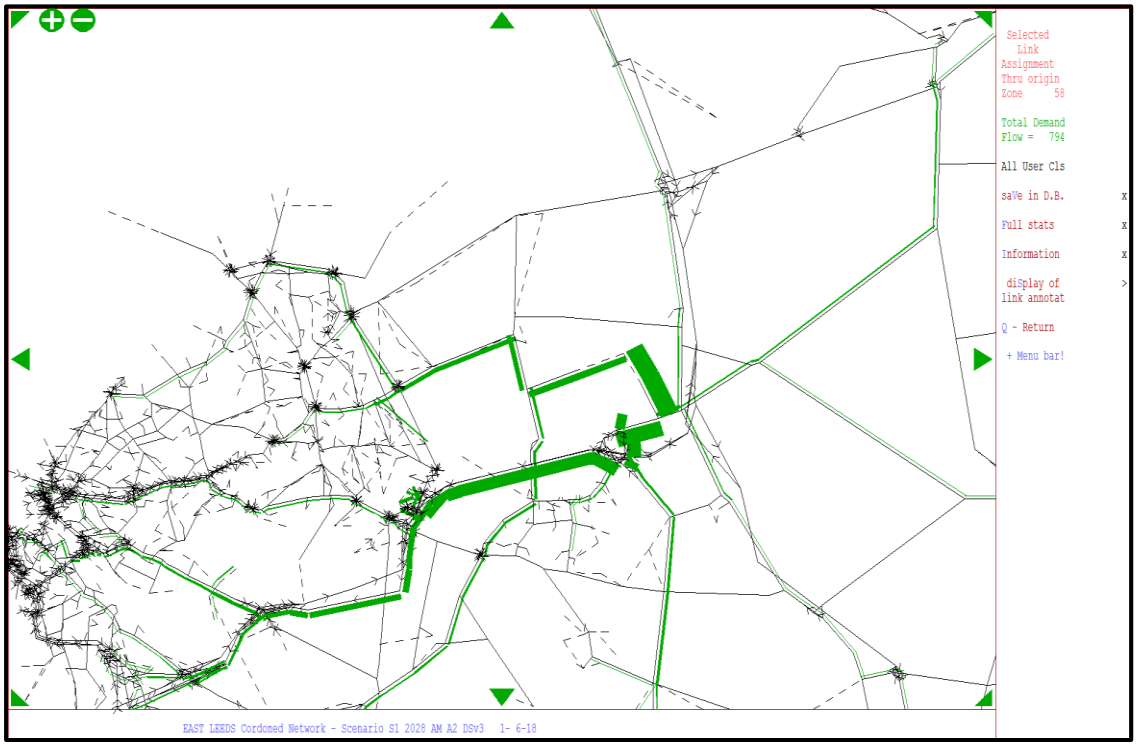


Figure 20 Do Something (Barwick Link Road) trips from the East of Garforth site in the AM peak (2028).

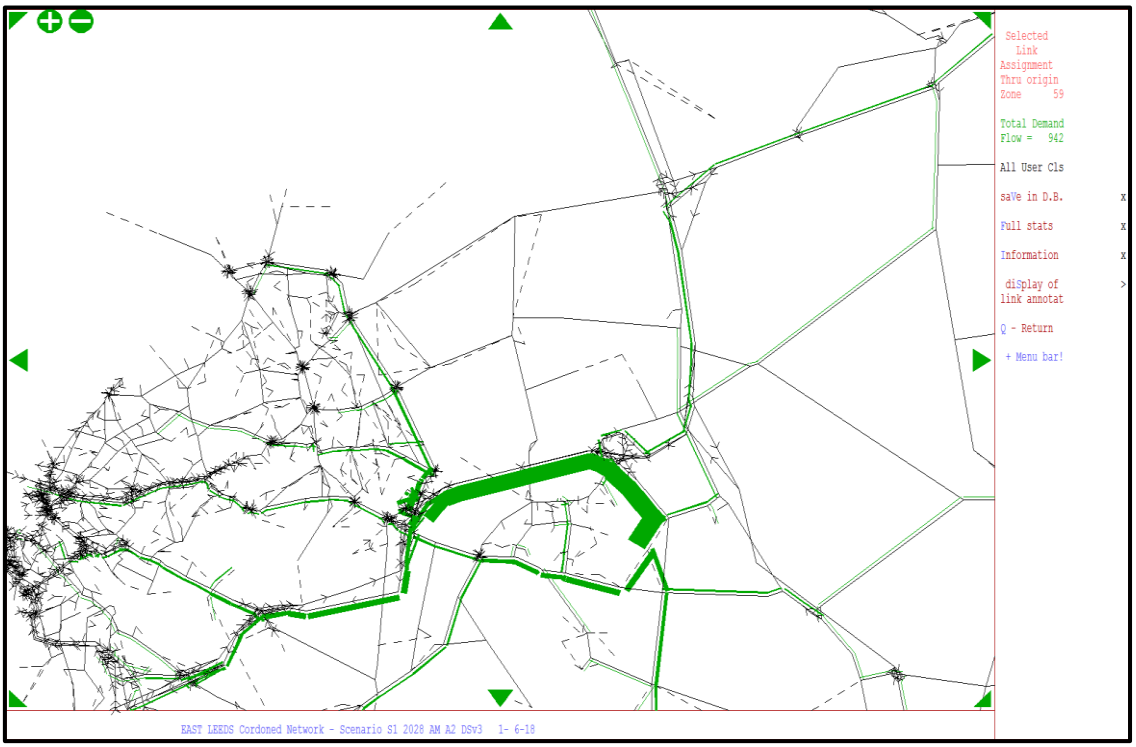


Figure 21 Do Something (Barwick Link Road) trips to the Parlington site in the PM peak (2028).

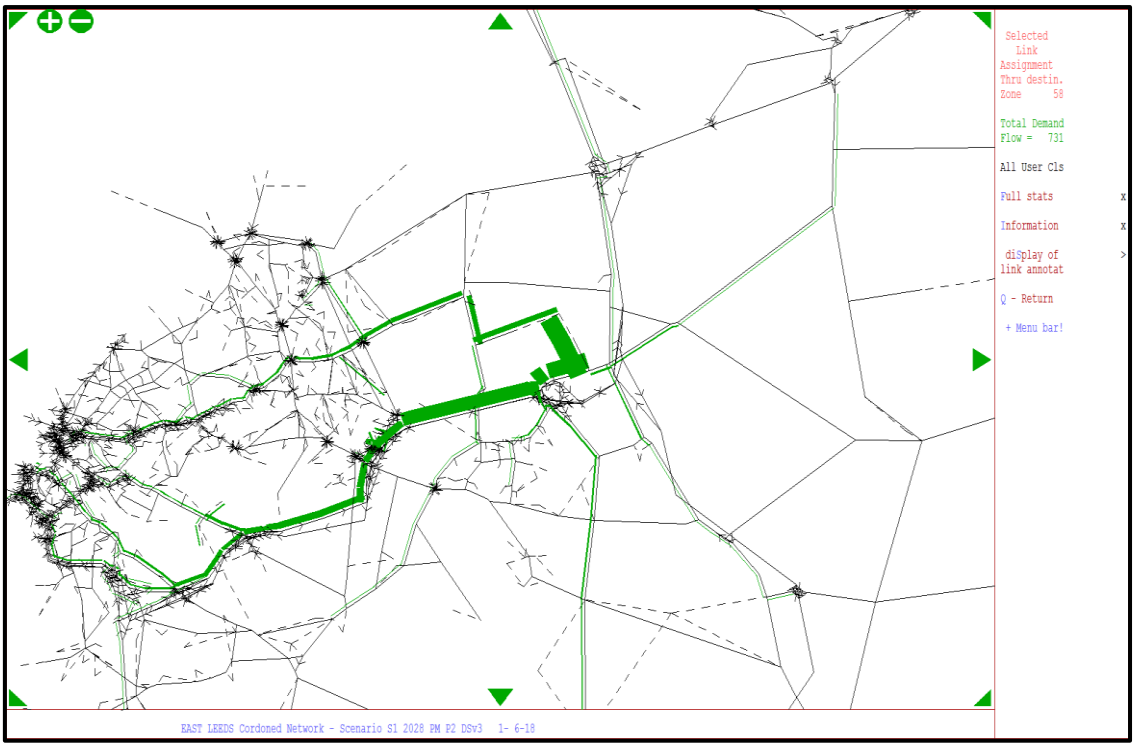


Figure 22 Do Something (Barwick Link Road) trips to the East of Garforth site in the PM peak (2028).

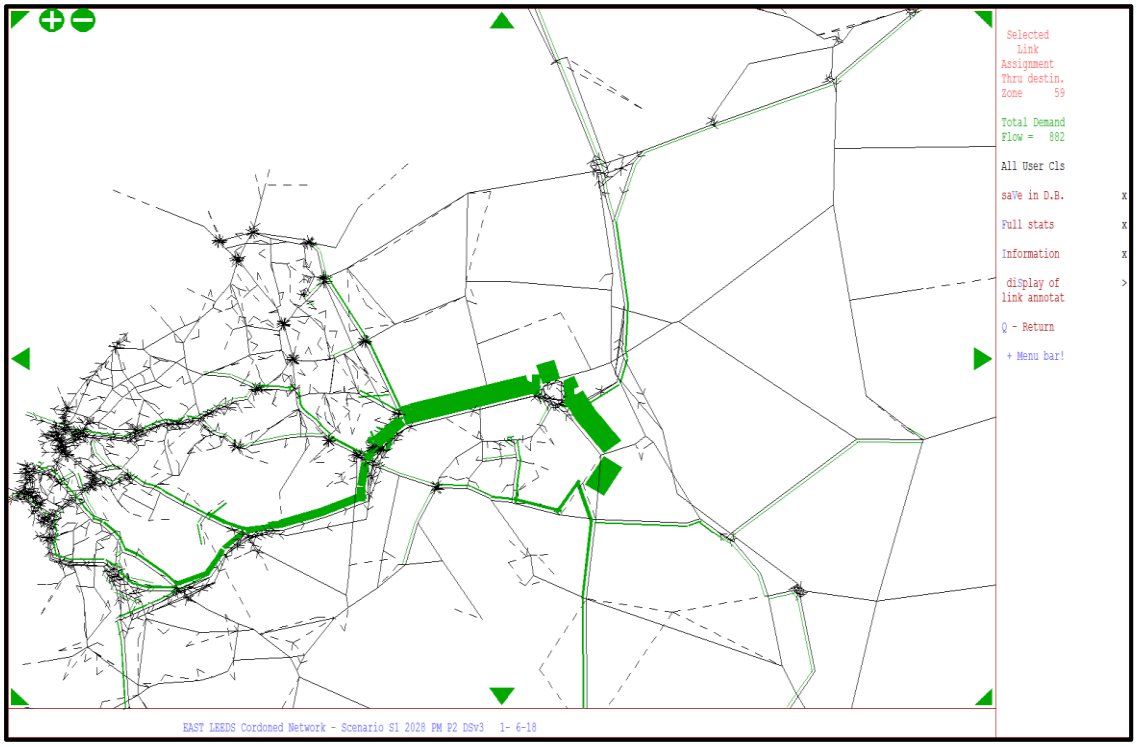


Table 28 Proportion of development related traffic on key links from (in the AM) and to (in the PM) the Parlington site in 2028.

Proportion of traffic from / to Parlington in 2028 Sc1 with Barwick Link Road scheme plus M1 junc 47 imp						
	Dir	No of trips	% of trips AM (origin)	Dir	No of trips	% of trips PM (destination)
A642 (south of M1 J47 Garforth)	sb	37	5%	nb	30	4%
A656 Ridge Road (south of M1 J47)	sb	64	8%	nb	44	6%
A656 Ridge Road (south of A63)	sb	64	8%	nb	43	6%
A1(M) (south of A63)	sb	10	1%	nb	9	1%
A63 (between Ninelands Lane and B6137)	wb	7	1%	eb	7	1%
M1 (between J46 and J47)	wb	391	49%	eb	436	60%
A63 East Leeds Link Road	wb	98	12%	eb	78	11%
M1 (north of A64)	nb	15	2%	sb	10	1%
A64 (east of A1(M))	eb	0	0%	wb	0	0%
Barwick Road (south of M1)	sb	73	9%	nb	21	3%
Leeds Road, Scholes (east of Scholes)	wb	130	16%	eb	133	18%
Main Street, Aberford	nb	22	3%	sb	14	2%
Cattle Lane, Barwick in Elmet	wb	0	0%	eb	0	0%
TOTAL	OUT	794		IN	731	

Table 29 Proportion of development related traffic on key links from (in the AM) and to (in the PM) the East of Garforth site in 2028.

Proportion of traffic from / to East of Garforth in 2028 Sc1 with Barwick Link Road scheme plus M1 junc 47 imp						
	Dir	No of trips	% of trips AM (origin)	Dir	No of trips	% of trips PM (destination)
A642 (south of M1 J47 Garforth)	sb	24	3%	nb	12	1%
A656 Ridge Road (south of M1 J47)	nb	580	62%	sb	690	78%
A656 Ridge Road (south of A63)	sb	95	10%	nb	68	8%
A1(M) (south of A63)	sb	12	1%	nb	11	1%
Church lane (Micklefield)	eb	38	4%	wb	9	1%
A63 (between Ninelands Lane and B6137)	wb	143	15%	eb	36	4%
M1 (between J46 and J47)	wb	512	54%	eb	642	73%
A63 East Leeds Link Road	wb	91	10%	eb	100	11%
M1 (north of A64)	nb	20	2%	sb	11	1%
A64 (east of A1(M))	eb	24	3%	wb	17	2%
Barwick Road (south of M1)	nb	7	1%	sb	6	1%
Leeds Road, Scholes (east of Scholes)	wb	3	0%	eb	4	0%
Main Street, Aberford	nb	10	1%	sb	6	1%
Cattle Lane, Barwick in Elmet	wb	5	1%	eb	3	0%
TOTAL	OUT	942		IN	882	

Table 30 Changes in delay between 2028 Do Minimum and 2028 Do Something (J47 and Barwick Link Road) in the AM peak at key junctions

Key Junction	Base 2016		Do Min 2028 Am pk			Do Som 2028 Am pk			Change from 2016 Base		%age change from 2016		Change from Do Min		%age change from DM	
Scenario 1	Traffic (pcus)	Delay (secs)	Traffic (pcus)	Delay (secs)	No of approaches where v/c exceeds	Traffic (pcus)	Delay (secs)	No of approaches where v/c exceeds	Traffic (pcus)	Delay (secs)	Traffic	Delay	Traffic (pcus)	Delay (secs)	Traffic	Delay
A63 Selby Rd / A656 Ridge Rd	2382	318	2759	351	3	2935	114	0	553	-204	23%	-64%	177	-237	6%	-67%
A63 Selby Rd / Ninelands La, Garforth	1573	153	1899	161	0	1783	162	0	210	8	13%	5%	-116	0	-6%	0%
A63 Selby Rd / B6137 Leeds Rd, Garforth	1889	31	2091	42	0	2043	33	0	154	2	8%	5%	-48	-9	-2%	-22%
A63 Selby Rd / B6137 Lidgett La, Garforth	2131	212	2155	204	1	2221	202	0	90	-10	4%	-5%	66	-2	3%	-1%
A63 Selby Rd / A642 Wakefield Rd, Garforth	3481	38	4248	616	4	4501	603	4	1019	565	29%	1496%	252	-13	6%	-2%
A64/A1(M) Junction 44	3353	70	3794	84	0	3638	87	0	285	17	9%	24%	-156	3	-4%	3%
A63 Pontefract La / M1 Junction 45	3111	153	4552	217	1	4541	233	1	1430	80	46%	52%	-11	16	0%	7%
A63 Selby Rd / A6120 / M1 Junction 46	5255	315	6474	1102	8	7032	532	5	1777	217	34%	69%	558	-570	9%	-52%
Thorpe Park/Jn46	1563	79	4734	223	2	4778	242	5	3215	163	206%	207%	44	19	1%	9%
A656 Ridge Rd / A642 Aberford Rd / B1217 Aberford Rd / M1 Junction 47	2879	25	4430	484	0	4673	171	91	1794	146	62%	584%	243	-312	5%	-65%
A656 Ridge Rd / Church La	1245	56	1987	745	3	2303	431	3	1058	375	85%	674%	315	-314	16%	-42%
A656 Ridge Rd / B6137 Longdike La	1417	181	2080	223	0	2277	248	0	860	67	61%	37%	197	25	9%	11%
A642 Aberford Rd / Bar La, Garforth	1382	29	1833	452	2	1933	131	2	552	103	40%	358%	100	-321	5%	-71%
A642 Aberford Rd / B6137 Main St / Barwick Rd, Garforth	1400	167	2101	781	3	2161	322	3	762	155	54%	93%	60	-459	3%	-59%
Leeds Rd / Long La, Barwick	776	18	1473	44	0	1453	31	0	678	13	87%	76%	-20	-12	-1%	-29%
Leeds Rd / Main St, Scholes	808	18	1461	32	0	1512	37	0	704	19	87%	108%	51	5	4%	15%
B1217 Aberford Rd / Gt North Rd / Bunkers Hill, Aberford	958	39	1682	41	0	1812	51	0	854	12	89%	32%	131	10	8%	25%
Main St / Cattle La, Aberford	653	16	1321	26	0	1051	21	0	398	5	61%	29%	-270	-5	-20%	-20%

Table 31 : Changes in delay between 2028 Do Minimum and 2028 Do Something (J47 and Barwick Link Road) in the PM peak at key junctions

Key Junction	Base 2016		Do Min 2028 Pm pk			Do Som 2028 Pm pk			Change from 2016 Base		%age change from 2016		Change from Do Min		%age change from DM	
Scenario 1	Traffic (pcus)	Delay (secs)	Traffic (pcus)	Delay (secs)	No of approaches where v/c exceeds	Traffic (pcus)	Delay (secs)	No of approaches where v/c exceeds	Traffic (pcus)	Delay (secs)	Traffic	Delay	Traffic (pcus)	Delay (secs)	Traffic	Delay
A63 Selby Rd / A656 Ridge Rd	2280	134	2597	190	0	2595	108	0	315	-27	14%	-20%	-2	-83	0%	-44%
A63 Selby Rd / Ninelands La, Garforth	1721	173	1767	191	0	1864	196	1	143	23	8%	13%	96	4	5%	2%
A63 Selby Rd / B6137 Leeds Rd, Garforth	2060	37	2149	43	0	2261	51	0	200	14	10%	38%	112	8	5%	18%
A63 Selby Rd / B6137 Lidgett La, Garforth	2125	239	2262	294	1	2279	319	1	155	80	7%	34%	18	24	1%	8%
A63 Selby Rd / A642 Wakefield Rd, Garforth	3444	54	4259	600	3	4044	287	2	600	232	17%	427%	-214	-314	-5%	-52%
A64/A1(M) Junction 44	3248	73	3446	85	0	3508	86	0	259	12	8%	17%	62	1	2%	1%
A63 Pontefract La / M1 Junction 45	2487	134	4368	156	0	2665	1058	2	178	924	7%	689%	-1704	902	-39%	577%
A63 Selby Rd / A6120 / M1 Junction 46	5191	434	5963	1157	9	6338	601	5	1148	167	22%	39%	375	-556	6%	-48%
Thorpe Park/Jn46	1576	78	4463	162	2	4335	515	3	2759	437	175%	561%	-128	353	-3%	217%
A656 Ridge Rd / A642 Aberford Rd / B1217 Aberford Rd / M1 Junction 47	2799	40	4314	351	0	4756	141	63	1957	101	70%	254%	442	-210	10%	-60%
A656 Ridge Rd / Church La	1225	55	2189	489	2	2242	564	1	1018	508	83%	918%	53	75	2%	15%
A656 Ridge Rd / B6137 Longdike La	1471	181	2174	241	0	2154	231	0	683	50	46%	27%	-20	-10	-1%	-4%
A642 Aberford Rd / Bar La, Garforth	1580	35	2012	105	1	1947	63	0	367	29	23%	84%	-65	-41	-3%	-39%
A642 Aberford Rd / B6137 Main St / Barwick Rd, Garforth	1417	168	2105	331	2	1784	194	0	367	25	26%	15%	-321	-137	-15%	-41%
Leeds Rd / Long La, Barwick	806	18	1692	40	0	1257	23	0	450	5	56%	25%	-436	-17	-26%	-42%
Leeds Rd / Main St, Scholes	876	17	1686	18	1	1275	15	0	399	-2	46%	-9%	-411	-2	-24%	-13%
B1217 Aberford Rd / Gt North Rd / Bunkers Hill, Aberford	897	37	1345	36	0	1524	45	0	627	8	70%	21%	180	9	13%	25%
Main St / Cattle La, Aberford	654	16	1295	23	0	960	18	0	306	2	47%	11%	-335	-5	-26%	-20%

Table 32 : Changes in journey time between 2016 base year and 2028 Do Something (J47 and Barwick Link Road) in the AM and PM peaks on the A63 through Garforth

Journey time results (seconds)			Scenario 1				
AM	A2 2016	A2 2028 DM	A2 2028 DS	change from base	% change	change from Do Min	% change
A63 westbound	547	1030	916	369	67%	-114	-11%
A63 eastbound	459	517	511	52	11%	-6	-1%
PM	P2 2016	P2 2028 DM	P2 2028 DS	change from base	% change	change from Do Min	% change
A63 westbound	497	540	470	-27	-5%	-70	-13%
A63 eastbound	582	949	729	147	25%	-220	-23%

8. SUMMARY AND CONCLUSIONS

8.1. Four potential mitigation options have been tested for the horizon year of 2028 to evaluate their impacts on reducing the impacts of the Leeds Site Allocations Plan developments in the Garforth and east Leeds area.

- **Test 1 - M1 junction 47 capacity upgrade scheme** (signalising all approaches to M1 junction 47 and widening of the approaches with additional circulatory lanes on the roundabout and a "tiger tail" parallel merge on the westbound slip road). The required merge upgrade will be confirmed by Highways England using a DMRB merge assessment.

- **Test 2 - Garforth Southern Bypass** (a new wide single carriageway road providing a southern bypass of Garforth between the A63 / A642 roundabout and the Ninelands Lane junction with the A63).

- **Test 3 - M1 junction 47 improvement and Garforth Southern Bypass combined** (as per Test 2, but with the junction 47 capacity upgrade from Test 1 included).

- **Test 4 - Link road from Parlington development to Long Lane Barwick-in-Elmet "Barwick Link road" with Junction 47 improvements** (a new single carriageway road providing a link between the Parlington development and Long Lane. A new roundabout junction has been assumed on Long Lane approximately half way between Barwick-in-Elmet and Garforth).

8.2. Without any mitigation scheme traffic levels and congestion are forecast to rise significantly and while none of the interventions fully addresses the rise in congestion it is clear that there are benefits associated with the potential interventions that reduce the level of delays at key junctions and diverts traffic away from more sensitive locations.

8.3. All four interventions have included improvements at the A656/A63 roundabout and at M1 Junction 46. At this stage neither of these interventions are funded. However, work is ongoing as part of the ELOR design to address the congestion issues arising at the junction 46 dumbbells during the PM peak.

8.4. Other than Test 2, all interventions have included improvements to M1 Junction 47, which are also not funded. The current HS2 proposals include modifications to this junction during construction. However, these proposals are still being developed. The modifications will therefore need to be considered in parallel to the proposals for the mitigation scheme at junction 47.

8.5. In addition both the Do Minimum all the options have a significant impact upon delays at the A656/Church Lane junction and mitigation here will need to be considered.

8.6. It should be noted that the east of Garforth housing site has been assumed to have direct access onto both the A63 and A656 roads, however, no junction form has been assumed in the model tests. Depending on the type and location of these junctions there may be impacts upon the assignment of traffic to and from this site.

8.7. Between M1 junctions 47, 46 and 45 westbound AM peak demand is forecast to get close to or exceed link capacity in all the Tests. The requirement for additional link capacity and merge diverge upgrades will be confirmed by Highways England using DMRB assessments.

Junction 47 Improvement (Test 1)

8.8. This scheme reduces peak hour delays on the A63[4] compared with the Do Minimum but does not perform as well as either of the bypass options in this respect.

8.9. Delays at M1 Junction 47 are markedly reduced compared with the Do Minimum.

8.10. Forecast delays at the main M1 Junction 46 roundabout are reduced compared with the Do Minimum but increase at the Thorpe Park dumbbells.

Garforth Southern Bypass (Test 2)

8.11. This scheme reduces delays on the A63 in both peak hours compared with the Do Minimum to a similar extent as the combination of the bypass and junction scheme (and by a greater amount that the other two options that don't include a bypass).

8.12. The volume of traffic carried by the A63 at Garforth is around 50% greater than options without a bypass but the volume of traffic remaining on the existing road is less than a third of that in the Do Minimum.

8.13. Although delays at Junction 47 are reduced compared with the Do Minimum this option performs less well than the other options

8.14. Forecast delays at the main M1 Junction 46 roundabout are reduced compared with the Do Minimum but increase at the Thorpe Park dumbbells. This option performs worst overall at the main junction and best at the dumbbells.

Junction 47 and Garforth bypass (Test 3)

8.15. This combined scheme performs best overall at reducing peak hour delays on the A63 when compared with the Do Minimum.

8.16. The volume of traffic carried by the A63 at Garforth is around 50% greater than options without a bypass but the volume of traffic remaining on the existing road is around a third of that in the Do Minimum.

8.17. It also performs best overall at mitigating delays at Junction 47, although it is not markedly different from either of the other options with an improvement at this location.

8.18. Forecast delays at the main M1 Junction 46 roundabout are reduced compared with the Do Minimum but increase at the Thorpe Park dumbbells. The overall improvement is least with this option.

8.19. This option has the greatest effect at reducing the level of additional traffic using the minor roads through Barwick and Scholes and also through Aberford, with flows some 30-40% less than the Do Minimum.

[4] A656 to Century Way "Cracked egg" junction.

Junction 47 and Barwick Road Link (Test 4)

8.20. This option also reduces delays on the A63 compared with the Do Minimum but to a lesser extent than either of the bypass options and is very similar to the junction 47 only option.

8.21. Delays at Junction 47 are reduced to the same extent as the option for improving junction 47 without the Barwick Road link.

8.22. Forecast delays at the main M1 Junction 46 roundabout are reduced compared with the Do Minimum but increase at the Thorpe Park dumbbells. This option (and the other improving M1 Junction 47 on its own) is slightly better overall than the options including a bypass.

8.23. This option results in the greatest level of use of the minor road network through Barwick and Scholes with overall, peak hour flows some 30% greater than the best performing option (but still 9% less than the Do Minimum).

Comparison of the 4 options

8.24. The results from the 4 options tested have been summarised in tables that are included in Appendix 2. Table are included for flows at key junctions, delays at key junctions, flows on key links for the AM and PM peaks, and journey times on the A63 through Garforth.

8.25. For each link the option with the highest flow or delay is highlighted in orange and the lowest highlighted in green.

Conclusion

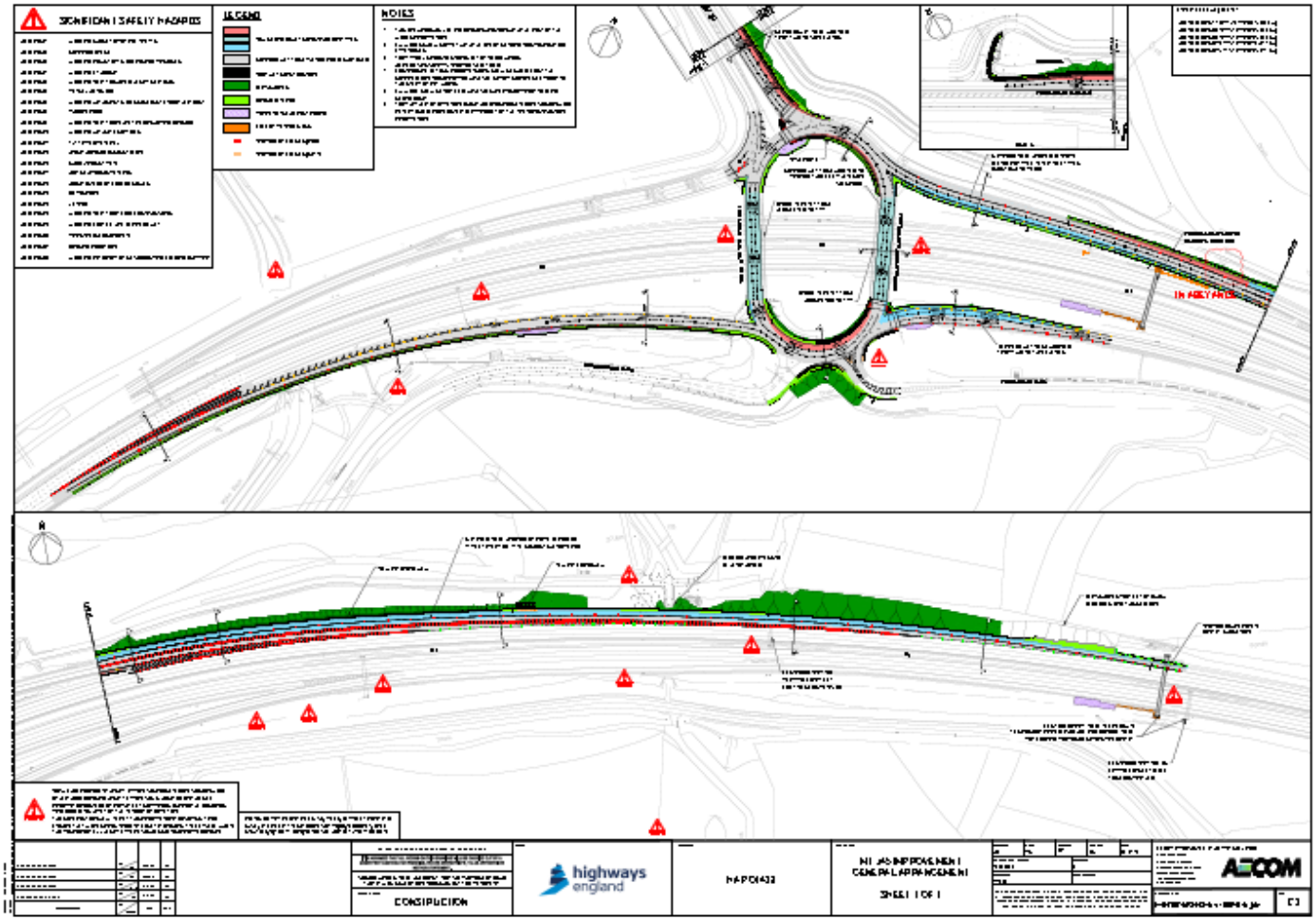
8.26. Across all the 4 mitigating options it is considered that the best performing option overall is the combination of the Junction 47 improvement with the Garforth bypass (Test 3).

8.27. This is because this option :

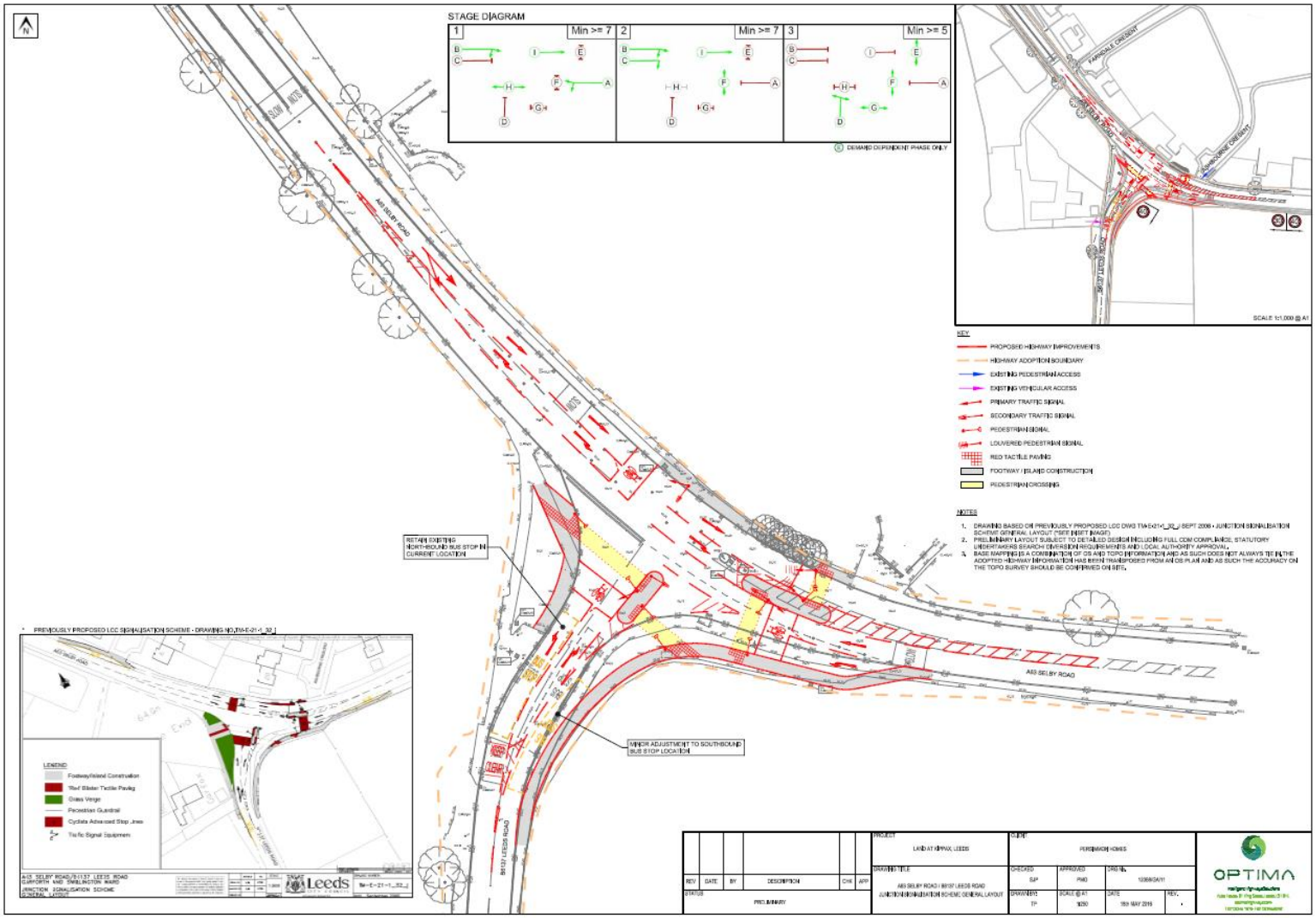
- Provides the greatest relief to traffic on the old A63 and greatest reductions in delay at junctions on the A63
- Has the least impact on minor roads around Barwick, Scholes and Aberford
- Has the most impact on reducing delay at M1 junction 47

APPENDIX 1 : Scheme plans for Do Minimum and Do Something proposals

Plan A1 : M1 junction 45 (Highways England Improvement scheme under construction)

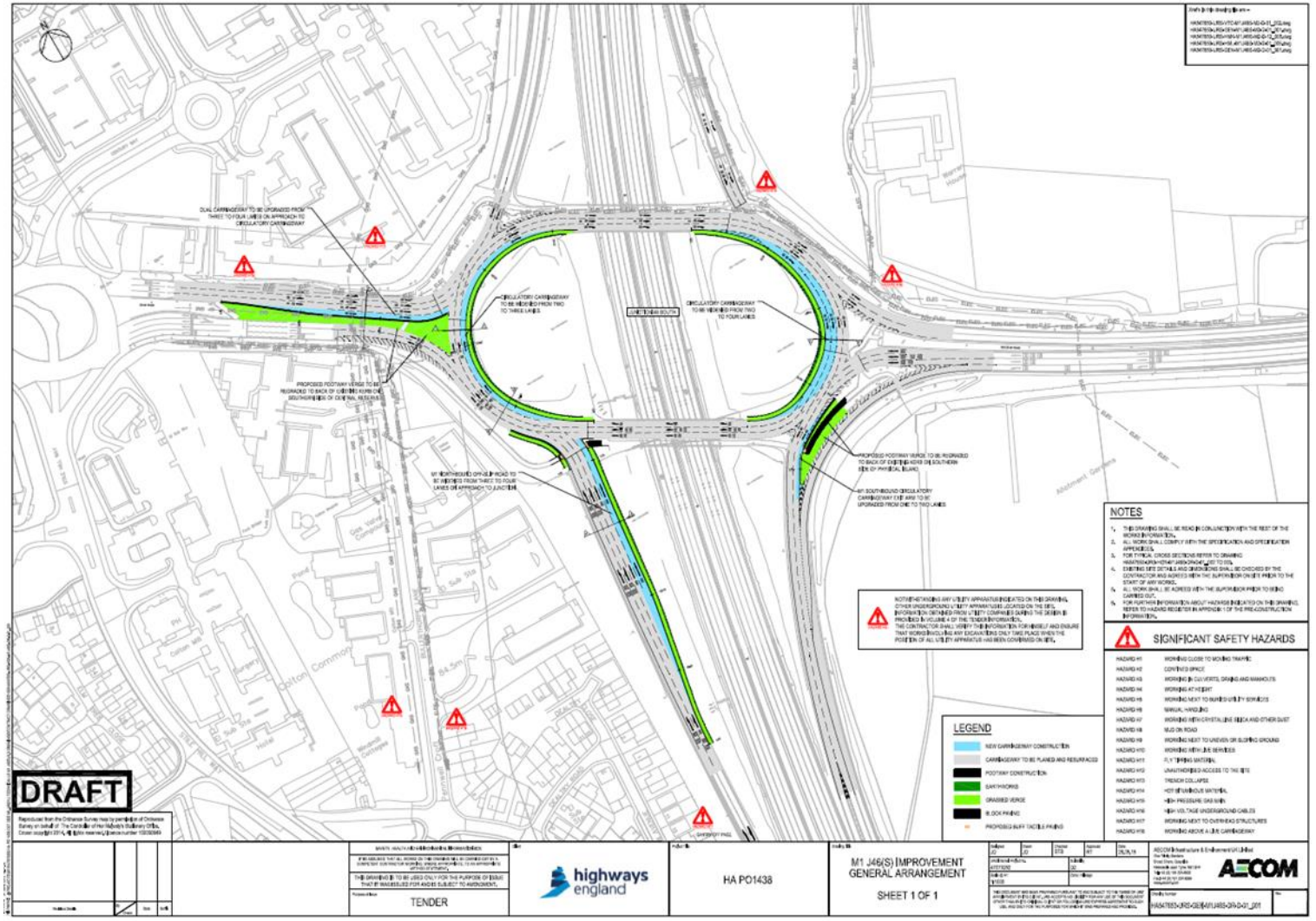


Plan A2 : A63 Selby Rd / Leeds Rd signalisation scheme

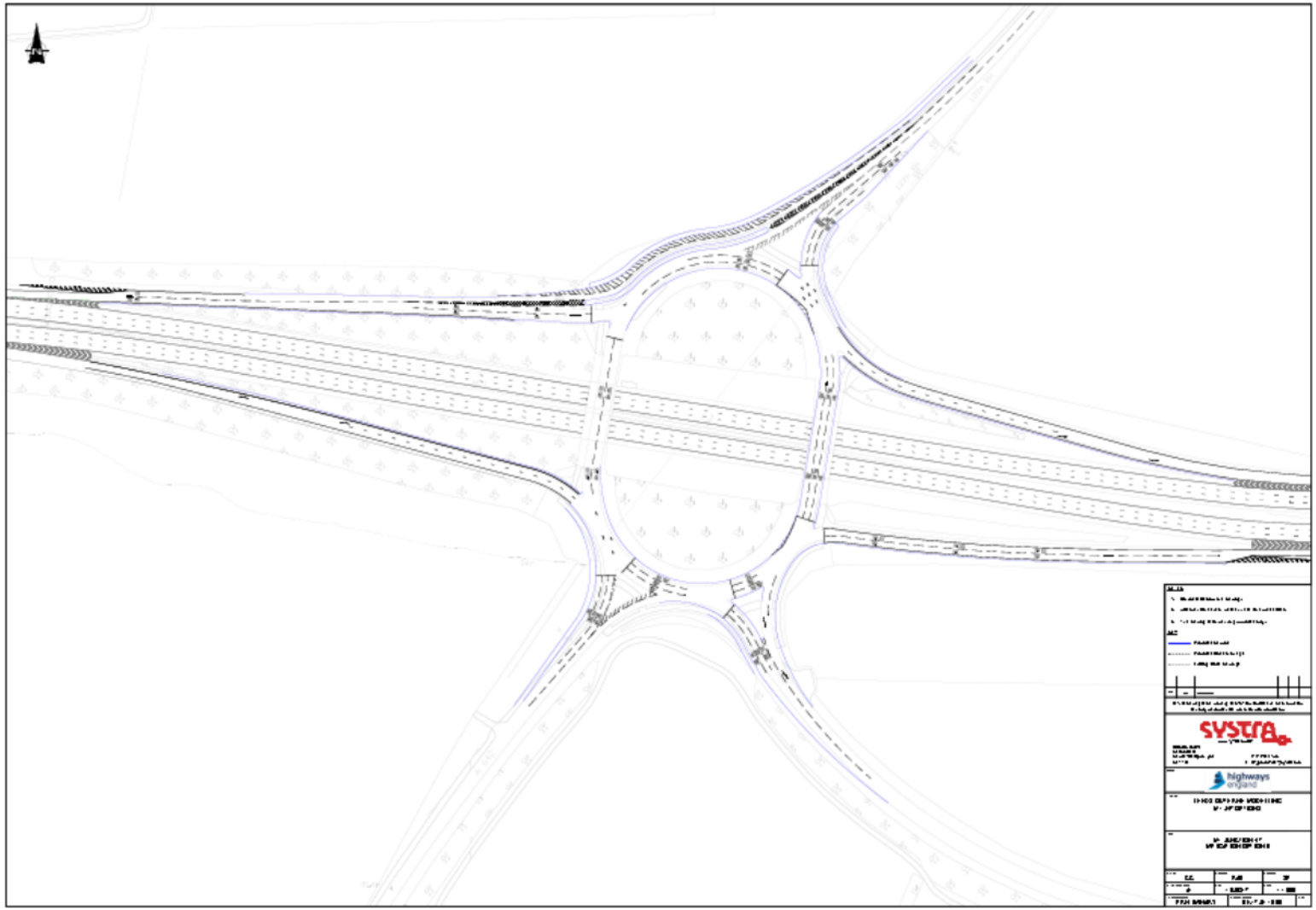


Plan A3 : Manston Lane Link Road and East Leeds Orbital Road Overview Plan

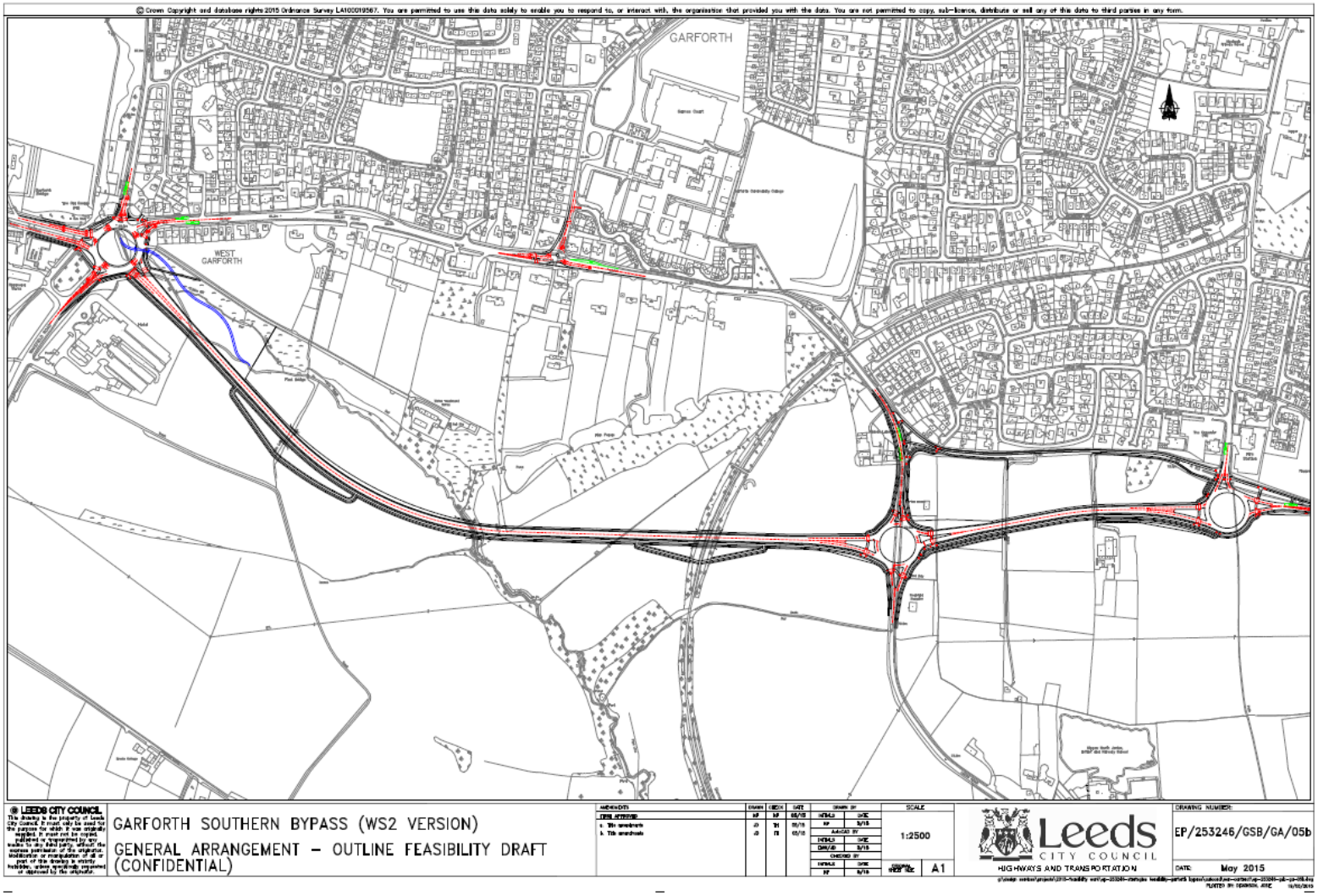
Plan A4 : Potential M1 junction 46 scheme (improvement scheme currently unfunded)



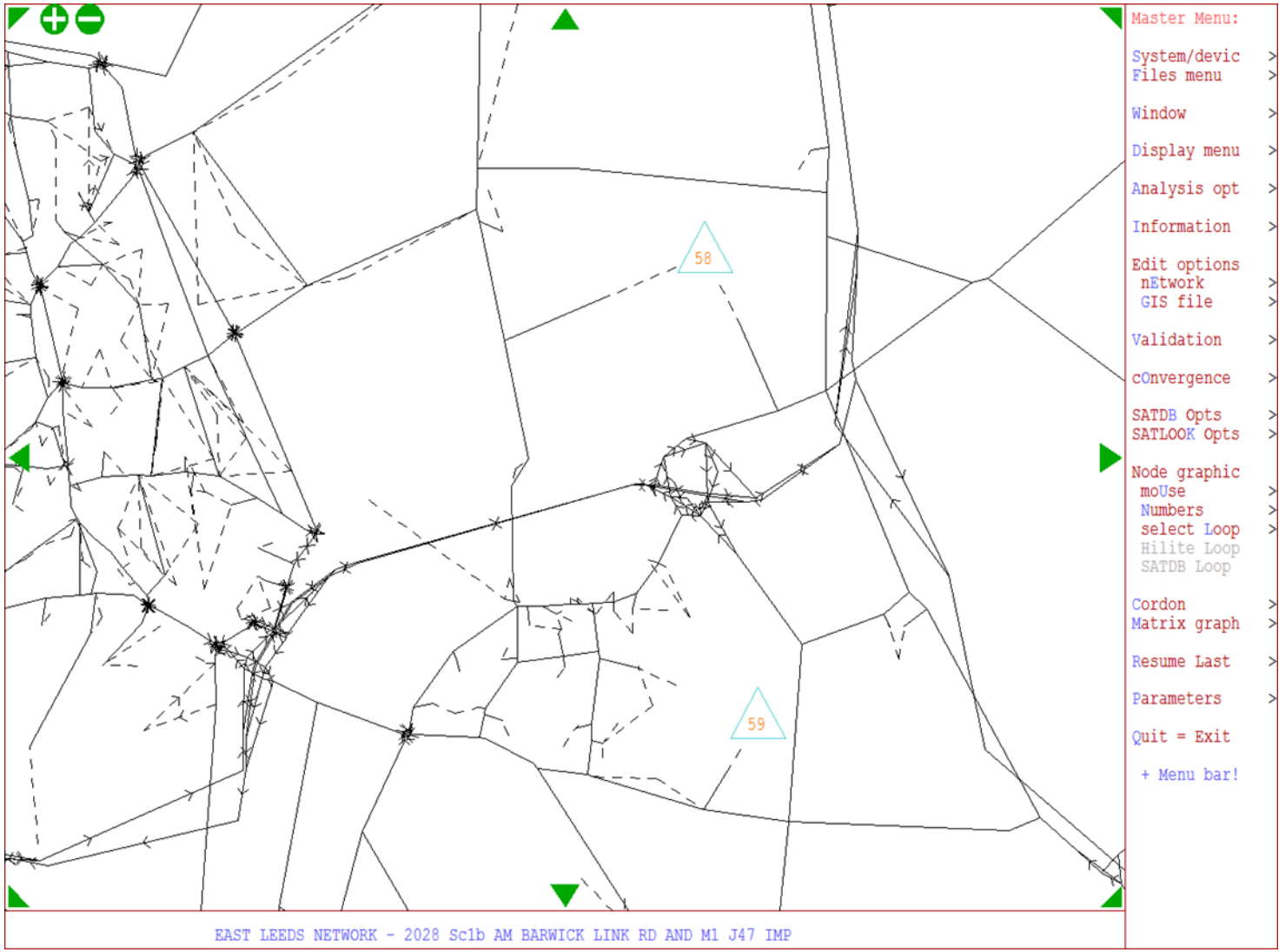
Plan A5 : Potential M1 Junction 47 improvements (currently unfunded)



Plan A6 : Potential Garforth southern bypass (currently unfunded)



Plan A7 : Saturn network plot of the test network with potential Barwick link road and M1 junction 47 improvements



APPENDIX 2 – Summary Tables

KEY JUNCTIONS

Table A1 : AM peak key junctions (traffic)

Am peak hour - traffic (pcus)	Scenario Sc1					
Key Junction		Do Min	Do Something			
	Base 2016	DM 2028	Jn 47 BY	Jn 47	Bypass	BLR J 47
A63 Selby Rd / A656 Ridge Rd	2382	2759	3173	2929	2978	2935
A63 Selby Rd / Ninelands La, Garforth	1573	1899	2291	1769	2438	1783
A63 Selby Rd / B6137 Leeds Rd, Garforth	1889	2091	3041	2041	3141	2043
A63 Selby Rd / B6137 Lidgett La, Garforth	2131	2155	1023	2221	1063	2221
A63 Selby Rd / A642 Wakefield Rd, Garforth	3481	4248	4914	4500	4828	4501
A64/A1(M) Junction 44	3353	3794	3674	3638	3752	3638
A63 Pontefract La / M1 Junction 45	3111	4552	4568	4541	4568	4541
A63 Selby Rd / A6120 / M1 Junction 46	5255	6474	7424	7027	7324	7032
Thorpe Park/Jn46	1563	4734	4858	4792	4788	4778
A656 Ridge Rd / A642 Aberford Rd / B1217 Aberford Rd / M1 Junction 4	2879	4430	4594	4808	4386	4673
A656 Ridge Rd / Church La	1245	1987	2294	2308	1993	2303
A656 Ridge Rd / B6137 Longdike La	1417	2080	2521	2270	2410	2277
A642 Aberford Rd / Bar La, Garforth	1382	1833	1821	1961	1805	1933
A642 Aberford Rd / B6137 Main St / Barwick Rd, Garforth	1400	2101	1718	2176	1679	2161
Leeds Rd / Long La, Barwick	776	1473	1277	1385	1278	1453
Leeds Rd / Main St, Scholes	808	1461	1327	1442	1328	1512
B1217 Aberford Rd / Gt North Rd / Bunkers Hill, Aberford	958	1682	1354	1840	1432	1812
Main St / Cattle La, Aberford	653	1321	1028	1154	1103	1051

Table A2 : PM peak key junctions (traffic)

Pm peak hour - traffic (pcus)	Scenario Sc1					
Key Junction		Do Min	Do Something			
	Base 2016	DM 2028	Jn 47 BY	Jn 47	Bypass	BLR J 47
A63 Selby Rd / A656 Ridge Rd	2280	2597	2525	2607	2770	2595
A63 Selby Rd / Ninelands La, Garforth	1721	1767	2385	1852	2323	1864
A63 Selby Rd / B6137 Leeds Rd, Garforth	2060	2149	3263	2264	3201	2261
A63 Selby Rd / B6137 Lidgett La, Garforth	2125	2262	737	2302	888	2279
A63 Selby Rd / A642 Wakefield Rd, Garforth	3444	4259	4847	4047	4861	4044
A64/A1(M) Junction 44	3248	3446	3505	3511	3455	3508
A63 Pontefract La / M1 Junction 45	2487	4368	4153	2681	4331	2665
A63 Selby Rd / A6120 / M1 Junction 46	5191	5963	6791	6333	6663	6338
Thorpe Park/Jn46	1576	4463	4190	4395	4110	4335
A656 Ridge Rd / A642 Aberford Rd / B1217 Aberford Rd / M1 Junction 4	2799	4314	4549	4903	4305	4756
A656 Ridge Rd / Church La	1225	2189	1794	2245	2115	2242
A656 Ridge Rd / B6137 Longdike La	1471	2174	2148	2155	2253	2154
A642 Aberford Rd / Bar La, Garforth	1580	2012	2015	1981	1902	1947
A642 Aberford Rd / B6137 Main St / Barwick Rd, Garforth	1417	2105	1784	1794	1801	1784
Leeds Rd / Long La, Barwick	806	1692	892	1144	1177	1257
Leeds Rd / Main St, Scholes	876	1686	948	1166	1227	1275
B1217 Aberford Rd / Gt North Rd / Bunkers Hill, Aberford	897	1345	1283	1512	1102	1524
Main St / Cattle La, Aberford	654	1295	839	1021	1006	960

Note: Test 3 (junction 47 and bypass) is shown first in the DS options as it is the preferred option. The remaining three tests are shown in ascending order (Test 1, Test 2 and Test4).

Table A3 : AM peak key junctions (delay)

Am peak hour - delays (secs)	Scenario Sc1					
Key Junction		Do Min	Do Something			
	Base 2016	DM 2028	Jn 47 BY	Jn 47	Bypass	BLR J 47
A63 Selby Rd / A656 Ridge Rd	318	351	124	114	114	114
A63 Selby Rd / Ninelands La, Garforth	153	161	168	160	175	162
A63 Selby Rd / B6137 Leeds Rd, Garforth	31	42	78	33	80	33
A63 Selby Rd / B6137 Lidgett La, Garforth	212	204	166	202	166	202
A63 Selby Rd / A642 Wakefield Rd, Garforth	38	616	313	631	315	603
A64/A1(M) Junction 44	70	84	86	87	85	87
A63 Pontefract La / M1 Junction 45	153	217	217	233	219	233
A63 Selby Rd / A6120 / M1 Junction 46	315	1102	584	531	613	532
Thorpe Park/Jn46	79	223	266	238	271	242
A656 Ridge Rd / A642 Aberford Rd / B1217 Aberford Rd / M1 Junction 4	25	484	156	171	294	171
A656 Ridge Rd / Church La	56	745	334	447	576	431
A656 Ridge Rd / B6137 Longdike La	181	223	286	247	271	248
A642 Aberford Rd / Bar La, Garforth	29	452	64	170	89	131
A642 Aberford Rd / B6137 Main St / Barwick Rd, Garforth	167	781	181	362	184	322
Leeds Rd / Long La, Barwick	18	44	27	34	28	31
Leeds Rd / Main St, Scholes	18	32	26	32	27	37
B1217 Aberford Rd / Gt North Rd / Bunkers Hill, Aberford	39	41	40	51	39	51
Main St / Cattle La, Aberford	16	26	20	23	22	21

Table A4 : PM peak key junctions (delay)

Pm peak hour - delays (secs)	Scenario Sc1					
Key Junction		Do Min	Do Something			
	Base 2016	DM 2028	Jn 47 BY	Jn 47	Bypass	BLR J 47
A63 Selby Rd / A656 Ridge Rd	134	190	106	108	111	108
A63 Selby Rd / Ninelands La, Garforth	173	191	219	194	237	196
A63 Selby Rd / B6137 Leeds Rd, Garforth	37	43	83	52	84	51
A63 Selby Rd / B6137 Lidgett La, Garforth	239	294	170	322	172	319
A63 Selby Rd / A642 Wakefield Rd, Garforth	54	600	318	298	319	287
A64/A1(M) Junction 44	73	85	86	86	83	86
A63 Pontefract La / M1 Junction 45	134	156	276	1052	164	1058
A63 Selby Rd / A6120 / M1 Junction 46	434	1157	840	602	1182	601
Thorpe Park/Jn46	78	162	609	532	158	515
A656 Ridge Rd / A642 Aberford Rd / B1217 Aberford Rd / M1 Junction 4	40	351	119	142	289	141
A656 Ridge Rd / Church La	55	489	706	565	437	564
A656 Ridge Rd / B6137 Longdike La	181	241	222	231	241	231
A642 Aberford Rd / Bar La, Garforth	35	105	87	72	66	63
A642 Aberford Rd / B6137 Main St / Barwick Rd, Garforth	168	331	188	192	193	194
Leeds Rd / Long La, Barwick	18	40	19	22	23	23
Leeds Rd / Main St, Scholes	17	18	15	15	15	15
B1217 Aberford Rd / Gt North Rd / Bunkers Hill, Aberford	37	36	41	44	35	45
Main St / Cattle La, Aberford	16	23	18	19	18	18

Note: Test 3 (junction 47 and bypass) is shown first in the DS options as it is the preferred option. The remaining three tests are shown in ascending order (Test 1, Test 2 and Test4).

KEY LINKS

Table A5 : AM peak key links (flow)

Am peak hour	Scenario SC1						
			Do Min	Do Something			
Link		Base 2016	DM 2028	Jn 47 BY	Jn 47	Bypass	BLR J 47
A63 east of Garforth	WB	668	1076	1262	913	1358	926
A63 east of Garforth	EB	495	527	532	601	532	597
A63 Garforth (E of Lidgett La	WB	1139	1270	440	1226	486	1220
A63 Garforth (E of Lidgett La	EB	581	523	121	631	123	634
A63 west of Garforth	WB	1807	2130	2615	2100	2568	2084
A63 west of Garforth	EB	1035	961	1088	1199	1054	1204
A63 Garforth Southern Bypa	WB	n/a	n/a	1746	n/a	1749	n/a
A63 Garforth Southern Bypa	EB	n/a	n/a	554	n/a	556	n/a
A656 south of Jn 47	NB	846	922	1325	1431	906	1431
A656 south of Jn 47	SB	371	787	794	663	770	659
A656 south of A63	NB	579	839	920	983	796	992
A656 south of A63	SB	447	722	739	767	720	767
A642 south of Jn 47	NB	609	680	625	547	785	544
A642 south of Jn 47	SB	540	762	794	780	776	724
A642 south of A63	NB	548	836	768	821	768	822
A642 south of A63	SB	475	785	916	867	913	882
B1217 north of Jn 47	WB	584	1171	1223	1452	1122	1328
B1217 north of Jn 47	EB	230	436	474	555	441	524
Main St Aberford	NB	289	880	603	717	684	645
Main St Aberford	SB	234	225	241	238	239	210
Cattle La	WB	143	641	394	525	424	448
Cattle La	EB	115	203	185	176	182	147
Long La south of Barwick	NB	250	247	302	305	294	431
Long La south of Barwick	SB	197	263	187	225	166	231
Leeds Rd west of Barwick	WB	429	950	813	920	836	991
Leeds Rd west of Barwick	EB	199	346	327	331	304	331
Leeds Rd west of Scholes	WB	324	1026	904	1014	929	1085
Leeds Rd west of Scholes	EB	145	360	328	344	307	350
M1 Jn 47-48	WB	4106	4725	4585	4537	4690	4538
M1 Jn 47-48	EB	4021	3946	4190	4151	4049	4147
M1 Jn 46-47	WB	4835	6121	6106	6220	6079	6220
M1 Jn 46-47	EB	3854	4769	4683	4607	4730	4602
M1 Jn 45-46	WB	5975	6220	6220	6220	6220	6220
M1 Jn 45-46	EB	4611	5272	5278	5280	5282	5281
Total		**40681**	**50619**	**52283**	**51343**	**51837**	**51215**

Note: Test 3 (junction 47 and bypass) is shown first in the DS options as it is the preferred option. The remaining three tests are shown in ascending order (Test 1, Test 2 and Test4).

Table A6 : PM peak key links (flow)

Pm peak hour	Scenario SC1						
			Do Min	Do Something			
Link		Base 2016	DM 2028	Jn 47 BY	Jn 47	Bypass	BLR J 47
A63 east of Garforth	WB	611	582	759	652	500	656
A63 east of Garforth	EB	578	821	998	710	1162	695
A63 Garforth (E of Lidgett La	WB	775	755	185	830	179	828
A63 Garforth (E of Lidgett La	EB	1029	1135	320	1161	467	1155
A63 west of Garforth	WB	935	817	1198	1004	942	1009
A63 west of Garforth	EB	1723	1917	2398	1810	2580	1806
A63 Garforth Southern Bypa	WB	n/a	n/a	1058	n/a	790	n/a
A63 Garforth Southern Bypa	EB	n/a	n/a	1416	n/a	1492	n/a
A656 south of Jn 47	NB	354	991	432	844	988	840
A656 south of Jn 47	SB	843	1098	1255	1320	1016	1323
A656 south of A63	NB	458	735	401	690	609	690
A656 south of A63	SB	550	718	731	773	689	781
A642 south of Jn 47	NB	619	993	967	927	952	918
A642 south of Jn 47	SB	580	688	772	681	734	662
A642 south of A63	NB	431	772	530	693	627	687
A642 south of A63	SB	706	1123	1124	907	1143	912
B1217 north of Jn 47	WB	260	662	676	700	648	566
B1217 north of Jn 47	EB	488	673	1125	1200	716	1144
Main St Aberford	NB	251	260	306	293	258	288
Main St Aberford	SB	238	896	360	554	597	500
Cattle La	WB	124	134	143	140	133	133
Cattle La	EB	117	731	203	400	445	345
Long La south of Barwick	NB	249	165	140	135	134	218
Long La south of Barwick	SB	240	491	237	304	294	396
Leeds Rd west of Barwick	WB	292	258	238	236	226	311
Leeds Rd west of Barwick	EB	362	1292	509	771	812	808
Leeds Rd west of Scholes	WB	246	301	287	283	272	360
Leeds Rd west of Scholes	EB	296	1277	587	802	867	836
M1 Jn 47-48	WB	3573	3885	3852	3886	3866	3892
M1 Jn 47-48	EB	3750	4041	3699	3651	3917	3657
M1 Jn 46-47	WB	3525	4621	4271	4693	4560	4617
M1 Jn 46-47	EB	4380	4740	5194	5287	4666	5273
M1 Jn 45-46	WB	4482	4966	4873	5349	4907	5342
M1 Jn 45-46	EB	5449	5344	5554	5404	5408	5408
Total		**38515**	**47882**	**46800**	**47089**	**47596**	**47054**

Note: Test 3 (junction 47 and bypass) is shown first in the DS options as it is the preferred option. The remaining three tests are shown in ascending order (Test 1, Test 2 and Test4).

Table A7 : JOURNEY TIMES (AM and PM)

Scenario Sc1						
Am peak hour - journey times (secs)		Do Min	Do Something			
Link	Base 2016	DM 2028	Jn 47 BY	Jn 47	Bypass	BLR J 47
A63 westbound	547	1030	733	933	754	916
A63 eastbound	459	517	479	510	476	511
	Change from Base 2016					
A63 westbound		483	186	386	207	369
A63 eastbound		58	20	51	17	52
	Change from DM 2028					
A63 westbound			-297	-97	-276	-114
A63 eastbound			-38	-7	-41	-6
Pm peak hour - journey times (secs)		Do Min	Do Something			
Link	Base 2016	DM 2028	Jn 47 BY	Jn 47	Bypass	BLR J 47
A63 westbound	497	540	465	470	424	470
A63 eastbound	582	949	563	741	657	729
	Change from Base 2016					
A63 westbound		43	-32	-27	-73	-27
A63 eastbound		367	-19	159	75	147
	Change from DM 2028					
A63 westbound			-75	-70	-116	-70
A63 eastbound			-386	-208	-292	-220

Note: Test 3 (junction 47 and bypass) is shown first in the DS options as it is the preferred option. The remaining three tests are shown in ascending order (Test 1, Test 2 and Test4).

APPENDIX 3 – LIST OF MODEL TESTS USED FOR THIS REPORT

Do Minimum

SC1_DMv2_2028

Do Something

Test 1 – Jn 47 impt

SC1_dsv3_J47_2028

Test 2 – Garforth southern Bypass

SC1_dsv4_BY_2028

Test 3 – Jn 47 impt and Garforth southern bypass

SC1_dsv4_J47BY_2028

Test 4 – Jn 47 impt and Barwick Link Road

SC1_dsv3_BLRJ47_2028