TECHNICAL NOTE 11

DATE:	08 January 2019	**CONFIDENTIALITY:**	Confidential
SUBJECT:	Comparison of flows on select links from 2014 Base Model and 2032 DS Model		
PROJECT:	70018699	**AUTHOR:**	Prashant Biradar
CHECKED:	Tom Randall	**APPROVED:**	Tom Randall

1 INTRODUCTION

This section of the note outlines the procedure carried out to compare the flows on select links between the 2014 Base model and 2032 Do Something model used for assessing the impact of the proposed local plan growth.

There are a total of 335 zones in the 2014 base model and 336 zones in the 2032 DS model. These zones were distributed into 14 sectors initially and later aggregated into four sectors as described in **Table 1**.

Table 1 - Sector Description

Sector Number	Area	Sectors Aggregation	Sector Name
1	Northern Halifax	1	Calderdale
2	*Halifax Town Centre*		
3	*Sowerby Bridge*		
4	*South Eastern Halifax*		
5	*West Halifax*		
6	*Elland*		
7	*Brighouse*		
8	*Hebden Bridge & Todmorden*		
9	*Bradford*	*2*	*Bradford*
10	*Kirklees*	*3*	*Kirklees*
11	*West of England, Wales and Scotland*	*4*	*Elsewhere*
12	*East of England*		
13	*Wakefield*		
14	*Leeds*		

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On select links into the Kirklees area, Bradford area and on junctions 24, 25 and 26 of M62, the number of trips originating from Calderdale, Bradford, Kirklees and elsewhere were identified. Select link analysis was performed on those links in both the 2014 base model and 2032 DS model, extracting demand flows.

The overall predicted change in traffic will be shown for each location, along with the contributions from Calderdale (related to the local plan) and from other areas (based on NTEM background growth). Additional traffic from Calderdale greater than 60 PCU (1 PCU per minute) is highlighted in yellow.

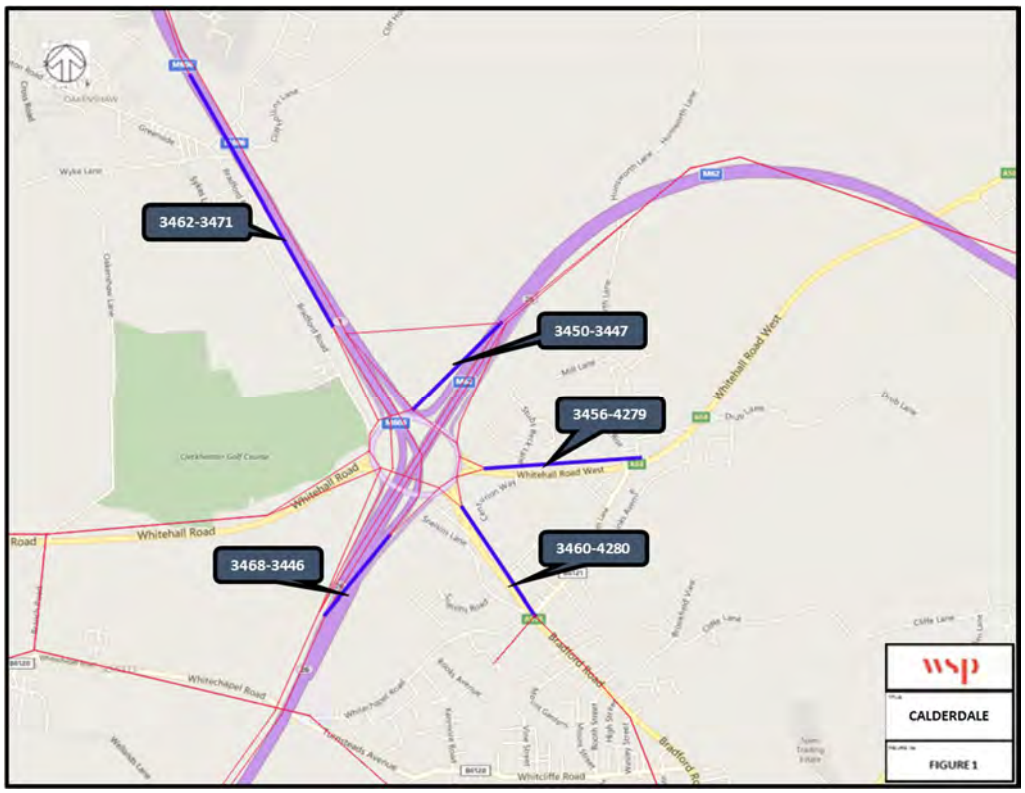
2 RESULTS FROM SELECT LINK ANALYSIS

2.1 Kirklees (Links into Kirklees)

CHAIN BAR ROUNDABOUT (A58)

Figure 1 shows the plan of Chain Bar Roundabout. This point of the network links Calderdale, via the A58, to the Motorway network, Bradford and Kirklees.

Figure 1 - Chain Bar Roundabout



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2.1.1 Link 3456-4279 – Whitehall Road West

Table 2 shows the flows on the above link in AM and PM period. Overall, the traffic has marginally decreased in the AM peak while in the PM peak the traffic has increased by around 50 PCU. The traffic growth on this link is shown to be from areas other than Calderdale.

Table 2 - Flows on link 3456-4279 – Whitehall Road West

Sl. No	Sectors	AM			PM		
		2014 Base	2032 DS	Growth	2014 Base	2032 DS	Growth
1	*Calderdale*	*56*	*50*	*-6*	*40*	*37*	*-3*
2	*Bradford*	*28*	*25*	*-3*	*21*	*25*	*3*
3	*Kirklees*	*42*	*35*	*-7*	*22*	*21*	*-1*
4	*Elsewhere*	*138*	*143*	*5*	*100*	*148*	*48*
Total		**264**	**254**	**-10**	**183**	**231**	**48**

2.1.2 Link 3460-4280 – Bradford Road (A638)

Table 3 shows the flows on Bradford Road for the AM and PM hour. In the AM and PM peaks the overall traffic has increased by 189 PCU (24%) and 72 PCU (10%) respectively. The major contributor is shown to be traffic originating in the Calderdale area.

Table 3 - Flows on link 3460-4280 (Bradford Road, A638)

Sl. No	Sectors	AM			PM		
		2014 Base	2032 DS	Growth	2014 Base	2032 DS	Growth
1	*Calderdale*	*146*	*387*	*241*	*252*	*347*	*95*
2	*Bradford*	*324*	*168*	*-155*	*187*	*160*	*-28*
3	*Kirklees*	*80*	*123*	*43*	*72*	*71*	*-1*
4	*Elsewhere*	*249*	*310*	*60*	*243*	*248*	*5*
Total		**798**	**988**	**189**	**754**	**826**	**72**

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COOPER BRIDGE(A644)

Figure 2 shows the plan of M62 junction 25 together with Cooper Bridge. This is a key area of growth in Calderdale and Kirklees.

Figure 2 - M62 Junction 25

2.1.3 Link 4092-4093 – Wakefield Road

Table 4 shows the flows on the above link in AM and PM period. Overall, an increase of 146 PCU (27%) is seen in the AM peak and 485 PCU (96%) in the PM peak is observed. Although the Calderdale area is the major contributor in the AM peak, in the PM peak there is significant growth shown from areas outside Calderdale and Bradford.

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Table 4 - Flows on link 4092-4093 (Wakefield Road, A644)

Sl. No	Sectors	AM			PM		
		2014 Base	2032 DS	Growth	2014 Base	2032 DS	Growth
1	*Calderdale*	*59*	*196*	*137*	*136*	*321*	*185*
2	*Bradford*	*182*	*201*	*19*	*102*	*167*	*65*
3	*Kirklees*	*7*	*0*	*-7*	*37*	*38*	*1*
4	*Elsewhere*	*295*	*291*	*-4*	*229*	*462*	*233*
Total		**544**	**689**	**146**	**504**	**989**	**485**

BRADLEY ROUNDABOUT(A641)

Figure 3 shows the plan of Bradley Roundabout and link used for the SLA.

Figure 3 - Bradley Roundabout

2.1.4 Link 3132-3133 (Huddersfield Road)

Table 5 shows the flows on the above link in the AM and PM peaks. Traffic has increased by 137 PCU (13%) and 73 PCU (7%) in the AM and PM peaks respectively. As expected, all growth is from the Calderdale area. This Calderdale related traffic growth is balanced by predicted reductions from Bradford and elsewhere.

Table 5- Flows on link 3132-3133 (Huddersfield Road A641)

Sl. No	Sectors	AM			PM		
		2014 Base	2032 DS	Growth	2014 Base	2032 DS	Growth
1	*Calderdale*	*832*	*1112*	*281*	*886*	*997*	*111*
2	*Bradford*	*173*	*49*	*-123*	*130*	*99*	*-30*
3	*Kirklees*	*0*	*0*	*0*	*0*	*0*	*0*
4	*Elsewhere*	*26*	*6*	*-20*	*9*	*1*	*-8*
Total		**1031**	**1167**	**137**	**1025**	**1098**	**73**

AINLEY TOP (A629)

Figure 4 shows the plan of M62 junction 24 including the Ainley Top roundabout.

Figure 4 - M62 Junction 24

2.1.5 Link 3302-3304 – A629 north of Ainley Top

Table 6 describes the flows on the above link in AM and PM peaks. It should be noted that this link contains traffic destined for both local roads in Kirklees and the M62. Overall, traffic has increased substantially by 791 PCU (77%) in the AM, with the majority of this being from Calderdale. In the PM period, a lower increase of 117 PCU is observed, again with the majority of this growth coming from Calderdale.

Table 6- Flows on link 3302-3304 (Ainley Top, A629)

Sl. No	Sectors	AM			PM		
		2014 Base	2032 DS	Growth	2014 Base	2032 DS	Growth
1	*Calderdale*	*985*	*1648*	*663*	*1069*	*1176*	*107*
2	*Bradford*	*39*	*168*	*129*	*25*	*35*	*9*
3	*Kirklees*	*0*	*0*	*0*	*0*	*0*	*0*
4	*Elsewhere*	*0*	*0*	*0*	*0*	*0*	*0*
Total		**1024**	**1815**	**791**	**1094**	**1211**	**117**

2.2 Bradford (Links into Bradford)

A58 (CHAIN BAR)

2.2.1 Link 3462-3471 (M606)

Table 7 shows the flows on the M606 toward Bradford (as shown in **Figure 1**). Overall, considering the nature of the road, traffic has increased marginally by 5% and 9% in the AM and PM peaks respectively. The majority of traffic growth is originating elsewhere.

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Table 7- Flows on link 3462-3471 (M606)

Sl. No	Sectors	AM			PM		
		2014 Base	2032 DS	Growth	2014 Base	2032 DS	Growth
1	*Calderdale*	*412*	*450*	*38*	*400*	*376*	*-24*
2	*Bradford*	*0*	*0*	*0*	*0*	*0*	*0*
3	*Kirklees*	*487*	*494*	*7*	*287*	*273*	*-14*
4	*Elsewhere*	*1874*	*1966*	*92*	*2323*	*2636*	*313*
Total		**2773**	**2910**	**137**	**3010**	**3285**	**275**

A641 (WYKE)

2.2.2 Link 3933-3475 (Huddersfield Road)

Table 8 shows the flows on the above link (as shown in **Figure 5**) in the AM and PM peak hours. Overall, traffic has increased by 200 PCU (24%) and 35 PCU (6%) in the AM and PM peaks respectively with the major contribution being from the Calderdale area.

Figure 5 - A641(Wyke)

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Table 8 - Flows on link 3933-3475 (Huddersfield Road)

Sl. No	Sectors	AM			PM		
		2014 Base	2032 DS	Growth	2014 Base	2032 DS	Growth
1	*Calderdale*	*829*	*1016*	*188*	*519*	*557*	*38*
2	*Bradford*	*0*	*0*	*0*	*0*	*0*	*0*
3	*Kirklees*	*15*	*26*	*11*	*34*	*31*	*-4*
4	*Elsewhere*	*2*	*3*	*1*	*5*	*6*	*1*
Total		**845**	**1045**	**200**	**559**	**594**	**35**

A6036

Figure 6 shows the plan of links examined at Queensbury.

Figure 6 - Queensbury

2.2.3 Link 3914-3235 (A6036 Halifax Road)

Table 9 shows the flows on the above link in the AM and PM peak. Overall, traffic has reduced by 159 PCU (16%) in the AM peak, while in the PM peak a 138 PCU (18%) increase is observed. In the AM period, the major contributor to the reduction is from the Calderdale area. In the PM period, the growth is spread evenly between the areas examined.

Table 9 - flows on link 3914-3235 (A6036 east of Stone Chair roundabout)

Sl. No	Sectors	AM			PM		
		2014 Base	2032 DS	Growth	2014 Base	2032 DS	Growth
1	*Calderdale*	*710*	*584*	*-126*	*583*	*615*	*31*
2	*Bradford*	*239*	*188*	*-51*	*144*	*186*	*42*
3	*Kirklees*	*25*	*43*	*18*	*17*	*60*	*43*
4	*Elsewhere*	*4*	*5*	*1*	*23*	*45*	*22*
Total		**979**	**821**	**-159**	**768**	**906**	**138**

2.2.4 Link 3227-3229 (Brighouse Road)

Table 10 describes the flows on the above link (as shown in **Figure 6**) in AM and PM peaks. Overall, traffic has reduced by 115 PCU (16%) in the AM, while in the PM a 196 PCU increase (37%) is observed. The growth shown in the PM period, is split roughly 50/50 between Calderdale and areas outside Calderdale, Bradford and Kirklees.

Table 10 - flows on link 3227-3229 (Brighouse Road)

Sl. No	Sectors	AM			PM		
		2014 Base	2032 DS	Growth	2014 Base	2032 DS	Growth
1	*Calderdale*	*373*	*269*	*-104*	*303*	*399*	*96*
2	*Bradford*	*3*	*3*	*0*	*5*	*36*	*31*
3	*Kirklees*	*222*	*214*	*-8*	*121*	*73*	*-49*
4	*Elsewhere*	*88*	*85*	*-3*	*94*	*212*	*118*
Total		**696**	**570**	**-115**	**524**	**720**	**196**

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2.2.5 Link 1453-1167 (Bradford Road)

Table 11 shows the flows on the above link (as shown in **Figure 6**) in the AM and PM peak. Overall, traffic has changed marginally in both peak hours on this link.

Table 11 - Flows on link 1453-1167 (Bradford Road)

Sl. No	Sectors	AM			PM		
		2014 Base	2032 DS	Growth	2014 Base	2032 DS	Growth
1	*Calderdale*	*539*	*513*	*-26*	*585*	*560*	*-25*
2	*Bradford*	*0*	*0*	*0*	*0*	*0*	*0*
3	*Kirklees*	*2*	*2*	*-1*	*1*	*31*	*30*
4	*Elsewhere*	*6*	*6*	*0*	*5*	*18*	*13*
Total		**547**	**521**	**-26**	**591**	**610**	**19**

A629

Figure 7 - A629

2.2.6 Link 1246-4016 (A629 Keighley Road)

Table 12 shows the flows on the above link (as shown in **Figure 7**) in the AM and PM peaks. In the AM and PM peaks the traffic has increased by 22 PCU (6%) and 140 PCU (27%) respectively. The majority of traffic growth is from the Kirklees area in the AM period. While in the PM period the Calderdale and Kirklees areas each contribute around half of the total growth predicted.

Table 12 - Flows on link 1246-4016 (Keighley Road)

Sl. No	Sectors	AM			PM		
		2014 Base	2032 DS	Growth	2014 Base	2032 DS	Growth
1	*Calderdale*	*336*	*333*	*-3*	*442*	*505*	*63*
2	*Bradford*	*0*	*0*	*0*	*0*	*0*	*0*
3	*Kirklees*	*18*	*42*	*24*	*22*	*88*	*67*
4	*Elsewhere*	*15*	*16*	*1*	*58*	*68*	*11*
Total		**369**	**391**	**22**	**522**	**662**	**140**

2.3 M62

JUNCTION 26 (CHAIN BAR)

2.3.1 Link 3450-3447 (eastbound on slip)Table 13 shows the flows on the above link (as shown in **Figure 1**) in the AM and PM peaks. Overall, traffic has increased substantially by 504 PCU in the AM and 382 PCU in the PM. Traffic from the Calderdale area makes up 56% of the growth shown in both peaks.

Table 13 - flows on link 3450-3447 (J26 eastbound on-slip)

Sl. No	Sectors	AM			PM		
		2014 Base	2032 DS	Growth	2014 Base	2032 DS	Growth
1	*Calderdale*	*507*	*791*	*284*	*372*	*585*	*213*
2	*Bradford*	*61*	*137*	*75*	*78*	*111*	*32*
3	*Kirklees*	*0*	*0*	*0*	*0*	*0*	*0*
4	*Elsewhere*	*102*	*247*	*145*	*87*	*225*	*137*
Total		**671**	**1175**	**504**	**538**	**921**	**382**

2.3.2 Link 3468-3446 (westbound on-slip)

Table 14 shows the flows on the above link (as shown in **Figure 1**) in the AM and PM peaks. Overall, traffic has increased by 258 PCU (14%) in the AM, while in the PM period a similar change is seen with an increase of 282 PCU (8%) growth. The contribution from Calderdale is minimal at this location.

Table 14 - Flows on link 3468-3446 (J26 westbound on-slip)

Sl. No	Sectors	AM			PM		
		2014 Base	2032 DS	Growth	2014 Base	2032 DS	Growth
1	*Calderdale*	*14*	*5*	*-10*	*26*	*53*	*27*
2	*Bradford*	*1018*	*1100*	*82*	*2954*	*3047*	*93*
3	*Kirklees*	*0*	*0*	*0*	*0*	*0*	*0*
4	*Elsewhere*	*791*	*977*	*186*	*326*	*489*	*162*
Total		**1824**	**2081**	**258**	**3307**	**3588**	**282**

JUNCTION 25 (COOPER BRIDGE)

2.3.3 Link 3427-3423 (eastbound on slip)

Table 15 shows the flows on the above link (as shown in **Figure 2**) in AM and PM peaks. Overall traffic has increased by 417 PCU (36%) in the AM peak and 240 PCU (22%) in the PM peak. Traffic growth on this link is dominated by increases from Calderdale, most significantly an increase of 161% in the AM peak. The net impact in the AM is reduced due to a significant reduction of about 38% for traffic from the Kirklees.

Table 15 - Flows on link 3427-3423 (J25 eastbound on-slip)

Sl. No	Sectors	AM			PM		
		2014 Base	2032 DS	Growth	2014 Base	2032 DS	Growth
1	*Calderdale*	*449*	*1170*	*721*	*633*	*859*	*226*
2	*Bradford*	*0*	*3*	*3*	*0*	*0*	*0*
3	*Kirklees*	*625*	*388*	*-237*	*414*	*438*	*24*
4	*Elsewhere*	*76*	*6*	*-70*	*60*	*49*	*-10*

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Sl. No	Sectors	AM			PM		
		2014 Base	2032 DS	Growth	2014 Base	2032 DS	Growth
Total		**1149**	**1567**	**417**	**1107**	**1346**	**240**

2.3.4 Link 3428-3414 (westbound on slip)

Table 16 shows the flows on the above link (as shown in **Figure 2** in AM and PM peaks. Overall traffic has increased by 69 PCU in the AM period with almost of the growth coming from Calderdale area. While in the PM period a 70 PCU reduction of traffic is observed. This reduction is mainly from other areas and Calderdale area.

It should be noted that the base flows on this link are not felt to be representative due to the nature of the Calderdale model.

Table 16 - flows on link 3428-3414 (J25 westbound on-slip)

Sl. No	Sectors	AM			PM		
		2014 Base	2032 DS	Growth	2014 Base	2032 DS	Growth
1	*Calderdale*	*63*	*129*	*66*	*137*	*118*	*-19*
2	*Bradford*	*0*	*0*	*0*	*1*	*3*	*2*
3	*Kirklees*	*0*	*0*	*0*	*16*	*4*	*-12*
4	*Elsewhere*	*131*	*133*	*2*	*68*	*27*	*-41*
Total		**194**	**262**	**69**	**222**	**152**	**-70**

JUNCTION 24 (AINLEY TOP)

2.3.5 Link 3410-3401 (eastbound on slip)

Table 17 shows the flows on the above link (as shown in **Figure 4** in AM and PM peaks. In the AM and PM peaks the traffic has increased by 576 PCU (52%) and 312 PCU (34%) respectively. Growth in the AM period is mainly due to contributions of about 50% each from Calderdale and Kirklees area. In the PM period the Calderdale area contributes around 2/3s of the growth in traffic.

Table 17 - Flows on link 3410-3401 (J24 eastbound on slip)

Sl. No	Sectors	AM			PM		
		2014 Base	2032 DS	Growth	2014 Base	2032 DS	Growth
1	Calderdale	507	770	262	449	634	185
2	Bradford	0	2	2	0	0	0
3	Kirklees	609	922	312	469	596	127
4	Elsewhere	1	0	-1	0	0	0
Total		**1118**	**1694**	**576**	**918**	**1230**	**312**

2.3.6 Link 3321-3398 (westbound on slip)

Table 18 shows the flows on the above link (as shown in **Figure 4**) in AM and PM peaks. Overall traffic has increased substantially by 426 PCU in the AM peak with the growth being split roughly 50/50 between Kirklees and Calderdale. In the PM period an increase of 105 PCU is shown, again split fairly equally between Calderdale and Kirklees.

Table 18 - Flows on link 3321-3398 (J24 westbound on-slip)

Sl. No	Sectors	AM			PM		
		2014 Base	2032 DS	Growth	2014 Base	2032 DS	Growth
1	Calderdale	159	389	229	126	192	65
2	Bradford	12	17	6	0	0	0
3	Kirklees	38	229*	191	40	81	40
4	Elsewhere	0	0	0	0	0	0
Total		**209**	**635**	**426**	**167**	**272**	**105**

JUNCTION 22-23

A further select link has been carried out on the mainline of the M62 west of Junction 23 (New Hey Road). This captures traffic exiting/entering the motorway at junction 23 as well as other traffic entering and exiting at Junctions 24, 25 and 26 already analysed above. The change in modelled traffic between 2014 and 2032 is shown in **Table 19**.

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Table 19 – Flow change (PCU) between M62 J22 and J23, 2014 to 2032

2014-2032 change	AM Westbound		AM Eastbound		Inter Peak Westbound		Inter Peak Eastbound		PM Westbound		PM Eastbound	
	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination
All	853	853	730	730	799	799	715	715	699	700	976	976
Calderdale	289	1	92	151	71	2	0	90	125	25	0	432

It can be seen that growth in traffic of between 700 and 976 pcus is shown by direction for the modelled hours. The largest contribution from Calderdale is seen eastbound in the PM peak hour, with an increase of over 400 PCU, making up 44% of the total traffic growth.

Table 20 shows the 2032 total flows and proportion related to Calderdale.

Table 20 - 2032 Flows (PCU) between M62 J22 and J23, 2032

2032	AM Westbound		AM Eastbound		Inter Peak Westbound		Inter Peak Eastbound		PM Westbound		PM Eastbound	
	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination	Origin	Destination
All	4571	4571	4746	4746	4678	4678	4352	4352	4631	4631	4977	4977
Calderdale	526	1	92	403	254	2	0	600	365	27	0	692
Calderdale %	12%	0%	2%	8%	5%	0%	0%	14%	8%	1%	0%	14%

The Calderdale modelled traffic is shown to be highest in the eastbound direction in the PM peak hour with almost 700 PCU, making up 14% of the total traffic.

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3 SUMMARY

3.1 Kirklees (Links into Kirklees)

From the links into Kirklees that have been examined, the following has been shown by the select link exercise:

- At Chain Bar the major impacts from Calderdale traffic are seen on Bradford Road in the AM peak with an increase of 24% in total flow.
- At Cooper Bridge the AM peak growth is primarily from Calderdale while in the PM peak less than 50% of the growth is from Calderdale.
- At Bradley Roundabout the Calderdale growth is significant, however the net increase is lower due to reductions in traffic from Bradford and elsewhere.
- At Ainley Top the significant growth is seen in the AM peak only, with the majority coming from Calderdale. However, a significant proportion will be accessing the M62 and not using local roads in Kirklees.

3.2 Bradford (Links into Bradford)

From the links into Bradford that have been examined, the following has been shown by the select link exercise:

- At Chain Bar, on the M606, there is a minimal impact related to Calderdale traffic.
- On the A641 the AM peak shows significant growth related to Calderdale.
- In Queensbury the impact from Calderdale traffic is only shown to be significant on Brighouse Road, although growth from other areas is of a similar scale at this location.
- On the A629, Calderdale growth is only significant in the PM, but is of a similar level to that originating in Kirklees.

3.3 M62 impacts

From the links onto the M62 that have been examined, the following has been shown by the select link exercise:

- At Chain Bar, the eastbound slip road shows 56% of total growth originating from Calderdale. The westbound on slip shows no impact from Calderdale.
- At junction 25 the eastbound slip is most affected by Calderdale traffic, however the net impact is lower due to reductions in traffic from elsewhere.
- At Ainley Top, the growth shown on both slip roads is shared (reasonably equally) between Kirklees and Calderdale originating traffic.
- Traffic increases at J22-23 show a maximum contribution to total growth between 2014 and 2032 of 44% from Calderdale. The total contribution from Calderdale to the modelled traffic flow in 2032 is a maximum of 14%.

TECHNICAL NOTE 11

DATE:	08 January 2019	**CONFIDENTIALITY:**	Confidential
SUBJECT:	Comparison of flows on select links from 2014 Base Model and 2032 DS Model		
PROJECT:	70018699	**AUTHOR:**	Prashant Biradar
CHECKED:	Tom Randall	**APPROVED:**	Tom Randall

Conclusions

This note has shown the predicted growth in traffic on key routes which interact with the neighbouring authorities to Calderdale and the M62. The increases shown should be viewed in the context of the spare capacity shown by the model and the more detailed knowledge of the local authorities and Highways England regarding their networks. It should also be noted that many of the links examined are on the edge of the Calderdale model simulation network and therefore will be less reliable at replicating base levels of traffic.