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CALDERDALE LOCAL PLAN TRANSPORT EVIDENCE BASE

TECHNICAL NOTE 4: ASSESSMENT OF CUMULATIVE IMPACT

CONFIDENTIAL

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WSP | PARSONS BRINCKERHOFF

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Calderdale Metropolitan Borough Council

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WSP | Parsons Brinckerhoff
Three White Rose Office Park
Millshaw Park Lane
Leeds
LS11 0DL

Tel: +44 (0) 113 395 6200
www.wsp-pb.com

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1 INTRODUCTION

1.1 PROJECT BACKGROUND

1.1.1 WSP | Parsons Brinckerhoff have been commissioned by Calderdale Council (CMBC) to prepare an evidence base related to transport in order to support the decisions made in the Local Plan allocations of development sites around the authority.

1.1.2 Previous to this report, earlier reported stages have been:

- Technical Note 1: Future Network Baseline;
- Technical Note 2: Implications of Settlement Growth; and
- Technical Note 3: Preferred Spatial Strategy.

1.1.3 Technical Note 1 set out a 'snapshot' of future network operation prior to the application of growth to be allocated under the Local Plan but following realisation of committed developments, windfalls and planned major transport schemes.

1.1.4 Technical Note 2 looked at the relative macro-level implications likely to result from development in each settlement. The purpose of the note was to inform a preferred distribution of growth across settlements within Calderdale.

1.1.5 Following the submission of these documents to CMBC, alongside a range of other non-transport considerations, an initial decision was made on the likely distribution of development within Calderdale. Technical Note 3 shows the supporting transport evidence for this preferred development distribution.

1.2 THIS DOCUMENT

1.2.1 This technical note describes two stages relating to the traffic modelling of the cumulative impact of the proposed Local Plan site allocations. These have been named 5a and 5b following the stages initially set out for the work on establishing the evidence base.

1.2.2 Stage 5a outlines an indicative traffic modelling exercise carried out using the best available information on the likely make-up of the Local Plan at the time (August 2016). The levels of settlement growth agreed by Calderdale were used alongside historic site data to give outputs, which were subsequently used to inform the more detailed decisions on individual site allocations.

1.2.3 This initial model run gave an early view as to the cumulative impact of development through the district and has been used to inform the decision making process regarding the final proposals for the makeup of the plan.

1.2.4 Stage 5b defines a subsequent modelling exercise carried out with the preferred site information most likely to be included within the final draft of the Local Plan (as received from CMBC in December 2016). This describes the levels of residential and employment developments used and the associated network congestion predicted by the model.

1.2.5 This further model run gives an overall picture of impacts across the Calderdale network.

1.2.6 Stage 5c, which includes the modelling of possible residential sites in Hipperholme (excluded from the stage 5b model), is detailed in Technical Note 5: Hipperholme Sensitivity Test. This additional piece of work has been necessary as a result of the decision by CMBC to exclude all sites within Hipperholme from the preferred allocations; it explores the implications of a limited relaxation of this decision.

2 METHODOLOGY – STAGE 5A (INDICATIVE MODELLING)

2.1 INTRODUCTION

2.1.1 The following section outlines the initial modelling exercise undertaken on an interim set of information regarding the likely Local Plan site allocations, as at August 2016. The findings from this initial scenario test were subsequently used to inform the final preferred site allocations that have since been developed.

2.2 SPATIAL DISTRIBUTION

2.2.1 The initial option for distribution of housing growth agreed by Calderdale Council officers in July 2016 is set out in Table 1 below. This was used to inform the modelling of residential growth and subsequent changes in traffic. It should be noted that this has no formal status.

Table 1 Preferred spatial distribution of housing growth (2012-2032)

Local Plan Area	Potential Distribution Of Dwellings	% Dwellings	Need for new allocations (dwellings following discounting of built sites, permissions and likely windfall)
Brighouse	6,909	39.14	6,397
Elland	1,800	10.20	1,354
Halifax	6,601	37.40	5,026
Hebden Bridge	252	1.43	107
Mytholmroyd / Luddenden	282	1.60	189
Northowram / Shelf	636	3.60	515
Ryburn Valley	71	0.40	-64
Sowerby Bridge	600	3.40	236
Todmorden	500	2.83	74
Calderdale	**17,651**	**100**	**13,834**

2.2.2 As the base year of the Calderdale Strategic Transport Model is 2014, the modelled Figures were adjusted to account for the actual housing delivery rates between the Local Plan base year of 2012 and 2014. These modelled totals (a reduction of around 1,000 dwellings overall) by settlement are shown in Table 2.

Table 2 Modelled totals for distribution of housing growth

Local Plan area	Potential Distribution Of Dwellings	Modelled Distribution of dwellings 2014 to 2032
Brighouse	6,909	6,736
Elland	1,800	1,680
Halifax	6,601	6,175
Hebden Bridge	252	228
Mytholmroyd / Luddenden	282	235
Northowram / Shelf	636	609
Ryburn Valley	71	40
Sowerby Bridge	600	513
Todmorden	500	432
Calderdale	**17,651**	**16,648**

2.2.3 For the distribution of employment growth throughout Calderdale, additional work was needed from the updated Employment Land Review before the final set of sites was available. Therefore this initial modelling exercise was based upon the settlement distribution as outlined in the now abandoned Core Strategy preferred options from 2012. This is shown in Table 3.

Table 3 Core Strategy Preferred Options Employment distribution

Local Plan Area	Preferred Options 2012 B1 Uses (sqm)	Preferred Options 2012 B2-B8 Uses (sqm)
Brighouse	35,000 (35.5%)	40,000 (20.1%)
Elland	10,000 (10.2%)	50,100 (25.2%)
Halifax	45,100 (45.8%)	85,000 (42.8%)
Hebden Bridge	1,000 (1%)	500 (0.3%)
Mytholmroyd /Luddenden	100 (0.1%)	10,000 (5%)
Northowram /Shelf	100 (0.1%)	0 (0%)
Ryburn Valley	200 (0.2%)	1,000 (0.5%)
Sowerby Bridge	1,000 (1%)	9,000 (4.5%)
Todmorden	2,000 (2%)	3,000 (1.5%)
Calderdale Total	**98,500**	**198,600**

2.3 SPECIFIC DEVELOPMENTS

2.3.1 As well as the settlement level distribution set out above, it has been necessary to model individual sites at an appropriate level of detail in order to capture the geographical distribution of growth more accurately. At this stage of the Local Plan process, the preferred sites were not yet known. Therefore, alternative sources of data were needed to represent the specific growth in housing and employment within each settlement.

2.3.2 For residential developments, a list of sites, originating from the Strategic Housing Land Availability Assessment (SHLAA), was used as a starting point. This was added to with a set of larger “urban extension” sites for Halifax and Brighouse as it was assumed that these sites, in some form, would be needed to make up the growth required in each of these settlements.

2.3.3 For employment sites, CMBC officers provided a list of employment sites with a red, amber, green rating for their likelihood of coming forward as part of the Local Plan.

2.3.4 For housing, the site sizes were adjusted so that each settlement met the targets set out in Table 2, the exception being Halifax and Brighouse, where the adjustment in size was made to the urban extension sites only as the number of units associated with these was assumed to be more speculative in nature. Sites with a capacity of less than 10 units were not modelled explicitly as these effectively constitute background growth for modelling purposes, the sites being too small to register significant impacts on the modelled network in their own right. The starting point and adjustments made in each settlement are set out in Table 4.

Table 4 Amendments made to size of developments in uncertainty log

SETTLEMENT	UNCERTAINTY LOG TOTAL CAPACITY	POSSIBLE URBAN EXTENSION SITES CAPACITY	FACTOR FOR UNCERTAINTY LOG/URBAN EXTENSIONS
Brighouse	3,882	4,112	0.69
Elland	2,312	-	0.73
Halifax	4,605	2,438	0.64
Hebden Bridge	305	-	0.75
Mytholmroyd / Luddenden	92	-	2.55
Sowerby Bridge	2,392	-	0.21
Todmorden	1,688	-	0.26

2.3.5 It can be seen that in most settlements there was a need to reduce the size of the modelled developments, in order to meet the targets set out in Table 2, given the capacity available from the possible sites and urban extensions.

2.3.6 For employment sites the most certain (RAG - green) sites were used as supplied by CMBC in order to calculate the number of jobs and subsequent trips. From this exercise the total site areas of the combined green sites came in below those stated in the 2012 preferred options, however the distribution between settlements is broadly similar. The site sizes are shown in Table 5 below.

Table 5 Modelled employment sites settlement distribution

SETTLEMENT	B1 SQM MODELLED	B2/B8 SQM MODELLED	B1 SQM PREFERRED OPTIONS TARGET (SQM)	B2/B8 PREFERRED OPTIONS TARGET (SQM)
Brighouse	37,890	71,400	35,000	40,000
Elland	2,220	48,210	10,000	50,100
Halifax	33,480	21,070	45,100	85,000
Hebden Bridge	-	-	1,000	500
Mytholmroyd/Luddenden	-	-	100	10,000
Northowram / Shelf	2,040	-	200	1,000
Ryburn Valle	-	6,440	200	9,000
Sowerby Bridge	-	-	1,000	9,000
Todmorden	-	2,135	2,000	3,000
Total	**75,630**	**149,255**	**94,500**	**198,600**

2.3.7 The additional growth in employment sites beyond that shown in Table 5, expected as part of the local plan, is modelled as part of the overall growth as described in section 2.4.

2.3.8 The specific developments inputted into the model have been informed from the best available data at the time on the likely spatial distribution of development. A large majority of sites from previous housing and employment land studies are assumed to carry forward to the Local Plan as they are already established and the urban extensions have also been modelled explicitly as they are likely to form a significant element of the growth.

2.4 OVERALL CAP ON GROWTH

2.4.1 In order to model the growth of traffic related to smaller and unallocated sites, beyond those modelled implicitly, a suitable overall cap on development growth is needed.

2.4.2 The overall cap on growth of housing and employment was based on the national trip end model (NTEM) v6.2 figures for Calderdale. This is a standard way of capping growth when forecasting within traffic models. The 2012 to 2032 growth Figures from NTEM, equivalent to the Local Plan period, are shown in Table 6 below.

Table 6 NTEM forecast growth in housing and employment

	NTEM v6.2 GROWTH 2012-2032
Households	18,000
Jobs	12,000

2.4.3 The NTEM v6.2 Figures tally well with the Local Plan target for housing of 17,651 units. The jobs Figure from NTEM v6.2 also fits well with the 9,000 jobs target from the preferred options 2012, given that the allocated sites are only in the B1, B2 and B8 use classes and there is an expectation of growth in other sectors such as retail etc.

2.5 TRIP CALCULATIONS

2.5.1 In order to provide trips to be modelled from the housing and employment sites, a number of calculations were needed. Trip rates for housing and employment were taken from the TRICS database and agreed by CMBC officers as an appropriate average figure for the assessment of the Local Plan. The trip rates as applied are shown in Tables 7 and 8.

Table 7 Residential trip rates

	AM ARRIVAL	AM DEPARTURE	IP ARRIVAL	IP DEPARTURE	PM ARRIVAL	PM DEPARTURE
Trips per dwelling	0.11	0.31	0.14	0.14	0.27	0.16

Table 8 Employment trip rates (per 100sqm GFA)

	AM ARRIVAL	AM DEPARTURE	IP ARRIVAL	IP DEPARTURE	PM ARRIVAL	PM DEPARTURE
B1	1.42	0.21	0.30	0.34	0.16	1.21
B2	0.57	0.16	0.20	0.21	0.08	0.48
B8	0.10	0.07	0.09	0.09	0.05	0.10

2.5.2 In some cases, the employment site data included an accurate Figure for the floor area which could be used with the Figures above. Where only a site area was given, a standard factor of 0.35 has been used to convert from site area to floor area.

2.6 GROWTH OUTSIDE CALDERDALE

2.6.1 For areas outside Calderdale, future growth was generally based on NTEM forecasts. Given the interaction with the neighbouring authorities of Kirklees and Bradford, more detailed site allocations were modelled in the same way as in Calderdale, utilising the best available data on the Local Plan of each local authority. The overall housing and employment growth applied in each area is shown in Table 9 below.

Table 9 NTEM growth in neighbouring authorities

	HOUSING GROWTH 2014-2032	JOB GROWTH 2014 - 2032
Kirklees	20,234	12,239
Bradford	13,850	23,703

2.7 NETWORK COMMITTED SCHEMES

2.7.1 To create a representative future network, the 2014 model network was updated to include committed highway schemes that are known to be coming forward in the Calderdale study area. These highway improvement schemes are unrelated to any development location or site, and are therefore standalone improvements. They are shown in Table 10. New junctions or improvements that are associated with development sites have not been modelled at this stage.

Table 10 Committed highway improvements

LOCATION	DESCRIPTION
Ovenden Road / Shroggs Road	The junction has had improved operation of the traffic signals applied (MOVA) since 2014
Queens Road / Kings Cross Road	The junction has had traffic signals installed since 2014
A641 / Mills Lane	The junction has been identified to have traffic signals installed
Rochdale Road / West Vale	A right turn lane has been incorporated on Rochdale Road Westbound
Copley Valley Link Road	A new link road between Hollas Lane on Wakefield Road and Mearclough Road to link to Sowerby Train Station in order to open up access to employment sites.

3 MODEL RESULTS – STAGE 5A (INDICATIVE MODELLING)

3.1.1 This section of the report gives details of the model outputs presented at a workshop with CMBC officers held on the 9th of August 2016. This information was produced to assist CMBC with the site sifting process they were undertaking in order to define a preferred set of development sites for the Local Plan.

3.1.2 The analysis has focussed on the impacts seen at a number of key locations identified in previous reporting. The plots showing the modelled delay in the base model of 2014 and the 2032 model are included as an appendix to this report. Appendix A shows the AM peak hour results while Appendix B shows the PM peak hour.

3.2 BRIGHOUSE

3.2.1 Brighouse has been modelled with a number of large housing sites in the North East, South East and South West as a result of the town having the largest share of the spatial distribution and the inclusion of urban extensions. There is also a focus for employment in Brighouse with large sites in the town centre and the employment zone site at Clifton Moor.

3.2.2 The key impacts, in terms of increased delay, seen in Brighouse are listed below:

- A641 southbound at Ludenscheid Link;
- A644 southbound at Ludenscheid Link;
- A641/A644; and
- A644 southbound, towards M62 J25.

3.2.3 Transport interventions will be planned as part of the master-planning process for the largest sites in Brighouse. This exercise has further emphasised the need for these mitigation works. The severity of the impacts (alongside other considerations) has meant that CMBC have reduced the scale of these sites as part of the decision-making process for the preferred set of allocations, although they are still of a significant enough size to meet the growth targets needed for the overall plan.

3.3 ELLAND

3.3.1 Elland as modelled shows the impact of large housing sites on Saddleworth Rd and Lower Edge Rd and a large employment site on South Lane, with delays shown in Appendix A and B. The key location of delay is as per the base model at the two junctions in West Vale; however there is not a significant worsening over the base due to the choice of routes available.

3.3.2 With the recognition of likely future improvements in Elland such as the WY+TF A629 Phase 4 scheme and a possible new station, CMBC have kept the level of proposed development within Elland broadly similar for the preferred sites.

3.4 HIPPERHOLME

3.4.1 As modelled, Hipperholme crossroads is impacted by a large housing site on Brighouse Road as well as others in the vicinity of the junction:

- Southbound to Hipperholme, links are at capacity on Denholme Gate Road. The northern arm of the junction shows 40% of flow is from Northowram.
- The east and south arms are over-capacity, causing blocking back through the Wakefield Rd junction.
- On the Southern arm, 25% of the flow is from the Southedge Quarry housing site, 50% of total flow goes north to Northowram and Queensbury.
- The East/West flow seems to be as a result of general increase and therefore not easily attributed to a development.
- On Wakefield Rd, traffic is severely restricted at this give-way arm

3.4.2 Further analysis has been provided below, which supports a decision by CMBC to not progress the Local Plan with any significant development in Hipperholme as a result of the impact this would have and the lack of likelihood of a suitable improvement scheme at this time.

3.5 BAILIFF BRIDGE / WYKE LION

- Wyke Lion junction sees a general increase in flow into junction on all arms, over capacity on all approaches.
- Bailiff Bridge is over-capacity on the south and west arms.
- There is an increase in flow on A641 north-south, due to Bradford growth, routing from Bradford to / from Brighouse and Elland.
- There is an increase in flow east-west on A58 and A649 as a result of general traffic increase – not easily attributed to a development.

3.5.1 The impacts at Bailiff Bridge/Wyke Lion are the result of wider traffic growth, rather than sites in the immediate vicinity, and are also likely to be addressed as part of the A641 WY+TF corridor scheme. Therefore, CMBC have not made changes to these site allocations as a result of this analysis.

3.6 A629

- There are large increases in flow south of Calder Hebble junction, through Ainley Top and into Kirklees
- The Calder/Hebble northbound, Jubilee Road and Ainley Top approaches all experience delay.
- The Calder/Hebble northbound experiences 10min or greater delay – this is limiting the changes in flow north towards Halifax. This influences flow increases on the A58 and Church Lane (through Southowram).
- Ainley Top junction is over capacity on all A629 approaches (north, south and link from M62 J24)

3.6.1 The modelling at this stage does not incorporate the A629 Corridor WY+TF schemes; it is expected that these impacts will be mitigated as a result of these interventions.

3.6.2 The PM modelled impacts, in the form of plots, are shown in Appendix B.

3.7 FURTHER HIPPERHOLME CROSSROADS ANALYSIS

3.7.1 Hipperholme crossroads is a particular location where impact has been examined in more detail as it is necessary to understand the impact that local development has on the junction. An exercise consisting of interrogating the model outputs has been carried out in order to understand the origins of traffic at the junction.

3.7.2 Select Link analysis has been undertaken on all of the approach roads to the cross roads, for the AM peak model, including the priority controlled link of Wakefield Road. This has given the origin and destination of traffic which can in turn be examined to identify which developments contribute to growth in traffic.

3.7.3 For the Calderdale settlements that are closest to Hipperholme and Bradford, the percentage contributions to the total flow on each arm of the junction have been extracted. For example, on the Leeds Road (A58 east) arm 14% of the flow is attributed to developments in Hipperholme, 9% from other areas of Calderdale (beyond Hipperholme, Northowram/Shelf and Brighouse) and 2% from Bradford. The remainder of traffic (75%) is related to existing traffic or growth from further afield, for example Leeds. This is shown in Table 11 for the entire junction for the AM peak.

Table 11 Development trips by area as a percentage of total flow (2 way) on approach arms

	Development Area									
	Hipperholme		Northowram / Shelf		Brighouse		Bradford		Rest of Calderdale	
Approach arm	Origin	Dest.	Origin	Dest.	Origin	Dest.	Origin	Dest.	Origin	Dest.
Denholme Gate (A644 north)	2%	1%	9%	4%	0%	1%	6%	9%	1%	1%
Leeds Road (A58 east)	14%	0%	0%	0%	0%	0%	0%	2%	4%	5%
Wakefield Road (A649)	19%	1%	0%	0%	0%	1%	3%	3%	7%	0%
Brighouse Road (A644 south)	13%	2%	7%	3%	1%	1%	3%	7%	1%	2%
Halifax Road (A58 west)	10%	1%	0%	0%	0%	0%	0%	0%	7%	4%

3.7.4 Table 11 demonstrates that, when analysing the additional traffic resulting from the local plan growth, the main contributions to the junction are from the local developments in Hipperholme. A number of significantly sized developments are located relatively close to the crossroads and there are few alternative routes available for traffic to take. Over 10% of the traffic on each arm (apart from Denholme Gate) is related to these developments.

3.7.5 Also to note is that the Brighouse developments, despite being large in nature, do not have much of an impact on Hipperholme cross roads. This is as a result of the availability of alternative routes such as via the M62 and through Southowram which result in a more diluted impact over a wider area.

3.7.6 The Northowram and Shelf development sites contribute traffic primarily to the north-south movement between Denholme Gate and Brighouse Road (although at a level that is less than 10% of the total flow on the arm). Considering the distance between these developments and the crossroads, the alternative route via Bradford/Halifax Road and the distribution pattern (which is skewed toward Bradford) this impact is relatively minor at around 90 two way trips in the AM peak hour. It should be noted that the model zoning in this area is coarse, putting traffic onto the network closer to Hipperholme than would be likely for allocation sites in Shelf; this will tend to over-state the impact at Hipperholme crossroads (at this stage no adjustment was made to the model to compensate for this).

4 SUMMARY – STAGE 5A (INDICATIVE MODELLING)

4.1 METHODOLOGY

4.1.1 As set out in Section 1, a set of information regarding the likely spatial make-up of the Local Plan was used with specific site information from a previous modelling exercise. This was a broadly representative scenario which could be used to give an initial steer as to the likely impacts and whether they were likely to be addressed by planned transport interventions.

4.2 OUTPUTS

4.2.1 The forecast model has been used to give a general indication as to where delays will worsen from the base situation. A specific exercise, requested by CMBC, was also carried out to examine the contributions from different areas of Calderdale and beyond to the Hipperholme crossroads.

4.2.2 Following the provision of the preferred set of allocations from officers at CMBC, the modelling exercise has been re-run and more detailed analysis carried out which will inform the likely infrastructure needs that will be required alongside the Local Plan, this is detailed within later sections of this report.

5 METHODOLOGY – STAGE 5B (PREFERRED SITES MODELLING)

5.1 INTRODUCTION

5.1.1 This section of the report describes the modelling carried out to analyse the cumulative impact of the preferred set of development sites to be carried forward into public consultation. Refinements have been made to the information and methodology used compared to the previous assessment described in section 4.

5.1.2 Modelling has been carried out using both a do-minimum highway network, with committed schemes only, and a do-something network with schemes included that are progressing as part of the West Yorkshire Plus Transport Fund.

5.1.3 The demand for travel has been calculated using the preferred set of housing and employment sites provided by CMBC in December 2016.

5.1.4 The Local Plan sites that have been modelled represent a 'worst-case scenario' for the network in which all development comes forward. This is modelled under conditions that can be described as "business as usual", with only limited highway improvements and no changes in demand that represent significant shift away from use of the private car or reduced levels of travel.

5.2 HOUSING

5.2.1 The methodology used for modelling Calderdale Local Plan growth in stage 5a has been updated with new information received, including modelling to an updated Local Plan total of 17,651 houses across a 2012 to 2032 period. This new total has been used to form new model matrices and predict traffic increases across the modelled area.

5.2.2 The Local Plan period starts in 2012 while the Calderdale Strategic Transport Model base year is 2014. The development growth between 2012 and 2014 was therefore subtracted by utilising information for sites that have been built during this period. This information was supplied by CMBC from records of housing completions between January 2008 and September 2016. The subtraction of housing completions between 2012 and 2014 (assumed to already be incorporated into the model) reduces the number of dwellings modelled between 2014 and 2032 to 17,219 in total (reduction of 432 units).

5.2.3 A lower limit for the sites specifically modelled has been applied at a size of 50 dwellings per site. This lower limit has been used as smaller sites will have negligible trip numbers for arrivals and departures to sites, and traffic related to these smaller sites is equally well represented by background growth. The 50 dwelling limit therefore creates a new modelled total of 12,034 dwellings, inclusive of the 432 dwellings on sites already built.

5.2.4 The log of Calderdale sites used can be found in appendix C.

5.2.5 Outside Calderdale, specific developments have only been included for Kirklees sites within a 2km buffer of the border with Calderdale as these are felt to be most influential on the Calderdale network and other areas of Kirklees and Bradford are not represented in specific detail in the model to apply specific development growth. All other areas have used the NTEM v7 dataset to apply an appropriate factored growth in demand.

5.3 EMPLOYMENT

5.3.1 Similar to housing, the methodology for representing employment sites has changed since the previous model run in stage 5a. An updated list of Local Plan sites has been made available following the Employment Land Review undertaken on behalf of CMBC. The sites used make up the total employment growth between 2016 and 2032.

5.3.2 Developments have been attributed a standard trip rate depending on site use, and a standard use class split across all sites unless other information has been attained.

5.3.3 Larger sites, such as Clifton Business Park, have been given their own site specific trip rates and use split based on current masterplanning exercises as this is the best information available at the time.

5.3.4 The log of Calderdale employment sites modelled can be found in Appendix C.

5.3.5 Outside Calderdale, employment growth has been modelled using NTEM v7 data with the exception of Kirklees where sites within 2km of the authority boundary have been specifically modelled as these sites will show the most interaction with the Calderdale network and the model is detailed enough in this area to model sites specifically.

5.4 GROWTH CAP

5.4.1 As described previously in section 2.4, in model forecasting the overall cap on growth of housing and employment is usually based on the national trip end model (NTEM). This is a standard way of capping growth when forecasting. The 2012 to 2032 growth Figures from NTEM v7.0, equivalent to the Local Plan period, are shown in Table 12 below.

Table 12 NTEM forecast growth in housing and employment

	NTEM v7.0 GROWTH 2012-2032
Households	12,475
Jobs	10,115

5.4.2 The NTEM version 7.0 figures are significantly lower than the Local Plan target for housing of 17,651, which if applied would give a reduction in the modelled quantum of growth across the district. The jobs figure from NTEM compares better against the 9,000 jobs target from the preferred options 2012, given that the allocated sites are only in the B1, B2 and B8 use classes and there is an expectation of growth in other sectors such as retail etc.

5.4.3 It is inappropriate to use the NTEM v7.0 forecast for growth in households as a cap, as it would mean that areas of the model without specific development sites would compensate by seeing a large reduction in growth which is not expected. Therefore, a cap has been set that matches the total households for the Local Plan.

5.5 TRIP CALCULATIONS

5.5.1 The trip rate calculations have been used as per the interim stage previously reported. The default trip rates have been taken from the TRICS database and have been agreed by CMBC officers as a best fit for trips across the district and for use in the Local Plan modelling. The rates used are shown in Tables 13 to 14 below.

Table 13 Residential trip rates

	AM Arrival	AM departure	IP Arrival	IP departure	PM Arrival	PM departure
Trips per dwelling	0.11	0.31	0.14	0.14	0.27	0.16

Table 14 Employment trip rates (per 100sqm GFA)

	AM Arrival	AM departure	IP Arrival	IP departure	PM Arrival	PM departure
B1	1.42	0.21	0.30	0.34	0.16	1.21
B2	0.57	0.16	0.20	0.21	0.08	0.48
B8	0.10	0.07	0.09	0.09	0.05	0.10

5.5.2 Individual trip rates have been calculated for the Clifton business park site and urban extensions. More detailed site assessments have been undertaken for these sites and these therefore represent a more accurate source of trip rate information. The trip rates used for these sites are shown in Tables 15 and 16.

Table 15 Sustainable Urban Extension Residential trip rates

	AM Arrival	AM departure	IP Arrival	IP departure	PM Arrival	PM departure
Trips per dwelling	0.159	0.589	0.227	0.198	0.417	0.257

TABLE 16 Clifton EMPLOYMENT SITE TRIP RATES (PER 100SQM GFA)

	AM Arrival	AM departure	IP Arrival	IP departure	PM Arrival	PM departure
B2	0.4828	0.2556	0.2858	0.28826	0.2769	0.4047
B8	0.3266	0.0355	0.035	0.04118	0.2556	0.213

5.5.3 As was used in Stage 5a, a factor for calculating floor areas (for use with the trip rates) from the site areas provided has been applied to all employment sites however an updated figure of 0.4 has been used based on recommendations from CMBC officers.

5.6 GROWTH OUTSIDE CALDERDALE

5.6.1 For areas outside Calderdale, future growth has been based on national forecasts. Given the close interaction with Kirklees, more detailed site specifics have been modelled in the same way as detailed above. The overall housing and employment growth applied for Kirklees is shown in Table 17 below.

Table 17 NTEM growth in Kirklees

	NTEM v7.0 GROWTH 2012-2032
Households	22,995
Jobs	12,177

5.6.2 The NTEM figures for residential growth in Kirklees are broadly similar to those set out in the council's local plan (currently un-adopted). Therefore they have been deemed suitable for use in assessing the impact of neighbouring growth on the Calderdale road network.

5.6.3 Remaining areas for growth outside Calderdale and Kirklees have used National Road Traffic Forecast figures (NRTF). This has been decided as the external areas of the model are not detailed enough for NTEM to be used. Where the detailed model network area ends, NRTF growth Figures between 2014 and 2032 have been used; therefore, neighbouring authorities (not explicitly modelled) and the rest of England have used NRTF. The NRTF growth Figures used are shown in Table 18 below.

Table 18 NRTF traffic growth Figures (2014 to 2032)

	CARS	LIGHT GOODS VEHICLES	OTHER GOODS VEHICLES (OGV1)[1]	OTHER GOODS VEHICLES (OGV 2)[2]
NRTF	1.268	1.4789	1.0913	1.1638

[1] 2 and 3 axle rigid
[2] 3 axle articulated and 4+ axle

6 MODELLING RESULTS – STAGE 5B (PREFERRED SITES MODELLING)

6.1 INTRODUCTION

6.1.1 This section of the report outlines the results based on the stage 5b model runs. This discussion helps to summarise the nature of congestion on the network, and informs the associated infrastructure requirements and recommendations to be considered alongside the Local Plan.

6.1.2 Two model runs have been undertaken with the same development demand but differing networks. A do-minimum network has been used, which only incorporates committed schemes, and a do-something network that also includes the A629 Phases 1a and 1b given the developed stage these improvements are at in the West Yorkshire + Transport Fund (WY+TF) process.

6.1.3 The do-something network has not included the later phases of the A629 scheme and other proposed WY+TF schemes such as the A641 corridor as these have not been developed sufficiently to allow them to be coded into the model network. There is also less certainty over their delivery within the plan period given the early stage of development and design which these schemes are currently at.

6.1.4 The analysis has focussed on the impacts seen at a number of key locations identified in previous reporting and any new sites that have emerged. The plots showing the change in modelled delay between the base model of 2014 and the 2032 model are included as an appendix to this report.

6.1.5 Appendix D and E show the AM and PM delays respectively.

6.1.6 Appendix F shows the comparison between 2032 and 2014 delay.

6.2 DO-MINIMUM MODELS

6.2.1 The Do-Minimum modelling shows levels of congestion that would be unacceptable without further intervention. The do-minimum scenario has only a small number of committed highway improvements included within the network.

6.2.2 The do-minimum models show that current areas of constraint are worsened as a result of the planned level of growth.

6.3 IMPACT OF DO-SOMETHING SCHEMES

6.3.1 As described above, the modelling of the Local Plan sites has been undertaken with a “do-minimum” network as well as a “do-something” network with highway improvements which although not strictly committed are progressed enough that they have a reasonable level of certainty to their implementation.

6.3.2 The demand for the do something model has been kept the same as the do-minimum scenario, therefore giving a direct like-for-like comparison between the two.

6.3.3 The overall impact on traffic flows with the introduction of the A629 phases 1a and 1b in the “do-something” scenario are shown below in Figures 1 and 2.

Figure 1 - Modelled Traffic Flow differences DM model against DS model, AM

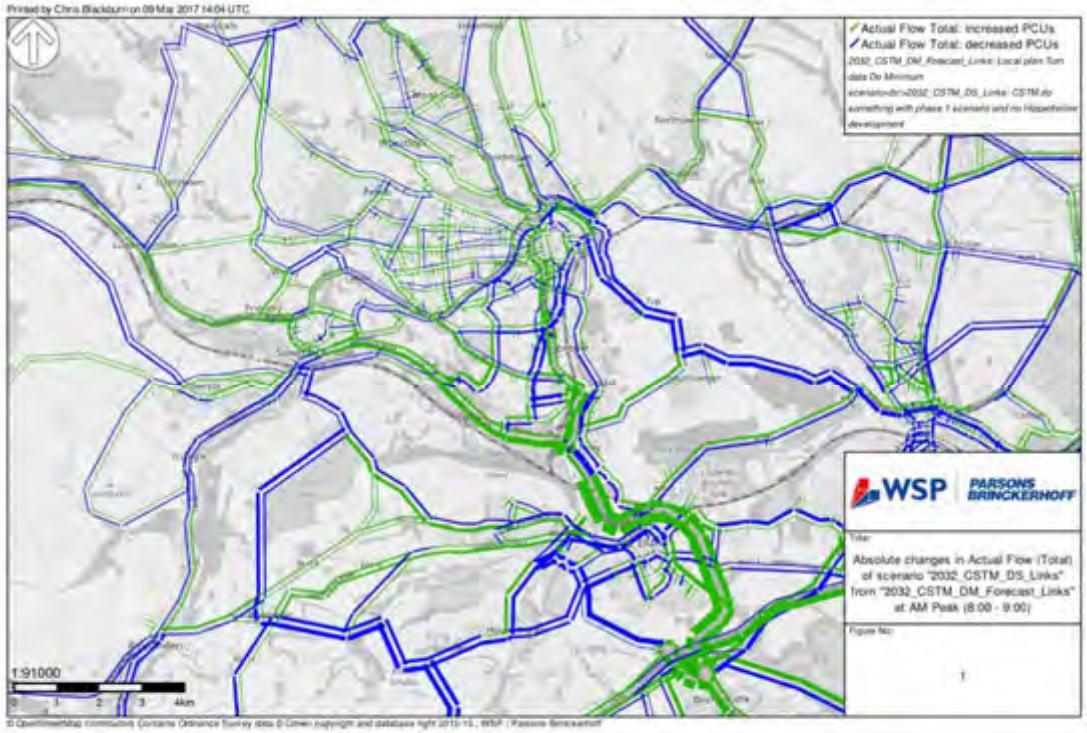
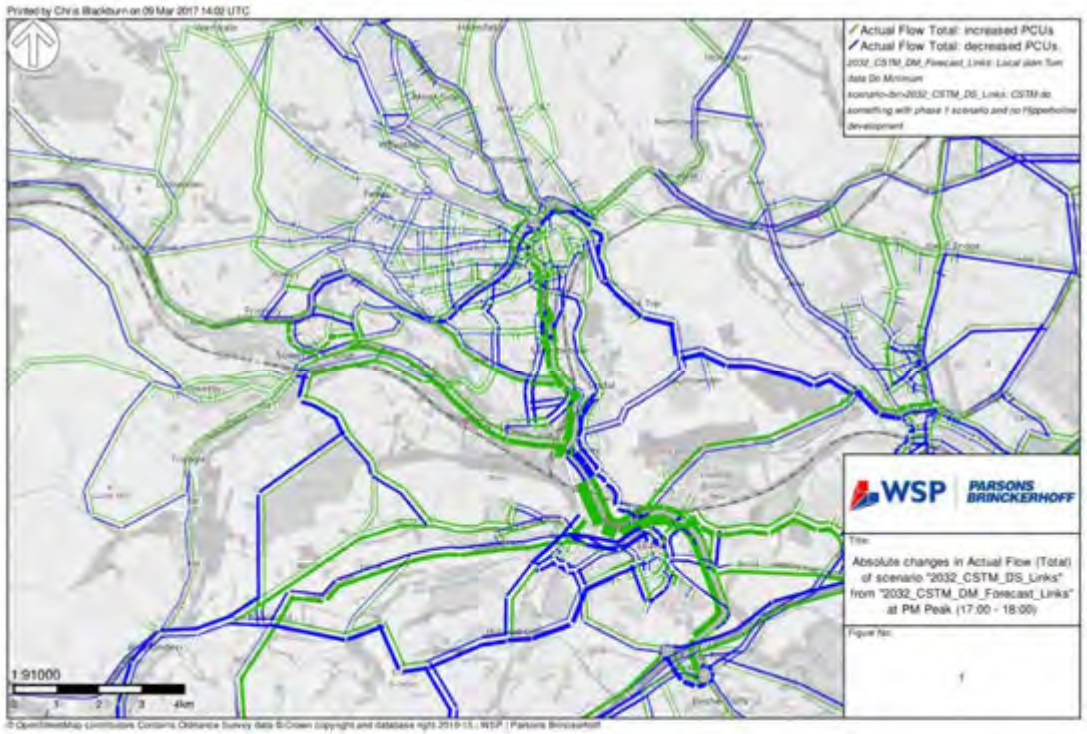


Figure 2 - Modelled Traffic Flow differences DM model against DS model, PM



6.3.4 It can be seen that the improvements along the A629 draw additional traffic along the route from the M62 and in turn reduce traffic westbound through Brighouse, Southowram and also parts of Elland. This gives a benefit to some areas that were highlighted as issues in previous reports.

6.4 IDENTIFYING SIGNIFICANT IMPACTS

6.4.1 In order to identify the areas in the DS model with significant congestion, the output from the modelling has been examined in terms of the ratio of volume over capacity (V/C). This compares the modelled traffic flow over an hour to the modelled capacity for an hour. The junctions with at least one arm showing a V/C ratio of greater than 85% (which is generally accepted as the point where congestion begins) and traffic flow of greater than 350 passenger car units (PCU) were identified (thereby excluding points where negligible flows are modelled).

6.4.2 The subsequent analysis of these points on the model network, alongside local knowledge gave rise to the specific locations described below which show worsened congestion as a result of the CMBC Local Plan growth.

6.5 OVERALL CONGESTION

6.5.1 The significantly congested points of the district have been identified in the model outputs using the method described in 6.3.

6.5.2 The areas are identified below in Figures 3 and 4, and have been discussed in the following paragraphs. Key locations of significant congestion, where a number of points are clustered, can be seen in Brighouse, Hipperholme, Stump Cross, Ainley Top, Sowerby Bridge, Godley Road/New Bank and in Ovenden.

Figure 3 - Worst congested nodes AM

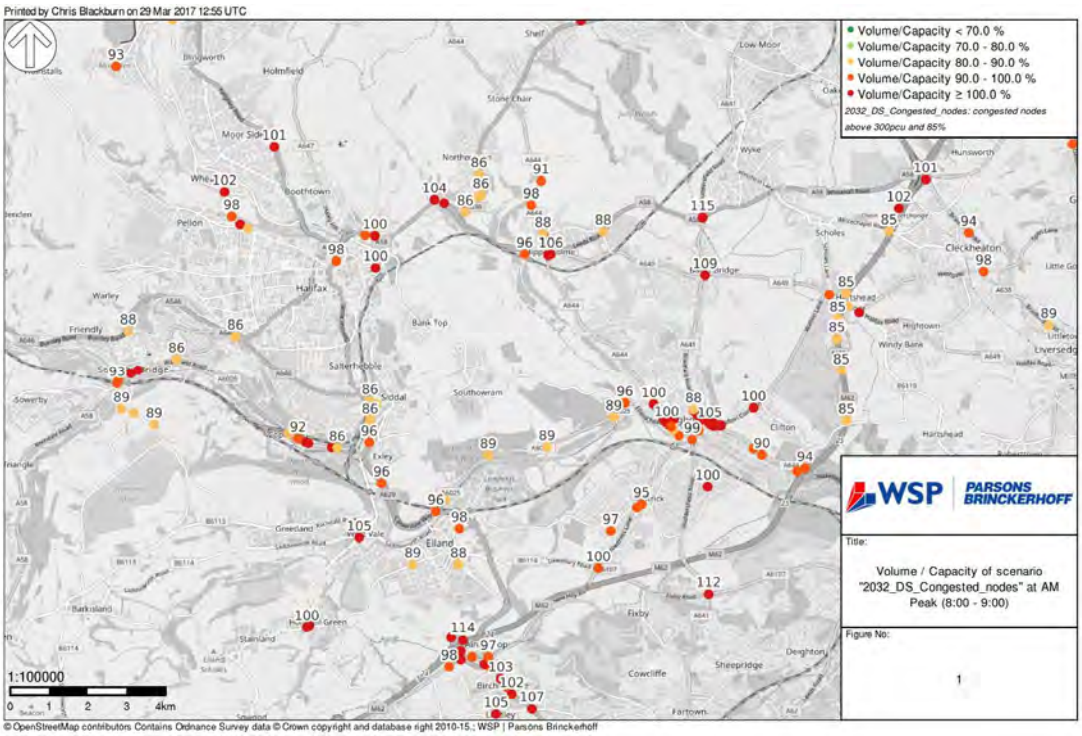
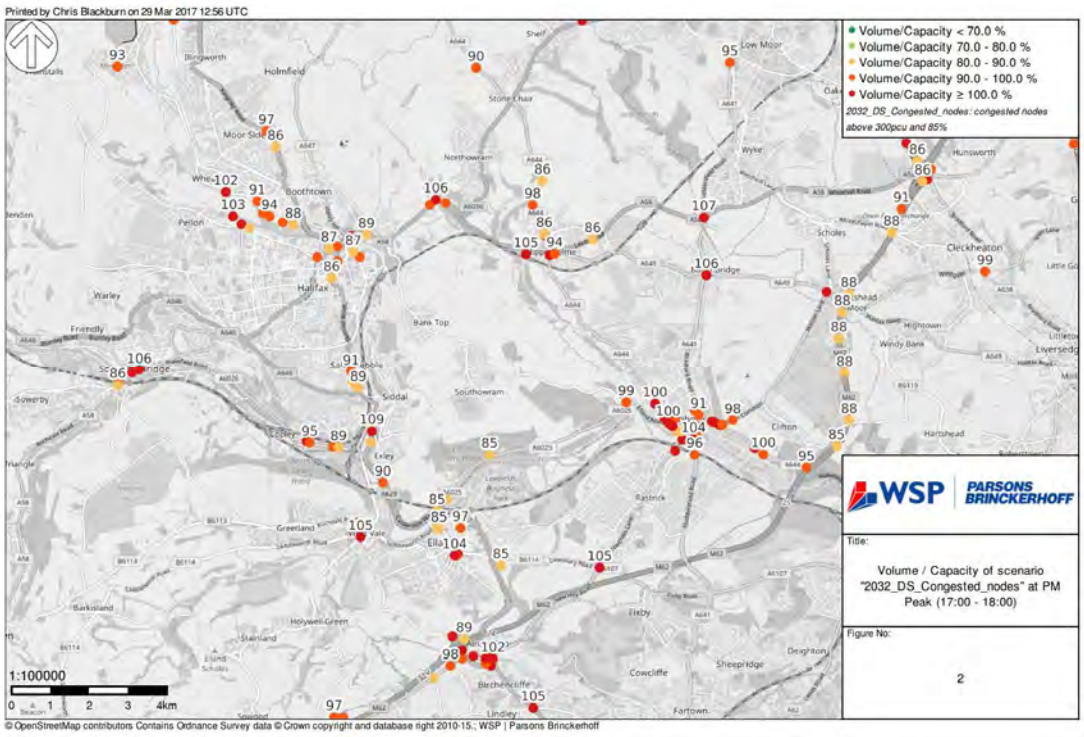


Figure 4 - Worst congested nodes - PM



6.5.3 The detailed examination of the model in the locations identified, as shown in the following sections, show V/C figures for modelled links (highlighted by side of the road travelled by vehicles). This output shows the overall constraint of the link in terms of capacity, which is typically a result of the downstream junction. It should be noted that the length of the link is purely a result of the network coding used rather than showing queue length.

6.6 HALIFAX

6.6.1 As can be seen in Figures 3 and 4, there are some points of congestion within Halifax town centre which are greater than 85%. However, the subsequent increase in delays from the 2014 model with the local plan growth applied is less than 1 minute and therefore not considered significant.

6.6.2 There are a number of elements in phase 2 of the A629 scheme which are envisaged to be able to mitigate this level of worsened performance.

6.7 BRIGHOUSE

6.7.1 Brighouse has had a large level of development included within the settlement, with significant additional housing and employment included with the Sustainable Urban Extensions and the Clifton Business Park site.

6.7.2 The key impacts seen in Brighouse are listed below:

- The western Ludenscheid Link roundabout experiences southbound and northbound movements that are over capacity.
- The traffic related to the large Thornhills housing site has a major impact on congestion and delays at the junction of the A644 and A643.

- The Thornhills site also produces an impact as a result of additional traffic using inappropriate links in the network, e.g. Thornhills Beck Lane.
- Existing congestion is worsened through the centre of Brighouse on the A641. The model showing an increase in delay of 4 minutes northbound and 1 ½ minutes southbound in the AM peak and 2 minutes in each direction in the PM peak.

6.7.3 Junction 25 of the M62 shows links at the junction to be close to capacity. These are shown on the roundabout itself rather than the A644 or the M62.

6.7.4 The links on the network with a V/C ratio of greater than 90% in the AM are shown in Figure 5 below. These generally show the constraint of downstream junctions at:

- Ludenscheid Link western roundabout (A6025/A644/A643)
- Wakefield Road/Clifton Road roundabout (A644/A643)
- Ludenscheid Link eastern roundabout (A641/A643)
- Huddersfield Road/Clifton Road (A641/A643)
- Brookfoot Lane/Elland Road (A6025)
- A641/Mill Royd Street

6.7.5 Other links showing V/C which indicate problematic congestion are shown on the A644 eastbound (near Clifton) and A643 northbound (south of the town centre). In these locations the link capacity causes a constraint rather than a downstream junction.

6.7.6 The same areas are shown as capacity constraints in the PM peak hour, as shown in Figure 6.

Figure 5 - Brighouse links greater than 90% V/C, AM

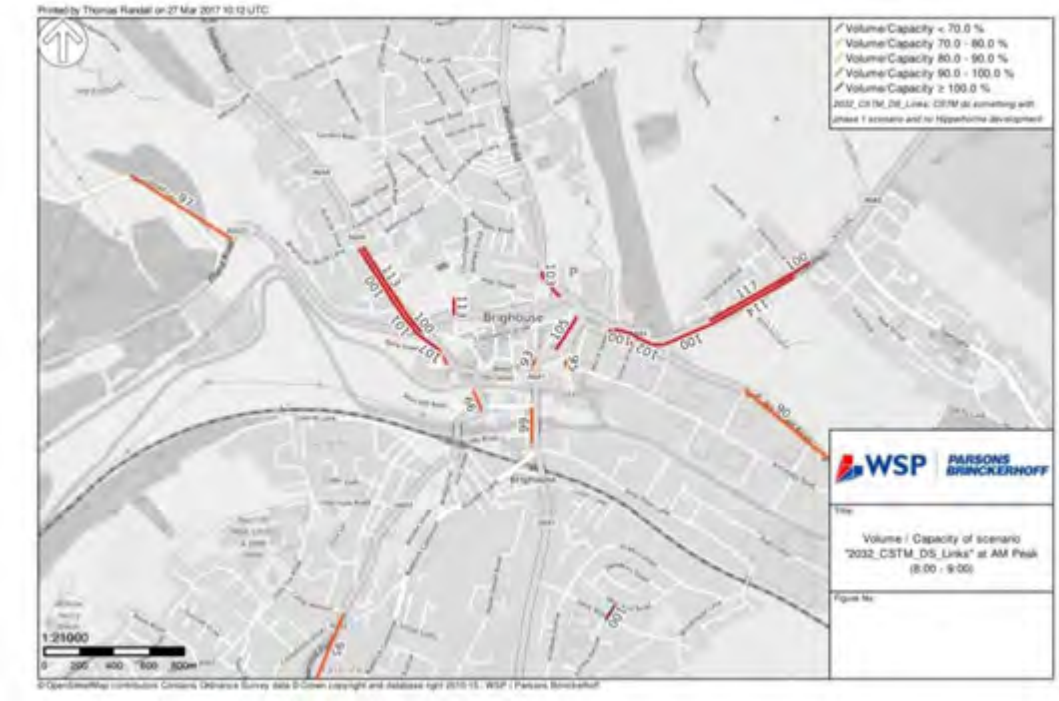


Figure 6 - Brighouse links greater than 90% V/C, PM

6.7.7 The key capacity constraints that show unacceptable levels of congestion in Brighouse are the worsening of existing issues, however these appear to be resolvable. The problem locations align with the proposed A641 corridor WY+TF scheme, which is currently at a pre-feasibility stage and can be tailored to suit the impacts of the Local Plan, and the significant transport infrastructure that will form part of the master planning of the Thornhills urban extension site and Clifton employment site.

6.8 ELLAND

6.8.1 Elland as modelled shows the impact of large housing sites on the land to the north of Elland on the opposite side to the A629, and the sites on Saddleworth Road.

6.8.2 As in the base model, the most significant congestion is shown at the two junctions at West Vale which is worsened via the Local Plan growth. There is an increase in delay of around 2.5 minutes for the eastbound arms at both junctions with the local plan traffic. All other increases in delay seen in Elland are less than 40 seconds.

6.8.3 The links on the network with a V/C ratio of greater than 90% in the AM are shown in Figure 7 below. These show a mixture of constraint from downstream junctions and link capacity. However, where a junction id the constraint issues are generally only seen on a single arm.

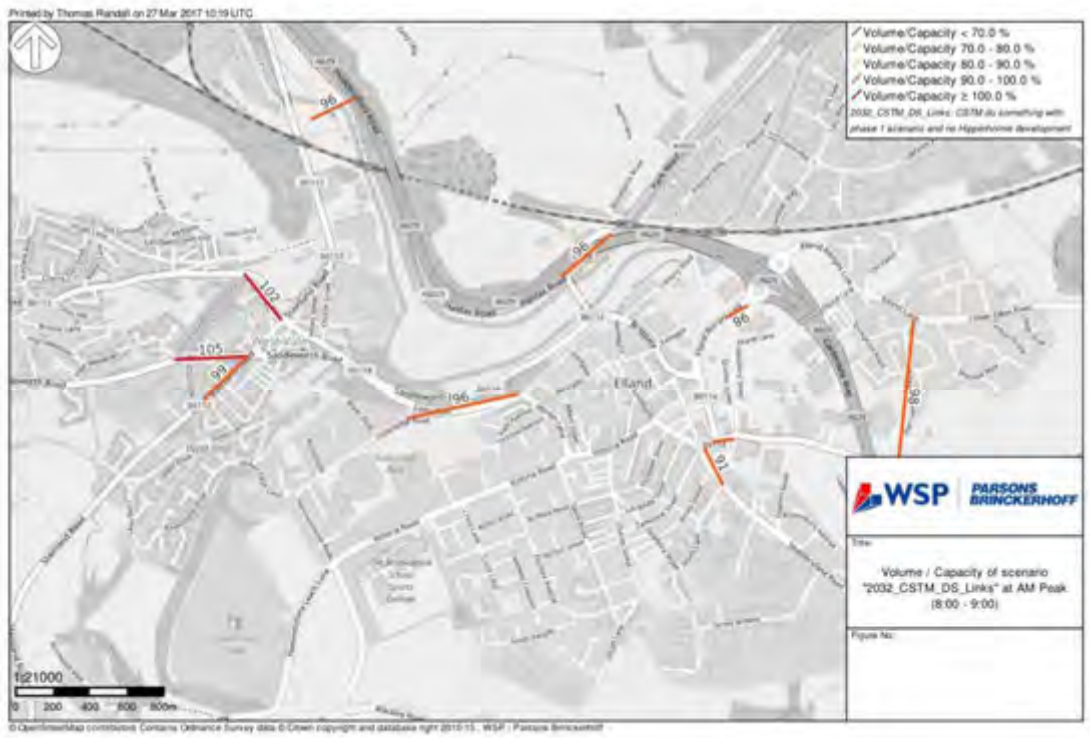
- Rochdale Road/Stainland Road (Junction capacity).
- Saddleworth Road/Stainland Road (Junction capacity).
- Hullenedge Road/Long Wall/Jepson Lane (Junction capacity).
- Park Road (A6025) (Link capacity).
- Elland Riorges Link/Elland Lane (junction capacity).
- Dewsbury Road/Elland Riorges Link (junction capacity).
- Huddersfield Road/South Lane (link capacity).
- Whitwell Green Lane/Dewsbury Road (junction capacity).

6.8.4 An issue is also seen on the new link formed between Stainland Road and the A629 as part of the A629 Phase 1b. However, this scheme has not been designed with the consideration of full local plan growth and the priority for the scheme is the A629 movement.

6.8.5 It should also be noted that stage 4 of the A629 scheme has not been modelled, as the scope is not yet confirmed, which is expected to benefit the centre of Elland and will contribute to mitigating the issues seen below.

6.8.6 The AM worst congested junctions are shown in Figure 7 below.

Figure 7 - Elland links greater than 90% V/C, AM



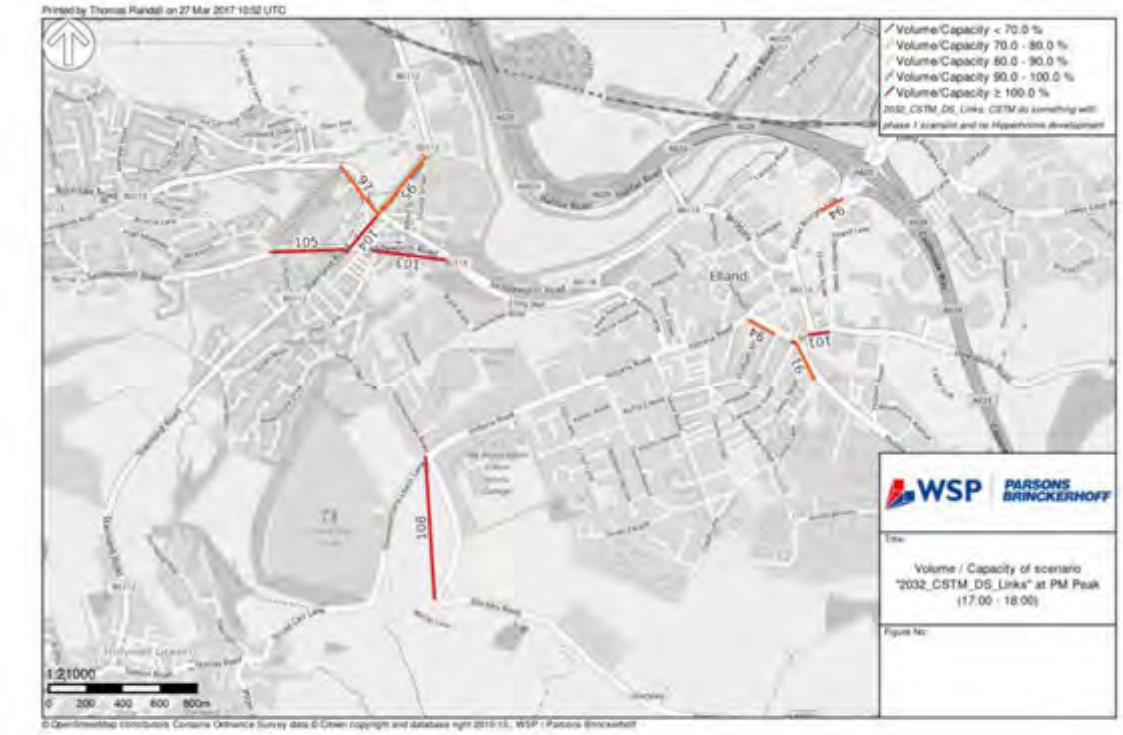
6.8.7 Elland shows a similar trend of capacity constraint in the PM peak

- → West Vale junctions.
- → Dewsbury Road/Southgate/Huddersfield Road junction.

6.8.8 As in the AM peak, the only significant additional delay (more than 1minute) is seen at the West Vale junctions. Additional delay of around 3 minutes is seen southbound on Stainland Road; Rochdale Road eastbound sees a 2 minute additional delay and Saddleworth Road westbound sees a minute of additional delay.

6.8.9 Figure 8 shows the congestion modelled in Elland for the PM peak.

Figure 8 - Elland links greater than 90% V/C, PM



6.8.10 The issues raised in Elland are generally localised in nature and appear to be resolvable with limited traffic management measures and minor junction improvements. The later stages of the A629 corridor improvements will also bring relief to the town centre.

6.8.11 The two West Vale junctions need to be treated as a whole when looking at interventions as there will likely be a need to rationalise traffic movements and apply area wide traffic management.

6.9 A58 CORRIDOR

6.9.1 A number of points along this corridor show significant congestion, but again are a worsening of current congestion issues.

6.9.2 The Wyke Lion junction shows an increase in delay, due to the future traffic growth, for the eastbound movement of over 4 minutes and around 30 seconds for the westbound and northbound arms.

6.9.3 Hipperholme has been modelled without any developments within the local vicinity as it has been felt by CMBC that the crossroads are already over capacity and there are currently no formal plans for improvement at the current time. Worsening of congestion is therefore as a result of growth in other areas of Calderdale and in other districts. There are delay increases seen between 2014 and 2032 of almost 1 ½ minutes on Denholme Gate (A644), 1minute on Wakefield Road (A649), 30 seconds on Brighouse Road (A644) and 45 seconds on Halifax Road (A58).

6.9.4 Tanhouse Hill shows a high V/C ratio, however this is an issue shown in the 2014 model and there is little additional delay caused by the modelled future traffic growth.

6.9.5 There is also a point of significant congestion seen at Stump Cross with almost 3 minutes additional delay for the Bradford Road arm (A6036). Further west on the A58 at New Bank/Beacon Hill Road the current congestion is only worsened slightly with Beacon Hill Road seeing additional delay of around 20 seconds.

6.9.6 The modelled congestion along the A58 corridor in the AM is shown in Figure 9 below.

Figure 9 – A58 corridor links greater than 90% V/C, AM

6.9.7 In the PM peak the signal junction at Wyke Lion shows capacity issues for the east/west movements, with around 2 minutes additional delay westbound and 1 minute eastbound. The north and south movements show additional delay of less than 1 minute each.

6.9.8 Hipperholme cross roads follows a similar trend to the AM peak with the Existing issues being worsened.

- → The northbound A644 arm is over capacity at 104% V/C, however this only Gives a 50 second increase in delay.
- → The westbound arm of the A58 is at 98% in the base, and moves to 102% in the future year. This results in an increase in delay of around 1 minute.
- → Wakefield Road sees additional delay of just less than 1 minute in the PM peak.

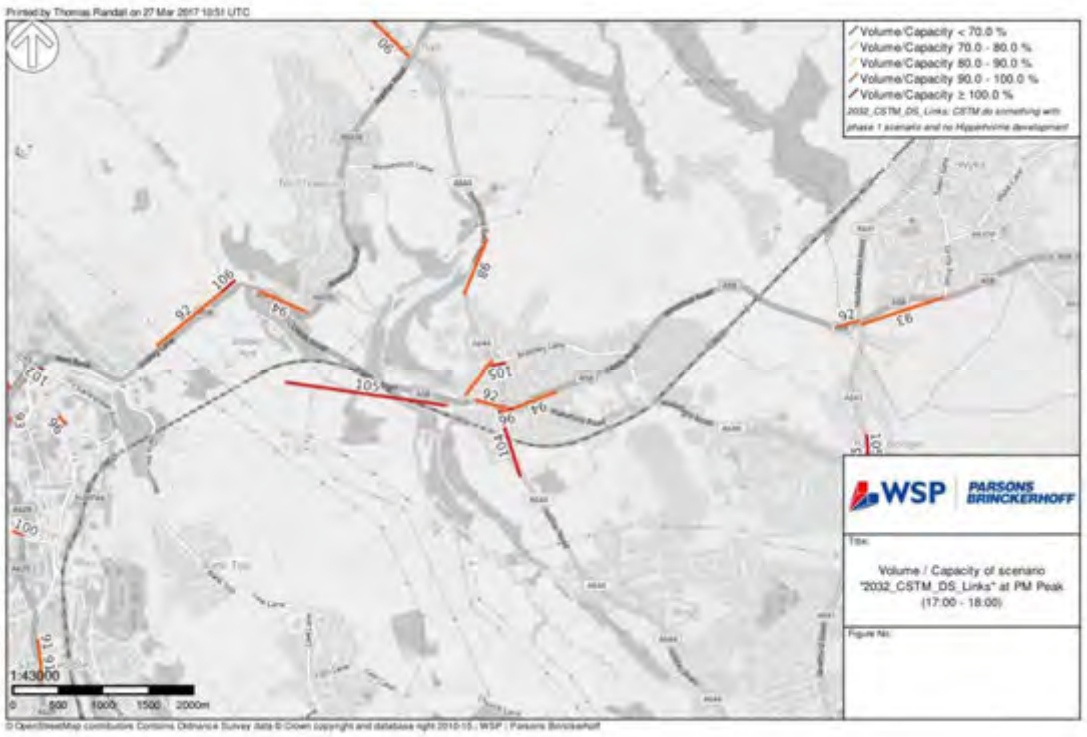
6.9.9 Away from the cross roads the effect of re-routing is seen at Bramley Lane / Denholme Gate Road which shows a large increase in V/C from 88% in the base to 104% in the future year. This leads to over 2 minutes additional delay for this movement from the A58 East to the A644 North.

6.9.10 Again, the movement eastbound on Halifax Old Road shows a high V/C ratio and this gives increased delay of around 1 ½ minutes.

6.9.11 Stump cross is also congested in the PM peak as a result of the tidal traffic flow from Halifax. The A58 movement from Halifax sees additional delay of 100 seconds.

6.9.12 The PM congestion on the A58 corridor is shown in Figure 10.

Figure 10 – A58 corridor links greater than 90% V/C, PM



6.9.13 From the analysis above there are significant issues shown at both Wyke Lion, for A58 traffic, and at Stump Cross, for A6036 traffic. There is some marginal worsening of the already significant issues currently seen at Hipperholme Cross Roads. It is expected that a comprehensive corridor study for the A58 will address these issues in a holistic manner and is also likely to incorporate the A6036 within its scope.

6.10 BAILIFF BRIDGE

6.10.1 Although Bailiff Bridge and Wyke don't have development modelled explicitly, they are affected by the traffic demands from the wider area.

- → Significant additional traffic using the junction at Bailiff Bridge in the AM peak, showing an increase in V/C to 104% on the eastbound approach. This gives a 2 minute increase in delays over the base year situation.

6.10.2 In the PM Bailiff Bridge shows the southbound arm of the A641 Bradford Road close to capacity in the base year, which then moves to over capacity at 105% in 2032. This leads to an increase in delay of 2 minutes. On all other arms there are smaller increases in delay of less than a minute.

6.10.3 The A641 corridor is being addressed as part of a WY+TF scheme. Given the level of additional delay modelled at Bailiff Bridge it is reasonable to expect the scheme to be able to mitigate this worsening.

6.11 A629 AND A6026 CORRIDORS

6.11.1 The A629 has been modelled with both the Phase1a scheme and the Phase 1b scheme given the greater level of detail known and the stage in the funding approvals process each is currently at. As shown previously, this has a significant impact on improving the flow of traffic through the corridor and relieves the majority of congestion, however with the growth in traffic as a result of the Local Plan developments some points of congestion still remain as follows:

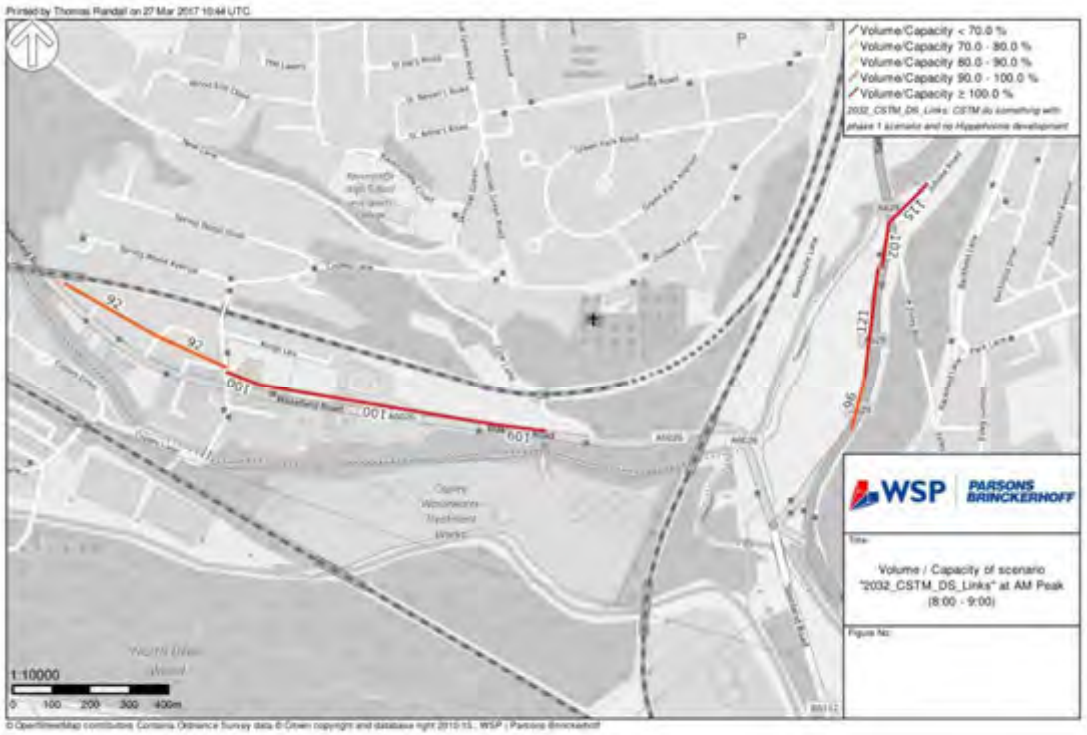
- → Jubilee Road and the merging of the two lanes between phase 1a and 1b are shown to be over capacity due to the movements along the corridor. This is as a result of the additional traffic attracted to the A629 in both the northbound and southbound directions. There is an increase in delay of around 6 minutes shown at this point, however there is a greater improvement in delay shown upstream at the Calder & Hebble junction which compensates for this.

6.11.2 Although not modelled at this stage due to lack of clarity on the detail, the Phase 1b scheme will include an improvement scheme at the Jubilee Road, with the aim of carrying two lanes through northbound on the A629 corridor between the Phase 1a and Phase 1b scheme.

6.11.3 The A6026 shows issues with both the junction with Copley Lane and the capacity of the A6026 itself at this point as a result of additional demand for travel and the improvements made at the Calder and Hebble junction on the A629. This gives an increase in delay of around 4 minutes westbound. This would need to be addressed separately to the A629 schemes and may be a relatively simple improvement to the operation of the signals at this point.

6.11.4 The modelled points of significant congestion on the A629 in the AM peak are shown below in Figure 11.

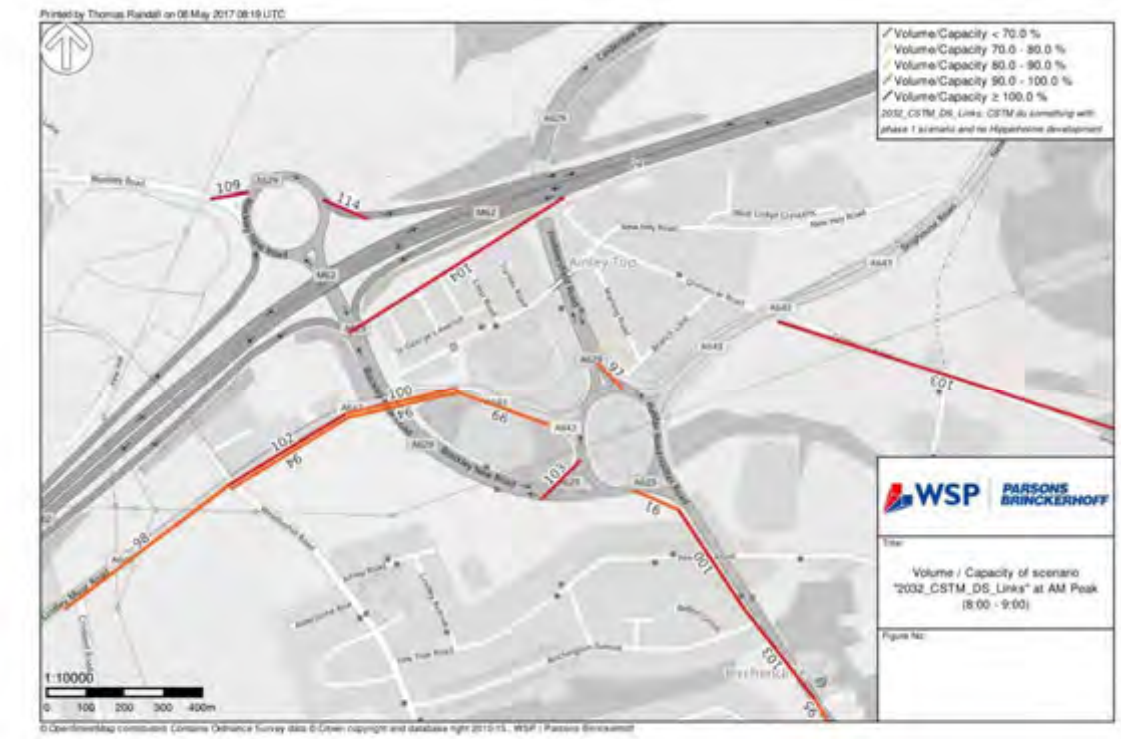
Figure 11 – A629/A6026 corridor links greater than 90% V/C, AM



6.11.5 Ainley Top Junction (Junction 24 of the M62) shows a number of points of high V/C as shown in Figure 12. However these are mostly current issues, with significant increases in delay seen at:

- The westbound off slip from the M62 (1 ½ minute delay increase).
- Blackley Road entry to the northern roundabout (3 ½ minute delay increase).
- Link capacity issues eastbound on slip to the M62 (4 minute delay increase).
- Link capacity issues on Lindley Moor Road (A643) (1minute increase in delay in both directions).

Figure 12 – Ainley Top, Links greater than 90% V/C, AM



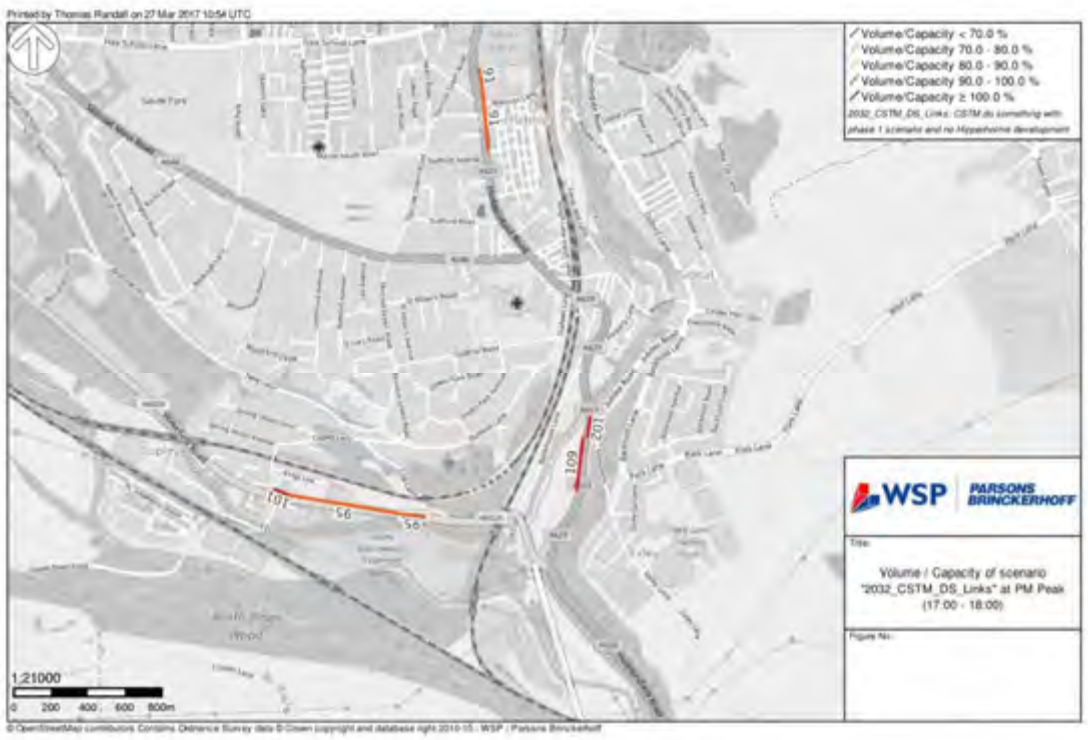
6.11.6 Due to the location of Ainley Top these points of additional congestion are significantly impacted by growth outside Calderdale, which will need to be considered when thinking about the need for intervention. However, there appears to be significant scope for the A629 Phase 4 scheme to address the more minor impacts and a need to engage with Highways England to understand their aspirations for capacity improvements to the slip roads and the impact of a possible junction 24a which will take traffic away from Ainley Top.

6.11.7 The A629 shows a similar trend in the PM peak to the AM, with only the Jubilee Road junction and lane narrowing creating additional delay. However, this is significantly lower than in the AM with around 2 ½ minutes extra delay.

6.11.8 On the A6026, the Copley Lane junction is again a pinch point for westbound traffic but causing less than 2 minutes additional delay.

6.11.9 These areas on the A629 are shown in Figure 13 below.

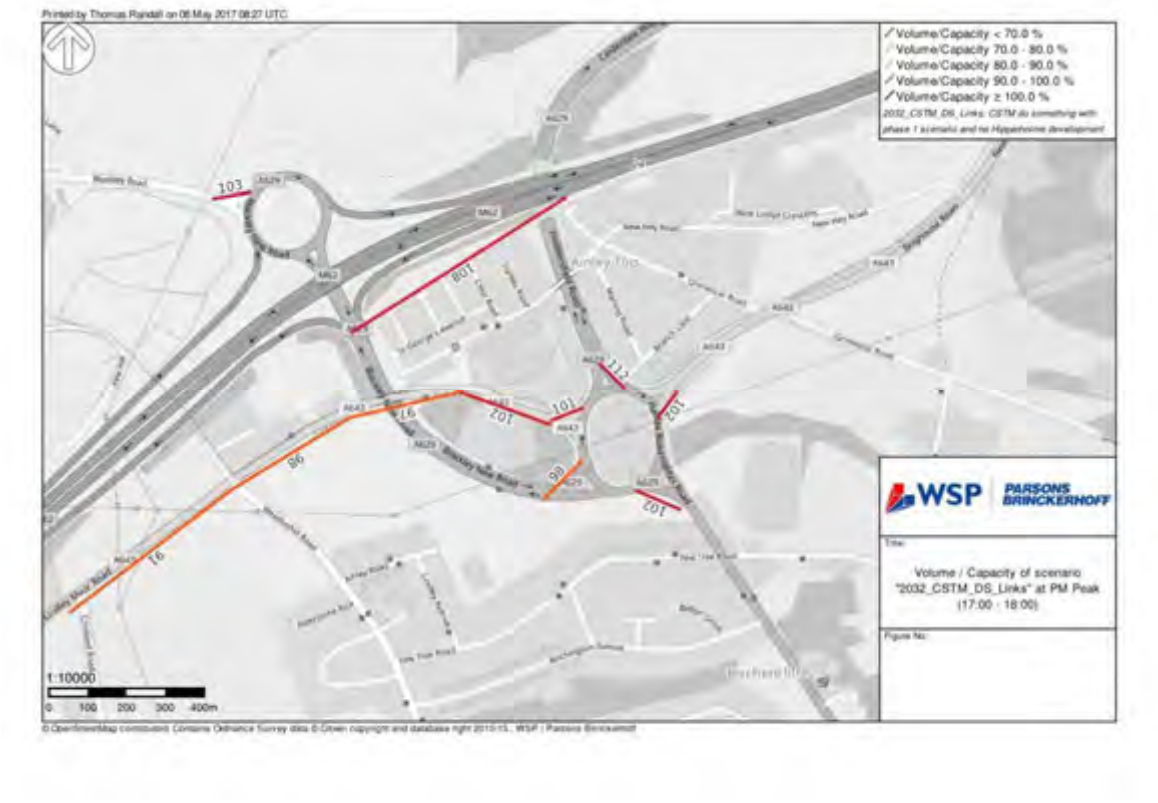
Figure 13 - A629/A6026 links greater than 90% V/C, PM



6.11.10 Ainley Top in the PM peak shows all approach arms to the roundabout either at or over capacity, as shown in Figure 14; however the increases in delay shown are generally lower than in the AM.

- The westbound off slip from the M62 (3 minute delay increase).
- Blackley Road entry to the northern roundabout (1 ½ minute delay increase).
- Southern roundabout shows increased delay of 1-2 minutes for the eastern, southern and western arms and 3 minutes for the northern arm.

Figure 14 - Ainley Top, Links greater than 90% V/C, PM



6.11.11 The A629 corridor has been modelled with the earliest phases of the improvement scheme included. It can be seen that points of congestion remain which match with the future phases which are still in development. The scale of the additional delay predicted is generally of a level where it is expected that this could be addressed by the wider A629 scheme. Additionally there is a need to consider some intervention on the A6026.

6.11.12 The worsening of Ainley top, particularly at the access/egress point of the M62, strengthens the case for relief of this junction via the proposed junction 24a which is currently being studied further as a separate commission.

6.12 SOWERBY BRIDGE

6.12.1 Within the settlement of Sowerby Bridge there are no developments that directly link on to the A58 in the town centre, meaning that the extra delay and flow experienced here are from developments that are slightly outside the town centre and on the edge of the settlement area.

6.12.2 The key points of congestion are the exacerbation of current issues:

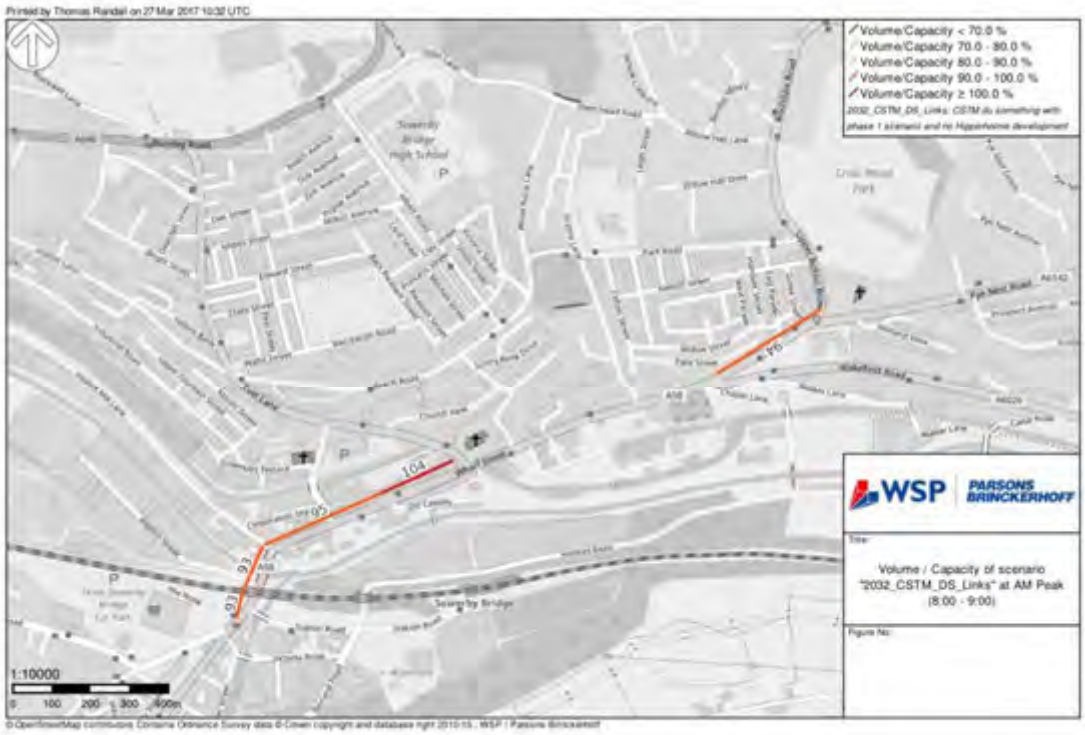
- → Wakefield Road (A6026)/Bolton Brow (A58).
- → Wharf Street (A58)/Tuel Lane (A6139).

6.12.3 The Wakefield Road and Bolton Brow arms see relatively small increases in delay of less than 30s each.

6.12.4 The A58 at Tuel Lane is modelled with almost 4 minutes of additional delay in the eastbound direction due to the large increase in flow.

6.12.5 The congested links in Sowerby Bridge are shown in Figure 15.

Figure 15 - Sowerby Bridge links greater than 90% V/C, AM



6.12.6 Sowerby Bridge shows similar capacity constraints in the PM peak, with the Junctions of Tuel Lane and Wakefield Road on the A58 being the main locations of capacity constraint. The junction of Station Road/Sowerby Street also shows issues of capacity in the PM (although the additional delay is of a minimal scale).

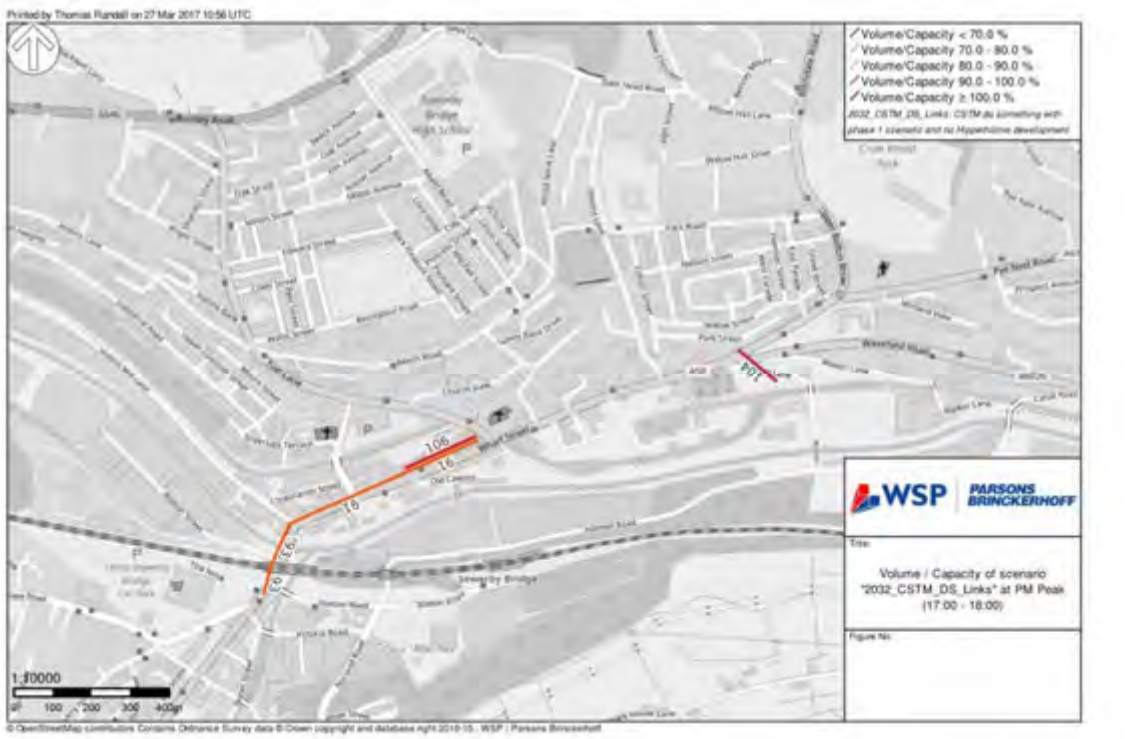
6.12.7 The following points of congestion are seen and shown in Figure 14 below:

- A58/Station Road/Sowerby Street (less than 30s additional delay).
- Wakefield Road (A6026)/Bolton Brow (A58)/Chapel Lane.
- Wharf Street (A58)/Tuel Lane (A6139).

6.12.8 The A58 at Tuel Lane sees an increase in delay of over 3 minutes. Other points on the network see smaller increases in delay of less than 30 seconds.

6.12.9 Chapel Lane sees a V/C of over 100% and a subsequent increase in delay of over 2 ½ minutes. However, this is as a result of a relatively minor increase in traffic of around 20 pcu. The coarse zoning in this area of the model also means this is an over-concentration of traffic on an inappropriate arm of the signalised junction and in reality this traffic would probably use a new access onto Wakefield Road and the effect dissipated.

Figure 16 – Sowerby Bridge links greater than 90% V/C, PM



6.12.10 Although there are currently no specific improvement schemes for the centre of Sowerby Bridge it is a potential area for improvement through the WY+TF Corridor Improvement Programme (CIP). The modelling shown above indicates that this should be aimed primarily at the Tuel Lane/A58 junction.

6.13 NORTH HALIFAX

6.13.1 The north of Halifax shows an increase in flow over the area, with the developments in Ovenden and Mixenden playing a large part in the increase in traffic heading southbound along the A629 towards Halifax Town Centre.

6.13.2 Although there is an increase in the traffic around Northern Halifax, the V/C's show relatively small changes, giving confidence that the network is performing similarly to the 2014 base, with only two points above this threshold;

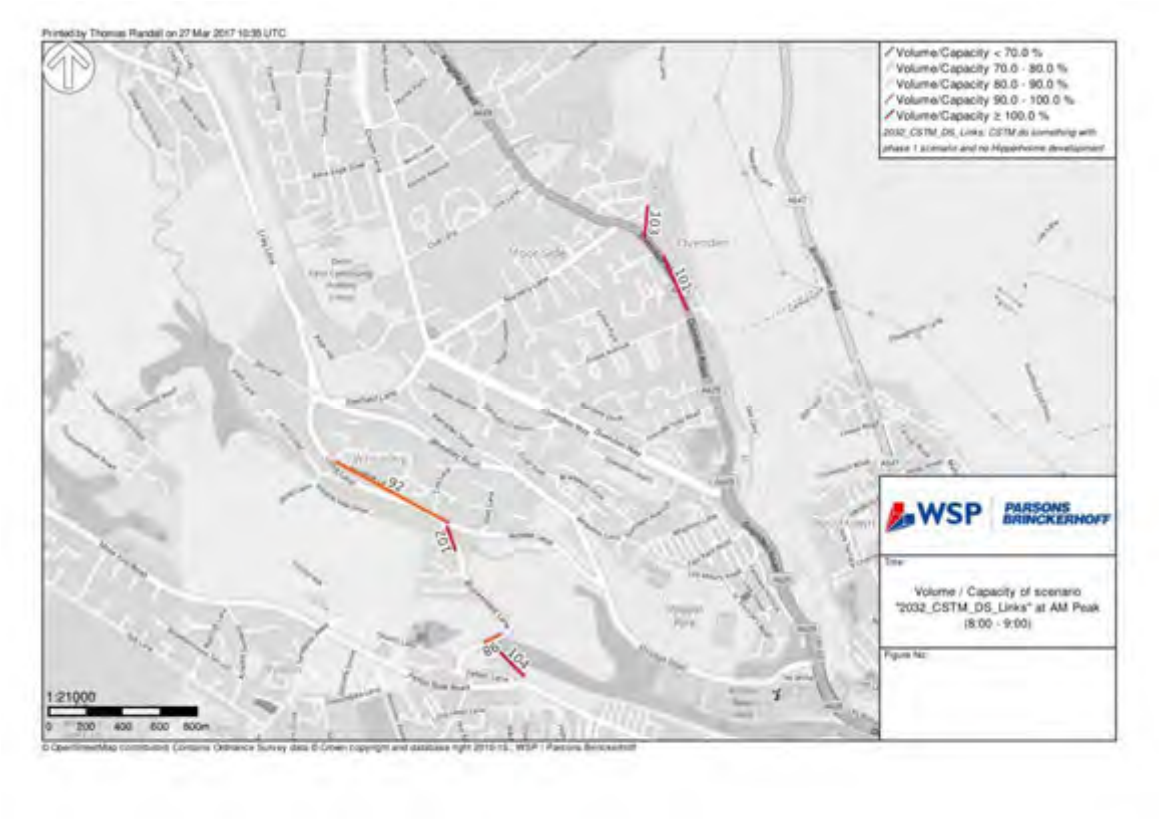
- Shay Lane/Keighley Road (A629) sees a junction constraint with an increase of 20% Volume to Capacity ratio, due to the developments in Illingworth and this being the quickest route south to enable use on the A629. The A629 also shows a link capacity issue to the south of Shay Lane, however this is due to a simplification in the model coding at this point and therefore not expected in reality.
- Brackenbed Lane/Pellon Lane shows capacity constraints at the junctions with Long Lane and Pellon New Road.

6.13.3 On Shay Lane there is an increase in delay of around 2 minutes due to the traffic growth of the Local Plan.

6.13.4 However, the impact on delays on Brackenbed Lane is relatively minor with approximately ½ a minute increase seen northbound and 50 second increase southbound. This level of worsening appears to be possible to mitigate through minor improvements.

6.13.5 The locations in North Halifax that show significant congestion can be seen in Figure 18.

Figure 18 - North Halifax links greater than 90% V/C, AM



6.13.6 Similar to the AM, there is a general uplift in traffic using the A629 north of Halifax. Ovenden Way and Boothtown Road also see an uplift in general traffic usage.

6.13.7 Due to the traffic using the network to the north of Halifax, there are some overcapacity links as follows:

- → Shay Lane/Keighley Road (A629) sees a junction constraint.
- → Brackenbed Lane/Pellon Lane shows capacity constraints at the junctions with Long Lane and Pellon New Road.
- → Shroggs Road shows a link capacity constraint.

6.13.8 After analysis of the model performance, Shroggs Road is not expected to be an issue and is a result of an overly low capacity which has been coded in the base year model.

6.13.9 Shay Lane sees an increase in delay of around 30 seconds. Brackenbed Lane and Pellon Lane both see increased delay in the region of 40 seconds.

6.13.10 See Figure 19 below for the PM modelled congestion in North Halifax.

Figure 19 - North Halifax links greater than 90% V/C, PM

6.13.11 With the exception of Shay Lane, the model shows relatively minor impacts in terms of additional delay in this area. The A629 north of Halifax is included in the scope of the WY+TF CIP and this has the potential to improve the Shay Lane junction and mitigate this impact.

6.14 HEBDEN BRIDGE

6.14.1 Hebden Bridge and the wider Upper Valley experiences a modest increase in traffic on the A646 as very little development is proposed for this area of Calderdale. However, over the modelled period of an hour there are no significant points of congestion shown, with V/C less than 80%. In reality there will be smaller peaks of congestion which are less than an hour in the centres of Todmorden, Hebden Bridge and Mytholmroyd. These are expected to be addressed through the improvements planned for the A646 as part of the WY+TF corridor improvement programme.

7 SUMMARY – STAGE 5B (PREFERRED SITES)

7.1 METHODOLOGY

7.1.1 The methodology outlined in section 5 for stage 5B shows detailed information regarding the development sites used alongside other sources of information to give a representative sample of district-wide growth. This was a comprehensive scenario with all (significantly sized) proposed allocation sites modelled within Calderdale within the simulation network. Therefore, all impacts can be quantified accordingly and proposals put forward for whether and how they could be addressed via specific interventions.

7.1.2 It should be again noted that the methodology used has taken a worst-case scenario approach. This means that current rates of high car dependency are expected to continue and possible modal shift or reductions in travel demand have not been assessed.

7.2 OUTPUTS

7.2.1 The outputs from this set of forecast models have quantified the impact of the Local Plan allocations in terms of the level of additional delays on the network.

7.2.2 In most cases the predicted level of additional delay at a point in the network is relatively minor (less than a minute). These are expected to be mitigated through relatively minor interventions to improve capacity if it is felt to be necessary, but in many cases the additional delay is likely to be acceptable.

7.2.3 Almost all areas have planned improvement schemes, even if they are at an early stage and the outputs of this work can be used to shape those that are less well defined. More significant impacts are seen in the east of the district where development pressure is greatest, but these manifest themselves in additional delays of a few minutes typically and are therefore it is expected that they can be significantly mitigated by the scale of intervention that is likely to be acceptable in Calderdale.

7.2.4 Where significant planning and investment will be necessary – for example on the corridors of the A641 and A58 – it will be necessary to phase the level of development in line with the delivery timescales for these interventions. This will be investigated in the next stage of the Local Plan transport evidence work.

8 SUMMARY

8.1 STAGES 5A AND 5B

8.1.1 This report has detailed the two stages of modelling the cumulative impact of the proposed Local Plan allocations, both an initial, indicative exercise and then a more detailed model run using the proposed sites. Forecast impacts upon the modelled highway network have been examined and the key locations for predicted congestion described. Finally, a qualitative assessment of the likely infrastructure improvements has been undertaken.

8.2 INTERVENTIONS

8.2.1 Following the assessment of the modelling of the cumulative impact and the subsequent stress on the network, an initial view on the broad form of infrastructure requirements has been taken. These interventions are required to mitigate the impacts of the growth in travel as a result of the Local Plan developments where this has been modelled to cause significant delays (typically more than 1 minute).

8.2.2 Table 19 below summarises the requirements and possible delivery mechanism for the various locations described in previous sections of the report.

Table 19 – Description of interventions necessary for mitigation of local plan impacts

LOCATION	INTERVENTION	POSSIBLE DELIVERY MECHANISM
Wyke Lion, Hipperholme cross roads, Stump Cross	Short term intervention to improve operation of signals at Hipperholme Cross Roads. Longer term need for A58 Corridor package of improvements across all modes of transport.	Developer Contributions. Possibility of a future West Yorkshire + Transport Fund (WY+TF) scheme.
A629 south of Halifax, Ainley Top	Phases 2-4 of WY+TF scheme M62 J24a	WY+TF. Highways England.
Brighouse Town Centre	Master planning of urban extension sites. A641 WY+TF scheme corridor improvements.	Developer contributions. WY+TF.
West Vale (Elland)	Local traffic management. Part of A629 Phase 4.	Developer contributions. WY +TF.
Sowerby Bridge	Local traffic management as part of the A58/A672 corridor improvement programme.	Developer contributions. WY+TF
A6026	Local traffic management as part of the A6026 corridor improvement programme.	Developer contributions. WY+TF
A629 north of Halifax	Local traffic management. As part of the WY+TF corridor improvement programme	Developer contributions. WY+TF.

8.2.3 As well as the interventions recommended for mitigation of the most significant effects of the local plan growth, other schemes will also assist in supporting the local plan aspirations. These are shown in Table 20.

Table 20 – Description of interventions necessary for mitigation of local plan impacts

LOCATION	INTERVENTION	POSSIBLE DELIVERY MECHANISM
Halifax Town Centre	Phase 2 of A629 WY+TF scheme and Halifax Station Gateway	WY+TF.
Hebden Bridge/Mytholmroyd/Todmorden	Local traffic management as part of the A646 element of the WY+TF corridor improvement scheme.	WY+TF
Brighouse, Elland, Halifax, Todmorden, Mytholmroyd, Hebden Bridge, Sowerby Bridge,	Improved multi-modal access and parking at stations (current and proposed)	WY+TF.
City Connect Phase 2 (Calderdale Canals)	Improvement of cycle routes on the Rochdale canal and Calder Hebble navigation.	City Connect (DfT)

8.2.4 The current modelling has not assumed any impact from the provision of public transport improvements for example the provision of a new rail station at Elland. These interventions will also form part of the mitigation of the Local Plan in terms of transport demand.

8.3 NEXT STEPS

8.3.1 The next steps to be taken following this report are as follows:

- → Undertake a sensitivity test which allocates a limited level of development within Hipperholme to create a clear picture of how the developments affect the already congested network operation, and to note if any mitigation measures are needed. This will form technical note 5.
- → Utilise the points of congestion identified in this report to suggest suitable mitigation measures and site apportionment to inform the infrastructure delivery plan. Undertake an assessment of the phasing of development and subsequent phasing of infrastructure provision and assess the level of cross-boundary influence on infrastructure needs. This will form technical note 6.

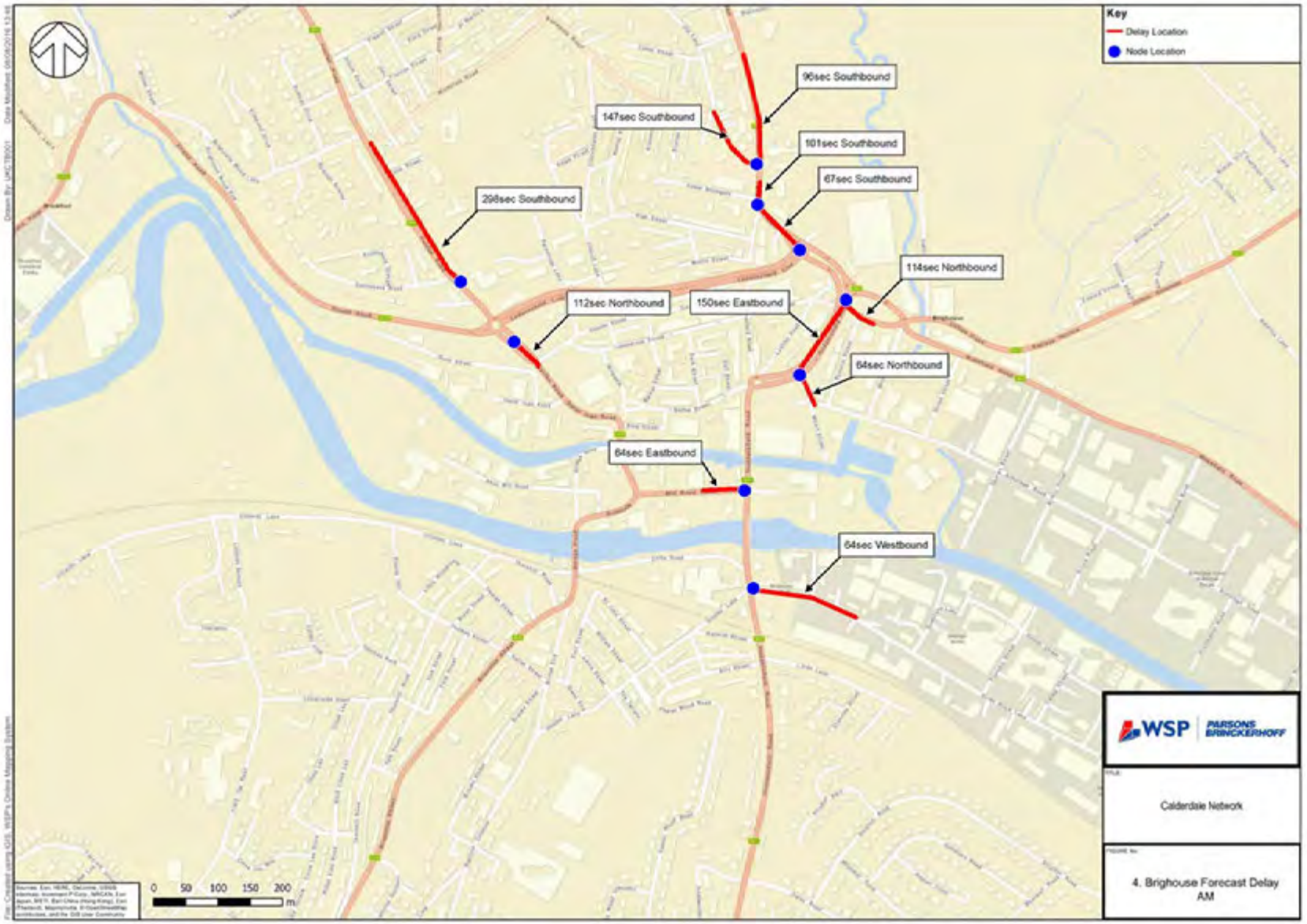
Appendix A

STAGE 5A (INITIAL MODELLING) BASE AND FORECAST MODELLED DELAYS AM

APPENDIX A-1

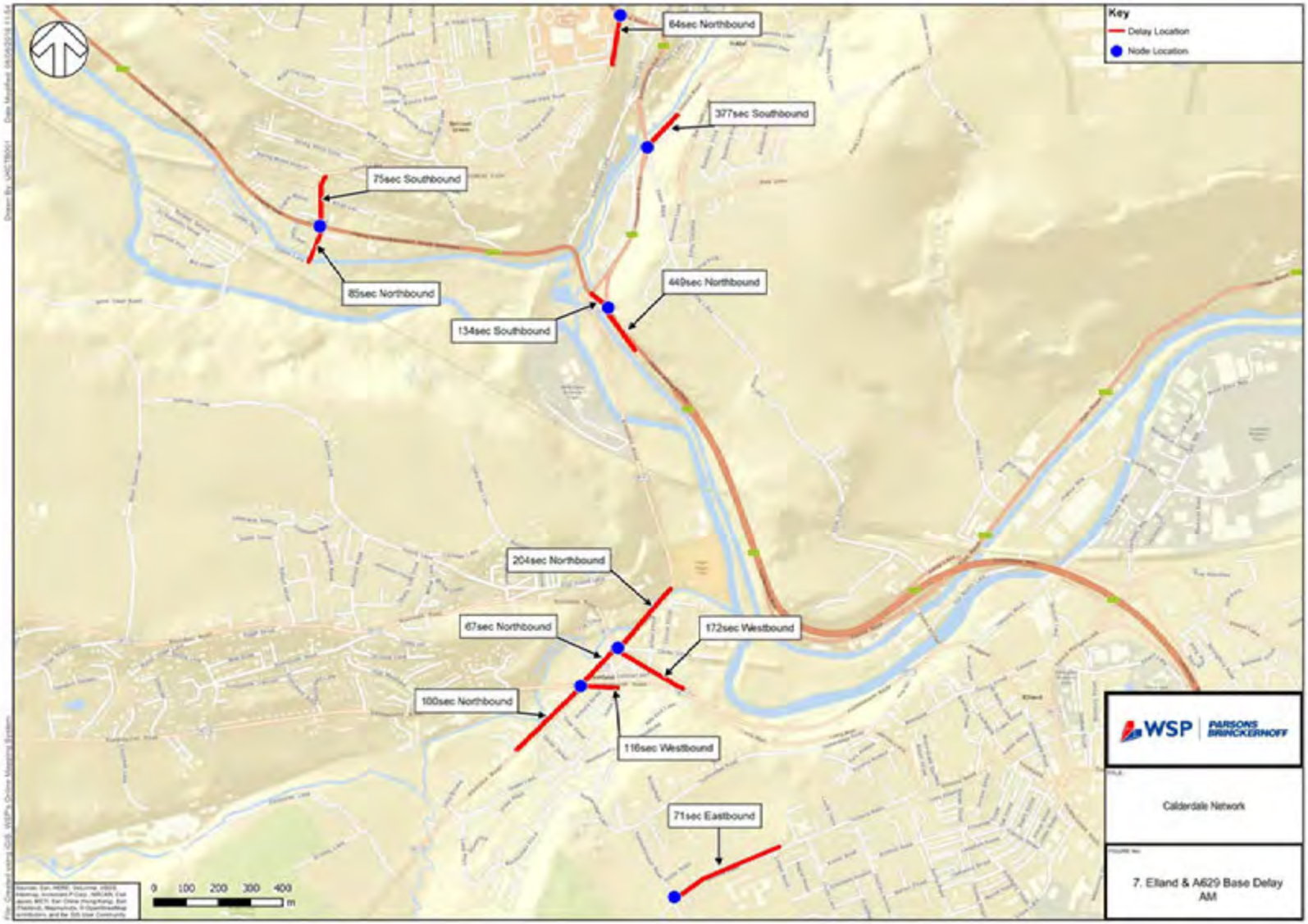
BRIGHOUSE AM


Key
Delay Location
Node Location
140sec Southbound
62sec Southbound
167sec Southbound
66sec Northbound
72sec Eastbound
0 50 100 150 200
m
WSP
PARSONS BRINCKERHOFF
Calderdale Network
3. Brighouse Base Delay AM


Key
Delay Location
Node Location
96sec Southbound
147sec Southbound
101sec Southbound
67sec Southbound
298sec Southbound
114sec Northbound
112sec Northbound
150sec Eastbound
64sec Northbound
64sec Eastbound
64sec Westbound
WSP
PARSONS BRINCKERHOFF
Calderdale Network
4. Brighouse Forecast Delay AM
0 50 100 150 200
m

APPENDIX A-2

ELLAND AND A629 AM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Delay Location
Node Location
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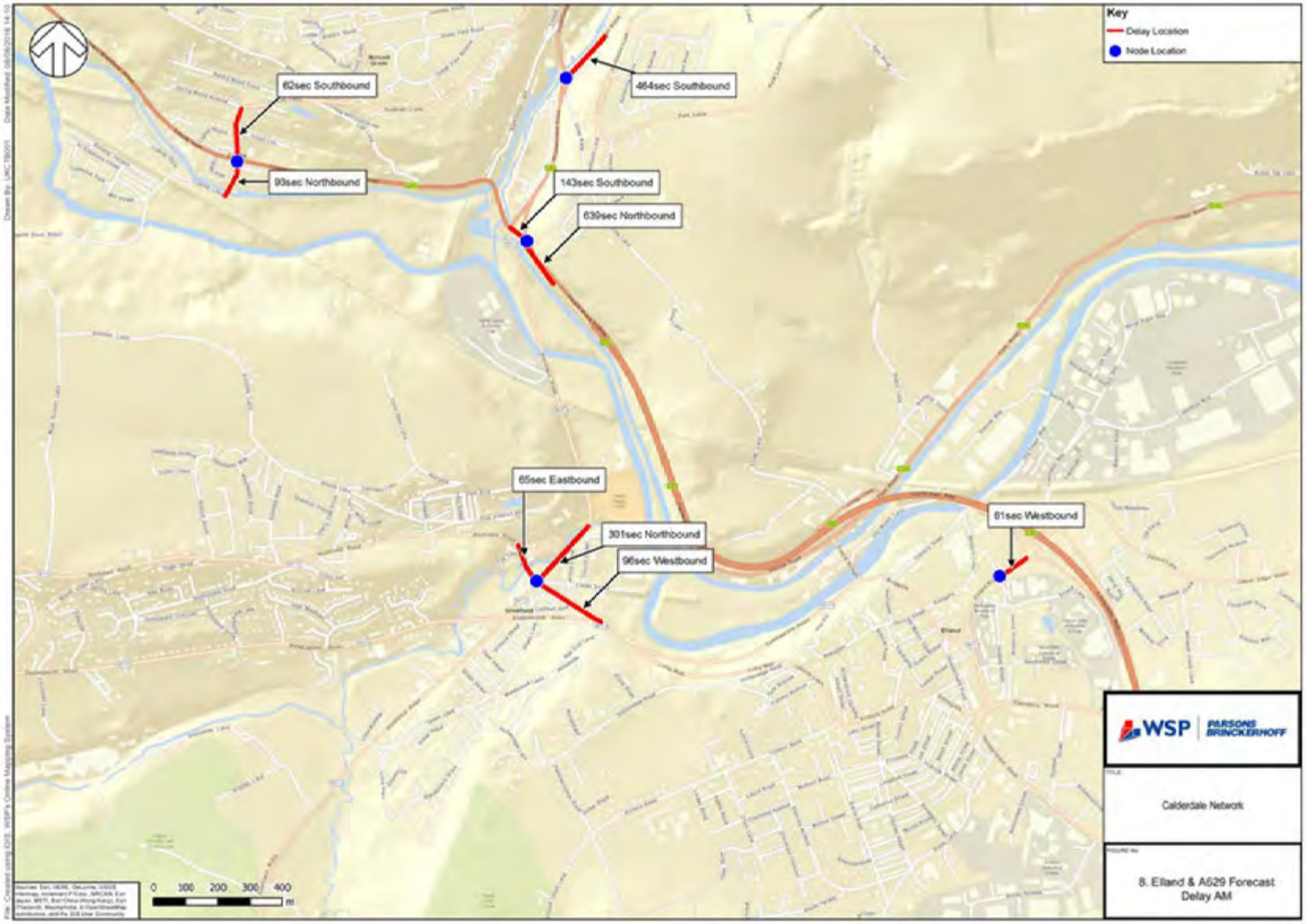
75sec Southbound
85sec Northbound
134sec Southbound
449sec Northbound
204sec Northbound
67sec Northbound
172sec Westbound
100sec Northbound
116sec Westbound
71sec Eastbound
0 100 200 300 400
m
WSP | PARSONS BRINCKERHOFF
Calderdale Network
7. Elland & A629 Base Delay AM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Delay Location
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464sec Southbound
143sec Southbound
639sec Northbound
65sec Eastbound
301sec Northbound
96sec Westbound
61sec Westbound
0 100 200 300 400
m
WSP | PARSONS BRINCKERHOFF
Calderdale Network
8. Elland & A629 Forecast Delay AM

APPENDIX A-3

HIPPERHOLME AM

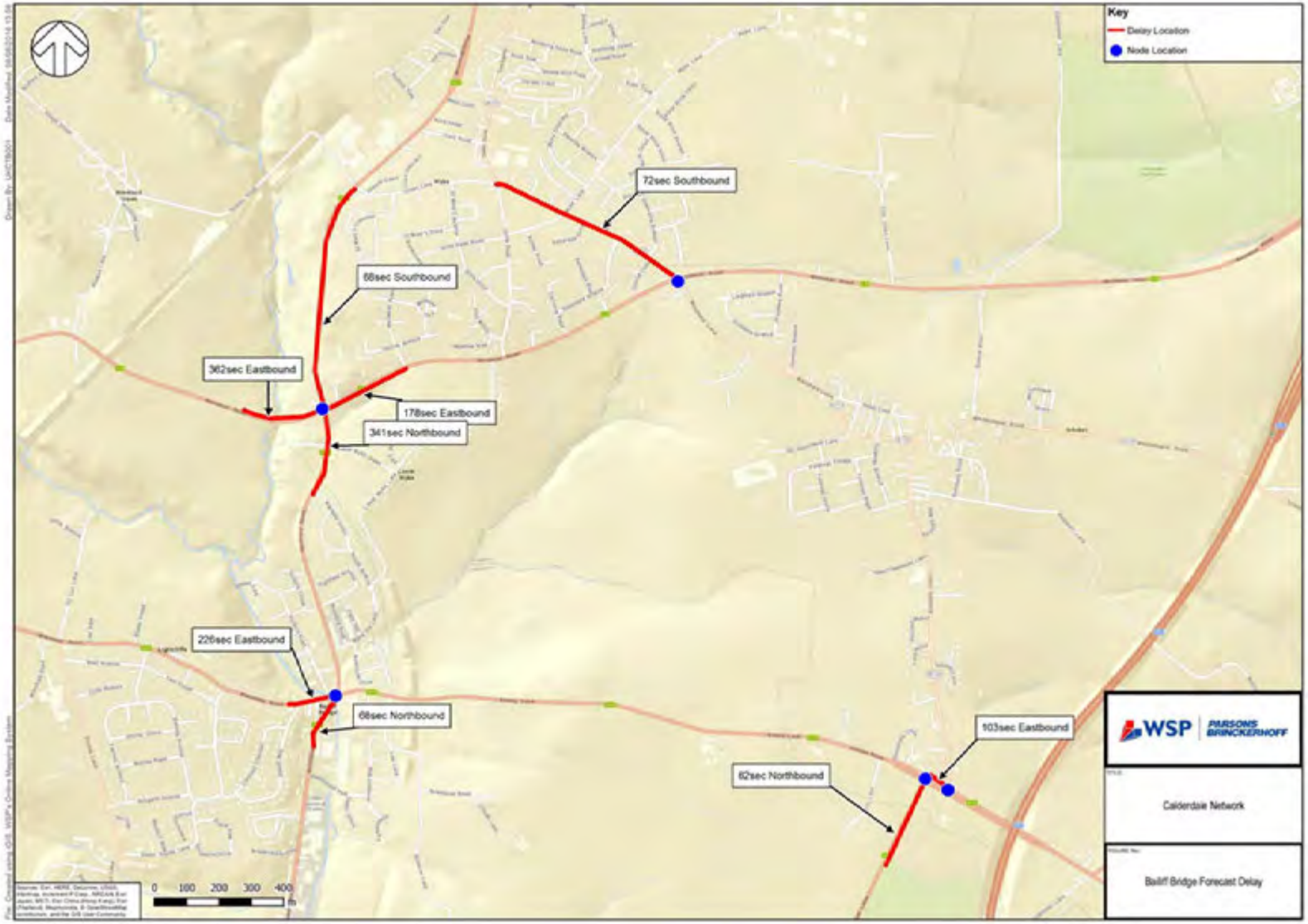

Key
Delay Location
Node Location
68sec Southbound
84sec Southbound
61sec Eastbound
146sec Westbound
85sec Westbound
92sec Northbound
0 50 100 150 200
m
WSP
PARSONS BRINCKERHOFF
Calderdale Network
5. Hipperholme Base Delay AM


Key
Delay Location
Node Location
72sec Southbound
72sec Southbound
118sec Southbound
62sec Southbound
76sec Southbound
69sec Eastbound
84sec Westbound
147sec Northbound
153sec Westbound
100sec Westbound
163sec Westbound
244sec Westbound
293sec Northbound
0 50 100 150 200
m
Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), Mapmyindia, © OpenStreetMap contributors, and the GIS User Community
WSP | PARSONS BRINCKERHOFF
TITLE:
Calderdale Network
FIGURE No:
6. Hipperholme Forecast Delay AM
File: Created using iGIS, WSP's Online Mapping System
Drawn By: UKCTB001
Date Modified: 08/08/2016 13:51

APPENDIX A-4

BAILIFF BRIDGE / WYKE LION AM


Key
Delay Location
Node Location
80sec Eastbound
75sec Eastbound
0 100 200 300 400
m
WSP
PARSONS BRINCKERHOFF
Calderdale Network
Bailiff Bridge Base Delay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Delay Location
Node Location
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362sec Eastbound
178sec Eastbound
341sec Northbound
226sec Eastbound
68sec Northbound
103sec Eastbound
82sec Northbound
WSP
PARSONS BRINCKERHOFF
Calderdale Network
Bailiff Bridge Forecast Delay
0 100 200 300 400

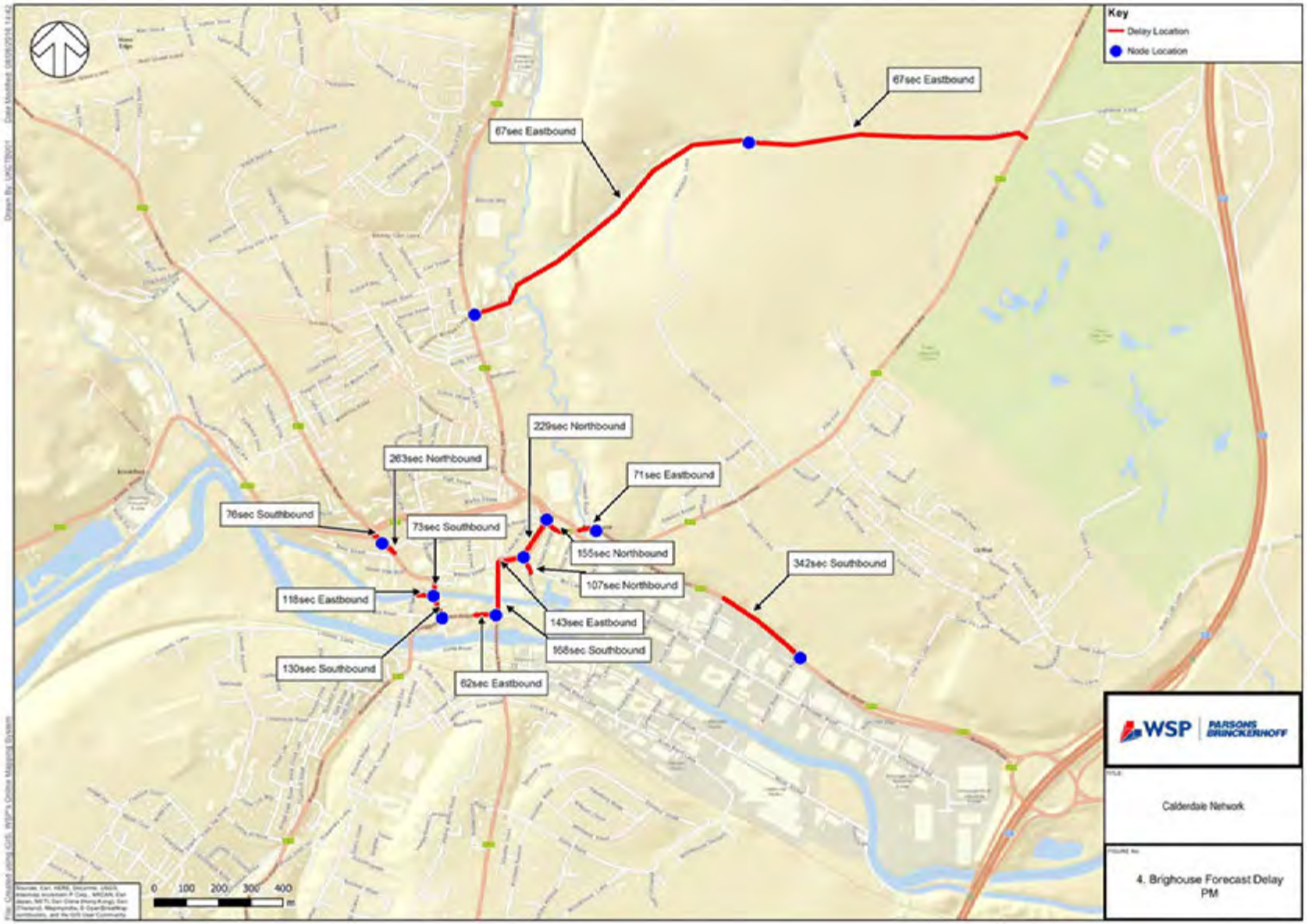
Appendix B

STAGE 5A (INITIAL MODELLING) BASE AND FORECAST MODELLED DELAYS PM

APPENDIX B-1

BRIGHOUSE PM


Key
Delay Location
Node Location
83sec Northbound
76sec Northbound
77sec Southbound
76sec Southbound
64sec Southbound
62sec Eastbound
WSP
PARSONS BRINCKERHOFF
Calderdale Network
3. Brighouse Base Delay PM
0
50
100
150
200
m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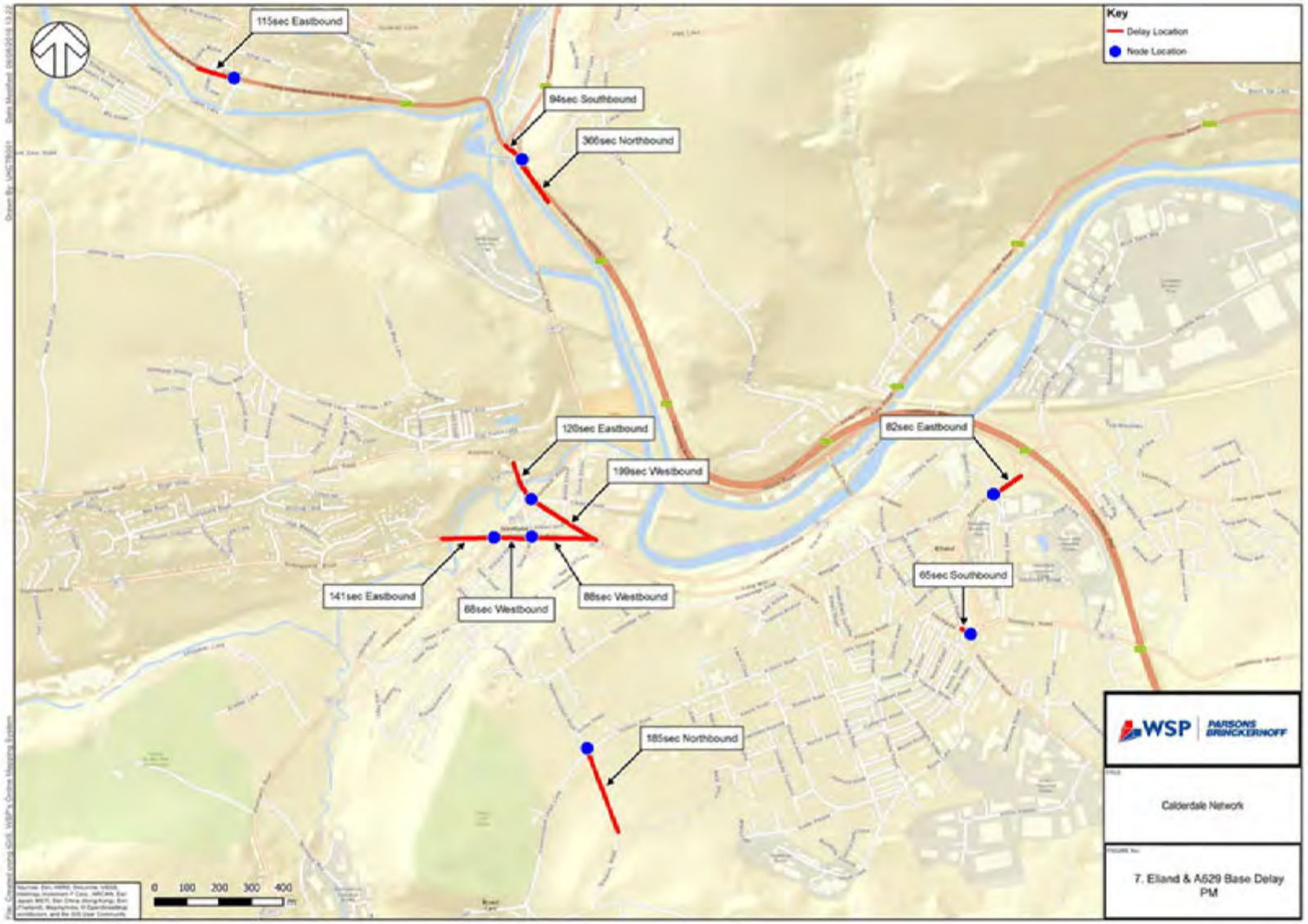
263sec Northbound
71sec Eastbound
76sec Southbound
73sec Southbound
155sec Northbound
342sec Southbound
107sec Northbound
118sec Eastbound
143sec Eastbound
168sec Southbound
130sec Southbound
62sec Eastbound
0 100 200 300 400
m
WSP | PARSONS BRINCKERHOFF
Caldendale Network
4. Brighouse Forecast Delay PM

APPENDIX B-2

ELLAND AND A629 PM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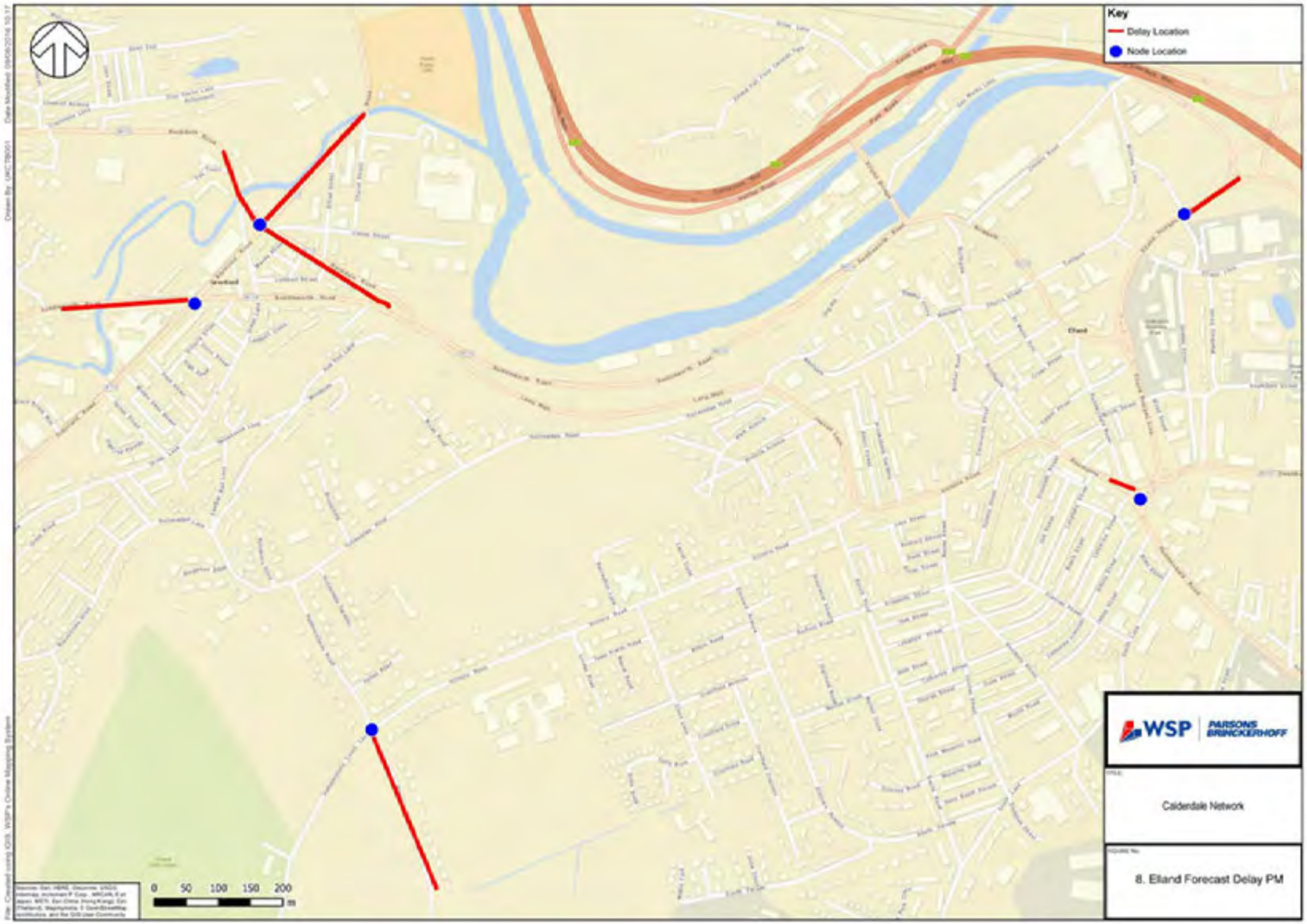
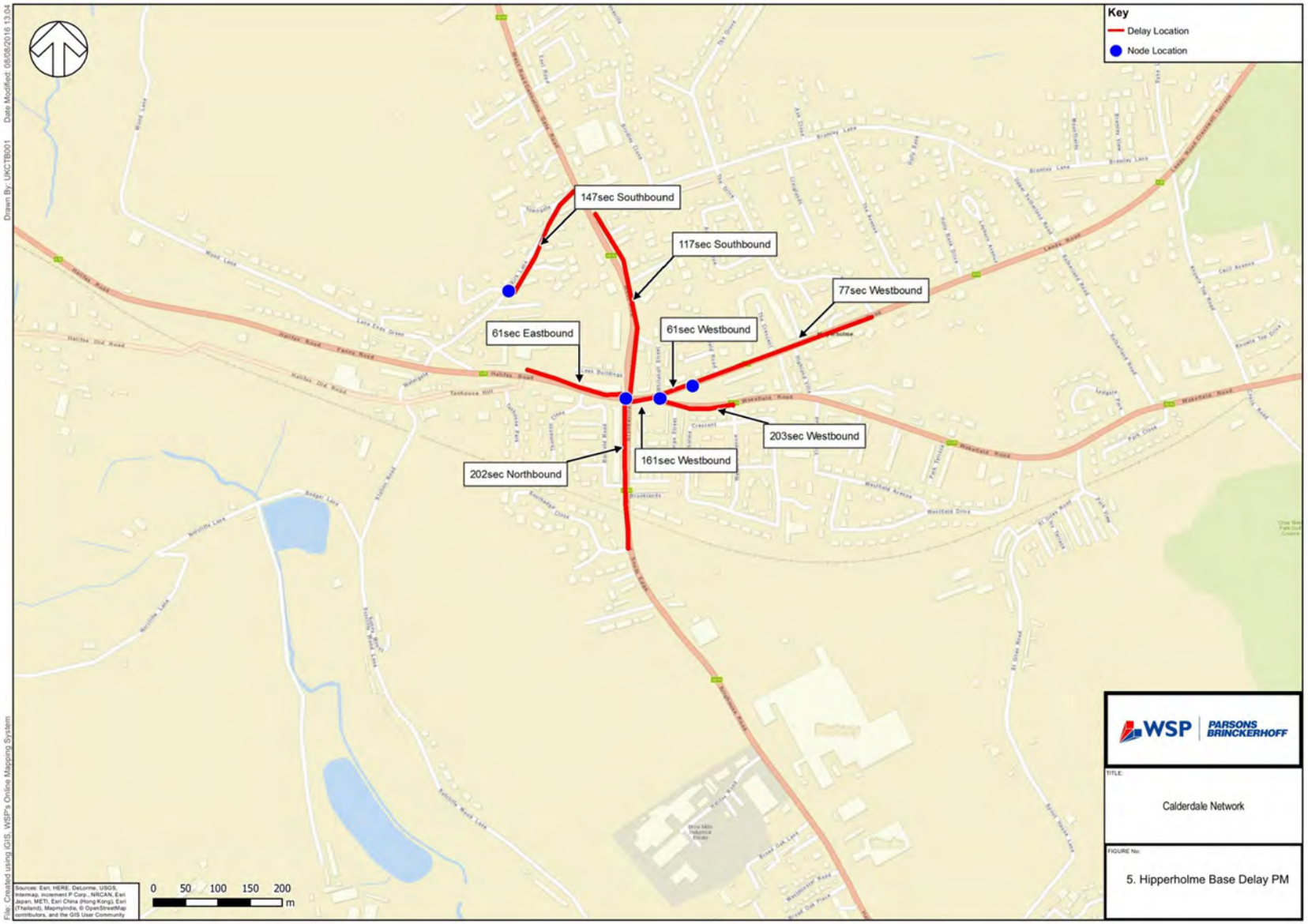
82sec Eastbound
141sec Eastbound
68sec Westbound
88sec Westbound
65sec Southbound
185sec Northbound
Key
Delay Location
Node Location
0 100 200 300 400
m
WSP | PARSONS BRINCKERHOFF
Calderdale Network
7. Elland & A629 Base Delay PM


Key
Delay Location
Node Location
0 50 100 150 200
m
WSP
PARSONS BRINCKERHOFF
Calderdale Network
8. Elland Forecast Delay PM

APPENDIX B-3

HIPPERHOLME PM


Key
Delay Location
Node Location
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77sec Westbound
61sec Eastbound
61sec Westbound
203sec Westbound
161sec Westbound
202sec Northbound
WSP | PARSONS BRINCKERHOFF
TITLE:
Calderdale Network
FIGURE No:
5. Hipperholme Base Delay PM
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Date Modified: 08/08/2016 13:04
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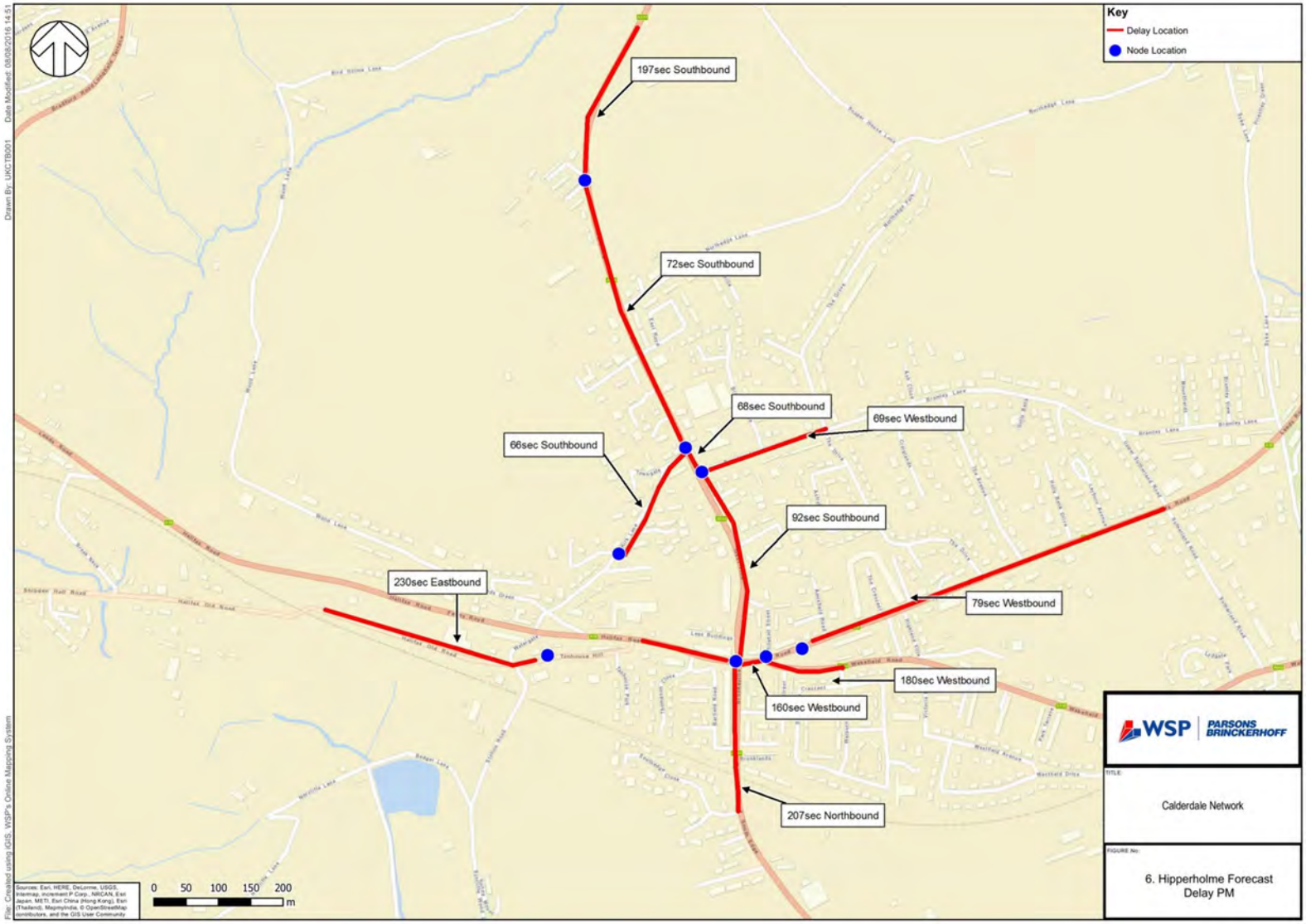
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Delay Location
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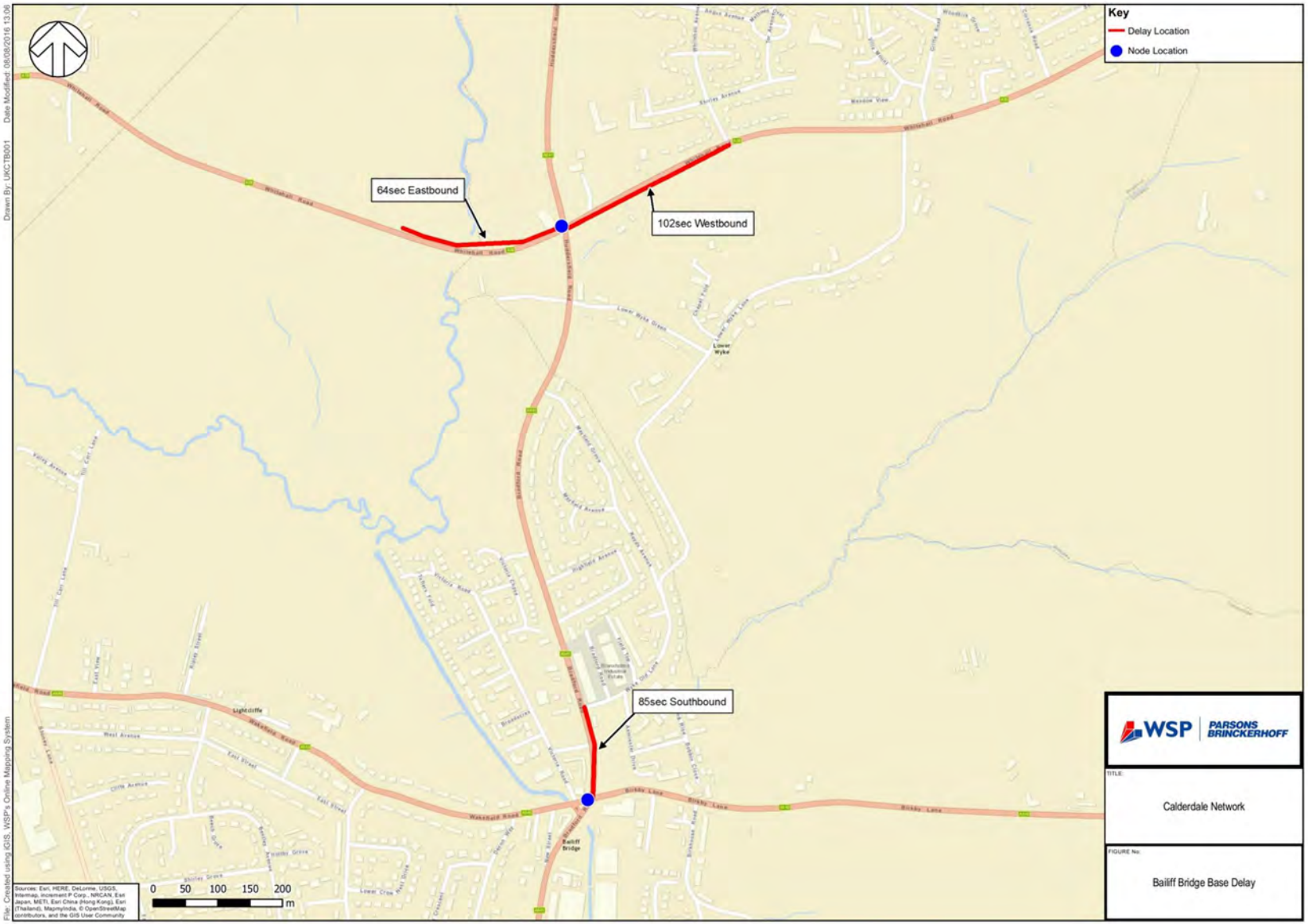
69sec Westbound
66sec Southbound
92sec Southbound
230sec Eastbound
79sec Westbound
180sec Westbound
160sec Westbound
207sec Northbound
0 50 100 150 200
m
WSP | PARSONS BRINCKERHOFF
TITLE:
Calderdale Network
FIGURE No:
6. Hipperholme Forecast Delay PM
Date Modified: 08/08/2016 14:51
Drawn By: UKCTB001
File: Created using iGIS, WSP's Online Mapping System

APPENDIX B-4

BAILIFF BRIDGE / WYKE LION PM


Key
Delay Location
Node Location
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102sec Westbound
85sec Southbound
Whitehall Road
Wakefield Road
Bailiff Bridge
Lower Wyke
Lightcliffe
Bradley Lane
0 50 100 150 200
m
WSP
PARSONS BRINCKERHOFF
TITLE:
Calderdale Network
FIGURE No:
Bailiff Bridge Base Delay
Date Modified: 08/08/2016 13:06
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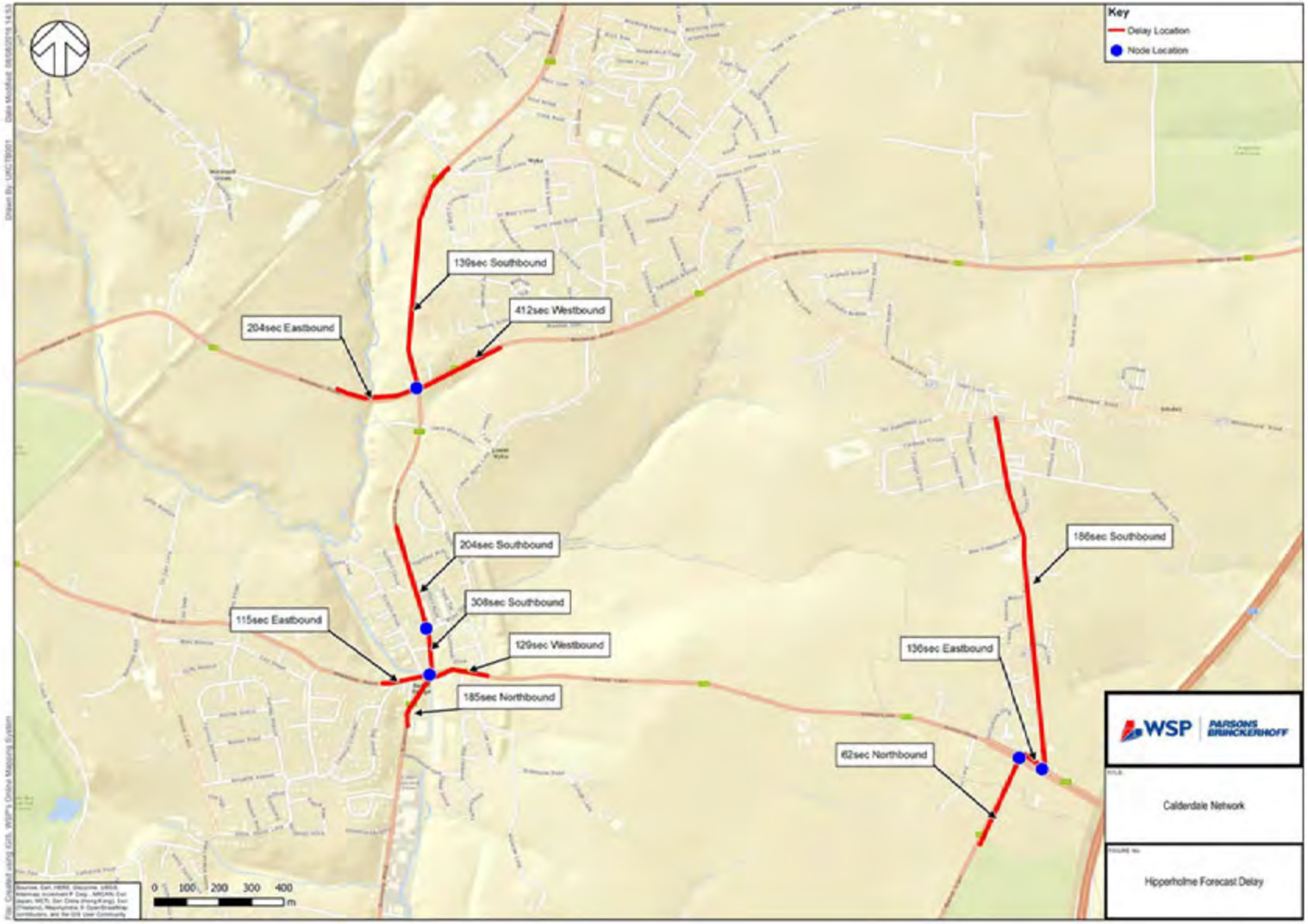
Key
Delay Location
Node Location
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204sec Eastbound
204sec Southbound
308sec Southbound
115sec Eastbound
129sec Westbound
185sec Northbound
186sec Southbound
136sec Eastbound
62sec Northbound
0 100 200 300 400
m
WSP
PARSONS BRINCKERHOFF
Calderdale Network
Hipperholme Forecast Delay

Appendix C

LOG OF DEVELOPMENT SITES MODELLED

APPENDIX C-1

RESIDENTIAL SITES MODELLED

2032 Calderdale Housing Sites

Local_Plan	Property_N	Road_Stree		Locality	Town	Postcode	Eastings	Northings	Site_Area	2016 to 2032
11	Tenterfields	Burnley Road	Tenterfields Burnley Road	Luddenden Foot	Halifax	HX2 6	404193	424221	2.475944996	68
26	The Gate Farm	Saddleworth Road	The Gate Farm Saddleworth Road	Greetland	Elland	HX4 8NW	407821	421053	2.129431248	64
44	Cemetery Lane	Lower Bentley Royd	Cemetery Lane Lower Bentley Royd		Sowerby Bridge	HX6 1DN	405098	423487	2.943886177	112
174	End of	Wilton Street	End of Wilton Street		Brighouse	HD6 2QY	413661	423455	2.818701029	87
177	Land adjacent Ellstones Place	Saddleworth Road	Land adjacent Ellstones Place Saddleworth Road	Greetland	Elland	HX4 9LG	408707	420894	9.999304638	279
220	Land off	Lower Edge Road	Land off Lower Edge Road		Elland	HX5 9PL	412258	421118	5.865376949	176
221	Land off		Land off	Northowram	Halifax	HX3	410991	426516	2.027377231	63
234	Swinton	Hays Lane	Swinton Hays Lane	Mixenden	Halifax		406344	429119	3.320017338	75
261	Land at	Turner Avenue South	Land at Turner Avenue South	Ovenden	Halifax		407025	427687	2.710635424	102
435	Land off	Sowerby New Road	Land off Sowerby New Road	Sowerby	Sowerby Bridge	HX6 3BJ	405289	422976	1.90772299	57
452	Land at Ovenden Green		Land at Ovenden Green	Ovenden	Halifax		408077	426567	2.452633858	72
523	Land at	Furness Avenue	Land at Furness Avenue	Ovenden	Halifax		406979	427994	3.365128756	101
531	Land off Whitehill Road	Keighley Road	Land off Whitehill Road Keighley Road	Illingworth	Halifax		407272	428224	7.196401119	209
568	Land south of Clough Lane	Rear of New Hey Road	Land south of Clough Lane Rear of New Hey Road	Rastrick	Brighouse	HD6	413386	420557	4.681541443	84
573	Land adjacent Mill Royd Street	Mill Royd Street	Land adjacent Mill Royd Street Mill Royd Street		Brighouse	HD6	414516	422643	3.085552692	71
579	126- 128	Bradford Road	126- 128 Bradford Road		Brighouse		414616	423634	0.422444016	60
640	Land off The Hollins	Stansfield Hall Road	Land off The Hollins, Stansfield Hall Road		Todmorden	OL14	393904	424796	1.321891427	59
651	Land off	Stoney Royd Lane	Land off Stoney Royd Lane		Todmorden		392754	425479	1.707069635	61
688	Land at	Bank Top/Common Lane	Land at Bank Top/Common Lane		Halifax	HX3 9PD	410644	424391	1.66208148	60
766	Land Off	Hall Lane	Land Off Hall Lane	Northowram	Halifax	HX3 7SN	410912	427503	5.813998699	170
773	Land Adjacent	Green Lane	Land Adjacent Green Lane	Illingworth	Halifax	HX2 9HZ	407580	429605	3.62982893	109
781	Land off	Raw Lane/Abbey Park Road	Land off Raw Lane/Abbey Park Road	Illingworth	Halifax		406882	428424	2.106795788	63
782	Land off	Cockhill Lane	Land off Cockhill Lane	Shelf	Halifax		411716	428652	5.850574017	176
815	Works Depot	Stannary Place	Works Depot Stannary Place		Halifax		408845	425657	1.431159496	64
856	Land off	West Lane	Land off West Lane	Southowram	Halifax		411070	423486	4.067766666	122
893	Boothroyd Farm	Boothroyd Lane	Boothroyd Farm Boothroyd Lane	Rastrick	Brighouse	HD6 3JW	413035	421842	13.06718824	225
914	Land Opposite 46-48	Hollins Road	Land Opposite 46-48 Hollins Road	Walsden	Todmorden	OL14 8BJ	393184	422460	2.016149759	46
945	Pond Quarry	Lightcliffe Road	Pond Quarry Lightcliffe Road		Brighouse	HD6 2JJ	414074	423953	1.81797564	65
948	Land at Rose Cottage Farm	Green Lane	Land at Rose Cottage Farm Green Lane	Shelf	Halifax	HX3 7TR	413017	428675	5.400883198	162
949	Carr House Farm		Carr House Farm	Shelf	Halifax	HX3 7RJ	412984	428871	4.197815418	126
950	Beacon Lodge Quarry	Long Lane	Beacon Lodge Quarry Long Lane		Halifax		410436	424846	5.945033737	54
952	Land at New Gate Farm	Saddleworth Road	Land at New Gate Farm Saddleworth Road	Greetland	Elland		407967	420816	10.63207912	276
968	Land at West End Golf Club	Paddock Lane	Land at West End Golf Club Paddock Lane	Highroad Well	Halifax	HX2 0NT	406574	425584	2.717568874	81
978	Land off	Lower Edge Road/Shaw Lane	Land off Lower Edge Road/Shaw Lane		Elland	HD6 3JN	412036	421508	8.278137207	248
988	The Whitehouse	12 Walt Royd	The Whitehouse 12 Walt Royd	Wheatley	Halifax	HX2 8TY	406759	427392	4.065433025	122
1009	Site of demolished School	Clough Lane / Brow Bottom Lane	Site of demolished School Clough Lane / Brow Bottom Lane	Mixenden	Halifax	HX2	405875	428441	1.516876101	54
1014	Scausby Hall	School Lane	Scausby Hall School Lane	Bradshaw	Halifax	HX2 9XD	407807	429654	2.092532873	63
1016	Land adjacent to	St Johns Cross Farm	Land adjacent to St Johns Cross Farm	Bradshaw	Halifax	HX2 9UT	408273	429679	3.446134806	89
1017	Land off	School Lane	Land off School Lane	Bradshaw	Halifax	HX2 9UT	408086	429423	13.18525791	395
1033	Land off	Toothill Bank	Land off Toothill Bank	Rastrick	Brighouse	HD6	413889	421361	3.302875996	80
1034	Land off Soaper Lane		Land off Soaper Lane	Shelf	Halifax	HX3 7PT	412581	429215	1.970316172	71
1036	Land at Shelf Cricket Ground	Carr House Lane	Land at Shelf Cricket Ground Carr House Lane	Shelf	Halifax		412732	429098	2.503756762	90
1044	Hud Hill Farm		Hud Hill Farm	Northowram	Halifax	HX3 7LH	411515	428040	1.882529874	87
1046	Land adjacent 44	Northowram Green	Land adjacent 44 Northowram Green	Northowram	Halifax	HX3 7SL	411332	427675	1.188833833	53
1078	Land between	Dewsbury Road and New Hey Road	Land between Dewsbury Road and New Hey Road	Rastrick	Brighouse	HD6	413023	420974	26.54831314	275
1082	Land at	Whitwell Green Lane	Land at Whitwell Green Lane		Elland	HX5	411617	420954	3.099854708	52
1095		Halifax Road	Halifax Road	Hove Edge	Brighouse	HD6	413404	423975	5.130259993	154
1103	Lumbrook Mills	Westercroft Lane	Lumbrook Mills Westercroft Lane	Northowram	Halifax	HX3 7TY	411844	426839	24.5544796	72
1133	Land off	Sedbergh Road and Siddal New Road	Land off Sedbergh Road and Siddal New Road		Halifax	HX3 9HB	409794	424226	4.347738743	86
1147	Victoria Reservoir	Gibbet Street	Victoria Reservoir Gibbet Street		Halifax		407466	425024	1.668107033	67
1216	Land off	Mill Lane and Old Lane	Land off Mill Lane and Old Lane	Boothtown	Halifax	HX2 0HT	408641	426966	9.539520264	195
1225	Calderside Works	Off Burnley Road	Calderside Works Off Burnley Road	Luddenden Foot	Halifax	HX2 6	403807	424574	3.167512178	80
1229		Near Royd	Near Royd	Ovenden	Halifax	HX3 5QP	408438	427383	21.00940132	370
1311	Four Fields	Cousin Lane	Four Fields Cousin Lane	Ovenden	Halifax		407206	427154	6.324202538	56
1322	George Street		George Street	Rastrick	Brighouse		414305	422482	0.287825942	50
1357		Reins Road	Reins Road	Rastrick	Brighouse		413372	422000	1.602809906	58
1398	Land on the West Side of Brockwell Lane		Land on the West Side of Brockwell Lane	Triangle	Sowerby Bridge	HX6 3PQ	404758	422813	4.103375912	123
1429	Former St Catherines High School	Holdsworth Road	Former St Catherines High School Holdsworth Road	Holmfield	Halifax	HX2 9TH	408252	426829	2.834963083	85
1451	Land between	Bradley Wood and Woodhouse Lane	Land between Bradley Wood and Woodhouse Lane	Rastrick	Brighouse		415241	421333	62.99701309	1223
1453	Land Off	Lillands Lane	Land Off Lillands Lane	Rastrick	Brighouse		413513	422316	10.28771496	180
1463	Land between	Highmoor Lane and Bradford Road	Land between Highmoor Lane and Bradford Road		Brighouse		415493	423707	140.6648865	1926
1470	Land behind	West View	Land behind West View	Stainland	Elland		408293	419976	2.899252892	87
1472	Land west of	Ridge Hill	Land west of Ridge Hill		Brighouse		413287	422088	3.163453102	86
1523	Land at	Westercroft Lane	Land at Westercroft Lane	Northowram	Halifax	HX3 7EN	411722	427124	1.474361706	64
1541	Land off	Wakefield Road	Land off Wakefield Road	Lightcliffe	Brighouse	HX3 8UF	414465	425404	2.977489281	80
1543	Land North and North West of	Wade House Road	Land North and North West of Wade House Road	Shelf	Halifax		412049	428756	11.13701153	330
1547	Land at	Abbey Park	Land at Abbey Park	Illingworth	Halifax	HX2 9LQ	406949	429013	2.251770258	68
1567	Land to the North of Eland		Land to the North of Eland		Eland		410623	422016	37.48352432	616
1570	Land adjacent to	Moor End Road and Clough Lane	Land adjacent to Moor End Road and Clough Lane	Mixenden	Halifax		405680	428116	5.923285484	58
1583	Land at Soaper Lane		Land at Soaper Lane	Shelf	Halifax	HX3 7PR	412392	429405	9.264291763	241
C160201			1st, 2nd, 3rd and 4th floors, Southgate House, Wards Ends, Halifax.				409336	424976		90
N010155			Borough Band Club, Wharf Street, Brighouse.				414830	422646		60
N090111			Site of Box Trees Mill, Boy Lane, Wheatley, Halifax.				406757	427097		87
N140151			Site Of Former Sterne Mill & Sewage Works, Wakefield Road, Sowerby Bridge.				407563	423441		148
N030118			Land at former Blackley Brickworks, Blackley Road, Elland.				410399	419878		60

APPENDIX C-2

EMPLOYMENT SITES MODELLED

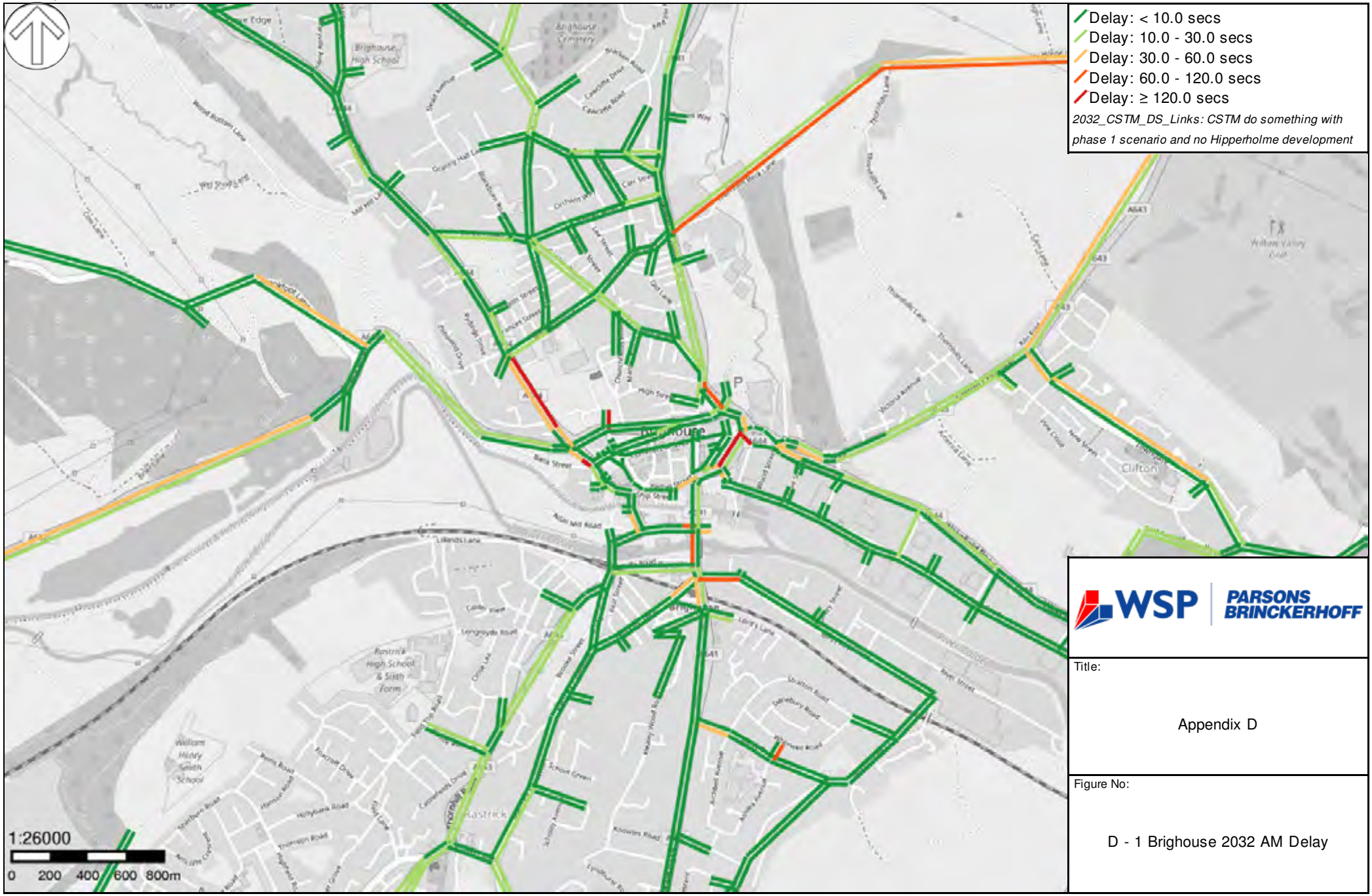
2032 Calderdale Employment Sites

Local Plan Site Ref	Reason for inclusion	Net area (ha) for employment use			Property Name/Number	Road/Street Name	Locality	Town	Postcode	Eastings	Northings	Site Area
LP0021	ELR 2012, New - LP initial assesment for employment or mixed use, CFS	4.93	B2	The original 'call for sites' submission proposed 5750m2 of commercial floorspace. A recent planning application by Cummings which was withdrawn proposed a total of 15,060m2 comprising 3,540m2 (B1a), 11,270m2 (B1), 4,250m2 (B8).	Land at Ainley Top	Brighouse Road	Ainley Top	Elland	HX2	412058	419695	6.99
LP0025	ELR 2012, New - LP initial assesment for employment or mixed use, CFS	0.82	B2 or B8 not yet identified		Land at Dewsbury Road	nr Clapgreas Cottages		Elland	HX5 9JU	411582	420657	1.68
LP0402	New - LP initial assesment for employment or mixed use, B & E support Employment or Mixed use	0.58	B1		Land off	Gas Works road		Sowerby Bridge		406768	423734	0.89
LP0429	New - LP initial assesment for employment or mixed use	0.64	B2		Land off	Bob Lane/Hubert Street	Highroad Well	Halifax		406966	425295	0.71
LP0472	New - LP initial assesment for employment or mixed use	0.7	B2		Land off	Lilly Lane		Halifax		409765	424843	0.78
LP0960	UDP Employment site, ELR 2012, New - LP initial site assesment for employment or mixed use, B & E support Employment or Mixed Use		B2		Land off	South Lane		Elland		410915	420095	5.66
LP0982	ELR 2012, New - LP initial assesent for employment or mixed use	0.96	B2		Land off	Stainland Road and Burnwood Way	Holywell Green	Elland	HX4	408893	420184	2.04
LP1078	ELR 2012, New - LP initial assesment for employment or mixed use, B & E support Employment or Mixed use, CFS	7.85	B1	Total site area for 'mixed use' is 26.55ha. 'Call for sites' submission proposes 12,000m of commercial/industrial floorspace on 5.6ha of the site. NLP suggest that a Mixed Use site could accommodate 9.2ha (gross) of B class employment in the SW corner of the site.	Land between	Dewsbury Road and New Hey Road	Rastrick	Brighouse	HD6	413023	420974	27.52
LP1087	New - LP initial assesment for employment or mixed use, B & E support Employment or Mixed use	1.60	B2			Church Street	West Vale	Elland	HX4 8LT	409877	421337	1.60
LP1139	ELR 2012, New - LP initial assesent for employment or mixed use, B & E support Employment or Mixed use, CFS	2.4	B2		Land off	Sudbergh Road and Siddal New Road		Halifax	HX3 9HB	409794	424226	4.35
LP1134	New - LP initial assesment for employment or mixed use, B & E support Employment or Mixed use	11,500 m2 B1, 1500 m2 B2	B1 and B2		Shaw Lodge Mill Complex	Shaw Lane		Halifax		409627	424123	1.41
LP1203	ELR 2012, CFS	1.72	B2		Star Garage	Wakefield Road	Copley	Halifax	HX3 0TD	408933	422494	1.72
LP1217	UDP Employment site, ELR 2012, New - LP initial site assesment for employment or mixed use, B & E support Employment or Mixed Use	1.25	B2		Land and Premises	HolmfieldIndustrial Estate	Holmfield	Halifax	HX2 9TN	408466	428978	2.93
LP1219	UDP Employment site, ELR 2012, New - LP initial site assesment for employment or mixed use, B & E support Employment or Mixed Use	6.15	B2		North of HolmfieldIndustrial Estate	HolmfieldIndustrial Estate		Halifax		408491	429502	6.80
LP1220	UDP Employment site, ELR 2012, New - LP initial site assesment for employment or mixed use, B & E support Employment or Mixed Use	3.22	B1		Adjacent Playfs	Wakefield Road	Copley	Halifax		407510	423712	4.02
LP1221	UDP Mixed Use site, ELR 2012	0.73	B2		EMG2	ArmitageRoad		Brighouse		416024	422203	0.73
LP1223	UDP Employment site, ELR 2012, New - LP initial site assesment for employment or mixed use, B & E support Employment or Mixed Use	2.52	B2		Lowfields	Lacy Way		Elland		411639	421920	5.07
LP1232	UDP Employment site, ELR 2012, New - LP initial site assesment for employment or mixed use, B & E support Employment or Mixed Use, CFS	20.46	B2 - 70%, B1 - 20%, B8 - 10%	Site is a major proposal within the LCR M62 Corridor Enterprise Zone	Land at	Wakefield Road/Clifton Common	Clifton	Brighouse	HD6	415606	422769	25.48
LP1431	LP 2nd stage assesment for mixed use , B & E support	0.22	B1/B2		Former Mayfield Garage	Queens Road	King Cross	Halifax		407891	424672	0.87
LP1502	New - LP initial assesment for emvoyment or mixed use	0.97	B2		part f a larger Mixed use sitevictoria Works	Victoria Road		Hebden Bridge		399233	427709	0.97
New J24a	nip new site	4.48	Range of B uses not yet identified									

Appendix D

AM 2032 MODELLED DELAYS

Printed by Chris Blackburn on 13 Feb 2017 15:21 UTC



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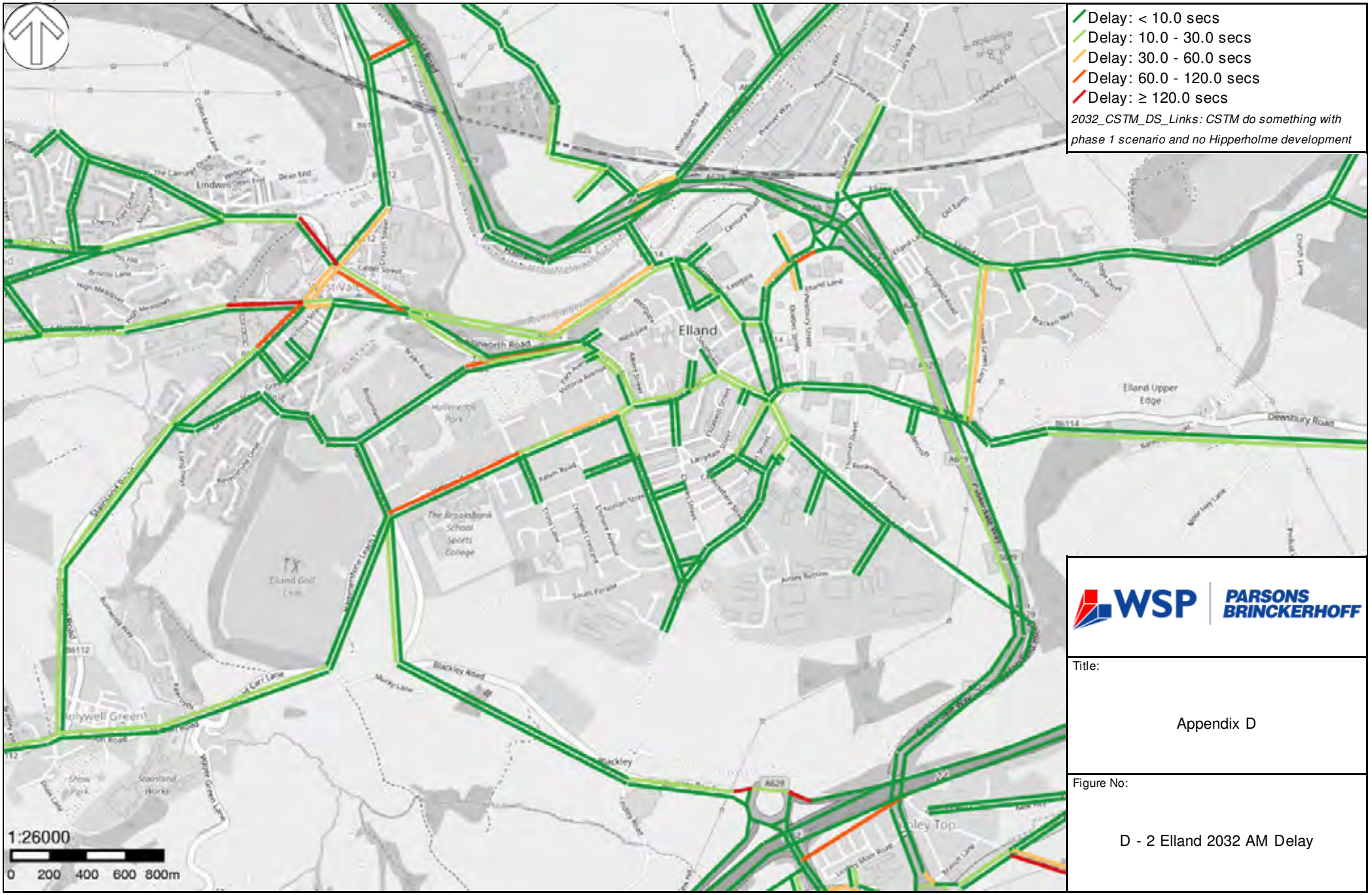
Title:

Appendix D

Figure No:

D - 1 Brighouse 2032 AM Delay

Printed by Chris Blackburn on 13 Feb 2017 15:41 UTC



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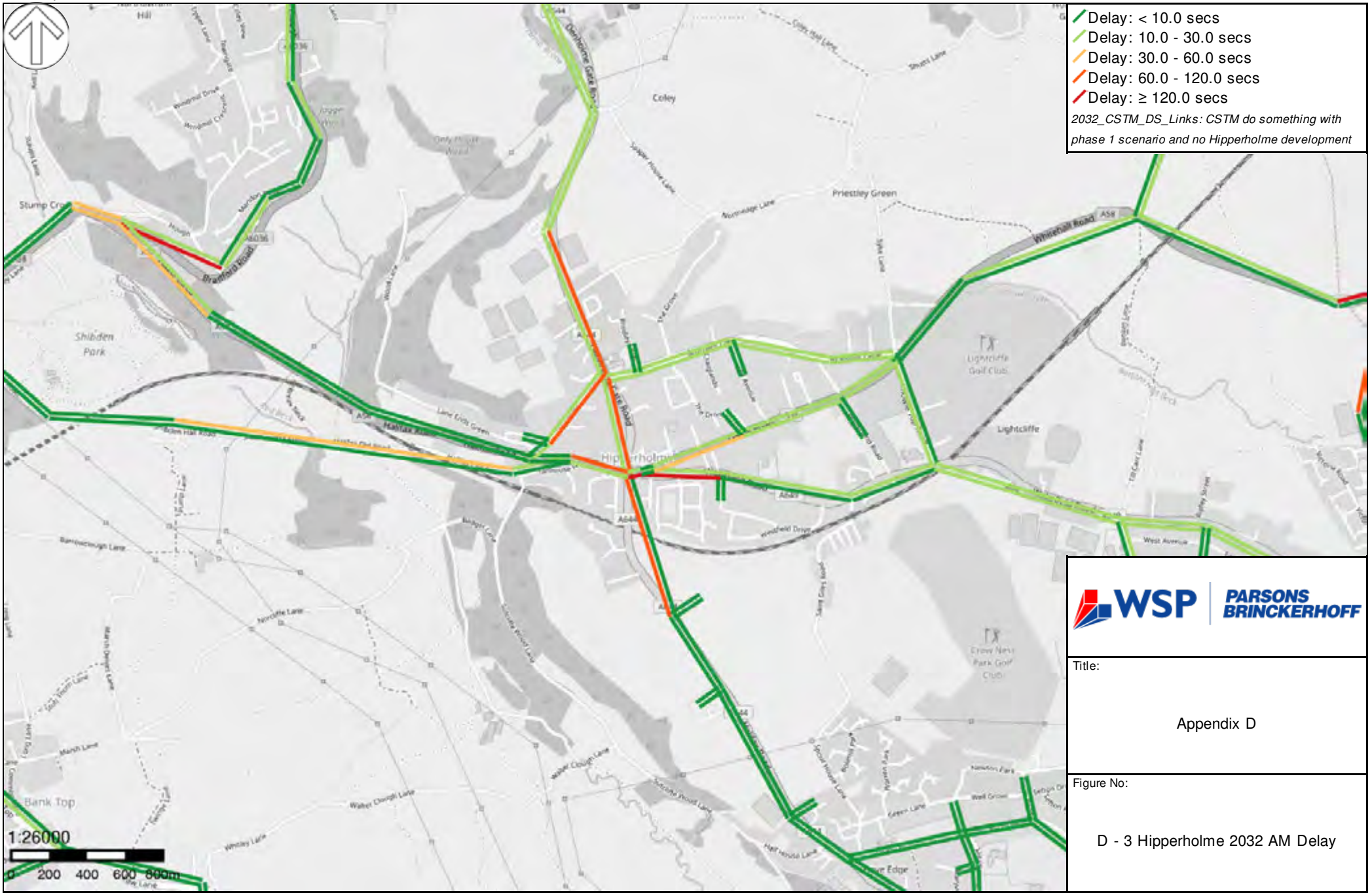
Title:

Appendix D

Figure No:

D - 2 Elland 2032 AM Delay

Printed by Chris Blackburn on 13 Feb 2017 15:42 UTC



WSP | PARSONS BRINCKERHOFF

Title:

Appendix D

Figure No:

D - 3 Hipperholme 2032 AM Delay

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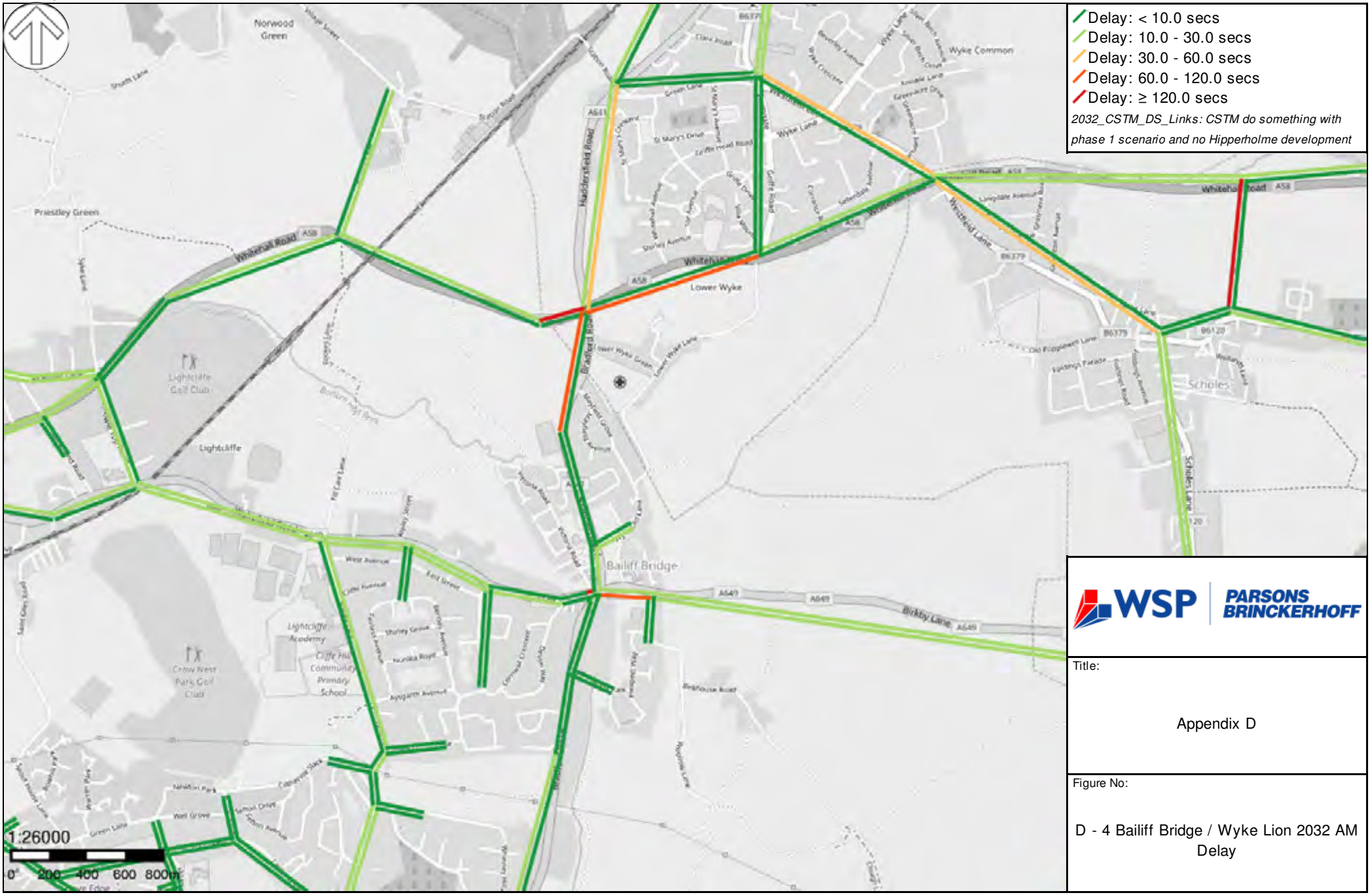

WSP | PARSONS BRINCKERHOFF

Title:

Appendix D

Figure No:

D - 4 Bailiff Bridge / Wyke Lion 2032 AM Delay

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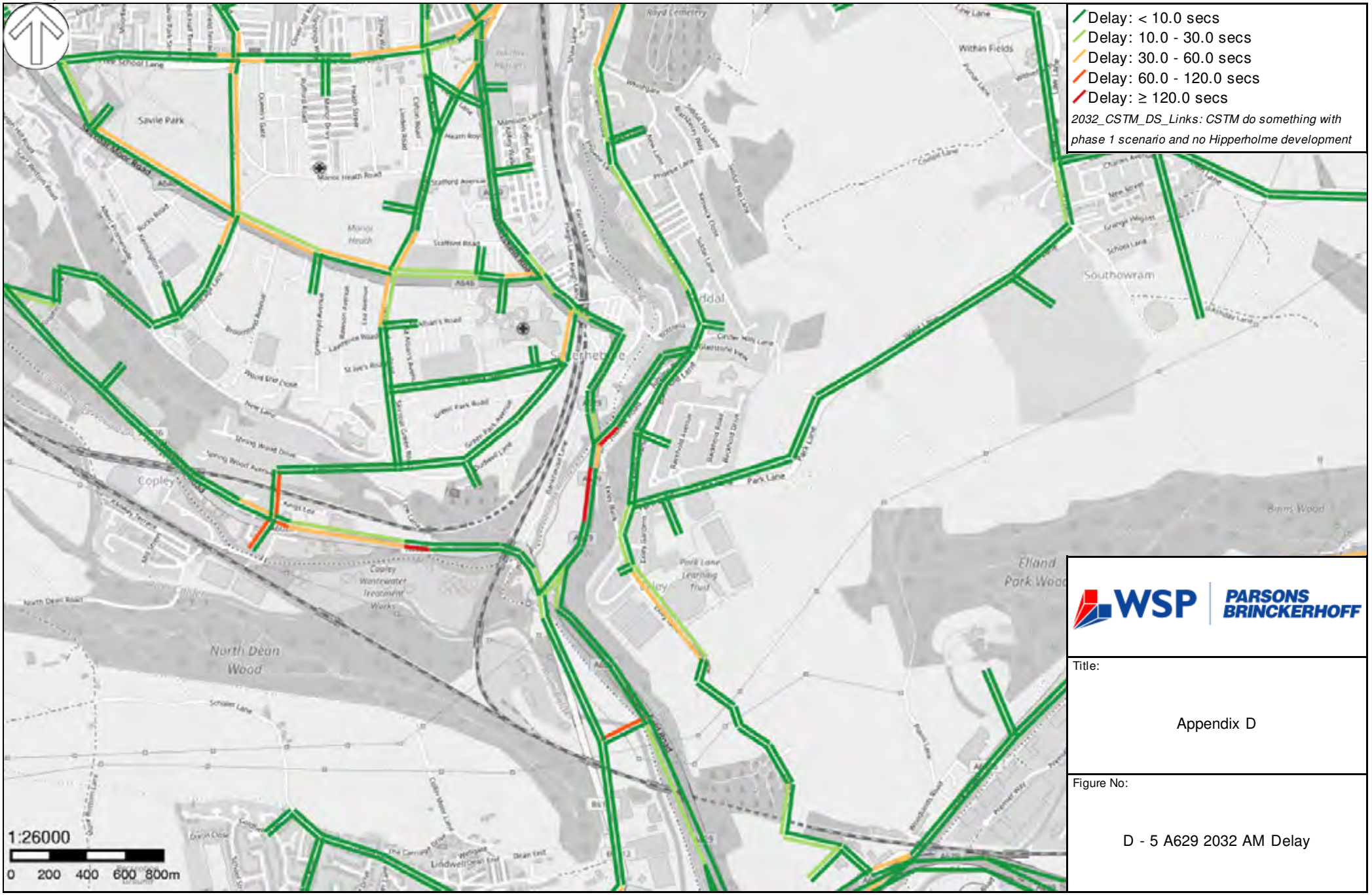

WSP | PARSONS BRINCKERHOFF

Title:

Appendix D

Figure No:

D - 5 A629 2032 AM Delay

Appendix E

PM 2032 MODELLED DELAYS

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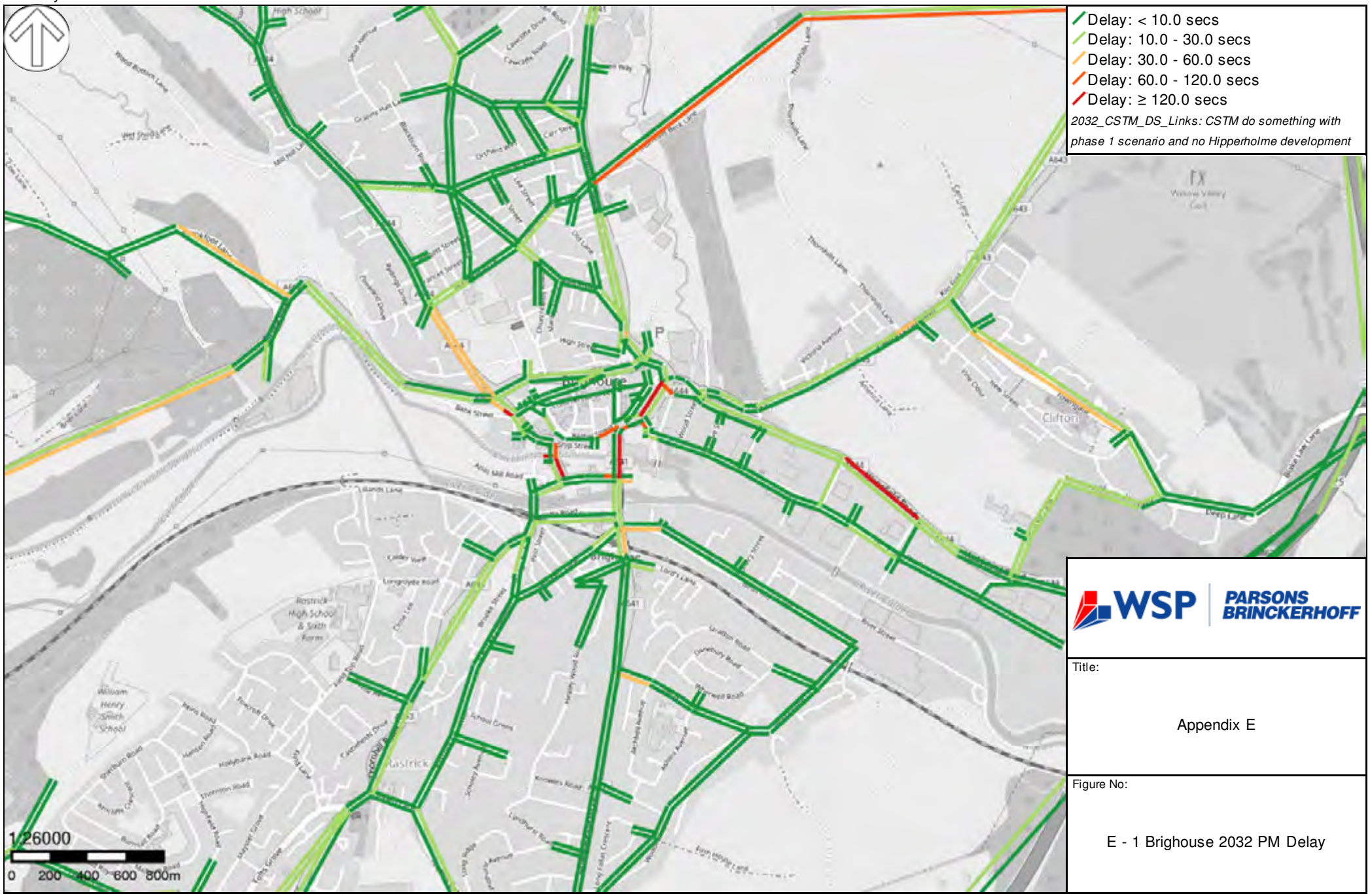

WSP | PARSONS BRINCKERHOFF

Title:

Appendix E

Figure No:

E - 1 Brighouse 2032 PM Delay

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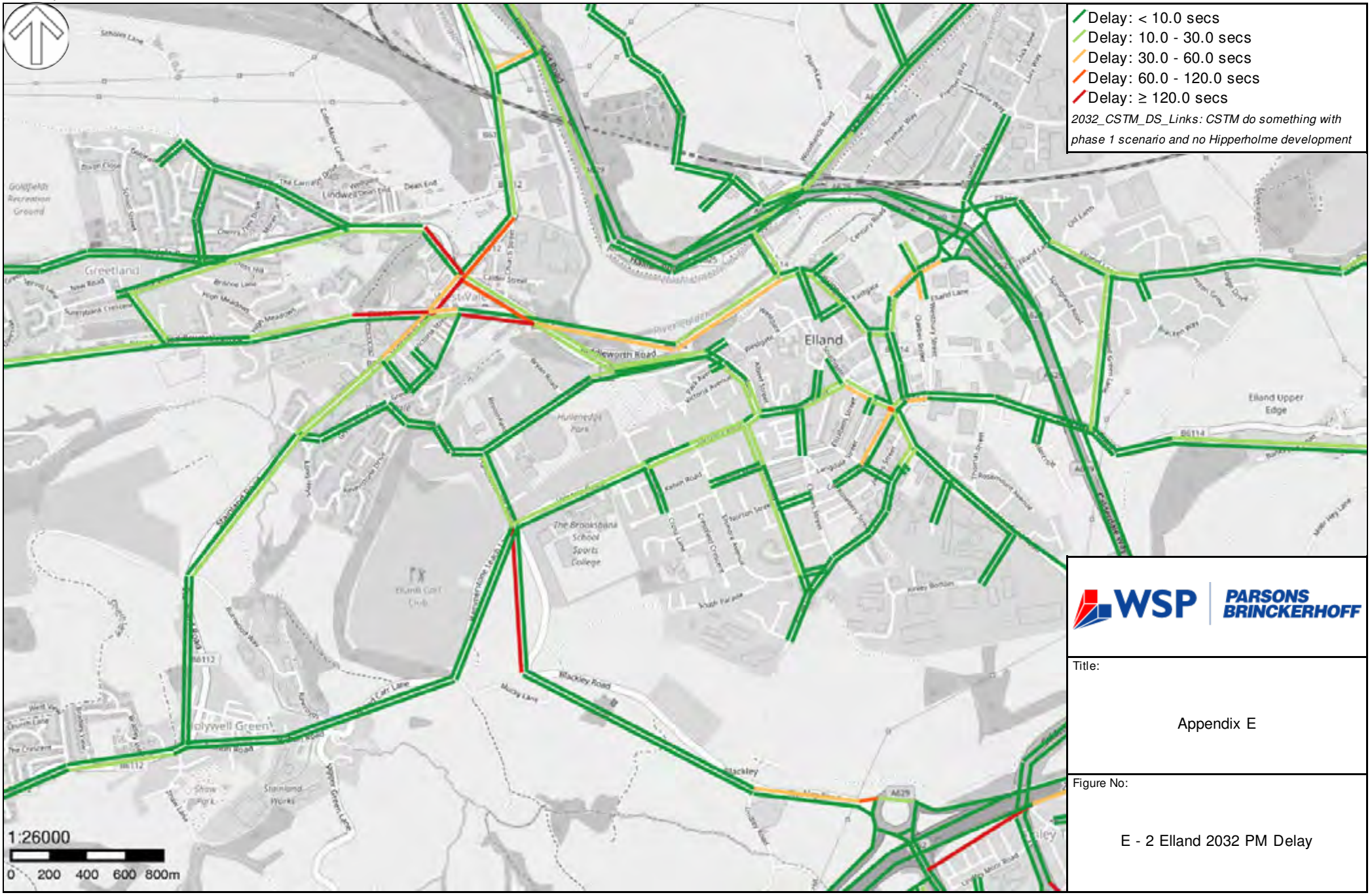

WSP | PARSONS BRINCKERHOFF

Title:

Appendix E

Figure No:

E - 2 Elland 2032 PM Delay

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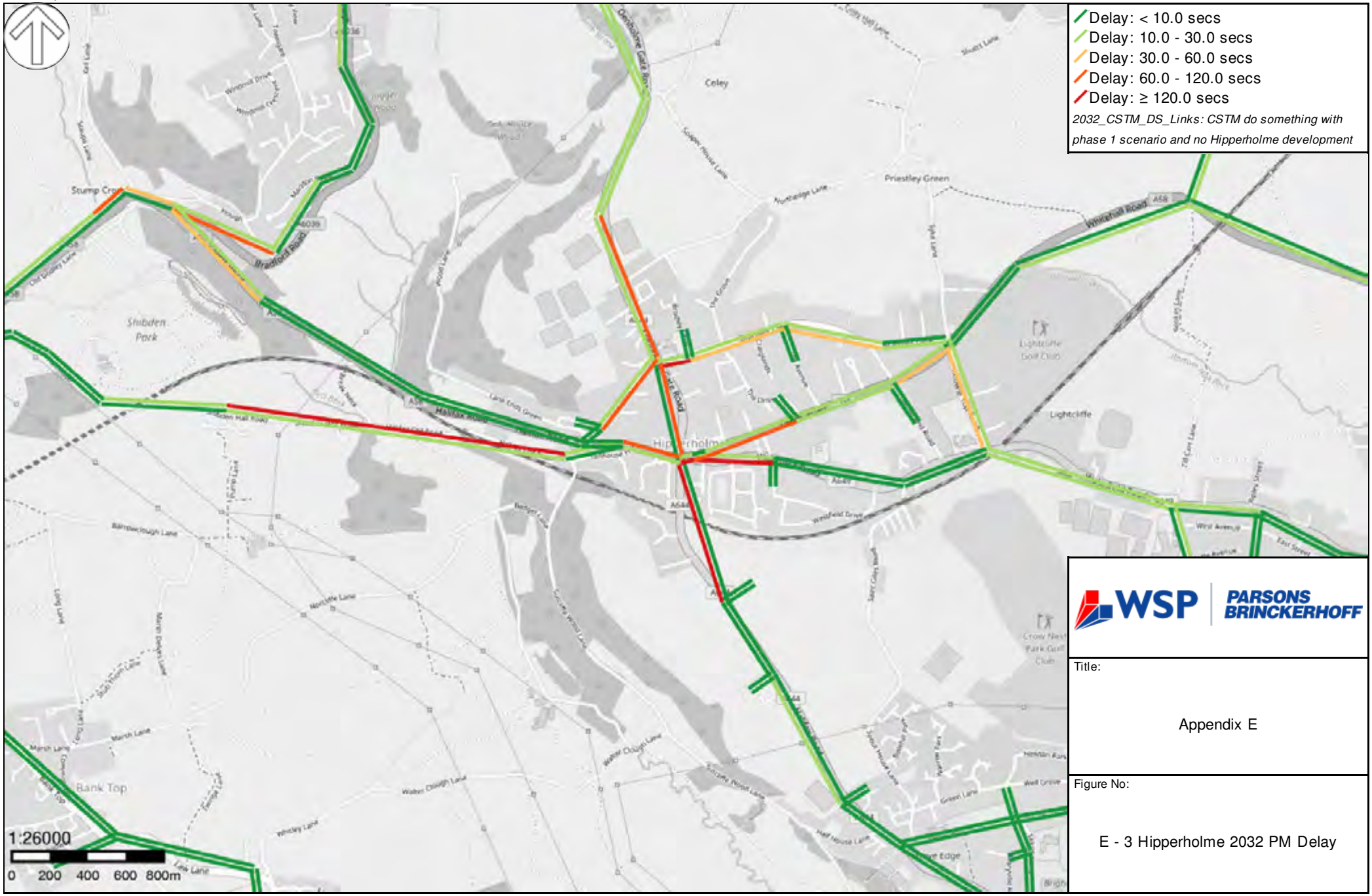

WSP | PARSONS BRINCKERHOFF

Title:

Appendix E

Figure No:

E - 3 Hipperholme 2032 PM Delay

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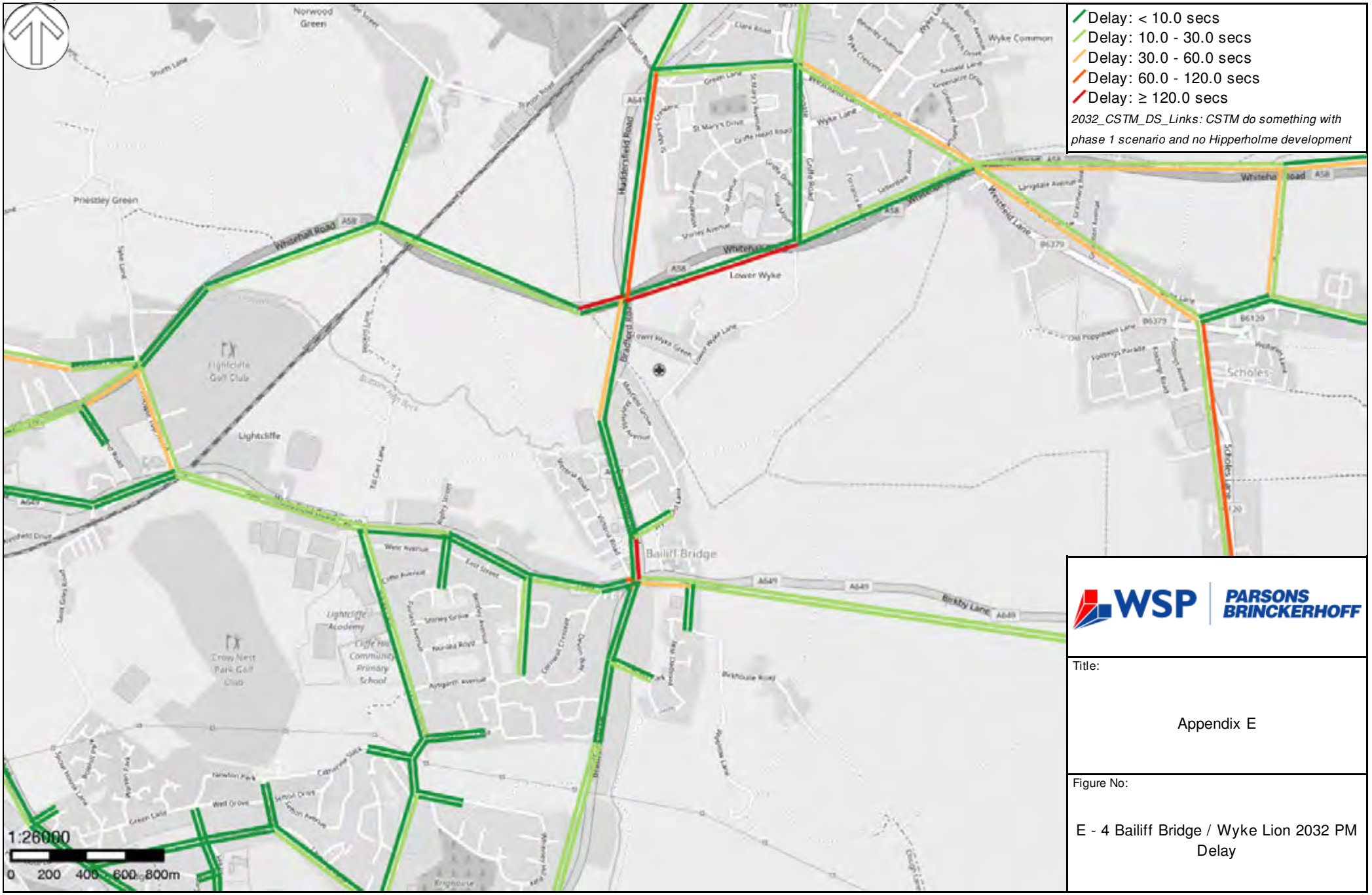

WSP | PARSONS BRINCKERHOFF

Title:

Appendix E

Figure No:

E - 4 Bailiff Bridge / Wyke Lion 2032 PM Delay

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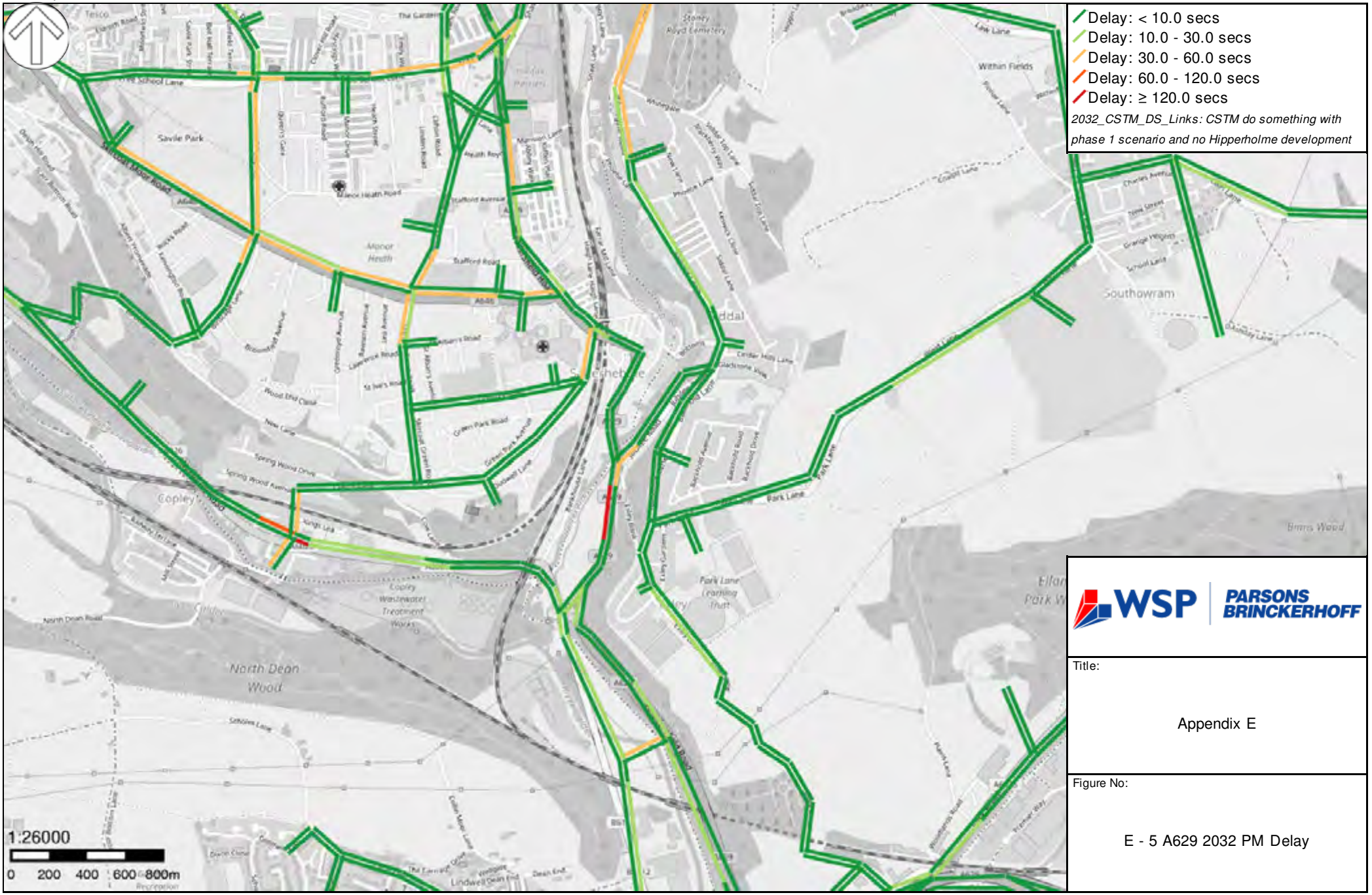

WSP | PARSONS BRINCKERHOFF

Title:

Appendix E

Figure No:

E - 5 A629 2032 PM Delay

Appendix F

CHANGE IN MODELLED DELAY BETWEEN 2014 AND 2032

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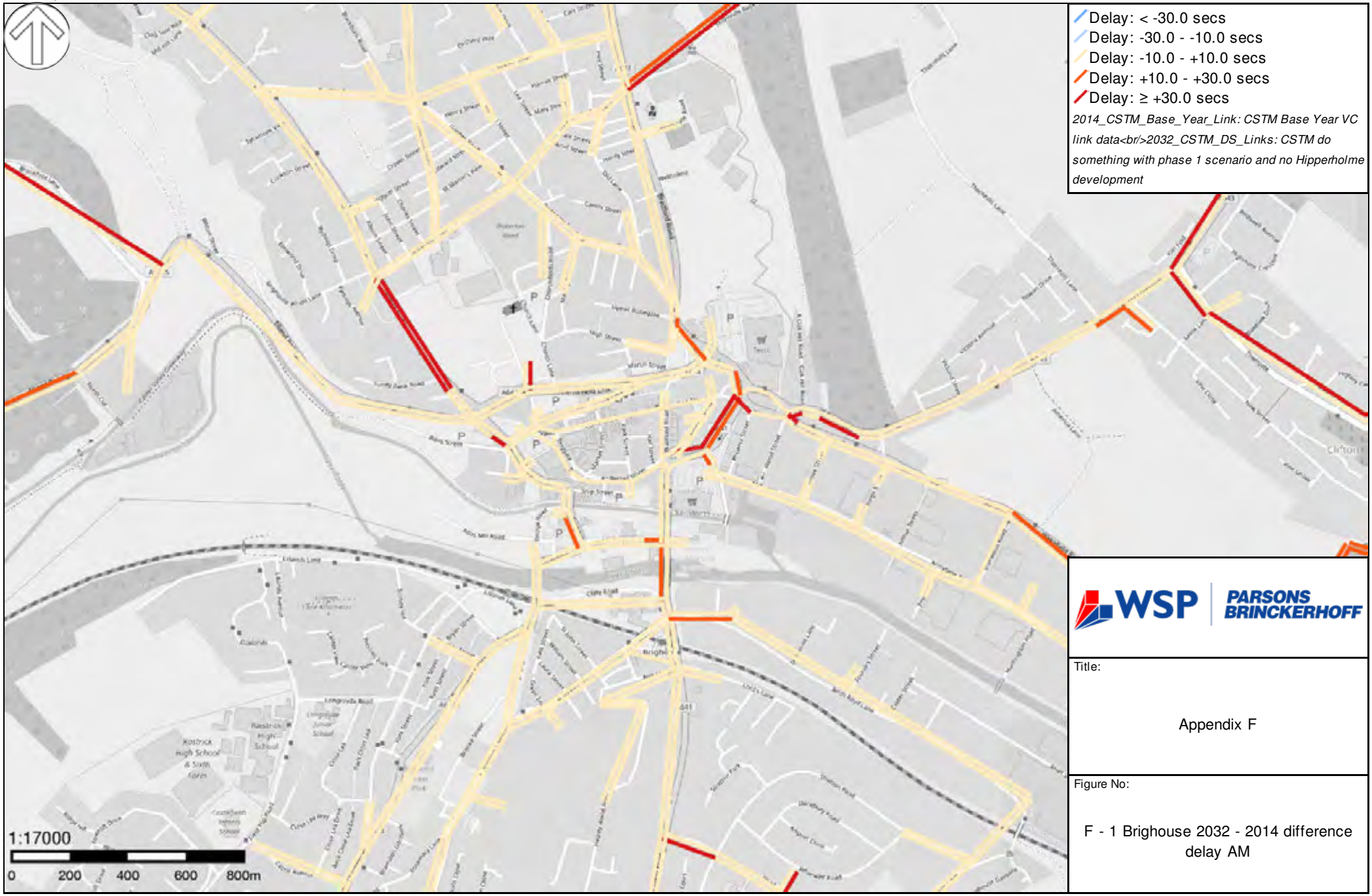

WSP | PARSONS BRINCKERHOFF

Title:

Appendix F

Figure No:

F - 1 Brighouse 2032 - 2014 difference delay AM

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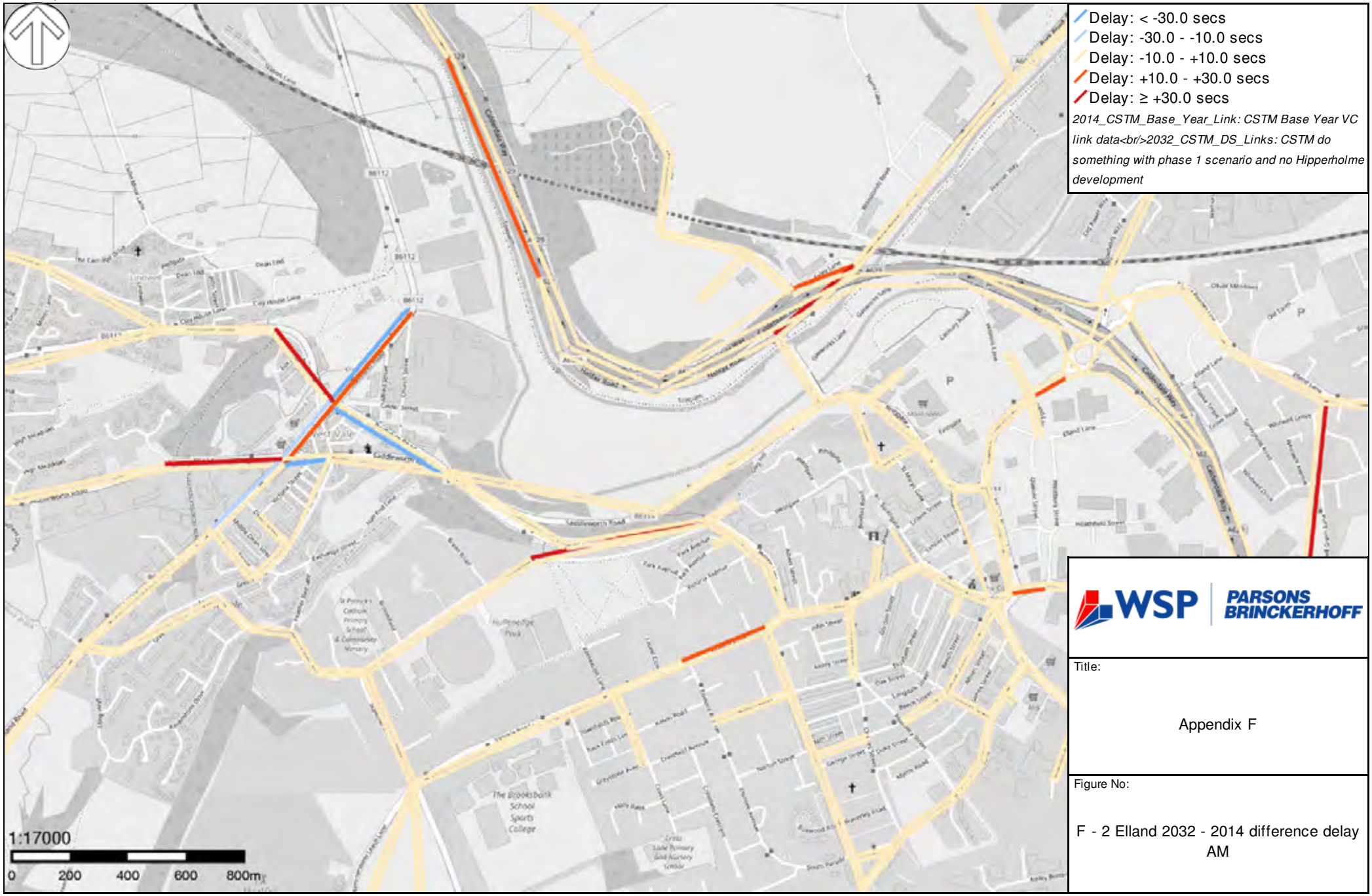

WSP | PARSONS BRINCKERHOFF

Title:

Appendix F

Figure No:

F - 2 Elland 2032 - 2014 difference delay AM

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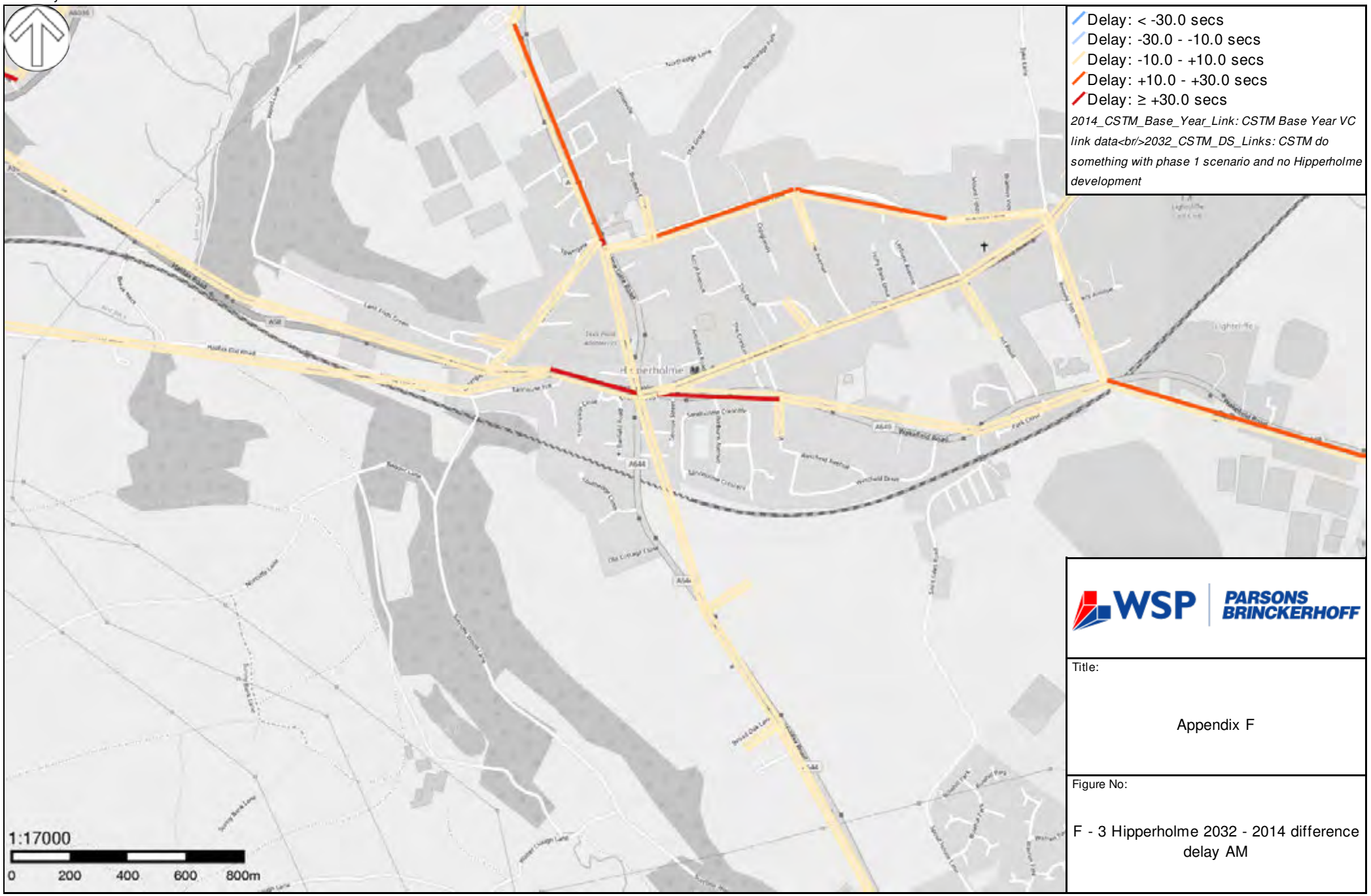

WSP | PARSONS BRINCKERHOFF

Title:

Appendix F

Figure No:

F - 3 Hipperholme 2032 - 2014 difference delay AM

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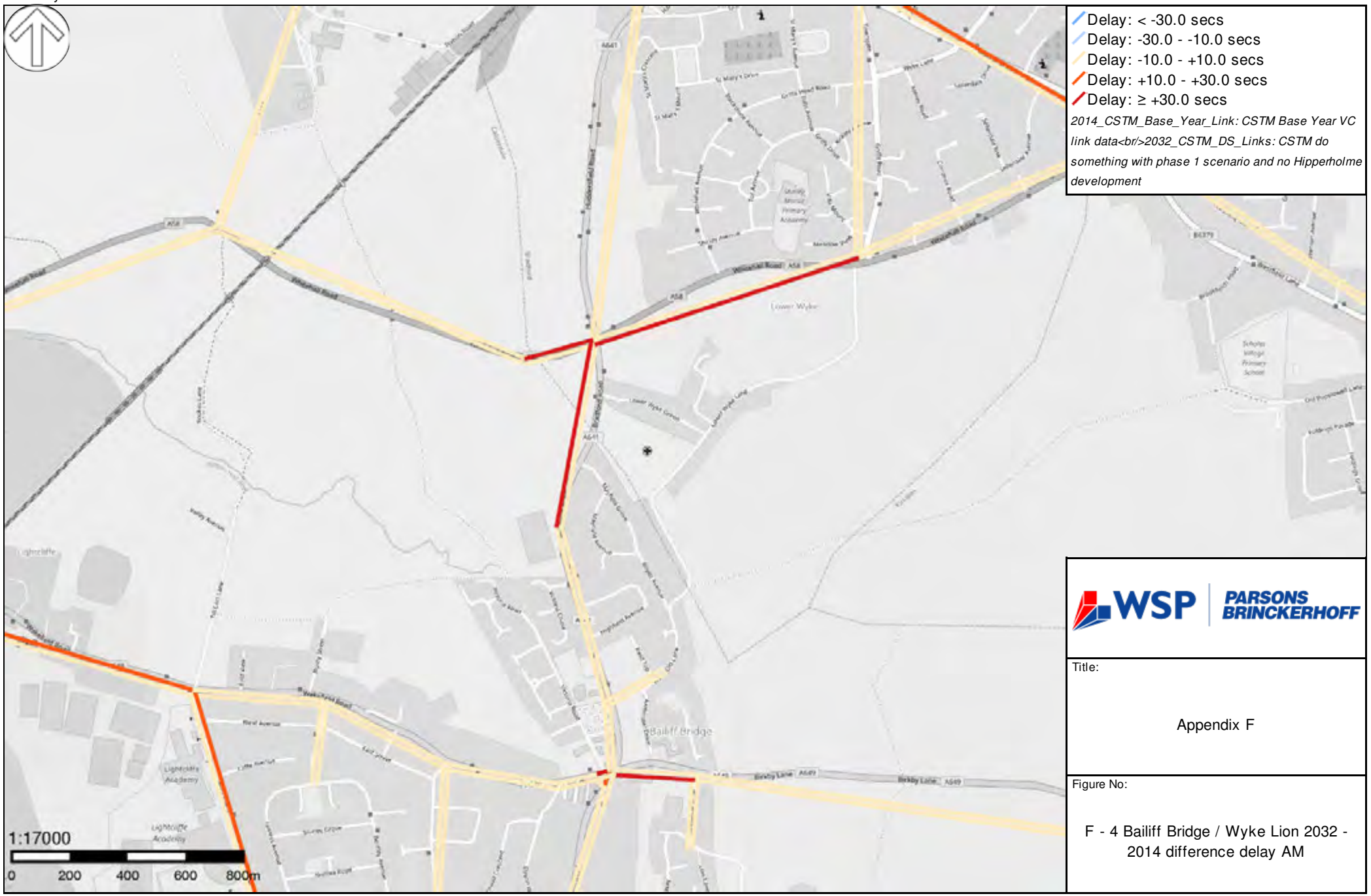

WSP | PARSONS BRINCKERHOFF

Title:

Appendix F

Figure No:

F - 4 Bailiff Bridge / Wyke Lion 2032 - 2014 difference delay AM

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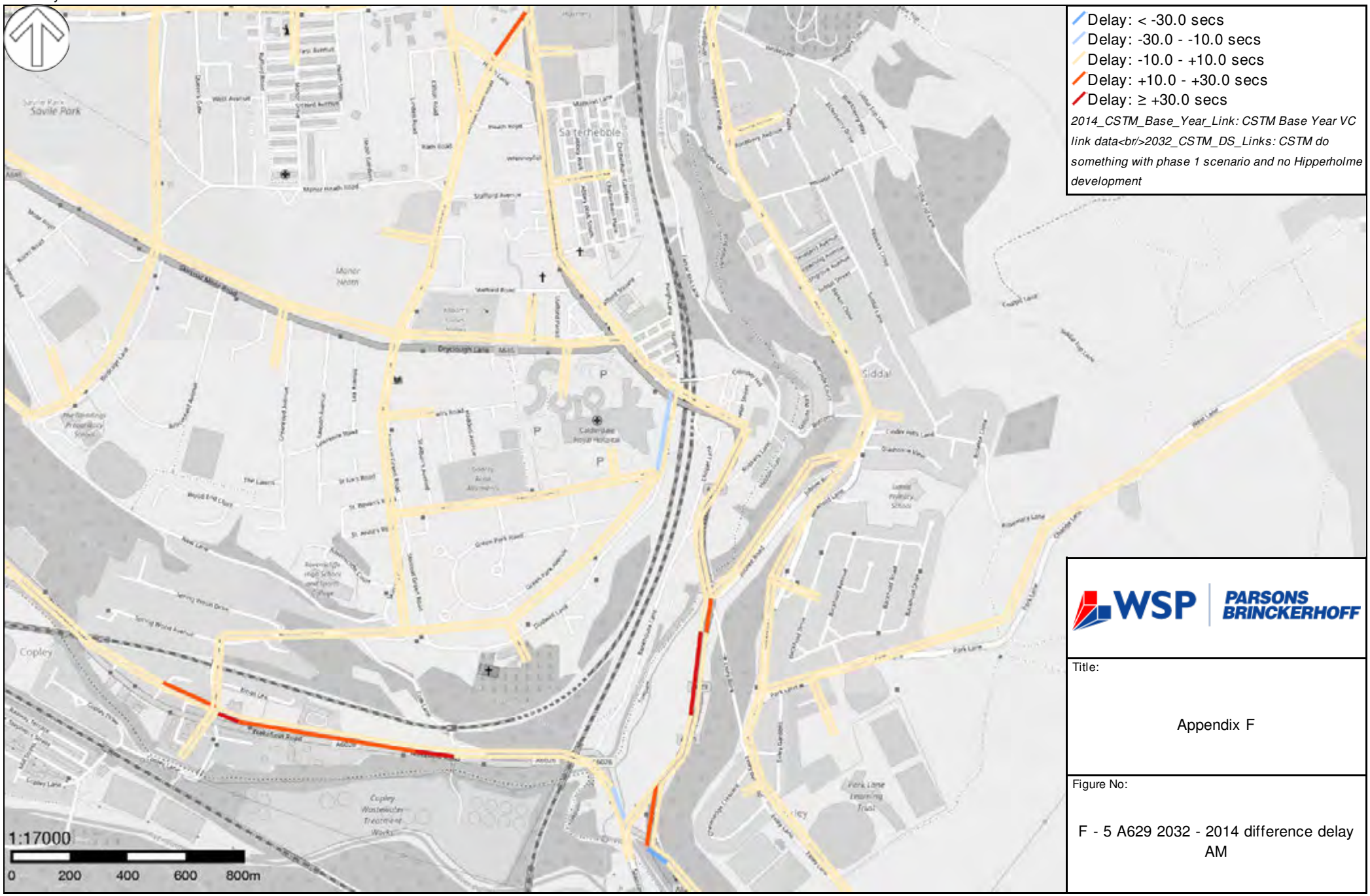

WSP | PARSONS BRINCKERHOFF

Title:

Appendix F

Figure No:

F - 5 A629 2032 - 2014 difference delay AM

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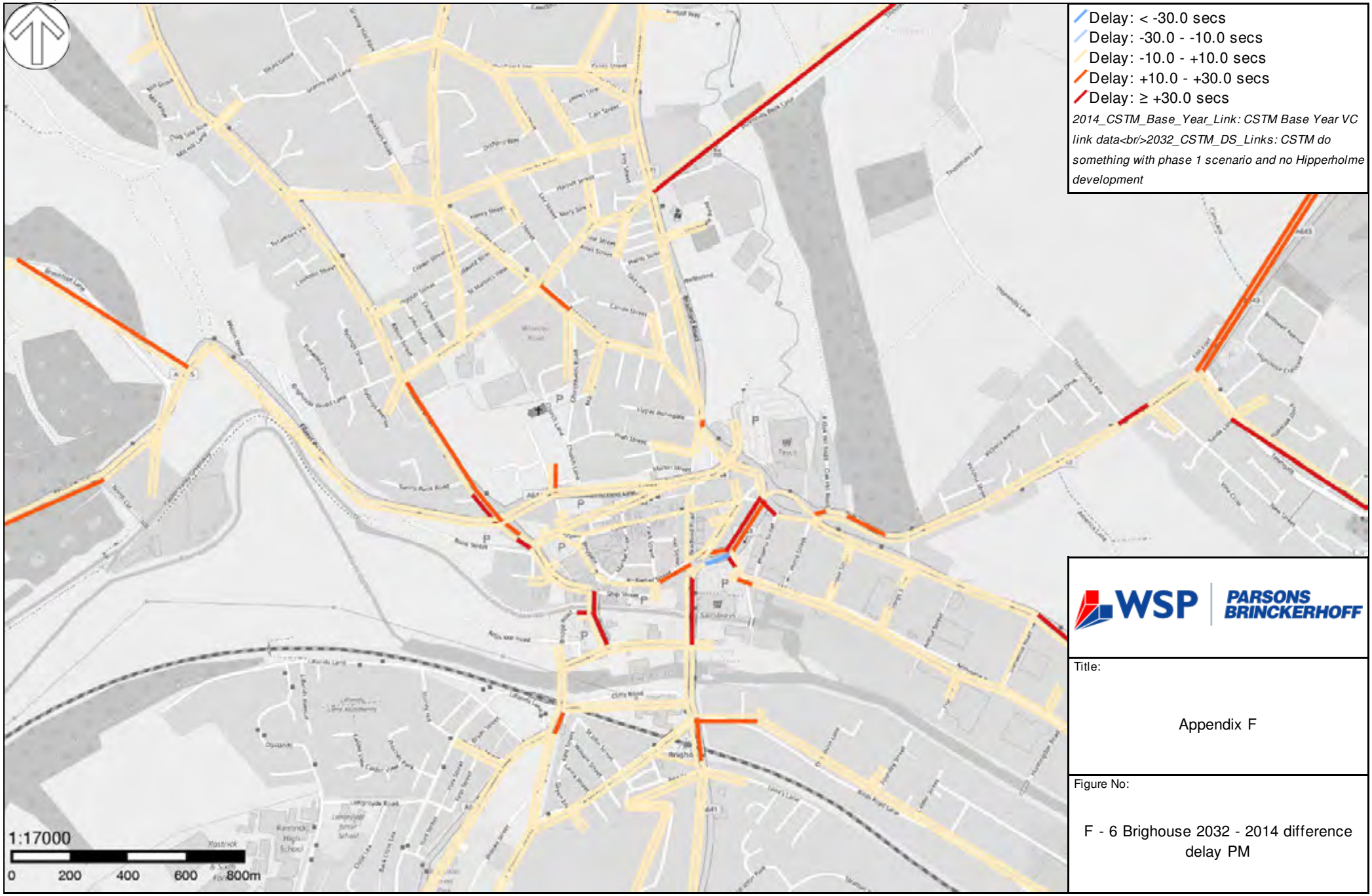

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Appendix F

Figure No:

F - 6 Brighouse 2032 - 2014 difference delay PM

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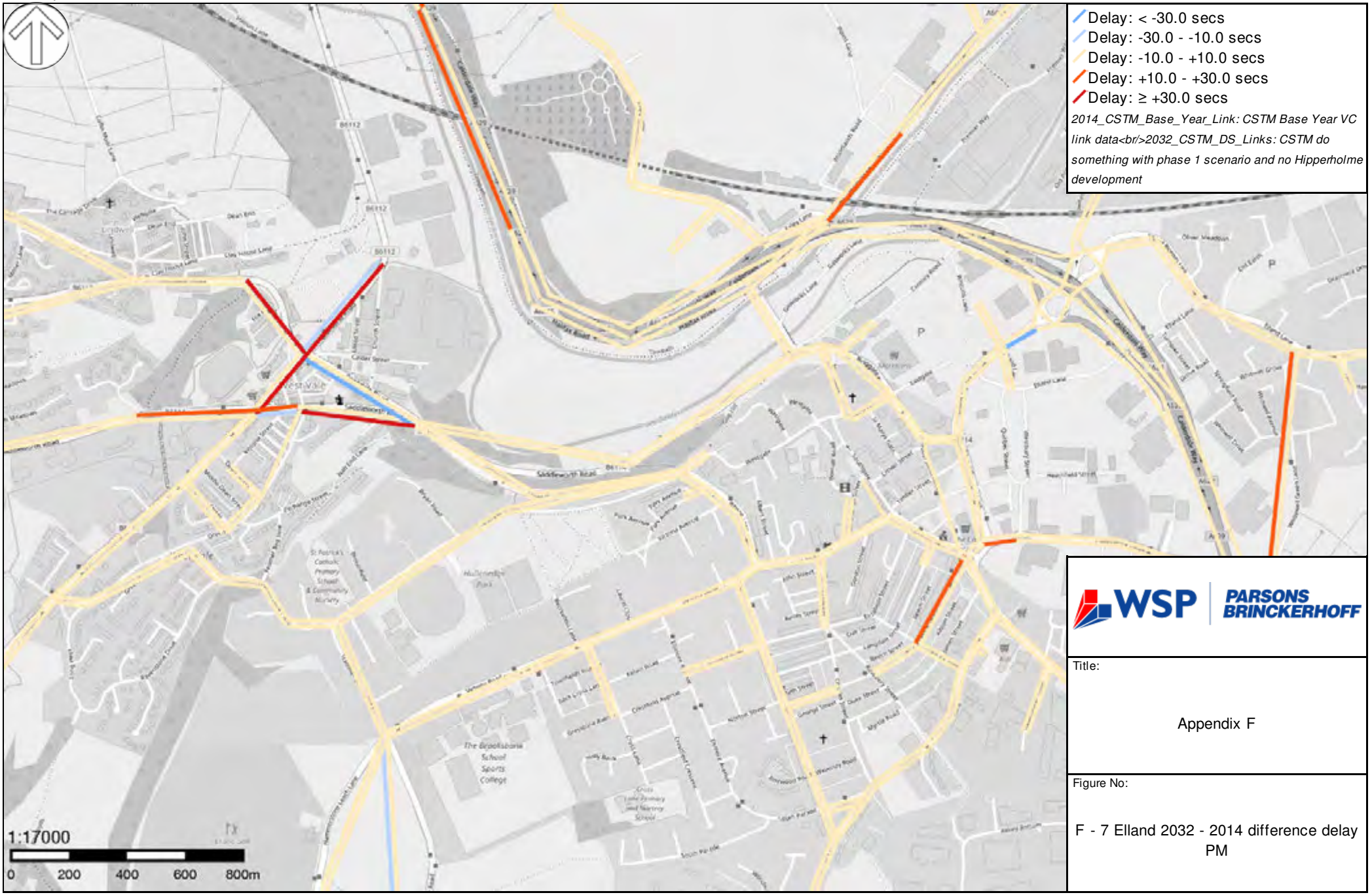

WSP | PARSONS BRINCKERHOFF

Title:

Appendix F

Figure No:

F - 7 Elland 2032 - 2014 difference delay PM

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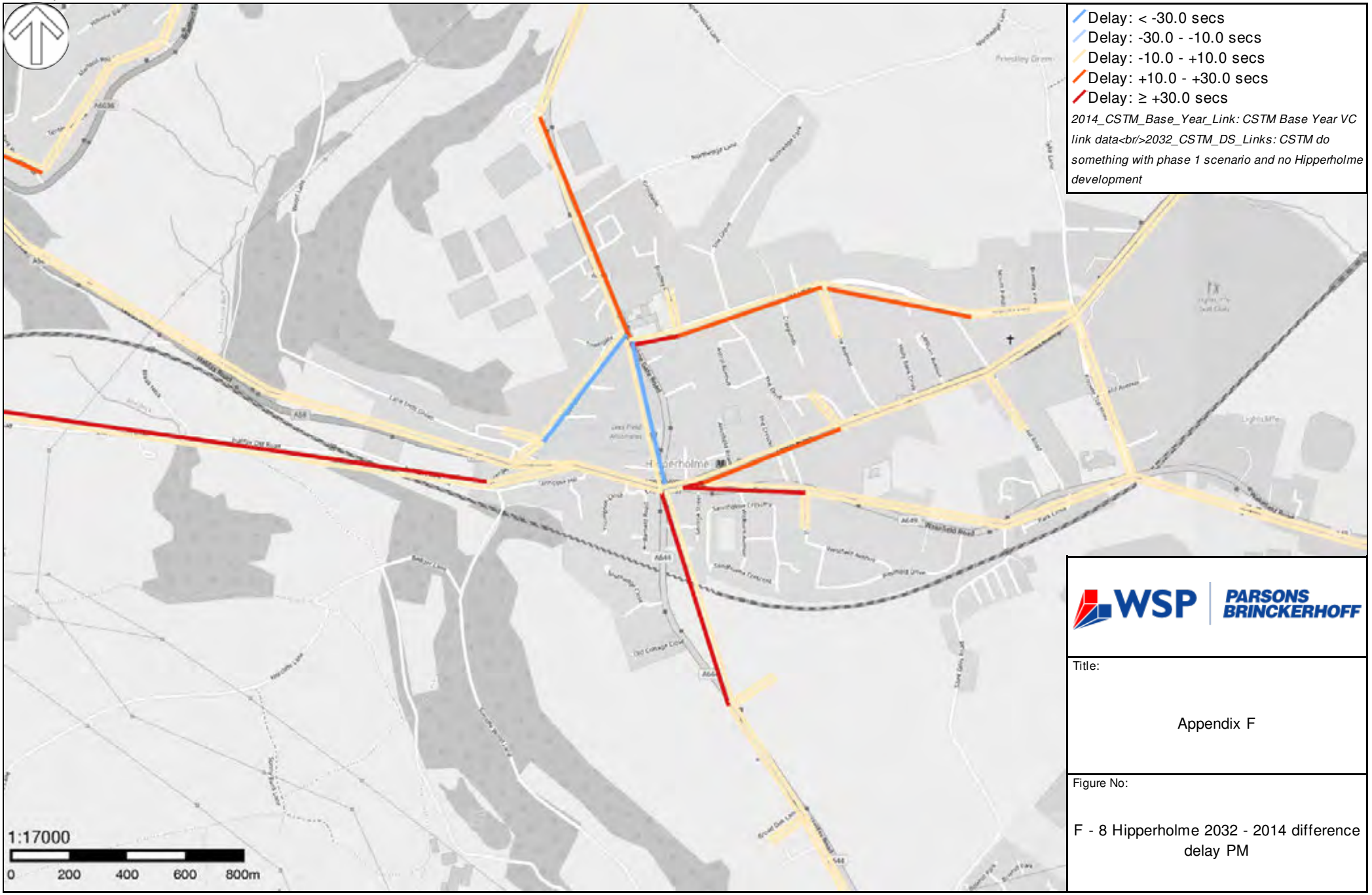

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Title:

Appendix F

Figure No:

F - 8 Hipperholme 2032 - 2014 difference delay PM

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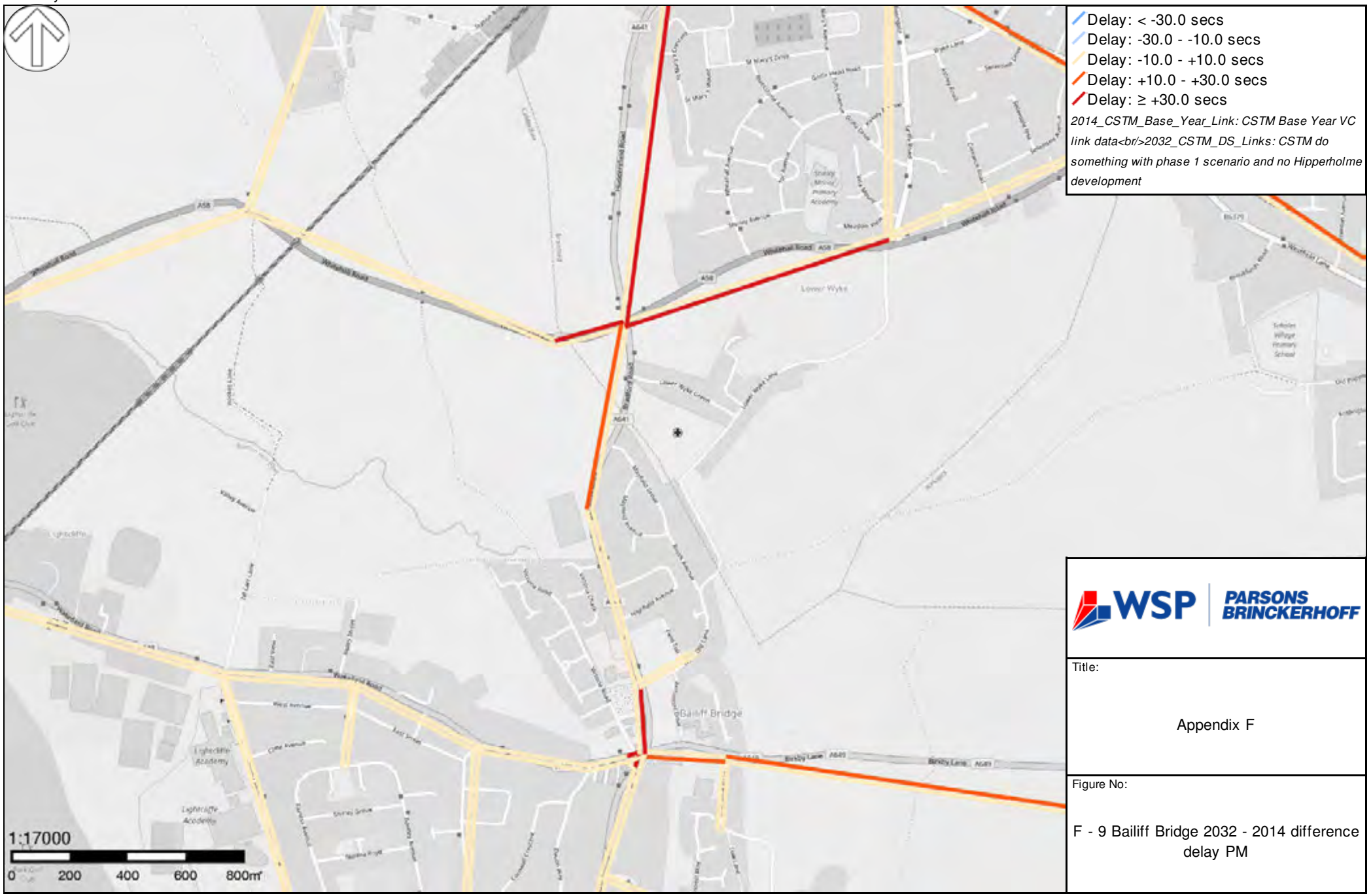

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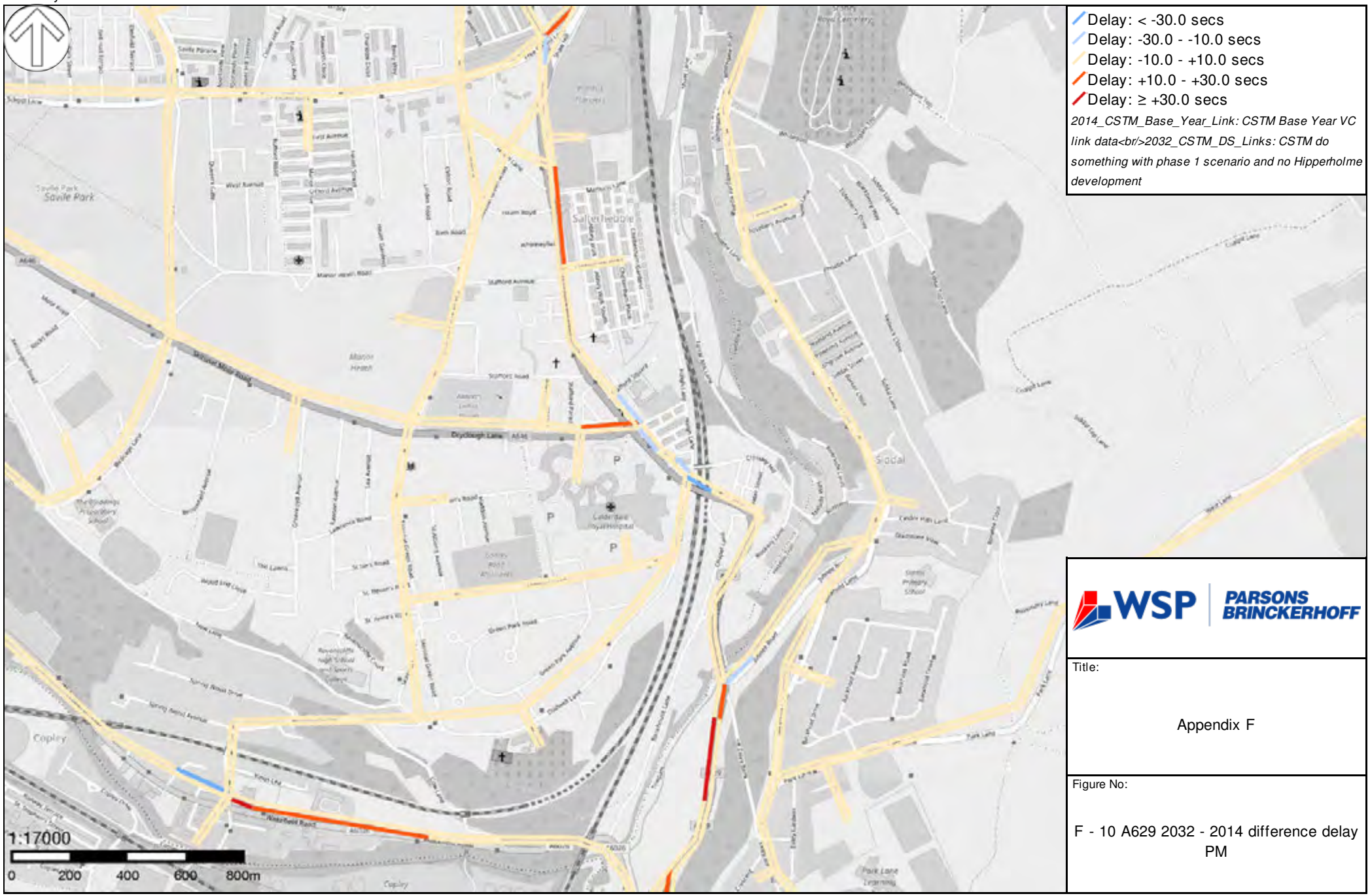

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Title:

Appendix F

Figure No:

F - 10 A629 2032 - 2014 difference delay PM