



Traffic Modelling and Transport Impacts Report

Proposed closure of slip road between A59 Liverpool Road (Penwortham Brow) and Guild Way

April 2019

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1. Introduction

- 1.1 This report summarises the traffic modelling assessment undertaken to determine the highway network and transport impacts resulting from the proposed removal (closure) of the link (slip road) between A59 Liverpool Road (Penwortham Brow) and Guild Way.
- 1.2 Closure of the slip road is proposed in accordance with Condition 10 of the Penwortham Bypass planning permission – *provide details of highways works to discourage through-traffic passing through Penwortham Centre along the A59.*
- 1.3 The proposed closure also promotes active travel by enabling the delivery of a Hutton to Preston City Centre Cycle Superhighway, providing health and wellbeing benefits. Plans for improved cycling and walking along Liverpool Road are in accordance with the Lancashire Cycling & Walking Strategy delivery plan and the Central Lancashire Highway and Transport Masterplan. A cycle superhighway along this route also overlaps with aspirations outlined in the Preston Transforming Cities Fund bid.
- 1.4 The proposal further supports air quality improvement in South Ribble Borough Council Air Quality Management Area (AQMA) no.1, which stretches along Liverpool Road from Queensway to Kingsway and along Priory Lane / Cop Lane between Kingsway and Moorhey Drive, by tackling air pollution and reducing carbon emissions.
- 1.5 The traffic assessment included modelling across three levels: macroscopic (strategic network); empirical (local junction); and, microscopic (local network), ensuring network impacts were fully understood. Modelling considered forecast traffic demand in the year 2022 providing analysis post opening of the Penwortham Bypass.

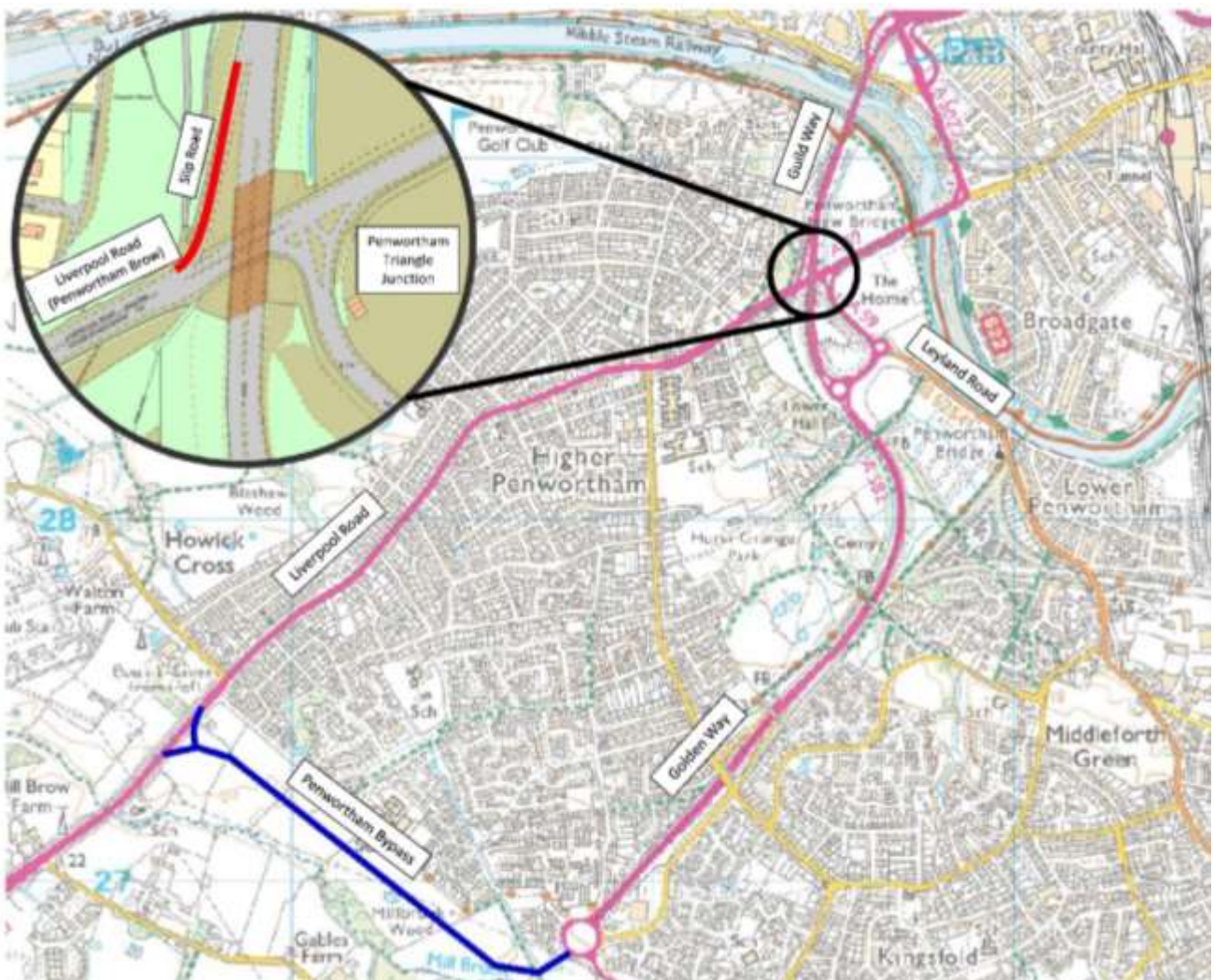
2. Current function of the slip road (pre-Penwortham Bypass)

- 2.1 The slip road currently provides a link between A59 Liverpool Road and A59 Guild Way serving an important function for northbound strategic trips on the A59 originating south-west of Preston travelling into Preston, towards Blackpool and onward journeys along the A59. The slip road also provides a shortened connection for local traffic from Penwortham travelling towards Preston city centre and the Docklands area.

3. Future function of the slip road (post Penwortham Bypass opening)

- 3.1 Completion of the Penwortham Bypass (currently under construction) will considerably alter the function of slip road. The bypass provides a new connection between the A59 Liverpool Road, west of Howick Moor Lane, and A59 Guild Way via the A582 Golden Way.
- 3.2 The intended purpose of the bypass is to remove through-traffic (strategic trips) from Penwortham Town Centre; alleviating the associated congestion. The bypass therefore replaces the slip road as the primary route for strategic trips travelling on the A59. Retention of the slip road provides a shortened connection for local traffic from Penwortham travelling towards Preston City Centre and the Docklands area, however, it also provides an alternative to bypass, attracting through-traffic and lessening the benefits of the bypass.

4. Location plan



5. Reason for proposed changes

- 5.1 Closure of the slip road is proposed to reduce the attraction of strategic trips continuing along Liverpool Road through Penwortham and to maximise the potential of the bypass. This proposal is in line with planning condition 10 of the bypass planning permission '*to discourage through-traffic passing through Penwortham Centre along the A59*'.
- 5.2 The slip road is predominantly used by traffic travelling along the A59 Liverpool Road south-west of Preston passing through Penwortham. Completion of the Penwortham Bypass will provide an alternative route between the A59 at its junction with the bypass and Guild Way via A582 Golden Way. In order to promote use of the bypass and discourage through-traffic continuing to pass through Penwortham it is proposed to close the slip road to vehicles.
- 5.3 The closure also supports the planned corridor improvements along Liverpool Road enabling the delivery of a cycle superhighway both through the further reduction in vehicle traffic and the removal of a conflict point. As a free flowing link the slip road is barrier to the provision of segregated cycle facilities and presents a significant risk of collision to cyclist travelling on carriageway towards the City Centre via Fishergate Hill. The planned cycle route between Hutton and Preston City Centre will complement the Transforming Cities Fund (TCF) bid, providing transformational investment, promoting sustainable transport and encouraging modal shift away from car journeys. The TCF bid includes the Fishergate Hill section of the cycle superhighway route from Strand Road to Preston city centre.

6. Associated highway works

- 6.1 Works at the junction of A59 Liverpool Road and A59 Leyland Road (Penwortham Triangle junction) are planned in accordance with condition 10 of the Penwortham Bypass planning permission. Modification of the road layout at the Penwortham Triangle junction will promote use of the bypass and discourage through-traffic passing through Penwortham from Preston. Junction alterations will reduce ahead movements for vehicles travelling southbound from Preston to a single lane and increase the left turn to 2 lanes reflecting the change in priority away from Liverpool Road and towards the Penwortham Bypass via the A582.
- 6.2 The works at Penwortham Triangle provide the opportunity to provide additional minor carriageway alterations and reconfiguration of traffic signal timings to complement the proposed closure of the slip road. Complementary associated works at Penwortham Triangle will ensure junction operational capacity is provided in accordance with local traffic demand.

7. Traffic Modelling Methodology

- 7.1 *Strategic Network* – The Central Lancashire Traffic Model (CLTM) has been used to analyse network impacts and generate forecast traffic flows for the year 2022. Updates to the model enabled a comparison of traffic flows and network delay with and without the slip road in place.
- 7.2 *Local Junction Modelling* – The impacts of the slip road closure at the junction of Liverpool Road and Leyland Road (Penwortham Triangle) have been assessed using industry standard local junction modelling software LinSig (v3). 2022 forecast traffic flows extracted from the CLTM were used to analyse junction capacity and to inform highways design and traffic signal timing requirements to complement the slip road closure.
- 7.3 *Local Network* – Microsimulation modelling software package Aimsun (v8.3) was used to evaluate traffic movements across a small localised network within the vicinity of the slip road comprising of Liverpool Road, Leyland Road, Golden Way, Guild Way and the 3 junctions associated junctions. A cordon covering the extents of the micro-network was applied to the CLTM to extract origin-destination matrices for the 2022 forecast year AM and PM peak hours. These matrices were then entered into the model. Traffic signal timings and updated lane arrangements at the Penwortham Triangle junction informed by local junction modelling were applied into the network to represent optimised capacity arrangements. Further planned modifications at the Leyland Road roundabout were also included in the network.
- 7.4 The Stochastic Route Choice fixed-assignment approach was used to replicate the demand patterns extracted from the CLTM. A total of twenty simulations using were run using the model to assess the network performance across a variety of traffic flow distribution conditions; ten in the AM peak hour and ten in the PM peak hour. An average was then taken to determine link delay time within each peak hour. A 15 minute warm-up period was applied to ensure traffic was fully assigned onto the network for the full 1 hour time set across each peak.
- 7.5 The microsimulation model enabled the impacts of the proposed slip road closure to be analysed in real time, providing visual outputs of traffic flows, junction capacity and the overall operational performance of the network.

8. Strategic Network Modelling

- 8.1 The CLTM is a strategic traffic model which has been used in the assessment of all multiple major City Deal schemes in Preston and South Ribble. The model has supported submission of the Preston Western Distributor (PWD) Road Full Business Case to DfT and planning applications for the PWD, Penwortham Bypass and the A582 dualling schemes. The forecast traffic flows reflect local growth (increased traffic) on the network and included all Local Plan development sites.
- 8.2 Network coding in the CLTM was updated to generate a new scenario representing the network without the link (slip road) between A59 Liverpool Road (Penwortham Brow) and Guild Way.
- 8.3 Comparison of the network **with** the slip road and **without** the slip road demonstrated traffic flow displacement and changes in delay resulting from the network alteration in the year 2022. Traffic flows results are shown as Passenger Car Units (PCUs) and delay values are shown in seconds. Network output plots showing the change in traffic flows for the AM and PM peak hours is included in **Appendices A and B** respectively. The total traffic flow on the network without the slip road is included in **Appendices C and D** respectively. Plots showing delay changes on the network in the AM and PM peak hours resulting from the slip road closure are included in **Appendices E and F** respectively.

AM Peak – Traffic Flows

- 8.4 Modelling showed that in the AM peak hour, **closure of the slip road resulted in 207 PCUs re-routing to the Penwortham Bypass in place of Liverpool Road. This represented a reduction of 196 PCUs travelling northbound through Penwortham Town Centre** and a total northbound reduction of 246 PCUs on Penwortham Brow.
- 8.5 Along Liverpool Road the model showed some slight southbound flow increase west of Carleton Drive as local traffic re-routes west towards the bypass in place of alternative routes to the north.
- 8.6 Within Penwortham Local Centre the **2-way traffic flow**, as shown in Annex C, **is 627 PCUs in the AM peak.**
- 8.7 Along Cop Lane between Liverpool Road and Manor Lane re-routing results in traffic flow reductions of up to 63 PCU. South of Manor Lane there are increase of up to 44 PCUs as

Cop Lane local traffic re-routes to Golden Way. The model demonstrated that re-routing of traffic through residential routes such as Blackthorn Drive would not occur.

- 8.8 At the Penwortham Triangle junction 27 PCUs re-route towards Leyland Road and 154 PCUs are re-route towards Strand Road. There were parallel reductions on Guild Way and on Junction Road at the junction of Strand Road.

AM Peak – Delay

- 8.9 Reductions in delay of up to 47 seconds on Guild Way between Liverpool Road and Marsh Lane resulting from the relief of merge conflicts on Guild Way at the top of the slip road and a reduction in weaving on Guild Way.
- 8.10 There are slight increases in delay of 8 seconds northbound at the junction of Strand Road / Port Way, 10 seconds northbound on Liverpool Road at Penwortham Triangle, and 13 seconds on Cop Lane southbound at the junction with the Cromwell Road and the Golden Way slip road and as local traffic is redistributed.
- 8.11 No significant resulting delay impacts elsewhere on the network in the AM peak.

PM Peak

- 8.12 Across the PM peak the pattern of traffic flow displacement was generally the same as the AM peak. Re-routing to the bypass in place of Liverpool Road for northbound traffic occurs. **Modelling shows an increase of 72 PCUs on the bypass and a reduction of 87 PCU through Penwortham Town Centre in the PM peak resulting from the slip road closure.** There is a reduction of 139 PCU on Penwortham Brow.
- 8.13 Southbound Liverpool Road flows are increased slightly south of Central Drive as local traffic from the southern end of Penwortham re-routing to the bypass.
- 8.14 Within Penwortham Local Centre the **2-way traffic flow, as shown in Annex D, is 623 PCUs in the PM peak.**
- 8.15 Along Cop Lane there are reductions northbound of up to 51 PCUs and southbound increases of up to 61 PCUs as local traffic re-routes towards Golden Way. There are some very minor flow changes along residential routes as residents of the estate south of Liverpool Road choose alternative routes in and out of the estate. Corresponding northbound reductions confirm that southbound increase originate from displacement within the estate and are not a result of rat-running.

8.16 38 PCUs re-route towards Leyland Road at the Penwortham Triangle junction and 113 PCUs re-route towards Strand Road. As per the AM there are parallel reductions on Guild Way of up to 111 PCUs and Junction Road at the junction of Strand Road of up to 56 PCUs.

PM Peak – Delay

8.17 There is a neutral impact on delay across the network in the PM peak resulting from the slip road closure.

Summary

8.18 The CLTM demonstrates that **closure of the slip road is an effective method of discouraging through-traffic passing through Penwortham Centre** along Liverpool Road instructed by the planning condition. There is an estimated northbound Annual Average Daily Traffic (AADT) reduction of 2,001 PCUs which is displaced to the bypass.

8.19 The displacement of strategic traffic in addition to that provided by the completion of the bypass does not induce rat-running on local roads in Penwortham. Modelling forecasts for the year 2022 demonstrate that, inclusive of measure to discourage through-traffic, there would remain an estimated 2-way AADT flow of 7,188 PCUs on Liverpool Road through Penwortham Town Centre.

8.20 There are benefits to the network of reduced delay on Guild Way in the AM peak and some minor delay time increases on Strand Road and Cop Lane as local traffic is redistributed. PM delay impacts are neutral.

9. Local Junction Modelling

9.1 Junction performance is measured in Practical Reserve Capacity (PRC) and degrees of saturation. A degree of saturation value of 100% means that demand and capacity on the lane are equal. Values of over 90% are typically regarded as congested with queues beginning to form, resulting in a negative PRC.

Junction of Liverpool Road / Leyland Road (Penwortham Triangle)

9.2 The Penwortham Triangle junction will operate with an AM peak PRC of +16.0% and a PM peak PRC of +20.9%. A full modelling report is included in Annex G.

9.3 Traffic flow changes resulting from slip road closure can be accommodated at the junction by optimizing the signal timings to provide additional green time to the Liverpool Road northbound approach. In the AM peak the ahead lane will operate with degree of saturation

of 77.6% and the right turn lane of 51.3%. In the PM peak ahead lane and right turn lane degrees of saturation are 24.1% and 50.8% respectively. Degrees of saturation remains below 90% on all other approach arms across both peaks. Positive PRC values of +16% and +20.9% in the AM and PM peaks respectively demonstrate that the junction is operating with spare capacity and can accommodate additional demand if required.

Junction of Liverpool Road / Strand Road / Fishergate Hill

- 9.4 Traffic flow reductions resulting from the introduction of the Penwortham Bypass provide sufficient spare capacity at the Strand Road / Fishergate Hill to accommodate the redistribution of local traffic resulting from the slip road closure.
- 9.5 The junction will operate with an AM peak PRC of +46.0% and a PM peak PRC of +12.4% demonstrating that delay at the junction will not be incurred. A full modelling report is included in Annex H.
- 9.6 The CLTM demonstrates an increase in left turning movements from Liverpool Road to Stand Road. This lane operates with a degree of saturation of 61.6% in the AM and 19.0% in the PM, well within the 90% threshold.

10. Microsimulation Modelling

- 10.1 Real times outputs from the model were used to observe local network performance with the slip road closed. Results are best viewed in video format (available on request); snapshots are included in Annex I. Figure 1 shows the modelled area.
- 10.2 Modelling demonstrated that removal of the slip road does not negatively impact the network performance in this area. Traffic will continue to flow freely within the model area across both the AM and PM peak hours.
- 10.3 Additional strategic trips relocated onto the Penwortham Bypass and Golden Way are efficiently managed by the signalised junction on Golden Way in both peak periods as they continue onto Guild Way.
- 10.4 Local traffic that re-routes via the Penwortham Triangle junction is also efficiently managed by traffic signals at the junction across both peak periods without queues forming. Onward re-routed local trips travelling through the uncontrolled Leyland Road roundabout and on the east arm of the Golden Way signalised junction do not impact network performance.



Figure 1: Microsimulation Model Network

- 10.5 Some unrelated queuing occurs on the south arm of the junction in the AM peak however cycle times are sufficient for queues to clear without resulting in disruption to the network.
- 10.6 Figures 2 and 3 show the average link delay on the network in each peak hour. Link delay at traffic signal is expected due traffic signal timings requiring stoppages whilst green time is allocated to other arms on the junction. The model demonstrates without the slip road, the network within the modelled area will operate without any significant delay across both the AM and PM peak hours.

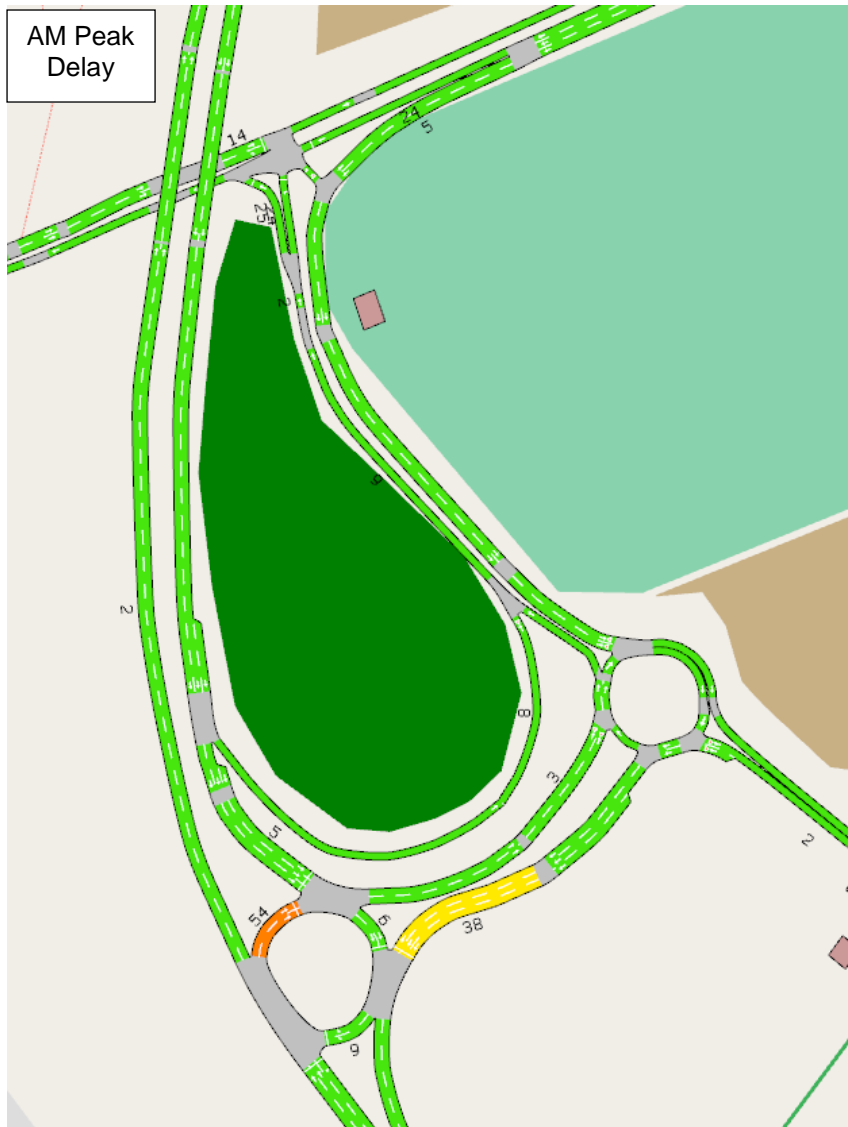


Figure 2: Microsimulation 2022 AM Average Link Delay



Figure 3: Microsimulation 2022 PM Average Link Delay

11. Summary of Highway Impacts

11.1 Impacts on the highway network resulting from the closure of the link between Liverpool Road (Penwortham Brow) and Guild Way can be summarised as follows:

- Further reduction in through-traffic on Liverpool Road through Penwortham, in accordance with Penwortham Bypass planning condition 10;
- Traffic flow increases on the Penwortham Bypass resulting from an estimated displacement of 2,000 trips per day travelling in to Preston;
- Remaining two-way traffic flow of approximately 7,000 trips per day on Liverpool Road in Penwortham;
- Improved road safety through the removal of conflict points at both ends of the slip road;
- No evidence of rat running on local roads resulting from changes to network;
- Reduced delay time on Guild Way demonstrating improved flow of traffic resulting from relief of merge conflicts on Guild Way at the top of the slip road and reduction in weaving on Guild Way;
- Some slight AM delay time increases towards Preston at the junctions of Cop Lane / Golden Way, Strand Road / Port Way and Liverpool Road / Leyland Road resulting from the redistribution of local traffic; and,
- No resulting junction capacity issues.

12. Health & Wellbeing Benefits

12.1 The slip road is currently a barrier to cycle journeys and an attraction to vehicle journeys. The proposed closure of the slip road supports the promotion of active travel and provides positive impacts in relation to road safety and air quality.

12.2 By reducing through-traffic and enabling improved cycle connections to Preston city centre and the Guild Wheel, the proposal has the potential to provide considerable health & wellbeing benefits to the conurbation of Penwortham through air quality improvements and increased physical activity.

12.3 National guidance provided by Public Health England states that short car trips (under 5 miles) are a prime area for switching to active travel and to public transport. Figure 4 shows a 2 miles radius from Penwortham Town Centre. Trips from Penwortham (and beyond to Hutton) to popular destinations such as Preston city centre and Docklands are comfortably within the 5 miles catchment defined as short trips.

12.5 The Hutton to Preston city centre corridor therefore provides the ideal opportunity to promote active travel.

12.4 Closure of the slip road supports plans to develop a Hutton to Preston city centre cycle superhighway through the removal of a free flowing traffic lane that presents an obstacle to the delivery of a safe dedicated cycle route.

12.5 The provision of a segregated cycle superhighway would be anticipated to result in modal shift to cycling from car (particularly single occupancy). By changing travel behaviour, the promotion of active travel has the potential to further reduce the number of vehicles on the network and provide exponentially increasing health & wellbeing benefits.

12.6 Road safety would significantly improve for on carriageway cycle journeys travelling northbound on Liverpool Road through the removal of the conflict point at the slip road diverge. The current provision is for cyclists traveling towards Fishergate Hill to exit the carriageway and wait to cross the slip road at a controlled crossing. On carriageway cyclist are required to change lanes and weave with free flowing traffic to divert away from the slip road and continue along Liverpool Road towards Preston.

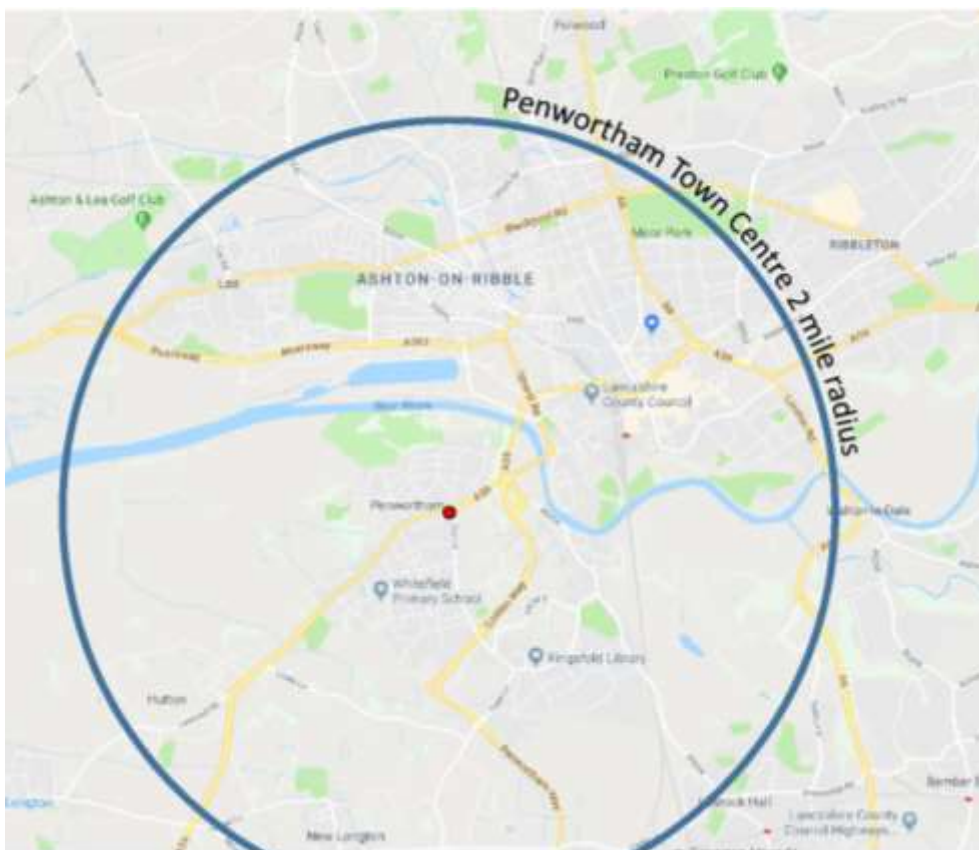


Figure 4: Destinations within a 2 mile radius of Penwortham Town Centre

13. Local planning policy and other investments

13.1 Increased travel by sustainable modes and improved air quality is high on the local policy agenda.

13.2 Through the Preston, South Ribble and Lancashire City Deal, the County Council is delivering significant investment to support economic growth in Central Lancashire including public and sustainable transport improvements along key corridors. Further investment public and sustainable transport is being sought through the Transforming Cities Fund.

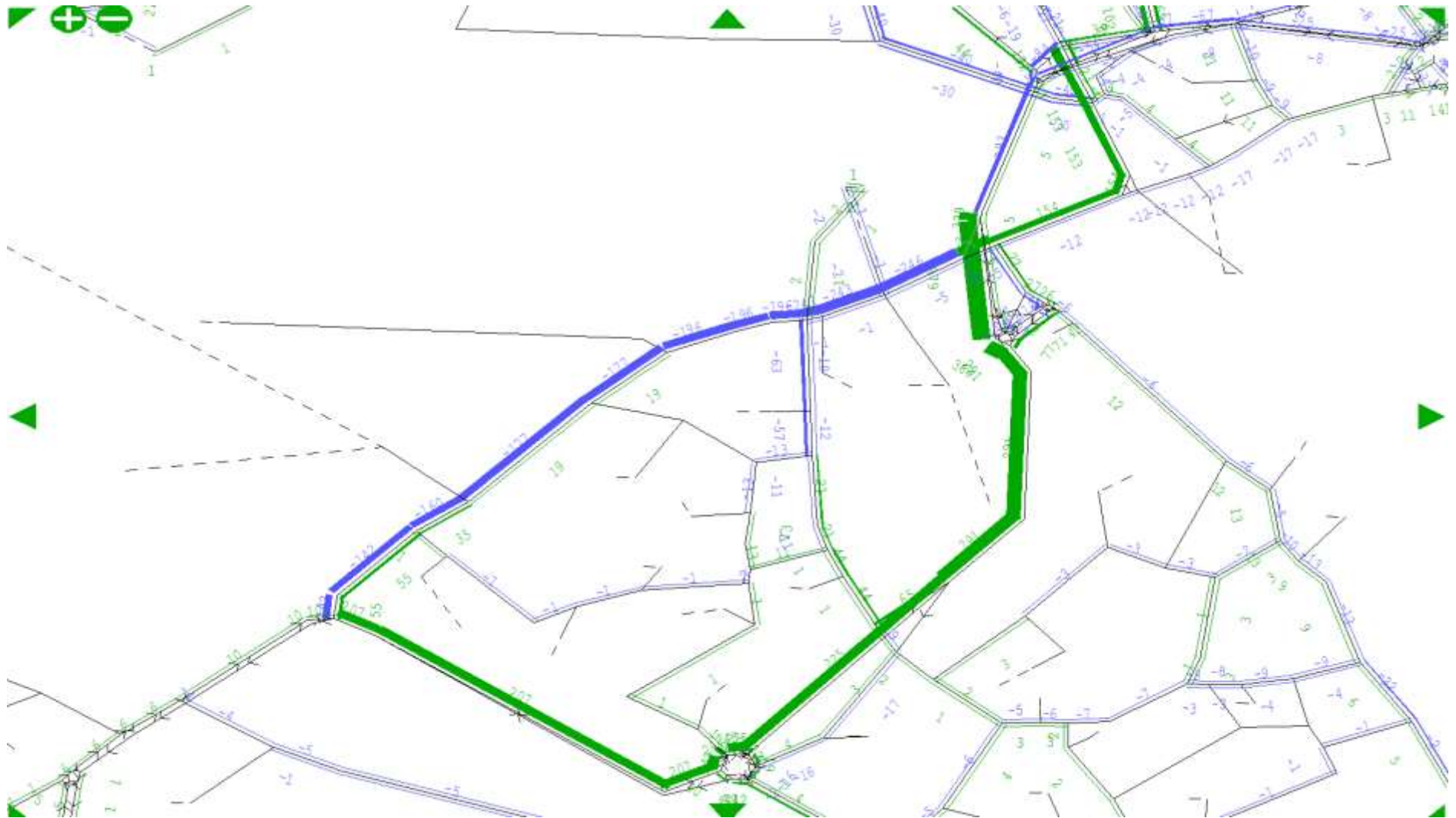
13.3 The proposed closure of the slip road:

- Supports the Central Lancashire Core Strategy Policy 3 by improving opportunities for cycling and enabling travellers to change their mode of travel and Policy 30 to improve air quality through taking account of air quality which prioritising measures to reduce road traffic congestion;
- Supports the South Ribble Local Plan Policy G8 by providing access to well-designed cycleways (both on and off road) to help link local services and facilities;
- Further supports planned City Deal sustainable transport improvements along the Penwortham Corridor and enhancements in Penwortham Centre as identified in the Central Lancashire Highways and Transport Masterplan;
- Enables delivery of cycle superhighway in line with Lancashire Cycling & Walking strategy;
- Is in accordance with the emerging Preston City Transport Plan which promotes increased cycling;
- Supports Local Transport Plan (LTP3) by increasing the attractiveness of cycling & walking and reducing the fear of traffic;
- Supports transformational investment (TCF bid) for sustainable transport routes into Preston City Centre; and,
- Provides air quality improvements in Penwortham (AQMA No.1) in accordance with the South Ribble Borough Council Air Quality Action Plan.

14. Recommendation

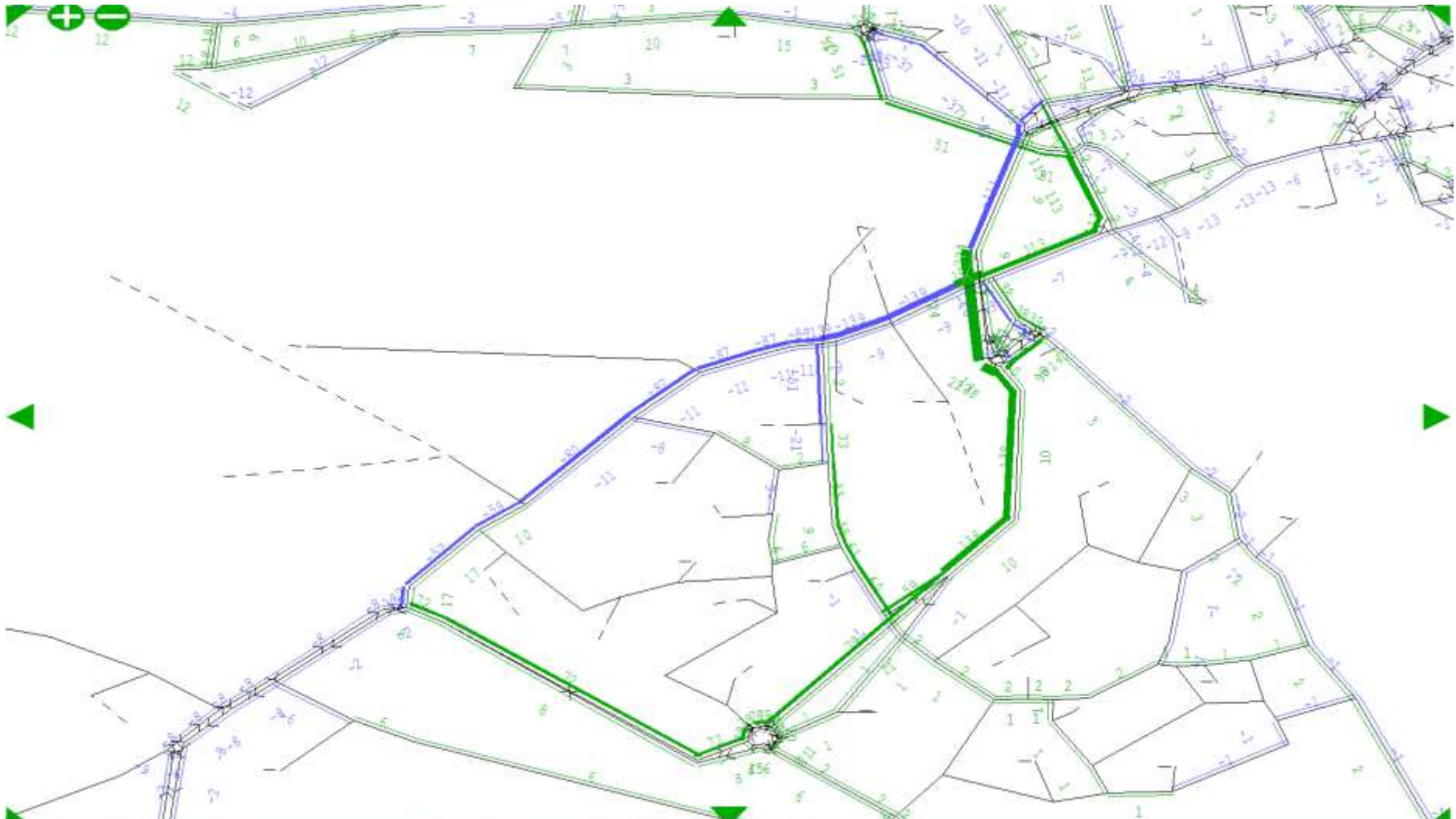
- 14.1 Based on the findings of this report the proposed removal (closure) of the link (slip road) between A59 Liverpool Road (Penwortham Brow) and Guild Way should be considered as a measure to discourage through-traffic passing through Penwortham centre along the A59.
- 14.2 Traffic modelling demonstrates the closure will result in additional strategic traffic transferring to the bypass, further reducing congestion in Penwortham and providing additional air quality benefits.
- 14.3 Rerouting of local traffic would result in minor delay time increases of up to 13 seconds on local roads however reductions of up to 47 seconds on Guild Way, generated by the removal of merging traffic and a reduction in weaving, would result in an overall net journey time saving.
- 14.4 Road safety improvements are also provided through removal of vehicular conflicts at the slip road merge on with Guild Way and conflicts between vehicles and northbound on-carriageway cyclists at the slip road diverge on Penwortham Brow.
- 14.5 The proposal is vital to enabling the delivery of high quality cycle superhighway infrastructure along the Hutton to Preston corridor where achieving Public Health England guidance to encourage the switch to active travel in place of short car journeys is highly achievable.
- 14.6 Closure of the slip supports multiple local planning policy objectives and provides synergy with existing and future investment strategies in Central Lancashire.

ANNEX A – 2022 AM traffic flow changes resulting from closure of slip road



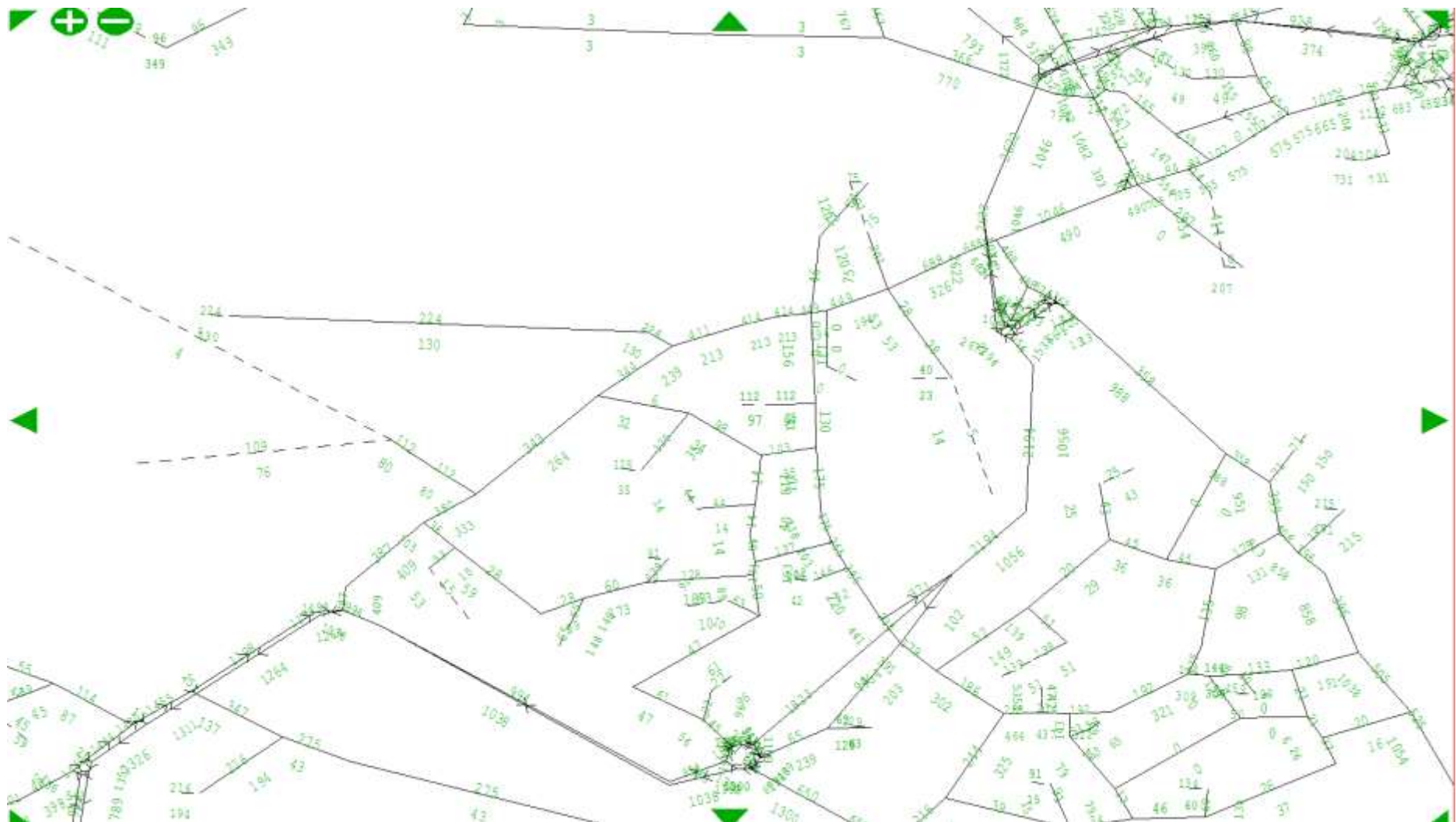
All values shown in PCU

ANNEX B – 2022 PM traffic flow changes resulting from closure of slip road



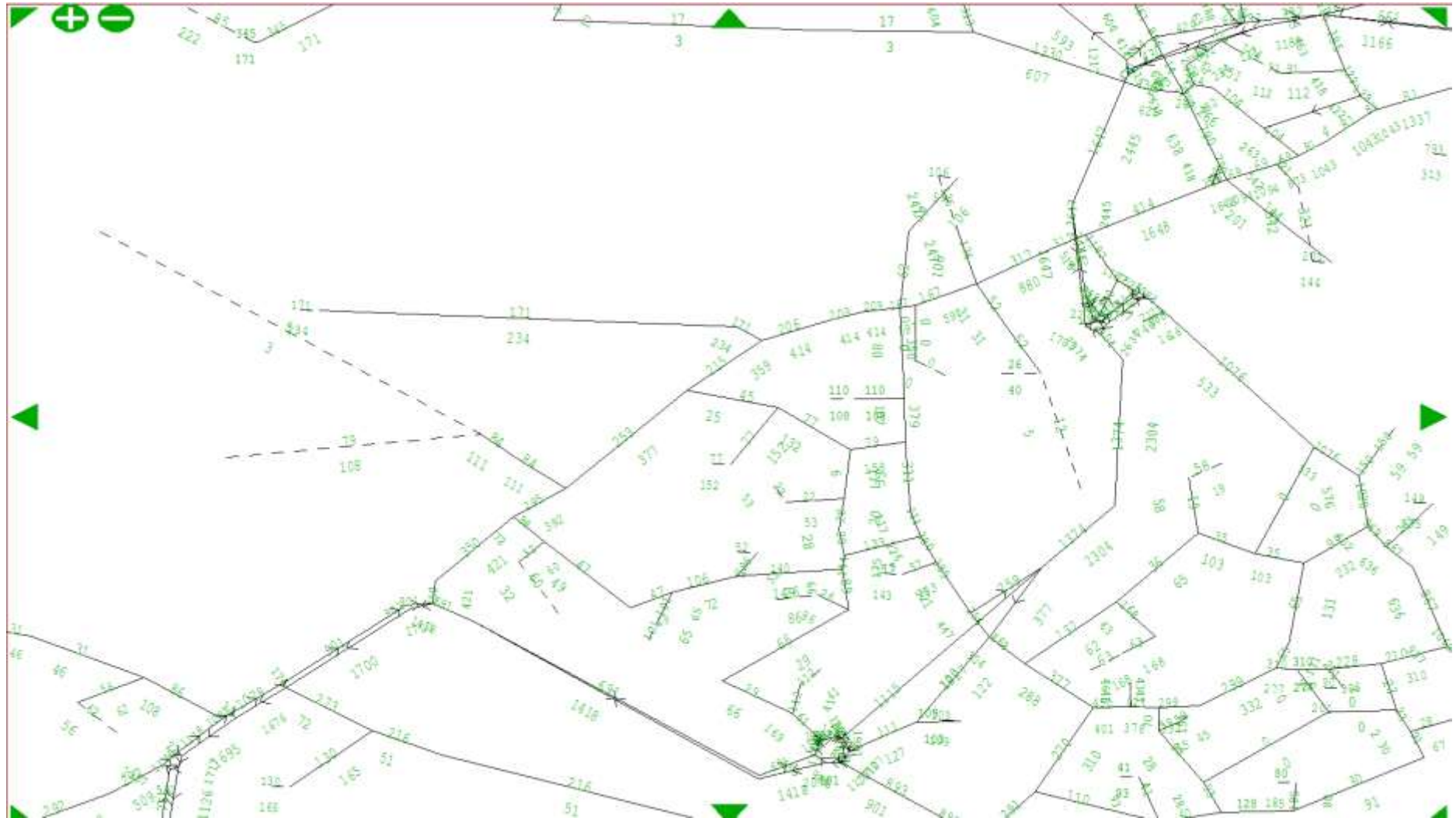
All values shown in PCU

ANNEX C – 2022 AM total traffic flow without slip road



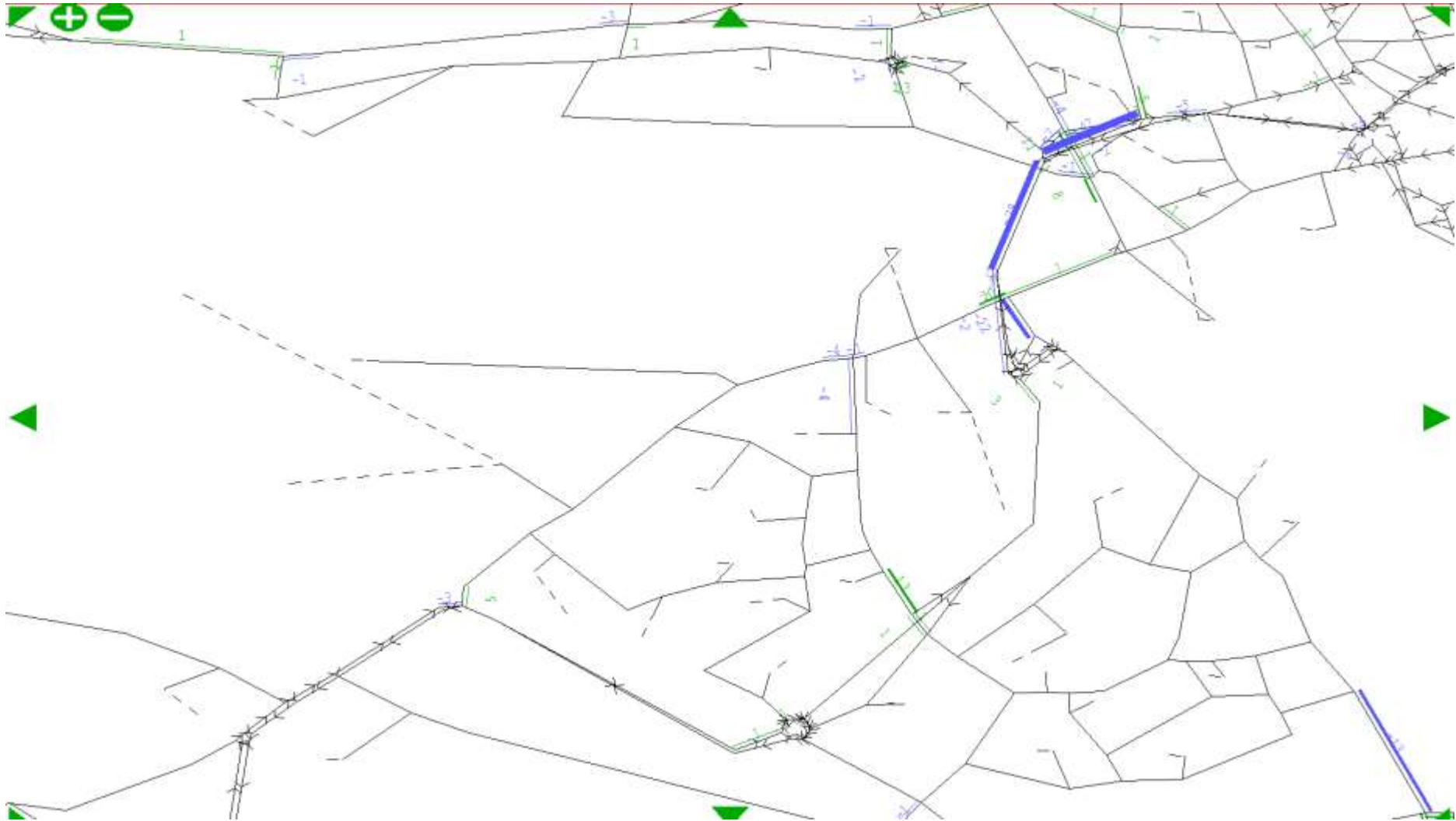
All values shown in PCU

ANNEX D – 2022 PM total traffic flow without slip road



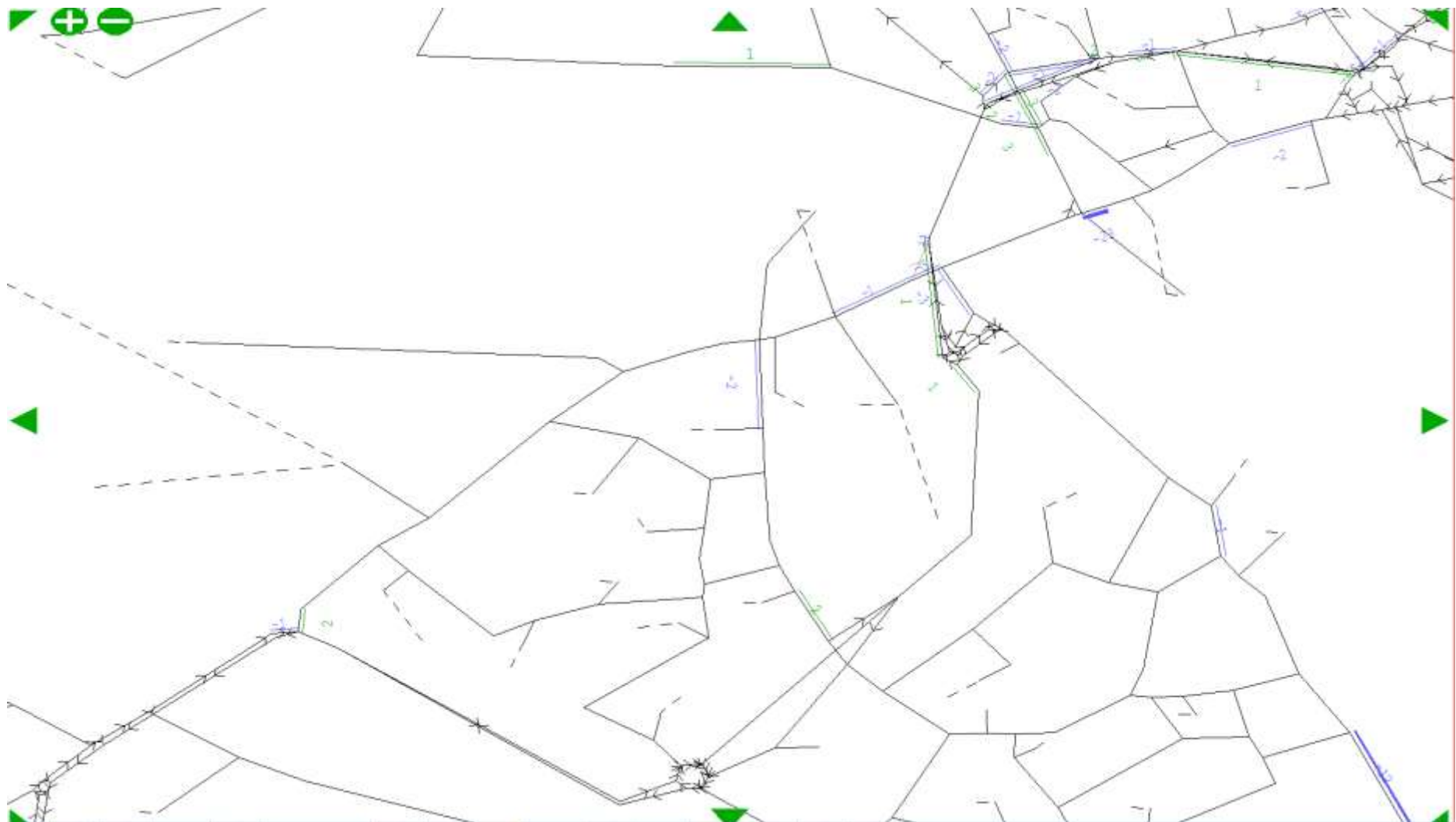
All values shown in PCU

ANNEX E – 2022 AM delay time changes resulting from closure of slip road



All values shown in time (seconds)

ANNEX F – 2022 PM delay time changes resulting from closure of slip road



All values shown in time (seconds)

Basic Results Summary
ANNEX G – Penwortham Triangle Junction Modelling Report

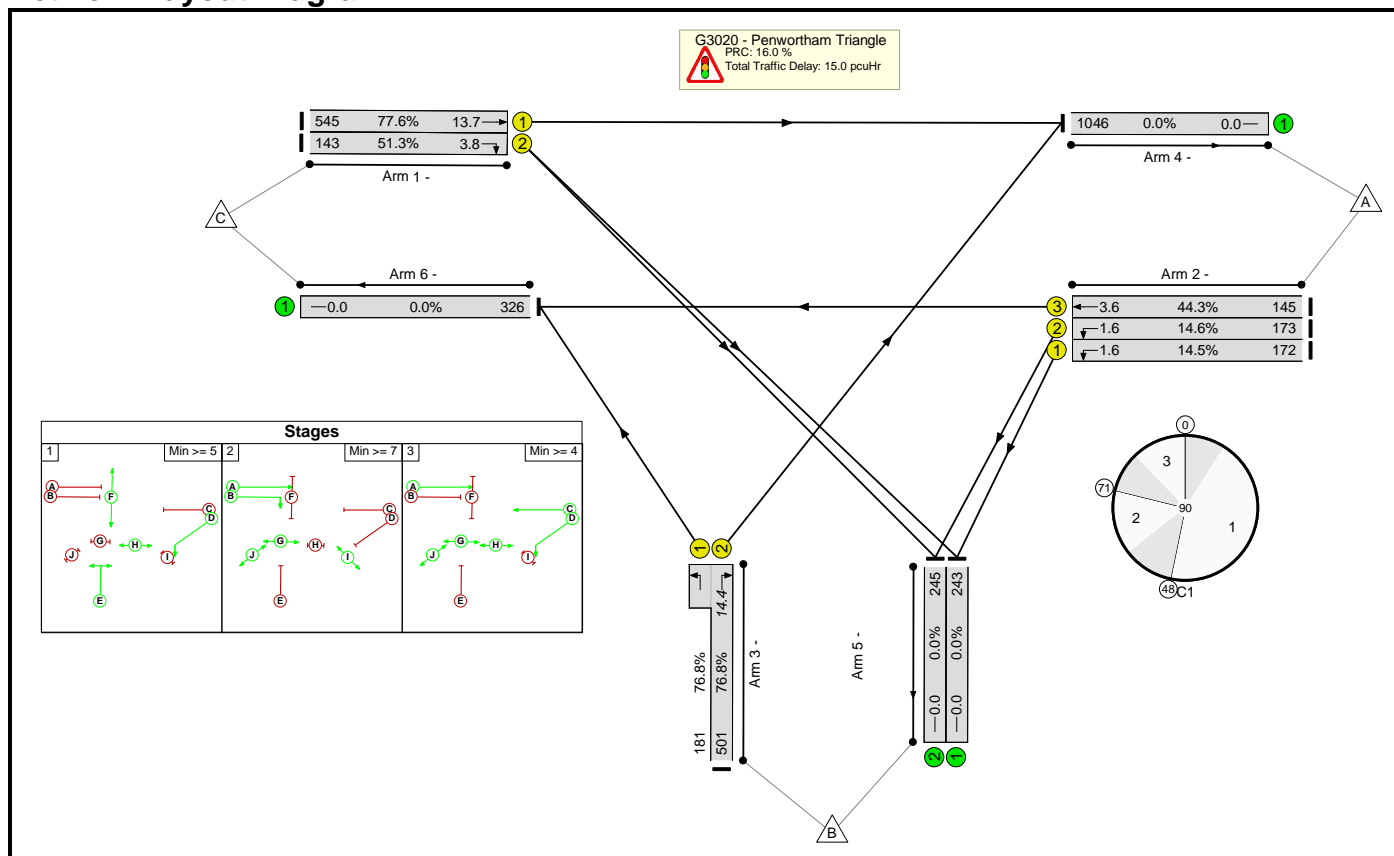
Basic Results Summary

User and Project Details

Project:	CLM13 Penwortham Triangle
Title:	Penwortham Triangle proposed junction arrangement
Location:	Liverpool Road / Leyland Road
Flow Details:	CLTM v1115
Additional detail:	Proposed junction arrangement
File name:	Penwortham Triangle - Junction A_Liverpool Road DS_slip closed (Saturn v1115 update).lsg3x
Author:	R Askew
Company:	LCC
Address:	County Hall, Preston, UK

Scenario 1: '2022 AM v1115' (FG3: '2022 AM updated', Plan 1: 'Network Control Plan 1')

Network Layout Diagram

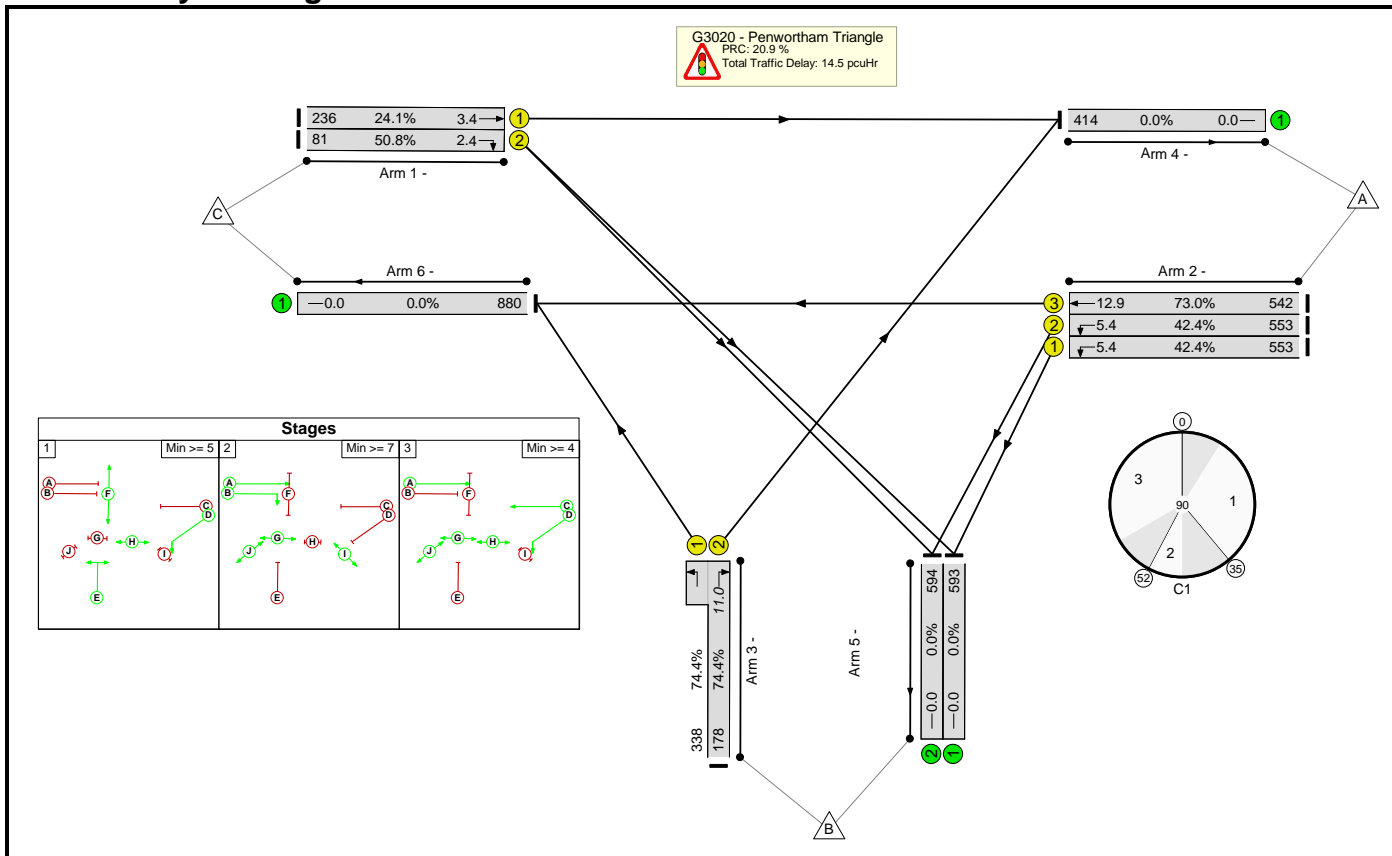


Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)														
Network: Penwortham Triangle	-	-	-		-	-	-	-	-	-	77.6%	0	0	0	15.0	-	-														
G3020 - Penwortham Triangle	-	-	-		-	-	-	-	-	-	77.6%	0	0	0	15.0	-	-														
1/1	Ahead	U	A		1	32	-	545	1915	702	77.6%	-	-	-	5.5	36.4	13.7														
1/2	Right	U	B		1	13	-	143	1793	279	51.3%	-	-	-	1.9	48.0	3.8														
2/1	Left	U	D		1	60	-	172	1752	1187	14.5%	-	-	-	0.3	7.0	1.6														
2/2	Left	U	D		1	60	-	173	1752	1187	14.6%	-	-	-	0.3	7.0	1.6														
2/3	Ahead	U	C		1	14	-	145	1965	327	44.3%	-	-	-	1.8	43.6	3.6														
3/2+3/1	Right Left	U	E		1	41	-	682	1750:2011	653+236	76.8 : 76.8%	-	-	-	5.2	27.4	14.4														
<table style="width:100%; border:none;"> <tr> <td style="width:20%; text-align:center;">C1</td> <td style="width:20%;">PRC for Signalled Lanes (%):</td> <td style="width:10%; text-align:right;">16.0</td> <td style="width:20%;">Total Delay for Signalled Lanes (pcuHr):</td> <td style="width:10%; text-align:right;">15.04</td> <td style="width:20%;">Cycle Time (s):</td> <td style="width:10%; text-align:right;">90</td> </tr> <tr> <td></td> <td>PRC Over All Lanes (%):</td> <td style="text-align:right;">16.0</td> <td>Total Delay Over All Lanes (pcuHr):</td> <td style="text-align:right;">15.04</td> <td></td> <td></td> </tr> </table>																		C1	PRC for Signalled Lanes (%):	16.0	Total Delay for Signalled Lanes (pcuHr):	15.04	Cycle Time (s):	90		PRC Over All Lanes (%):	16.0	Total Delay Over All Lanes (pcuHr):	15.04		
C1	PRC for Signalled Lanes (%):	16.0	Total Delay for Signalled Lanes (pcuHr):	15.04	Cycle Time (s):	90																									
	PRC Over All Lanes (%):	16.0	Total Delay Over All Lanes (pcuHr):	15.04																											

Network Layout Diagram



Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: Penwortham Triangle	-	-	-		-	-	-	-	-	-	74.4%	0	0	0	14.5	-	-
G3020 - Penwortham Triangle	-	-	-		-	-	-	-	-	-	74.4%	0	0	0	14.5	-	-
1/1	Ahead	U	A		1	45	-	236	1915	979	24.1%	-	-	-	1.0	14.7	3.4
1/2	Right	U	B		1	7	-	81	1793	159	50.8%	-	-	-	1.4	61.8	2.4
2/1	Left	U	D		1	66	-	553	1752	1304	42.4%	-	-	-	1.0	6.7	5.4
2/2	Left	U	D		1	66	-	553	1752	1304	42.4%	-	-	-	1.0	6.7	5.4
2/3	Ahead	U	C		1	33	-	542	1965	742	73.0%	-	-	-	5.0	32.9	12.9
3/2+3/1	Right Left	U	E		1	28	-	516	1750:2011	239+454	74.4 : 74.4%	-	-	-	5.1	35.8	11.0
C1					PRC for Signalled Lanes (%):			20.9	Total Delay for Signalled Lanes (pcuHr):			14.49	Cycle Time (s):		90		
					PRC Over All Lanes (%):			20.9	Total Delay Over All Lanes(pcuHr):			14.49					

Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-		-	-	-	-	-	-	61.6%	273	675	34	13.3	-	-
Strand Road / Fishergate Hill	-	-	-		-	-	-	-	-	-	61.6%	273	675	34	13.3	-	-
1/1		U	-		-	-	-	236	2080	2080	11.3%	-	-	-	0.1	1.0	0.1
1/2		U	-		-	-	-	254	1940	1940	13.1%	-	-	-	0.1	1.1	0.1
2/1	Liverpool Rd Left	O	G		1	75	-	775	1940	1257	61.6%	234	507	34	1.5	7.0	5.8
2/2	Liverpool Rd Right Ahead	O	F		1	28	-	267	2120	434	61.5%	39	168	0	2.6	35.2	5.9
3/1		U	-		-	-	-	1078	1940	1940	55.6%	-	-	-	0.7	2.3	5.1
4/1	Strand Rd Right Left	U	A		1	9	-	57	2120	236	24.2%	-	-	-	0.7	46.6	1.5
4/2	Strand Rd Right Ahead	U	A		1	9	-	55	2120	236	23.3%	-	-	-	0.7	46.5	1.4
5/2+5/1	Broadgate Left Ahead	U	D E		1	9	-	0	2120:2120	224+224	0.0 : 0.0%	-	-	-	0.0	0.0	0.0
6/1		U	-		-	-	-	207	1940	1940	10.7%	-	-	-	0.1	1.0	0.1
7/1		U	-		-	-	-	84	2120	2120	4.0%	-	-	-	0.0	0.9	0.0
8/1	Fishergate Hill Left	O	-		-	-	-	0	1940	1610	0.0%	0	0	0	0.0	0.0	0.0
8/2	Fishergate Hill Ahead	U	B		1	24	-	203	2120	589	34.5%	-	-	-	1.7	30.6	4.3
8/3	Fishergate Hill Ahead	U	B		1	24	-	199	2120	589	33.8%	-	-	-	1.7	30.5	4.2
8/4	Fishergate Hill Right	U	C		1	20	-	303	2120	495	61.3%	-	-	-	3.4	40.2	7.5
Ped Link: P1	Unnamed Ped Link	-	M		1	7	-	0	-	0	0.0%	-	-	-	-	-	-
Ped Link: P2	Unnamed Ped Link	-	K		1	7	-	0	-	0	0.0%	-	-	-	-	-	-

Basic Results Summary

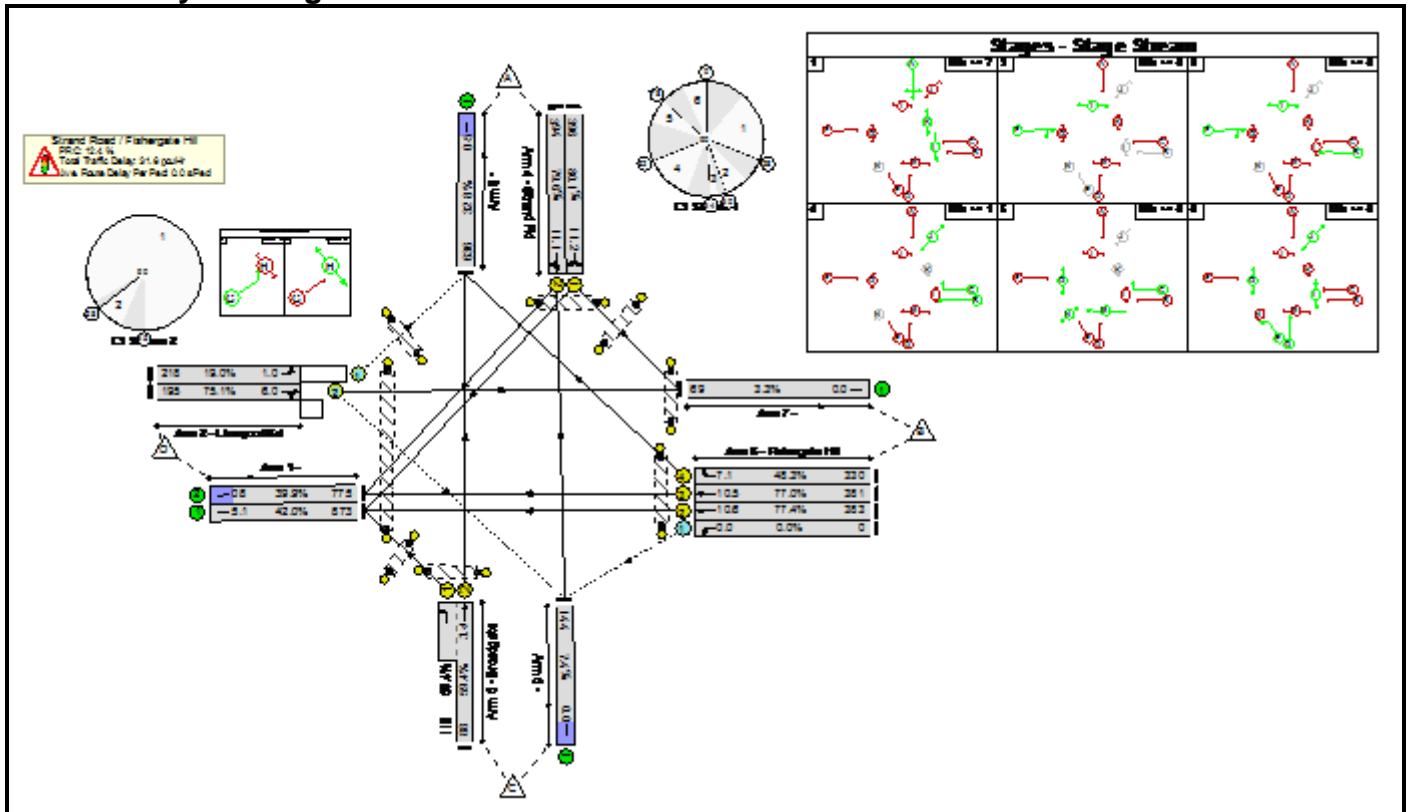
Ped Link: P3	Unnamed Ped Link	-	O		1	20	-	0	-	0	0.0%	-	-	-	-	-	-
Ped Link: P4	Unnamed Ped Link	-	N		1	16	-	0	-	0	0.0%	-	-	-	-	-	-
Ped Link: P5	Unnamed Ped Link	-	L		1	25	-	0	-	0	0.0%	-	-	-	-	-	-
Ped Link: P6	Unnamed Ped Link	-	J		2	24	-	0	-	0	0.0%	-	-	-	-	-	-
Ped Link: P7	Unnamed Ped Link	-	I		1	27	-	0	-	0	0.0%	-	-	-	-	-	-
Ped Link: P8	Unnamed Ped Link	-	H		1	7	-	0	-	0	0.0%	-	-	-	-	-	-

C1	Stream: 1 PRC for Signalled Lanes (%):	46.2	Total Delay for Signalled Lanes (pcuHr):	10.85	Cycle Time (s):	90
C1	Stream: 2 PRC for Signalled Lanes (%):	46.0	Total Delay for Signalled Lanes (pcuHr):	1.51	Cycle Time (s):	90
	PRC Over All Lanes (%):	46.0	Total Delay Over All Lanes(pcuHr):	13.28		

Basic Results Summary

Scenario 2: '2022 PM' (FG2: 'PM 2022', Plan 1: 'Network Control Plan 1')

Network Layout Diagram



Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-		-	-	-	-	-	-	80.1%	131	221	10	31.6	-	-
Strand Road / Fishergate Hill	-	-	-		-	-	-	-	-	-	80.1%	131	221	10	31.6	-	-
1/1		U	-		-	-	-	873	2080	2080	42.0%	-	-	-	0.4	1.5	5.1
1/2		U	-		-	-	-	775	1940	1940	39.9%	-	-	-	0.4	1.8	0.8
2/1	Liverpool Rd Left	O	G		1	75	-	218	1940	1144	19.0%	99	109	10	0.2	3.5	1.0
2/2	Liverpool Rd Right Ahead	O	F		1	11	-	195	2120	260	75.1%	32	112	0	3.6	67.3	6.0
3/1		U	-		-	-	-	636	1940	1940	32.8%	-	-	-	0.3	1.4	0.5
4/1	Strand Rd Right Left	U	A		1	20	-	396	2120	495	80.1%	-	-	-	5.5	50.1	11.2
4/2	Strand Rd Right Ahead	U	A		1	20	-	394	2120	495	79.6%	-	-	-	5.4	49.7	11.1
5/2+5/1	Broadgate Left Ahead	U	D E		1	7	-	200	2120:2120	148+188	59.4 : 59.4%	-	-	-	2.9	52.3	3.4
6/1		U	-		-	-	-	144	1940	1940	7.4%	-	-	-	0.0	1.0	0.0
7/1		U	-		-	-	-	69	2120	2120	3.3%	-	-	-	0.0	0.9	0.0
8/1	Fishergate Hill Left	O	-		-	-	-	0	1940	1341	0.0%	0	0	0	0.0	0.0	0.0
8/2	Fishergate Hill Ahead	U	B		1	20	-	383	2120	495	77.4%	-	-	-	5.1	47.9	10.6
8/3	Fishergate Hill Ahead	U	B		1	20	-	381	2120	495	77.0%	-	-	-	5.0	47.6	10.5
8/4	Fishergate Hill Right	U	C		1	28	-	330	2120	683	48.3%	-	-	-	2.7	29.6	7.1

Basic Results Summary

Ped Link: P1	Unnamed Ped Link	-	M		1	7	-	0	-	0	0.0%	-	-	-	-	-	-
Ped Link: P2	Unnamed Ped Link	-	K		1	18	-	0	-	0	0.0%	-	-	-	-	-	-
Ped Link: P3	Unnamed Ped Link	-	O		1	18	-	0	-	0	0.0%	-	-	-	-	-	-
Ped Link: P4	Unnamed Ped Link	-	N		1	16	-	0	-	0	0.0%	-	-	-	-	-	-
Ped Link: P5	Unnamed Ped Link	-	L		1	34	-	0	-	0	0.0%	-	-	-	-	-	-
Ped Link: P6	Unnamed Ped Link	-	J		2	30	-	0	-	0	0.0%	-	-	-	-	-	-
Ped Link: P7	Unnamed Ped Link	-	I		1	10	-	0	-	0	0.0%	-	-	-	-	-	-
Ped Link: P8	Unnamed Ped Link	-	H		1	7	-	0	-	0	0.0%	-	-	-	-	-	-
				C1	Stream: 1 PRC for Signalled Lanes (%):			12.4	Total Delay for Signalled Lanes (pcuHr):			30.36	Cycle Time (s):			90	
				C1	Stream: 2 PRC for Signalled Lanes (%):			372.5	Total Delay for Signalled Lanes (pcuHr):			0.21	Cycle Time (s):			90	
					PRC Over All Lanes (%):			12.4	Total Delay Over All Lanes(pcuHr):			31.65					

ANNEX I – Microsimulation Modelling Snapshots

2022 AM Network 08:35 to 08:40



2022 PM Network 17:25 to 17:30

