

Temple Way LinSig Modelling Summary

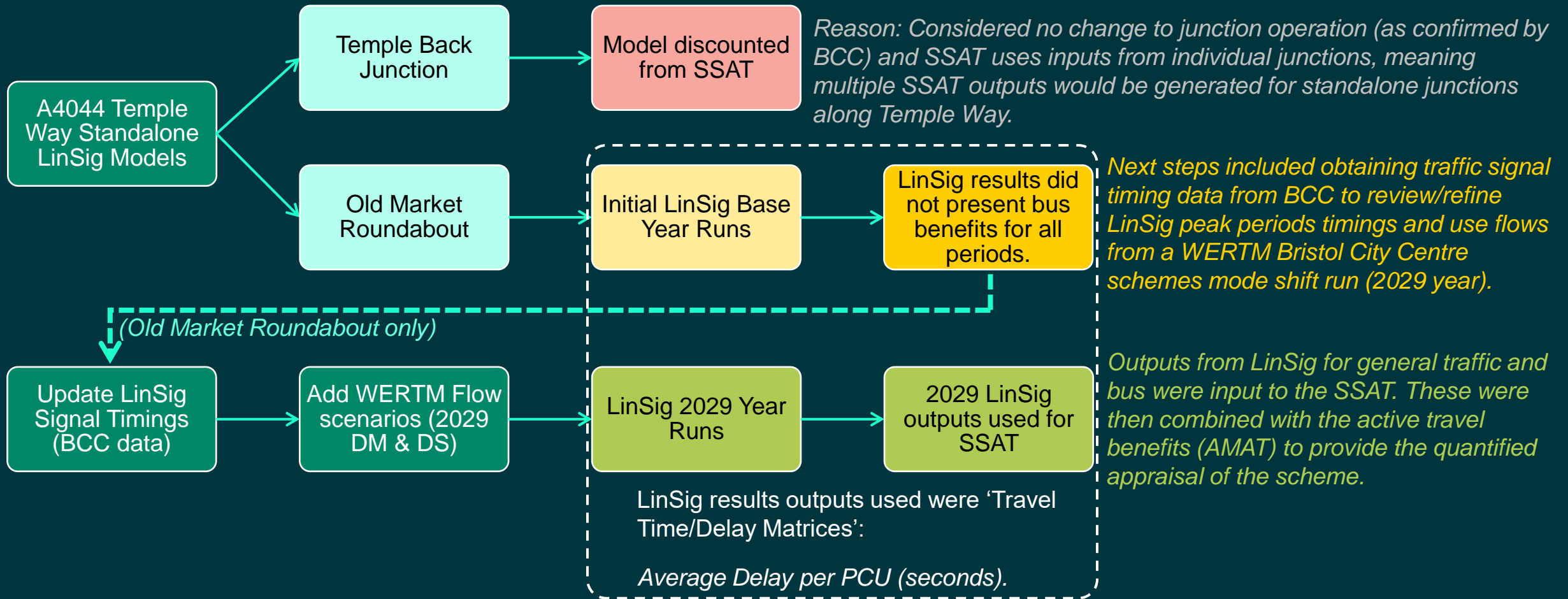
Bristol City Centre Transport Changes

Full Business Case (FBC) Supporting Documents

Bristol City Council

December 2024

Executive Summary



Note: This document provides an overview to the LinSig modelling undertaken to provide inputs for the scheme appraisal. It does not detail the Business Case DfT Small Schemes Appraisal Toolkit (SSAT) process and quantified appraisal itself.

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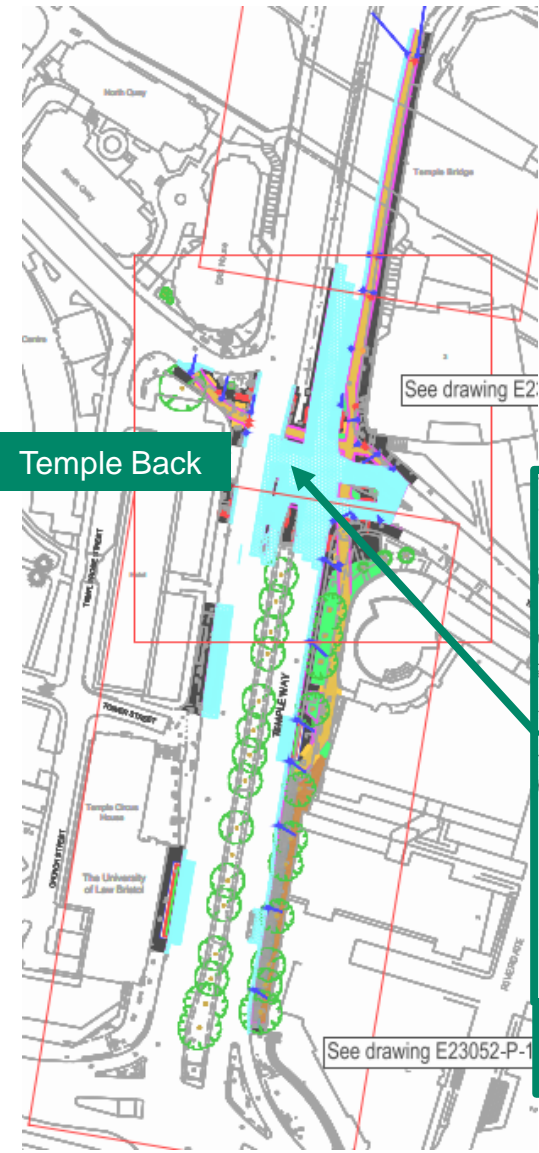
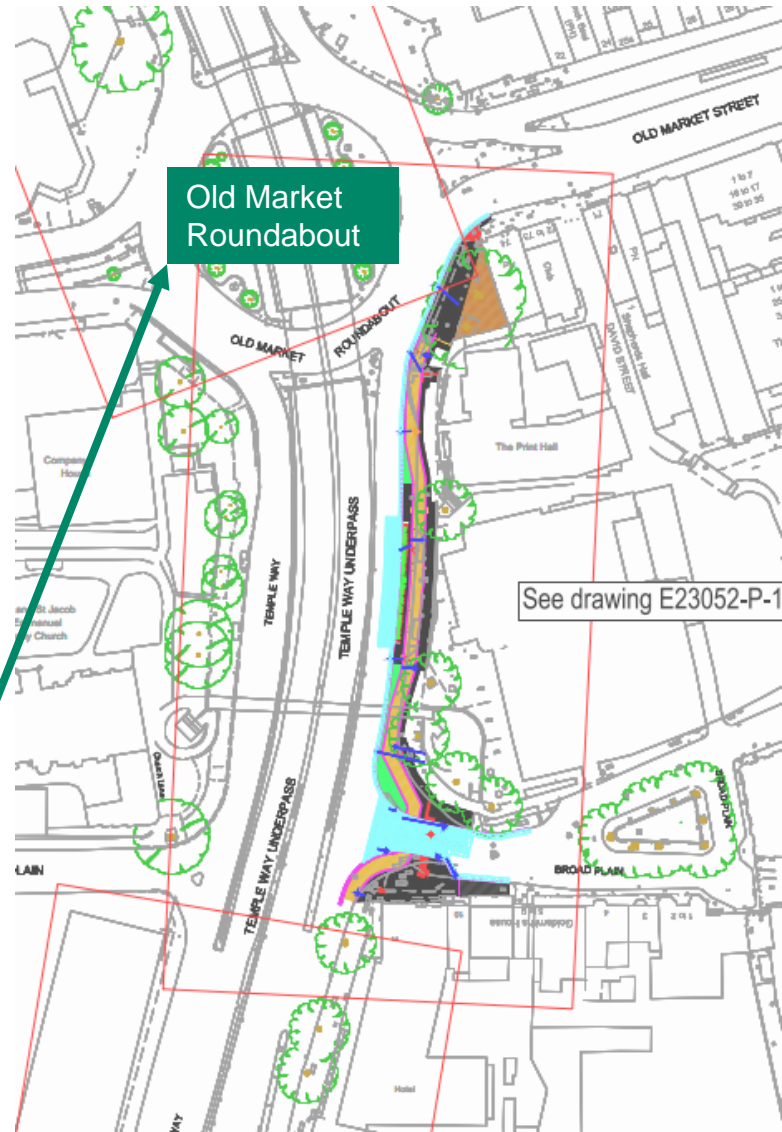
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LinSig Models Overview

Temple Way models received, reviewed and updates:

- a. Temple Back model received
- b. Temple Back model discounted
- c. Old Market Roundabout model received
- d. Old Market Roundabout model review
- e. Old Market Roundabout model updates, initial results and next steps

Temple Way Scheme Design (at LinSig Junctions)



Main changes to highway layout

Widened bus lane to bypass bus stops (loss of traffic lane)

Bus hatching on circulatory stop line

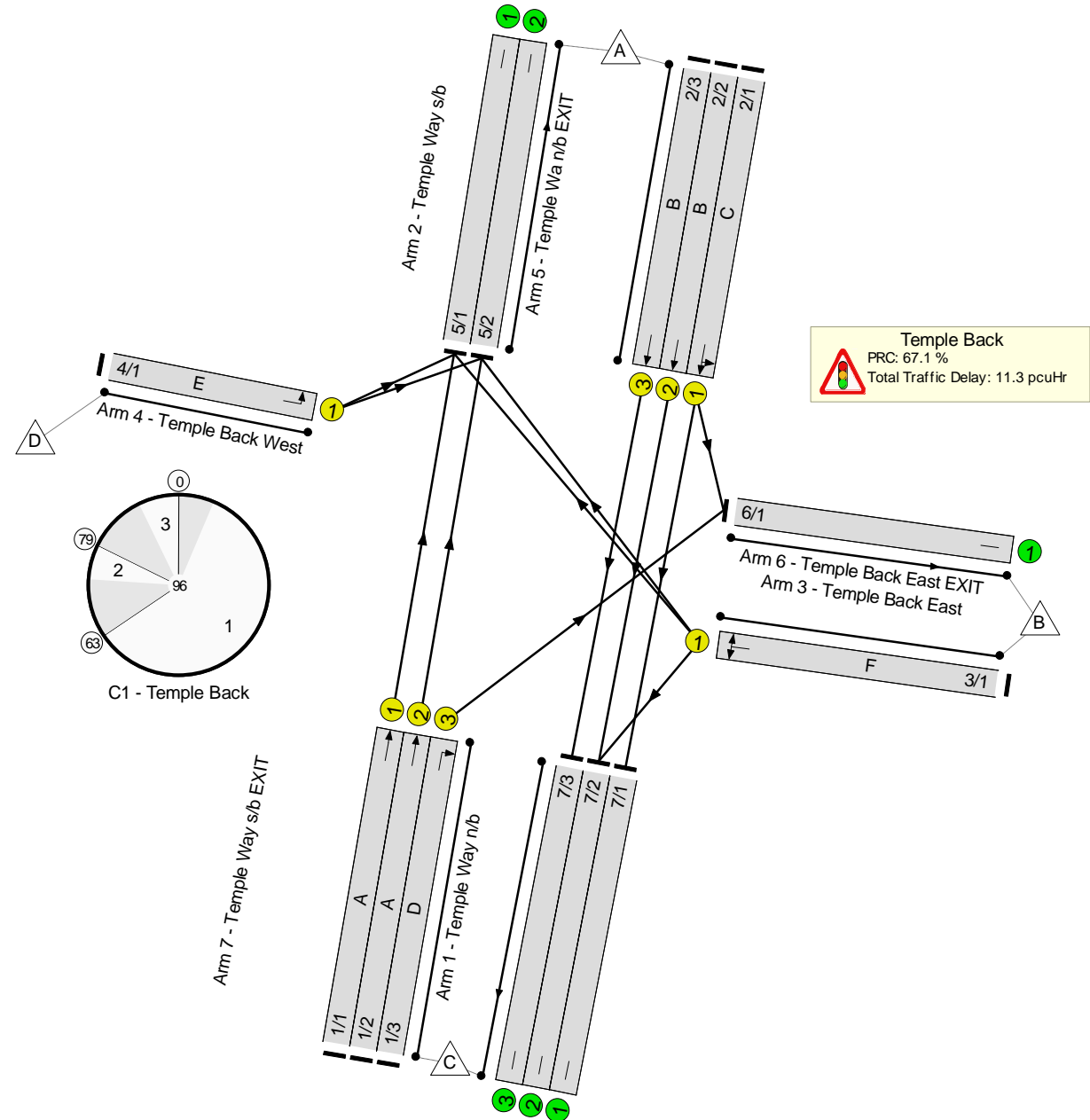
Cycle crossings to run 2-stage as per existing ped. crossings.

1a

Temple Back LinSig Overview

A summary of the BCC LinSig received:

- Single LinSig model received (*Temple Way-TempleBack_CycleCrossing.lsg3x*).
- No coding changes between scenarios.
- ‘Base’ scenarios 1 and 2 (AM and PM only) represented 2013 flows.
- Cycle crossing scenarios 3 to 5 (AM, PM, IP) used 2022 flows.
- As summarised on the next page, BCC noted proposals at this junction would represent no change to junctions' signal control staging.
- Alongside this, the SSAT would require a standalone process, *therefore this model was excluded from the assessment.*



Temple Way Corridor – Temple Back LinSig Discounted

The A4044 Temple Way/Temple Back signalised junction was discounted from the SSAT process as it would have provided outputs for each junction on an isolated scheme basis.

Furthermore, the BCC Traffic Signal team confirmed the proposals at the Temple Back junction would not change the existing traffic signal operation; i.e. the proposed cycle crossings will effectively run in a two-stage crossing operation (in parallel as per the existing pedestrian crossing facilities).

BCC did assess the viability of running the cycle crossings as a single stage (requires a traffic all-red), but this approach was dismissed for the following reasons:

- *It would create a 4-stage junction, which would cause difficulties coordinating with the nearby junctions (operating a 3-stage sequence). Plus, a minimum cycle time of over a minute, which could create inefficiencies for all users outside of the peak hours.*
- *Loss of approx. 17 seconds green time for the Temple Way southbound movement every cycle of the signals, therefore, would introduce delay to buses regardless of junction capacity.*
- *It could also present a slower crossing option for peds and cycles across Temple Back east. At the existing 2-stage crossing, the southern crossing (across the Temple Back East stop line) is typically be green for 70 out of 90 seconds. The northern crossing is green for 8 seconds, but as it is across a single lane that is only lightly trafficked, most will cross unaided in gaps. A single stage crossing will only be green for 8 seconds and as it is across 2 lanes you will have less opportunity to cross in gaps, so more likely to have to wait for the green man.*

1d Old Market Roundabout LinSig Review

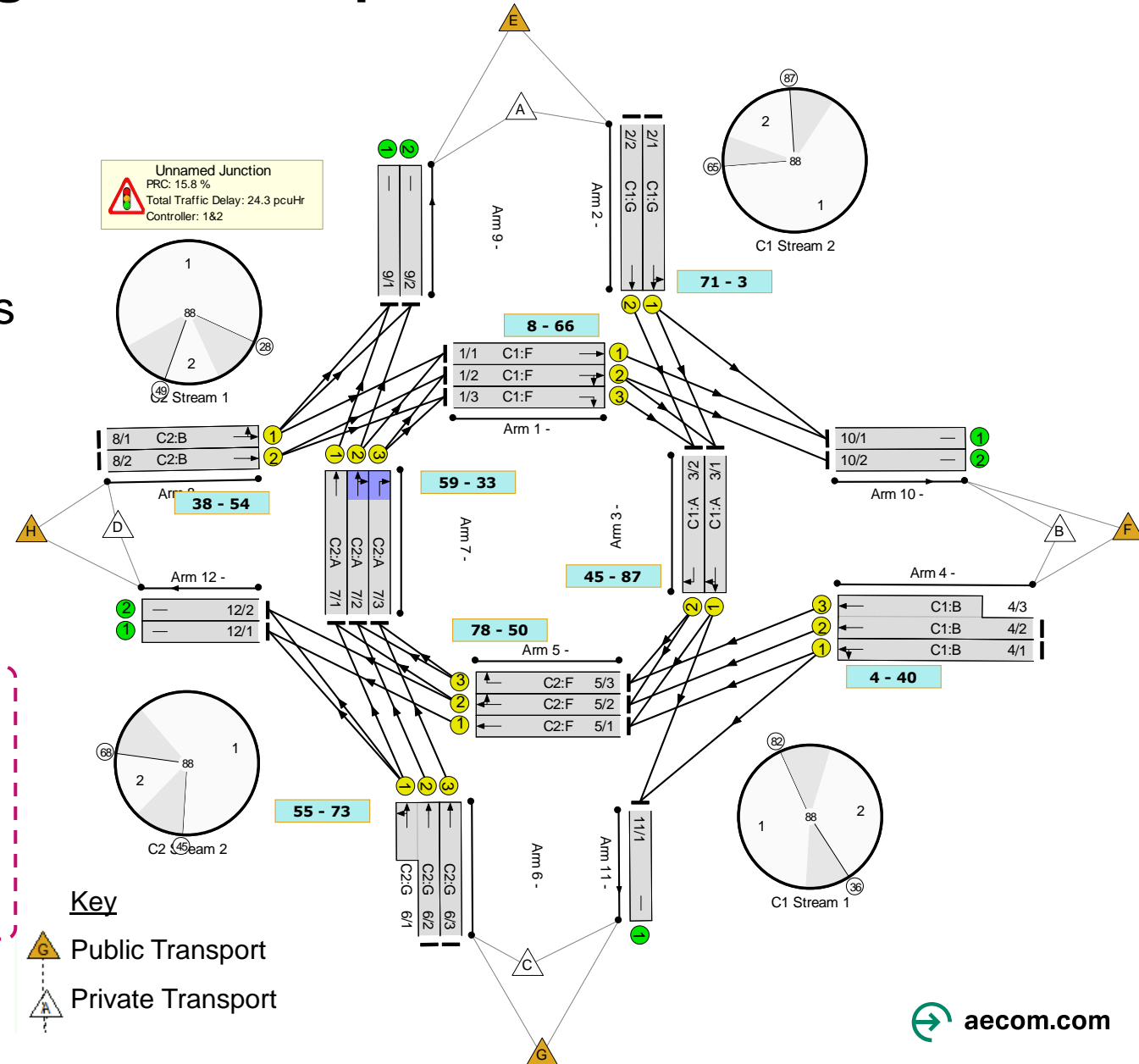
AECOM reviewed the models received (DM and DS) scenarios and compiled a list of queries which were discussed and clarified by BCC, with some items actioned by AECOM to update the suitability of the model for FBC. The Temple Back LinSig was excluded from this assessment by this point.

Query	BCC Clarification / Action
AM/PM Flows – unable to exactly match model peak hours to the respective survey results	Peak movements used and combined. Peak hour to be used instead.
IP flows – assume average 10am-4pm	Yes. Only for 2019 Base scenarios. AECOM to add 2023 IP for DM/DS.
Presume Base signal timings derived from on-street logs? Or from CLF plans/other?	Yes.
Link/lane coding default lengths (60pcu, except short lanes). Use of lane connector mean cruise times applied throughout.	Confirmed based on calculations. AECOM will not adjust Base or Scheme study area extent or coding lane lengths/cruise time calcs.
Scheme timings – manually adjusted timings/offsets? Any optimisation (PRC)?	Manual adjustments/refinement. AECOM to adjust timings as necessary / consider impacts of optimising junction.
Different cycle times between different peak scenarios	Focused on AM/PM. BCC provided signal timing outputs for AECOM to update model for scenario testing and future year assessments.
Scheme option – bus movements were not locked in some scenarios / inconsistent routing.	AECOM to update so consistent between all periods.
Initial use of outputs tested in SSAT generally reporting negative BCRs.	AECOM to split demand matrices to quantify specific bus JTs/delays.

Old Market Roundabout LinSig – AECOM Updates

- Base (DM) scenarios updated to utilise the 2023 flows used in the scheme scenario.
- All scenarios demand matrices were split to private vehicles and public transport demands (all in PCUs). This utilised the 2023 count data to define the bus flows. *A summary of this is shown on the next page.*
- This approach to split matrix demands was adopted to facilitate a more detailed results analysis of specific bus journey times/delays.
- Recent signal controller timings provided by BCC from their UTC system. Timings and offsets analysed and applied to the Base AM, PM and IP scenarios.

Undertaken after initial 2023 scenario runs and to provide an improved starting position of 2029 scenarios assessment.



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Old Market Roundabout LinSig – AECOM Updates: 2023 Bus Flows



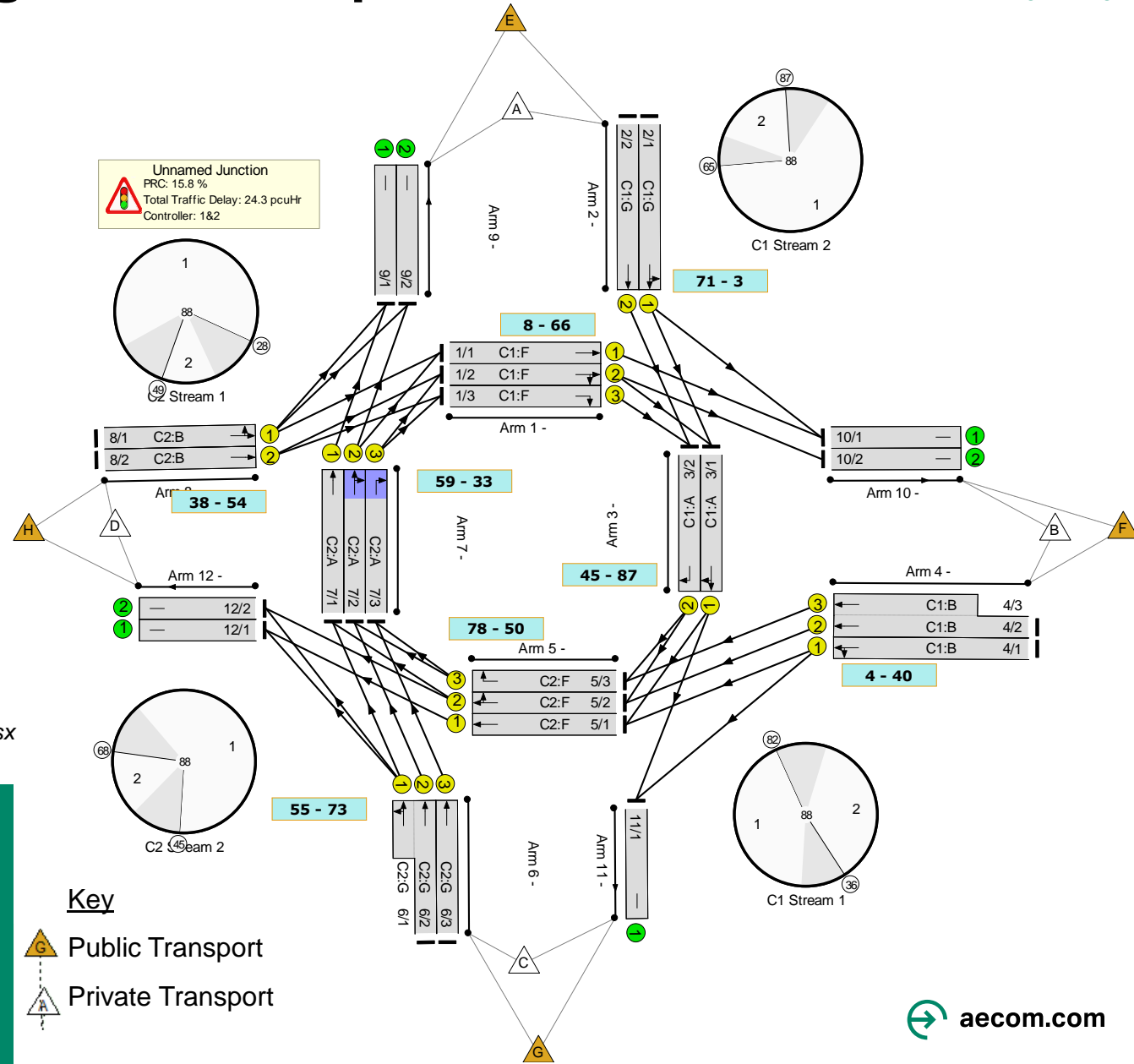
AM 08:00 to 09:00	BUS	E	F	G	H	Tot
	E	6	2	2	0	10
	F	58	0	2	2	62
	G	16	4	0	0	20
	H	2	64	8	0	74
	Tot	82	70	12	2	166

IP Average Hour (10:00 to 16:00)	BUS	E	F	G	H	Tot
	E	2	0	1	0	3
	F	60	0	0	4	64
	G	25	2	0	1	28
	H	0	56	16	0	72
Tot	87	58	17	5	167	

PM 17:00 to 18:00	BUS	E	F	G	H	Tot
	E	2	0	2	0	4
	F	52	0	0	2	54
	G	24	0	2	4	30
	H	0	52	20	0	72
Tot	78	52	24	6	160	

- All bus flows are in PCU values
- Flow matrices derived from BCC traffic survey programme at Old Market Roundabout on Wednesday 6th September 2023. Survey results spreadsheet: JTC Old Mkt Rbt 06.09.23.xlsx
- Noted the count may capture some other bus/coaches not specifically timetable services.

- Split 2023 flows to 2x matrices; general traffic and bus, to ascertain area of influence journey time/delays for private and public transport.
- This retained use of the 2023 junction count at Old Market Roundabout.
- The junction counts observed Public Service Vehicles (PSV) flow was used and factored for PCU input to LinSig.



Old Market Roundabout LinSig – AECOM Updates: 2023 Summary

- Initial LinSig runs were undertaken using the split 2023 demand scenarios *i.e. this did not take account of any traffic rerouting.*
- However, analysis of LinSig delay results were showing increases to general traffic delays, whilst marginal changes to bus delays. It was understood some of these differences may have been associated to different signals cycle times between DM and DS scenarios (inter-peak for example).
- Therefore, next steps included:
 - Revisiting the signals staging, cycle times in more detail between the peaks (particularly the IP).
 - Undertake a DM and DS assessment in a forecast year scenario and strategic model run to ascertain likely rerouting/flow change through junction given the scheme proposals at this location and across the city centre.

02

LinSig Model Results

2029 Year model results

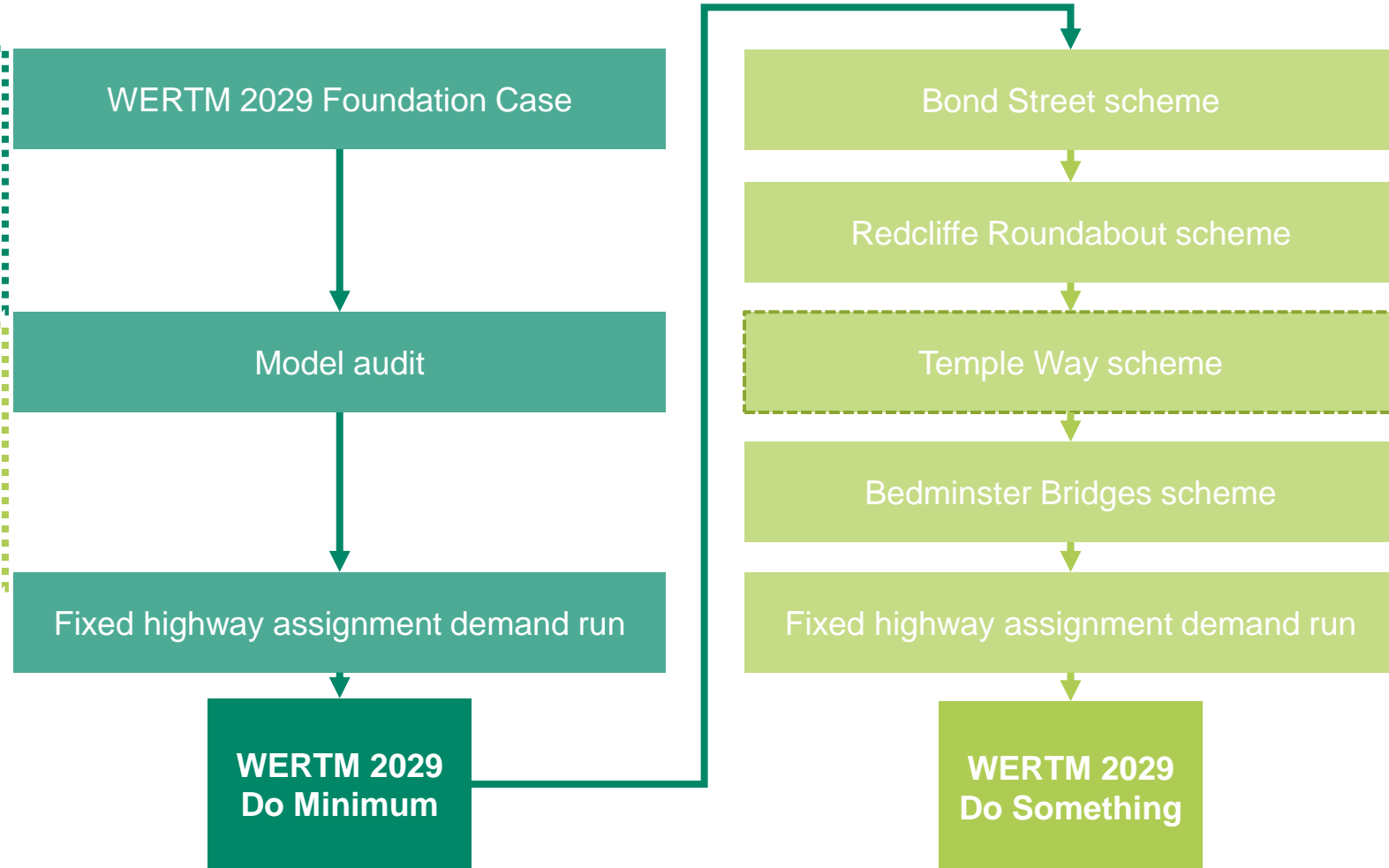
- a. WERTM 2029 forecast year flows overview
- b. Old Market Roundabout LinSig Results
- c. Results Summary

Old Market Roundabout LinSig – 2029 Year Assessment Overview

- This assessment utilised flows cordoned from the WERTM 2029-year (DM & DS) strategic modelling of the City Centre schemes. This was applicable for AM, IP and PM scenarios. *A separate Note summarises the strategic modelling undertaken of the City Centre schemes.*
- Buses retained the 'Base' LinSig flows (derived from a 2023 junction count).
- Refinements were made to signal timings to provide the optimum benefit to bus routes, whilst not impacting on the overall junction capacity and/or limiting impacts to key general traffic movements.
- Headline summaries are the 2029 DS scenarios showed a reduction in delay for buses, and some reductions in delay for some general traffic movements; it is worth noting the latter is partly related to the flow reductions in DS compared to DM (following strategic modelling rerouting of trips).

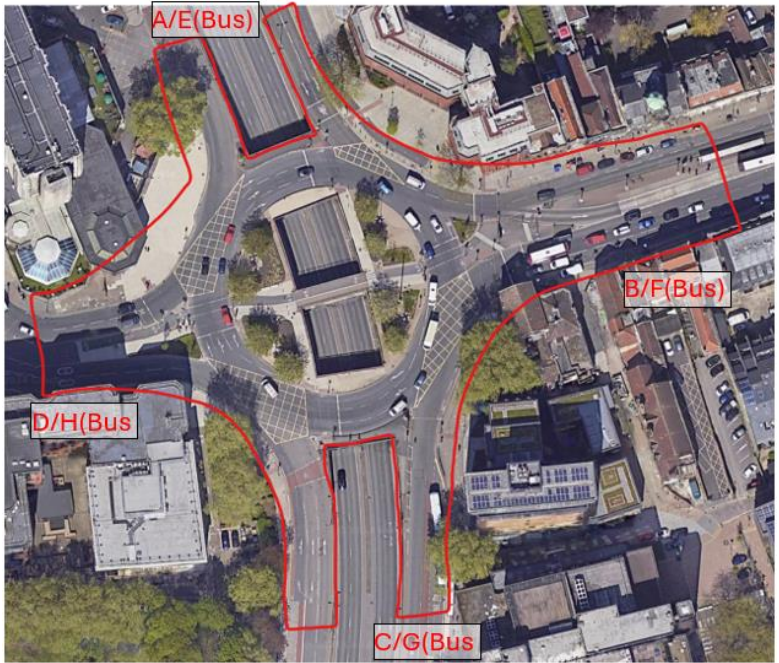
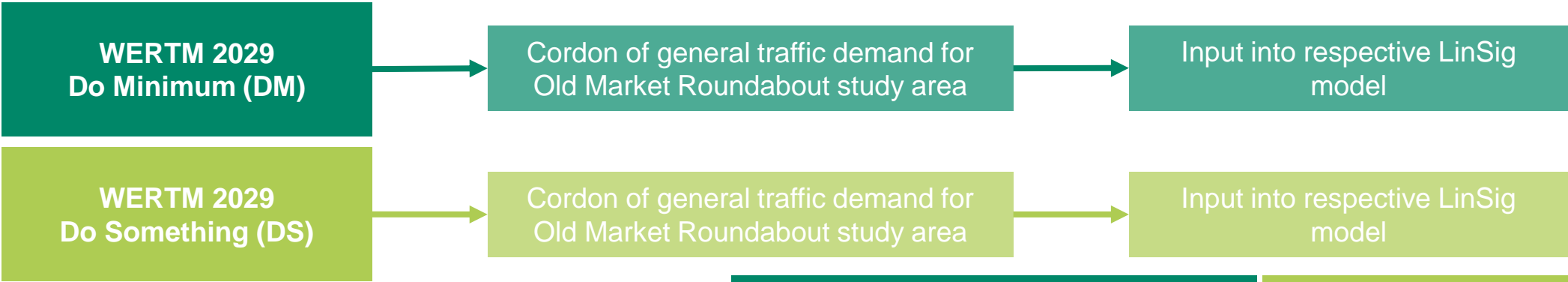
WERTM Overview – Part 1

- 2029 WERTM Do Minimum (DM) fixed highway assignment was run (includes schemes considered near certain, or more than likely to go ahead).
- 2029 WERTM Do Something (DS) fixed highway assignment was run (includes Bond Street, Temple Way, Redcliffe Roundabout and Bedminster Bridges schemes)
- Highway demand is consistent in 2029 DM and DS Scenarios. The only change between the scenarios is the impact of the schemes and therefore shows the forecast rerouting impact of the four schemes when assessed in combination.
- No Public Transport changes.



2a

WERTM Overview – Part 2



	2029 Do Minimum (DM)						2029 Do Something (DS)					
AM 08:00 to 09:00	AM	A	B	C	D	Total	AM	A	B	C	D	Total
	A	1	121	71	394	587	A	1	106	15	379	502
	B	737	41	74	288	1140	B	654	50	127	222	1053
	C	45	313	49	72	479	C	45	338	51	70	504
	D	107	25	32	38	201	D	105	27	47	22	200
	Total	889	501	226	792	2407	Total	804	520	240	694	2258
IP Average Hour (10:00 to 16:00)	IP	A	B	C	D	Total	IP	A	B	C	D	Total
	A	1	108	8	404	520	A	1	84	7	373	465
	B	528	9	47	295	879	B	543	22	99	248	913
	C	39	285	20	94	438	C	39	280	12	93	424
	D	119	74	92	58	343	D	119	94	105	25	343
	Total	687	476	167	850	2180	Total	703	480	223	740	2146
PM 17:00 to 18:00	PM	A	B	C	D	Total	PM	A	B	C	D	Total
	A	2	178	12	489	681	A	1	64	11	486	562
	B	573	21	138	255	987	B	548	45	135	279	1006
	C	59	427	57	82	625	C	60	425	57	67	610
	D	195	54	50	30	329	D	195	55	56	23	330
	Total	829	679	257	855	2621	Total	804	590	260	855	2508



Note the above matrices excludes Bus flows. Bus Origin-Destination movements (E, F, G, H) in 2029 scenarios retained the 'Base' 2023 bus demands (shown in Section 1 – derived from the 2023 junction count).

2b

Old Market LinSig 2029 Results: Average Delay (secs) Outputs/PCU



2029 Do Minimum (DM)

	AM	A	B	C	D	E	F	G	H
AM 08:00 to 09:00	A	104.0	67.9	70.9	84.5				
	B	33.9	38.2	25.2	28.3				
	C	52.8	64.2	66.8	50.4				
	D	40.4	41.9	50.5	54.7				
	E					76.8	67.9	75.0	0.0
	F					46.8	0.0	25.2	36.7
	G					70.0	82.2	0.0	0.0
	H					40.4	42.5	46.8	0.0

2029 Do Something (DS)



	AM	A	B	C	D	E	F	G	H
AM	A	97.7	50.8	54.9	68.5				
	B	39.8	42.7	17.5	21.3				
	C	53.6	66.7	70.1	47.4				
	D	40.5	41.9	98.5	113.7				
	E					74.4	50.8	73.0	0.0
	F					35.6	0.0	17.5	25.5
	G					68.1	81.5	0.0	0.0
	H					40.5	42.4	48.6	0.0

Avg. Delay Difference (DS vs DM) (secs)

	AM	A	B	C	D	E	F	G	H
AM	A	-6.3	-17.1	-16.0	-16.0				
	B	5.9	4.5	-7.7	-7.0				
	C	0.8	2.5	3.3	-3.0				
	D	0.1	0.0	48.0	59.0				
	E					-2.4	-17.1	-2.0	0.0
	F					-11.2	0.0	-7.7	-11.2
	G					-1.9	-0.7	0.0	0.0
	H					0.1	-0.1	1.8	0.0



	IP	A	B	C	D	E	F	G	H
IP Avg. Hour (10:00 to 16:00)	A	60.5	46.3	48.4	63.9				
	B	43.7	58.9	37.8	41.0				
	C	43.5	54.7	56.7	41.2				
	D	32.8	34.5	40.2	44.7				
	E					55.3	0.0	48.8	0.0
	F					59.4	0.0	0.0	50.8
	G					66.7	79.2	0.0	41.2
	H					0.0	39.6	43.1	0.0

	IP	A	B	C	D	E	F	G	H
IP	A	68.1	46.0	50.6	66.7				
	B	53.7	46.1	21.0	24.9				
	C	45.8	50.7	52.7	34.7				
	D	25.2	26.9	66.1	83.8				
	E					64.7	0.0	59.7	0.0
	F					42.9	0.0	0.0	36.0
	G					58.1	70.4	0.0	34.7
	H					0.0	32.5	48.0	0.0

	IP	A	B	C	D	E	F	G	H
IP	A	7.6	-0.3	2.2	2.8				
	B	10.0	-12.8	-16.8	-16.1				
	C	2.3	-4.0	-4.0	-6.5				
	D	-7.6	-7.6	25.9	39.1				
	E					9.4	0.0	10.9	0.0
	F					-16.5	0.0	0.0	-14.8
	G					-8.6	-8.8	0.0	-6.5
	H					0.0	-7.1	4.9	0.0

	PM	A	B	C	D	E	F	G	H
PM 17:00 to 18:00	A	66.8	46.6	48.7	70.7				
	B	52.6	71.5	45.5	49.0				
	C	50.2	66.7	69.7	46.6				
	D	31.0	32.6	38.7	44.2				
	E					56.2	0.0	48.9	0.0
	F					76.8	0.0	0.0	63.3
	G					75.3	0.0	105.1	46.6
	H					0.0	37.5	40.5	0.0

	PM	A	B	C	D	E	F	G	H
PM	A	78.1	50.7	54.8	76.1				
	B	59.5	64.5	26.6	30.1				
	C	56.7	64.7	66.4	46.3				
	D	29.1	30.2	75.5	96.6				
	E					63.2	0.0	58.0	0.0
	F					49.2	0.0	0.0	42.6
	G					71.6	0.0	129.7	46.3
	H					0.0	34.8	46.4	0.0

	PM	A	B	C	D	E	F	G	H
PM	A	11.3	4.1	6.1	5.4				
	B	6.9	-7.0	-18.9	-18.9				
	C	6.5	-2.0	-3.3	-0.3				
	D	-1.9	-2.4	36.8	52.4				
	E					7.0	0.0	9.1	0.0
	F					-27.6	0.0	0.0	-20.7
	G					-3.7	0.0	24.6	-0.3
	H					0.0	-2.7	5.9	0.0

2c

Old Market Roundabout LinSig 2029 Results Summary

- Overall, there is a positive reduction to bus delays (average delay/PCU) through the junction in all 2029 DS peak scenarios, compared to 2029 DM.
- There are some marginal increases to bus delay on the Southbound off-slip (arm E) in the IP and PM, but these are associated to low bus flows observed and with no improved proposals on this section.
- The only bus movement which shows any notable increase to delay is a U-turn in the PM peak, which is unlikely to be a timetable bus service captured from the count (a single bus/coach).
- There are some minor reductions in delay for some general traffic movements; it is worth noting this is partly related to the flow reductions in DS compared to DM (following strategic modelling rerouting of trips).

Avg. Delay Difference (DS vs DM) (secs)

AM	A	B	C	D	E	F	G	H
A	-6.3	-17.1	-16.0	-16.0				
B	5.9	4.5	-7.7	-7.0				
C	0.8	2.5	3.3	-3.0				
D	0.1	0.0	48.0	59.0				
E					-2.4	-17.1	-2.0	0.0
F					-11.2	0.0	-7.7	-11.2
G					-1.9	-0.7	0.0	0.0
H					0.1	-0.1	1.8	0.0

IP	A	B	C	D	E	F	G	H
A	7.6	-0.3	2.2	2.8				
B	10.0	-12.8	-16.8	-16.1				
C	2.3	-4.0	-4.0	-6.5				
D	-7.6	-7.6	25.9	39.1				
E					9.4	0.0	10.9	0.0
F					-16.5	0.0	0.0	-14.8
G					-8.6	-8.8	0.0	-6.5
H					0.0	-7.1	4.9	0.0

PM	A	B	C	D	E	F	G	H
A	11.3	4.1	6.1	5.4				
B	6.9	-7.0	-18.9	-18.9				
C	6.5	-2.0	-3.3	-0.3				
D	-1.9	-2.4	36.8	52.4				
E					7.0	0.0	9.1	0.0
F					-27.6	0.0	0.0	-20.7
G					-3.7	0.0	24.6	-0.3
H					0.0	-2.7	5.9	0.0

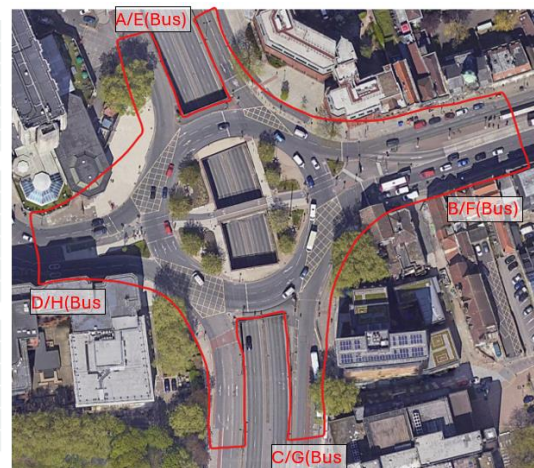
Bus flows modelled

AM 08:00 to 09:00	BUS	E	F	G	H	Tot
	E	6	2	2	0	10
	F	58	0	2	2	62
	G	16	4	0	0	20
	H	2	64	8	0	74
	Tot	82	70	12	2	166

IP Average Hour (10:00 to 16:00)	BUS	E	F	G	H	Tot
	E	2	0	1	0	3
	F	60	0	0	4	64
	G	25	2	0	1	28
	H	0	56	16	0	72
	Tot	87	58	17	5	167

PM 17:00 to 18:00	BUS	E	F	G	H	Tot
	E	2	0	2	0	4
	F	52	0	0	2	54
	G	24	0	2	4	30
	H	0	52	20	0	72
	Tot	78	52	24	6	160

All bus flows are in PCU values



The average travel time/delay per PCU (in seconds) LinSig output was factored to the respective peak period vehicle trip totals to provide a 'total travel time/delay' in vehicle hours, and then used for input to the SSAT.



Appendix A

Old Market Roundabout LinSig Model 'Full Input Data & Results Output file'

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